Proceedings of National Workshop on

"PROTOCOL FOR THE VETERINARY CARE AND SAFETY OF WILD ANIMALS DURING TRANSPORTATION WITH SPECIAL REFERENCE TO DEER SPECIES"

24th to 28th January, 2011, Chennai

Organized by

Department of Wildlife Science
Madras Veterinary College
TANUVAS, Chennai - 600 007
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(in collaboration with Arignar Anna Zoological Park, Vandalur)

Sponsored by

CENTRAL ZOO AUTHORITY
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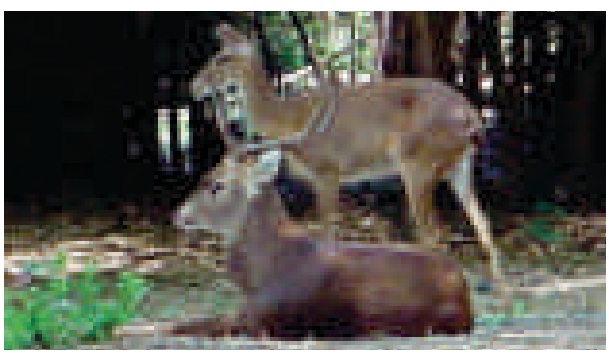

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Inaugural Session
(24th January, 2011)

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Welcome address

by

Dr.S.R.Srinivasan

Dean, Faculty of Basic Sciences

Madras Veterinary College, Chennai

I feel privileged to be here to deliver the welcome address for the national workshop on "PROTOCOL FOR VETERINARY CARE AND SAFETY OF WILD ANIMALS DURING TRANSPORTATION WITH THE SPECIAL REFERENCE TO DEER SPECIES". As a Dean, Faculty of Basic Sciences, of this institute, I would like to first welcome the participants (zoo vets) from all over India. For without you there is no workshop. The concept of the workshop has been well thought out. Though there are lots of intricacies in transporting animals, one has to shoulder the entire responsibility to ensure the safety for the handlers and security for the wildlife. Participants, please make the best opportunity of the workshop.

I would like to welcome the international resource person Dr.Carlos Sanchez, Associate Veterinarian, Chicago Zoological Society, Brookfield Zoo. He had an adventurous arrival to India yesterday night after he missed the flights. We are happy to have him here and all the participants would be looking forward to your lectures, deliberations and interactions with you. We hope you share all your experiences in this workshop and later take back fond memories of the workshop, Madras Veterinary College, Chennai and India.

I would like to welcome the second international speaker Dr. Kevin Lazarus's, Director Zoo Taiping & Night Safari, Malaysia. He is also here to deliver lectures and share his experiences with all the participants. The participants should make the best use of this golden opportunity and interact with you. In the same way we expect you to take back good memories.

I would like to welcome all the national resource persons from different parts of India for taking time off to be here and share their experiences.

The chief guest Shri. B.S. Bonal, I.F.S, Member Secretary, Central Zoo Authority of India, New Delhi is amongst us here to be a part of this important workshop. At this juncture, it's my duty to extend my heartfelt gratitude to the Member secretary, for having chosen Madras Veterinary College to organize this workshop. I definitely know that a lot of hard work has been put forth by the organizers to get this workshop into shape. The participants will be greatly benefited I am sure. For the benefit of others the member secretary has previously held different positions namely Chief Conservator of Forests rank officer, Assam

cadre, Director, Kaziranga National Park & Director, National Zoological Park, New Delhi. He has achieved quite a lot holding these posts. He is now an apt person to take CZA to great heights and ultimately wildlife will be benefited to a great extent. We welcome you Sir.

Dr. V.Irai Anbu, I.A.S. Secretary, Environment and forests Department, Govt. of Tamilnadu is a keen student of human psychology. Mr.Irai Anbu is an admirable judge of people, which is a hallmark of a good writer. He is a rare combination of a scholar and a fine administrator. "Random Thoughts" a compilation of articles written by him was recently launched by Hindu. He is really involved whole heartedly in his post and achieving quite a lot. We welcome you Sir.

I welcome our young and dynamic Vice Chancellor, Dr.R.Prbahakaran for this workshop. He has been a source of inspiration to all of us.

I welcome all the University officers, the Heads of the Department and other teaching staff. I welcome all the other staff from CZA especially Dr.Naim who has been coordinating constantly with the organizing secretary.

I welcome the media for having gathered in large numbers here and we hope thhe outcome of this workshop is given a lot of publicity.

I welcome one and all.

Release of Compendium and Special address

by

Shri.B.S.Bonal

Member Secretary, Central Zoo Authority, India

Conservation of captive wild animals is given nowadays. Significant amount of attention in our country as in case of any other country. From the past experience, it is concretely understood that the transport of wild animals especially the deer species deserves to be paid additional attention by the zoo authorities. In this context, the workshop entitled- "Protocol for the Veterinary Care and safety of Wild animals during transportation with special reference to deer species" has been sponsored in collaboration with Arignar Anna Zoological Park and is being conducted at MVC, by department of wildlife science. There is no doubt that all the zoo veterinarians who participate from different parts of this country will get immensely benefitted by this national workshop

Release of CD and Inaugural address
by
Dr.V.Iraianbu
Secretary, Department of Environment and Forests
Government of Tamilnadu

In India, there are multiple species of wild animals which particularly deserve conservation oriented remedial measures. In this aspect, it is an appreciable one that the Department of Wildlife Science in Madras Veterinary College of TANUVAS has organized this five days - Workshop at the National level entitled "PROTOCOL FOR THE VETERINARY CARE AND SAFETY OF WILD ANIMALS DURING TRANSPORTATION WITH SPECIAL REFERENCE TO DEER SPECIES" for the veterinary doctors working in various zoological parks, zoos, zoological gardens etc now.

The workshop additionally has the credit of having a good support from Central Zoo Authority of India which is sponsoring this whole event. The collaboration with Arignar Anna Zoological Park, Vandalur further will further strengthen this workshop.

Nature conservation has changed from an idealistic philosophy to serious technology. The conservation – the science that underpins the technology is still to provide all the wisdom that it must. "Earth is our mother and we are its children" is the theme taught by Vedas in our country.

There is no doubt that wild animals that are kept in the confined status in various captive wild animal places need to be given maximum care and management measures. The health status and diseases of various wild carnivores, herbivores, omnivores, reptiles, aviary species etc. are to be taken care of not only at the place of their confinement but also in the periods during transport also.

It is crystal clear that the transport of wild animals poses so much stress on the part of the wild animals, regardless of the species especially in case of the highly excitable species like spotted deer. Hence, even in this workshop, more emphasis is being given on various deer species in addition to the other species of wild animals like elephant, bear, non-human primates etc.

The charm of visiting the zoological parks or zoos is never going to diminish as they are indisputably capable of mesmerising every one visiting the captive wild animal places. Ultimately it is the children who need and wants to see different wild animals in one place like a zoo.

Since mortality may be an inevitable, sometimes due to multiple associated factors during transport, the conducting of workshop like this at TANUVAS which is a pioneer Institution in the whole country for having started a separate Department of Wildlife Science at this Madras Veterinary College – is the highly apt one in the current periods.

India is a great country wherein conservation is given maximum significance not only of the endangered wild fauna and flora, but also on other species also. Additionally, many national experts and International experts like Dr. Kevin Lazarus's, Director, Zoo Taiping & Night Safari of Malaysia and Dr.Carlos Sanchez, Associate Veterinarian of Brookfield Zoo, Chicago in USA. are going to interact with the participating zoo veterinarians in this national level workshop.

I wish the function all success.

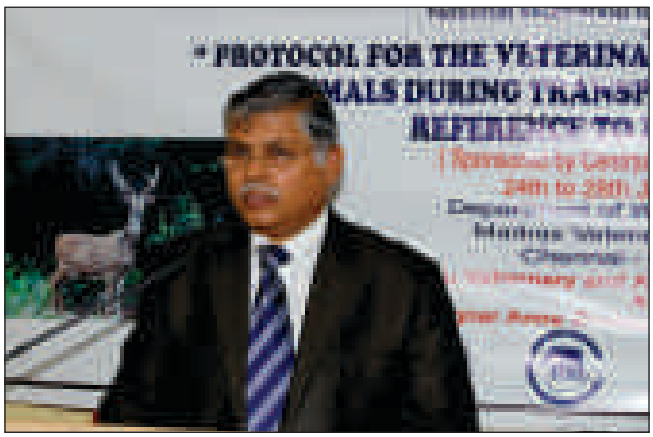
Presidential address

by

Dr.R.Prabakaran

Vice-Chancellor

Tamil Nadu Veterinary and Animal Sciences University, Chennai



Let me begin my speech with a quote :

"You must be the change you wish to see in the world."

- Mahatma Gandhi

It is my great pleasure to have been invited to preside over this important National workshop on "PROTOCOL FOR VETERINARY CARE AND SAFETY OF WILD ANIMALS DURING TRANSPORTATION WITH THE SPECIAL REFERENCE TO DEER SPECIES". Let me join the Forest Secretary in welcoming you all to this workshop.

The main objective of this workshop is to complement and strengthen the national efforts of conservation in this country with rich bio-diversity and emphasis on the safe transport of wild animals either within forest areas or between zoos. This objective can be achieved only if we have the requisite technical competence in translocation of animals with nil mortality. Though there has been considerable progress in the field of transport of wild fauna, most of the zoo vets are performing this task based on individual experience only. Data base on transport methods and precautionary strategies are still lacking. Hence, it is good on the part of CZA to have identified an important topic pertaining to transport of wild animals with emphasis on deer. The member secretary and his team is to be complimented here.

I definitely feel that this workshop for zoo veterinarians will help in developing new strategies for future transport of wild animals safely. These kind of workshops are organized with the objectives of capacity building of zoo vets in carrying out the systematic procedures for safe and secured transport of captive wild animals.

There is a need for greater cooperation and networking between the zoos and veterinary institutions for a two way flow of knowledge in veterinary care and disease management of wild animals in the future. Recognizing the need for closer cooperation with the zoos, the Veterinary Council of India has now made internships at zoo mandatory for veterinary graduates before completion of the B.V.Sc. & A.H programme. We welcome this step and zoos should be ready to improve their hospital infrastructure.

This workshop should greatly benefit all the participants since we have very good international resource persons like Dr.Carlos and Dr.Kevin. I expect the participants to extract the maximum out of them. I have also been told that some of the national level speakers have got lot of experience and there are no doubts that they will share their valuable knowledge. The zoo vets should also take advantage of this new opportunity available to them in this workshop to develop a systematic strategy for the safe transport of wild animals especially the deer species.

Over the next five days a wealth of academic, practical and policy presentations will be made at this workshop, which should provide meaningful input to enrich and further reveal strategies required for safe transport of wild animals with health related measures especially in deer.

I hope after the workshop we expect to see a "change" in you.

Let me conclude by wishing " A great success to this workshop."

Vote of thanks

by

Dr.M.G.Jayathangaraj
Organizing Secretary & Professor and Head
Department of Wildlife Science
Madras Veterinary College, Chennai

I feel honoured in proposing the vote of thanks for this inaugural function of the National Workshop sponsored by Central Zoo Authority on "Protocol for the Veterinary Care and safety of Wild animals during transportation with special reference to deer species" in Collaboration with Arignar Anna Zoological Park.

I am grateful to the Secretary, Tamilnadu Forest Department Dr.V.Iriaianbu who has readily consented to release the CD on "Digital Field Guide for Vets on Important Avian Species" and offer the inaugural address despite his onerous responsibilities. The Hon'ble Secretary is the source of great strength to all of us in the conduct of this workshop, as in all the endeavours of this University. Thank you very much, sir.

I am indebted to our Hon'ble Vice – Chancellor, and the President of the function Dr.R.Prabaharan for immediately sanctioning us the permission to organize this National Workshop.Thank you very much, sir.

It is a matter of great pleasure to place on record our deep sense of gratitude to Mr.B.S.Bonal, Member secretary, Central Zoo Authority, New Delhi whose support for organizing this workshop was a great source of strength to us. Thank you very much, Sir.

We express the deep sense of gratitude to the Dean, Faculty of Basic Sciences for his constant motivation, Valuable directions and guidance in the successful conduct of this workshop. Thank you very much. Sir.

We are indebted to the encouraging activities of Principal Chief Conservator of Forests and Director, Arignar Anna Zoological Park for the successful conduct of the programme.

We thank all the faculty members of Madras Veterinary College, and the officials of the TANUVAS for their co-operation rendered.

I am honoured to place on record our deep sense of gratitude to Dr.Carlos sanchez, & Dr.Kevin Lazraus, and all national experts, for sparing their valuable experience with participants.

More over, I thank one and one all.

Technical Session I
(24th January, 2011)

Need for Protocol
Shri. B.S. Bonal, Member Secretary, CZA

CZA guidelines on safety and veterinary care of animals during transportation
Shri. Naim Akhtar, CZA

Captive Wild Animal Management : Arignar Anna Zoological Park-Experience
Shri. K.S.S.V.P.Reddy, Chief Conservator of Forests and Director, Arignar Anna Zoological Park, Vandalur

Generalities of zoo animal chemical restraint
Dr.Carlos Sanchez, Associate Veterinarian Brookfield Zoo, USA

Animal Transactions – transportation, regulations etc
Dr.Kevin Lazarus's, Director Zoo Taiping & Night Safari

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Need for Protocol

Shri. B.S. Bonal, IFS
Member Secretary
Central Zoo Authority
New Delhi

The presentation provided significant in-sight with regard to the framing of protocol on safety & veterinary care of animals during transportation. The reasons for the requirement of protocol in this regard were specifically detailed to the participants. Zoo Veterinarians interacted with their queries.

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Need of protocol on safety and veterinary care of animals during transportation

What we want:

- Pre transport activity (preparation) at donar and receiving end
- During transportation
- Post transportation e.g. Quarantine, Health care, Feed, and monitoring

WHY PROTOCOL REQUIRED ?

No comprehensive guidelines and protocols

- Frequent incidences of deer casualties during transportation
- Importance of transport cages
- Preparation before transport of animals
- Legal formalities to be completed
- Need to have species specific guidelines

Proposed protocol should have relevant guidelines from

- ATA guidelines
- IUCN guidelines
- CITES guidelines
- Animal deer guideline- Deer
- Ethics and managing risks for physiological and behaviour
- Formulating policies for welfare of animals during transportation
- Historical perspectives on long distance transport of animals
- Minimal standards of EAZA 2008
- Study on temperature in animal during transport on farm animals
- Transport of wild birds and their safety
- Transportation of zoo animals
- UK guidelines on transport of animals

CZA guidelines on safety and veterinary care of animals during transportation

Dr. Naim Akhtar
Scientific Officer
Central Zoo Authority
New Delhi

The presentation specified the Central Zoo Authority guidelines of safety and veterinary care of animals during the transportation. The recognition of Zoo rules and national Zoo policy were also dealt, in addition to the guidelines for the transport of wild animals.

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CZA's guidelines on safety and veterinary care of animals during transportation

- Recognition of Zoo Rules, 2009
- National Zoo Policy 1998
- Guidelines for the scientific management of zoos
- Guidelines for the transport of animals
- Manual on transport cages and nest boxes

Recognition of Zoo Rules, 2009

Rule 10, 3 (3) Every zoo shall, in consultation with the Central Zoo Authority, prepare a collection plan indicating the names of the species and maximum number of animals of each species to be housed in the zoo, having due regard to the congeniality of the climatic conditions of the locality for the general health and well being of the species, availability of the space and infrastructural support for proper upkeep and healthcare of the species, proximity of the zoo to the habitat range of the species and the past record of the zoo in management and breeding of the species and no zoo shall compromise on housing and upkeep standards of animals for accommodating new species or additional animals of the species in its collection.

Recognition of Zoo Rules, 2009

Rule 10, 4 (1) Every zoo shall endeavour to display the animals in nature interesting and genuine.

Rule 10, 5 (3) The curator and the veterinary staff shall keep a close watch on the general behaviour and health parameters of the zoo animals. The animals shall be handled only by the staff having experience and training in handling the individual animals.

Rule 10, 5 (7) Any animal that shows any sign of illness, loss of appetite, injury or abnormal behaviour shall be thoroughly assessed and provided medical attention promptly as per the standards specified by the Central Zoo Authority in this regard from time to time and the Director of the Zoo administration.

Rule 10, 5 (8) Every zoo animal shall be screened for parasitic loads as per uniform schedule prepared by the zoo in consultation with the veterinary officer and prophylactic medicines administered as per clinical requirements and vaccination of animals against infectious diseases shall also be done, as per the schedule prescribed by the Veterinary Officer from time to time.

Recognition of Zoo Rules, 2009

R15. 5 (10). Every zoo shall maintain detailed records of observations of biological and social behaviour and health status of the animals including feed intake, medication and treatment provided in the keepers diary, daily records and life history cards and treatment cards as per standards specified by the Central Zoo Authority

Rule 10, 3 (6) Every zoo shall have linkages with the eminent institutions and organizations working in the field of wild animal healthcare with the objectives to provide for:
(a) the assistance in scientific diagnosis of diseases of serious nature and advice on the effective remedial treatment;
(b) the training and upgrading technical skills of zoo staff; and
(c) the development of protocols for preventive medicines and vaccination
Rule 10, 9 (b) For the purpose of transportation of animals from one place to another, the standards specified in this regard by the Central Zoo Authority shall be complied with

National Zoo Policy, 1998

1.5. As zoos are visited by a large number of visitors, zoos are a potent tool for education people about the close linkage between protection of natural areas for maintaining the life support processes of nature.

Any wrong activity or mishandling cause setback to ex-situ conservation planning of the zoo/country.

3.2.2. Zoos shall not enter into any transaction involving violation of the law and provision of international conventions on wildlife conservation

3.3.1. The Zoo shall ensure availability of the highest standards of veterinary care to all the animals in their collection

Guidelines for the transport of captive animals

1. Animals in good health only should be transported. Sub-adult animals should be preferred for transportation.
2. Pregnant or females which have recently given birth should be avoided for transport.
3. Infants and too young, incapable of feeding themselves should also not be transported unless prior arrangements have been made for taking all due care for the same.
4. The antlered animals in velvet should not be transported.
5. The animal should be separated from the herd if needed, sufficiently in advance before transport and complete health check up should be done before transport for assessing its health conditions.

6. The related papers like animal history cards, treatment cards, health certificate should accompany animal while transportation.
7. Necessary arrangements for quarantine at the recipient station should be arranged in advance.
8. The dimensions of the transportation containers for mammalian species should be such that the animal is not able to turn around or to stumble and fall.
9. The transport container should preferably be of suitable local material. For many animals, the preferred material will be timber or, such materials as bamboo, hardboard and metal may often be suitable for the construction of transportation cage. For transport by air, fiber glass transportation cages can also be preferred as these are light in weight.

10. The floor of the container should be made removable with liquid proof trays under the slatted floor. The slatted construction should be so designed and constructed that the spacing between the slates in such that there is no danger of the animals feet becoming trapped.
11. It is important that all transportation containers should have inner surfaces which are completely free of any projecting nails, screws, ends of mesh or any other sharp material, which could cause injury to the animal. There should not be any sharp edges. Moreover, if any wood preservative or paint is used on the container, it should not be toxic or a skin irritant. It should also be padded with rubber pads to save the animals from injury.

12. The transportation container should have adequate air circulation at all times. There should be additional ventilation by means of holes of suitable size in all walls of the container
13. Suitable lifting handles or gripers bars should be provided and when the containers will be heavy loaded, the hooks for crane slings and facilities for handling by fork-lift should also be fitted
14. On long journeys, the animals should be provided suitable bedding materials such as straw or hessian pad.
15. Arrangements for feeding and watering as per the requirement of the species and duration of the journey should be provided.

16. The animals which might have been sedated before their transportation should be transported only under the supervision of a qualified veterinarian only and details of sedation should accompany the animal. Partial sedation of some of the species and individuals when recommended may also be resorted to during transportation.
17. The handling of animals during the transportation should be avoided to the possible extent. The animals should be disturbed as little as possible during the transportation.
18. The transportation of animals should be avoided during extreme weather conditions like dry hot summer and very cold winter.
19. The journey should preferably be performed during day time. The time between 11:00 A.M. to 4:00 P.M. may be avoided during hot summers and nights during winter.

20. While transportation from one climatic zone to another, it is important that the animals are not suddenly moved to contrasting climate to which they are not accustomed. If this is not avoidable, the desired controlled environment should be made available, so that they are exposed to change climatic conditions slowly.
21. The transportation cage should be secured fully to avoid any possible movement or sliding during transport. It is very important to ensure that the transportation cages are kept horizontal throughout the journey.
22. The animal should be accompanied by a qualified veterinarian and required number of keepers having experience and training in handling individual animals.

23. Every care should be taken to avoid unnecessary discomfort, behavioural stress or physical harm to the animals while crating and transporting.
24. While transporting the animals, due screening of the staff involved in transportation of animal should be made and it must be ensured that they do not infected of any such diseases that can infect the animal.
25. The accompanying Veterinarian should carry all necessary drugs medicines, first aid kit, restraining equipments and drugs which may be required during emergency. In the unlikely event of animal sustaining injury during transportation or falling sick, there should be arrangement in the cage for handling the animal for treatment.

26. Arrangement for carrying water sprayers, buckets, additional ropes etc. should also be made and tools for temporary repair of the cages may also be carried during transportation.
27. It is preferred to cage only one animal in a single container, except in birds or mother with babies.
28. For longer distances, the possibility of air lifting should be explored. Lighter transport cages like fiber glass should be preferred for air journeys. The transportation cages should not be placed in closed wagon during transportation by rail.

25. The animals avoid feeding while transportation. It is advisable to properly feed the animals along with required supplament before crating and transportation.
30. There are various guidelines by IATA or CITES for transportation of animals by air. These should be kept in mind while transporting animals by air.
31. The senior most personnel accompanying the animal should carry sufficient money and should have authority to spend the same to meet any unforeseen emergency during transportation.

32 Certificate from the concerned zoo consigning the transportation should accompany the animal and it should be mentioned that no taxes etc should be paid and vehicle should not be detained. This will ensure smooth transportation without any hindrance, particularly in inter state check gates.
33 During transportation if there is any emergent need for any assistance from any nearby zoo, the concerned zoo should provide all possible assistance. In case of transportation, it will be ideal to keep the way finds zoo informed in advance about such movement

Captive Wild Animal Management : Arignar Anna Zoological Park-Experience

Shri. K.S.S.V.P.Reddy, IFS
Chief Conservator of Forests and Director, Arignar Anna Zoological Park
Vandalur, Chennai

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CAPTIVE WILD ANIMAL MANAGEMENT - AAZP EXPERIENCE

Madras had the distinction of having the first zoo in India, which was started during the year 1855. This zoo was in effect a menagerie. The major concerns of a menagerie would be species husbandry and propagation with the standard style of exhibit in a cage. Therefore, a cage is practically the only form of exhibit which guarantees a close look at the animals which is also satisfying the general visitors. The animal is genuinely captive before their eyes. Moreover people were fascinated by diversity. Therefore, the older zoos or menageries try to exhibit as many different kinds of animals as possible. The menagerie does not reflect the essential features and characteristics of zoological park eg. Animal habitats and behavioral biology, understanding of holistic conservation both by zoo managers as well as visitors.

The Madras Zoo lacked in several features and characteristics and was not truly an ex-situ conservation facility for conservation of flora and fauna of Eastern and Western Ghats. To achieve this objective, relocation of the (menagerie) old Corporation zoo to a larger area with conditions conducive for such ex-situ conservation was planned and accomplished with the shifting of the zoo to Vandalur RF. This place sprawling over an area of about 510 ha (in its initial stages) provided an environment similar to natural wilderness which helped to meet the biological and physiological need of the animals and birds.

Further, in the case of Madras zoo factors like air and sound pollution, insufficient place for accommodating the animals, and highly dense human population around the zoo was a health hazard to animals. The situation necessitated the shifting of the zoo to a more conducive and ideal place for establishment of a modern zoological park. The Madras zoo was shifted to Vandalur Reserve Forest in the out-skirt of Madras city and work for the establishment of the zoo was started in 1976. This is one of the biggest zoos in South East Asia extending to an area of 602 ha. The zoo was opened for the public during the year 1985. The existing landscape has been utilized as it is and all the animals are exhibited in large open moated island type enclosure with simulated environment. The entire area of 602 ha has been clothed with vegetation both by natural and artificial regeneration.

The modern zoological park set up in Vandalur was conceived for collecting an array of animals of Eastern and Western Ghats and arranging them as per the taxonomic classifications, ecological characteristics and behavioural repertoire exhibited by animals. The assemblage should reflect the natural occurrence of animals in wild.

Any zoo or captive facility should look into the following aspects to make it successful and viable one:

1. Behavioural management

   Animals in captivity should exhibit their natural behavior. A lion should behave like a lion and deer should behave like a deer. A lion should not behave like a deer and vice versa. Hand reared and lone animals may not have the chance to learn the natural behavior of that species in captivity but few are exhibited as inborn characters. Social animals will learn the normal behavior from their parents or herd mates

2. Environmental enrichment

   In the wild, animals engage themselves throughout their active periods in their habitats either for finding food / prey, grazing, hunting, finding mates…etc. But in captivity all these are readily available in a small habitat called enclosure and the animals develop the habit of sedentary lifestyle and as a result all sorts of behavioral abnormalities. Vices like pacing, aggression, plucking of feathers…etc are exhibited by these animals.

   To prevent all these abnormalities and to maintain behavioural and psychological well-being, the enrichment of enclosures should be carried out. There are different types of enrichments like Physical, social, sensory, occupational and nutritional enrichments.

3. Reinforcement training

   Operant conditioning techniques may be used as a method of enrichment for captive wild animals. Operant conditioning can be divided into three types: positive reinforcement, negative reinforcement and punishment.

4. Improving husbandry and veterinary skills

   The most important aspect of captive wild animal management is providing and improving husbandry practices for the animal in question. Husbandry manuals may help in this regard. The healthcare management of captive wild animals will be taken care of by the veterinary unit and the unit should be capable of handling emerging diseases and conditions alike. They should improve their skills in diagnosing and treating the diseases and handling emergency situations.

5. Managing social interactions

   In gregarious animals, the hierarchy should be established well so that the dominant animal should tolerate the presence of sub dominant animals in the groups. By using co-operative feeding technique, the compatibility related issues can be overcome.

6. Psychological well being

   If the captive animal is provided with all the required facilities and is properly trained, abnormal behavior like stereotypic behavior (an indicator of poor well being) can be reduced.

7. Improving captive breeding

   Captive animals should exhibit the normal reproductive behavior and as a result successful breeding should happen. Only healthy animals can breed successfully and all the requisites for such breeding should be provided to the animal in captivity.

8. Reintroduction into the wild

   The ultimate goal of captive breeding is to reintroduce or restock the species in the wild.

9. Beautiful visual experience to the visitors

   Finally the visit to the zoo by the general public should be a pleasing and ever remembered one.

Generalities of zoo animal chemical restraint

Dr. Carlos Sanchez
Associate Veterinarian
Chicago Zoological Society
Brookfield Zoo, USA

This presentation offered insight about physiological aspects in relation to chemical restraint was given emphasis in captive wild animals. Similarly use of drugs for restraining for non-domestic carnivores and hoof stock was stressed. The participants of the net workshop interacted with this resource person Dr. Carlos

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Carlos Sanchez, DVM, MSc
Chicago Zoological Society
Brookfield Zoo

Physiology and chemical restraint

January 2011

PHYSIOLOGY CONCEPTS APPLICABLE TO THE CHEMICAL IMMOBILIZATION OF WILD ANIMALS

Physiology, the science that studies the functions of organisms or their components, is a subject which can be taught as extensive as on many levels, and encompasses a wide range of topics. This lecture will provide only those information which seems relevant to the capture of wild animals.

Definition of terms:

1. Basal Metabolic Rate: The metabolic rate necessary to produce the energy required by an animal to carry out vital functions while the animal is at rest in the basal metabolic state. These functions include blood circulation, respiration, kidney function, and maintenance of all tissues at the cellular level.

2. Homeostasis: Homeostasis is the maintenance of body functions within ranges compatible with life, mediated by actions of mechanisms initiated in response to environmental change. It is a state of internal balance and stability.

3. Hypoxia: Hypoxia means decreased availability of oxygen in the tissues. Anoxia is a total absence of oxygen. Hypoxia may be generalized, in which all tissues lack sufficient brain and cardiac muscles, which are particularly sensitive to insufficient oxygen.
   Causes: Some species can breathe through both the mouth and nostrils, others breathe primarily through the nose (equids, elephants). Airways may be obstructed by tight ropes or snares around the neck, too tight a grip can occur easily if an animal sticks its head through a net or a webbing containing spaces inappropriately sized for the species. Obstruction of the nostrils during restraint can lead to hypoxia. Gloves diminish tactile discrimination and may mask excessive pressure applied to the thoracic cavity while gripping the animal. Birds breath with a bellows-type of respiration that necessitates movement of the keel bone or sternum forward and downward in inspiration and backwards and up for expiration. Any restraint procedure that interferes with keel movement will quickly produce suffocation.
   Other causes of hypoxia include respiratory disease with consolidation of lungs, pleuritis, and anemia. Respiratory diseases such as pneumonia or emphysema, and blood loss. Wild animals are capable of masking signs of severe respiratory disease until the condition is almost terminal.

4. Hypoglycemia: Hypoglycemia is a decrease of glucose levels in the blood. Any undernourished animal may be prone to develop hypoglycemia especially if forced to quickly mobilize energy reserves, as might occur with capture. Hypoglycemia deprives the brain of the substrate upon which it is dependent for the use of oxygen. Thus hypoglycemia results in hypoxia and anoxia of the brain. If continued it results in convulsions, coma, and irreversible brain damage.

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5. Acidosis: Homeostasis necessitates maintenance of a delicate acid-base balance in the blood. Normal mammalian blood pH varies between 7.35 and 7.45. Minor changes in either direction trigger serious metabolic consequences. If the pH is less than 7.35 the condition is called acidosis and if over 7.45 it is called alkalosis. The prime cause of acidosis in restrained animals is excessive muscular activity associated with excitement, chase and resistance to chemical capture. Acidosis associated with exercise persists for several minutes after running or struggling has ceased, thus animals are commonly manipulated or anesthetized while in an acidotic state.

6. Electrolyte imbalance: Blood contains a balance of ionic substances that aid primarily in water balance. Of these, sodium, chloride, and potassium are the most important. Because the body can only tolerate these concentrations within very narrow limits, even minor fluctuations can be life threatening.

7. Dehydration: Dehydration results when the total amount of body fluids, both within the circulation and the tissues, is less than normal. It can be a life-threatening condition because of the necessity of a substance that is so necessary to follow normal life.

Vital Organs

At a very basic level, organisms are composed of cells, which then group themselves into tissues, organs and systems. While all these are necessary for the overall well being of the organism, some are considered vital, which means pertaining to life. Loss or lesser function of these organs potentially results in loss of life. The respiratory system, cardiovascular system, central nervous system, liver, and kidneys are the vital organs and tissues which are of most importance in field conditions of capture and restraint. The basic functions and consequences of functional loss of each will be discussed in turn.

Central Nervous System

The central nervous system is comprised of the brain and spinal cord. The brain functions directly in the control of the most vital functions, including heart rate, respiration, and blood pressure. With loss of function death can quickly result. The most likely cause for loss of central nervous system function in field situations is through traumatic injury or drug overdose. Fractures of the skull or spinal cord may result in acute loss of consciousness or paralysis, respectively. Trauma to the head which does not fracture the skull can lead to significant brain edema or intracranial bleeding and pressure elevation of the brain tissue which can be immediately life-threatening. Since the immobilizing drugs affect the central nervous system directly, calculation of dosage is important. Drugs that reduce blood pressure and/or oxygenation are likely to result in hypoxia to the brain because its oxygen requirements are high.

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Cardiovascular System
The cardiovascular system is composed of the heart, the vessels and the blood within the system. Its main function is the pumping of oxygen-laden blood to the entire body so that oxygen can be used in the production of energy needed for functional requirements and maintenance of tissues. The heart is the pump that receives deoxygenated blood from the body, pumps it through the lungs where it receives oxygen, receives it back from the lungs and then pumps it in its oxygenated form back to the body. Because of the opening and closing of the valves in the heart, auscultation allows two distinct sounds (lub, dub) to be heard normally. The beating of the heart is controlled by a sophisticated nervous system network and in general the larger the size of an animal, the slower the rate under normal circumstances. Heart rate increases dramatically with exercise and stress and may be altered significantly by some drugs.
Blood consists of red cells, white cells and platelets suspended in a protein rich fluid called plasma. The functions of the blood are included in the following list:

1. Blood carries nutrients made available by the digestive tract to the body tissues.
2. Blood carries oxygen from the lungs to the tissues
3. Blood carries carbon dioxide from the tissue to the lungs
4. Waste products from various tissues are carried to the kidneys for excretion (urine)
5. Hormones are carried from endocrine glands to other organs of the body (insulin, thyroxin)
6. Blood plays and important role in temperature control by transporting heat from deeper structures to the surfaces of the body
7. Water balance is partly maintained by the blood
8. Buffers such as bicarbonate in the blood help maintain a constant pH (acid-base balance) of the tissues and body fluids
9. The clotting ability of blood prevents excess loss of blood from injuries (platelets, clotting factors)
10. Blood contains important factors for defense of the body against disease (white blood cells, antibodies, plasma proteins)
11. Drugs, their metabolites and other compounds are carried in the blood to sites of action, metabolism and excretion.

Because blood functions in different systems, signs of functional loss are varied. The most obvious and potentially related effect of the blood occurs with exsanguinations, which rapidly results in generalized hypoxia because the blood's ability to carry oxygen and carbon dioxide are lost with the loss of red blood cells. Underlying disease conditions that result in functional disturbances of the blood. For example anemia (extreme parasitism or malnutrition) can be common and the capture of an animal with such a condition may unbalance the already altered state of homeostasis enough to result in death.

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Blood pressure is one of the important features of the cardiovascular system and is defined as the pressure that blood exerts against the vessel walls. Many drugs are capable of causing significant lowering of the blood pressure, which if sustained, can cause serious damage because of hypoxia. The renal tubules in the kidneys are often damaged when shock develops because of the associated drop in blood pressure and resultant hypoxia.

Respiratory system:
The cardiovascular and respiratory systems are closely linked in function and disturbances in one system invariably result in changes in the other. The ventilatory function of the lung is well appreciated, but it has other functions as well, including body defense from irritants and pathogens in the air, metabolic functions, filtration of blood, and reservoir for blood, heat exchange and elimination of volatile substances.

Liver
The liver is the largest gland in the body and has many complex functions. These include the formation of bile, storage of carbohydrates, metabolism of carbohydrates and fats, manufacture of plasma proteins, and the metabolism of many drugs and toxic compounds. With underlying hepatic disease (biliary system parasites, hepatitis) metabolism of drugs can be slowed and the effects might, therefore, be greater and of longer duration. In addition, since the metabolites of some drugs are toxic, and since the liver is the organ where the toxic metabolites are produced, liver damage can result when drugs are used.

Kidneys
The kidney, along with the rest of the urinary system, is responsible for excretion of many waste products of the body. It also has a role in maintaining the homeostasis, including the regulation of water balance, pH, osmotic pressure, and electrolyte levels, which is achieved through filtration of blood. The kidney also functions in the metabolism of some drugs. Adequate arterial blood pressure is important functionally for the kidney, not only for its filtration function but also for its basic metabolic needs. The renal tubules are very sensitive to hypoxia, making them very sensitive to the effects of shock.
As animals age kidney function tends to decline. This is of minimal clinical relevance due to the tremendous reserve capacity of the kidneys, but may be important when using a drug (ketamine) which might be metabolized by the kidneys. If the functional capability is less than normal the drug's effects might be of a magnitude greater than desired, or might last longer, both of which might be deleterious to the animal.

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DRUG DELIVERY SYSTEMS

After making the decision on the type of drug to be used, the next challenge is to get the immobilizing agent into the animal. The most satisfactory method varies from species to species and from animal to animal, according to the size, distance from the operator, ability to physically confine the animal, operator skill, and the availability of equipment. Delivery options may be oral or by means of injection.

- *Oral:* Effectiveness of oral medication to sedate wild animals depends upon the acceptance of the drug and the absorption and stability of the drug once taken orally. Unfortunately, it is difficult to deliver an adequate dose orally to sedate wild animals. Drugs such as ketamine, midazolam may be effective in sedating primates but doses often need to be repeated several times, and most primates learn the first time not to accept the same food the second time. Oral administration of tranquilizers such as haloperidol has been found to be effective when administered in fodder to certain hoofstock and game birds may be captured by offering grain impregnated with an immobilizing agent. Wildlife professionals in Namibia successfully captured stock-raiding lions by adding tranquilizer (midazolam) to the bait. Following ingestion, the animals became sufficiently tranquilized to approach and dart.

- *Hand-held syringes:* Intramuscular (IM) injections can be given very quickly, with practice, using a hand-held syringe. This may be used when an animal is cornered but extreme caution must be used when using dangerous immobilizing agents to prevent accidental self injection. To gain experience, hand injection techniques may be practiced on a water-filled orange using a hypodermic needle attached to a hand-held syringe.

- *Pole syringes/Jab sticks:* Various homemade and commercial pole syringes act as extensions of arms for administering drugs to dangerous animals confined in cages or

lengths. All work on the principle of injection immediately upon inserting the needle into the muscle – therefore a quick jab is necessary to avoid [illegible] [illegible] [illegible]. The operator should follow through with the [illegible] [illegible] jumps away in order to assure a complete injection. Commercially available spring-loaded pole syringes (e.g. Dan-Inject®) negate the need to follow through with injection. The risk of the animal biting or kicking the jab stick is always present [illegible] [illegible].

- *Blow darts:* Blow-darts have been used for centuries to capture wild animals. The blow-dart system offers certain advantages over other delivery systems, in particular, its silent projection and low delivery impact energy. It is adaptable for use on small and large animals, is easily managed, and has no mechanical parts requiring maintenance. The disadvantages of the blow dart projection include its length and relatively short range (15-25 meters) but it is useful in the house or [illegible] situation. Blow-dart projectors can be purchased commercially or easily constructed from aluminum, conduit, copper, stainless steel, plastic etc. Darts may be purchased commercially or easily crafted from regular plastic syringes.

- *Crossbows:* The crossbow has been adapted for use with various projectile syringes. It tends to be accurate and dependent on design [illegible]. However, the system is bulky, difficult to manipulate in a restricted space and may require considerable strength to cock the crossbow.

- *Projectile syringes or darts:* The requirements of a dart system for capturing wild animals include rugged and dependable design, [illegible] [illegible], limited need for spare parts, accuracy at long range, versatility (ability to accurately and safely project the dart both short and long distances), light weight darts to reduce impact trauma, and cost effectiveness. The most popular darting systems available fulfill these criteria.

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Important Concepts In Darting Wild Animals

A frequent mistake among [illegible] distance and impact energy [illegible] in a long-range [illegible] is essential. The projectile that [illegible] shot at high velocity describes a curve through the air and will drop considerably at long distances. Accuracy with a dart gun requires experience by the operator in estimating distances and modifying the charge and/or power emission control to compensate for unexpected changes in distance. Adjustments need to be made rapidly as the opportunity to dart often lasts only a few seconds before the animal moves away. Extensive practice and familiarity with the darting system is the key prior to going out into the field.

The temptation to use powerful projectors at close range to improve accuracy should be avoided at all costs. Impact energy is an important concept in the understanding of dart-related tissue damage and one of the major problems with the delivery of drugs via projectile syringes is excessive impact energy, which may lead to trauma, fractures and other significant tissue damage. Impact or kinetic energy (KE) refers to the amount of energy generated when the dart strikes the animal and is proportional to a function of dart mass (m) and the square of the velocity (v) at which the dart travels through the air.

$$KE = \frac{1}{2}mv^2$$

As a result, with a fixed dart size and mass, the amount of energy generated when the dart impacts the animal increases greatly with even minor increases in dart velocity. The velocity of the projected dart depends on a number of complicated factors and ultimate power that [illegible]. The simplest way to deal with the problem of excessive impact energy, therefore, is to use the lowest projection velocity that will get the dart to the animal. In small or thin-skinned animals, reducing the drug volume and choosing the smallest and lightest dart available will provide added benefits. The following examples illustrate the significant differences in common dart systems: the [illegible] aluminum Palmer Cap-Chur dart (Palmer Chemical and Equipment Company, Douglasville, Georgia USA).

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Loaded with water weighs 19.0 grams; darts of a similar capacity, made of plastic (Telinject, Telinject Inc., White Bear Lake, Minnesota USA) or plastic and aluminum (Pneu-Dart, Pneu-Dart Inc., Williamsport, Pennsylvania USA) weigh 5.5 grams and 11.0 grams respectively. All of these darts are [illegible] alike and can be used in a number of different dart projectors. At similar velocity, the latter two darts will result in reduced impact energy and therefore have considerably less potential to injure the animal. However, even lightweight darts fired at a high velocity will strike the animal with a proportionately much greater energy and will likely cause significant muscle trauma and hemorrhage. The concept of impact energy should always be considered.

Injection Routes And Dart Sites

There are a number of routes available for injecting animals. The most suitable injection route is intramuscular (IM) and the aim of injection by any projectile syringe is an IM injection. The objective is to introduce the syringe contents into vascular tissues, from which rapid absorption can take place. Recommended drug dosages tend to be selected and calibrated for IM injections.

Alternative Routes Of Drug Administration

Intravenous (IV): This may be a suitable route once the animal is immobile and is the preferred route for the administration of the antidote. If an animal is lightly sedated then it may be dangerous to attempt an IV injection. Many operators administer antidotes by one or more routes – IV, SQ (subcutaneous) or IM. Most antelope and giraffe can be injected into the jugular vein, or the [illegible] vein running over the outside of the hock in hind legs. Some species such as zebra have a number of superficial veins on the hind legs, which may be easily accessed. Elephants and rhino have well developed ear veins and the rhino has a superficial vein (radial vein) on the inside of the front leg just above the carpus (knee); [illegible] the elephant also has superficial veins in the hind limbs. The recurrent tarsal vein is preferred in the [illegible] (waterbuck) and some antelope. Some antelope have a prominent vein just above the knee joint. Cats may be injected in the saphenous vein (hind leg), recurrent tarsal and tail vein in larger species.

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Intra-arterial (IA): It is very unlikely that an injection with a projectile syringe will be made into an artery; arterial walls tend to be thick and highly elastic. When administering drugs by hand injection, however, it is imperative that the operator draws back on the syringe to ensure an artery has not been accessed (bright red colored blood will be seen). Injection of certain drugs such as local anesthetics (e.g. lidocaine) may result in convulsions if injected intra-arterially.

Subcutaneous (SQ): SQ injections result in slow absorption especially in those animals that have extensive fatty tissue or connective tissue layers under the skin. Once an injection has been made SQ it is difficult to assess the speed of action and degree of sedation [illegible].

Intrapulmonary (IPul): Inadvertent IPul injections (chest shots) [illegible] darts that penetrate the thorax are absorbed very rapidly. The force of the explosive injection can severely damage lung tissue and cause local hemorrhage.

Intraperitoneal (IP): IP injections (into the abdominal cavity) are absorbed more quickly than those given IM and there is a significant danger of damage to vital organs. Certain species such as zebra tend to have really thin skin and particularly thin abdominal walls; mis-placed darts penetrate easily and then result in fatal peritonitis.

Intraosseous (IO): IO injections (into bone tissue) usually result in a dart blockage without injection. Ribs, shoulder blades (scapula), and hips [illegible] are the most frequently hit. Significant pain in addition to bone fracture are common and serious complications.

The Capture Event

The duration of the capture process should not be underestimated. In the majority of cases it is important to begin the process early in the day so that all work may be performed during daylight hours – animals darted at dusk may be impossible to locate

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once immobilized. Each capture episode should be meticulously planned in advance and a contingency plan developed. Extensive planning, accurate record keeping is a prerequisite for successful wild animal capture. This is important to track the expenditure of legally controlled drugs as well as for determining the most appropriate drug dosages and combinations for use in other animals. Chemical capture is expensive so it is important that it be performed correctly at the first attempt.

It is essential to check and test all equipment before attempting to dart an animal. The dart gun should be clean and functional and with many of the 'reusable' systems it is important to ensure that the darts have not become misshapen and fit smoothly into the barrel of the dart projector. During the preoperative phase consideration should be given to the following:

- Species peculiarities (The effects of drugs may vary between species as well as within species. For example, [illegible] is a useful drug agent for immobilizing eland but works very [illegible]; xylazine is more effective in a quiet animal than in a nervous animal.)
- Physiological factors (Old or very young animals or those in poor health may require substantially less drug for effective immobilization than a healthy animal.)
- Physical condition of the animal (Fit or strong animals are more metabolically efficient and may modify the effects of the chemical restraint agent. Free-living wild animals generally maintain excellent physical condition in order to avoid or escape predators. During adverse climatic conditions such as prolonged drought or when captive, wild animals often lack optimal physical conditioning and choice of immobilizing drug and dosage should reflect these considerations.)
- Emotional status of the target animal (Highly excited or alarmed animals may be resistant to the effects of certain sedatives.)

Prior to darting the animal, it is advisable to write a checklist of important procedures that must be performed before darting so that can easily be forgotten during the procedure.

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Approaching the animal for Darting

The operator must approach the target silently and calmly. To prevent alerting the animal, a direct approach should be avoided and a tangential approach from a downwind position tends to have the greatest chance of a success. Consideration of distance from target, wind speed, movement of the animal and access to suitable darting sites must be made before selecting a projection system, [illegible]. The operator should be prepared to attempt the shot as soon as an opportunity presents itself, as there is often only a single chance to dart before the animal moves away. The operator should always however carry a basic immobilizing drug kit and a spare dart, as well as the [illegible] basic monitoring equipment etc. Occasionally, following a missed shot, there remains an opportunity to attempt a second shot and the operator should be prepared for this. If the shot is successful, the person darting is often the first to arrive at the immobilized animal and must be prepared to begin anesthetic monitoring immediately.

When darting from a moving vehicle or a helicopter it is very important not to chase the animal over long distances, particularly when it is hot. Wild animals tend to be adapted for short bursts of speed, not sustained, long-distance chases which can lead to exhaustion, hyperthermia and capture myopathy.

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Target Sites for Darting or Injection

Studies by Harthoorn in 1976 showed that animals injected in the abdomen, subcutaneous tissue or [illegible] took longer to become immobilized and appeared more prone to capture stress and mortality. In these studies the most rapid induction times occurred following injection in the muscle of the neck (hindquarters) closely followed by shoulder and withers. Injections in the hindquarters took about 25% longer to take effect and those in the lumbar region twice as long. An animal may be severely compromised by a slow induction and the operator must make every effort to place the dart accurately and in a large muscle mass. Animals as large as elephant can be immobilized in as little as 5 minutes if dart placement is good.

<u>Neck:</u> This is a suitable injection area in heavily muscled animals including rhino, hippo, zebra, buffalo and antelope such as oryx, eland and wildebeest. It is suitable for elephant if the ear can be avoided. The neck should be avoided in smaller antelope (impala, gerenuk and gazelle) and in those larger species with thin necks (giraffe). The cervical vertebrae lie close to the surface in the mid portion of the neck and there are vital structures nearby. Injection into the nuchal ligament of the neck will result in failure to immobilize the animal.

Shoulder: The shoulders (muscles of the shoulder, triceps and biceps) are generally one of the best places for remote injection in ungulate species and present a good site for darting rhino and elephant. The upper part of the shoulder should be avoided because the dart needle may embed in the cartilage. In slight or emaciated animals, darts may strike the spine of the scapula and result in fracture, hemorrhage and dart blockage. In thin or lightly muscled animals, the hindquarters may offer a preferable dart site.

<u>Buttocks and thighs:</u> The buttocks and thighs have well-developed muscles/[illegible] and due to the large muscle mass in this region, it provides a suitable dart site. When aiming from

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above (e.g. when darting from a helicopter) the target site may appear large but due to the proximity of the head leaves little room for error and can be surprisingly easy to miss.

Chest: The brisket and pectoral area can be a target for darting when no other sites are available and animals such as giraffe, buffalo and eland have been darted successfully in these areas. In the interest of animal safety, the chest region should only be used when the subject [illegible] accuracy of the shot.

Hindquarters: This area is a very common site for injection and there are good muscle masses present (e.g. quadriceps [illegible] group). It is possible to dart most ungulates from any angle into the hind leg but the dart must be perpendicular to the surface to prevent deflection and to ensure deep IM injection. The mid lateral part of the hind leg should be avoided due to the proximity of the femur and a large bony prominence palpable in [illegible]. Placement of a dart high up on the hind leg from behind and to the side should be avoided as the bony prominences of the pelvis may deflect the dart.

The dart should not [illegible] and below the base. In certain situations it is possible to place a dart into the muscle mass on the inside of the hind leg however, darting from directly behind the animal should be avoided due to the possibility of penetrating the soft tissues of the perineum. This is particularly so in [illegible] species.

Care should be taken to avoid the following areas when darting animals:

- Thorax: A dart hitting the chest will either strike a rib, intercostal muscle or even penetrate the pleural cavity. This may result in damage to the lung and possible lung collapse. The chest bones are less dense in [illegible] species, darts may penetrate deeply resulting in death.
- Lumbar region: This area is an unlikely target site when darting from the ground because of the angle required for the dart to strike perpendicularly. In most cases [illegible] of the animal. There are [illegible] in the

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For larger species however, and on occasion, this region can provide a narrow and acceptable target when darting large, well-muscled animals (e.g. darting from a helicopter).

- Flank and abdominal area: This is not a suitable site for darting but it is an area that is frequently struck when aiming at the hindquarters from the side. The flank, in most species is resilient, and thick and darts generally do not penetrate completely [illegible]. The abdomen, situated below the flank area should be avoided in all animals.

Animal Transactions – transportation, regulations etc

Dr.Kevin Lazarus's
Director Zoo Taiping
& Night Safari
Malaysia

This presentation offered significant emphasis with regard to the transactions of wild animals and attention was paid on IATA regulations crate designs for deer and CITES. The intricate aspects of physical restraint & Chemical restraint including the various types of delivery systems were felt in detail. Zoo Veterinarians interacted with their queries.

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Animal Transactions

Logistics of Animal Transfers

Involves Co-ordination & Communication
Between where the animal is and where it is going to

Always ensure

- the recipient and the donor are in constant communication
- The recipient is prepared to receive the animal, and has prepared the appropriate accommodation (quarantine, temporary or permanent)
- Both donor and recipient are aware of all the logistics involved and possible problems

Decision Making

To be considered

- Institution Policy
- Studbook Keepers recommendations
- Restrictions of ownership

LEGISLATION

Regulations may be

- **National**
- **International e.g. CITES**

and may affect transfers for both conservation and veterinary reasons

CITES

CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES

CITES was established for the purposes of controlling and monitoring international trade in animals and plants considered to be threatened or likely to be threatened through commercial exploitation

CITES PERMITS

♦**Appendix I**
Require both import and export permits

♦**Appendix II**
Export permit only

Other permits/ requirements

- ♦ Veterinary import/export permits
- ♦ Health certificates from the federal, state or relevant authorities
- ♦ Customs clearance
- ♦ Quarantine requirements
  - prior to shipment
  - requirement at country receiving the animal

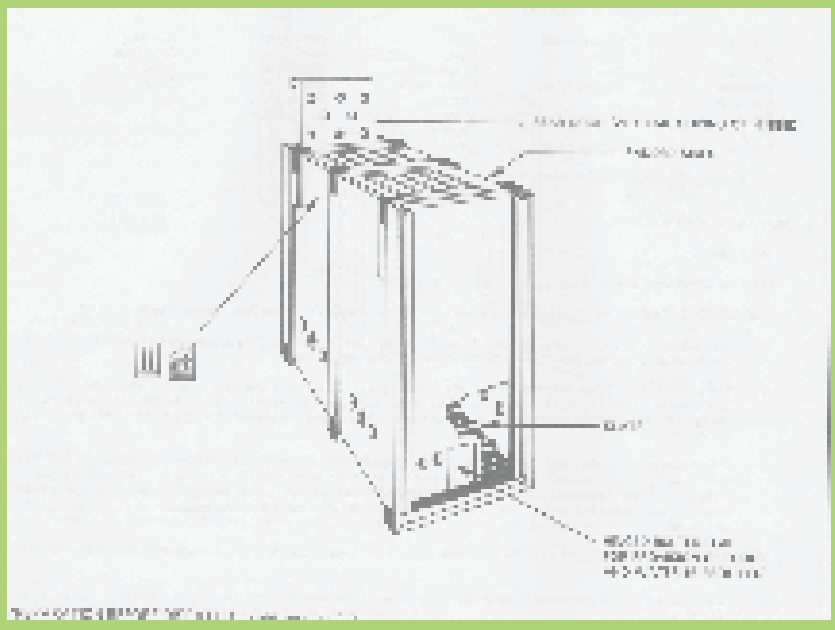
TRAVEL

- Mode of transport
- Restrictions
- Reservations
- Journey time
- Crates

THE IATA LIVE ANIMALS REGULATIONS (LAR)

Purpose is to ensure the correct packaging, storing, loading and transportation of live animal shipments by air.

IATA Recommended Crate For Deer



Design and Construction

General Requirements

• animals will be accepted only in suitable clean, closed containers, which must be leak proof and escape proof

• be constructed in a manner which will allow access to handling staff to give the necessary attention without being harmed by the animal (feeding, watering)

• adequate litter should be provided to absorb excreta

• use of straw should be avoided, as many countries impose restrictions on import

Design and Construction

General Requirements

- **should be well constructed, dimensions where stated are in length, width and height and should be related to the actual size of the animal**
- **do not use material which will affect the health if the animal – paint, treated wood, some soldered tin**
- **handles and spacer devises**
- **containers intended to be reused should be able to be cleaned and sterilised**

Principles of design

Materials

- **metal or wood or combination and burlap or canvas for padding if required**
- **sound construction with smooth interior**
- **sides close boarded, at least up to the height of the animal's eye level when standing**
- **above that can be slated, but ensure horns can not get trapped, and boards close enough to prevent heads or legs sticking out**

Principles of design

- **for horned animals the height and width of the container must be sufficient to allow the animal to stand in a natural upright position with head extended**
- **a sliding or hinge door provided at the rear, properly designed and secured to prevent accidental opening**
- **the floor should be of pegboard or slated to prevent slipping. A droppings tray must be provided**
- **the dimensions of the container must sufficiently restrict movement, to prevent turning around etc**

Principles of design

Note

deer species may only be accepted after they have shed their antlers or when they have been cut off if hard

INTER INSTITUTIONAL COMMUNICATION

- **Confirmation of permit acquisition**
- **Itinerary & Collection Details**
- **Species management information**
- **Specimen records**
- **Staff accompaniment**
- **Loan agreements**

COMMUNICATION IN-HOUSE

The following should be confirmed with appropriate staff

- **Faecal checks**
- **Crate training**
- **Inoculations & Tests where required**
- **Dimensions of available crates**

VETERINARY

- Specimens leaving a collection should be clear of internal/external parasites.
- General health certified by veterinarian.
- For particular species and countries further tests may be required.

D DAY

- Crating
- Confirmation of I.D. data collected if animal is in hand
- Transfer to departure point
- Paperwork
- Communication / Confirmation

RESPONSIBILITY

To work effectively one person must co-ordinate this process.

THE ANIMAL REGISTRAR

- if not a person dedicated to the shipment

Technical Session II
(24th January, 2011)

Pharmacology of drugs used in zoo/wild animal anesthesia

Dr.Carlos Sanchez, Associate Veterinarian Brookfield Zoo, USA

Chemical and Physical Restraint of Wild Animals – special emphasis on deer

Dr.Kevin Lazarus's, Director Zoo Taiping & Night Safari Malasya

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Pharmacology of drugs used in zoo/wild animal anesthesia

Dr. Carlos Sanchez
Associate Veterinarian
Chicago Zoological Society
Brookfield Zoo, USA

This presentation offered insight about physiological aspects in relation to chemical restraint was given emphasis in captive wild animals. Similarly use of drugs for restraining for non-domestic carnivores and hoof stock was stressed. The participants of the net workshop interacted with this resource person Dr. Carlos

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[illegible]
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CHEMICAL RESTRAINT OF NON-DOMESTIC CARNIVORES AND HOOFSTOCK

GENERALITIES

Unless it is an emergency, always plan an anesthetic procedure.
-What needs to be done? (Clinical, biological samples, Perform physical exam?)
-Is anesthesia necessary? – Is physical restraint possible?
-Where is the anesthesia going to be carried out?
-Do we have the necessary equipment to carry out the immobilization and the procedure?
-Do we have the personnel to carry out the procedure?
-Do we have the right drugs to chemically restrain the animal(s)?
-Take the weather conditions into account.
-Be aware of possible complications.
-Know how to prevent and treat/respond to these complications.
-Assign roles to the different personnel involved in the procedure.
-Obtain a recent weight of the animal to be anesthetized whenever possible.

Preparation for the procedure
*Human safety is paramount
*Animal safety is very important
*Review information on the species to be captured/anesthetized
*Contact people with experience anesthetizing this species
*If possible perform a visual exam PRIOR to the anesthetic event

FREE RANGE vs CAPTIVE ANESTHESIA

Reasons to anesthetize:
- Free ranging: Translocation, health assessment, [illegible] injuries / human interventions, ecological studies (GPS telemetry)
- Captive: Emergency, PE, blood sample, Radiographs, Quarantine exams, Pre-shipment exam, transportation.

Free range	Captive
Higher dosages are required due to [illegible] of the animal, [illegible]	Animals accustomed to human presence. Therefore lower dosages are needed. Physical restraint [illegible] if possible
Fasting will not be possible	Fast accordingly to size/metabolism of animal
Estimated body weights at the best	More accurate weights
More affected by climate	More control on weather and temp
Difficult to approach animal for drug delivery	Different options to deliver drugs
Need higher volume of drugs	[illegible]
Monitoring could be more difficult	Easier to monitor

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Herbivore and carnivore chemical restraint

January 2011

Ideal anesthetic agent must be/have:

-Potent
-High safety margin (TI)
-Smooth and fast induction and recovery
-Reversible effect
-Short lasting
-Minimal side effects
-Non toxic

One product with all these characteristics DOES NOT EXIST

The combination of drugs reach this!! ⇒ ideal anesthetic plane.

-Know drug pharmacokinetics/Pharmacodynamics (mechanisms), side effects.

*Narcotics – Renarcotization
*Alpha-2 – Recycling
*Stress – Override alpha 2 effects
*[illegible] has been associated with deaths in tigers and at least one panda.

-Know basic principles of species anatomy, physiology and [illegible]

*Stress – Capture myopathy
*Position will be different for different species once in recumbency
Hoofstock: Sternal with head up and nose pointing down to prevent regurgitation
Elephant, tapirs: Do not keep in sternal >20min ⇒ [illegible]
*Physiological adaptations: [illegible]

-Recognize that we anesthetize some animals with health problems that [illegible]

*Kidney disease
*Liver disease
*Cardiac disease

Drug delivery

Routes

Injection – IM – IV
Oral – [illegible]
Inhalation

Administration methods:

Hand injection
Physical restraint
Squeeze cage
Training

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Livestock and carnivore chemical restraint [illegible]
January 20[illegible]

Darts
Plastic
Metal
Homemade
Blowpipes
Long-bow/crossbows
[illegible] projectile [illegible]
CO_2
.22 caliber (powder charge [illegible] permit)
[illegible]
Pole syringes
Manual
Spring-loaded

Drugs commonly used in zoo and free ranging mammals
Tranquilizers
Sedatives
Dissociatives (Cyclohexamines)
Opioids (Narcotics)
Hypnotics (ultra short acting)
Inhalant agents
*[illegible]

Tranquilizer
Decrease anxiety, aggression and fear
Calms the animal [illegible]
[illegible] reflexes
↑ Dose ⟹ ↑ [illegible]
[illegible]
e.g. [illegible]
[illegible]

Sedative
[illegible]
[illegible]
Decrease motor activity
↑ Dose ⟹ ↑ [illegible]
Useful as [illegible]
e.g. Benzodiazepines
Alpha-2 agonists

[illegible]

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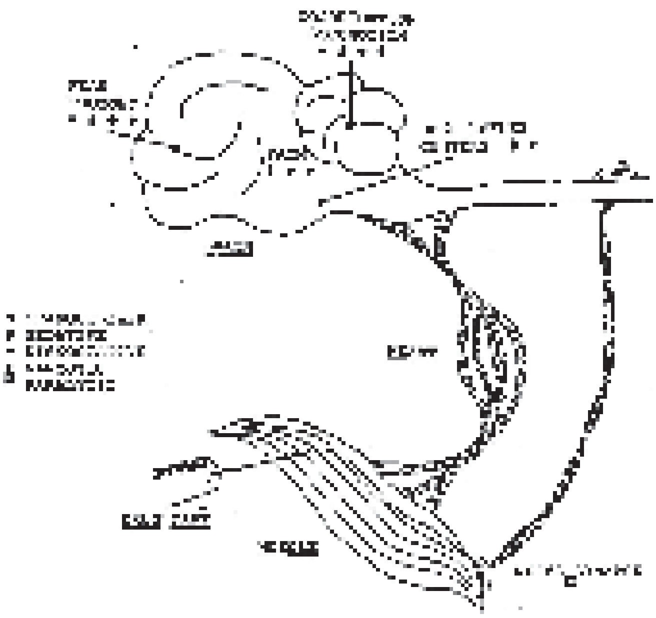
Hoofstock and Antelope Chemical Restraint
January 2011



Sites of drug actions.

Tranquilizers

Phenothiazines

Propiopromazine

-Perphenazine (long acting)

-Acepromazine

Antiemetic

Antispasmodic

Causes hypotension

Affects thermoregulation

Does not provide analgesia

Moderately long action (4-12 hrs)

Butyrophenones

- Azaperone (considered a short acting neuroleptic)
  - Useful for short transports
  - Effect 2-6 hrs
- Haloperidol (Haldol)
  - Medium to long action (water soluble) – Long acting (oil based solution)
  - Useful in live Stock transportation

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Guidelines for carnivore chemical restraint. January 2011

Sedatives

Benzodiazepines

Commonly used in combination with cyclohexamines in carnivores and primates. Especially useful to control seizures.

All benzodiazepines can be reversed with flumazenil ($$$$$)

-Diazepam – Non-water soluble
- Controlled substance
- Muscle relaxation
- Anticonvulsion
- Anxiolytic
- IV: Respiratory depression
- IM: Variable effect
- Metabolized in liver

-Midazolam – Water soluble
- Controlled substance
- 4x more potent than diazepam
- Similar effects than diazepam but more expensive
- Less respiratory depression if given IV
- Better absorption (and more consistent effect) when given IM
- IV, IM and oral route

-Zolazepam
- In combination with tiletamine (Telazol)

-Lorazepam
- Used orally in humans

Alpha 2 adrenoceptor agonists

Normally used in combination with cyclohexamine compounds.

Reversible with any of the alpha 2 antagonist: Atipamezole, tolazoline, yohimbine

Produce sedation and muscle relaxation.

Marked cardiac effects (bradycardia, cardiac AV blockage type II)

-Triphasic cardiovascular effects: Initial hypertension followed by hypotension.

-Avoid supplementation of alpha-2 if possible.

Vasodilatation ⟹ ⇩ blood pressure

⇩ Blood pressure ⟹ vasoconstriction

Vasoconstriction ⟹ difficult to get [illegible] pulse [illegible]

Vasoconstriction ⟹ more difficult to have access to peripheral veins

Over excitation ⟹ increase in circulating catecholamines

Circulating catecholamines ⟹ override alpha 2 effects

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Handouts [illegible] chemical restraint [illegible] January 2011

-Xylazine (Rompun®) (160:1 alpha-2 : alpha-1)

Ruminants more susceptible than horses, horses more susceptible than carnivores
Causes vomiting in carnivores
Route IM or IV (IV route will cause increased CR effects)
Initial effect (IM): 10-20 min.
*Can be reversed with yohimbine, tolazoline or atipamezole

-Detomidine (Dormosedan®) (260:1 alpha-2 : alpha-1)

Similar effects to xylazine but 50-100 more potent
Used for standing sedation in [illegible] are [illegible]
*Can be reversed with yohimbine, tolazoline or atipamezole

-Medetomidine (Domitor®) (1620:1 alpha-2 : alpha-1)

[illegible]
10x more potent and specific than xylazine
Marked hypertension followed by drop in blood pressure in carnivores & primates
Atipamezole is the specific reversal agent for medetomidine.

- Dexmedetomidine (Dexdomitor®) (Considered a full agonist of alpha-2 [illegible])

Active enantiomer of medetomidine (Dextro enantiomer)
Does not contain the inactive enantiomer levomedetomidine (levo enantiomer)
Levomedetomidine prolongs hepatic metabolism of ketamine and other drugs
Degree of sedation higher with dexmedetomidine [illegible] when in combination with levomedetomidine (Domitor®)
Reversible with atipamezole

Cyclohexamines

Cause a dissociative effect
Although ketamine can be used alone in primates it is better to combine it with a sedative.
Palpebral and corneal reflex present and eyes wide open (lubrication)
Pharyngeal and laryngeal reflexes remain present: therefore intubation is more difficult to achieve
They do not cause muscle relaxation, occasionally [illegible] seizures.

Ketamine

Most used agent in primate anesthesia
Rapid effect when given IM (2-10 min)
It has cardio stimulatory effects
Wide safety margin
Minimal to moderate analgesia
Increases blood and CSF pressure
If given IV too fast it could cause respiratory depression
It is NOT reversible
Ketamine is metabolized in liver, therefore [illegible] the dose [illegible] duration of effect.
Ketamine is excreted by the kidneys, avoid in animals with [illegible] or suspected renal disease.
Duration of effect 45 - 90 min (dose dependent)

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Herbivore and carnivore chemical restraint — January 20[illegible]

Ideal agent for supplementation
- **Tiletamine** (only sold mixed with zolazepam)
  - Commercial form: [illegible] 100 mg/ml ⟶ [illegible]
  - Depending on the species the tiletamine or the [illegible] metabolized first (e.g.) then the zolazepam [illegible]
  - Once reconstituted [illegible] be stored in [illegible]
  - 3-4x more potent than ketamine
  - Initial effect (IM) 1-2 min
  - Effect last 3-4x more than ketamine
  - Affects thermoregulation
  - [illegible]
  - Good analgesia and muscle relaxation
  - High dosages can cause respiratory depression
  - [illegible]
  - Long recoveries [illegible] is metabolized first)
  - Rough recoveries sometimes (when zolazepam is metabolized first)
  - Do not use in tigers, [illegible]

Opioids (Narcotics)
- Often used in combination with alpha-2 adrenergic agonists, phenothiazine derivatives or butyrophenones.
- Mostly used in ungulates and occasionally in bears, not used in felids or canids

- Ultra potent narcotics – Etorphine (M-99), Carfentanil, A-3080
  - A single drop can kill a person in [illegible] minutes without the appropriate treatment
  - Must be used by experienced people with an emergency safety plan.
  - Act on specific opioid receptors in the CNS ([illegible])
  - Provide good analgesia but poor muscle relaxation
  - Etorphine is 1,000x more potent than morphine
  - Carfentanil is 10,000x more potent than morphine
  - Cause severe respiratory depression
  - Reversible
    - Naltrexone: pure antagonist, long half life; diprenorphine (M50-50): Partial agonist – antagonist [illegible] naloxone [illegible] approved human pure antagonist [illegible] very short half life [illegible] "renarcotization"
  - Renarcotization [illegible] (24-72 hr post antagonist administration)

- **Butorphanol**
  - Agonist/antagonist
  - Causes deep sedation rather than anesthesia
  - [illegible] more potent than morphine
  - Commercial presentation [illegible]
  - Causes excellent analgesia
  - [illegible] causes [illegible] sedation
  - Can be given oral (slow absorption), IM or IV

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Hoofstock and carnivore chemical restraint
January 2011

Reversible with naloxone or naltrexone

Used to partially reverse the cardio respiratory effects of the super narcotics when used as an antagonist

Fentanyl

100x more potent than morphine

Rapid onset (more lipid soluble than morphine thus quickly crosses the blood brain barrier)

Short duration of action (30 min)

Causes minimal cardio respiratory depression even at larger dosages

Route: Oral, IV

Excellent to produce initial sedation in great apes prior to darting them

Hypnotics

-Propofol

Must be given IV therefore only practical if animal is physically restrained first

IM injection causes severe pain

Rapid redistribution of the drug from the brain to other body compartments therefore rapid recovery is expected

Provides only mild to no analgesia

Metabolized in the liver and extrahepatic

Effects last 5-10 min (dose dependent)

Should be given slowly over 60-90 sec, not too fast

Can cause [illegible] by excessive [illegible] in animals with hypovolemia

Is a potent respiratory depressant and if O2 is not supplemented arterial O2 levels ↓ and arterial CO2 levels will ↑

[illegible] is strongly irritant

Excellent for animals with liver or renal disease

Inhalant anesthesia

Rarely used in the field but commonly used in captivity

Appropriate equipment needed

Solubility: Sevoflurane < Isoflurane < Halothane. The higher the solubility the more dissolved the drug will be in the organism.

Sevoflurane will cause shorter induction and recoveries due to minimal solubility

Halothane

Can cause hepatic damage

Causes cardiac arrhythmias

Can cause malignant hyperthermia

Isoflurane

Causes less cardiac arrhythmias than halothane

Less flammable than halothane

Less toxic for humans

Sevoflurane

As it is less soluble, higher concentrations of the gas are needed for induction

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January 2011

Its [illegible] makes it very safe

Long acting neuroleptics

- Used to tranquilize and decrease stress in animals that have to adapt to a new environment or situation

All but Haldol are phenothiazine derivates

Zuclopenthixol
Perphenazine enanthate
Pipothiazine palmitate
-Fluphenazine decanoate

Supportive or emergency drugs

-Anticholinergics (atropine/glycopyrrolate) – Hypersalivation and severe HR (bradycardia)
-Doxapram – Respiratory stimulant – short half life
Prednisolone sodium succinate – Head trauma
Dexamethasone – Shock
Crystalloid / Colloid fluids – Hypotension, hypovolemia, shock
Epinephrine – Cardiac arrest
- Dopamine/Dobutamine – Severe hypotension

MONITORING

Free range	Captive
MM CRT and color (blue MM – cyanosis)? Respiration (frequency, depth, rhythm, effort)? Auscultation? – pulse?	MM CRT color (blue MM – cyanosis)? Respiration (frequency, depth, rhythm, effort)? Auscultation? – pulse?
Temperature? Pulse oximetry? (HR, SPO2, CO2?) Should be >95%	Temperature? Pulse oximetry? (HR, SPO2, CO2) Should be >95%
Blood gases (iSTAT)	Blood pressure? (invasive or indirect) Electrocardiography
	Blood gases (iSTAT or in house lab)

[illegible]

Hypoxemia:

- Slow respiration [illegible], irregular respiration and/or [illegible] respiration
  Pale or cyanotic MM
  Tachycardia / bradycardia
  Cardiac arrhythmia can be normal [illegible]
- Weak or absent pulse
- CRT > 2 secs
- Dilated [illegible]
  Severe hypotension/hypovolemia

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[illegible] January 2011

THE ANESTHETIC PLANE IS TOO DEEP AND COMPLICATIONS CAN ARISE ANY TIME.

COMPLICATIONS - EMERGENCIES

Human:

-Exposure to one of the [illegible]

Have and know the emergency exposure protocol for these drugs (antagonist, CPR training, supportive care).

Trauma:

-Animal

Before drugs delivered	During procedure	During reversal	After procedure
Stress	Regurgitation [illegible] ⇓ Aspiration	Rough recovery ↓ Trauma	Capture myopathy -Acute death syndrome -Delayed peracute death syndrome -Ataxic myoglobinuric syndrome -Muscle rupture syndrome
Trauma	Bloat	Too fast recovery ↓ Trauma	[illegible] ↓ Vomit ⇨ Aspiration
Hyperthermia	Hyperthermia Hypothermia Seizures Vomiting Respiratory problems -Hypoventilation -Hypopnea/Apnea -Hyperventilation -Hypoxia -Respiratory insufficiency -Respiratory arrest Cardiac problems Hypotension/peripheral vasoconstriction Bradycardia/tachycardia Arrhythmias [illegible]	[illegible]	Renarcotization Trauma

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Blank

Chemical and Physical Restraint of Wild Animals – special emphasis on deer

Dr.Kevin Lazarus's
Director Zoo Taiping
& Night Safari
Malaysia

This presentation offered significant emphasis with regard to the transactions of wild animals and attention was paid on IATA regulations crate designs for deer and CITES. The intricate aspects of physical restraint & Chemical restraint including the various types of delivery systems were felt in detail. Zoo Veterinarians interacted with their queries.

Blank

Chemical And Physical Restraint Of Wild Animals: Special Emphasis on Deer

Restraint

1. **A responsibility**
2. **Has some effect on the behaviour, life and activities of the animal.**
3. **Each time an animal has to be restrained, the following should be considered.**

- **What procedure will produce the greatest gain at least hazard.**
- **When is the best time to restrain the animal.**
- **Who will be the most qualified to accomplish this .**

-The basic principles of restraint apply to all classes of animals.

-The degree of restraint varies from confinement in an unnatural enclosure to complete restriction of muscular activity or immobilisation (hypokinesia)

-Both physical and chemical restraint are practised.

Factors to be considered when selecting a restraint technique:-

1) will it be safe for the person who must handle the animal

2) Does it provide maximum safety for the animal

3) Will it be possible to accomplish the intended procedure

4) Can constant observation and attention be given till the animal is fully recovered.

Physical Restraint

- To be successful we must understand their behavioral characteristics and the aspect of their psychological make up.
- The successful restraint operator must understand and have working experience with the tools of restraint (including use of voice) and with manual and chemical restraint techniques
- Avoid handling animals when ambient temperatures are too high (above 32c) or very high humidity (above 70%)
- If necessary prepare for cooling equipment accessories.
- Sometimes best to handle diurnal animals at night and nocturnal in the day.

- Recently transported animals are poor restraint risks.
- Transport in crates , truck and places is a stressful event.
- The longer the journey the greater the potential for hyperthermia and other stresses to develop.
- Method of handling and the type of accommodations used in transport are important
- If possible , allow time to acclimatise to a new environment before additional restraint.

- Tools used in effecting a given degree of restraint vary greatly.
- Tools desirable for dealing with one species maybe contraindicated for use with another.
- Success in the art of restraint requires both experience and study to know when it is appropriate to use a specific type of restraint.
- Inappropriate use of certain techniques may not only be unwise but also dangerous to human or animal.

- Tools are placed into the following groups

1) Psychological tools

2) Diminishing sense perceptions

3) Methods of confinement

4) Tools to lend added strength or to extend the arms

5) Physical barriers

6) Physical force

7) Chemical agents – to sedate , immobilize or anesthesize

Psychological Tools

Voice

-Emotional state reflected in voice

-domestic /wild animal rapidly perceive fear or lack of confidence

- If lack confidence in self or procedure best to remain silent

-Other mannerisms

-timidity, how one approaches etc

-Training may involved establishment of dominance over animal

-The significance of physiological and behavioral phenomena of social and flight distance.

Diminishing Senses

-Reduction and elimination of animals visual communication with it environment

-Placement of animal in darkened environment (eg. dark house for deer)

-blindfolding , ear plugs

- **Much stress relieved when animal is blindfolded**
- **Sedated animals in sunlight should always be blindfolded to prevent damage to retina**

Diminishing Senses

- **Excessive sounds of talking, motors, noisy vehicles and other strange sounds should be eliminated / minimized as they may seriously upset a wild animal**

- Restraint is easier to achieve if sounds can be dampened and harsh tones of voice eliminated or diminished in proximity to the animal

- Touching – kept to a minimum as required

Confinement

- **The acceptable degree of confinement may vary depending or the species and the situation .**
- **To a free living adult wild animal, placement in a large fenced area represents confinement and result in a certain degree of stress.**
- **Confinement stress can be progressively intensified by a gradual shift to smaller enclosures .**
- **In a zoo situation, this may be a raceway, stall etc**

- The closest and most stressful confinement is placement into a special holding area such as a transfer cage, a special night box, a shipping crate or one of the many different type of squeeze cages.
- Squeeze cages are a valuable restraint tool for wild animal
- Is important to recognise that no squeeze cage can be adapted for universal use
- Animals vary in both anatomical conformation and physiological requirement and the design must fulfill these.

- Confinement may be done in special bags
- Animal can be wrapped in towels or cloth, birds placed in stockinettes or nylon hose, reptiles inserted in plastic tubes.

Extension of the Handler's Arms

- **Ropes**
- **Snares**

- a snare is an important tool but if used carelessly can cause suffocation or unnecessary pain.

Nets

-in all sizes and shapes
small nets to capture tiny insects to large cargo nets to restrain musk ox.

- **A variety of sizes should be obtained so that a wide range of species can be manipulated.**
- **A variety of procedures can be done, such as medication, examination, injections, collecting samples etc.**

Physical Barriers

- **Maybe used to protect both handler and animal or to allow handlers close proximity without alarming the animal.**
- **Shields or baffle boards are important restraint tools and may consist of simple plywood sheets and maybe equipped with handles on the back.**
- **Shields can allow close approach to an animal and can be used between two transfer cages having swinging instead of guillotine doors.**
- **Plastic shields are useful in handling large, non venomous reptiles, some of the smaller mammals and some birds.**

- a blanket maybe used to shield the animal from the handler
- A small antelope may be captured by allowing it to jump into the blanket
- Animals recognise an opaque plastic sheet as a barrier, and thus can be directed into holding crates or into chutes.
- Plastic sheeting has it greatest application in the herding of hoofed animals.

Physical Force

- Most manipulative procedures require use of the hands.
- The restrainer must know where and how to grasp the animal in order to protect himself and to accomplish the restraint required
- The greatest protection for the hands is detailed knowledge of the animal to be restrained.
- Gloves are an important tool of restraint. Material varies from thin cotton for small rodents to heavy leather gloves for primates. Leather welder's gloves are excellent for general use.
- Restrainers should realize that wearing gloves diminishes tactile discrimination.

Chemical Restraint

- **The use of drugs to restrain and immobilise wild animals has developed tremendously.**
- **Commonly used drugs now permit manipulative procedures to be done safety.**
- **The search for an ideal drug for chemical restraint probably continues.**
- **However certain drugs meet many of the needs for individual species.**

- **An ideal drug for chemical restraint**

1. **Have a high therapeutive index (wide margin of safety: lethal dose/effective dose)**
2. **Should not irritate the muscle**
3. **Have a short induction period**
4. **Have a antidote, which reverses its effects and prevents death from respiratory arrest**
5. **Be stable as a solution for a long period of time in room temperature.**
6. **Low effective dose, to allow use in small volume darts (or in concentrated solution)**

Delivery Systems

- **The first challenge facing the person using a chemical agent for immobilisation and restraint is to administer it to a site that allows absorption**
- **Satisfactory techniques vary from species to species and from animal to animal , according to size, distance from operator , ability to partially confine the animal, operator skill and the effectiveness of the available equipment.**

Oral

- **Not very reliable , not tolerated by many species.**
- **Effectiveness is often minimal as many chemical restraint agents are either unabsorbed or destroyed in the digestive tract.**
- **Difficult to administer –except maybe some primates and some carnivores**
- **Ketamine , zoletil (telazol) maybe effective if given 2-3 times the normal parental dose.**

Hand-held syringe / pole syringe

- Intramuscular injection can be given very quickly with a hand held syringe
- A large gauge needle should be used to deliver the liquid quickly
- A luer-lok connection is desirable
- the syringe must be concealed when primates or carnivores are approached
- If the animal is caged one must wait for it to present a suitable muscular area near the side of the cage
- The restrainer then quickly jobs the syringe and needle through the skin and at the same time makes the injection.

Projectile Syringes or Darts

Modern chemical restraint requires equipment capable of projecting a syringe some distance and discharging the content upon impact

-Various systems are available

1) blow pipe

2) compressed air / co2 powered system

-Pipes

-Guns / rifles –telinject

3)charge powered rifles

-Cap chur

-Distinject

- Each system have their own type of darts and mechanism for drug release
- Plastic blow darts
  - ❖ Work on compressed (positive pressure) air / gas with needle tips sealed , hole at side of needle covered with a sleeve
- Gas powered guns/ rifles
  - ❖ have very sturdy plastic darts that work similarly to the blow darts
- powder powered guns/ rifles
  - ❖ have metal darts that work on a small explosive within darts that explode on impact and discharge the drug

Pre Restraint Considerations

-When preparing to chemically immobilise an animal , consider the following

1) the species

2) the physiological alarm status of the animal including the age, sex, general health

3) the physical condition

4) the emotional status of the animal

- No chemical restraint agent available is equally effective and safe for use with all 45, 000 vertebrate species

- Dosages of chemical restraint drugs are based on body weight, therefore it is important to develop the ability to estimate this accurately

- Small species such as cage birds or rodents should be weighed

- Animal may be suffering from various degrees of malnutrition and disease and this will influence the outcome of immobilisation
- The most important factor to consider in chemical restraint is the emotional status of the animal at the time of injection.
- Injecting a drug into an animal that is in a state of alarm may produce effects opposite to those occuring in a normal quiet animal.
- It is not always possible to immobilise an animal under ideal conditions, however the closer the approach to the ideal the safer the immobilisation process.

Adverse Effects of Restraint

- **Successful immobilisation of a wild animal is an art , and many factors are involved.**
- **The operator must consider not only what equipment to use and the animals condition but personal ability as well.**
- **If the operator is not skilled in the use of the chosen device , it will be difficult to utilize it to its greatest advantage.**

Causes for failure of immobilisation procedures may be categorised into 3 major areas :-

1) equipment failure

2) operator fault

3) miscellanous conditions

1. Equipment Failure

- Gas leaks – rifles , pistols, darts
- High impact darts may break at needle hub
- Syringe charge may fail to explode
- The propelling charge may be insufficient to carry the dart to the animal

  -wrong calculation of distance

  -inadequate pressure / charge

  - leaks

  - damaged charges

  - insufficient breath- for blow darts

Equipment Failure

- Large gauge needles may be plugged with skin
- Needles that discharge from the side solve this problem
- Improper loading of dart – imbalance
- Damaged tail piece

2. Operator Failure

- The operator must ensure that all equipment is clean, lubricated and in proper repair.
- Needles should be inspected for patency
- The most common operator fault is missing the target entirely or making an injection at an inappropriate site.
- As far as possible one should not attempt to dart a moving target
- Darts should enter the skin at a perpendicular angle, if at too acute an angle the dart may fail to discharge or it may glance off the animal, or the needle may bend or break off

- With excessive force of impact , the whole dart may be driven through the skin of an animal. This is likely to happen if too high a charge is used or distance is badly misjudged
- Small antelopes and deer have thin skin that is easily penetrated

- **Infections may develop at the injection site**

  -It is not possible to disinfect the dart site

  -Therefore syringes, needles and all paraphernalia used to load syringes should be clean and sterile to minimise post injection infection

  -Wound infections occur more frequently when there is extensive contusion at the impact site

- **The dart occasionally falls from the animal before all the content has been discharged**

  -needle bore too small

  -charge to weak / gas leaks

  -impact too great – dart bounced off

Collars / barbs have been attached to many needles to impede the release of the syringe and allow complete discharge of the contents

3. Miscellanous Conditions

- **Climatic conditions effect the functioning of equipment and flight path of the dart**
- **Wind can have a marked effect on trajectory**
- **Warmer weather increase gas efficiency adding to the range of the C02 projector, cold weather decreases the range**
- **Possibility of the partially drugged animal stumbling and falling into precarious situations**

  - sudden falls can result in a fractures or contusions, broken teeth , GIT ruptures etc.

- **Access to pools, ponds and moats should be prevented**
- **Partially sedated animal may fall into them and drown**
- **Primates frequently climb up bars, trees and other fixtures and injure themselves by falling as the drug takes effect**
- **Proper equipment must be available to administer oxygen or to give other emergency treatment**

Restraint and Anesthesia

- Smaller deer can be caught by hand if they are first contained in a small room, alleyway or special chute (there are exceptions in some sensitive species like barking deer)
- Larger species can be trained to work through a circular chute arrangement into squeeze chutes
- However physical restraint may be extremely taxing on both the animals and the handlers
- Chemical immobilisation is much more satisfactory for procedures that last more than a few minutes

Restraint and Anesthesia

- Many chemical immobilising agents have been used on cervids
- Xylazine HCl, usually in combination with Ketamine HCl, Etorphine HCl or Zoletil can be a agent of choice
- Dosages vary markedly from species to species
- Endotracheal intubation is not easy to perform – Halothane and methoxyflurane have both been used for general anesthesia

References

1) Fowler., M.E. (1986) Restraint In Zoo and Wild Animal Medicine 2nd ed. W. B. Saunders Co., West Washington Square, Philadelphia PA 19105 USA pp 43 – 50, 981 – 984

2) Kock., M.d. et al (1997) Chemical and Physical Restraint of Wild Animals: A Course Manual. Zimbabwe Vet Assoc.

3) McKenzie., A.A. Ed (1993) The Capture and Care Manual: Capture, Care, Accommodation and Transportation of Wild African Animals. Publ. Wildlife Division Support Service. The South African Veterinary Foundation

Technical Session III
(24th January, 2011)

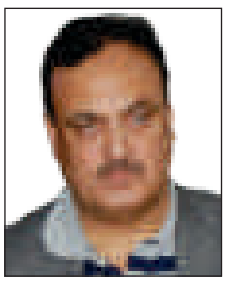
Handling and Restraint of Deer prior to transport

Dr. Mir Mansoor, Jammu & Kashmir

Complications of chemical restraint and how to prevent them

Dr. Carlos Sanchez, Associate Veterinarian, Brookfield Zoo, USA

Handling and Restraint of Deer prior to transport



Dr. Mir M. Mansoor
Chief Wildlife Biologist
& Vet., Jammu & Kashmir
State Wildlife Protection
Department

The presentation emphasized about the handling of restraint of deer prior to the transport. Various methods of transport of deer were specifically dealt in a systematic manner. Detailed discussions were made with concerned on the field problems.

HANDLING AND RESTRAINT OF DEER PRIOR TO TRANSPORT

Risk factors

Generally, deer during handling (prior to transport) become exposed to high risk of:

1. stress,
2. shock and
3. capture myopathy

The risk increases if:

1. The deer with antlers or in velvet are allowed to struggle during their capture or restraint.
2. The process is carried out in hot weather.

Species Categories

1. *Large-sized deer:* e.g.
   Pere Davids Deer (Elaphurus davidianus), Sambar (Rusa unicolor), Red Deer (Cervus elaphus), Barasingha (Rucervus duvaucelli). *(>150 kgs)*
2. *Medium-sized deer:* e.g.
   Hog Deer *(Axis porcinus)*, Chital *(Axis axis)*, *Fallow Deer (Dama dama)*, Sika Deer *(Cervus nipponi)*, *Eld's Deer (Rucervus eldi)*. *(50-150 kgs)*
3. *Small-sized deer:* e.g.
   Chinese water deer *(Hydropotes inermis)*, Musk deer *(Moschus moschiferus)*, Barking Deer *(Muntiacus muntjak)* *(< 50 kgs)*

Considerations

Any wild animal capture process requires proper planning that includes the following:

- Type and number of the animals.
- Identification of the capture method
- Breeding, moulting, hibernation.
- Physical state
  - Young
  - Advanced pregnancy
- Sex and age.
- Climatic condition.
- Terrain of the capture site.
- Availability of immobilizing / tranquillizing drugs.
- Availability of vehicles & transport crates etc.
- Animal health requirements e.g. quarantine of animals captured.

Equipment/Chemicals/Accessories to be kept handy:

- Appropriate nets –
  a. walk-towards nets (100 cm wide x several mtr long) similar to tennis netting in appearance
  b. Hand nets (100 cm depth x 70cm frame (rim) dia.) with 10cm mesh & a stout 1m handle.
- Appropriate blindfold/ suitable cloth or bandage for use as a blindfold.
- Carrying equipment such as stretcher or cargo net.
- Dart gun and darts if chemical restraint is required for capture.
- Appropriate drugs if required for capture or restraint.
- Gloves (various types)
- Boxes/cages/bags/sacks
- Blankets/towels/rope
- Knife/wire-cutters
- Graspers
- Goggles or similar eye protection.

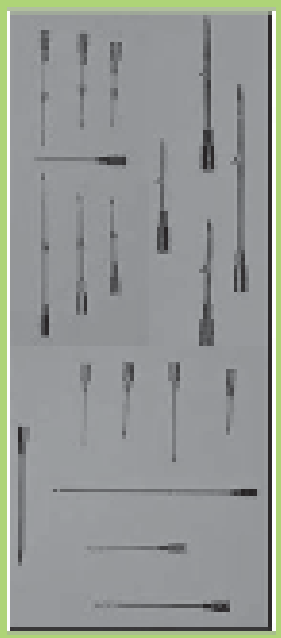
Choice of Capture Method

Many methods -

- Chemical using dart guns, blow pipes & jab sticks etc.
- Biological using lures, baits etc
- Physical using snares, nets & cages

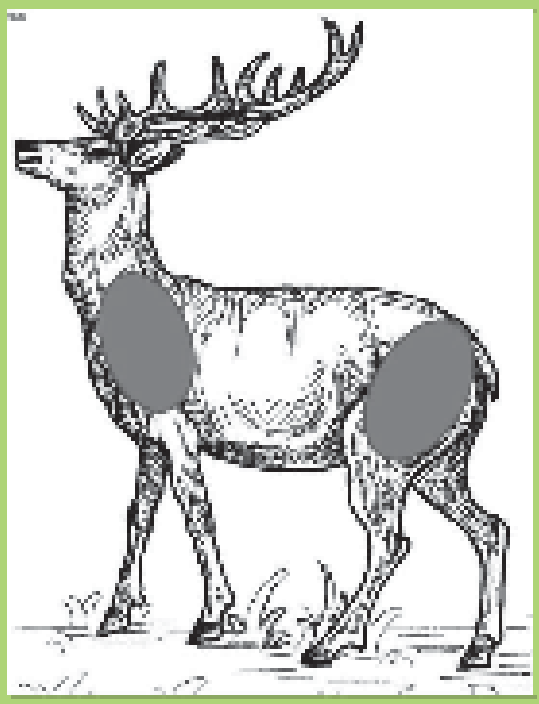
Equipment

Accessories



Darting Posture

Aiming the right Site



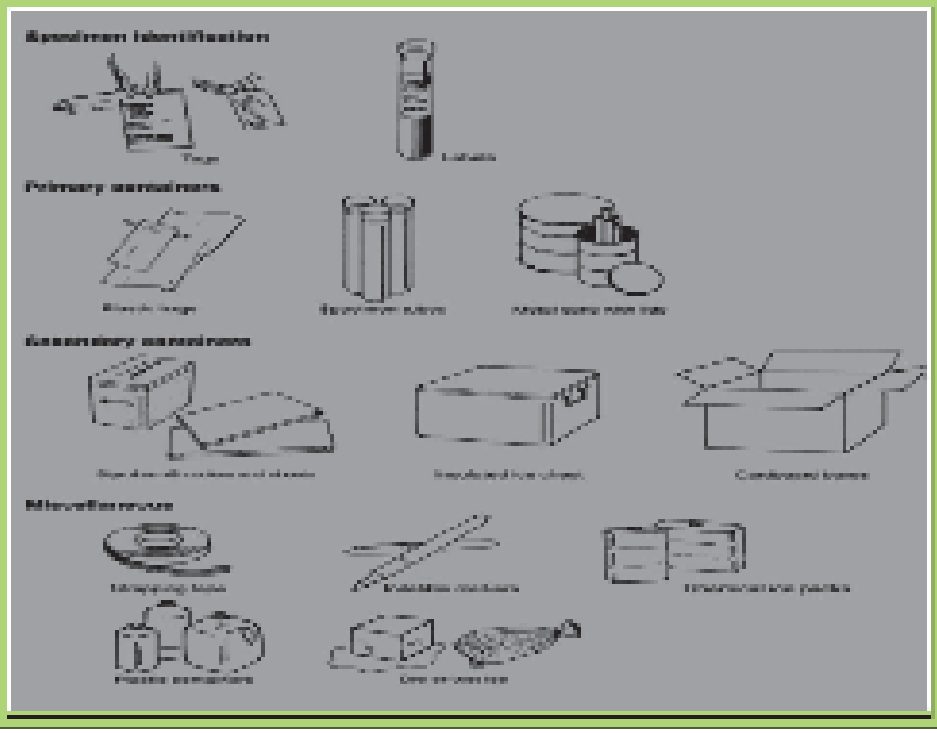
Right handling & Insulation

Right way of carrying

Dealing with Emergencies

Samples Collection

Specimen collection & packaging



Capturing large-sized deer:

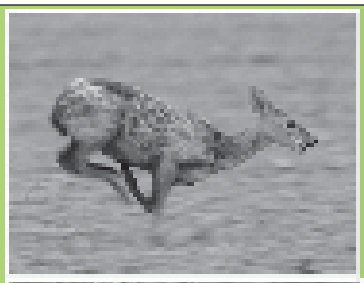
1. If still mobile require sedation/ general anesthesia.
2. If partially immobilized e.g. caught in a fence or severely injured in a road traffic accident, will still require sedation/general anesthesia for the safety of handlers and to minimize stress to the deer.
3. Sedation/general anesthesia contra-indicated in animals in shock.
4. Always cover the eyes as soon as possible to help calm the animal.

Capturing medium-sized deer:

5. Catching in a "walk-towards" net
6. At least 2 people are preferable for handling:
   one person should hold the head/neck and forelimbs, the other leave control over the hindquarters, to minimise kicking and thrashing.
7. Hard antlers (out of velvet) may be used for holding the head; (antlers of roe deer are very sharp).
8. Care must be taken to avoid damage to antlers in velvet.
9. Transfer to an appropriate-sized and preferably padded transport crate as

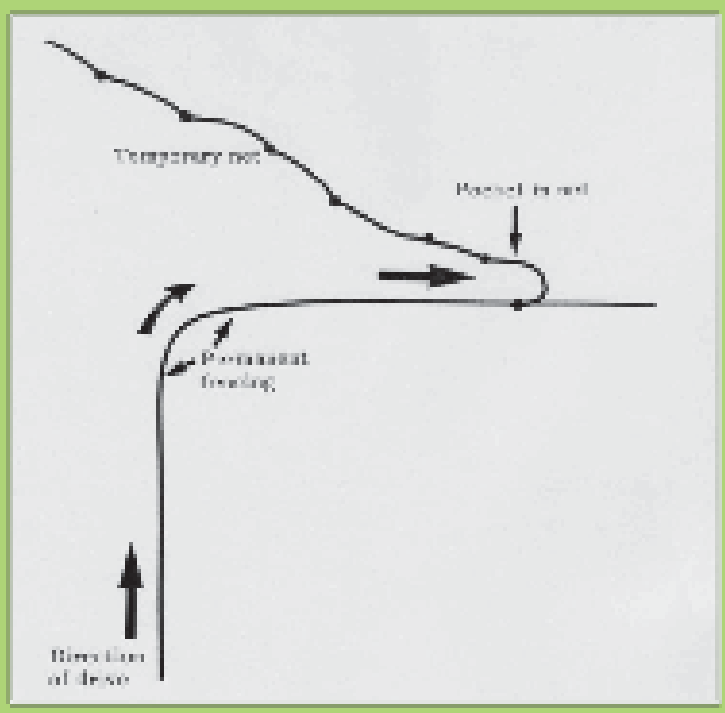
Capturing Small-sized deer:

10. These species are very nervous and more prone to stress and capture myopathy.
11. Large long-handled nets and/or "walk-towards" nets may be used for catching small deer.
12. The time taken in running the deer into a net must be minimised. (Chinese water deer in particular may easily overheat if they are run around for more than a few minutes.)
13. Deer caught in a net may struggle sufficiently to break a leg or neck; the risk may be minimised by rapid physical restraint by one or two people
    a) The deer should be restrained by being held to the ground by the shoulders and rump.
    b) Kneeling astride the deer may be useful but great care must be taken

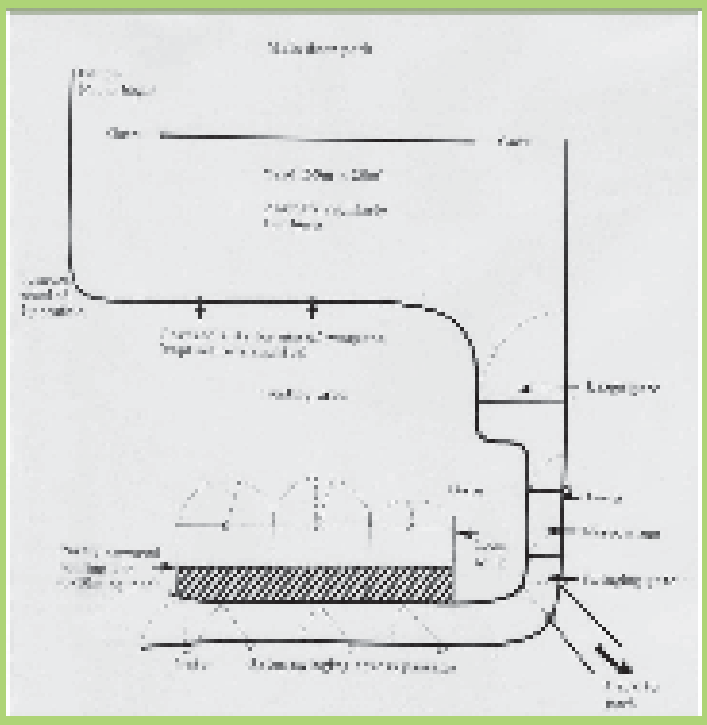


Using fixed nets for small deer

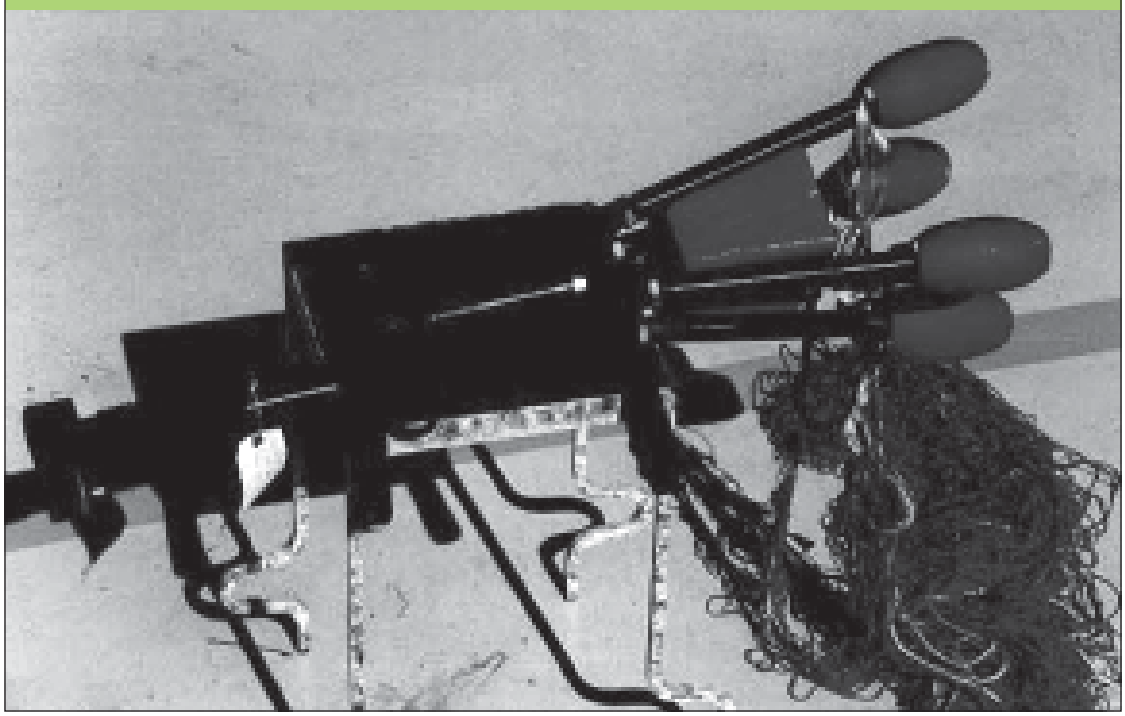
Using Temporary netting for corner capturing



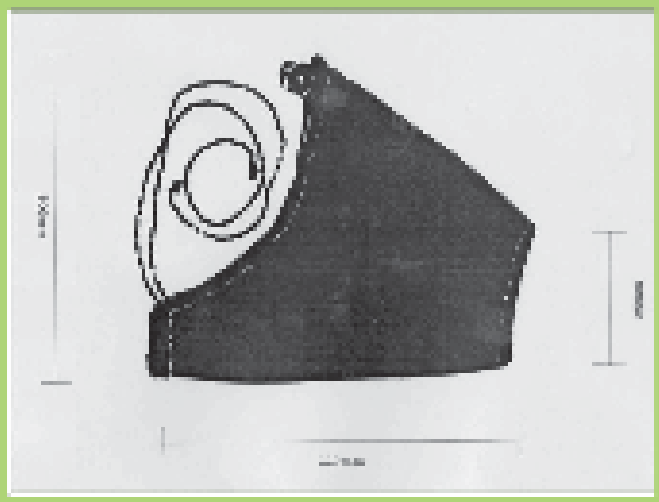
Using holding pens for deer handling



Net Gun

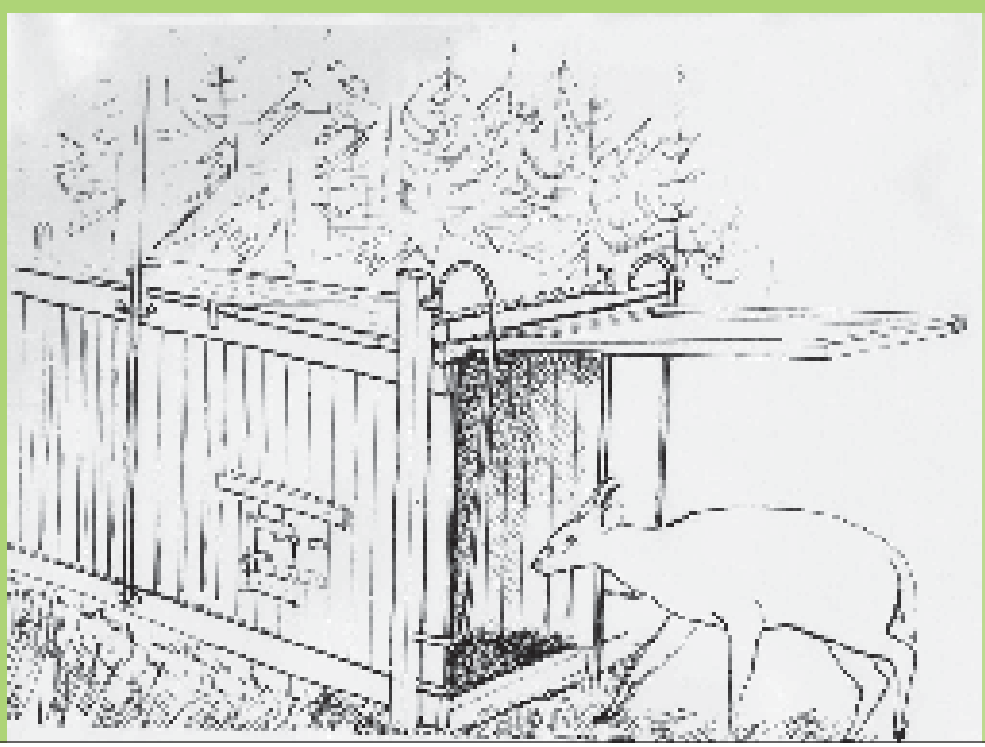


Use of Blind Folds



Keeping small deer comfortable

Using specifically designed transport cages



EXERTIONAL OR CAPTURE MYOPATHY IN WILD UNGULATES

Risk Factor

- Exertional/capture myopathy is a non-infectious disease of muscles.
- It is characterized by damage to muscle tissues brought about by physiological changes, usually following :
  a. extreme exertion,
  b. struggle and/or
  c. stress.

Distribution

- Geographic: This condition can occur anywhere animals are pursued or trapped.
- Seasonality: All year. Warm weather can exacerbate this condition.

Species Affected

- Both mammals and birds of all ages and sexes are susceptible to this disease.
- Species differ in their susceptibility to this disease because of physical and behavioural attributes.
- It is most commonly seen in wild ungulates.

Variation in symptoms/intensity

- Signs vary depending on:
  1. Species,
  2. Cause of exertion and
  3. Biochemical imbalances causing muscular damage.

- Intensity of disease:
  1. *Hyperacute*: Sudden onset & death often noted.
  2. *Acute*: Heart muscle necrosis - death in 2- 4 days.
  3. *Subacute*: Release of myoglobin - Kidney failure
  4. *Chronic*: Heart failure & paralysis - death in 2-4 wks.

Mechanism of Action / Signs & Symptoms

- Early signs include
  1. sudden death or
  2. increased breathing and heart rates,
  3. increased body temperature.

- Additional signs include:
  1. depression,
  2. muscle stiffness,
  3. weakness,
  4. tremors,
  5. in-coordination, or
  6. shock, appearing within hours to days following severe exertion.

Residual Signs

On survival of animal, residual signs last for a month which may include:

1. Red to brown urine due to break down of muscle components .
2. Animals may predispose to kidney failure, predation or accident.
3. Muscles appear haemorrhagic and oedematous with pale & wet or dark red & dry consistency.
4. Kidneys appear swollen, with multiple haemorrhages.
5. Lung tissues oedematous.
6. In severe cases, animals will often die.

Disease occurrence

1. May occur when prey species try to escape predators.
2. Associated with strenuous use of fore and hind limb muscles while capturing and handling wild ungulates.
3. It is extremely difficult to treat and is best to avoid through prevention as mentioned under:
   a) reduce stress & damage to animals,
   b) minimize pursuit, struggling & handling time,
   c) select suitable weather conditions for handling
   d) ensures proper method of capture & handling
   e) ensures animals are released in less stressful conditions as quickly as possible.

Samples for Diagnosis

1. Portions of affected muscles from different areas of the body
2. Sections of heart and kidney tissue

(Samples stored in formalin and submitted for histo-pathological examination.)

Similar Diseases

The development of exertional or capture myopathy may be predisposed to by nutritional imbalances such as selenium deficiency.

Treatment

Generally, if animal is suffering from capture myopathy with apparent clinical signs – then poor prognosis.

Reasons: The muscles die and become incapable of re-growing and the survival of the animal becomes a welfare issue, as the animal:

a) suffers from horrible cramping,
b) feels pain from failing kidneys,
c) becomes incapable of breathing due to congested lungs
d) dies within a month or later.

Treatment Cont.....

In situations where disease is recognized at the hyperthermia stage, it is believed to be possible to treat it. Treatment is quite intensive and expensive.

1) Sedation of animal (*Sedative like valium may reduce anxiety* and assist in muscle relaxation)

2) Administration of intravenous fluids e.g. 0.9% saline (treatment for acute kidney failure). The goal of giving fluids is to:

a) Improve the blood supply to the kidney
b) Dilute the damage that myoglobin does to the kidney
c) Dilute the lactic acid in the blood stream, thus improving heart function
d) Expand the blood volume and address the mechanisms of shock
e) Reverse the hyperthermia

Treatment Cont.....

1) I/V administration of Dantrolene (muscle relaxant) used by some western zoos. The same drug is used in humans for a similar condition - malignant hyperthermia. ***(It can damage the liver and kidney).***
2) Use of Cortisone for its anti-inflammatory properties. It may also help to reverse hyperthermia.
3) Vitamin E and selenium can be used as an antioxidant. This comes as Selvite-E. The dose rate is 1ml per 50 kg. It is given every 7 days under the skin. More frequently will harm the animal.

PREVENTION

The key to prevention of this condition - animal's life is in your hands. Because you can:

a) plan the capture,
b) plan to use sedation,
c) plan what to do if something goes wrong.

Plan the best capture method and keep sufficient man power to quickly trap the animal.

a. Don't chase the animal
b. Encourage the target animal/animals to come into a trap.
c. Spent some time in observing the animal and its escape route and then coordinate your moves.
d. Minimize the pursuit time - muscle enzymes begin to increase after 3 minutes of capture and then damage begins.
e. Reduce struggling by covering the eyes and
f. place the captured animal into a bag.
g. Keep the human noise down.
h. Reduce the amount of handling time
i. Release the animal/s in a less stressful place as soon as possible.
j. Do not catch up animals when the ambient temperature >20°C.
k. Do not leave a sedated animal in direct sunlight.
l. Ensure that you keep the animal's temperature down: good ventilation,
m. Use damp cloths if required.

HANDLING AND RESTRAINT OF DEER PRIOR TO TRANSPORT

Generally, deer are at high risk of stress, shock and capture myopathy while they are being handled prior to their transport from one place to another. The risk increases if the deer with antlers or in velvet are allowed to struggle during their capture or restraint and the process is carried out in hot weather.

To reduce such risk and calm down the deer before they are transported, a well planned deer handling and restraint protocol needs to be developed in tone with the onsite situation and the same needs to be followed strictly by the deer handling and restraint team comprising of animal handlers, assisting workers and veterinarians working on the assignment.

In today's lecture my sole focus will be the handling and restraint of deer species as a whole and I will be discussing the general protocol required for their safe handling and restraint with minimum risk to the human members assigned with this type of job as a part of the main animal transport strategy.

For the purpose of catching, restraining and carrying out the examination & treatment of different deer species, this group of ungulates needs to be categorized on the basis of their size:

1) Large-sized deer: Pere David's deer (Elaphurus davidianus), Sambar (Rusa unicolor), Red deer (Cervus elaphus), Barasingha (Rucervus duvaucelii).

2) Medium-sized deer: Hog deer (Axis porcinus), Chital (Axis axis), Fallow deer (Dama dama), Sika deer (Cervus nippon), Eld's deer (Rucervus eldii).

3) Small-sized deer: Chinese water deer (Hydropotes inermis), Musk deer (Moschus moschiferus), Barking Deer (Muntiacus muntjak)

Equipment / Chemicals / Accessories to be kept handy

1) Appropriate nets - large hand-nets, "walk-towards" nets.
1) Hand net of one metre depth, 70cm frame (rim) dia., 10cm mesh, with a stout 1m handle.
2) "Walk towards" net one metre wide, several metres long, similar to tennis netting in appearance.
2) Appropriate blindfold/ suitable cloth or bandage for use as a blindfold.
3) Carrying equipment such as stretcher or cargo net.
4) Dart gun and darts if chemical restraint is required for capture.
5) Appropriate drugs if required for capture or restraint.
6) Gloves (various types)
7) Boxes/cages
8) Bags/sacks
9) Blankets/towels
10) Rope
11) Knife
12) Wire-cutters
13) Graspers
14) Goggles or similar eye protection.

Handling and Restraint process

A. Catching

Large-sized deer

1. Large deer which are still mobile require sedation/general anesthesia with drugs administered by darting (remote injection).
2. Large deer which are partially immobilized, for example caught in a fence or severely injured in a road traffic accident, will generally require sedation/general anesthesia delivered by dart, pole syringe or possibly by hand injection, in order to allow safe restraint with minimum risk of injury to deer or handlers and minimum stress to the deer.
3. Only for animals which are already in shock sedation/general anesthesia may be contraindicated.
4. Always cover the eyes as soon as possible to help calm the animal, e.g. with a blanket or large towel thrown over before the deer is under control (for a deer which is partially immobilized, for example caught in a fence) or a shirt tied under the chin once the deer is caught.

Medium-sized deer

1. The deer which are still mobile may require sedation/general anaesthesia with drugs administered by darting (remote injection).
2. Catching in a "walk-towards" net (these are about 1 metre wide, several metres long and similar in appearance to a tennis net) may also be applicable.
3. Deer which are partially immobilised, for example caught in a fence or severely injured in a road traffic accident, may also require sedation/general anaesthesia delivered by dart, pole syringe or hand injection, in order to allow safe handling with minimum risk of injury to deer or handlers and minimum stress to the deer.
4. Only for animals which are already in shock may tranquillisation be unnecessary or contraindicated.
5. A minimum of two people are preferable for handling; one person should hold the head/neck and forelimbs, the other have control over the hindquarters, to minimise kicking and thrashing.
6. Always cover the eyes as soon as possible to help calm the animal, e.g. with a blanket or large towel thrown over before the deer is under control (for a deer which is partially immobilised, for example caught in a fence) or a shirt tied under the chin once the deer is caught.
7. Hard antlers (out of velvet) may be used for holding the head; antlers should be covered with cloth such as a towel as soon as possible to help prevent goring injuries to the handlers (antlers of roe deer are very sharp).
8. Care must be taken to avoid damage to antlers in velvet.
9. Transfer to an appropriate-sized and preferably padded transport crate as soon as possible.

Small-sized deer

1. These species are very nervous and prone to stress and capture myopathy.
2. Large long-handled nets and/or "walk-towards" nets (these are about 1 metre wide, several metres long and imilar in appearance to a tennis net) may be used for catching small deer.
3. If possible a "walk-towards" net should be placed in position without the deer being aware of the operation

- It has been documented that muntjac which have had a chance to see and inspect a net before being driven towards it will be reluctant to approach the net, make considerable efforts to avoid it and be more likely to be in a highly excited state by the time capture is successful

4. The time taken in running the deer into a net must be minimised.

- Chinese water deer in particular may easily overheat if they are run around for more than a few minutes.

5. Deer caught in a net may struggle sufficiently to break a leg or their neck; the risk of this may be minimised by rapid restraint of the animal by one or two people.

- The deer should be retrained by being held to the ground by the shoulders and rump.
- Kneeling astride the deer may be useful but great care must be taken not to kneel/tread on the deer's legs nor to put excessive pressure on the deer (it should not be sat on).

6. Always cover the eyes as soon as possible to help calm the animal, e.g. with a blanket or large towel thrown over before the deer is under control or a shirt tied under the chin once the deer is caught.
7. Hard antlers (out of velvet) may be used for holding the head; antlers should be covered with cloth such as a towel as soon as possible to help prevent goring injuries to the handlers.
8. Care must be taken to avoid damage to antlers in velvet.
9. Mild sedation by hand-injection may be appropriate to reduce risk of injury to deer or handlers and minimum stress to the deer.
10. Transfer to an appropriate-sized and preferably padded transport crate as soon as possible. - Transport Container

B. Handling/Carrying

Large-sized deer

1. Larger deer species, unless severely injured/debilitated, require sedation/general anaesthesia for safe handling and carrying.

- Handling of non-sedated individuals should not be attempted with conscious, bright, wild adult deer.

2. The eyes should be covered as soon as possible and kept covered during handling and carrying.
3. Hard antlers (out of velvet) may be used for holding the head; antlers should be covered with cloth such as a towel as soon as possible to help prevent goring injuries to the handlers.
4. Care must be taken to avoid damage to antlers in velvet.
5. Once sedated, these deer may be carried on a stretcher, on a tarpaulin or using a cargo net. At least two people will be required for carrying these deer; more people may be required for carrying animals over difficult terrain including uphill or through mud.

Medium-sized deer

1. The deer should be restrained by being held to the ground by the shoulders and rump.

- Kneeling astride the deer may be useful but great care must be taken not to kneel/tread on the deer's legs nor to put excessive pressure on the deer (it should not be sat on).

2. Mild sedation by hand-injection is required for carrying and handling except perhaps for severely debilitated animals or deer in shock.

3. Cover the eyes as soon as possible with a cloth mask and keep them covered during handling.
4. Hard antlers (out of velvet) may be used for holding the head; antlers should be covered with cloth such as a towel as soon as possible to help prevent goring injuries to the handlers.
5. Care must be taken to avoid damage to antlers in velvet.
6. Careful restraint is important to prevent the legs thrashing around and reduce the risk of self inflicted injury, including leg fractures.
7. These deer may be carried using a stretcher, a cargo net or a tarpaulin carried by at least two people; more people may be required for carrying animals over difficult terrain including uphill or through mud.
8. These deer should preferably be carried inside an appropriate-sized and preferably padded transport crate - Transport Container

Small-sized deer

1. These species are very nervous and prone to stress and capture myopathy.
2. The deer should be restrained by being held to the ground by the shoulders and rump.
   - Kneeling astride the deer may be useful but great care must be taken not to kneel/tread on the deer's legs nor to put excessive pressure on the deer (it should not be sat on).
3. Careful restraint is important to prevent the legs thrashing around and reduce the risk of self inflicted injury, including leg fractures.
4. Hard antlers (out of velvet) may be used for holding the head of muntjac deer; antlers should be covered with cloth such as a towel as soon as possible to avoid goring injuries to the handlers.
5. Care must be taken to avoid damage to antlers in velvet.
6. Cover the eyes as soon as possible with a cloth mask and keep them covered during handling.
7. It is possible for deer of this size to be carried by hand by one person; this is not appropriate for bright, active deer but may be useful for stunned animals or animals in shock.
8. Mild sedation by hand-injection may be appropriate to reduce risk of injury to deer or handlers and minimum stress to the deer.
9. These deer should preferably be carried inside an appropriate-sized and preferably padded transport crate - Transport Container

C. Restraint for examination and treatment:

Large-sized deer -

1. Sedation/general anaesthesia is generally required for examination and treatment of individuals of these species.
2. Only for animals which are already in shock may sedation/general anaesthesia be unnecessary or contraindicated.
3. The eyes should be kept covered at all times for animals which are not fully anaesthetised

Medium-sized deer

1. Brief examination and minor treatment may be possible using physical restraint only.
2. If physical restraint is used, the deer should be restrained in a quiet stable on ample bedding such as hay, with particular care taken to ensure adequate careful restraint of the limbs and antlers.

- The head and legs must be controlled quickly.
- Hold the animal in a sitting position (sternal recumbency) if possible.
- A firm but flexible grip on the legs is required; leg fractures may result from too rigid holding.

3. Hard antlers (out of velvet) may be used for holding the head; antlers should be covered with cloth such as a towel as soon as possible to avoid goring injuries to the handlers
4. Care must be taken to avoid damage to antlers in velvet.
5. Sedation/general anaesthesia may be required for prolonged examination and extensive treatment of individuals of this species.
6. The animals already in shock, sedation/general anaesthesia may be contraindicated.
7. The eyes should be kept covered at all times for animals which are not fully anaesthetised.

Small-sized deer

1. These species are very nervous and prone to stress and capture myopathy.
2. Brief examination and minor treatment may be possible using physical restraint.
3. If physical restraint is used, the deer should be restrained in a quiet stable on ample bedding such as hay, with particular care taken to ensure adequate careful restraint of the limbs and antlers.

- The head and legs must be controlled quickly.
- Hold the animal in a sitting position (sternal recumbency) if possible.
- A firm but flexible grip on the legs is required; leg fractures may result from too rigid holding.

4. Hard antlers (out of velvet) may be used for holding the head of muntjac deer; antlers should be covered with cloth such as a towel as soon as possible to avoid goring injuries to the handlers.
5. Care must be taken to avoid damage to antlers in velvet.
6. Cover the eyes as soon as possible with a cloth mask and keep them covered during handling.
7. Sedation/general anaesthesia may be required for prolonged examination and extensive treatment of individuals of these species.
8. Only for animals which are already in shock may sedation/general anaesthesia be contraindicated.
9. The eyes should be kept covered at all times for animals which are not fully anaesthetised.
10. An elaborate crate has been described, incorporating observation panels and a crush facility to allow examination and restraint prior to anaesthesia of muntjac deer during scientific studies.

Complications of chemical restraint and how to prevent them

Dr. Carlos Sanchez
Associate Veterinarian
Chicago Zoological Society
Brookfield Zoo, USA

This presentation offered insight about physiological aspects in relation to chemical restraint was given emphasis in captive wild animals. Similarly use of drugs for restraining for non-domestic carnivores and hoof stock was stressed. The participants of the net workshop interacted with this resource person Dr. Carlos

Carlos Sanchez, DVM, MSC
Chicago Zoological Society
Brookfield Zoo

Capture Myopathy
January 2011

Complications during physical and chemical restraint
CAPTURE MYOPATHY

Summary: It is a syndrome that causes fatalities and debilitation in wild animals following capture or prolonged exertion. It is characterized by degeneration and necrosis of skeletal and cardiac muscle. The myoglobin released causes kidney damage that often leads to death.

Other names include:

- Exertional rhabdomyolysis
- Muscular dystrophy
- Overstraining disease
- Capture stress disease
- White muscle disease
- Idiopathic muscle necrosis

Most common in wild ungulates but also reported in:

- Primates
- Crocodiles
- Birds ([illegible], pelicans)
- Kangaroos

Similar syndromes seen in:

- Humans (Marching disease)
- Dogs
- Horses (Monday morning disease, azoturia, tying-up)
- Cattle
- Sheep

<u>Causes:</u>

It is a complex process involving perception of fear or stress, activity of the sympathetic nervous and adrenal systems, and muscular activity. It involves the failure of physiological mechanisms [illegible] to maintain homeostasis during stress, similar to shock.

Causes:

<u>Prolonged exertion</u>

- Intense air or ground pursuit (Sequel of strenuous exercise)
- Capture with or without drugs
- Transportation

<u>Fear and anxiety</u>

May act as triggering mechanism accentuated by overexertion, exhaustion, <u>hyperthermia</u>, circulatory disturbances such as handling, transportation and shock.

Severe stress

Immobilizing drugs that cause hyperthermia and acidosis

Other possible causes:

Carlos Sanchez, DVM, MSc
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January 2011

Capture Myopathy

Nutritional factors:

Vitamin E/Selenium deficiency – their role is unclear

*Animals deficient in selenium may be more susceptible to CM?

Genetic?

Some species more susceptible (waterbuck, zebras, pelicans, kudu, Oryx)

Pathogenesis and signs:

May occur within hours, days or weeks after restraint

Early clinical signs:

Increased respiratory and cardiac rate

Elevated temperature

Unsteady gait, incoordination, stiffness, ataxia and paralysis

Inability to stand

MYOGLOBINURIA (red-black urine) may be present.

Pathophysiology

METABOLIC ACIDOSIS IN AN IMPORTANT COMPONENT OF THE PATHOPHYSIOLOGY OF CAPTURE MYOPATHY

The biochemistry of stress and fear create an atmosphere of increased metabolic activity and oxygen and glucose requirements. The muscles use up all available oxygen and resort to anaerobic glycolysis, a normal physiological process in muscle tissue. A by-product of glycolysis is lactic acid. Lactic acid is usually further metabolized in the liver to glycogen, but with sudden strenuous exercise, the massive increase of lactic acid creates a localized acidosis which progresses to a systemic acidosis.

Classification:

Four different syndromes related to Capture Myopathy

Capture shock syndrome

Ataxic myoglobinuric syndrome

Ruptured muscle syndrome

Delayed peracute syndrome

Capture shock syndrome

Clinical signs: shallow rapid breathing, rapid pulse, hypotension, elevated temperature, death

Animals usually die within 1-6 hrs post capture

Ataxic myoglobinuric syndrome

Most common form

Clinical signs: ataxia, torticollis, myoglobinuria

Animals show signs several hrs-several days post capture

May survive if signs are mild.

Ruptured muscle syndrome

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Brookfield Zoo

Capture Myopathy | January 2011

Normal at capture. Clinical signs develop 24-48 hrs later
Drop in blood pressure with hypoperfusion of brain due to rupture of [illegible] muscle
May survive for several weeks then die

Delayed-peracute syndrome

Affected animals have been in captivity for at least 24 hrs
Appear clinically normal until disturbed
Acute death due to ventricular fibrillation

Pathology

Similar lesions to those observed in syndromes in domestic animals with nutritional myopathies (Vitamin E and selenium – White muscle disease)

Affected muscles: Large muscles of limbs (gluteals, biceps femoris, semitendinosus & semimembranosus) and gastrocnemius; also present in [illegible] muscle

Lesions tend to be bilateral and symmetrical

Muscular lesions

- Early stages: Hemorrhages and edema with uniform pallor and/or chalky white streaks
- Later stages: More prominent lesions that appear as coarse [illegible] white streaks

Other organs:

- Liver: Swollen and pale
- Kidneys: Swollen and pale or dark
- Lungs: Pulmonary hyperemia and edema, tracheal and bronchial froth
- Urinary bladder: Red urine

Diagnosis

History

Clinical signs

Clinical pathology: Elevation of "muscle enzymes" particularly CPK due to muscular insult. CPK can be as high as 100,000 IU/L. Metabolic acidosis (low pH, low bicarbonate)

Treatment

It is very difficult, if not impossible, to treat once clinical signs become apparent. Treatment is basically supportive treatment. NOTE: **Avoid causing more stress/fear to the animal.**

Multiple treatments reported in the literature, some have been successful:

Treatments:

- Fluid therapy (stimulate diuresis and prevent renal damage due to myoglobin)
- Supportive care (steroids, anti-inflammatories)
- Antioxidants
  - Vit E 3-7 IU/kg IM, PO
  - Vit C SQ, PO
  - Selenium 0.05-0.1 mg/kg, IM
- Sodium bicarbonate IV (with fluids)

Muscle relaxants (methocarbamol)

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Brookfield Zoo
January 2011

Capture Myopathy
Short/long acting neuroleptics

PREVENTION RATHER THAN TREATMENT

Prevention

- Minimize pursuit [illegible]
- Avoid excessive struggling/restraint
- Avoid [illegible]
- Maintain body temperature, ventilation, blood pressure/volume
- Do not exhaust animals (long chases)
- Reduce fear stress
- Minimize contact with humans (use blindfolds and a well trained crew!)
- Short [illegible]

RECOMMENDED LITERATURE

Kristine M. Smith DVM, Susan Murray DVM, PhD, ACZM, Carlos Sanchez DVM, MSc. Successful treatment of suspected exertional myopathy in a rhea (Rhea americana). Journal of Zoo and Wildlife Medicine 36(2):316-320. 2005

Meltzer, D and Kock, N. Stress and capture related death (Chapter 8). In: Chemical and Physical Restraint of Wild Animals (A training and field manual for African species). Ed. By Kock, M, Meltzer, D. and Burroughs R. 2005 Pp 68-77.

Spraker TR. Stress and capture myopathy in artiodactyls. In: Zoo and Wild Animal Medicine Current Therapy 3. Ed By Fowler M. 1993. Pp 481-488.

Wildlife Restraint Series (African Series). Compiled and edited by Clark R and Jessup D. Chapter 3; Medical concerns. 1991

Specific Protocols for Hoofstock with emphasis on deer anesthesia

Dr. Carlos Sanchez
Associate Veterinarian
Chicago Zoological Society
Brookfield Zoo, USA

This presentation offered insight about physiological aspects in relation to chemical restraint was given emphasis in captive wild animals. Similarly use of drugs for restraining for non-domestic carnivores and hoof stock was stressed. The participants of the net workshop interacted with this resource person Dr. Carlos

MIXING INSTRUCTIONS:

Using a sterile three cc or larger syringe and a sterile needle (18-22 gauge) remove the contents of the suspension vial (? cc), and inject into the butorphanol vial. Remove excess air from the butorphanol vial by aspiration with the syringe as you inject the suspension. Next, remove the contents of the medetomidine vial (? cc) and inject into the butorphanol vial again removing excess air from the vial by aspiration with the syringe as you inject. You will have [illegible] cc of the BAM mix in the butorphanol vial. Clearly mark this as BAM. Protect from excessive heat and direct sunlight. Administer the antagonists (naltrexone, tolazoline and atipamezole (Antisedan)) in separate sterile syringes and needles deep into the muscle tissue.

White-tailed Deer Dose Chart for BAM

Butorphanol	50 mg/ml	6	300	27.3	[illegible]	0.5–0.6 cc	1.0–1.2 cc	2 cc [illegible] 2.25 cc
Azaperone	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
Medetomidine	[illegible]	3	20	[illegible]	[illegible]			
Total ml								
Antagonists:		[illegible]						
Atipamezole	[illegible]	[illegible]						
Naltrexone	[illegible]	[illegible]						
Tolazoline	200 mg/ml	[illegible]						

Elk Dose Chart for BAM

Butorphanol	50 mg/ml	6	300	27.3	[illegible]	3 cc	3 cc
Azaperone	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Medetomidine	[illegible]	3	[illegible]	[illegible]	[illegible]		
Total ml							
Antagonists:		[illegible]					
Atipamezole	5 mg/ml	[illegible]					
Naltrexone	[illegible]	[illegible]					
Tolazoline	200 mg/ml	[illegible]					

The information provided in this document is for guideline purposes only and is based on experience. Please consult your veterinarian for advice for your specific situation.

Copyright [illegible]

Anesthesia Record for Animals

Date: ____________

Species:

Accession # ____________

House Name: Sex

Birth Date/Age

Procedure: ____________

Physical status: ____________

Comments: ____________

Blood: S: ☐ E: ☐

EDTA: # Tubes ____

Serum: # Tubes ____

Vaccinated: ☐ ☐ ☐

Antibiotic: ____________

Fluids: ml

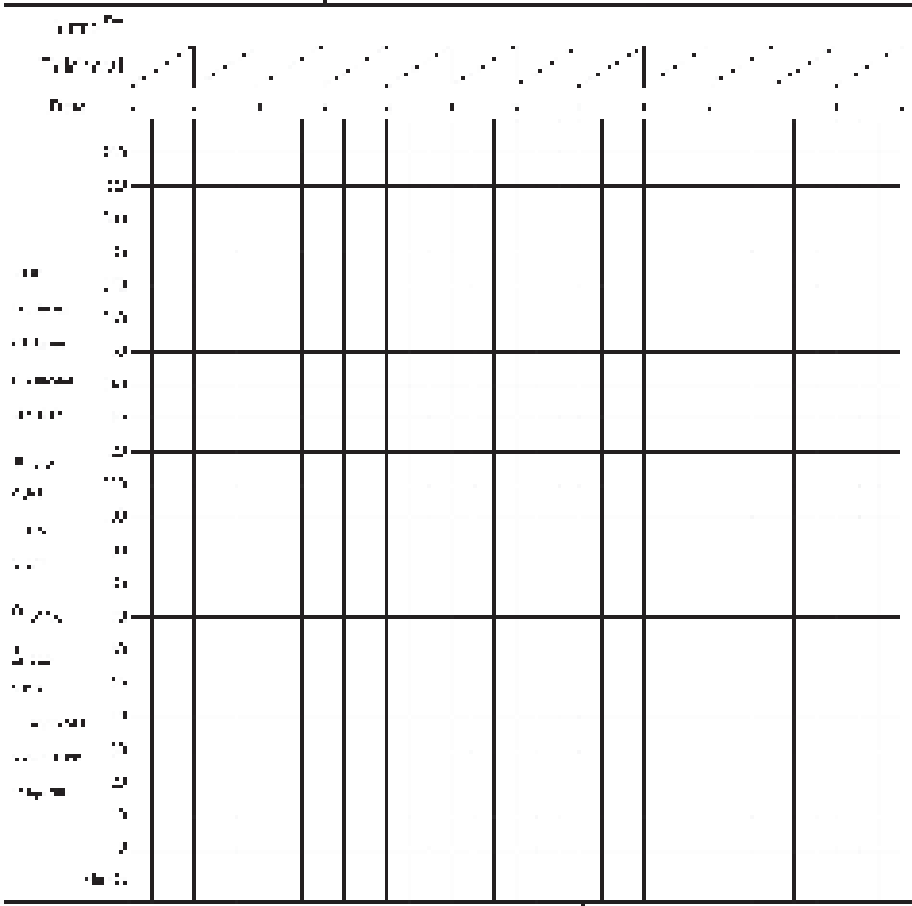
Subcutaneous ☐

Intravenous ☐

Body score:

[illegible]

Anesthesia Record



Chemical Immobilization of Wild Animals in Captivity in Taiping Zoo

Dr.Kevin Lazarus's
Director Zoo Taiping
& Night Safari
Malaysia

This presentation offered significant emphasis with regard to the transactions of wild animals and attention was paid on IATA regulations crate designs for deer and CITES. The intricate aspects of physical restraint & Chemical restraint including the various types of delivery systems were felt in detail. Zoo Veterinarians interacted with their queries.

Chemical Immobilisation Of Wild Mammals in Captivity in Taiping Zoo

Some common / immobilising agents for deer

1) Etorphine HCl (M99, Immobilon)

2) Ketamine HCl

3) Zoletil or Telazol (Tiletamine HCl + Zolazepam HCl)

4) Xylazine HCl

Cervidae: Biological Data

- The unique anatomical characteristic of cervids is the antler
- Of the 41 species of cervids, the males of only two species (Musk Deer ans Chinese Water Deer) lack antlers
- The Reindeer or Caribou is the only deer species in which the female normally has antlers
- Deer are true ruminants. There is no gallbladder except in the musk deer

Biological Data

- Deer utilize scent glands for territorial and hierarchical interactions.
- Most species have preorbital glands along with interdigital glands
- There are 4 nipples in the mammary gland

Behaviour

- Deer are social animals for the most part, forming smaller groups or harems during the mating season
- The males are usually fierce and dangerous at this time
- Deer are usually good swimmers

Transportation of Elephants and Deer

Dr.N.S.Manoharan
Forest Veterinary Officer
Coimbatore Circle

The practical aspects of the immobilization evens pertaining to elephants and deers in detail. Detailed discussions were made with concerned on the field problems.

TRANSPORTATION OF ELEPHANTS AND DEERS

TRANSPORTATION OF ELEPHANTS

Classification

Kingdom	:	Animalia
Phylum	:	Chordata
Order	:	Proboscidea
Family	:	Elephantidae
Genus	:	Elephas maximus (Asian elephant)

Before associating with transport of elephants, one should know the danger potential pertaining to elephants.

Danger potentials with elephants

Movement

- When watching elephants moving, one may receive the impression that the elephant is slow. But they can run at amazing speed.

Trunk

- The trunk probably is capable of causing more injuries than any other weapon. It can be used as either an offensive or a defensive weapon. The elephant does not usually bite, but the victim may be pulled close by the trunk and/or it can be banged against solid objects.
- In addition to direct contact, the trunk can be used as a tool to throw objects such as feces, straw, dirt, pieces of wood, rocks, or other missiles at a handler.
- Some elephants have the bad habit of slapping people with the trunk. Pl. mind that the. The force can even fracture facial bones or ribs or knock a person over.

Tusk

- The tusks are an obvious hazard. Elephants have gored unwary victims and have also been known to crush people against walls with the tusks.
- Body
- The vast bulk of the elephant may also injure by pressing people against solid objects.

Feet

- Those who work around elephants should be extremely careful; the elephant continually moves from one foot to another, and if due caution is not followed, exercised; a person may be stepped on - either by accident or on purpose.
- It is unwise for anyone to work on an elephant alone. Some elephants become adept at maneuvering a person into a position where he or she cannot get free. The regular attendant should be present to control the head and command the elephant to move into positions suitable for examination and/or treatment.

Chemical restraint of elephant

One should know about restraint based drugs with dosing regimen.

- Numerous drugs are being used to immobilize the elephants.

Sedative and Chemical restraint- agents used in elephants

Agent	Asian Elephant			
	Sedation		**Immobilization**	
	Total dose	**mg/kg**	**Total dose**	**mg/kg**
Acepromazine	10 – 30	0.004-0.005		
Carfentanil			5 – 12	0.002-0.004
Etrophine			6 – 20	0.002-0.004
Xylazine	180 - 360	0.04 – 0.08		0.15-0.20
Xylazine/Ketamine				0.12/0.33

The above table lists a variety of drugs that have been used in elephants.

- Free ranging elephants may require a higher dose than a docile captive animal and Asian elephants may require more than comparably sized Africans.
- No inexperienced person should attempt to sedate or immobilize an elephant without prior consultation with experienced veterinarians.
- Etorphine hydrochloride (M99) is valuable when it is necessary to obtain complete control of an elephant. It is a marvel of biology that 5mg of a drug given to an elephant weighing 5,000 kg can immobilize it within 15-30 minutes.
- In a zoo, the procedure for immobilizing an elephant should include draining of any pools in the enclosure and chaining the elephant, so it does not fall into a moat or empty pool.
- Effects of etorphine may will be observed within 10-15 minutes. The trunk hangs limp or loses some of its investigativeness. The animal will start to sway back and forth and falls suddenly.
- Keepers or handlers must stay away from the animal from this point on because the elephant may fall suddenly. Recumbency occurs generally within 20-30 minutes.
- At the conclusion of the necessary period of immobilization The antidote, diprenorphine (M50-50), is administered intravenously in an ear vein. The dosage is double that of the etorphine. The elephant will begin to investigate with its trunk within 1 - 2 minutes.

Transportation

Elephants can be preferably trained and habituated to transport, with no obvious ill effects. However, zoo elephants are not routinely transported, and planning for movement should be started well in advance. Transport plans require coordination between elephant handlers familiar with the individual elephant to be moved, veterinarians and elephant managers at the sending and receiving institutions, and the contracted transporter; and must comply with local, state, and centralfederal regulations

The following information should be used as general guidelines when conducting an elephant transport. The final decision for specific procedures should be made in partnership between the shipping and receiving institutions.

Prior to Transport

- Transport should be arranged with an individual or company experienced in and properly equipped for moving an elephant.
- A written- transport plan should be developed.
- Elephant managers and veterinarians from the sending and receiving institutions should be involved.

- Plan should detail responsibilities of all parties involved.
- Facilities in route should be contacted in advance for assistance with possible emergencies.
- If an elephant will be transported in a trailer, the trailer should be inspected and meet the following criteria:
- Allow the elephant to stand comfortably.
- Provide drainage for urine.
- The animal needs to be comfortable throughout transport but at the same time safe. HBe adequately reinforced and allow the elephant to be safely tethered.
- Have adequate heating or cooling systems to maintain the temperature between 55 and 70 degrees F with adequate ventilation; if temperatures will be outside this range, the elephant should be monitored more frequently.
- Permit access for food and water.
- Allow handlers to adequately monitor the elephant's condition.
- If an elephant is to be will be transported in a crate, it is best to contact personnel other facilities with experience in crate design.
- Elephants to be shipped by airline must meet the guidelines of the International Air Transport Association (IATA).
- Acclimatization to the trailer or crate may take from 1-6 weeks depending on the individual elephant's temperament. This process should begin as early as possible before the transport date. Note: access to the trailer being used for transport may not be feasible if the institution contracts with a private transporter.

During Transport

- Handlers familiar with the individual elephant should travel with the elephant up to the receiving place institution.
- A two week supply of routine feedhay and grain should accompany the elephant to the new facility. This allows a gradual transition to the new diet.
- The decision to use sedation or chemical immobilization for transport of an elephant should be made in advance as part of the written transport plan.
- If chemical immobilization or sedation is used to load the animal, the elephant should be held for up to 24 hours and preferably, or have a veterinarian to accompany the transport-vehicle in order to accompany the shipment to avoid complications associated with drug effects.
- Personnel accompanying the elephant must be familiar with common side effects of the drugs and actions needed to prevent or correct complications. Adequate equipment and supplies should be available.
- If the elephant is being transported by airplane, it is strongly recommended that a veterinarian should accompany the elephant. The effects of sedatives or anesthetic drugs combined with the effects of altitude may lead to potentially more serious signs.
- During transport, the elephant should periodically be provided with feed in moderate amounts hay and should be given access to water if the transport time is greater than 16 hours.
- Personnel should regularly monitor the condition of the animal during transport. It is important that adequate ventilation and temperature control be maintained for the comfort and well-being of the elephant.

Head facing side

- In day time: Head may face front/back of truck (have barrier if head faces driver-cabin).
- In night time: Better to have head facing the front of truck.
- In slope (from upper to lower place): Better to have head facing backward.
- In slope (from lower to upper place): Better to have head facing towards anterior side of truck.
- If specially designed truck is not used, you will go for make-shift truck. In this case specially use the scaffolding structures. Have adequate number of logs, ropes, buckets, mugs, chains etc., in vehicle.
- Travel in cooler parts of day.
- In case of nervous (or) in experienced elephants under transport, "side-padding" is a must with wooden logs on sides of the elephant.
- Mahout is to be with animal in case of trained elephant.
- Especially in slope or undulating terrains, legs should be tied separately.
- Break in case of long-journey is a must.
- Avoid driving on 'bridge-route' (If highly unavoidable, let him drive slowly and cautiously).
- In rail journey, request the driver to move the train slowly esp. when crossing tunnel or bridge.
- Speed of truck should be around 30-40 kmph in National Highways and he has to avoid applying sudden brakes and should negotiate well in speed-breakers.
- Pilot vehicle in front of vehicle with elephant is often necessary to regulate the crowd and to have smooth transport esp. in case of a nervous or inexperienced or wild elephant.
- If mother and calf are to be transported, it appears better that the calf is to be tied with the fore limb of the mother.

After transport

- Off-loading should be smooth and comfortable (gentle slope fitted precisely to the back of truck)
- Feed, water and shade should be provided as soon as it lands down.

TRANSPORTATION OF DEER

- Transportation of deer can be a stressful experience not only to deer but also the associated veterinarian. Deer should be well accustomed to being handled.
- Only deer that are healthy are eligible for transport. The animals must be free from diseases and the deer must be socially compatible with pen cohorts.
- Animals should have no discharges from external orifices or skin diseases.

Factors to be taken into account

- Animals should be bright and mentally alert.
- Young animals must be sufficiently developed to cope with the duration and type of journey.
- Animals must stand on all feet and be able to move freely.
- Any wounds should be under treatment and not likely to present problems in transit.
- Where animals are on medication, consideration must be given to whether the stress of travel might compromise that animal's health.

- Body weight must be adequate for the duration and type of journey
- Young deer must be a minimum age of 6 months and must have been weaned for at least 2 months prior to assembly for export.
- Avoid transport of deer in last trimester of pregnancy.
- Males with velvet should not be transported. Male deer with bleeding antler stubs or in the first week after velveting must not be transported.
- Stags over 1 year of age must not be transported in group during the roar and rut periods.
- Deer should be fed with moderate amount of feed and water before or during or after transport.
- Clean and palatable drinking water must be provided at all times, on an ad-libitum basis.
- Deer should be grouped according to body weight (+/- 10%) and sex.
- All right angled corners or sharp objects on or next to the feeding and watering troughs in particular must be covered or smoothed.
- All pens, containers and fittings must be designed for easy operation and be strong enough to contain the animals' weight, to prevent the animals escaping or falling out and to allow ready access to food and water.
- Bedding, such as straw, shavings or sawdust must be provided and must be spread before the deer are loaded.
- Ventilation system must be capable of allowing normal animal behaviour during extreme climatic conditions. Deer are very sensitive to heat stress and there must be management practices in place to cope with effects of high temperatures and humidity such as increasing air flow, increasing the concentrate content of the diet, increasing water consumption, spraying etc.
- Deer must be fed no less than maintenance rations. Two per cent of the body weight of good quality fodder, or its equivalent, will usually achieve this. Where concentrates are fed, they should be included at an approximate rate of 1:4 with the roughage.
- Clean and palatable water should be available to deer within12 hours of leaving the zoo/farm.
- Clean and palatable water must be available on demand throughout the transport period.
- Padding of sides of vehicle is a must.
- Single animal transport: Mild sedation is better for the single deer before transport because single deer is often nervous otherwise.
- Group of animals transport: Sedation may not be needed in general when group of deer are transported.

Post-transport

- Release the deer in new environment with sufficient day time.
- The floor of truck associated with transport of deer is normally slippery. Hence it is advisable to use sand as bedding material (at least half foot depth).

Experiences & learning from Translocation of Deer

Shri. Thulasi Rao
Dy.Conservator of Forests
Biodiversity Research Center
Project Tiger, Srisailam

Various techniques of capture and restraint pertaining to deer species, they were associated and most of the Zoo Veterinarians interacted to the speaker.

Experiences on Transportation of Deer and Elephants

Prof. Dr Jacob V. Cheeran
Director, Technical Services
Cheerans Lab (P) LimitedNew
Church Street, Trichur, Kerala

Dr. Cheeran elaborated about the transportation pertaining to Deers and Elephants. The participants of the net workshop interacted with the resource person.

TRANSPORTING OF DEER AND ELEPHANTS

Transportation of Elephants

As an elephant range country with large number of captive elephants our requirements are much different from rest of the world. Captive elephants are also transported frequently for various purposes. In addition, deprading wild elephants when caught are transported to the nearby camp on foot and then to the destination often using truck. Hence we have to discuss and set standard and humane protocol for elephant transport. Elephants by their very size, versatile nature and intelligence are a formidable task both with wild elephants and intractable captive elephants. Skilled mahout with his ward which is tame and docile is almost exactly opposite to the one mentioned earlier. In this context 'captive elephant' means an animal which is either caught from the wild or born in captivity and tamed and trained.

Captive elephants

Transporting norms for elephants depend upon the mode of transport like on foot, truck, rail or by air as the case may be. For any type of transport a fitness certificate from a qualified veterinarian is required. If the transport is from one district to another district a transport permit from the designated forest officer is required. If the transport is trans-national it needs CITES permit compliance.

1. On foot

Often this method is used to transport elephants from one elephant facility to another like one elephant camp to another or from one zoo to another zoo or for ceremonial or festival occasions. During transport do not change the mahout. Because a new mahout will take time to establish dominance over the animal. Our free contact system is based on establishing dominance over the animal and submission by the animal unlike the protected contact a method often practiced in non-range country zoos. Ensure that the animal is familiar with the festival and the fire- works, involving crackers associated with it. Kerala State has a rule like 'Captive Elephant Management Rules'. If the sate concerned has any rules like that needless to say that those rules are to be adhered to.

Inter-state transfer will involve language problem like, command words, food and fodder, restraint methods (E.g Spiked hobbles) It may be noted that spiked hobbles are not humane and not recommended. This is important when animals are taken from the northern States to the southern States. If the mahouts are different at new facility retain the old mahout for while till the mahouts at the new site is confident about the animal. There are cases in which the old mahouts never allow the new mahouts to familiarise with animal fearing the loss of job. In a leisurely walk, elephants can cover a distance of 4-5 kilometres in an hour. Animals are walked for 2-3 hours in the morning and another 2-3 hours in the evening avoiding heat of the day. Hence the optimum distance covered in a day will be 25-30 Kms. Tethering site during halt should be away from sound and noise of the road and rail traffic. This is more so at night halt.

Crossing a river or a water body like a lake should be done with caution. Elephants are good swimmers especially if used to. Mahouts shall preferably keep standing on the elephant, since elephants a have habit of ducking in the water while it is in the water. Mahouts by default should know how to swim. Animal is allowed to cool down before taken into the water if it is coming from a long march. Experienced elephants will even stand on raft. Avoid flood and quick sand. If the river is having strong current like in the monsoon two elephants are tied together. Keep the large one at the upstream and the smaller one downstream. If a calf is to be crossed, it is kept in between two elephants with the larger one upstream and smaller one downstream. This how the wild elephants take their young ones across the river!

Rail-road level cross are another place to take caution in the case of animal which are not familiar with. The sight and sound of the train can frighten the animal and bolt.

2. On Truck

Floor should be strong enough to support the weight of the animal not only at rest but also when the vehicle takes a quick turn the body weight will shift differently. Experienced animals will need very little or even no support at all to mount on to the truck. First mahout is to enter the truck at first, put some fodder and call the animal inside. The second mahout may coax it from behind. Truck shall remain steady either putting block at the wheels or applying hand break. Reversing the truck to a straight land cutting and making the animal walk into the truck is another method, if animal is not familiar with loading itself into a truck. Intractable animals are put on mild sedation (80mg xylazine for a ton of B.Wt). Neck is tied to the sides and a knot in the shape of figure of '8' is put at the hind. A sharp knife is kept handy to cut the ropes in case of emergency. For long distance journey a vet shall accompany to top-up the sedation if needed. Truck is driven only for 5 hours at a stretch. Drive slow and steady, avoid crowded areas. Elephants are always crowd puller. In extreme climatic conditions like heavy snow or blizzard crate is used, which has provision for heating.

3. On Rail

Two adult animals can be put on double sized flat open wagon. Provide proper scaffolding for the elephants and hoods for mahout. Provide with 100.Lit drum for water.(Cutting a 200 L drum in the middle and round off the sharp edges). Familiarisation or trial runs are sometimes done before a long distance journey. Some animals may need mild sedative initially. Do not stop in the hot sun with the animals which are sedated, to avoid sun burn. Adult animals can stand for days. Calves are loaded into the horse wagon, wherein it can lie down, rest and sleep even. Have provision for cleaning and supply of fodder.

4. On Air

International Air Transport Association (IATA) regulations are to be checked. Not all airlines take elephants as cargo. There are height specifications. Make sure that the animal does not grow beyond the prescribed limit by the time 'red-tape' formalities are completed. Establish proper communication both at the shipping end and receiving end. Crate should have all the necessary information like shipping origin, destination, and emergency contacts both in transit as well at the destination etc. Crate is designed so that it can be easily handled by the airport cargo handling system. More details are available at <iataonline.com>. If the mahout is accompanying the animal give details of health, de-worming, particulars of musth, (in males), temperament, etc.

Salient points of crate

- Roof over the head should restrict undue movements of head and trunk
- No sharp projections into the crate.
- Design to protect humans from elephant.
- Strong platform
- The whole crate should be strong enough to restrain the animal
- Non-slip floor.
- Adequate ventilation
- Provision for drainage and ventilation

Better to be accompanied by an experienced vet and mahout and carry emergency drugs like sedative, reversing agents, respiratory stimulants, parentral fluids, etc.

Wild-Caught.

Usually on foot to the nearest camp and next to a distant place on truck. On transport to the camp kumkies depending on the size of the animal, like two in the front to pull, one or two at the back to push and on

sides to prevent from straying away. If possible avoid which is musth, advanced pregnancy or cow with a calf at foot. Considerable resistance will be put up by the wild one and conspecifics may come to help the herd-mate. To subdue the wild-caught, a mock fight with the kumkies are done after a shot of mild sedative to the new capture. Often a small portion of the tip of the tusk is also cut, say 10 Cms or so to disorient the animal in putting up resistance using its tusk. Thick ropes made of natural fibre are preferred over chain and single strong rope made of synthetic material. Ropes are tied in webbed fashion to avoid limb injury. The animal is loaded into the truck with front facing backward.

Always EXPECT THE UNEXPECTED! Try to get the help of an experienced elephant vet if possible. A mock drill with a captive one can be done.

If animal is to be released in protected area tagging, with radio collar is ideal. Visual marking can be put on the rump or shoulder preferably on both sides using rubber based road paint like one used for zebra-marking. This will last even after wallowing. This tagging will help in finding the home range, health condition, establishing its herd hierarchy etc.

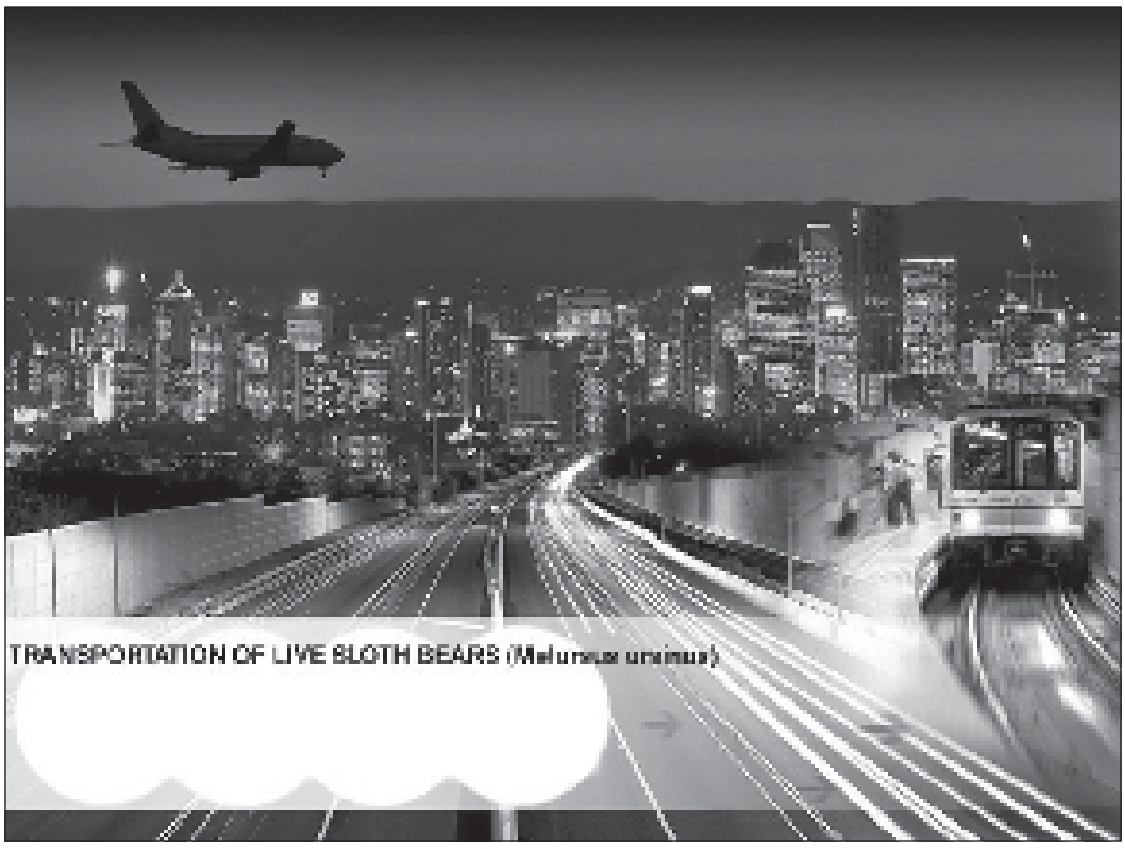
TRANSPORTATION OF DEER

- Sambar is the sturdiest and he cheetal (spotted deer) most delicate.
- Claim like familiarisation of cage and transporting without sedation has not been proved beyond doubt.
- Long distance is not a problem once the animal is familiarised with the cage and sound and shake of transport.
- Droppings placed in the cage/crate has calming effect.
- Release in the back ward direction so that the animal will not run strait and hit on objects or barrier. The lack stereoscopic vision and blind at the front.
- Black plastic sheets can be used in herding the flock and make visual barriers
- Bloating of rumen is common in ruminants. Mild bloat can be cured by stretching the neck, pulling the tongue, stimulating at the throat and massaging the area of rumen. In full blown bloat antizymotics are to be used. If the distance is long and not accompanied by a vet, not monitored and also is in a laying position, it safe to give the anizymotic as a safe precaution.
- Keeper accompanying in a contact position has always to have a calming effect on the animal.
- Responsible persons at the receiving end should be informed sufficiently in advance and if there is any change in the schedule, that too is to be intimated accordingly.
- In long distance transport if vet,is not accompanying, he should be informed from time to time as well other officers concerned.

Experiences on transportation of live sloth bears

Dr.A.Sha.Arun
Head, Veterinary Operations
Wildlife SOS., Bannerghatta
Bear Rescue Centre
Bannerghatta Biological Park
Bangalore

Dr. Asha Arun elaborated about the basic principles pertaining to the transportation of live sloth bears. Minute details including the crate design, precaution for loading, ventilation etc were dealt in detail. The participants of the net workshop interacted with this resource person Dr.A.Sha.Arun.



INTRODUCTION

- Transportation of any live captive / Zoo animal or free ranging wild animal in group or individual from place to place is very critical, in terms of safety and transit care.
- Transportation is one of the most traumatic events to which a wild animal can be exposed.
- More animals die during transportation, or due to injuries or infections sustained during transportation, than during capture.
- Many of these deaths go unnoticed because the animals usually die in the field after release.

CITES guidelines for Transport

http://www.cites.org/eng/resources/transport/index.shtml

Wildlife SOS

- An Indian Non Governmental Organisation, have involved in many wildlife transportation which includes reptiles to large mammals like elephants within the country due to various reasons like confiscation, rescued from natural calamities like flood, Tsunami etc.
- For example, we shifted five Asiatic Lions from Sangli Municipal Corporation Zoo, Maharashtra to Thirupathi Zoo of Andhra Pradesh by trucks on road due to heavy flood at former place.
- We shifted Sloth bears (2 Nos) by air from Goa to Delhi and by road safely within the country.

Sloth bear — Family : Ursidae
Order : Carnivora — Genus : Melursus

Very interesting interstate shifting of Sloth bears in India were carried out.

for example

from Rescued bear transit facility, Hyderabad to Agra Bear RF (26 Nos),

from		
	West Bengal	(22 Nos),
	Nagpur	(3 Nos),
	Chattisgarh	(2 Nos),
	Chennai	(3 Nos),
	Puducherry	(2 Nos)

Wild Sloth bear with two cubs which were delivered in an abandoned house close to the natural habitat to Bannerghatta bear rescue & rehabilitation centre, Bangalore, in addition to many other intra state short distance transportation.

Any wild animal should only be transported by experienced persons using suitable equipment and if possible in avoid Floods, Temperature extremes, and injuries which are the major fatal factors.

Stress

- ✓ Psychological &
- ✓ Physical stress

- ❖ are usually caused by excessive muscular exercise or fear during capture, loading, or transportation.
- ❖ This excessive muscular exertion may result in damage to locomotor, respiratory, or heart muscles, resulting in 'white muscle disease' or capture myopathy.
- ❖ At times the situation may be so stressful that the animal dies immediately of shock.
- ❖ On the other hand, the animal may show no immediate signs of the stress but may later succumb to an infection as a secondary result of the stress.
- ❖ Animals that have been unduly stressed during capture usually die during transportation, especially if transported over a long distance. This may not be a reflection of the quality of the transport operation.

Extremes Temperature

- Temperatures must be kept in mind at all times during the capture, loading, and transportation.
- As a thumb rule the conditions most favorable for capture are also best suited for transportation.
- Both capture and transportation should be avoided during the hot summer unless it is emergency.
- In that case hyperthermia, or over-heating, can be a serious problem, but can be prevented by using properly ventilated vehicles or crates and by loading the correct number of animals in a mass crate.

Extremes Temperature

- A crate left in the sun and a breakdown of the vehicle during the daytime in summer can have disastrous results.
- Exposure to very low temperatures can be serious, often resulting in hypothermia and death.
- Alternatively, pneumonia may develop which may lead to mortality after release.
- Hypothermia can be prevented by using sufficient bedding during transportation, and by planning transportation times and routes.

Physical Injuries

- Injuries may be caused by the capture process, but usually occur during loading and transportation.
- Excessive trauma may be caused by using incorrectly designed crates or vehicles, or by animals fighting during transportation.

SOME BASIC PRINCIPLES FOLLOWED FOR THE TRANSPORTATION OPERATION

- Keeping the road as mode of transportation the following steps were suggested based on experience, although the transportation technique used to be a species specific one, certain basic principles to be followed in transportation of any wild animal such as,

Preparation before transportation

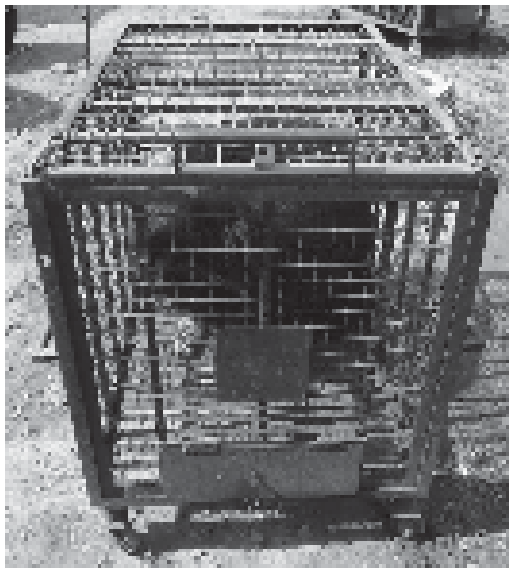
- Preconditioning of animals: Crate training, mode of transport like by air, by road or by sea. Based on road transport, the major categories are

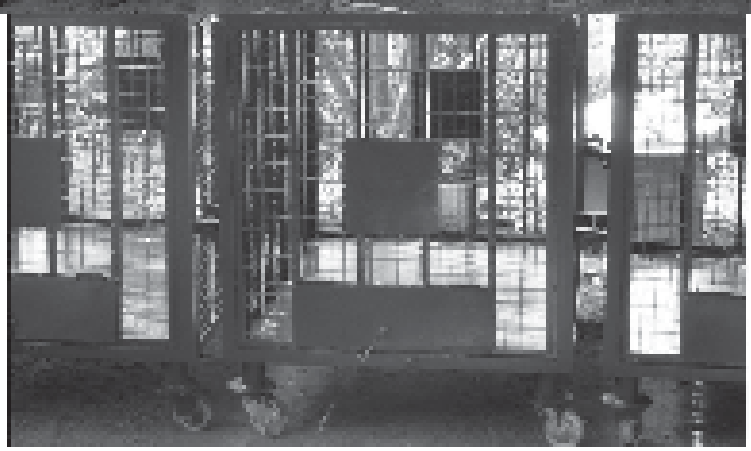
  - ❑ Short travel (< 100 Kms or < 5 hrs)
  - ❑ Long travel (> 100 Kms to 500 Kms or < 24 hrs)
  - ❑ Very long travel (> 500 Kms or > 24 hrs)

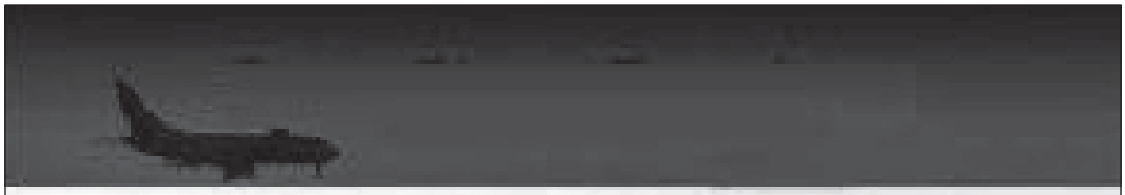
- According to the length of travel, the bears need to be preconditioned by keeping them in a transport cage for 10 to 15 minutes twice in a day for couple of days. If the animal is reluctant to get into the transport cage, then the tranquilisation procedure should be followed and the bear should be placed inside the transport cage 8 to 12 hours before the departure day of the transportation

Size of transportation cage

- An optimum size of the transportation cage for bears would be 6'6" L x 3' W x 3' H, of variable age (above 2 yrs) and body weight (70 kgs upto 200 kgs).







- For bears the transportation cage should have the feeding passage on the bottom side of the sliding door, so that en route feeding and watering of the bear would be easily taken care off.
- Accompanying veterinarian with necessary veterinary drug kit should be made ready in addition to the documentation part of the animal and vehicle.
- Section 48 A – Restriction of Transportation of Wildlife.

Target animal

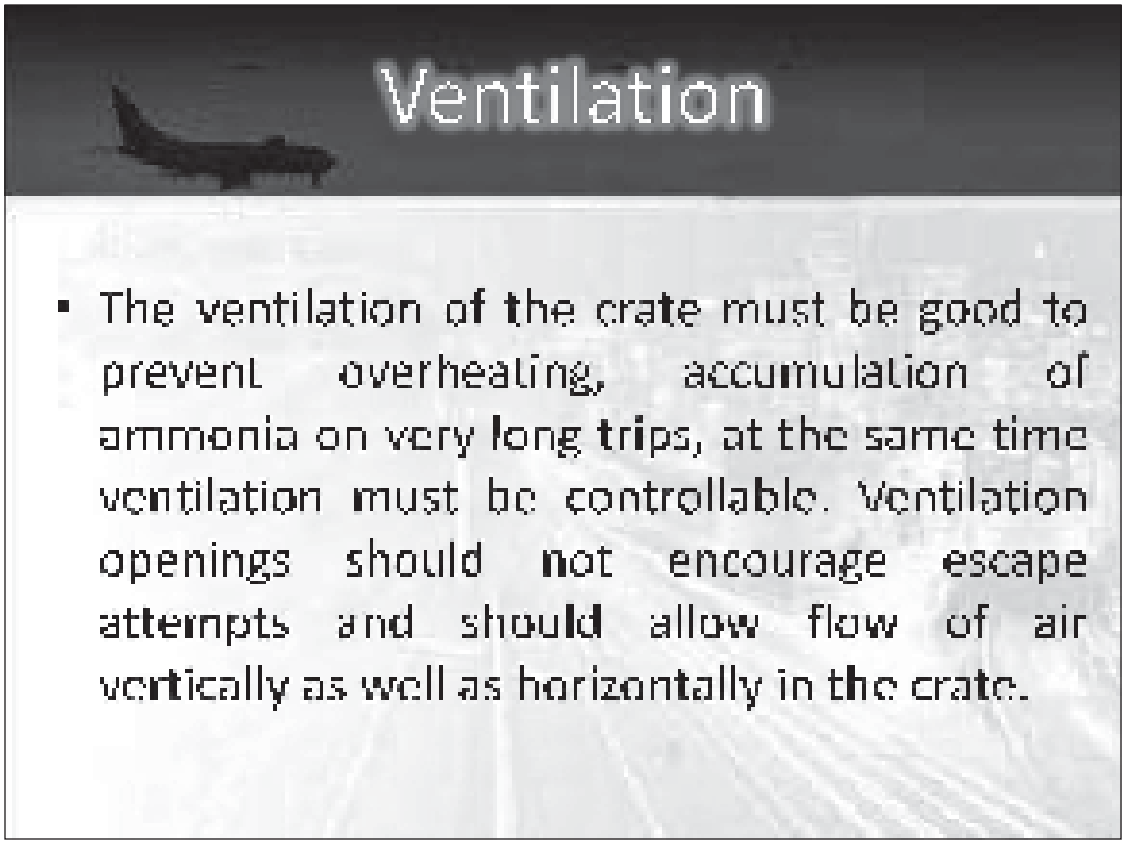
- Apart from species characterization, specific individual animal's behavior, mode of transportation, time of transportation, degree of restraint required for the transportation of captive wild animal/s like Zoo animals or of Free ranging wild animal/s should be taken into account.
- In case of Sloth bears, Individual crate approach is advisable than mass transportation approach. Behavioral characteristic like male used to be dominant, Mother bear should be shifted along with cubs with minimal handling etc..
- Though it is necessary to cover the crates in both captive and wild caught animals, it is must to give extra calm environment to the non captive wild animals for stress free travel and ventilation.

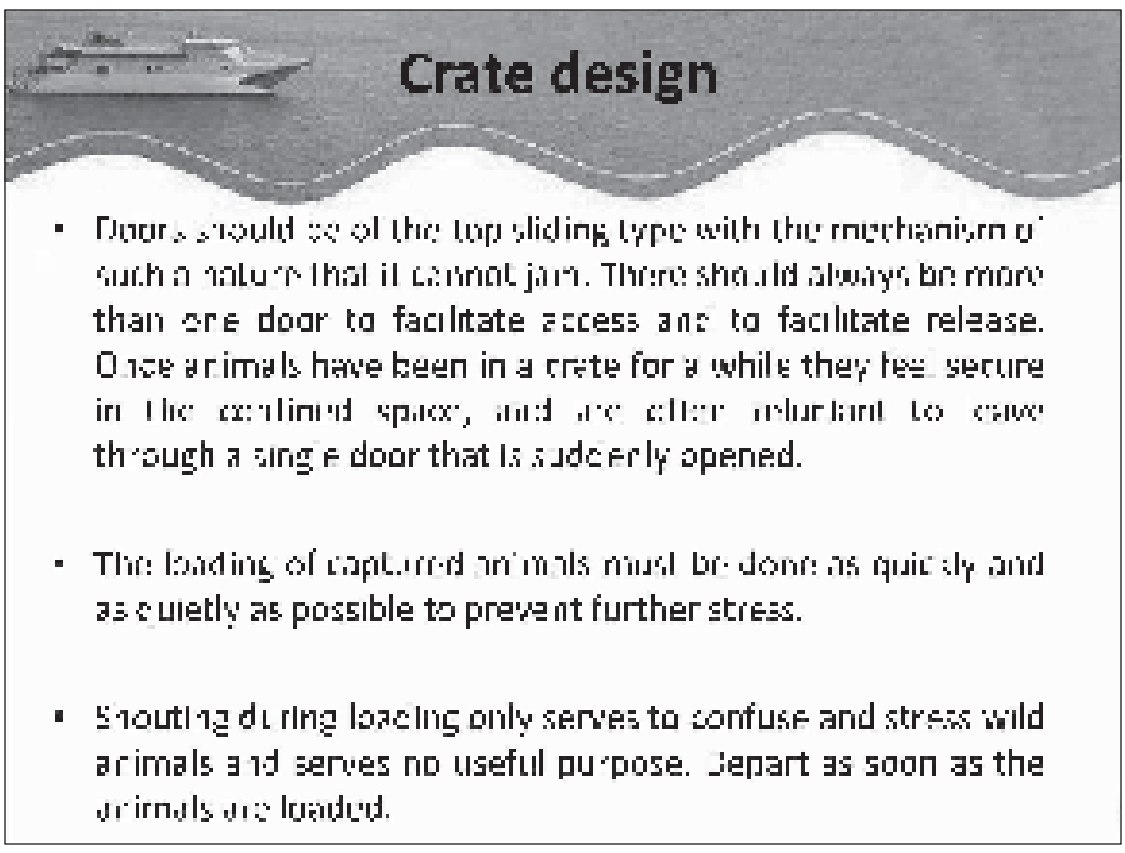
Use of tranquillizers

- The use of tranquillizers remains an area of uncertainty. Currently there is no scientific data to support both use and non use of tranquilizers claim the success of the operation often depends more on the style and ability of the transporter than on drugs or other technological solutions.
- Both short and long acting tranquilizers are used extensively to facilitate the transportation of aggressive animals.
- Tranquilisers can also reduce the stress levels of the transported animals and can thereby improve success rates and reduce mortality during and after transportation.
- The dose rate of 2 mg/ Kg b.w. Xylazine and Ketamine @ 5 mg/Kg is ideal

Selection of crate & loading

- In addition to the size, sex and age of the wild animal, knowing the [illegible] pattern of the animal is immensely important in designing a transportation crate or cage.
- Confinement in a crate or vehicle after capture results in additional stress for the animal.
- The size and strength of the crate must be appropriate for the animal to be transported in addition to a good locking mechanism.
- Padding on the sides and grass or sand bedding on the floor of the crate should facilitate less damage on the extremities of the less badly injured animal and minimize damage and to retain its footing even on rough roads. The floor must allow drainage of urine or spilt water.


Ventilation
The ventilation of the crate must be good to prevent overheating, accumulation of ammonia on very long trips, at the same time ventilation must be controllable. Ventilation openings should not encourage escape attempts and should allow flow of air vertically as well as horizontally in the crate.

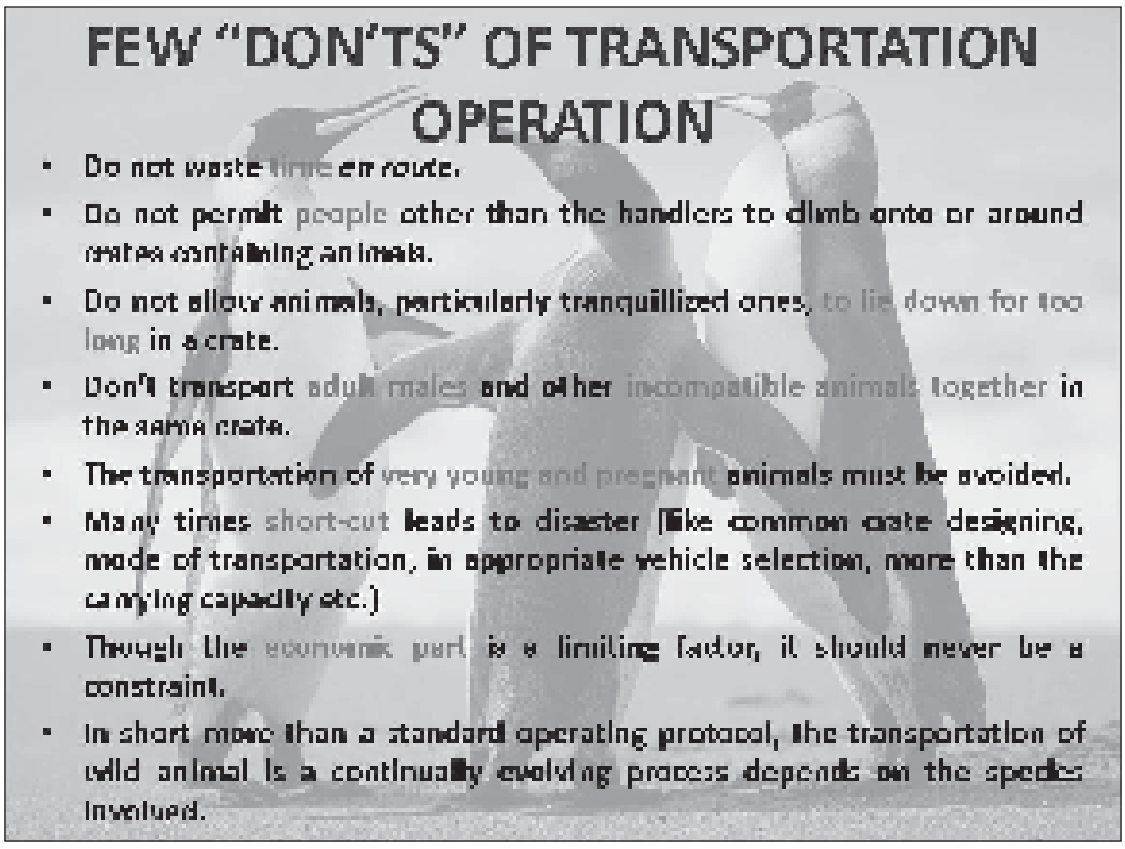

Crate design
Doors should be of the top sliding type with the mechanism of such a nature that it cannot jam. There should always be more than one door to facilitate access and to facilitate release. Once animals have been in a crate for a while they feel secure in the confined space, and are often reluctant to leave through a single door that is suddenly opened.
The loading of captured animals must be done as quickly and as quietly as possible to prevent further stress.
Shouting during loading only serves to confuse and stress wild animals and serves no useful purpose. Depart as soon as the animals are loaded.

Selection of vehicle and route

- The selection of the vehicle should be appropriate based on the number of animal which are moved. the size of the vehicle should be fair enough to hold multiple cages with free air movement and space to access individual cages for feeding, cleaning and treatment.
- The selection of route should be very important.

Key Points

- According to the length of travel the feeding should be done in between but the watering of animal is must irrespective of travel length unless if it is a sealed animal.
- Even fairly tamed animals will not eat or drink when deprived of freedom of movement.
- In general feeding and watering is usually only necessary on very long (>24 hour) trips. But we practice once in 6 to 8 hours the beast should be fed with fresh fruits and drinking water
- The key points are.
- Avoid brake or accelerate sharply, travel slowly on rough roads.
- Take more than care of bastards that cause the animals to work from side to side.
- If injections must be administered en route this must be done away from crowds of people.
- Stops should be as brief and infrequent as possible.



ACKNOWLEDGEMENT

Geeta Seshamani, Secretary, Wildlife SOS (I)

Kartick Satyanarayan, Co-Founder Chairman, Wildlife SOS (I) &

All my Veterinary Colleagues of Wildlife SOS.

TRANSPORTATION OF LIVE SLOTH BEARS *(Melursus ursinus)*

Introduction

Transportation of any live captive / Zoo animal or free ranging wild animal in group or individual from place to place is very critical, important in terms of safety and transit care. Transportation is one of the most traumatic events to which a wild animal can be exposed. More animals die during transportation, or due to injuries or infections sustained during transportation, than during capture. Many of these deaths go unnoticed because the animals usually die in the field after release.

We in Wildlife SOS, an Indian Non Governmental Organisation, have involved in much wildlife transportation which includes many reptiles to large mammals like elephants within the country due to various reasons like confiscation, rescued from natural calamities like flood, Tsunami etc. For example, we shifted five Asiatic Lions from Sangli Municipal Corporation Zoo, Maharashtra to Thirupathi Zoo of Andhra Pradesh by trucks on road due to heavy flood at former place. We shifted Sloth bears (2 Nos) by air from Goa to Delhi and by road safely within the country.

Sloth bears belong to the order Carnivore, family Ursidae and genus Melursus. We have done inter and intra state shifting of Sloth bears in India, for example from Rescued bear transit facility, Hyderabad to Agra bear Rescue Facility (26 Nos), from West Bengal (22 Nos), Nagpur (3 Nos), Chhattisgarh (2 Nos), Chennai (3 Nos), Puducherry (2 Nos) wild Sloth bear with two cubs which were delivered in an abandoned house close to the natural habitat to Bannerghatta bear rescue & rehabilitation centre, Bangalore, in addition to many other intra state short distance transportation. Any wild animal should only be transported by experienced persons using suitable equipment and principles to avoid Stress, Temperature extremes, and Injuries which are the major fatal factors.

Stress

Both psychological stress and physical stress are usually caused by excessive muscular exertion or fear during capture, loading, or transportation. This excessive muscular exertion may result in damage to locomotor, respiratory, or heart muscles, resulting in 'white muscle disease' or capture myopathy. At times the situation may be so stressful that the animal dies immediately of shock. On the other hand, the animal may show no immediate signs of the stress but may later succumb to an infection as a secondary result of the stress. Animals that have been unduly stressed during capture usually die during transportation, especially if transported over a long distance. This may not be a reflection of the quality of the transport operation.

Extremes Temperature

Temperatures must be kept in mind at all times during the capture, loading, and transportation. As a thumb rule the conditions most favorable for capture are also best suited for transportation. Both capture and transportation should be avoided during the hot summer unless it is emergency. In that case hyperthermia, or over-heating, can be a serious problem, but can be prevented by using properly ventilated vehicles or crates and by loading the correct number of animals in a mass crate. A crate left in the sun and a breakdown of the vehicle during the daytime in summer can have disastrous results. Exposure to very low temperatures can be serious, often resulting in hypothermia and death. Alternatively, pneumonia may develop which may lead to mortality after release. Hypothermia can be prevented by using sufficient bedding during transportation, and by planning transportation times and routes.

Physical Injuries

Injuries may be caused by the capture process, but usually occur during loading and transportation. Excessive trauma may be caused by using incorrectly designed crates or vehicles, or by animals fighting during transportation.

SOME BASIC PRINCIPLES FOLLOWED FOR THE TRANSPORTATION OPERATION

Keeping the road as mode of transportation the following steps were suggested based on experience, although the transportation technique used to be a species specific one, certain basic principles to be followed in transportation of any wild animal such as,

i) Preparation before transportation

Preconditioning of animals: (Boma training in case of herbivores) or Crate training, mode of transport like by air, by road or by sea. Based on road transport, the major categories are

a) Short travel (< 100 Kms or < 5 hrs)

b) Long travel (> 100 Kms to 500 Kms or < 24 hrs)

c) Very long travel (> 500 Kms or > 24 hrs)

According to the length of travel, the bears need to precondition by keeping them in a transport cage for 10 to 15 minutes twice in a day for couple of days. If the animal is reluctant to get into the transport cage, then the tranquilisation procedure should be followed and the bear should be placed inside the transport cage 8 to 12 hours before the departure day of the transportation. An optimum size of the transportation cage would be 4'6" L X 3' W X 3' H, this would be the best for bears of various age (above 2 yrs) and body weight (40 kgs upto 200 kgs). For bears the transportation cage should have the feeding passage on the bottom side of the sliding door, so that en route feeding and watering of the bear would be easily taken care off.

Accompanying veterinarian with necessary veterinary drug kit should be made ready in addition to the documentation part of the animal and vehicle.

ii) Target animal

Apart from species characterization, specific individual animal's behavior, mode of transportation, time of transportation, degree of restraint required for the transportation of captive wild animal/s like Zoo animals or of Free ranging wild animal/s should be taken into account. In case of Sloth bears, individual crate approach is advisable than mass transportation approach. Behavioral characteristic like male used to be dominant, Mother bear should be shifted along with cubs with minimal handling etc. Though it is necessary to cover the crates in both captive and wild caught animals, it is must to give extra calm environment to the non captive wild animals for stress free travel and ventilation.

The use of tranquillizers remains an area of uncertainty. Currently there is no scientific data to support both use and non use of tranquilisers claim: the success of the operation often depends more on the style and ability of the transporter than on drugs or other technological solutions. Both short- and long-acting tranquilisers are used extensively to facilitate the transportation of aggressive animals. Tranquilisers can also reduce the stress levels of the transported animal, and can thereby improve success rates and reduce mortality during and after transportation. The dose rate of 2 mg/ Kg b.wt Xylazine and Ketamin @ 5 mg/Kg.b.wt is ideal. In case of heavily injured animals, the maintenance dose of 0.5 mg /Kg.b.wt Xylazine and 2 mg/Kg.b.wt of Ketamin can be used whenever the bear shows the symptom of recovery, to avoid self injuries or aggressive behavior due to stress and pain during transportation. Remote injection using a pole syringe or distance projectile also eliminates some of the stress associated with injection.

iii) Selection of crate & loading

In addition to the size, sex and age of the wild animal, knowing the basic behavior pattern of the animal is immense importance in designing a transportation crate or cage. Confinement in a crate or vehicle after capture results in additional stress for the animal. This may be particularly severe if the crate or vehicle is not of proper design or construction, or if the animals continually attempt to escape. The size and strength of the crate must be appropriate for the animal to be transported in addition to a good locking mechanism. Too

large a crate is often as bad as a crate that is too small. Padding on the sides and grass or sand bedding on the floor of the crate should facilitate less damage on the extremities of the bear body as well as the claw and canine damage also to retain its footing even on rough roads. The floor must allow drainage of urine or spilt water.

The ventilation of the crate must be good to prevent overheating, accumulation of ammonia on very long trips, at the same time ventilation must be controllable. Ventilation openings should not encourage escape attempts and should allow flow of air vertically as well as horizontally in the crate. Doors should be of the top sliding type with the mechanism of such a nature that it cannot jam. There should always be more than one door to facilitate access and to facilitate release. Once animals have been in a crate for a while they feel secure in the confined space, and are often reluctant to leave through a single door that is suddenly opened.

The loading of captured animals must be done as quickly and as quietly as possible to prevent further stress. Animals should be loaded in the early morning and transported during the day in the cold winter months and night transportation is often resorted to in summer to avoid excessively high temperatures. Shouting during loading only serves to confuse and stress wild animals and serves no useful purpose. Depart as soon as the animals are loaded.

iv) Selection of vehicle and route

The selection of the vehicle should be appropriate based on the number of animal which are moved, the size of the vehicle should be fair enough to hold multiple cages with free air movement and space to access individual cages for feeding, cleaning and treatment.

The selection of route should be very important to avoid bad roads and heavily traffic. Negotiation should be done between well connected high ways with short distance of very bad roads.

v) During en route

According to the length of travel the feeding should be done in between but the watering of animal is must irrespective of travel length unless if it is a sedated animal. Even fairly tamed animals will not eat or drink when deprived of freedom of movement, and their health will be affected adversely if they are transported in this state for prolonged periods. In general feeding and watering is usually only necessary on very long (>24 hour) trips. But we practice once in 6 to 8 hours the bear should be fed with fresh fruits and drinking water. During the short halt the bear should be checked for injuries like damages in claws and canines. The key points are,

- Avoid brake or accelerate sharply.
- Travel slowly on rough roads.
- Take maximum care of obstacles that cause the vehicle to rock from side to side.
- Stops should be made away from areas of noisy or high activity.
- If injections must be administered en route this must be done away from crowds of people.
- Stops should be as brief and infrequent as possible. Animals tend to settle down once the vehicle is moving, and unnecessary stops disturb the animals.
- Two drivers should be used for long journeys to ensure a rapid, uninterrupted trip, and to avoid problems with driver fatigue. Change drivers every eight hours or every 400 km.

FEW "DON'TS" OF TRANSPORTATION OPERATION

- Do not waste time en route.
- Do not permit people other than the handlers to climb onto or around crates containing animals.

- Do not allow animals, particularly tranquillized ones, to lie down for too long in a crate.
- Don't transport adult males and other incompatible animals together in the same crate.
- The transportation of very young and pregnant animals must be avoided.
- Many times short-cut leads to disaster (like common crate designing, mode of transportation, in appropriate vehicle selection, more than the carrying capacity etc.)
- Though the economic part is a limiting factor, it should never be a constraint.

In short more than a standard operating protocol, the transportation of wild animal is a continually evolving process depends on the species involved.

Sharing of Experience

Group Formation

Dr. M.G. Jayathangaraj
Organizing Secretary &
Professor and Head
Department of Wildlife Science
Madras Veterinary College
Chennai

Dr.M.G.Jayathangaraj, Organizing Secretary & Professor and Head, Department of Wildlife Science, Madras Veterinary College discussions and interactions were made with various participants hailing from different parts of this country. Focus was laid on individual –experience of the transport of wild fauna and groups were formed. The participants attached with different groups, interaction and recommendation were made accordingly.

Group Formation

Working Group I - Deer

Facilitator : **Dr.Carlos Sanchez**
Recorder : **Dr. Prabhu**
Members :

1. **Dr.N.Panneerselvam,** National Zoological Park, New Delhi
2. **Dr.Srinivas.V.,** Indira Gandhi Zoological Park, Vizag
3. **Dr.Palit, M.,** Tata Steel Zoological Park, Jamshedpur
4. **Dr.Rathore.S.S.,** Jodhpur Zoo
5. **Dr.R.Thirumurugan,** Arignar Anna Zoological Park, Vandalur
6. **Dr.Vinaya R. Jangle,** Sanjay Gandhi National Park, Mumbai.

Working Group II - Carnivore

Facilitator : **Shri. Naim Akhtar**
Recorder : **Dr. Kathiravan**
Members :

1. **Dr.M.P.Singh,** M.C.Zoological Park, Chhatbir, Chandigarh
2. **Dr.Kavehiya Vipul P.,** GEER Foundation, Indroda Naure Park Zoo, Gujarat
3. **Dr.S.K.Mittal,** Gandhi Zoological Park, Phoolbagh, Gwalior
4. **Dr.Jai Kishor Jadiya,** O/o The Divisional Forest Officer, Raipur Division Raipur (Chhatisgarh)
5. **Dr.Dinesh Kumar Pradip,** Bhagwan Birsa Biological Park, Ranchi,
6. **Dr. Kadivar Riyazahmed F.,** Sakkarbaug Zoological Park, Junagadh, Gujarat.

Working Group III - Reptiles

Facilitator : **Dr. Gowri Mallapur**
Recorder : **Dr. Mohanapriya & Dr. Jalantha**
Members :

1. **Dr.Jithesh J Poonattu,** Dr. Shivaram Karanth Pilikula Biological Park, Vamanjoor, Mangalore (D.K), Karnataka
2. **Dr.A.Biswas,** Indra Gandhi Park Zoo, Rourkela, Orissa
3. **Dr.R.Perumalsamy,** V.O.C. Park Mini Zoo, Coimbatore Corporation, Coimbatore.
4. **Dr.Aravind Mathur,** Jaipur Zoo, Jaipur, Rajasthan

Group Formation

Working Group IV - Birds

Facilitator : **Dr.Naveen Kumar & Dr. Cheeran**
Recorder : **Dr.Sachin**
Members :

1. **Dr.C.Suresh Kumar**, Sri Chamarajendra Zoological Gardens, Mysore
2. **Dr.Sarat Kumar Sahu**, Nandankanan, Zoological Park, Bhubaneswar, Orissa
3. **Dr.Karma Doma Bhutia**, Himalayan Zoological Park, Bulbulay, Gangtok
4. **Dr.Sajal Chandra Das**, Sepahijala Zoological Park, Tripura
5. **Dr.P.Srinivas**, Nehru Zoological Park, Hyderabad

Working Group V - Primates

Facilitator : **Dr. Kevin Lazarus**, Zoo Taiping & Night Safari, Malaysia

Recorder : **Dr. Shanmugasundaram**
Members :

1. **Dr.S.P. Arun**, Sri Venkateshwara Zoological Park, Tirupati
2. **Dr. L. Sarat Chandra Singh**, Manipur Zoological Garden, Iroisemba, Imphal
3. **Dr. P.K. Chandan**, Kanan Pendari Zoological Garden, Bilaspur, Chattishgard
4. **Dr. Mohan Lal Smith**, Assam State Zoo, Guwahati, Assam
5. **Dr. Jayant B. Kacha**, Kanda Nehru Zoological Garden, Kankaria, Ahmedabad
6. **Dr. B.B. Gupta**, Himalayan National Park, Kufri, Shimla

Experience sharing and interactions on Transport of reptiles, deer and birds species

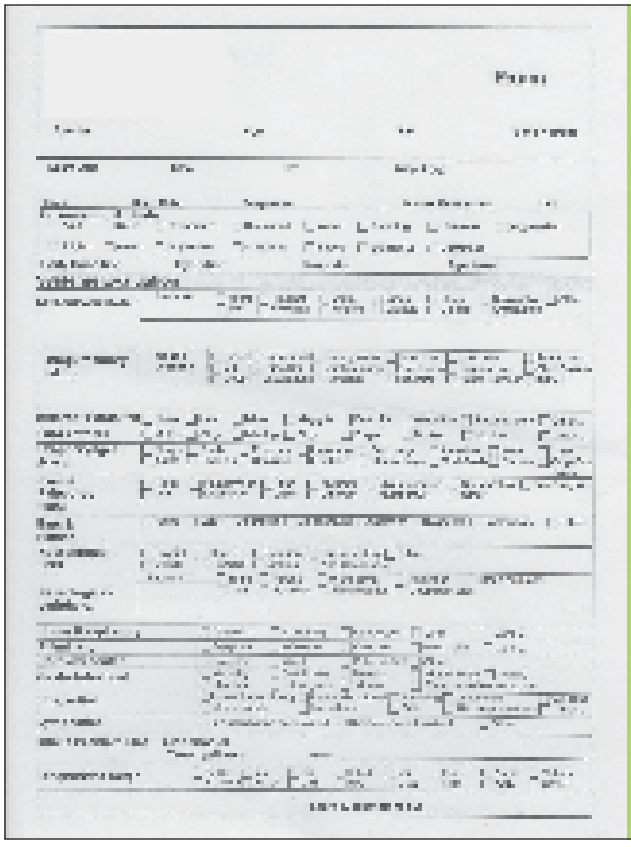
Mr. Neelim Khair
Rajiv Gandhi Zoological Park
Pune

Field based experience were shard with regard to the successful transport of reptiles, deer and birds species. Detailed discussions were made with concerned on the field problems.

Transportation of Wild Animals

Veterinarian's check list during transportation

- Animal health
- Medicines & veterinary equipments



Animal Examination form

Animal Keeper's check list

- Check transportation cage
- Get feeding schedule from veterinarian
- Inform veterinarian in case of change in animal behavior.

Curator's Check List

- Legal documentation related to animal transportation -
- transit permits, sanction letters
- Vehicle checkup
- Vehicle documentation - Vehicle papers, PUC certificate, driver's license
- Driver's health and well being (a stand-by driver for long distance journeys)

Use GPS

- GPS is useful in remote areas. The trace route feature is useful for the return journey through thick forests desert etc.
- GPS is also useful for recording animal release sites.

Transportation of Wild Animal

- Reptiles should not be sedated
- Animals of different sizes (even of same species) should not be transported in the same compartment or cages.
- Unless reptiles of the same species are known to be compatible with one another, they should not be reported in same bag or compartment.

Transportation of Wild Animal

- Animals should be left undisturbed during transportation.
- Sick or injured animals should receive veterinary treatment as soon as possible. Record of such occurrence should be kept.
- Care should be exercised in handling transport containers so that they are not tossed, dropped, needlessly tilted, or stacked in a manner that could result in physical trauma or stress.
- Do not feed reptiles before or after transportation except young tortoises or iguanas.

Transportation of Wild Animal

- The transportation container should be made of wood.
- To ensure adequate air flow and ventilation holes should be provided.
- There should be no sharp edges inside the container.
- Do not use toxic wood preservative or paint
- The Paint should be dry

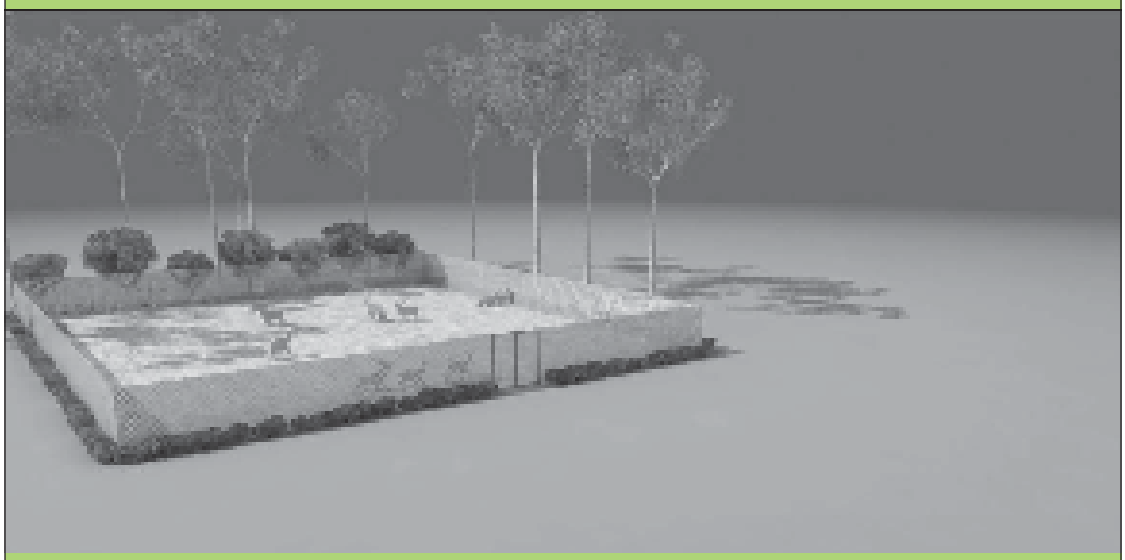
Transportation of Wild Animal

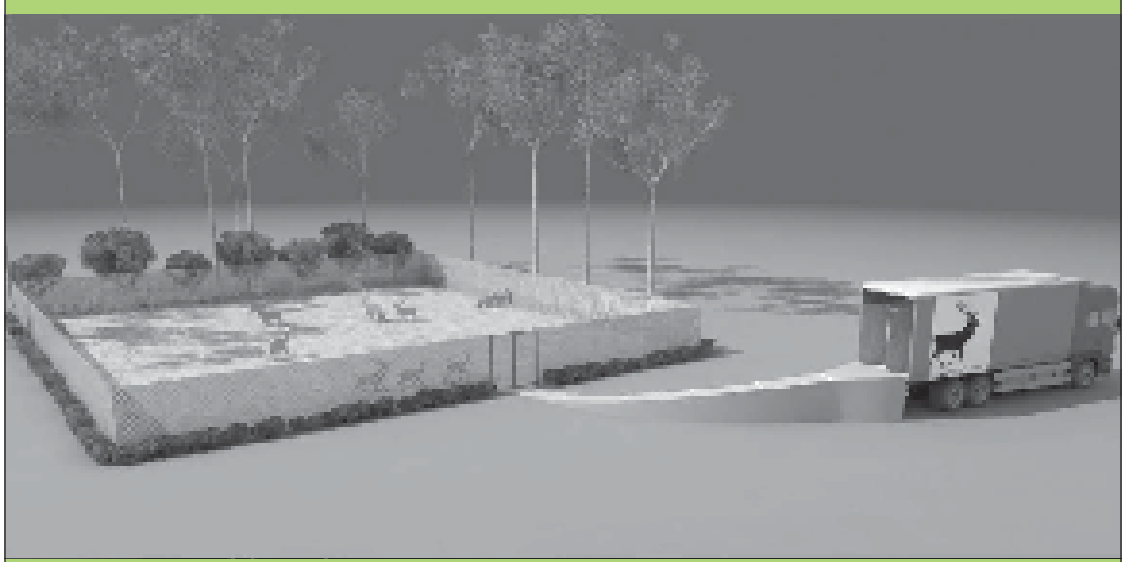
- During long distance transportation of wild animals, halts can be taken in between at zoos or animal rescue centers with prior intimation. Thus stress can be minimized and animals can be fed
- Care should be taken to keep the in-transit animals away from regular zoo animals to avoid any infection.

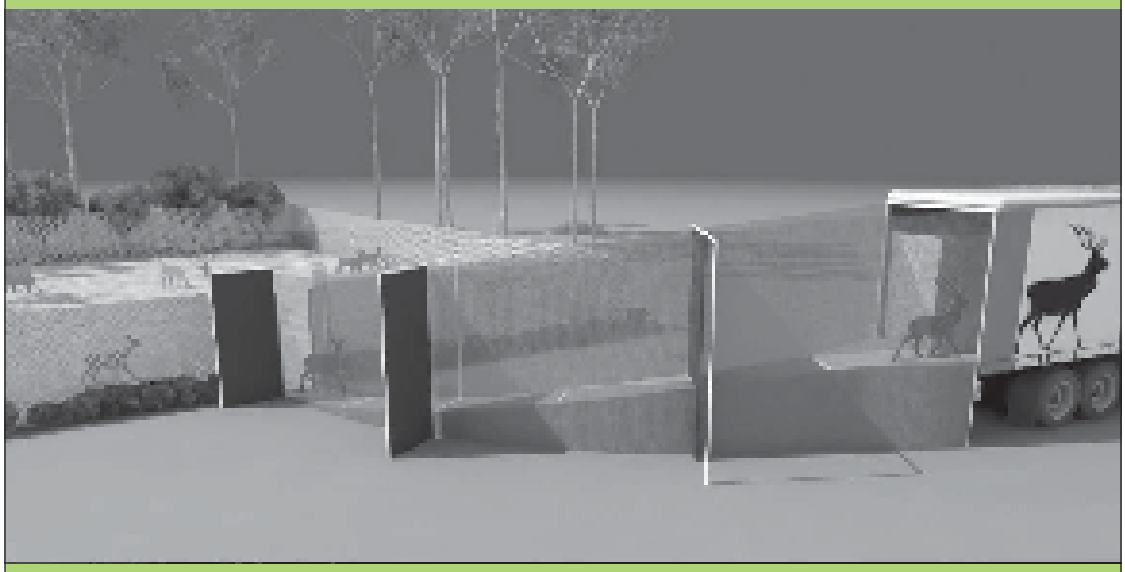
Transportation of Wild Animal

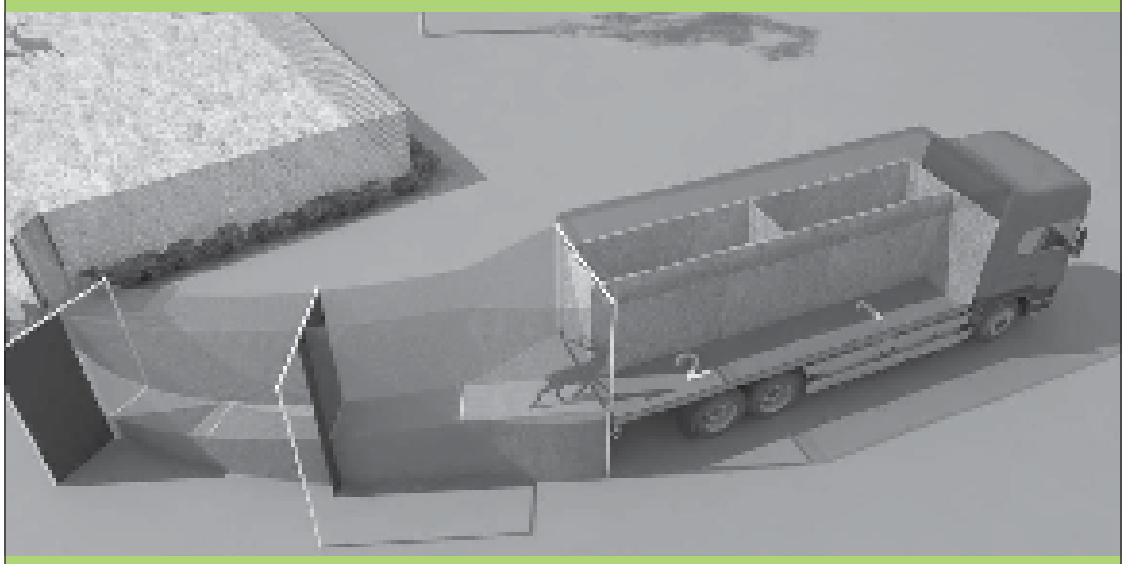
- A digital thermometer with wired probe should be used to measure the container's temperature every hour.
- Protect the cages from direct sunlight.
- During summer, avoid day-time travel if the vehicle does not have an AC. The journey can be made during evening and at night

Deer transportation and release

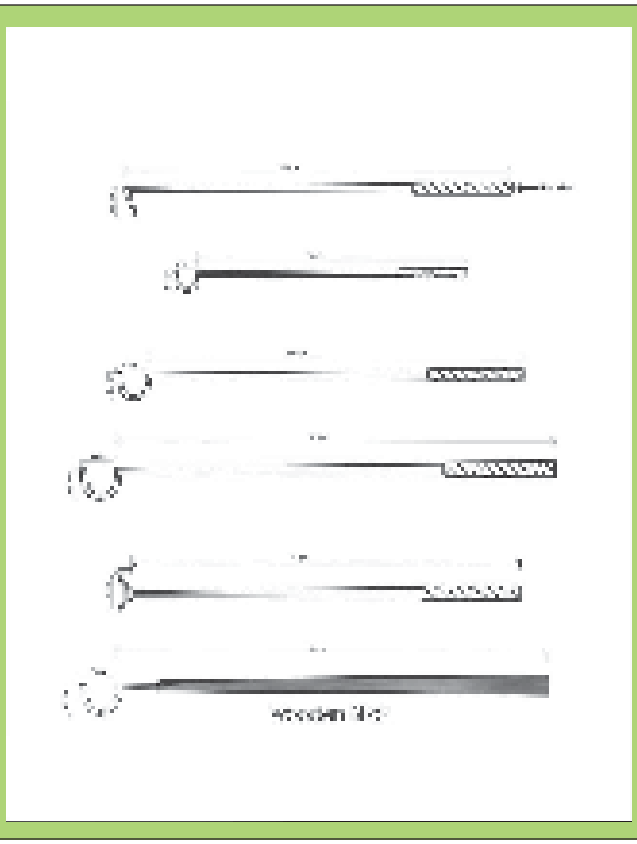








Handling & Transportation of Snakes



Hook sticks

Handling & Transportation of Crocodile

Handling Crocodiles

If it is essential to restrain the limb temporarily (to prevent struggling), use snare or tape. Tie loosely so as not to restrict blood circulation. Do not restrain limb for more than 2 hours. This procedure causes Oedema (fluid accumulation) in the limb & can cause severe tissue damage or loss of limb.

Precautions while handling Wild Animals

Precautions

- Wash your hands with hot soapy water after handling any animal, cage, accessories
- Wear gloves and face protection while cleaning the animal cage, pond, tub, role.
- Handle poisonous reptiles with due care
- Keep ASV nearby along with the first aid kit
- Handle mammals carefully that may carry rabies, consult a doctor immediately if scratched or bitten.

Procedures for release in the wild

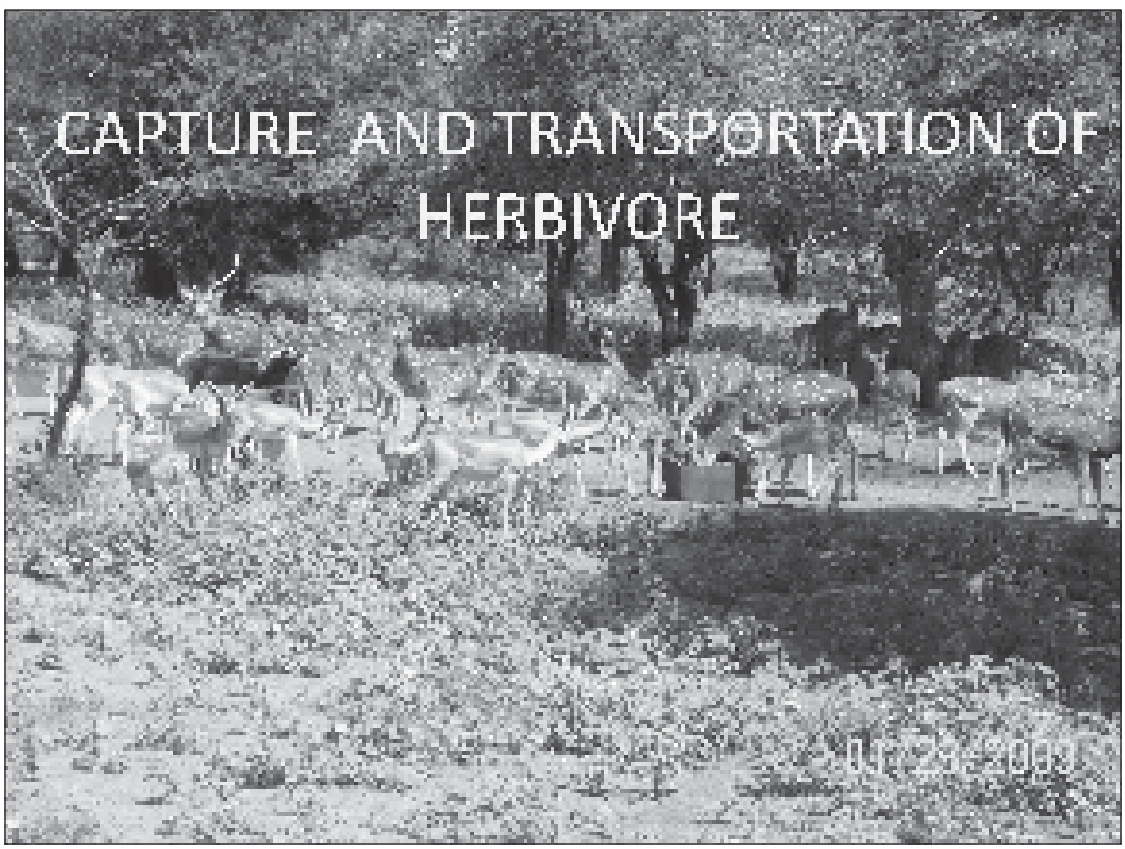
- All releases should conform to IUCN guidelines.
- According to the Wild Life Protection Act, wild animals can be released only in presence of a forest officer.
- A'Release Panchanama' should be obtained from the forest officer.
- There should be photographic documentation of the release.

Experiences on Transportation of deer and Animal Capture & Restraint Methods

Dr. Naveen Kumar
Former Veterinary Officer
Nehru Zoological Park
Hyderabad

Dr. Naveeen Kumar briefed about the protocol for the veterinary care of safety of wild animals during transportation with special references to deer species and zoo veterinarians from different parts of this country interacted with due clarifications. Zoo Veterinarians interacted with their queries.

PROTOCOL FOR THE VETERINARY CARE AND SAFETY OF WILD ANIMALS DURING TRANSPORTATION WITH SPECIAL REFERENCE TO DEER SPECIES



Animal capture and Restraint, shifting of animals/squeeze cage/transport cage

- Handling and restraint has some effect on the behavior, activities and life processes of animals. Therefore, considerable thought to be given to the need, methods of restraint, safely of animals and staff and after effects prior to the operation of actual handling/restraint of animals.
- Supervisory staff engaged in restraint operations should have working acquittence and experience with the restraint and equipment.
- There are three basic methods need for the restraint of animals i.e., psychological, physical and chemical. The response of the animals of these methods very considerably.

- The physical restraint method is more stressful than the other two. The psychological method is less stressful because it manipulates the animals through training. Conditional reflex, voice and manariens of the operator. The capture wild animals should be therefore habituated/conditioned by their keeper to be handled, moved in and out of cage, since the time of their infancy.
- Many animals respond negatively to the human touch, sounds of speech, vehicles and other strange noises. During restraint operations, therefore, sounds of speech and noises should be minimised in proximity of animals.
- While restraining or capturing it is important to recognise that timidity, absence of confidence in the operator is readily perceived by a wild animal which can result in aggressive response. Persons lacking confidence in the procedure should not be engaged in restraint operation.

- The staff engaged in restraint operation should have knowledge of the agility, threshold of tolerance, flight distance, strike reach and behavior of an species because a covered wild animal may fling itself against a wall or a barrier or attack without regard for its own safety.
- By placing a blindfold (dark coloured cloth bag) over the head of the hoofed animal, the visual contract with the environment is reduced making it easier to handle an animal.
- Squeeze cages are good for restraining animals but the design of the squeeze cage should be in confirmity with the anatomical and physical features of an animal.
- Small animals can be restrained with the help of tough leather gloves, torg, D. shaped sticks, cloth bag and thick towels but the keeper should be confident and experienced.

- Ropes, Snares, Nets and poles are good tools for use of physical and manual restraint of animals and snale different sizes and material should be always be available at a central place and known to all the concerned staff of zoo.
- Use of physical barriers such as boards, transparent or a opaque plastic shields can allow close approach to an animals, example medium sized primate, carnivore.
- While engaged in restraint of animals, a restrainer should know where and how to group the animal and the amount of force to be used to accomplish the restraint.
- Large carnivores can slip through ropes, snares or bite through nets, gloves and effect an escape. Therefore while restraining carnivores extra precautions should be taken and if possible chemical restraint should be used.

- While chemical restraint, check access of animals to pools, moats, pits should be prevented.
- Animal chemically restraints and the animal to be unampulated to Brisket position to prevent regurgitation and checking of trachea (Wind pipe).

General care and precautions for Transport of Wild Animals

Zoo should ensure that the carriers (Truck operators, Railway Authorities and Airlines) give priority to animals over goods during transportation.

Only animals in good health and free of disease should be transported.

If sick or ill animal is required to be transported for any reason, it should be accompanied by a qualified Veterinarian.

It is undesirable to transport pregnant animals, animals that are dependant on their mothers or antlered animals in velvet.

Generally sedation of animals during transportation is not advisable, however in cases which merit sedation, a veterinarian should accompany the animal.

Transportation of animals during extreme heat, cold, rainy period should be avoided so that animal is not subjected to the extremes of temperature or drought.

It is generally a safe and established convention that each animal should be transported in a separate crate/cage/container.

Facilities should be provided for water and food for animals during transportation involving journeys for long duration by rail or road.

If the animal develops sickness or get injured during transportation, a veterinarian of zoo should be contacted at next stop on journey.

If an animal dies during transportation, a veterinarian or a zoo authority should be contacted to establish the cause of it's death and a certificate to that effect should be obtained before disposal of carcass.

Guidelines for preparing Transport Cages

- Depending on the species and the mode of transport, cages/containers may be made of wood, hardboard, plywood, cardboard, plastic, polystyrene, or metals such as steel, aluminum, tin or wire mesh, etc. Irrespective of the above material used for the construction of cage/container, it should be ensured that the cage is sufficiently strong, rigid and secure to withstand the handling involved during transport and to avoid escape of animals enroute as well as to ensure the safety and well being of the animal.

- When wood, plywood, hardboard, plyboard, is used for construction of the cage/container, it should be built on a framework of angle iron of suitable strength. In case of large, strong animals, bolts and nuts should be used on joints instead of screws, nails, wires for fixing top, bottom and sides of the cage on the frame work.

- The dimensions of the cage/container should be such that the animal is unable to turn round or to somersault. The space inside the cage/container should be adequate to allow comfort movements of the animals.

- The inside surface of all cages/containers should be devoid of any projecting nails, screws, bolts, ends of mesh or any other sharp or jagged material which could cause injury to the animals.

- Only non-toxic and non-allergic paints, polish or wood preservatives should be used to paint the cage/container/box. Painting of inside of the cage/container is not recommended.

- In case of large animals, the floor of the cage/container should be slated or meshed to allow the urine and excreta of the animals to pass through and fall into a tin or aluminum tray provided for the purpose between the floor and the bottom. The dimension of the slats, the spacing and the mesh hole should be such that there is no possibility of the animal's feet being trapped or injured. In case of smaller animals, absorbent saw dust, sand or straw may be used in place of slated floor and tray.

- Cages or containers designed for transportation of animals that have strong gnawing or clawing, for examples Bears, should have inner walls and the floor of the cages/containers lined with steel/aluminum sheet of sufficient strength.

- In order to avoid undue stress due to visual stimulation, a loose thin cover of Hessain cloth or plywood should be fitted over any mesh or bar front/rear or sides. This cover, however, should be easily removable for inspection, feeding or watering purpose. Care should be exercised that this cover does not impair air circulation. Openings of suitable dimensions need to be made at intervals in such covering.

- The front and rear sides of the cage/container should be fitted with sliding doors, instead of hinged doors, so as to provide ease entry and exit of animals. The slide channels for such sliding doors should be of full length of the front / rear side.

- The front read sliding doors/gates should be provided with arrangements for locking at the top or sides.

- All transport cages / containers should provide sufficient ventilation. Regardless of the fact that the cages/containers may have mesh or bar front and rear, ventilation holes should be provided on side walls and roof. The diameter of ventilation holes should depend on the species for which the container/cage is made but it should be in the rate of 10 mms to 50 mms. It is, however, important that no part of the animal should be able to protrude through these holes. If necessary, the fine wire mesh should be fixed over the holes. In addition, spacer bars of adequate size should be fitted on the outer sides of the cage/container to ensure free flow of air to the animals in the event of close stacking or stowing of other goods and cages.

- All cages/containers should be provided with strong lifting handles/grip bars on sides to facilitate easy lifting/loading/unloading.

- The Cages/containers for large animals should have strong batons fixed length wise under the bottom for easy sliding, however, these batons should not protrude beyond the length of the cage/container.

- It is not advised to keep any kind of vessel or pot (made of stone, metal, plastic, paper, etc.) for water or food inside the cage/container as the animal in a nervous state may try to chew or swallow it. Instead, arrangement in the form of a flanged, narrow slit, should be provided at the bottom end of the front slide door through which water or food can be served in a pan (shallow metal container with a handle) and taken out after serving.

- Cages/containers for animals which have strong jumping habits (Kangaroo, deer, antelope, horse, Zebra, wild ass etc.) should have non-abrasive padding (foam rubber, paper shredding, rags etc.) on the roof and inner sides to avoid risk of injury. Care, however, should be exercised that the padding does not impede ventilation.

- When cage/container is reused it should be thoroughly cleaned, disinfected and dried before reuse.

Sizes of the Cages for Carnivores

S.No.	Species	Size of the cage	Inner size of the cage
I. CARNIVORES :			
1.	Tiger / Lions (Adults)	195 X 75 X 105 cms.	Length - 6 ½ feet Width - 2 ½ feet Height - 3 ½ feet
2.	Panthers and Jaguars	120 X 60 X 90 cms.	Length - 4 feet Width - 2 feet Height - 3 feet
3.	Bears	180 X 75 X 100 cms.	Length - 6 feet Width - 2 ½ feet Height - 3 ½ feet

Sizes of the Cages for Herbivores

S.No.	Species	Size of the cage	Inner size of the cage
I. HERBIVORES :			
1.	Nilgai / Sambar	180 X 68 X 150 cms.	Length - 6 feet Width - 2 ½ feet Height - 5 feet
2.	Swamp Deer	165 X 60 X 150 cms.	Length - 5 ½ feet Width - 2 feet Height - 5 feet
3.	Spotted Deer	150 X 55 X 120 cms.	Length - 5 feet Width - 1.10 feet Height - 4 feet
4.	Hog Deer / Barking Deer	90 X 45 X 75 cms.	Length - 3 feet Width - 1 ½ feet Height - 2 ½ feet

Drug Dosage for Herbivores

S.No.	Species	Drug	Drug Dosage
I. HERBIVORES :			
1.	Spotted Deer (Adult) Spotted Deer (Sub adult)	HBM -do-	1.0 – 1.5 ml 0.30
2.	Spotted Deer (Adult)	HBM	0.60 – 1.0 ml
3.	Blackbuck (Adult)	HBM	0.3 – 0.4 ml
4.	Sambar and Barasinga	HBM	2.0 – 2.25 ml
5.	Sambar	Immobilon (2 ml) + Acipromozine (20 mg)	2 ml
6.	Nilgai	HBM	1.0 – 1.8 ml
7.	Wild ass	Immobilon (7.1 ml) + Acipromozine (25 mg)	2.5 ml

Drug Dosage for Carnivores

S.No.	Species	Drug	Drug Dosage
I. CARNIVORES :			
1.	Tiger	Capture all Ketamine (100 mg), Xylagine (50 mg)	4 ml
2.	Leopard or Panther	-- do--	2.0 – 3.0 ml
3.	Lion	-- do --	4 ml
4.	Jackal / Wolf	-- do --	2.0 ml

Arignar Anna Zoological Park, Vandalur

Madras Crocodile Bank Trust - Experience sharing and interaction

Field exercise to the participants of National Workshop

Dr.R.Thirumurugan
Veterinary Assistant Surgeon
Arignar Anna Zoological Park
Vandalur, Chennai

Dr. Thirumurugan elaborated the basic principles pertaining to the transportation of live Sambar Deer along with Dr. Carlos. The participants had a good interaction with the resource persons.

FIELD EXERCISE TO THE PARTICIPANTS OF NATIONAL WORKSHOP

The zoo veterinarians were apprised of the technical advancement in the field of immobilization that may be highly required as a pre-requisite often before immobilization of various herbivores like deer. Immobilization during the routinely carried out clinical interventions led to the opportunities for witnessing of immobilization events by the participants of the national workshop on "Protocol for the Veterinary Care and Safety of Wild animals during transportation with special reference to deer species" sponsored by Central Zoo Authority of India, in collaboration with Arignar Anna Zoological Park.

The practical aspects of chemical immobilization using drugs like xylazine, ketamine, and etorphine were demonstrated to the participants. Dr.Carlos Sanchez, Associate Veterinarian, Brookfield Zoo of United States of America interacted in this regard and delivered more useful technical information in this regard. Practical aspects of handling of various gadgets were dealt additionally.

Similarly, Dr Kevin Lazarus of Zoo Taiping & Night Safari, Taiping, Perak, Malaysia demonstrated about the easy way of preparing dart and the method of application to the participants of the national workshop, in addition to technical information on the safe transport of wild fauna. The zoo veterinarians-the participants of this workshop got highly benefited with regard to the first-hand information and the direct information pertaining to the immobilization effects in the concerned wild animal species studied.

The interactions made by the participants were much useful for all and the methods of safe transport of various species, especially deer species like spotted deer and sambar deer were analysed in a critical manner. The pros and cons of the transport of deer species were dealt elaborately, with participations from many field veterinarians who had exposure at their individual working places.

The Conservator of Forest and Director of the Arignar Anna Zoological Park, Vandalur – Shri. K.S.S.V.P. Reddy, IFS interacted with participants emphasizing the need of safe transport of wild animals especially the deer species.

Health Care of Crocodiles under Transport

Dr.Gowri Mallapur
Madras Crocodile Bank Trust/
Centre for Herpetology
Mamallapuram, Tamil Nadu

Transport of reptiles with emphasis on crocodiles were dealt in a systematic manner revealing different examples. Interactions on the queries were made with Dr. Gowri Mallapur.

HEALTH CARE OF CROCODILE UNDER TRANSPORT

The first thing that comes to mind when one talks of transporting is crocodile is why? Why would one want to transport a mostly large potentially dangerous animal? Transport need not necessarily pertain to moving animals over very large distances. Rogue crocodiles are captured in the wild and moved away to safer locations but often it could be a few yards, from one enclosure to another. But the precautions and the care remain unchanged.

Only animals that are in good health should be transported, but there may be occasions when it may be necessary, in the animals' interest, for them to travel to another location. On such occasions it is probable that the animal will be accompanied by a qualified veterinarian or trained attendant.

Transport

The method of transport used for live crocodiles will generally be determined by the size of crocodile(s) involved. Care must always be taken to avoid the effects of exposure, including dehydration, overheating (>35°C), excessive cooling (<20°C) and struggling, and to minimize transport time. Smooth interiors for containers and padding around the snout of the crocodile can minimize snout damage, and are recommended. A simple restraining board with webbing straps is effective for crocodiles up to 3m long for short□]term transport under supervision. Crocodiles may also be transported in a vehicle for short distances if adequately restrained.

A solid ventilated box is necessary for long-distance transport or unsupervised cartage. It is almost always necessary to build containers on a framework when timber or hardboard is employed. In the case of certain large animals, the use of bolts and nuts in place of screws and metal reinforcement for corners, and for walls and roof, is also to be recommended. It is important that all containers should have inner surfaces which are completely free of any projecting nails, screws, ends of mesh or any other sharp or jagged materials which could cause injury to the animal. If any wood preservative or paint is used on the containers, it should not be toxic or a skin irritant.

The container may be designed to house one specimen only, or may be made up of a number of compartments, provided that the overall size is such that it may be handled without difficulty. The container or compartment should be of a size which prevents undue movement of the reptiles, and thus minimizes the risk of injury in the event of violent movement of the container. Health Care of Crocodile Under Transport.

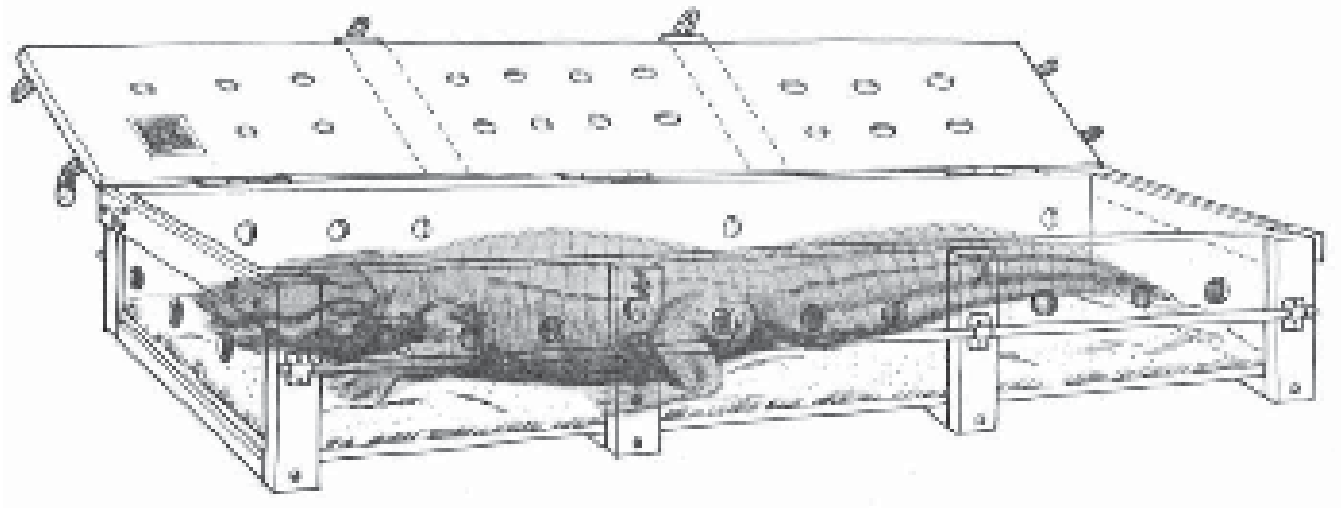
In most cases the containers are more satisfactory if sliding doors are fitted, as the ingress and egress of the animals is more easily controlled than with hinged doors. Suitable lifting handles or gripper bars should be fitted and, in the case of heavily loaded containers.

Always ensure that the head is not lower than the body during transport so that any regurgitated fluids can flow back down the oesophagus rather than pool at the opening of the glottis. If the mouth of a crocodile is tied closed and a fasting history is not known, a stick or block must be placed between the teeth to hold the mouth slightly ajar. This will minimize the risk of drowning and if it vomits under restraint. Where possible, crocodiles should not be fed for at least three days prior to transport to minimize risks. The boxes should have smooth material that will limit frictional damage to the skin and claws when the animal moves or struggles.

Despite their size, crocodiles are delicate animals and are easily killed by pounding on hard surfaces during transportation. Suitable cushioning must be used to minimize vibration and shocks, where these are unavoidable. There should be no sharp edges or projections on the inside surfaces of the container. Gavials should have their noses protected

Where possible, crocodiles should not be subjected to large public gatherings and display during transport or handling operations. Visual stimulation should be reduced by covering the eyes or keeping the crocodile in a dark container. Captured animals are already in a stressed condition and noise and handling must be kept to a minimum.

As the effects of capture stress may persist for many days, animals must be closely monitored for the first few days after release.

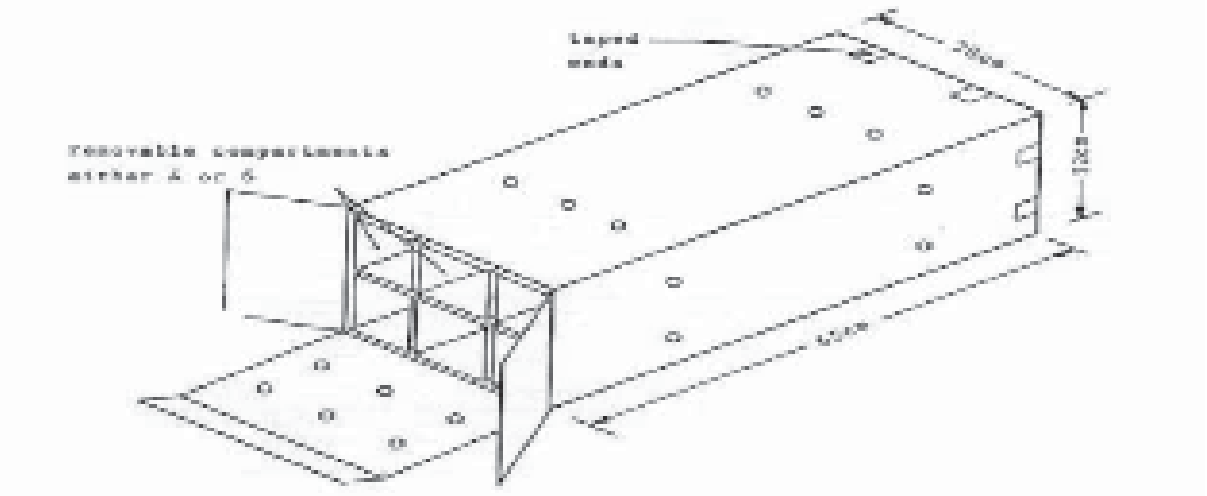


Restraint

Attempting to restrain large crocodiles for transport over long distances by tying ropes at multiple points on the body is rarely effective and can lead to severe injuries if the animal struggles. The most effective method for holding an animal for any length of time is for it to be unrestrained within a specially designed crocodile transport box. Great care must be taken to ensure that crocodiles are not exposed to direct sunlight for any length of time. Direct sunlight can kill within hours through overheating. Crocodiles held out of water for more than a day or two must be covered with sacks and watered regularly to prevent sunburn which causes cracking and bleeding between the scales. Care must be taken to ensure the crocodile is not attacked by ants or that moist parts of the body, like eyes and nostrils, or open wounds, do not get fly-blown. The condition of restrained animals must be monitored regularly.

Limb restraint

As soon as the jaws are secured, the eyes must be covered with a wet sack (hessian bag) to reduce visual stimulation. If it is essential to restrain the limbs temporarily (to prevent struggling), use only wide webbing or tape (5-10cm wide), tied loosely so as not to restrict the blood circulation. Do not restrain the limbs of crocodiles for longer than two hours. This procedure invariably causes oedema (fluid accumulation) in the feet and can cause severe tissue damage or loss of limbs.



General welfare

- Ideally Pregnant / Gravid animals should not be transported. .
- Sedation is inadvisable, as the side-effects are still not fully known and, furthermore, animals that are in a lethargic state are very vulnerable to injury if violent movement of the aircraft, ship, lorry or train is experienced.
- Animals of different species should not be housed in the same container. Under certain conditions each unit of a fully partitioned container can be treated as a separate container.
- Containers should be secured to the carrier to avoid any possible movement and when being handled it is important that every care be taken to ensure that the containers are kept in a horizontal position.
- When animals are being transported over long distances, and will be passing from one climatic zone to another, it is important to plan the journey so that animals are not suddenly moved to a country having a contrasting climate to that which they are accustomed, unless a controlled environment is available.
- Great distress can be caused to animals due to prolonged transit. It is, therefore, most important that, on occasions when these transit stops are likely to occur, proper arrangements be made in advance to ensure that they are not subjected to extremes of temperature.
- Advance preparation should be made for any necessary quarantine measures or other animal health regulations at the ports of intermediate stops or final destination.
- Animal consignments should be collected promptly at their final destination. If live animals have to be left for prolonged periods in airports, etc., they should be housed in places to which unauthorized persons do not have access. Animals that are already under considerable stress, as a result of being transported, suffer great distress through unnecessary interference by curious members of the public. Crated animals should be kept away from direct exposure to the sun and inappropriate temperatures.
- One of the causes of death in animals during transport is lack of sufficient air, so great attention should be paid to the ventilation of containers. Regardless of the fact that containers may have mesh or bar fronts, ventilation holes should be provided in all walls and, in certain cases, also in the roof. The diameter of these holes should be governed by the species of animal the container is to house, and it is important that no part of the animal should be able to protrude through these holes; in the case of certain animals, these holes would require to be covered with fine mesh. However, in spite of this, careful attention should also be given to insulation.

Labeling and documentation

Durable, waterproof labels should be provided as follows:

"LIVE REPTILES" . DO NOT TIP" on all sides and top.

"THIS WAY UP", with arrows indicating the top, on all sides.

Consignor's and consignee's name, address and telephone number. Box numbers should not be used as the sole address. Detailed list of contents: number of reptiles, scientific name and common names used in the exporting and importing countries.

Temperature range required.

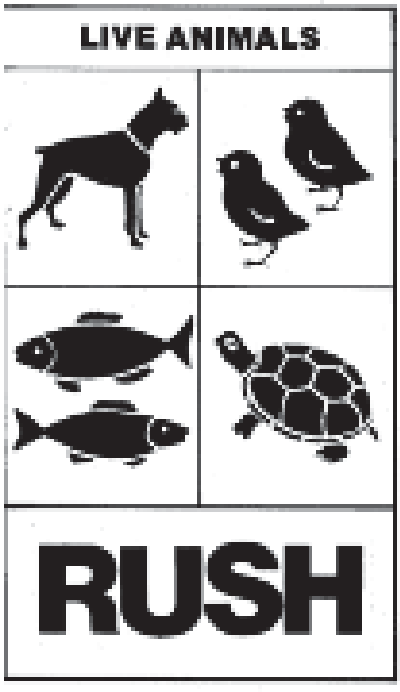
Date on which reptiles were packed for transport.

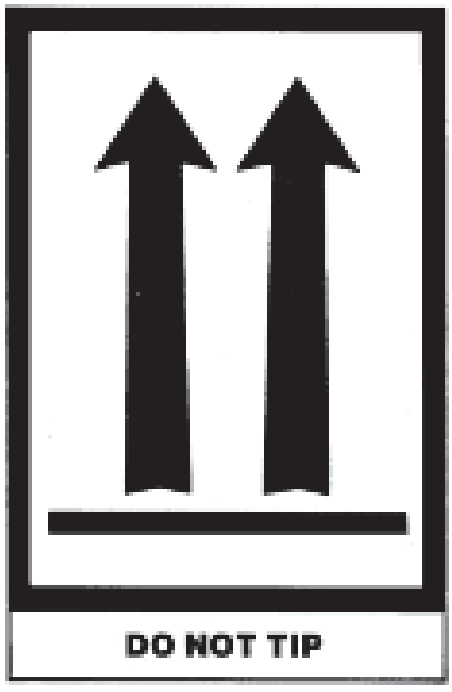
Copies of relevant export and import licenses.

Copy of valid health certificate issued in accordance with the requirements of the importing country.

Duplicate information regarding temperature range required.

CONSIGNOR	VIA	DESTINATION
Name: Address: Tel. No: Date of despatch:	DATE OF DESPATCH Carrier's official stamp	Name: Address: Tel. No.
CONTENTS		FEEDING
Scientific name:		
Common name in exporting country: Common name in importing country: Number of animals:		
TEMPERATURE RANGE REQUIRED MAX °C. _____ MIN °C. _____	SEDATION	ATTACHMENTS Duplicate details of those given on this label Copies of relevant export and import licences Valid health certificate Details of any sedation or treatment given





Reference

Department of Environment and Resource Management (07) 3330 5259 Approved in accordance with section 174A of the Nature Conservation Act 1992 http://www.derm.qld.gov.au/register/p02708aa.pdf

Guidelines for transport and preparation for shipment of live wild animals and plants 1981. CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA. http://www.cites.org/eng/resources/transport/index.shtml

Transportation of Native Non-human Primates

Dr. M. Palanivelrajan
Assistant Professor, Department of Wildlife Science
Madras Veterinary College
Chennai

Dr. Palanivelrajan shared technical information with regard to the transportation of Native Non-human Primates in a systematic manner. The interactions were useful for participants.

TRANSPORTATION OF NATIVE NON-HUMAN PRIMATES

Safe and humane transportation of non-human primates requires dedicated and informed personnel who carefully plan and attend to the details of appropriate animal care and handling throughout the shipping process. Transportation must be anticipated by the authorities well in advance of the specified date of transport, because it always been a complex task in order to getting the prior permission for the transportation of Bonnet macaques. Planning and executing of primates locally and internationally can be an over healing experience. Considering how many variables are at play, including quarantine of the animals, meticulous preparation of paperwork, along with applying for import and export permits, it can be a daunting task. In addition to that each country has its own unique import requirements and the rules change continually. Shipping animals internationally can make for an extremely time consuming project.

Animals die during transportation due to injuries and stress than capture. Those who care for primates in captivity should be aware that any form of transport may induce stress in a primate. Transporting an animal around within a local area (between rooms or buildings), short local road transport, long road transport (as much as 24 hours), combined transportation by plane (nationally or internationally), ship and road with a total journey time that may exceed 60 hours. Full account should be taken of the impact on the animals when carrying out a cost-benefit analysis of obtaining and using animals for scientific procedures. Pairing animals allows for mutual support during stress. The factors to consider for transportation are:

- Regulatory requirements
- Crates design
- Vehicle selection
- Route planning
- Physical and environmental conditions
- Attitude and skills of handling and transporting staff
- Animal Selection

To avoid the needless transportation and relocating of non-human primates that obviously would not be acceptable. Hence, the transportation of non-human primates should be healthy and free from diseases. Transportation of pregnant, very young and very old animals should be carried out only where there is no other option for that special consideration and veterinary monitoring should be given.

Smaller animals can be shipped in pairs within the transport container. However it is therefore particularly important that the social compatibility of animals transported together should be ensured. Some may worry about the potential for animals to harm each other when subjected to the stressful conditions undoubtedly imposed during the transport process. Evidence suggests that when primates are subjected to a stressful event, either in the presence of conspecifics or when alone, they exhibit markedly reduced physiological stress when in the presence of other individuals. Pairing animals allows for mutual support during stress.

Preparation of shipment crates

Container size and structure standards are described by IATA. There are four types of container (CR31, CR32, CR33 and CR34) were used for transportation of primates. The container types are based up on the both the species and individuals. IATA defines the dimensions and construction (including building materials) of containers to meet their specifications ensuring sufficient space, ventilation, separation and light for the occupants. The removal of faeces and urine is also important to ensure hygiene and comfort, and the IATA requirements specify that the provision of waterproof droppings tray at the base of the container.

Selection of vehicle and route

The selection of the vehicle should be based on the number of animals which are transported and have good space to hold crates with free air movement. The selection of route should be very important. Well connection high ways with short distance and also to avoid bad roads and traffic.

Capture

Non-human primates have large canine teeth and strong jaws. The adult males used the canine teeth as weapons. Non-human primates are able to grasp with strong fingers and hard fingernails, and scratches may be deep and painful. Hence, handling is dangerous because of their large canine teeth and their aggressiveness. Handling of non-human primates by using hand gloves is most important. The arms of a monkey may be gripped above the elbows and pulled behind the back. Nets and trap cages are commonly used to capture primates weighing up to 15 kg. Special precautions should be taken when capturing of an individual from a group, because the alpha male may attack. Large non-human primates should be handled in squeeze cages or by chemical restraint. Use low doses for quick procedures. While administering chemical immobilizing drugs to nonhuman primates that are in oestrus should take more caution.

Immobilization Drugs	Animal size	Dosage
Ketamine	Smaller individuals require a higher dose	8.0–15.0 mg/kg
Combination of Tiletamine/Zolazepam	Smaller animals	7.0–8.0 mg/kg
	Medium-sized animals	4.0–6.0 mg/kg
	Larger animals	3.0–4.0 mg/kg

Loading

The loading of animals must be done as quickly as possible to prevent further stress. Animals should be loaded in the early morning and transported during the day in the cold winter months and during summer to avoid high temperatures, transportation of animals in night. Start the journey as soon as loaded the vehicles.

Feeding and watering

In general, primates should not feed during transport for a short period (less then 12 hours). Transporting primates for a long period (more than 12 hours) it will cause dehydration. In such kind of transportation sufficient quantity of portable water should be provided to primates to overcome their thirst. Water should be provided at least twice a day. Fruits and fresh vegetables have more moisture content it meet both water and feed requirements. Sufficient quantity of any familiar, non-perishable/dry diet also provided during long period transport. Any change in diet (unfamiliar diet) that can affect the gut flora may cause stress to the animal.

Environment

The environment in the back of a truck or van and an aircraft compartment are likely to give stressful atmosphere to the primates due to motion, vibration, noise, humidity, temperature and unusual smells. Measures should be taken to prevent exposing the animals in such environments. Temperature should be maintained within the range of 180 -240C. Unless any emergency, transportation should be avoided during the hot summer.

Special consideration

The transportation of primates requires special consideration because the risk of zoonotic disease transmission is higher. Disease transmission risks may be associated with the transportation of primates, both

between the animals and handling staff and between the animals. Personal hygiene precautions should be taken who handed primates. Transport container design should be such as to prevent physical contact between the animals and staff. This is particularly in case of animals with unknown health profile that may be carrying zoonotic diseases.

Disinfection and sanitation

Transportation protocols should have standardized procedures for disinfection and sanitation of crates, transport vehicles and holding areas. It prevents the transmission of disease from one shipment to the next shipment by using the same crates, vehicles and areas.

Physical Injuries

Injuries may be caused during loading and transportation. During transportation, trauma may be caused by incorrectly designed crates or vehicles, or by animals fighting.

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Transport of a Nile Hippopotamus

Dr.K.Senthilkumar
Assistant Professor, Department of Wildlife Science
Madras Veterinary College
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Dr. Senthilkumar shared information with regard to the safety based transportation of Hippopotamus and different gadgets associated with transportation of Hippopotamus were dealt in detail.

TRANSPORT OF A NILE HIPPOPOTAMUS

Soundarya, the Chamarajendra Zoological Gardens, Mysore, 6-year-old Nile hippopotamus, was transported on January 30, 2006, to his new home at the Arignar anna Zoological Park at Vandalur, Chennai. The 1000-kg hippo arrived safely, shortly after 3 p.m. on January 31, at her destination.

Soundarya's move to Arignar Anna Zoological park will pair her with 6-year old male hippo, Wampuri, for possible breeding. Soundraya was transported in a custom-made, spacious, wooden-framed and lumber-lined crate built by Chamarajendra Zoological garden staff.

Size of the Hippo

The river hippopotamus males average about 1.5 to 1.8 tons., with the females averaging 1.3 to 1.5 tons. They can be as long as a dozen feet and stand 5 feet tall at the shoulder. The males continue putting on weight as they grow older, but the females stop growing when they reach about 25 years old.

The Crate

When the keepers, curators, and scientists at the Arignar Anna Zoological Park and Chamarajendra Zoological gardens made the decision to transfer Soundraya to AAZP, where she will have male hippo companion and an enlarged luxurious habitat, they wanted to make that transition was as smooth as possible.

Moving a 1,500-kg animal requires careful forethought and planning, as well as special equipment. In this case, Soundraya went to AAZP, Chennai by truck, so she needed somewhere to spend the drive.

The crate ended up being almost fifteen feet long, nine feet tall, and seven feet wide. Because of its solid steel construction, it ended up weighing 1300 kg-without its hippo occupant!

Once it was complete, the builders needed to test the crate to make sure it could safely hold a hippo as a crane lifted it up onto the flatbed truck for transport. Given Soundraya's one-ton weight, so how would they weight-test the crate? Nothing the Zoo had, other than Soundaraya's, was heavy enough to suit the engineers but also small enough to fit into the crate. So they contacted an elevator company and asked to borrow the weights used to test elevators. Eventually, they loaded the crate with 2 tons and watched as a crane lifted it up in the air and held it there for ten minutes. (When it came time to lift Soundaraya, the crate was in the air for less than five minutes.)

Both the ends of the crate is having doors that can be opened on either side. The doors are designed in such a way that the keepers could open it easily and safely to check in on Soundaraya during drive. Ventilation slats gave him lots of fresh air and kept her comfortably during his drive.

Capture of Hippo

The hippo was trained daily to enter and calmly remain in the crate by feeding grasses and apples in the crate to prepare him for the road trip to AAZPBoth the ends of the crate were closed on the day of transfer by the keepers once the Hippo entered the crate for feeding on the day. Soundaraya was not sedated for the journey.

The crate was lifted onto the back of a flatbed truck by use of a construction crane. The truck started its journey at approximately 6 p.m and followed by a car with a veterinarian and a Forestor. Two animal keepers were traveled along the Hippo in the truck.

The Journey

The Hippo traveled nearly 500 km and reached Arignar Anna Zoological Park in the next day (31-01-2006) at approximately 4 p.m. Through out the journey the vehicle was stopped for every 2 hrs and checked the condition of the animal. Spraying of water allover the body and to the mouth by a simple garden sprayer.

Upon arrival, Soundaraya entered quarantine in the Zoo's indoor hippo holding area where she remained for six weeks before his public debut to visitors of the Arignar Anna Zoological Park.

Technical Session VII
(27th January, 2011)

Experience sharing and interactions on "Health protocol for transportation of rescued animals with special reference to deer and leopards"

Dr. NKV. Ashraf, Wildlife Trust of India

Groups Discussion & preparation of presentation for all members

Deer

Carnivore

Reptiles

Birds

Primates

Experience sharing and interactions on "Health protocol for transportation of rescued animals with special reference to deer and leopards"

Dr. NVK Ashraf
C.O.O., Wildlife Trust of India
NOIDA (UP)

In this presentation, protocol for the transportation of rescued animals was revealed in a systematic manner in addition to the quotes on the health related measures pertaining to the transportation. Detailed discussions were made with concerned on the field problems.

HEALTH PROTOCOL FOR TRANSPORTATION OF RESCUED ANIMALS, WITH SPECIAL REFERENCE TO DEER AND LEOPARDS

Rescue of wildlife stranded or displaced from its natural habitat due to natural calamities and anthropogenic causes have attained great importance in human dominated landscapes where wildlife is forced to share its environment with overabundant human presence. Deforestation, encroachment, fragmentation and other forms of biotic interferences have restricted the movement of animals, forcing wild animals to 'stray out' of their forest habitats into human dominated landscapes, where they either get killed or traumatically wounded, or caught and deposited in zoos (Ashraf et al, 2006). More often than not, such animals require no handling but overenthusiastic amateurs cause more harm to the animals by trying to 'rescue' them. Where intervention become necessary, every precaution has to be taken for the safety of the animal as well as the handler.

Unlike healthy animals being captured for the purpose of translocation (or for captive breeding or research), wild animals in distress more often than not, do demand elaborate efforts be captured. Their wellbeing is already compromised due to man-made or natural causes and is also incapable of defending themselves when approached by rescuers. At times wildlife managers consider animals especially carnivores living in or near human dominated landscapes as threat to people and property and prescribe capture and translocation as a possible solution to conflict (Athreya, et al 2010). Since 'rescue' by definition is "to save or set free from harm, loss or danger" (Longman's dictionary of contemporary English), even non-target animals may sometimes be drug immobilized to facilitate the rescue of its conspecific, and to safeguard public from getting injured or safeguard the animal itself from being persecuted or killed.

Fig 1. Injuries received by barbed wires when chased

If the animal is healthy and is not in a compromising situation, chemical capture can be undertaken. Chasing of animals may force them to take a dangerous path like through barbed wire/drains resulting in their injuries (Fig 1). Aggressive and nervous animals may also injure the public if approached closely. Chasing animals can also lead to exhaustion, fatigue and shock resulting in their death. For these reasons, all efforts are made to guide or drive the stranded animals back to the herd or forest without any handling if the animal is not injured or diseased.

Healthy animals should be released at or near the site of capture at the earliest (Fig 2). The animal need not be transferred a rescue centre in case of minor injuries as transportation would mean further stress to the animal. Animals with minor bruise or laceration can be released immediately with a first aid treatment.

Fig 2. Release of a leopard in Assam.

Next to elephants, two of the most commonly rescued species of mammals at the Centre for Wildlife Rehabilitation and Conservation (CWRC) and its

associated satellite centres in Assam have been hog deer (Axis porcinus) and common leopard *(Panthera pardus)* (WTI, data unpubl.). Since 2001, veterinarians at Wildlife Trust of India working in the states of Assam, Arunachal Pradesh, Uttarakhand and Uttar Pradesh have handled 305 cases of deer and 78 cases of leopards. The wealth of experience gained during the rescue operations during the transfer of deer and leopards is presented in this paper.

Translocation of ungulates and carnivores

Translocation of an already compromised animal is fraught with danger to its life and handlers. Rescued animals do not recognize the attempts of the rescuers trying to help them (Loftin, 1985) and therefore have to be calmed down to avoid struggle and the resulting untoward accidents. Transportation of animals after a rescue operation is different from transfer of healthy animals for the purpose of reintroduction or restocking.

- Rescued animals, especially leopards and ungulates, are invariably translocated in single and rarely in groups
- While translocation operations can be organized at a suitable season and time of the day, rescue can happen at any period of the year or time of the day. It can be during extremely hot or cold hours of a season.
- Deer translocations are taken up during the post-breeding season when antlers are shed, while rescue can happen at any time. The deer at the time of 'rescue' may be with velvet or hard antlers and this is a major disadvantage when it comes to capture, transfer and accommodation.

For reasons mentioned above, handling a 'rescued' animal during transportation demands greater attention on the part of the handlers.

Handling a captured animal

A blindfolded animal can be directed towards the crate. Blindfolding all animals under sedation has the double benefit of calming down the animal as w ell as protecting its eyes. Reducing or eliminating an animal's visual contact with its environment is an important restrain technique (Fig 3). If the crate is far away, the animal may have to be carried on a stretcher. In the case of ungulates, this would necessitate restraining the animal with ropes, but this must be avoided as much as possible. Where necessary, especially in the case of grown up fawns, the legs can be secured with jute or cotton ropes, as a method of physical restraint. The conventional practice of transporting the animal upside down by tying the legs to a pole should be avoided on all accounts (Fig 4). A canwash-made stretcher is a good means of transporting the animal from the field to the crate or vehicle, and from the crate to the enclosure at the captive facility. In the case of adult male deer, antlers can be used to restrain head. It can be padded and wrapped up to prevent injury to the handlers. If the buck is in velvet, care should be taken to avoid injury to the animal.

Fig 3. A blindfolded leopard and hog deer under medical care in Assam.

Initially, the rescued animal should be left alone to stabilize and recover from the stress of capture and shock. This is obligatory in situations where the animal is not in a position to further withstand the rigours of transportation to a rescue centre or veterinary facility. Depending on the condition of the animal and nature of injury, bleeding if any should be arrested by applying pressure bandage or administration of anticoagulants. Monitor ambient temperature and ensure comfortable breathing.

All body measurements and if possible the weight of the 'rescued' animal should be recorded when opportunity presents itself after chemical restraint. Ketamine hydrochloride induced anaesthesia is known to cause seizures in rare cases in felids, even when Xylazine hydrochloride is added. Administer Diazepam (5-10 mg per leopard, slow IV) to control seizures that are not self limiting (Athreya and Belsare, 2007).

Care during transportation

It is important to use appropriate crates during transport which in turn can eliminate the risk of escape during transportation. The standard crate dimensions of most of the mammalian species are available in various publications (Singh and Malhotra, 2008; McKenzie, 1993). Calves of elephant, rhino and large ruminants do not require a crate as they can be transported directly in a vehicle. For adult and sub-adult big cats, rhinos and antler-shed deer crates are preferred if transit time is long. Large ungulates such as wild buffalo *(Bubalus arnee)* and gaur *(Bos gaurus)* can be transported as such once they can be loaded into a truck directly.

Crates of appropriate size should be used to prevent injury of the animal during transit. There are standard specifications recommended for ungulates and big cats. All crates should have most of the features recommended by Openshaw (1993) and Espie (1993) (Table 1).

Table 1: Essential features of ungulate and carnivore crates

Crate essentials for ungulates	Crate essentials for carnivores
(i) spacious enough to permit getting up and lying down	For short distances, just wide enough to accommodate the animal and for long distances wide enough to permit turn
(ii) narrow well placed and adequate number of ventilator holes (sides, front & rear)	100 mm ventilation holes spaced out at 300 mm interval along sides near the top
(iii) solid floor which is not slippery for the hooves of the animal	Floor can be wooden with metal lining or slated to permit urine & faeces to pass through
(iv) sides must be high and wide if horned/antlered	High enough to allow the animal get up on its feet
(v) Doors must be of vertical sliding type	Double vertical sliding doors on either side

Carnivores that are awake seem to consider the ventilator holes of the box as possible exits and scratch them, trying to escape; it is therefore very important to have boxes with many small holes instead of a few big ones (Ryser-Degiorgis et al, 2002). If the crate is dark and the animal is used to it, the animal can be transported without drug immobilization, though this would depend on the individual animal's temperament (Espie, 1993).

- Chemical restraint: All trapped leopards, even if meant for release in a short period of time, should be mandatorily drug-immobilized to permit closer examination. They will anyway need to be immobilized for loading them into a crate. A trap cage is not a crate and has many disadvantages if used to serve also as a transportation cage. A trap cage will not have sliding doors on either side, trays to collect urine and feaces or for that matter provisions to provide a darker environment. Otherwise, the crate or trap cage should be covered with a sheet of tarpaulin or thick cloth to provide a darker and secure environment inside (Fig 5). However, chemical restraint would also help in the treatment of injuries sustained during capture or conflict with people. Trapped leopards get abrasions and cut wounds on the head with contusions in the ocular region and sometimes even damaged claws and broken teeth. These bruises would require some dressing with topical applicants and parental administration of long acting antibiotics.

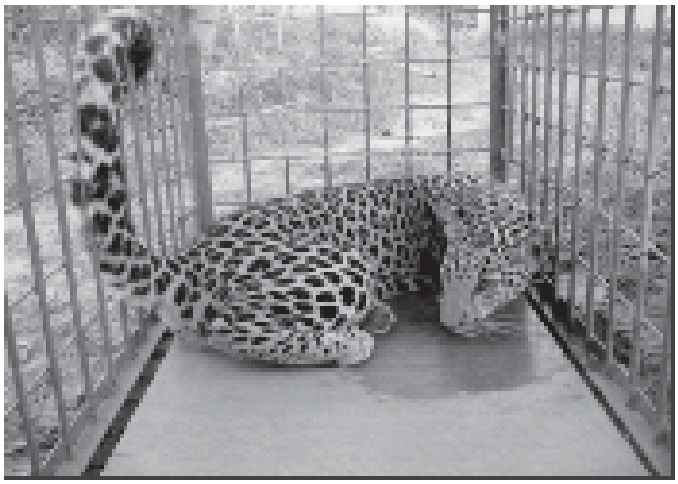

Fig 5. Crates like this have to be covered with dark sheets to calm down the animal.

- Posture during transit: Healthy rescued animals, especially ungulates, do not lie down during transit. To avoid anxiety and restlessness, it is advisable to administer mild sedatives strong enough to keep them quiet and mild enough to prevent them from becoming recumbent. Being ruminants, all cervids should be kept in sternal recumbency during most part of the journey. Tranquilized animals in particular have to be ensured to remain so to avoid regurgitation of ruminal contents and development of bloat. Legs should be folded below the body, head held high and the muzzle directed towards the ground (Burroughs and McKenzie, 1993). It will be ideal to keep shifting the position of sternally recumbent deer from left to right or vice versa to facilitate the release of gas from the rumen. Shifting the position may not be feasible in large ungulates like sambar deer, gaur or wild buffalos, especially when the sedated animals are in a crate or truck. Rarely, even change of positions may not facilitate the release of gas and during such occasions, guttural or laryngeal region can be externally stimulated to trigger eructation. In times of emergency, the rumen can be depressurized using a stomach tube or punctured using trocar and canula or large bore hypodermic needle.

- In the case of carnivores like leopards, lateral recumbency is appropriate. The position of the tongue in carnivores should be checked regularly and if the tongue is immobile and flaccid, it should be pulled out to one side after opening the mouth (Burroughs and McKenzie, 1993). This is to prevent it from getting dry.

- Body temperature: The body temperature of the immobilized animals should be regularly examined rectally during transit. Signs of hyperthermia include rapid panting, hyper salivation, licking of forearms, chest, hind legs, congested mucous membrane, dehydration and oliguria (Choy, 2006). In extreme cases, if need be, a hyperthermic animal can be doused with cold water to increase heat loss. Cooling also diminishes an animals' ability to respond to stimuli. Precautions need to be taken to avoid pouring water into the nostrils or ears, which can be anyway avoided if the animal is held upright in

sternal recumbency. Signs of hypothermia include cold skin - especially the extremities, lethargy and bradycardia. Provision of artificial source of heat is a simple ameliorative measure.

- Eyes and ears: Since Ketamine induced immobilizations leave the animals with eyes wide open, it is ideal to apply some ointment in the eyes to prevent drying. As immobilized animals can be aroused by strong auditory stimuli, one should avoid taking the animal through crowded areas with loud noise. In extreme cases, it may be advisable to plug the auditory canal with cotton, but one should ensure that these are promptly removed before the animal's release.
- Respiration and pulse: A deer held in appropriate sternal position and carried in a well ventilated vehicle should exhibit a regular deep respiration. Respiration can become shallow and slow under the effects of high dosage resulting in deep anaesthesia, and sometimes due to obstructions in the passage because of handling or bloating. If bradypoenea is drug induced, administration of the specific antagonist could be considered. Respiratory stimulants like Doxapram can be administered I/V in species that cannot be restrained manually after drug reversal. For monitoring pulse of an immobilized ungulate, carotid, femoral, facial or sometimes ear arteries can be palpated (Burroughs and McKenzie, 1993).
- Feeding: Newly captured animals generally avoid feeding in the new environment. It is not necessary to feed or water animals during transit from the field to the rescue centre or zoo. If captive facility is far away, the animal could be held in a makeshift enclosure temporarily till it is stabilized and judged fit enough to take a longer journey. Feeding and watering will then become necessary during transit and the animals would have also by then got accustomed to accept them.
- Capture myopathy: Also known as exertional myopathy, this is perhaps the single most important cause of death among ungulates during capture, pursuit, restraint and translocation. It is a non-infectious disease characterized by damage to muscle tissues brought about by complex physiological changes. Hyperthermia and metabolic acidosis due to elevated levels of lactic acid from anaerobic glycolysis, as a response to intense muscular activity, are said to be the central factors (Williams and Thorne, 1996). All cervids are generally very nervous and easily stressed and prone to capture myopathy.
- Treatment and diagnosis: The opportunity could be utilized to collect blood samples for laboratory investigations like haematology, blood chemistry, serology, genetic and cell culture research. However, the results of these laboratory investigations may not have any bearing in the case of temporarily displaced deer and leopards. Non-Steroid Anti Inflammatory Drugs (NSAID) are contraindicated in felids. These include paracetamol, diclofenac, ibuprofen, meloxicam etc. Fluid therapy is required if more than 5% of the body mass has been lost. All orphans (calves and cubs) should be given oral rehydration fluids first before slowly introducing milk formulas. Fluids should be administered after assessing the degree of dehydration and that too after making sure that the animal is warm and its condition is stabilized (Choy, 2006).
- At destination: As soon as the rescued deer reaches the destination, it should be moved to dark, quiet and well padded warm enclosure as soon as possible, and allowed to recover. Carnivores like leopard can be held in the crate itself if it is only a matter of hours before it is released, or moved into a treatment cage if it has to be housed for a week for treatment, or released into a larger enclosure if it requires a long term care.

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Groups Discussion

Working Group I - Deer

Working Group II - Carnivore

Working Group III - Reptiles

Working Group IV - Birds

Working Group V - Primates

Working Group Sessions

Working Group I - Deer

Working Group II - Carnivore

Working Group III - Reptiles

Working Group IV - Birds

Working Group V - Primates

"Protocol for Transport of Wild Animals" - Deer

Facilitator : Dr.Carlos Sanchez

Recorder : Dr. Prabhu

Members :

1. **Dr.N.Panneerselvam,** National Zoological Park, New Delhi
2. **Dr.Srinivas.V.,** Indira Gandhi Zoological Park, Vizag
3. **Dr.Palit, M.,** Tata Steel Zoological Park, Jamshedpur
4. **Dr.Rathore.S.S.,** Jodhpur Zoo
5. **Dr.R.Thirumurugan,** Arignar Anna Zoological Park, Vandalur
6. **Dr.Vinaya R. Jangle,** Sanjay Gandhi National Park, Mumbai.

S. No.	Titles	Information to be prepared after discussion
1.	SPECIES – NAME	DEER AND ANTELOPE (HOOFSTOCK)
2.	Financial Considerations	• **Financial consideration on providing permanent manpower** • **Provision of fund for Transport** • **Provision for fund for upkeep and veterinary care of the animal**
3.	Availability of Enclosure	• **Yes or No** • **If Yes, Whether the design of the said enclosure is approved by CZA or not**
4.	Animal Considerations	• **No. of animals to be transported** 1. Animals should have priority over merchandise 2. 4-5 animals may be transported at a time 3. 1 male per crate 4. Smaller species: 2 females in a crate 5. Larger species: 1 female in a crate • **Age of the animal** 1. Adults and sub-adults should only be transported • **Sex of the animal** 1. As per the need both the sexes can be transported in separate crates • **Status of animal marking (ID)** 1. Microchip and/or ear tags may be used for identification • **Stud book details (endangered species)** 1. Stud book details should be enclosed to know the pedigree and to avoid inbreeding • **Breeding details (for other species)** 1. Breeding details should accompany • **Biological consideration of the animals** 1. Pregnant, geriatric, lactating, suckling young ones, sick, weak, injured, deformed animals, males in velvet should not be transported.

S. No.	Titles	Information to be prepared after discussion
		• **Preparation for transport of young one if needed(compelling demand)** 1.Young ones still sucking, should be transported with the mother in the crate 2. In case of orphaned / handreared young ones, the keeper / handler concerned should accompany with the prescribed feed formula. • **Preparation for transport of rescued animalsfrom free range (injured/orphaned/mother with young one/pregnant, sick animals)** 1.Animals should be kept under quarantine for a minimum period of 30 days, during which coprological, serological and hematological examinations should be carried out. 2. Veterinary assistance, if needed, should be taken care of immediately. • **Preparation for transport in extreme climatic conditions and varying climatic zones of existence** 1.Transport of wild animals under extreme climatic conditions should be avoided 2. If it is unavoidable, provision to minimize the effects of abrupt changes should be made in the design of crate or the necessary facilities should be provided in the crate. • **Assessment of body weight and other morphometric features** 1.Body weight should be measured and morphometric features may be estimated to determine the crate design. • **Timing and Season of transportation** 1.Extreme climatic conditions and seasons should be avoided.
5.	**Preparation of Crate**	• **Material of the crate** 1. Crate should be made of wood / wooden or metal frame with plywood or laminated plywood. • **Shape of the crate** 1. should be rectangular • **Dimensions of crate** 1.The crate should match with the size of the animal to be transported in such a way that the animal kept inside should only be able to stand or sit in sternal recumbency and cannot turn or somersault. 2.For dimensions of the crates for different species, "Manual of Transport Cages and Nest Boxes" published by CZA may be referred. • **Safety of animal (crate design and transport related)** 1.The crate should be well ventilated and make sure animal should not extend their extremities outside 2. Temporary facilities for providing feed and water should be provided

S. No.	Titles	Information to be prepared after discussion
		3.Facility for cleaning the excreta should be provided 4.Floor: bedding with paddy straw, sand…etc. should be provided and the floor may be peg bored to avoid slipping. 5.Sides: Padding with the help of paddy straw filled gunny bags, coir, foam/ cotton cushions should be provided. 6.No protrusions, sharp objects should be there in the interior of the crate. • **Safety of human for the crate related shifting** 1.Handholds or bars should be provided on the sides for easy handling. 2.Antler or horn tips may be padded to prevent injuries. 3.Only trained / experienced handler / attendant / keeper should be deputed for the task. • **General comments on design of crate** 1.The crate should not be too heavy to handle 2.The crate should not be painted from inside.
6.	**Carrier (vehicle) Considerations**	• **Identification of the vehicle** 1.Carrier company that is experienced in transporting animals should be selected. 2.Transporter or vehicle should be insured. 3.All vehicle related documents should be valid (R.C., insurance, driver's licence…etc) and should be checked. 4.An agreement should be signed between the carrier company and consigner so that an alternate vehicle will be arranged as early as possible by the carrier company, in case of breakdown or other emergencies that may arise en route. 5. If possible use newer vehicle for the purpose • **Preparation of the vehicle for wild animal transport (padding, fuel, tyres etc.)** 1.Vehicle should be disinfected properly prior to the transport. 2.The vehicle should be serviced and thorough check up should be carried prior to the transport. 3.Fuel level should be checked prior to transport 4.The tyre pressures should be checked properly. • **Preparation of the animal for transport in the identified vehicle** 1.Identification of the animals should be done prior to transport. 2.All the prophylactic measures like vaccination and deworming should be carried out at least 3 weeks earlier. 3.Animals should be housed in stress free environment. 4.If chemical immobilization has to be carried out, the animal should be fasted for 24 hours and depraved of water for 12-16 hours. 5.If physical capture method is adopted, the animal should be allowed to acclimatize with the transport crate.

S. No.	Titles	Information to be prepared after discussion
		• **Assessment of the routes** 1.Prior to transport, a detailed discussion should be held with the donor, recipient, carrier company and the identified escort team. 2.Shortest road worthy route should be selected. 3.Before transportation, factors like weather forecast, possible disturbances (blockade, processions, festivals, public functions,…etc.) during the proposed time should be taken into mind and planned accordingly. 4.Zoos and other facilities en route should be informed of the transport so that necessary assistance (food, healthcare…etc) can be obtained as and when needed. 5. Contact information of Directors/Veterinarians of zoos en route should be available with the transporting team • **Assignment of Pilot vehicle** 1.Pilot vehicle should have a team of competent authority, veterinarian, drugs, equipment for physical and immobilization and communication facilities. 2.Uniform personnel with proper dress code should accompany the vehicle. 3.The team in the pilot vehicle should inform the toll / check gates in advance so that unnecessary delay is avoided • **Provision of emergency lights in vehicle** 1. Emergency lights with enough batteries should be kept in the vehicle and pilot vehicle. • **Additional arrangement of vehicle in emergency conditions** 1.For safe and secured transportation, forest department personnel of the concerned district or state and security agencies like police my be contacted for necessary help. • **Guidelines IATA , CITES etc.** 1.IATA and other guidelines should be followed in specific cases
7.	**Veterinary Considerations**	**Donor-Zoo** • **Observation of behavioural derangements if any** 1. Disturbance to the Animal to be minimized 2.Behavioural abnormalities / derangements should be considered / recorded. • **Observation of Clinical Signs if any** 1. Necessary records should be kept for observation of any clinical signs and treatment should be provided accordingly. • **Coprological examination for evidences of parasites and remedial measures** 1. Coprological examination should be carried out and necessary treatment should be provided 2 weeks prior to the transport • **Techniques for Physical capture of animal if any** 1.Practices like crate training, luring, narrowing the path, net capture…etc. may be carried out to avoid undue stress.

S. No.	Titles	Information to be prepared after discussion
		• **Techniques for Chemical capture of animal** 1.The chemical capture should be carried out during cool hours of the day. 2.Standard techniques should be followed during chemical immobilization. 3.Best available drugs should be used for transportation of different deer species amongst them are, the drugs Available in India: Xylazine, Ketamine and Acepromazine and drugs not available in India such as Butophanol, Azaperone, Detomidine, Medetomidine, Telazol, Midazolam, Haloperidol, etorphine and reversal agents Atipamazole, Yohimbine, Tolazoline , Flumazenil and Naltrexone. 4.All the equipment should be kept ready. • **Drug details including the dosing regimen** 1.Drugs suitable for the particular species should be used for chemical capture. • **Haematological, serological and Biochemical examination of samples depending on species** 1.If and when required, blood may be collected and haematological, serological and biochemical examination may be carried out prior to transportation. • **Vaccination** 1.If required, necessary vaccines may be administered, in consultation with the vet at the recipient zoo. • **Transport related animal special features eg. deer in soft or hard antler / horn** 1.Deer with soft / velvet antlered should not be transported. • **Veterinary considerations in injured or diseased animals (eg. From wild to zoo)** 1.Quick and prompt veterinary consultation and treatment should be extended for injured and diseased animals. 2.Circus animals should not be shifted to the zoo, rather should be kept in rescue centres. 3.If they have to be shifted to the zoo, strict quarantine protocol should be followed. • **Issue of Health Certificate from the zoo vet** 1.A health certificate in standard format with all health related details should be issued by the veterinarian of the donor zoo to the recipient zoo. • **Animal History card, treatment card and diet chart** 1.All the necessary records should be handed over to the recipient zoo. **Recipient-Zoo** 1.Before getting approval from the Central Zoo Authority, the recipient zoo vet should visit the donor zoo and mutually agreed on the animals to be exchanged.

S. No.	Titles	Information to be prepared after discussion
		• **Observation of animal health during transportation** 1.Observation of the animal for general health should be carried out en route as and when needed. • **Provision of food and water during transportation** 1.Sufficient quantity of food and water should be kept in the vehicle during transportation. • **Check list for Veterinary drugs and equipment during transportation** 1.A check list should be prepared and kept ready • **Quarantine and health check up after arrival** 1.Quarantine and health check up should be carried out as per the protocol. • **Monitoring of animal after arrival** 1.Close monitoring of the animal for behaviour, feeding pattern and health should be carried out.
8.	**Human Resource Considerations**	**Recipient-Zoo** **No.of Veterinarian to be deputed as per the number of animals** 1.Veterinarians of both the donor and recipient zoo may accompany the animals during transportation. **No.of assisting staff to accompany** 1.One Forest Range Officer, one supervisor, two to three animal attendants should accompany. **Appointment of animal keepers for newly arrived animal** 1.Zoo should arrange a full time keeper for the animal in advance. **Provision of training to the keeper in advance** 1.The recipient zoo should arrange training for the keeper engaged for the animal at the donor zoo three months in advance.
9.	**Liaisoning with Agencies**	**Permission from Chief Wildlife Wardens concerned** **CZA (for permission)** **Donor / Recipient Zoo** **CITES (for permission: International exchange of animals)** **Quarantine officer of the region** **DGFT (for custom clearance: International exchange of animals)** **MOEF, Govt of India : International exchange of animals for permission)** **State Forest Department** **Zoos: En-route** **State Forest Department/s: En route** **Agencies for emergency-assistance (as per the requirement)**

Director **Biologist** **Veterinary Officer**

S. No.	Titles	Information to be prepared after discussion
		7. In any conditions, less than 3 month cubs should not be transported between zoos and also in extreme climates. 8. For rescued / injured / sick / Orphan / pregnant any free ranging carnivore. a. Approximate crate with suitable bedding materials b. Medical kit c. Tranquilizing kit d. Supplementary feeding e. Emergency lights, torches f. Nets / Snares / Gunny bags, ropes along with veterinary officer and necessary staffs g. Rescue van and pilot vehicle . 9. **Transportation :**In emergencies, Vehicle should have thermoregulatory facilities as per requirement of transporting animal. 10. if in anesthesia: a. Proper weight b. Length c. Girth d. Height e. Dentition f. Other Physical observation. g. Vital parameters also taken 11. As cats are nocturnal **a.** Extreme adverse conditions should be avoided.
5.	**Preparation of Crate**	1. Preparation of Crates: a. Should be light and strong as much as possible b. Conduit GI Circular shaped c. Conduit GI square shaped d. Shape of Crate e. Size of crate should be based on size and animal f. Dimensions should be referred to CZA guidelines g. Paint polish should be non-toxic and odourless, Not wet / sticky h. Preferably Natural And Non oil paints i. Sharp objects / edges should be avoided j. Crates should be closed with plywood k. With sufficient Ventilation and examination window, floor of crate should be perforated and has movable waste tray that can be used to remove the excreta l. Anterior / Posterior sides of crates should have sliding doors with lock facility m. Sling to carry the crate should be of folding nature n. Handles should be on the top and at the sides o. Crate may have provision of 4 wheels of which two front wheels are movable. Cage should have strong iron bars with appropriate spacing so that legs should not come out of the bars / crate.

S. No.	Titles	Information to be prepared after discussion
		p. Plywood sheets should have two rows of 1" diameter holes **q.** Guidance for grate Design will be taken from CZA, IATA guidelines.
6.	**Carrier (vehicle) Considerations**	a. Vehicle should be in good condition with not more than 5 years of Manufacture years b. Camouflage facilities, covering facilities to tarpaulin (Dark) c. If necessary rates can be cornered with gunny bags or suitable ventilating materials d. Truck should be of low floor, with minimum vibration of sound and satisfying smoke pollution norms. e. Vehicles should carry additional fuel tyre in case of emergency. f. In long route plan, additional dress should be provided. g. Accompanying person should assess the route well in advance. h. Pilot vehicle is essential to provide follow up to the truck carrying animal i. Emergency medical light / oldsquaw bunkers should be installed on the top of cabin of transport vehicle with hooted sound j. There should be provision for communication between transport and pilot vehicle. eg. walkie talkie/ wireless k. Both vehicles should have search lights. Stepney and tool box should be accompanied l. Additional arrangements made for food and water, also for animals and staffs **m.** For international transport IATA guidelines should b followed
7.	**Veterinary Considerations**	1. Animals should be observed before 24 hrs for behavioral changes 2. Animals should be observed before 12 hrs for changes in clinical signs 3. Last faecal examination report should be studied and action taken. 4. Squeeze cage should be used preferably to avoid stress 5. Entry can be facilitated by baiting. 6. Chemical restraint can be applied after adequate fasting and revival should be followed before transportation 7. Chemical restraint means proper protocol should be followed. 8. Drugs should be as per veterinarian's guidance. 9. Haematology / bacteriological examination/ vaccination records should be attached. 10. Ketamine 2-3mg/kg

S. No.	Titles	Information to be prepared after discussion
		11. Xylazine 1-2 mg/kg 12. Diazepam?????????? 13. Meteodimidine??????? 14. Monitoring should be done using a proper performa with due permission from the director 15. Vaccinated animals should not be transported for 21 days from the date of vaccination. 16. Vaccination should be done as per schedule from guidelines of IVRI. 17. Health certificate should be issued by veterinary officer of donor zoo with the diet chart. 18. Veterinary officer should verify all the details given by donor zoo. 19. Physical activities should be observed and also animal should be least disturbed. 20. Food/ water should be avoided in moving vehicle < 12hrs –no need of food and water 21. Feed twice a day with smaller quantity, during rest especially cooler hours of the day. 22. In case of emergency the veterinary officer can make decision accordingly 23. Antibiotics 24. Anti-inflammatory 25. Anti histaminic 26. Anti emetics 27. Dressing materials 28. Supportive therapy 29. Tranquilizing drugs and equipment 30. Quarantine- away from main enclosures 31. Quarantine for 30 days 32. Feed / water as per diet chart of the donor zoo 33. Complete rest of animal 34. Animal must be made acclimatized to newer environment for at least 7 days 35. If any abnormalities observed during Quarantine relevant test should be performed.
8.	**Human Resource Considerations**	1. One veterinarian in pilot vehicle 2. As per requirement of veterinarian 3. In large carnivore not less than 5 persons 4. Proposed keeper should have adequate training from donar zoo in care and management of animals In advance.

S. No.	Titles	Information to be prepared after discussion
9.	**Liaisoning with Agencies**	Mutual agreement between donar and recipient zoo 2. Approval of CZA is mandatory 3. In international exchange permission from, CITES, DGFT, MOEF in advance 4. Zoos enroute should be informed in advance to help in case of emergency with intimation to CZA 5. Different states enroute for the movement of animals timely informed 6. Transit passes should be issued by the donar zoo well in advance

Director **Biologist** **Veterinary Officer**

S. No.	TITLE	INFORMATION	
		Timing and season of transport	• Avoid peak summer / peak winter / monsoons **associated periods for transport.** • **If transport involves more than a day, better to place gunny bags with water sprayed or spray water frequently to avoid damage to skin** • Better to begin the transport in early hours of the day.
		Breeding details	As per ISIS
		Studbook details	As per ISIS
	Preparation of Crate	Material of Crate	Marine Ply 4-6 mm
		Shape of crate	As per the size of crocodile/alligator/gavial
		Dimensions of crate	As per the size of crocodile/alligator/gavial
		Safety of animals (crate design and transport related)	• Need of fasting prior to transport. • Care of snout esp. in gavials by padding of crate. • Head should not be lower than body, • Need of well ventilated and **well secured carrier**
		Safety of humans for crate related shifitng	Experienced handlers only to be allowed for transport related operations
		General comments on crate design	As per IATA standards
	Carrier/ vehicle consideration	Identification of vehicle	• Truck/train/air depending on distance and availability of funds and season • Try to select route that assists the minimising of transport time
		Preparation of vehicle	**Consultation with biologist** Communication with transport-authorities including airport authorities and customs, booking train bogie or any other mode of transport and inspection of the transport facility and suggesting modifications with assistance from zoo veterinarian etc.
		Assessment of route	Avoid rough roads
		Assessment of pilot vehicle	vet travels in pilot vehicle which rides in front of the transport vehicle for road transport
		Provision of emergency light	if travelling at night torches/headlamps must be carried. 2 charged lamps in the truck

S. No.	TITLE	INFORMATION	
		Additional arrangement of vehicle	• **Clarify in advance with the transport-company on need of arrangement of a new vehicle if irreparable problem occurs in the vehicle during the transport of crocodile** • Communication system needs to be finalised between transport vehicle and pilot vehicle.
		IATA guidelines etc	**Biologist needs to complete the paperworks with CZA, Zoos and other agencies (permission letters), zoo veterinarian (health certificate) and carrier agency (for clearance and verification of the conditions)**
	Veterinary considerations	**Donor zoo**	
		observe behavioural derangements if any	Note if any
		Clinical signs	• Rule out any injuries, bloat, discharges from eyes/nostril/ mouth etc. The teeth should be clean and white and should not be brittle or translucent. • Rule out any accumulation of algae on teeth because this may often reflect lack of feeding.
		Faecal examination and treatment if necessary	Must be done **three weeks** before the date of transport
		Techniques for physical capture	Need of associating the experienced animal keepers Check for the required infrastructures quoted below, before the physical restraint : • **Restraining ropes / tubes** • **Gunny bag** • **First aid Kit** • **Shift boards** • **Snares** **Do not tie the legs esp. for more than 1 hour due to risk of development of oedema/ acidosis etc.**
		Techniques for chemical capture	Not advised **in general**
		Drug details including dosages	-

S. No.	TITLE	INFORMATION	
		Haematological and biochemical examinations	At-least 2 weeks in advance- samples need to be collected for estimation of haematocrit **in particular** and serum biochemical **profile,** esp. calcium and phosphorus)
		Vet considerations in injured/diseased animals	Rule out and treat the injuries, metabolic bone diseases, dermatitis etc.
		Diet sheet	Should have the type of feed, amount and feeding schedule prior to the transport
		Health certificate from donor agency	Issue of health certificate in advance for transport outside country (as per IATA standard) Gross examination 48 hrs in advance for transport within India
		Recipient zoo	
		Observation of health during transport	Check for breathing abnormalities etc.
		Provision of food and water during transport	-
		Vet drugs and equipments	All capture equipments- ropes, gunny bags, rubberbands emergency medications including fluids, sodabicarb(iv), **doxapram hydrochloride**, **enrofloxacin,** prednisolone / dexamethasone, adrenaline, atropine, styptic etc.
		Quarantine and health check up	Conduct the Physical examination to rule out the injuries, bloat, discharges from eyes,nostril, mouth. The teeth should be clean and white and not brittle or translucent. Rule out any accumulation of algae. **Examine the blood samples for haematological and biochemical parameters, before introducing into the collection-spots.** **Do the Coprological examinations to rule out evidences of parasites.**
		Monitoring animals on arrival	Monitor the time spent on land, time spent in water, preferred temperature zone, swimming ability, **movement pattern** etc.
	HR considerations	Recepient zoo	
		Number of vets **to accompany**	Minimum one veterinarian
		no of assisting staff to accompany	Curatorial staff, Maintenance staff subsequent to the discussion with management-personnel

S. No.	TITLE	INFORMATION	
		Appointment of animals keepers for care of crocodiles to be received	**To be taken care by zoo authority**
		Provision of training to keepers in advance	send to experienced zoo for training for atleast 5 days prior to arrival of animal.

Protocol for veterinary care of snakes during transportation			
S. No	**TITLE**	**INFORMATION**	
	Animal considerations	No of animals to be transported	snakes are tranported in bags inside containers. The container may comprise a number of compartments, provided that the overall size of the container is such that it may be handled without difficulty. Large snakes may be transported directly in well ventilated boxes
		Age of animals	
		Sex of the animal	
		ID	PIT
		Biological consideration of animal	with biologist/curatorial team. Avoid transport of gravid animals or animals in hibernation
		Preparation for transport of young on	NA
		Preparation for transport of rescued animals from free range	transpoted in a bag or tupperware box of adequate size. The box should be cobvered to minimise stress on the animal. Transport via road to recognised rescue centre in area/FD facility
		Preparation for transport in extreme climatic condition and varying climatic conditions	summers- transport boxes to be covvered with wet hessian sacs which can be moistened and winters crates may be lined with styrofoam
		assessment of BW and morphmetric features	BW actual, SVL,TL,
		Timing and season of transport	avoid at peak summer and peak winter and during monsoons. Transport to begin in early hours of the day/ night
		Breeding details	As per ISIS
		Studbook details	As per ISIS
	Preparation of Crate	material of Crate	Marine Ply 4-6 mm. cotton bags or imported snake bags tied with a firm tie to prevent escape
		Shape of crate	as per animals

S. No	TITLE	INFORMATION	
		Dimensionsof crate	as per animals
		Safety of animals (crate design and transport related	fasting prior to transport. If necessary, dampened sphagnum moss or foam chippings may be packed around the reptiles – certain species may require salt water. The bags should be firmly attached to the container. bags should be labelled venomous reptile or non-venomous reptile well ventilated. The crate should have not protrusions, nails or any corrosive materials or l.ead based paint
		Safety of humans for crate related shifitng	experienced handlers only
		General comments on crate design	
	Carrier/ vehicle considerati on	Identification of vehicle	truck/train/air depending on distance and finances and season to minimise transport time
		Preparation of vehicle	communication with authorities, booking train bogie afetr inspection. Booking cargo by air and communication with airport authorities and customs
		Assessment of route	avoid rough roads
		Assessment of pilot vehicle	vet travels in pilot vehicle which rides in front of the transport vehicle for road transport
		Provision of emergency light	if travelling at night torches/headlamps must be carried. 2 charged lamps in the truck
		Additional arrangement of vehicle	to be handles by transport company. But should be clarified in adavance Communication system finalised b/w transport vehicle and pilot vehicle.
		IATA guidelines etc	paperwork from zoos, health certificate, clearences from carrier
	Veterinary considerati ons	Donor zoo	
		observation of behavioural derangements	
		Clinical signs	injuries, discharges from eyes,nostril, imporper eccdysis, sub cutaneous abscesses
		Faecal examination and treatment if necessary	must be done 2 weeks in advance to date of transport
		techniques for physical capture	use of snake hooks and restarin tubes

S. No	TITLE	INFORMATION	
		techniques for chemical capture	Not advised
		drug details including dosages	NA
		haematological and biochem examinations	atleast 2 weeks in advance- Haematocrit, serum biochemistry, Ca, Phos, etc if possible
		vet considerations in injured/diseased animals	injuries-external, MBD, ectoparasites, stomatitis, gingivitis, scale rot, poor eccdysis, retained eye caps
		diet sheet	type of feed, amount
		health certi from donor agency	examination 48 hrs in advance
		recepient zoo	
		observation of health during transport	Do not try to handle animals during transport
		Provision of food and water during transport	NA
		Vet drugs and equipments	Extra snake bags, snake hooks of appropriate size, restarining tubes, ASV in ice box emergency medications- fluids, sodabicarb(iv) prednisolone,dexamethasone, adrenaline, atropine, styptic etc
		Quarantine and health check up	injuries, discharges from eyes,nostril, improper eccdysis, sub cutaneous abscesses, blood examinations- haematology/ serum biochemistry if possible
		Monitoring animals on arrival	time spent on land, time spent in water, preferred temperature zone
	HR considerations	Recepient zoo	
		Number of vets per animal	minimum 1
		no of assisting staff to accompany	curatorial staff, maintenance staff after discussion with the management
		Appointment of animals keeprs	as per directives from curatorial staff afetr discussion with the management
		Provision of training to keepers in advance	send to experienced zoo for training atleast 5 days prior to arrival of animals.

Protocol for veterinary care of chelonians during transportation			
S. No	**TITLE**	**INFORMATION**	
	Animal considerations	No of animals to be transported	several turtles in a box without piling up. Preferably packed in independent bags/ compartments
		Age of animals	dependant on species but not under 7 cms carapace diameter
		Sex of the animal	
		ID	PIT/scute mark
		Biological consideration of animal	with biologist/curatorial team. Avoid transport of gravid animals
		Preparation for transport of young on	NA
		Preparation for transport of rescued animals from free range	transported in a compartmentalised crate via road to recognised rescue centre in area/FD facility
		Preparation for transport in extreme climatic condition and varying climatic conditions	summers- transport boxes to be covered with wet hessian sacs which can be moistened and winters crates may be lined with styrofoam
		assessment of BW and morphmetric features	BW actual, carapace length, tail length, carapace width (at the broadest pont) plastron length, plastron width
		Timing and season of transport	avoid at peak summer and peak winter and during monsoons. Transport to begin in early hours of the day or night
		Breeding details	As per ISIS
		Studbook details	As per ISIS
	Preparation of Crate	material of Crate	Marine Ply 4-6 mm
		Shape of crate	The container should be sufficiently shallow to prevent reptiles, such as tortoises, from climbing on top of one another, and should be of a size which prevents undue movement of the reptiles, and hence minimizes the risk of injury due to violent movement of the container.
		Dimensionsof crate	The container should be sufficiently shallow to prevent reptiles, such as tortoises, from climbing on top of one another, and should be of a size which prevents undue movement of the reptiles, and hence minimizes the risk of injury due to violent movement of the container.well ventilated

S. No	TITLE	INFORMATION	
		Safety of animals (crate design and transport related	fasting prior to transport avoid piling and violent movements, for soft shelled trutles keep wet towels so that there is no drying.
		Safety of humans for crate related shifitng	experienced handlers only
		General comments on crate design	
	Carrier/ vehicle considerat ion	Identification of vehicle	truck/train/air depending on distance and finances and season to minimise transport time, well ventilated
		Preparation of vehicle	check ventilation communication with authorities, booking train bogie afetr inspection. Booking cargo by air and communication with airport authorities and customs
		Assessment of route	avoid rough roads
		Assessment of pilot vehicle	vet travels in pilot vehicle which rides in front of the transport vehicle for road transport
		Provision of emergency light	if travelling at night torches/headlamps must be carried. 2 charged lamps in the truck
		Additional arrangement of vehicle	to be handles by transport company. But should be clarified in adavance
		IATA guidelines etc	paperwork from zoos, health certificate, clearences from carrier
	Veterinary considera tions	Donor zoo	
		observation of behavioural derangements	
		Clinical signs	injuries,discharges from eyes,nostril, shell density, swollen eyes, abscesses, MBD
		Faecal examination and treatment if necessary	must be done 2 weeks in advance to date of transport
		techniques for physical capture	hand/ hoop traps
		techniques for chemical capture	Not advised
		drug details including dosages	NA
		haematological and biochem examinations	atleast 2 weeks in advance if possible
		vet considerations in injured/diseased animals	injuries,discharges from eyes,nostril, shell density, swollen eyes, abscesses, MBD

S. No	TITLE	INFORMATION	
		diet sheet	type of feed, amount
		health certi from donor agency	examination 48 hrs in advance
		recepient zoo	
		observation of health during transport	check for piling up in crate during transport
		Provision of food and water during transport	NA
		Vet drugs and equipments	fluids, sodabicarb(iv) prednisolone,dexamethasone, adrenaline, atropine, styptic,
		Quarantine and health check up	physical exam- injuries, discharges from eyes,nostril, blood tests post quarantine before introducing into collection id possible. Faecal exam, MBD, Shell density, hypovitaminosis A, swollen eyes, fungal disease esp in soft shells.
		Monitoring animals on arrival	time spent on land, time spent in water(for turtles), preferred temperature zone, swimming ability.
	HR considerations	Recepient zoo	
		Number of vets per animal	as per zoo availability
		no of assisting staff to accompany	curatorial staff, maintenance staff afetr discussion with management
		Appointment of animals keeprs	as per directives from curatorial staff after discussion with management.
		Provision of training to keepers in advance	send to experienced zoo for training atleast 5 days prior to arrival of animals.

Protocol for veterinary care of lizards during transportation		
TITLE	**INFORMATION**	
Animal considerations	No of animals to be transported	several lizards in a compartmentalised box. 1 per compartment
	Age of animals	dependant on the species
	Sex of the animal	
	ID	PIT
	Biological consideration of animal	with biologist/curatorial team. Avoid transport of gravid animals. In some lizards esp chameleons misting might be needed depending on duration of transport.
	Preparation for transport of young on	NA

TITLE	INFORMATION	
	Preparation for transport of rescued animals from free range	transported in a box via road to recognised rescue centre in area/FD facility
	Preparation for transport in extreme climatic condition and varying climatic conditions	summers- transport boxes to be covered with wet hessian sacs which can be moistened and winters crates may be lined with styrofoam
	assessment of BW and morphmetric features	BW actual,SVL, total length,
	Timing and season of transport	avoid at peak summer and peak winter and during monsoons. Transport to begin in early hours of the day
	Breeding details	As per ISIS
	Studbook details	As per ISIS
Preparation of Crate	material of Crate	Marine Ply 4-6 mm/ tupperware
	Shape of crate	bags are not suitable for general transportation of chameleons (Chamaeleonidae) and lizards of a spiny nature, such as some agamas (Agamidae). The first mentioned travel better in containers furnished with a network of rigid perches and the others in containers furnished with soft, loose material into which they can burrow.
	Dimensionsof crate	The container should be sufficient to provide space for the lizards and also allow for rigid perches esp in case of Chameleonidae.
	Safety of animals (crate design and transport related	fasting prior to transport
	Safety of humans for crate related shifitng	experienced handlers only
	General comments on crate design	
Carrier/ vehicle consideration	Identification of vehicle	truck/train/air depending on distance and finances and season to minimise transport time, well ventilated
	Preparation of vehicle	check ventilation, communication with authorities, booking train bogie afetr inspection. Booking cargo by air and communication with airport authorities and customs
	Assessment of route	avoid rough roads
	Assessment of pilot vehicle	vet travels in pilot vehicle which rides in front of the transport vehicle for road transport
	Provision of emergency light	if travelling at night torches/headlamps must be carried. 2 charged lamps in the truck

TITLE	INFORMATION	
	Additional arrangement of vehicle	to be handles by transport company. But should be clarified in adavance. Communication system finalised b/w transport vehicle and pilot vehicle.
	IATA guidelines etc	paperwork from zoos, health certificate, clearences from carrier
Veterinary considerations	Donor zoo	
	observation of behavioural derangements	
	Clinical signs	injuries,discharges from eyes,nostril, abscesses, MBD, eccdysis. Skin mites
	Faecal examination and treatment if necessary	must be done 2 weeks in advance to date of transport using rectal swab
	techniques for physical capture	
	techniques for chemical capture	Not advised
	drug details including dosages	NA
	haematological and biochem examinations	atleast 2 weeks in advance often difficult in small lizards/ geckos and chameleons. Depend on clinical signs
	vet considerations in injured/diseased animals	injuries,discharges from eyes,nostril, abscesses, MBD, eccdysis. Skin mites
	diet sheet	type of feed, amount, supplements
	health certi from donor agency	examination 48 hrs in advance
	recepient zoo	
	observation of health during transport	check for perching.
	Provision of food and water during transport	NA
	Vet drugs and equipments	fluids, prednisolone,dexamethasone, adrenaline, atropine, styptic, misters/sprayers
	Quarantine and health check up	physical exam- injuries, discharges from eyes,nostril, blood tests post quarantine before introducing into collection if possible. Faecal exam, MBD,
	Monitoring animals on arrival	feeding, ability to climb and balance skin tone and integrity.
HR considerations	Recepient zoo	
	Number of vets per animal	as per zoo availability

TITLE	INFORMATION	
	no of assisting staff to accompany	curatorial staff, maintenance staff after discussion with management
	Appointment of animals keeprs	as per directives from curatorial staff after discussion with management
	Provision of training to keepers in advance	send to experienced zoo for training for atleast 5 days prior to arrival of animals.

Preparation for transport of rescued animals from free range (injured/orphaned /mother with young one/pregnant, sick animals)	For orphan birds erect tree and provide nest	Total bird colony can be transported	Blind fold and transport	
Preparation for transport in extreme climatic conditions and varying climatic zones of existence	Transportation not advised			
Assessment of body weight and other morphometric features	Weighing and other measurements of all birds shall be taken			
Timing and Season of transportation	Avoid transportation during breeding season			

Preparation of Crate

Material of the crate	Wooden or ply wood materials with proper ventilation	
Shape of the crate	Bird size measurements shall be taken when lying down/ wings closed	
Dimensions of crate	Height of the crate is equal the bird	
Safety of animal (crate design and transport related)	Provide Bedding, avoid sharp points inside and doors should be closed	
Safety of human for the crate related shifting	Separate handles to hold the crate, person should not catch the crate directly	
General comments on design of crate	Avoid broad space so that bird should not open its wings	Partition for group birds

Carrier (vehicle) Considerations

Identification of the vehicle	Depending on no. Of birds. Road/rail/air/sea Open vehicle not advised	
Preparation of the vehicle for wild animal transport (padding, fuel, tyres etc.)	Bedding must be secured Arrest crate movement	
Preparation of the animal for transport in the identified vehicle	Keep enough food in vehicle and provide to birds when vehicle stops	
Assessment of the routes	Good and short route	
Assignment of Pilot vehicle	Separate vehicle for support staff	
Provision of emergency lights in vehicle	Required	
Additional arrangement of vehicle in emergency conditions	Yes	
Guidelines IATA etc.	Yes	

Veterinary Considerations

Donor-Zoo		
Observation of behavioural derangements if any	If any deviation observed, post pone the transport	
Observation of Clinical Signs if any	Secretions, excreta, feces and health conditions	
Coprological examination for evidences of parasites and remedial measures	Advised	
Techniques for Physical capture of animal if any	Only physical capture, nets/proper equip.	

Techniques for Chemical capture of animal	Not advised	
Drug details including the dosing regimen	No	
Haematological, serological and Biochemical examination of samples depending on species	Screening should be done before transportation	
Vaccination	In case prevalence of particular disease	
Veterinary considerations in injured or diseased animals (eg. From circus to zoo)	Quarantine and screening	
Issue of Health Certificate from the zoo vet	Provide	
Animal History card	Provide	
Treatment card	Provide	
Diet chart	Provide	

Recipient-Zoo		
Observation of animal health during transportation	Advised	
Provision of food and water during transportation	Advised	
Check list for Veterinary drugs and equipment during transportation	Necessary drug according to sps. Along with emergency kit	
Quarantine and health check up after arrival	30 days	
Monitoring of animal after arrival	Behaviour, acceptance of food and health conditions	

Human Resource Considerations

Recipient-Zoo		
No.of Veterinarian to be deputed as per the number of animals	0ne vet	
No.of assisting staff to accompany	Depending on no. Of birds One person per sps.	
Appointment of animal keepers for newly arrived animal	Person who is engaged during quarantine period is advised	
Provision of training to the keeper in advance	Advised	

Director **Biologist** **Veterinary Officer**

S. No.	Titles	Information to be prepared after discussion
5.	Preparation of Crate	• Material of the crate – iron mesh cage with framing • Shape of the crate -rectangle • Dimensions of crate –according to species / animal size • Safety of animal (crate design and transport related) – provision of feeding and watering with secure opening, no sharp projections • Safety of human for the crate related shifting – sliding doors latched with lock, handles for lifting • General comments on design of crate
6.	Carrier (vehicle) Considerations	• Identification of the vehicle – legal transport company • Preparation of the vehicle for wild animal transport (padding, fuel, tyres etc.) – ensure proper and sufficient • Preparation of the animal for transport in the identified vehicle - ID of the animal, crate training • Assessment of the routes – prior to actual departure • Assignment of Pilot vehicle - yes • Provision of emergency lights in vehicle - yes • Additional arrangement of vehicle in emergency conditions - yes • Guidelines IATA etc. – yes(when it is needed)
7.	Veterinary Considerations	Donor-Zoo • Observation of behavioural derangements if any - yes • Observation of Clinical Signs if any – yes (only healthy animal can be transported, pregnant and young should be avoided) • Coprological examination for evidences of parasites and remedial measures - yes • Techniques for Physical capture of animal if any – crate training, net capturing • Techniques for Chemical capture of animal – blow dart, squeeze cage, • Drug details including the dosing regimen – Ketamine HCl (5 – 10 mg / Kg) • Haematological, serological and Biochemical examination of samples depending on species - yes • Vaccination - no • Transport related animal special features eg. deer in soft or hard antler / horn - NA • Veterinary considerations in injured or diseased animals (e.g. From circus to zoo) – to be consider • Issue of Health Certificate from the zoo vet - yes • Animal History card, treatment card and diet chart - yes Recipient-Zoo • Observation of animal health during transportation - yes • Provision of food and water during transportation - yes

S. No.	Titles	Information to be prepared after discussion
		• Check list for Veterinary drugs and equipment during transportation • Ketamine Hcl – 1vial, Syringes – 3, 5, 10ml, needles – 23G, 21G, 18G, emergency kit, rope, • Quarantine and health check up after arrival – 60 days (as per CZA guidelines) • Monitoring of animal after arrival – yes
8.	Human Resource Considerations	Recipient-Zoo No. of Veterinarian to be deputed as per the number of animals 1 veterinary officer per 4 animal No. of assisting staff to accompany 2 zoo keeper Appointment of animal keepers for newly arrived animal – zoo keeper appointed (1 keeper / 4 animals) Provision of training to the keeper in advance – yes
9.	Liaisoning with Agencies	CZA (for permission) Donor / Recipient Zoo CITES (for permission: International exchange of animals) DGFT (for custom clearance: International exchange of animals) MOEF, Govt of India : International exchange of animals for permission) State Forest Department Zoos: En-route State Forest Department/s: En route Agencies for emergency-assistance (as per the requirement)

Signature of Director Signature of Veterinary Officer Signature of Concerned Officer

Technical Session VIII
(28th January, 2011)

Wild animal Anesthesia
Dr. Justin Williams, Professor, Dept. of Veterinary Surgery and Radiology, Madras Veterinary College, Chennai

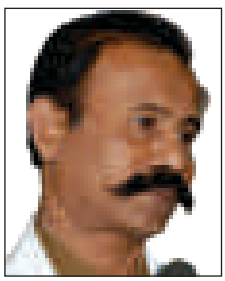
Transport of Small Indian / Black Kites and barn owls
Dr. M.G. Jayathangaraj, Organizing Secretary
& Professor and Head, Dept. of Wildlife Science
Madras Veterinary College, Chennai

Post mortem examination of wild animals with special reference to deer
Dr. R. Sridhar, Professor & Head, Dept. of Veterinary Pathology, Madras Veterinary College, Chennai

Sharing of Experience - Jodhpur Zoo
Dr. Shravan Singh Rathore, Jodhpur Zoo

Group presentation & discussion

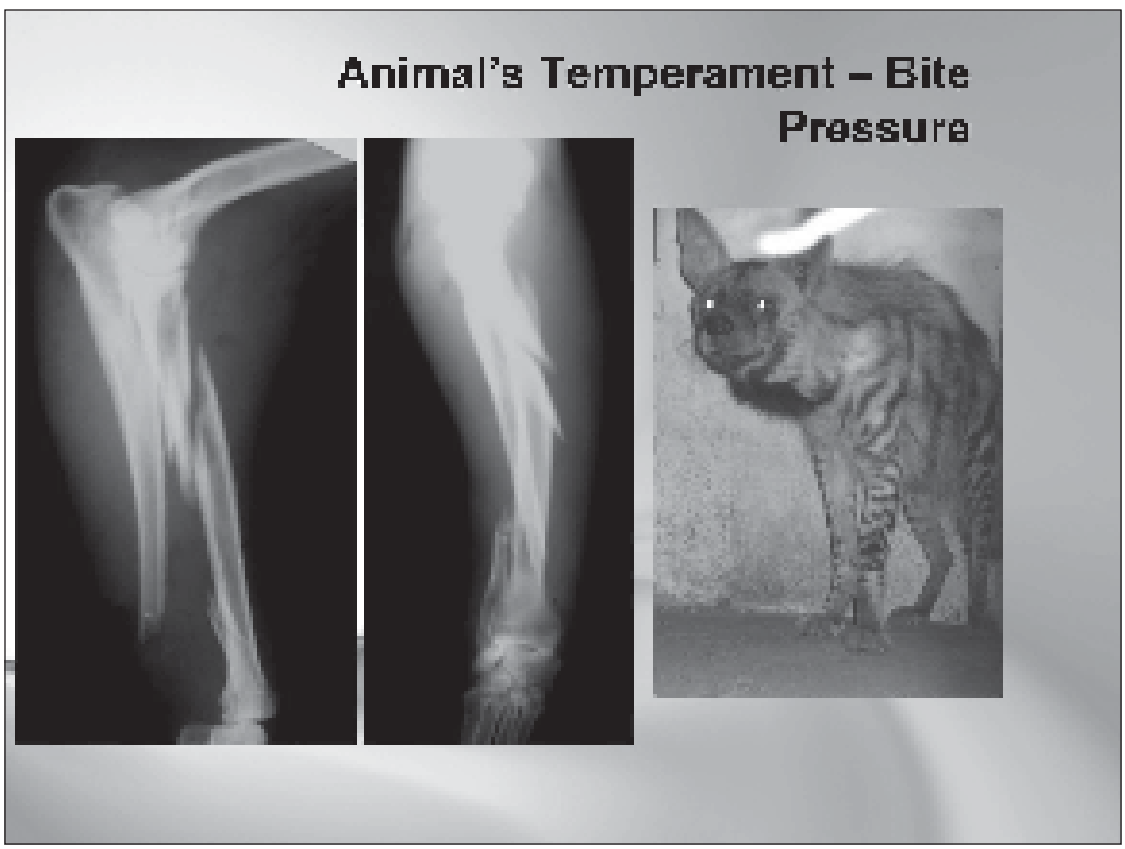
Wild animal Anesthesia

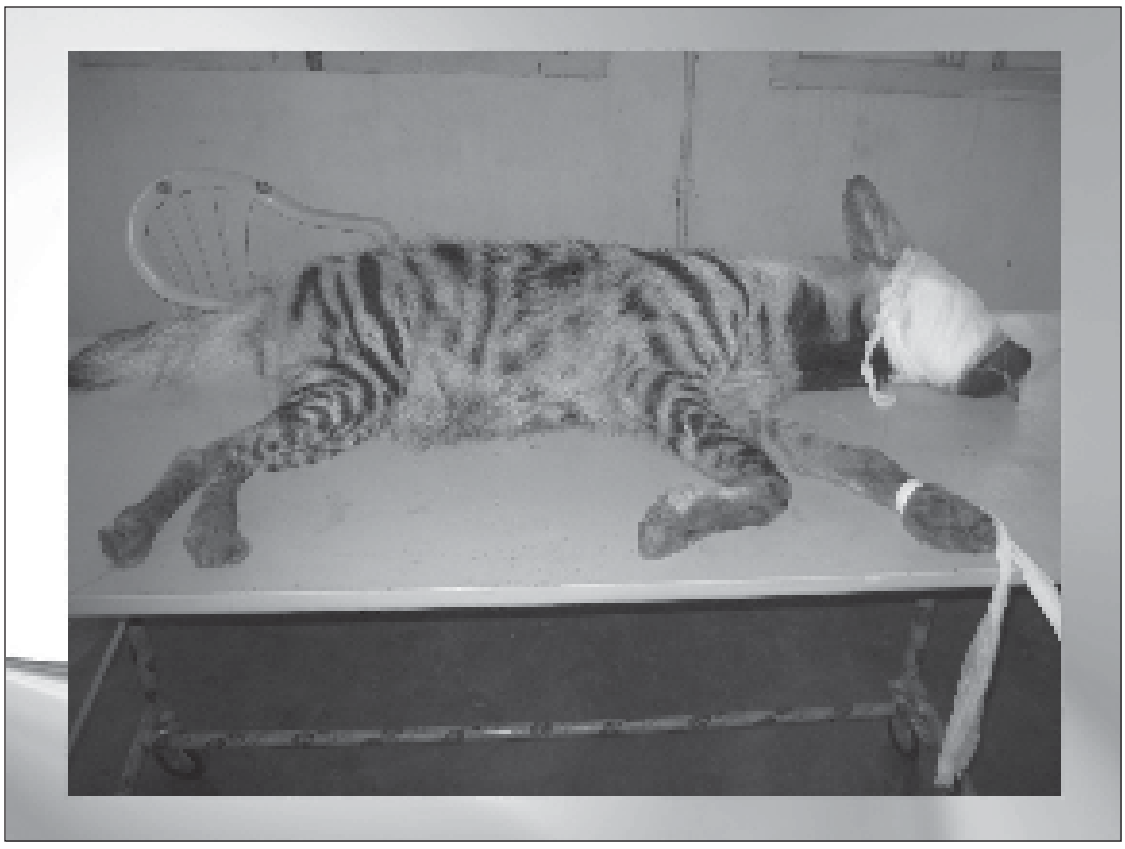


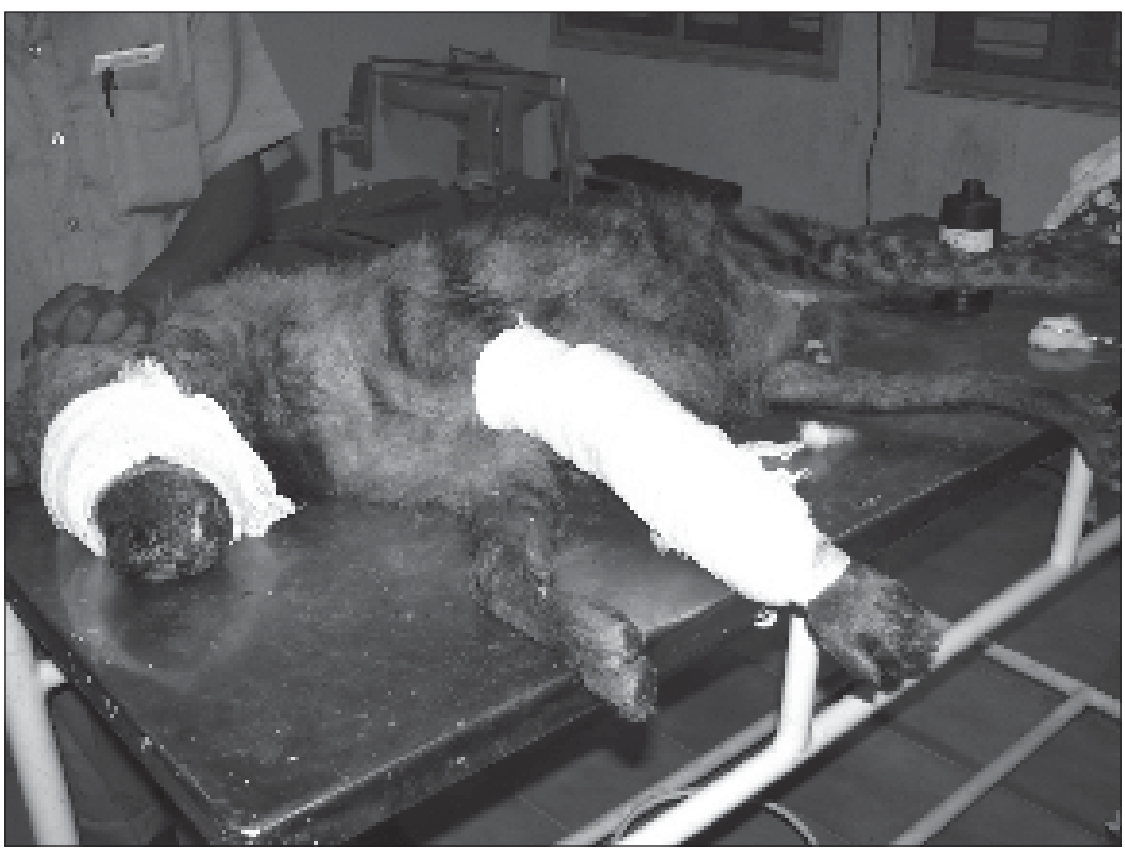
Dr. Justin Williams
Professor, Dept. of Veterinary Surgery and Radiology,
Madras Veterinary College,
Chennai

Wild Animal anaesthesia related scientific information were presented to the participating Zoo Veterinarians from different part of this country. The participants of the net workshop interacted with this resource person.


Vet's Experience and Knowledge


Animal's Temperament – Bite Pressure

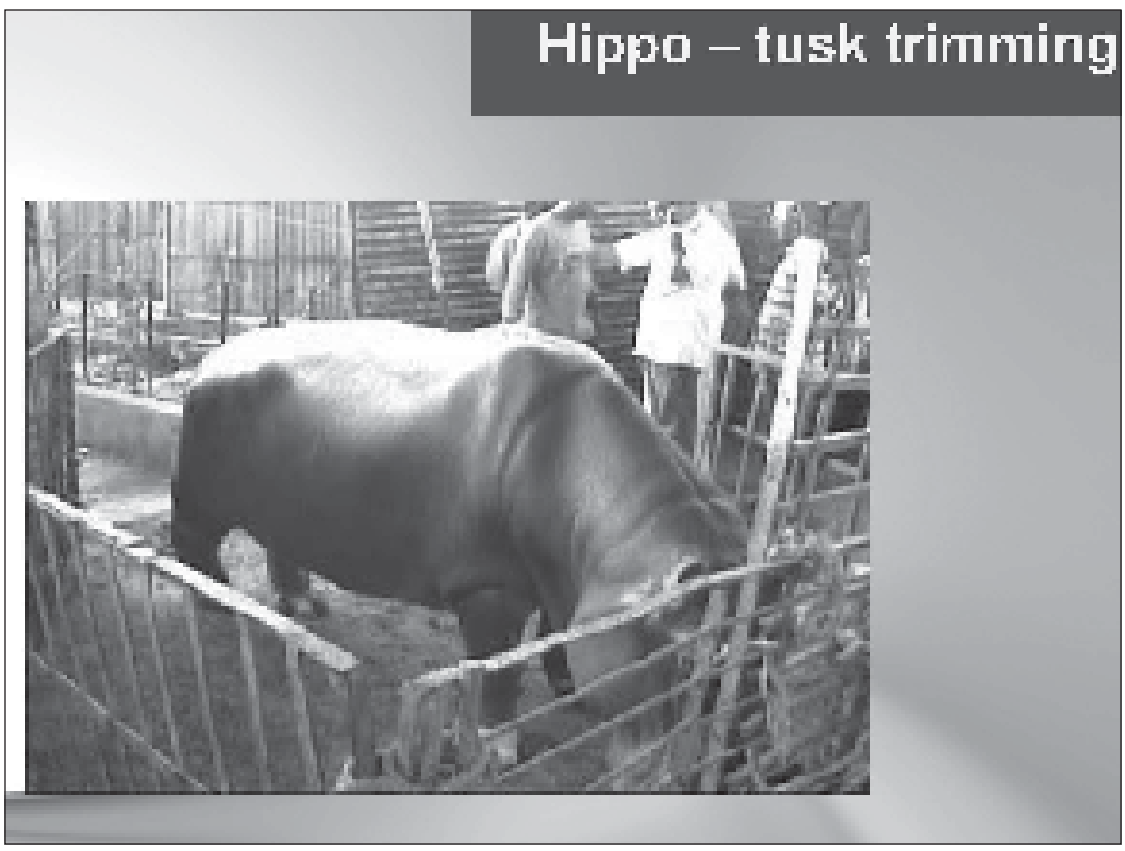




Transporting the animal

Anaesthesia

- Xylazine @ 1mg/kg and 30 minutes later
- Ketamine @ 20 mg/kg b.wt. and 30 minutes later
- Diazepam @ 0.25 mg/kg IM at caudal tail muscles


Hippo – tusk trimming

Transport of Small Indian / Black Kites and barn owls

Dr. M.G. Jayathangaraj
Organizing Secretary &
Professor and Head
Department of Wildlife Science
Madras Veterinary College
Chennai

The specific details with regard to the transportation of frequently encountered small Indian / black kite & barn owl were elaborated in a systematic manner. Zoo Veterinarians interacted with their queries.

TRANSPORT OF SMALL INDIAN BLACK KITES & BARN OWLS

TIME OF TRANSPORT

CONTAINER
(type, space, material, pa

Mixing of sps

Acclimatization

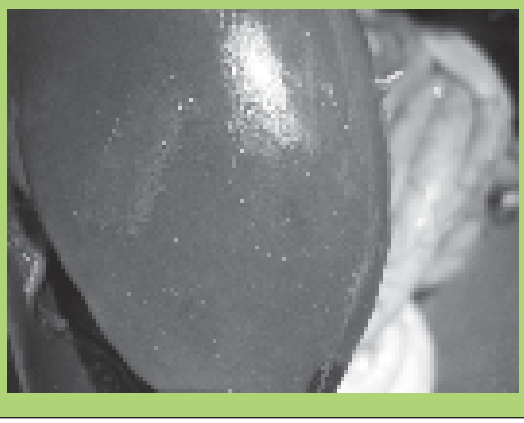
HEALTH CHECK UP
Droppings& Blood

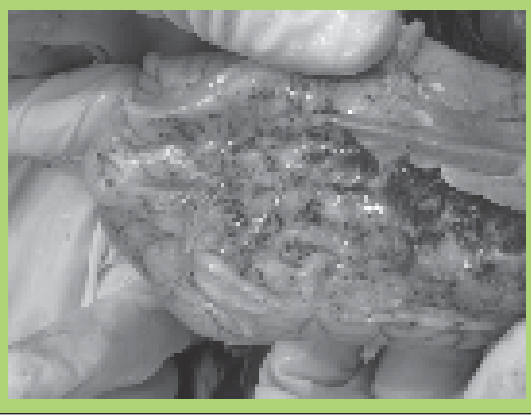
VEHICLE

Watering

External stress -factors

Feeding





Transport of Small Indian / Black Kites (milvus Migrans) And Barn Owls (Tyto alba)

The transport related information pertaining to small Indian black kites and barn owls are furnished here since they are the frequently rescued birds as observed in the past fourteen years in general.

Planning

Plan the trip well in advance associating the followings in the planning process:

- Whether the bird is recently caught from wild or under captive condition for a long term.
- Mode of the transport.
- Infrastructures required in case of emergency.
- Number of transfers
- Number of times of rest
- Legal issues

Mode of transport

- Road
- Rail
- Ship
- Air

Follow international air transport association for live animal registration

Time of transport

- Being a nocturnal bird it is better to transport the barn owls at day time because the activities of these birds are less during the day time.
- Similarly, being a diurnal bird it is better to transport the small Indian black kites mainly during the night time.
- Avoid the transportation of these birds during extremes of climate as well as in the mid day of the peak summer season.

Activities before transport

Observation for existence of many birds in a single confinement place

Observe by combining the birds of same species in a single cage/cabin/compartment/other container and if they do not tolerate each other, it is better to have one bird only in each cage/cabin/box/other container.

Acclimatization Activity and rejection of aviary species for transport:

If the numbers of birds are more for transport to a very distant place (exceeding about 500-600 kms):

It appears better to have acclimatization trial before the transporting day.

- Birds that were found dull or with fluffed appearance or with crouched appearance after about 20 minutes of confined condition inside the actual transport cage (in which acclimatization trial is ongoing) may be avoided for the actual transport.
- Birds that have not taken feed or the ones that have not drunk water (as assessed from the texture of droppings from these birds) may be avoided for the actual transport.

All these measures may assist the enhancement of the survival rate in general for the aviary species in large numbers to be transported.

HEALTH CARE MEASURES

- Rule out parasitic evidences and deworm them accordingly.
- Rule out specific disease depending on endemicity or frequency of occurrence of specific disease/s in birds of that region.
- Administration of B'complex fluids in water few days prior to transport may be of helpful
- Any bird with signs of diarrhea, lameness, ruffled feathers, crouching, dullness, wound/abscess, swelling etc. is to be avoided for transportation.
- Preferably, Ketamine with diazepam or xylazine with ketamine may be used prior to the transport in order to minimize the stress of transport in the birds.

Size of cage/ cabin/ box/other container

For transport, the bird in general requires to be placed in normal posture in the selected cage / cabin / box / container. The provision of space for flying activity is not recommended.

Note:

However, there should be adequate space for the bird under transport to move around inside.

Floor and sides of cage/cabin/box/other container

- To reduce any hazards, it is better to pad the floor and sides of these with materials that will not harm the bird species inside. Anchored - clean carpeting may be more appropriate for raptor birds like black Indian kite, barn owl etc.

Finishing of cage/ cabin/ box/other container

- There should not be any protrusions in the moving spaces of small Indian black kite or the barn owl.
- Should not have paint-flakes hanging inside and if not bird may consume accidentally and get intoxicated leading to health related problems.
- Multiple birds in cage/ cabin/ box/other container
- Avoid over-crowding inside. If not, there are likely chances of development of excess heat or disruption in the ventilation and ultimately, all these may often lead to mortality among the transported birds.

Perch

Placement of non-slip and harmless perch/s inside the cage/cabin/box/other container may help to minimize the occurrence of injuries and such excitement during the transport may lead the bird to feel more secure, in general.

Ventilation

Adequate arrangement should be carried out to provide more ventilation inside the confinement place.

Temperature

- Thermal variation may quickly lead to stress and collapse of the bird.
- Stress will be more if there is excitement of the bird in the place with high temperature. In case of transport of prococcical birds or altricial nestling, the provision of protected heat source is better inside the transport cage. In case of young ones, take care of hand feeding intermittently.

Food and water

- One hour distance, there is no necessity to provide with food or water.

Legal issues

Legal matters are to be taken care of both at national as well as international levels.

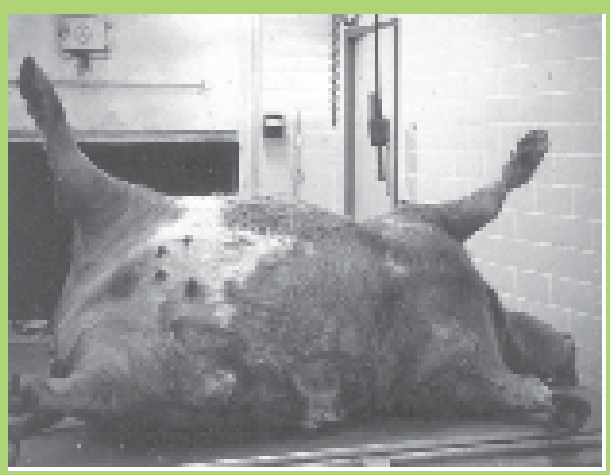
Post mortem examination of wild animals with special reference to deer

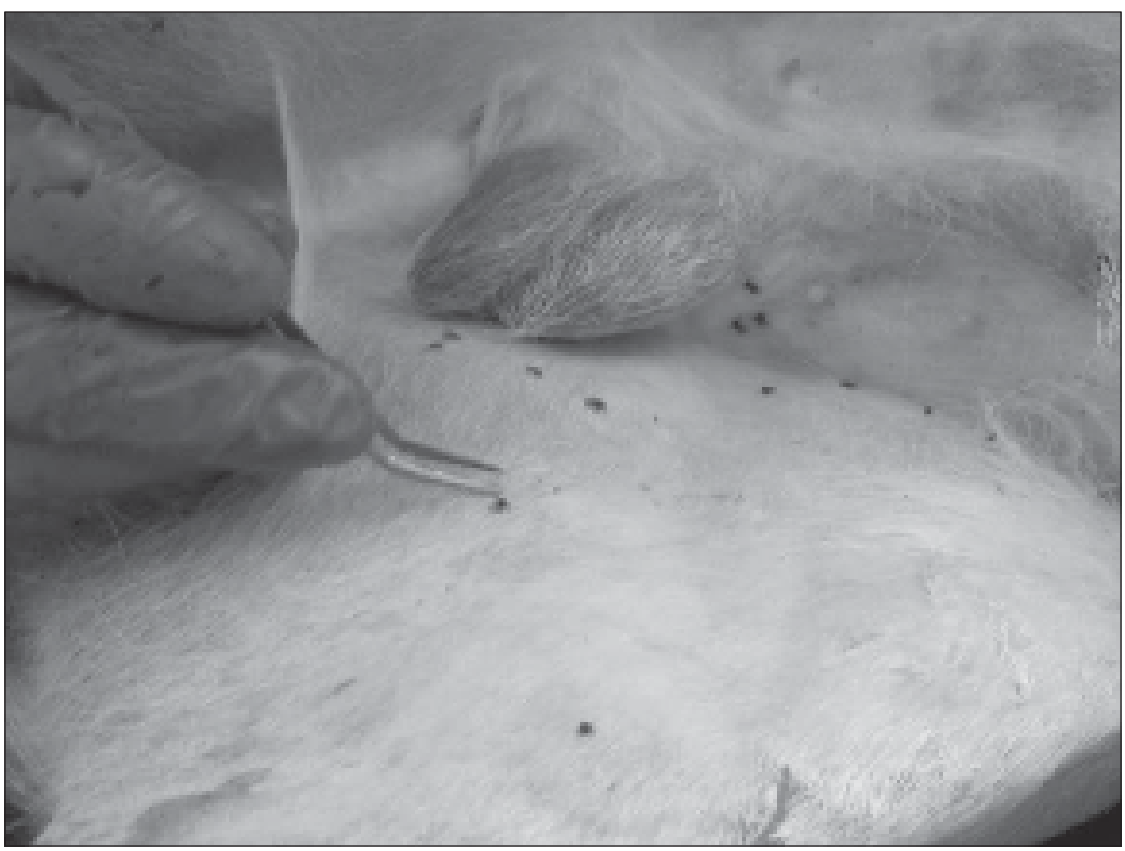
Dr. R.Sridhar
Professor and Head
Department of Veterinary Pathology, Madras Veterinary College, Chennai

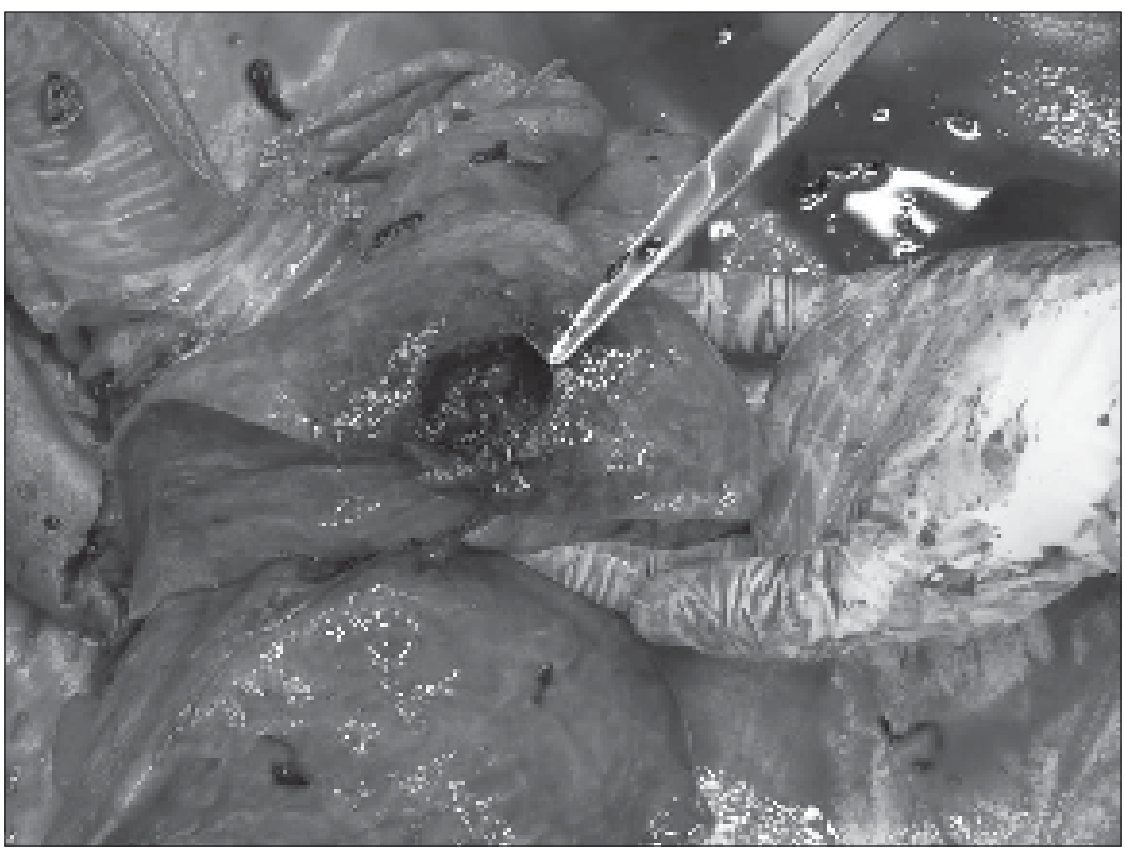
The post-mortem examination related features were dealt elaborately in case of wild animals with special significance to deer. Detailed discussions were made with concerned on the field problems.

POST-MORTEM EXAMINATION OF WILD ANIMALS WITH SPECIAL REFERENCE TO DEER

BLACK BUCK (ALL HERBIVORES)







Post-mortem of Wild Animals with Special Reference to Deer

The postmortem examination or necropsyy is often the most important factor in establishing a diagnosis. Evaluation of gross lesions tells the Pathologist what type of disease process has occurred and to what extent it has damaged specific organ systems. Therefore autopsy is an indispensable tool for the scientific understanding of the disease process.

What is necropsy?

The methodical examination of organs and tissues of dead animal may be called either Necropsy (Greek NECROS dead body; plus OPSIS = sight) or Autopsy (Greek AUTOPSIA = SEEN BY ONSESELF).

It is also commonly known as post-mortem examination (Latin POST-MORTEM = after death). Veterinary pathologists prefer necropsy and autopsy is used in Medical pathology; but can be used interchangeably.

Objectives of necropsy

1. Diagnosis of disease
2. Experimental purpose - produces diseases artificially in experimental animals and study the nature of the disease process.
3. In vetero-legal cases - to know the cause of death and the time of death (Forensic Pathology)
4. To detect and eliminate abnormalities, including contamination in food animals, as well as to enforce meat inspection legislation throughout the world.
5. To advance general knowledge and contribute to the science of disease.
6. Autopsy also serves as an instrument for education at all levels, for the beginners and advanced learners.
7. Autopsy creates a direct link to research in laboratory sciences such as experimental pathology and bacteriology.

Different types of necropsy

1. Diagnostic necropsy
2. Cosmetic necropsy
3. Vetero-legal necropsy

I. Necropsy procedure for wild animals

Difficulties in determining the cause of death in non-domestic animals in captivity or natural habitat are attributed to

1. Want of history
2. Observation not possible before death
3. Animals exhibit no symptoms of illness until they are too weak to walk, fly or crawl.
4. Sudden death without showing gross or microscopic lesions.
5. Veterinarians who are un-familiar with the normal habits and anatomy of wild animals.

Necropsy procedures for certain wild animals are similar to that of domestic animals as indicated below:

II. Necropsy procedure for herbivores

External examination procedure is common to all species

1. Place the animal on the left side so that the rumen is away from the prosecutor.
2. Make incision on the midline from between jaws to the perineal regional avoiding mammary gland and external genitalia of male.

3. Lift the right leg away from the body.
4. Make incision down on the medial side of each leg connecting the midline.
5. Reflect the skin and cut the muscle to separate the legs. Disarticulate the hip joint to separate hind legs.
6. Open the abdominal cavity by incising the abdominal muscles, the incision extends from the sternum to pelvis.
7. To open the abdominal cavity by incising the abdominal muscles, the incision extends from the sternum to pelvis.
8. To open the thoracic cavity cut through ribs at the joints junction with sternum, costo-chondral and vertebra. Cut the diaphragm.
9. Pelvic cavity is opened by cutting the pubis to examine the organs.
10. Remove the omentum.
11. By lifting the left leg tips the carcass. Examine anterior surfaces of reticulum.
12. Remove the spleen and examine (Anthrax, Anaplasmosis, traumatic peritonitis, Copper poisoning, tumor).
13. Remove the mammary gland with skin intact. Examine for symmetry, swelling, and atrophy; palpate each quarter separately; examine the mammary lymph nodes. Cut each quarter from teat canal to cistern.
14. Open and examine the nasal cavity for ulcers, granulomas, parasites or tumors.
15. Examine the pericardium by palpation for thickening and fluid accumulation.
16. Open the pericardium from the apex; tip the apex to draw the contents that collect at the bottom of the heart.
17. Examine the thyroid and parathyroid.
18. Remove the tongue, larynx, trachea and esophagus along with heart and lung by cutting soft tissues and the mandible (cut before premolar and after the molar).
19. Examine mouth and tongue.
20. Arrange thoracic organs in normal position and wash.
21. Open the esophagus, larynx and trachea and examine.
22. Examine lung by palpation and also after incision.
23. Examine the heart for dilatation and hypertrophy.
24. Cut open the heart on right side first and then left side. Examine the muscle, endocardial valves and also the vessels.
25. Examine pancreas and mesenteric lymph nodes.
26. Straighten the intestine and then cut open and examine.
27. Examine the liver surface for fibrinous tufts, adhesion or thickening of the covering.
28. Free the liver from the attachment to the diaphragm. Note the size, weight border and the cut surface.
29. Open the gall bladder and bile duct and examine for worms, glasstones, inflammation etc.
30. Examine the adrenals, kidneys and ureter.
31. Remove the kidney and then remove the capsule after incising the organ longitudinally.
32. Examine the cortex, medulla and pelvis.
33. Open the urinary bladder and examine nature of content.
34. Open and examine the uterus, vagina and vulva.
35. Open the skull and examine the meninges and then open and examine the brain.

Diseases and Pathology of Cervids (Deer)

Introduction

Deer are the most ancient of all ruminants. India has a distinction of having the largest number of deer species in the world. The species found in India varies in size as per the areas they live in. They are one of the most beautiful creatures on this earth and extend to approximately 34 species. They are affected by many diseases both infectious and non infectious diseases. Some of the common diseases are highlighted.

Viral Diseases

Vesicular Diseases

Foot-and-mouth disease (FMD) is a highly contagious viral disease that primarily affects cloven-hooved livestock and wildlife.-virus - Aphthovirus, There are seven immunologically distinct serotypes - O, A, C, SAT 1, SAT 2, SAT 3 and Asia 1 -Deer highly susceptible FMDV can infect most or all members of the order Artiodactyla (cloven-hooved mammals), as well as a few species in other orders. The characteristic lesions of foot-and-mouth disease are single or multiple, fluid-filled vesicles or bullae from 2 mm to 10 cm in diameter. Foot-and-mouth disease is characterized by fever and vesicles (blisters) on the feet, in and around the mouth, and on the mammary gland. Occasionally, vesicles may occur at other locations including the vulva, prepuce or pressure points on the legs. Vesicles often rupture rapidly, becoming erosions. Pain and discomfort from the lesions leads to a variety of symptoms including depression, anorexia, excessive salivation, lameness and reluctance to move or rise.

Rabies : Rhabdovirus

Most of the deer in zoos or free ranging deer near parks are as a result of rabid dog bites Rabid deer may display abnormal behavior ranging from severe depression to violent aggression, or they may appear uncoordinated, partially paralyzed, or unable to rise. Diagnosis -rarely clinical signs (if observed), FAT, HP

Deer Cutaneous Fibromas: Papillomavirus

Syndromes: cutaneous wart-like growths Infection: direct contact Species: all deer species Histopath: features of papillomas, fibropapilloma or fibromas

Bluetongue : Orbiviruses;

Bluetongue virus infects many domesticated and wild ruminants including sheep, goats, cattle, buffalo, deer, antelope. Clinical signs - peracute, hemorrhages, respiratory distress lameness and sudden death., , chronic: overgrown hoof, cracks in hoof wall, sloughing of hooves.Infection: Culicoides vectorSpecies: All species Histopath: DIC, petechial, ecchymotic or suffusive hemorrhages anywhere esp. gi tract, heart, pulmonary artery, pyloris of abomasums

Bacterial Diseases

Anthrax

Anthrax is a bacterial disease that can cause rapid death losses in deer and in unvaccinated domestic livestock. Organism - Bacillus anthracis. Spores of the bacterium can survive for years in the soil, and sudden changes in soil moisture caused by flooding or drought can trigger the development of infectious bacteria from these dormant spores. Animals become afflicted when they ingest the anthrax bacteria and are rapidly overwhelmed when the bacteria invade all body systems. Classical signs of anthrax include failure of the blood to clot, bleeding from body orifices, an enlarged spleen, and sudden death. In case of suspicion do not open the carcass. Take smears rule out Anthrax before opening. Spores can also survive for two years in water, 10 years in milk, and up to 71 years on silk threads. Vegetative organisms are thought to be destroyed within a few days during the decomposition of unopened carcasses. If a carcass is opened by mistake then tarry unclotted blood, enlarged spleen and lesions of septicemia are observed.

Bovine Tuberculosis

Deer are becoming more and more susceptible -aerosol or oral ingestion --Associated with infected cattle especially in encroached areas, high deer density, - subclinical infection, cranila lymph nodes lungs, disseminated Species -all species

Histopath: caseogranulomas, partial mineralization, multi-nucleated giant cells, rare Acid-fast bacilli

Pasteurellosis

Pasteurella multocida,

More common in captivity rare in wild. Major clinical signs and pathologic changes included extensive swelling of the head and the neck and peracute or acute septic pneumonia, fibrino-suppurative bronchopneumonia, petechial and ecchymotic hemorrhages on serous membranes, and severely hemorrhagic adrenal glands and abomasum.

Leptospirosis

Leptrospirosis can be caused by any of over 189 known serovars of the spirochete Leptospira interogans. The organism infects a large variety of domestic and wild animals, including humans. Studies indicate that deer are routinely exposed to the organism but rarely suffer clinical signs of infection. Signs- asymptomatic. Additionally, it does not appear the deer are of significance in either the maintenance or spread of the organism. In captivity contact with contaminated environment and rodents, mongoose etc

Are likely way they can get infected.

Johne's Disease

-Mycobacterium avium subsp. Paratuberculosis

-Primarily captive species: -Infection: fecal-oral, massive fecal shedding, early age infection -Signs: diarrhea, weight loss, chronic -Lesions: thickened ileum & cecum, enlarged ileo-cecal lymph node, histiocytic or granulomatous infiltrate with numerous acid-fast bacilli

Brucellosis

-Brucella abortus, B. suis

-Species: all the species-Syndromes: abortion, retained placenta, metritis, orchitis, epididymitis -Infection associated with cattle.

Abscesses & Bacterial Infection of CNS

Staphylococcus, Streptococcus, Arcanobacterium pyogenes: These pyogenic bacteria are commonly associated with subcutaneous abscesses. Clinical signs: subcutaneous abscesses; brain abscesses & menigoencepahlitis. Infection: dermal abrasions and wounds; direct extension from retrobulbar; hematogenous.Species: all cervids susceptible

Histopath: suppurative cellulitis and abscesses, with bacterial colonies

Black Leg

-All cervids susceptible

-Clostridium chauvei, Cl. Novyi, Cl. Septicum

-Trauma to muscle mass results in anaerobic environment, growth of bacteria, release of preformed toxins -Gross: muscles dark red to black, gas-bubbles, spongy, dry

-Histopath: muscle necrosis, large bacterial rods

Parasitic Infestations

External Parasites Fleas, ticks and lice:

Many genera and species of biting & sucking lice, ticks, fleas

Syndromes: incidental, clinical anemia and debilitation, secondary infections

Species: all deer susceptible, more severe in neonates, seasonality

Ticks

-Amblyomma, Ixodes, & Dermacentor spp.

-Local irratation and swelling, heavy infestation anemia

-May carry Lyme Disease

Sarcoptic Mange

Sarcoptes scabiei: Contagious burrowing skin mite of man and animals, worldwide

Syndromes: Mange, immunosuppression, debilitation, death

Infection: direct and indirect contact

Species: Moose, elk, caribou, not reported white-tailed

Histopath: pruritis, crusts, hyperkeratosis, epidermal hyperplasia, intracorneal tunnels containing myriads of adults, larvae, eggs

Demodectic Mange

Demodex sp.-Hosts: Deer Spp. : subclinical, alopecic dermatitis, marked subcutaneous edema distal muzzle, Infection: Not considered contagious, normal skin inhabitant to dermatitis -Histopath: low numbers of organism in hair follicles or sebaceous glands are incidental; alopecia, folliculitis, furunculosis, granulomatous cellulitis, lymphadenopathy, associated with high numbers of classic cigar-shaped, stubby limbed intra-follicular adult and larval mites

Internal Parasites

Nasal Bots

Cephenemyia spp.: Nasal/pharyngeal bots of deer; adults free-living

Clinical signs: subclinical. Species: cervids, histopath: Minimal inflammation of pharyngeal lining

Lung Worms

-Dictyocaulus viviparus, high infestation rate

-Hosts: all species

-No intermediate hosts

-Signs: weakness, respiratory distress, patchy consolidation & pneumonia

-Gross: slender white nematodes 3-4 cm in length, filling trachea, bronchi, alveoli

-Histo: bronchointerstital pneumonia, numerous adults, larvae & eggs

Liver Flukes

-Fasciolodes spp-

Hosts: all species. Life cycle: require aquatic intermediates including snails

Aberrant hosts: variety of domestic ruminants Lesions: thick fibrous capsules in liver, migration tracts, black fluke pigment

Echinococcosis- Hydatid Disease

-Echinococcous granulosis- zoonotic disease

-Hosts: Carnivore definitive host: wolf, coyote, fox, small 3-5 mm long adult tapeworm in gi tract. Cervid intermediate host: -Lesions: numerous pale, fluid-filled cystic cavities in lungs and liver.

-Histopath: thick-walled fibrous capsule, protoscoleces & hydatid sand

Protozoan parasites

Trypanosomosis /Surra is a protozoal disease that can affect most mammals but is generally more severe in horses. An acute form of the disease, which is generally fatal unless treated, occurs in cattle, buffalo, deer, and other animals. This form is caused by Trypanosoma evansi and is transmitted by horse-flies. In deer, surra is usually chronic and is characterized by edema, anemia, emaciation, and nervous signs.Post -motem lesions may include emaciation of the carcass, anemia, and petechiae on some internal organs. Hydrothorax and ascites are sometimes seen. The spleen and lymph nodes may be enlarged. To detect trypanosomes, several thick and thin blood films should be made during the febrile phase and air-dried. Thick and thin slides may be also made from needle biopsies of the prescapular or precrural lymph nodes, and smears from any skin exudates. Post-mortem, impression smears should be collected from the lungs, liver, and kidney.In live animals, repeated sampling may be necessary to detect the organism.

Miscellaneous Conditions

Peritoneal Fibrosis

-Deer have very reactive peritoneum, similar to domestic ruminants -Fibrotic response may become excessive, fibrotic encapsulation of abdominal viscera -Similar to humans undergoing peritoneal dialysis for renal failure prior to modern dialysis machines

Tumors and Tumor-like Masses

Lymphosarcoma

- Sites: Lymph nodes, spleen, liver, kidney, lung heart, retrobulbar area

-No known association with retroviruses -Uncommon incidence

Cervids and Antlers

-Antlers are bony structures, covered with highly vascular velvet during growth, shed and regrown annually.-Physiology: -Pedicle is thickened periosteum and spongy bone from which the antler developes -Increasing daylight stimulates antler growth -Antlers are the most rapidly growing tissue of any adult mammalian tissue; completely regenerates annually.-Antlers generally grow over a 3 to 6 month period, depending on species

Deformities: Antler -Genetic causes-Injury: directly to the growing antler or pedicle; indirect to contra-lateral hindlimb, or same-side front limb-Physiologic/endocrine: testosterone, estrogen, pituitary hormones, thyroid hormones, all play a role in controlling antler growth & development Antlers & Testosterone: -Castrated fawns never develop antlers -Increasing testosterone level results in velvet loss, cessation of growth, and eventual death of antler tissue -Decreasing testosterone leads to casting off antlers, and subsequent regrowth -Antlered deer which are castrated develop uncontrolled antler growth. - Antleromas

Trauma ; deer are highly prone for trauma since they are easily frightened. Shock and stress related death is also common among deer improperly handled.

Capture myopathy: Exertional myopathies are a group of diseases or exhaustive activity of the major muscle groups (gluteal, femoral and lumbar muscles).Main factors here is extensive running as result of being chased or frightened. Following skeletal muscle damage there is a massive release of myoglobin, aspartate aminotransferase (AST) and creatine kinase into the circulation. Results in myoglobinuria and death.

General Recommendation

Protocol for transport of animals in India

The need of the comprehensive protocol for the transport of the animals especially for deer species has been felt in India from time to time due to frequent exchange of animals between various zoological parks, zoological gardens, zoos etc. in India and occasional incidents of animal's casualties occurred during transport.

To address these issues, the CZA organized a workshop of zoo veterinarians at Chennai in collaboration with Madras Veterinary College and Arignar Anna Zoological Park from 24th -28th January, 2011. Twenty seven zoo veterinarians participated in this National level workshop.

After detailed deliberations, protocols for the transport of the selected wild animal species with emphasis on deer species were developed under following heads which are associated with each other.

1. Financial Considerations

There are following components which require immediate attention, whenever a zoo plans to acquire new animal/s in its collection:

- Financial consideration on providing permanent manpower
- Provision of fund for Transport
- Provision of fund for upkeep of the animal associated with transport
- Provision for veterinary care of the animal

Director of zoo will ensure above mention items in zoo prior to the transport of the animals.

2. Availability of Enclosure

As soon as zoo decide to acquire new animal(s); zoo will ensure that newly arrived animals have enclosure in the zoo, built in advance as per the CZA guidelines. In case of endangered species, design of the enclosure should be approved by the CZA.

3. Animal Considerations

Animals should have top priority over any other business. There are certain features which are directly related to the animals and need to be considered prior to the transportation of the animals e.g.

A. Deer Species

a. Maximum 4 -5 animals may be transported at a time.

b. 1 male per crate

c. Smaller species: 2 females in a crate

d. Larger species: 1 female in a crate.

e. As per the need both the sexes can be transported in separate crates.

B. Carnivore

a. Maximum 1 -2 animals may be transported at a time.

b. 1 male per crate

C. Primates

a. Maximum 1 -4 animals may be transported at a time.

b. 1 animal per crate

D. Birds

a. Storks, cranes, ratites may be transported in pair.

b. Galliformes, may be transported in pair.

c. Parakeet, pigeons may be transported in group

d. Ducks, teals may be transported single

e. Raptor may be transported in pair.

E. Reptiles

a. Crocodlies should be transported in single.

b. Turtles & Tortoise: Large size single, small size may be groups.

c. Snakes: King Cobra, cobra, python and other cannibal snakes single. Other snakes may be group.

General Consideration

- Adults and sub-adults should only be transported.
- Microchip and/or ear tags may be used for identification for deer species. Carnivores should be marked with Microchip (transponders) whereas birds should be marked with colour bands. Reptiles (turtles) may be marked with notch marking whereas snakes may have microchips.
- Studbook and breeding details should be accompanied with animals to know the pedigree and to avoid inbreeding.
- Pregnant, geriatric, lactating, suckling young ones, sick, weak, injured, deformed animals, males in velvet should not be transported.
- In case of compelling demand, young ones still sucking should be transported with the mother in the same crate. In case of orphaned / hand reared young ones, the keeper / handler concerned should accompany with the prescribed feed formula.
- In case of injured/orphaned/mother with young one/pregnant, sick animals; animals should be kept under quarantine for a minimum period of 30 days, during which coprological, serological and hematological examinations should be carried out. Veterinary assistance, if needed, should be taken care of immediately.
- Transport of wild animals under extreme climatic conditions should be avoided. If it is unavoidable, provision to minimize the effects of abrupt changes should be made in the design of crate or the necessary facilities should be provided in the crate.
- Body weight and morphometric features may be estimated to determine the crate design.
- Extreme climatic conditions and seasons should be avoided.

Animals of different species should not be transported in the same container.

4. Preparation of Crate

- The crate should not be too heavy to handle.
- The crate should not be painted from inside.
- Crate should be disinfected properly prior to the transport.
- Crate should be made of wood / wooden or metal frame with plywood or laminated plywood.

- Shape of the crate should be rectangular.
- The crate should match with the size of the animal to be transported in such a way that the animal kept inside should only be able to stand or sit in sternal recumbency and cannot turn or somersault.
- The crate should be well ventilated and make sure animal should not extend their extremities outside.
- Temporary facilities for providing feed and water should be provided.
- Facility for cleaning the excreta should be provided.
- Bedding with paddy straw, sand etc should be provided and the floor may be peg bored to avoid slipping.
- Sides: Padding with the help of paddy straw filled gunny bags, coir, foam/ cotton cushions should be provided.
- No protrusions, sharp edges, sharp objects should be there in the interior surfaces of the crate.
- Handholds or bars should be provided on the sides for easy handling.
- In case of deer, Antler or horn tips may be padded to prevent injuries.
- Only trained / experienced handler / attendant / keeper should be deputed for the task.
- For dimensions of the crates for different species, "Manual of Transport Cages and Nest Boxes" published by CZA may be referred.

A. Deer Species

Indicative dimension of the crate may be as below :

Name of the species	Length (cm)	Width (cm)	Height (cm)	Remark
Sambar (*Cervus unicolor*)	180	68	150	For ventilation holes on side of 12 mm. Crates for other species of deer may be designed accordingly keeping the size of animal in view.
Swamp deer (*Cervus duvaucelli*)	165	60	150	
Spotted deer (*Cevus axis*)	150	55	120	
Barking deer (*Muntiacus muntjac*)	90	45	75	

Frame: All around solid wooden batten of 4 mm or metallic.

Sides- Plywood water proof 12 mm thick.

Floor- 19 mm thick water proof ply.

Roof- Water proof plywood 12 mm thick.

Doors- Water proof ply 12 mm thick, sliding doors on both sides with bolts and chain.

B. Carnivores:

Indicative dimension of the crate may be as below:

Name of the species	Length (cm)	Width (cm)	Height (cm)	Remark
Tiger/lion	195	75	105	
Bear	180	75	100	
Leopard/jaguar	120	60	90	

Frame: MS angle 40 x 40 x 6 mm.

Sides- Plywood water proof 12 mm thick with cover of iron sheet of thickness of 3 mm.

Floor- 19 mm thick water proof ply on MS flat of 35 x 4 mn @ 350 c/c floor and two sides also covered from inside with iron sheet of 2 mm. Holes on floor 20 mm in diameter. Whole crate should rest on 50 x 50 mn iron long pegs. Tow 25 mm deep removable trays to be kept below the floor to receive urine and excreta.

Roof- Water proof plywood 12 mm thick.

Doors- 12 mm diameter MS bar @ 50 mm c/c should be welded with frame and covered with 5 mm thick plywood. Bolt and chain system for closing and opening the doors.

C. Primates

Indicative dimension of the crate may be as below:

Name of the species	Length (cm)	Width (cm)	Height (cm)	Remark
All macaques	90	68	75	

Frame: Solid wooden batten 35 x 35 mm all around.

Sides- Waterproof plywood 12 mm thick.

Floor- Waterproof plywood 12 mm thick with saw dust on base.

Roof- Water proof plywood 12 mm thick.

Doors- Only on one side with up slide facility made up of waterproof ply of 9 mm thickness.

Ventilation: Holes of 20 mm diameter on two sides welded mesh at rear top of the width of 100 mm.

D. Birds

Indicative dimension of the crate may be as below:

Name of the species	Length (cm)	Width (cm)	Height (cm)	Remark
Munia/ Budgerigar	75	75	22.5	Sufficient for 2—25 munias, wire mesh size of 150 x 600 mm
Kite/Shikra	75	45	45	For one bird, perch at 50 mm, should have enough space to turn around. Wire mesh size 150 x 30 mm
Pheasants	60	45	60	For one bird, if the tail is long, the length may be increased accordingly, wire mesh size 100 x 600
Emu and Cassowary	75	60	150	
Small parakeets	75	75	25	Sufficient for 15 parrots, perch of 10 mm in diameter inside at 50 mm above.

Bird size measurements shall be taken when lying down/ wings closed, Height of the crate is equal the bird

Frame: Solid wooden batten 30 x 30 mm all around, in case of Emu 75 x 50 mm.

Slides- Waterproof plywood 9 mm thick, in case of Emu 12 mm with Iron bars of 25 cm in length be fixed at equal distance.

Floor- Waterproof plywood 12 mm thick, in case of Emu 19 mm in thickness with saw dust.

Roof- Water proof plywood 9 mm thick, in case of Emu 19 mm.

Doors- Sliding on one side, Back side closed, Door made up of 9 mm thick plywood. In case of Emu 19 mm.

Ventilation: Wire mesh at rear end at top of the, in case of Emu holes on both sides.

2. For dimensions of the crates for different species, "Manual of Transport Cages and Nest Boxes" published by CZA may be referred

E. Reptiles

Indicative dimension of the crate may be as below:

Name of the species	Length (cm)	Width (cm)	Height (cm)	Remark
Crocodile/Alligator/ Gharial	195 cm	60	40	Small size are preferred
Python	75	90	45	Handles on both sides to carry
Cobra or other snakes	60	75	30	Handles on both sides to carry

Frame: Solid wooden batten 35 x 35 mm all around, in case of python MS angle of 25 x 25 x 4 mm and with additional support of MS flat of 25 x 4 mm as required. For other snakes, solid wooden batten of 25 x 25 mm size.

Sides- Waterproof plywood 12 mm thick with 35 x 35 mm solid wooden batten as support (4 No.). In case of python, 19 mm mm plywood and wire mesh on two sides. For other snakes, waterproof ply of 9 mm with wire mesh on two sides.

Floor- For crocodile and other snakes waterproof plywood 12 mm thick with saw dust on base. In case of python, 19 mm mm plywood with dry paddy at base.

Roof- For crocodile and other snakes water proof plywood 12 mm thick. In case of python waterproof ply of 19 mm in thickness with hinges and locking arrangement. The top will act as a door.

Doors- Sliding on both sides with 12 mm thick waterproof.

Ventilation: Holes on sides and top as required.

5. Carrier (vehicle) Considerations

- Carrier company that is experienced in transporting animals should be selected.
- Transport vehicle should be insured.
- All vehicle related documents should be valid (R.C., insurance, driver's licence…etc) and should be checked.

- An agreement should be signed between the carrier company and consigner so that an alternate vehicle will be arranged as early as possible by the carrier company, in case of breakdown or other emergencies that may arise en route.
- If possible use newer vehicle for the purpose.
- Vehicle should be disinfected properly prior to the transport.
- The vehicle should be serviced and thorough check up should be carried prior to the transport.
- Fuel level should be checked prior to transport.
- The tyre pressures should be checked properly.
- Identification of the animals should be done prior to transport.
- Prior to transport, a detailed discussion should be held with the donor, recipient, carrier company and the identified escort team.
- Shortest road worthy route should be selected.
- Before transportation, factors like weather forecast, possible disturbances (blockade, processions, festivals, public functions,…etc.) during the proposed time should be taken into mind and planned accordingly.
- Information on zoos and other facilities en route should be accompanied with the vehicle so that necessary assistance (food, healthcare…etc) can be obtained as and when needed.
- Contact information of Directors/Veterinarians of zoos en route should be available with the transporting team.
- Pilot vehicle should have a team of competent authority, veterinarian, drugs, equipment for physical and immobilization and communication facilities.
- Uniform personnel with proper dress code should accompany the vehicle.
- The team in the pilot vehicle should inform the toll / check gates in advance so that unnecessary delay is avoided.
- Emergency lights with enough batteries should be kept in the vehicle and pilot vehicle.
- For safe and secured transportation, forest department personnel of the concerned district or state and security agencies like police may be contacted for necessary help.
- Guidelines of IATA, CITES etc. should be followed in specific cases.

6. Veterinary Considerations

Donor-Zoo

- All the prophylactic measures like vaccination and deworming should be carried out at least 3 weeks earlier.
- If physical capture method is adopted, the animal should be allowed to acclimatize with the transport crate.
- If chemical immobilization has to be carried out, the animal should be fasted for 24 hours and depraved of water for 12-16 hours.
- While in transportation, disturbance to the Animal to be minimized. Behavioural abnormalities / derangements should be recorded.
- To avoid cross-infection and for health and hygiene reason, human contact with animals should be avoided.
- Necessary records should be kept for observation of any clinical signs and treatment should be provided accordingly.

- Coprological examination should be carried out and necessary treatment should be provided 2 weeks prior to the transport
- For Physical capture of animal; practices like crate training, luring, narrowing the path, net capture…etc. may be adopted to avoid undue stress.
- If and when required, blood may be collected and haematological, serological and biochemical examination may be carried out prior to transportation.
- Deer with soft / velvet antlered should not be transported.
- Quick and prompt veterinary consultation and treatment should be extended for injured and diseased animals if brought from wild. If shifted to the zoo, strict quarantine protocol should be followed.
- A health certificate in standard format with all health related details should be issued by the veterinarian of the donor zoo to the recipient zoo.
- All the necessary records of animals should be handed over to the recipient zoo.
- Techniques for Chemical capture of animal

Deer

- The chemical capture should be carried out during cool hours of the day.
- Standard techniques should be followed during chemical immobilization.
- Drugs suitable for the particular species should be used for chemical capture.
- Best available drugs should be used for transportation of different deer species amongst them are, the drugs Available in India: Xylazine, Ketamine and Acepromazine and drugs not available in India such as Butophanol, Azaperone, Detomidine, Medetomidine, Telazol, Midazolam, Haloperidol, etorphine and reversal agents Atipamazole, Yohimbine, Tolazoline, Flumazenil and Naltrexone.
- Dose regime for chemical immobilization of the animals may be as given below subject to the advice of the veterinary officer on case to basis:

Name of the species	Drug	Dose regime	
Spotted deer (Cervus axis)	Xylazine and Ketamine	6 mg/kg and 1.2 mg/kg	IM
	Meditomidine and Ketamine	0.05-1.0 mg/kg and 0.8-3.2 mg/kg	IM
Hog deer (Cervus porcinus)	Xylazine and Ketamine	6 mg/kg and 1.2 mg/kg	IM
	Meditomidine and Ketamine	0.05-1.0 mg/kg and 0.8-3.2 mg/kg	IM
Swamp deer (Cervus duvaucelli)	Etorpine and Xylazine	0.003 mg/kg and 5-8 mg/animal	IM
Blackbuck (Antelope cervicapra)	Ketamine and medetomidine	2 mg/kg and 0.25 mg/kg	IM
	Xylazine	20 mg/ animal	IM
Nilgai	Etorpine, acepromazine and Xylazine	0.03 mg/kg, 0.12 mg/kg and 0.16 – 0.23 mg/kg	IM
Barking deer	Xylazine and Ketamine	3 mg/kg and 2 mg/kg	IM

*Kindly refer to report on "Standards, guidelines and protocol" prepared by the IVRI for CZA

Carnivores

- The chemical capture should be carried out during cool hours of the day.
- Standard techniques and dose regime should be followed during chemical.
- Drugs suitable for the particular species should be used for chemical capture.
- Dose regime for chemical immobilization of the animals may be as given below subject to the advice of the veterinary officer on case to basis:

Name of the species	Drug	Dose regime	
Wolf	Xylazine and Ketamine	10 mg/kg and 2 mg/kg	IM
Himalayan Black bear	Tiletamine/zolazepam and medetomidine	0.5 mg/ kg and 0.01 mg/kg	IM
Sloth bear	Ketamine and Xylazine	7.5 mg/kg and 2 mg/kg	IM
	Ketamine and Meditomidine	3 mg/kg and 0.05 mg/kg	IM
Red Panda	Ketamine and Meditomidine	5 mg/kg and 0.1 mg/kg	IM
Civet and Binturong	Ketamine and Xylazine	10 mg/kg and 1-2 mg/kg	IM
Lion	Ketamine and Xylazine	4.5 mg/kg and 1 mg/kg	IM
Tiger	Ketamine and Xylazine	5 mg/kg and 1 mg/kg	IM
Snow leopard	Ketamine and Meditomidine	2.5-3.0 mg/kg and 0.06- 0.08 mg/kg	IM
Leopard	Ketamine and Meditomidine	3 mg/kg and 0.07 mg/kg	IM
Small felids (cats)	Ketamine	5-10 mg/kg	IM
	Ketamine and Xylazine	3-5 mg/kg and 0.06-0.08 mg/kg	IM

*Kindly refer to report on "Standards, guidelines and protocol" prepared by the IVRI for CZA

Primates

- The chemical capture should be carried out during cool hours of the day.
- Standard techniques and dose regime should be followed during chemical immobilization.
- Drugs suitable for the particular species should be used for chemical capture.
- Dose regime for chemical immobilization of the animals may be as given below subject to the advice of the veterinary officer on case to basis:

Name of the species	Drug	Dose regime	
Macaques, langur and leaf monkeys	Ketamine and medetomidine	5-10 mg/kg and 0.05 mg/kg	IM

*Kindly refer to report on "Standards, guidelines and protocol" prepared by the IVRI for CZA

All the equipment should be kept ready.

Recipient-Zoo

- Before getting approval from the Central Zoo Authority, the recipient zoo veterinarian may visit the donor zoo and mutually agreed on the animals to be exchanged.
- Animals should be housed in stress free environment.
- Observation of the animal for general health should be carried out en route as and when needed.
- Sufficient quantity of food and water should be kept in the vehicle during transportation.
- Check list for Veterinary drugs and equipment during transportation should be prepared and kept ready.
- Quarantine and health check up should be carried out as per the veterinary protocol.
- Close monitoring of the animal for behaviour, feeding pattern and health should be carried out.

7. Human Resource Considerations

- Veterinarian of the recipient zoo should accompany the animals during the transportation. In special case, Veterinarians of both the donor and recipient zoo may accompany the animals during transportation.
- One Forest Range Officer (In case of Forest Department zoos), one supervisor, two to three animal attendants should accompany.
- Recipient Zoo should arrange at least a full time keeper for the animal in advance.
- The recipient zoo should arrange training for the keeper engaged for the newly arrived animal at the donor zoo three months in advance.

8. Liaison with Agencies

The Director of zoo should arrange permission and liaise with the following agencies/departments for any animals:

- Donor / Recipient Zoo agreement
- Chief Wildlife Wardens and State Forest Department of concern states
- CZA (for permission)
- CITES (for permission: International exchange of animals)
- Quarantine officer of the region
- DGFT (International exchange of animals)
- MoEF, Govt of India : (International exchange of animals for permission)
- Custom department (International exchange of animals)
- Zoos: En-route
- State Forest Department/s: En route
- Agencies for emergency-assistance (as per the requirement)

Concluding Session
(28th January, 2011)

Valedictory Address

by

Shri. R. Sundararaju, I.F.S.
Principal Chief Conservator of Forests and Chief Wildlife Warden, Chennai

In many countries, the vital significance of an ecological balance among homosapiens, wild fauna and flora are still not well emphasized, despite the undertaking of multiple efforts of conservation. If fauna gets eradicated or disappears, tomorrow it is the animal and finally it is the man who will disappear. So, we need to conserve wild fauna and flora not for animal welfare but for our sake, in reality!. By adapting the protective measures for different species of wild animals, we may achieve the sustainable conservation in our country.

Among animals, the wild animals are the ones unlike domestic animals suffer most from transport or other handling related events either in the form of capture myopathy or shock condition, which directly or indirectly affects the functioning of heart, thus leading to death of these animals in comparatively a shorter period to the surprise of everybody.

Such scientific information and facts have been brought to limelight many a times, by not only national but also the international scientific community who are in association with zoos or protected regions.

Hence, it is high time that this workshop has been organized focusing the transport related problems.

Especially among wild animals, as understood by many veterinarians serving in zoological parks or zoos or zoological gardens, it is the deer species that gets affected mostly by transport related events !

It is really appreciable that the Central Zoo Authority of India and TANUVAS in collaboration with Arignar Anna Zoological Park are focusing on the arriving of protocols for a safe transport of wild animals especially giving emphasis on deer.

There is no doubt that many zoo veterinarians would have failed in the successful and safe transport of different species of deer. Further, let me reiterate that deer species of this country or others are highly vulnerable to the muscle related disorder specifically.

I came to understand that different groups were formed with zoo veterinarians as members of the groups

like DEER GROUP, BIRDS GROUP, REPTILES GROUP and PRIMATES GROUP. Elaborate discussions were carried out almost in two separate sessions and finally conclusions were analysed and protocols are being arrived at for recommendation to Central Zoo Authority of India.

Let me really congratulate the Department of Wildlife Science at Madras Veterinary College of TANUVAS for having successfully conducted this CZA sponsored workshop at National Level associating the Zoo Veterinarians from length and breadth of this country.

At the outset, let me request the zoo veterinarians to take utmost care in assisting the safe transport of wild animals, so that the conservation of wild fauna will get tremendously strengthened.

In this workshop many reputed scientists as well as veterinarians in the field of wildlife medicine have delivered addresses about safe transport of various wild animal species including small Indian black kites and barn owls.

Hence, it may be crystal clear that the wide spectrum coverage would have implanted many useful and scientific information among zoo veterinarians in large in this National Workshop.

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