GUIDE
Safe Animal Capture and Sampling

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**Objective**: To provide principles and general considerations for the safe capture of wild animals and safety of personnel during these captures.

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SECTION 1. LEARNING OBJECTIVES AND CONFIRMATION

If you understand the material in this Guide, you should be able to:

- Explain the PREDICT Bushmeat Sampling Policy.
- Safely participate in animal capture activities.
- Identify potential personnel risks of injuries and risks of exposure to zoonotic pathogens associated with the capture of wild animals.
- Develop a personnel safety plan for animal capture activities.
- Identify potential risks of injury or harm to animals that may be captured and identify ways to minimize those risks.
- Explain the special hazards associated with the use of anesthetic drugs and other chemicals used in animal capture.
- Explain important precautions to protect animals when the animals are anesthetized or physically restrained.

Confirm you understand the material of this Guide:

When you are familiar with the information in this Guide, take the PREDICT quiz on Animal Capture Safety.

The instructions for taking the quiz on Animal Capture Safety may be obtained by contacting your Country Coordinator or David Bunn at dabunn@ucdavis.edu.
All sampling of wildlife will be conducted in a humane and ethical manner, minimizing the impacts on wild populations. The "Three-Rs" of wildlife research will be observed:

- **Replacement** - Animals may be used only if the investigator's best efforts to find a replacement by which to obtain the required information have failed.

- **Reduction** - The fewest animals appropriate to provide valid information and statistical inference.

- **Refinement** - The most humane, least invasive techniques must be used with the goal of minimizing pain and distress.


Even in situations when lethal sampling may be perceived as quicker, easier or less expensive, we will pursue humane and non-lethal methods for sampling.

In some instances, an unrecognized or previously undescribed species may be captured during sampling activities. Under these circumstances, the PREDICT partner may deem it necessary to collect a voucher specimen in order to identify the species of animal. Collecting a voucher specimen requires the euthanasia and preservation of an entire animal for the purpose of performing detailed genetic and morphological characterization. If the collection of a voucher specimen is necessary for identification, then that animal will be euthanized in accordance with the humane practices defined in the relevant IACUC protocol. Whenever a voucher specimen is collected, the PREDICT Executive Board will be notified.

Finally, no incentives, financial or otherwise, should be given to local hunters, vendors, or others that would lead to the capture or killing of additional animals or species that would not otherwise have been taken from the wild, either on the day of sampling or in the future. This includes not purchasing animals for sample collection purposes, even in market settings; as such purchases either through exchange of money or a financial equivalent, could exacerbate perceived demand. PREDICT partners will maintain vigilance regarding the potential for their presence to alter local market or trade dynamics, and PREDICT staff will modify their behavior and methodologies as needed if sellers or collectors seem to be tailoring their activities to match perceived PREDICT interests.
SECTION 3. PRINCIPLES & GUIDELINES FOR PERSONNEL SAFETY AND HEALTH DURING WILD ANIMAL CAPTURE

1. Personnel Safety

Capture, handling, and anesthesia of wildlife during field projects are often carried out in remote areas away from medical assistance. Therefore, every possible effort must be made to prevent injuries to personnel. The following precautions should be considered for fieldwork that involves handling animals for diagnostic samples:

- Field teams, particularly animal capture teams, must be prepared to deal with potentially hazardous situations and have contingency plans in place to respond to accidents, injuries or other unexpected circumstances.

- Investigators implement measures, in accordance with protocols or established guidelines, to protect their staff, co-workers and themselves against possible injury or exposure to potentially dangerous procedures, drugs, chemicals, animals, or animal fluids and waste.

- Investigators must clearly identify and discuss with project personnel the hazards to human health and safety and the appropriate safety precautions to be taken when working with wild animals.

- Investigators should ensure that all project personnel are properly trained, have written procedures, and have the appropriate protective clothing and personal protective equipment (PPE) for their safety.

- Investigators should familiarize themselves with known biohazards specific to the species under study and with the procedures to avoid exposure to these agents.

- Personnel should work in teams of at least two people in the field, especially when involved in physical or chemical restraint and handling of animals or other high-risk situations.

- Field personnel should use appropriate physical and/or chemical animal restraints to prevent injury to an animal and personnel.

- If an animal becomes difficult to handle safely, the handler should release the animal if it is safe to do so. Additional restraints, chemical or physical, may be needed to adequately control the animal safely.

Keep an open route of escape when working with animals.
• Personnel may need to wear protective clothing including protective footwear with non-slip soles, sturdy clothing (e.g. long-sleeve shirts, long trousers, plastic aprons, etc), and gloves. The appropriate protective clothing depends on site-specific field conditions.

• Field workers should be trained in the tasks and safety procedures relevant to the animal capture and handling activities, including how to avoid injury from equipment or animals and to how to avoid exposure to potential pathogens.

Special considerations:

• Individuals with known allergies associated with animals, with immune deficiency diseases, or on immunosuppressant therapy, should not engage in studies involving the handling of wild animals.

• Certain animals, including but not limited to bats, dogs, and non-human primates, are known to harbor disease agents considered to be deadly to humans such as rabies. Any capture and manipulation of these animals warrant that the handlers wear double gloves, catching gloves (if necessary), and immediately report any bites or exchange of blood/fluids to supervisors, field coordinator or medical professionals if present in the area.

2. Safe Operation of Equipment

Personnel involved in wildlife capture should have current training in the use of pertinent equipment, including but not limited to different kind of traps, dart rifles, dart pistols and darts, nets, jab-sticks (pole-syringes), snare poles (rabies-poles) and all terrain vehicles (ATV’s). Knowledge on the correct use of equipment will help to minimize injury due to accident or the misuse of equipment during animal capture and handling.

3. Safe Handling of Animals

Supervising veterinarians and other PREDICT staff will handle animals as part of the surveillance program and sampling fieldwork. Staff should be trained on the potential hazards and safe handling techniques for specific types of animals they are likely to handle. Animal hazards may include injuries due to sudden animal movements, bites and scratches, and exposure to zoonotic pathogens. The following precautions should be considered for the safe handling of animals:

• Handlers should have a basic understanding of the animal’s typical behavior.

• All animal handlers should be trained in basic animal handling techniques and those techniques should be used consistently.
• Generally, slow and deliberate movements should be used around animals.

• Animal behavior can be unpredictable. Therefore, personnel should remain constantly alert when handling them. Personnel should watch for warning signs of animal aggressiveness and fear. These signs vary with animal species and may include vocalizations, raised fur, flattened ears, twitching tails, or bared teeth. An animal that feels threatened or cornered may be more aggressive than under normal circumstances.

• Extra caution should be used when handling animals that are sick, hurt, or are new mothers or highly territorial animals.

• If capture and sampling procedures may cause pain, animals should be handled safely and humanely with chemical immobilization and animal restraint devices as needed.

• Workers should use extreme caution when giving injections and handling sharps around animals; sudden animal movements could cause a needle stick injury to the personnel or injury to the animal’s vital organs.

4. Exposure to Anesthetic Drugs and Other Chemicals

Capture of free-ranging wildlife may place personnel at risk of injury. Injury can occur from animal attacks, capture equipment, or exposure to potent drugs. Every possible effort must be made to minimize the probability of human injury when undertaking chemical restraint and/or anesthesia of wildlife. The following precautions should be followed when using anesthetic drugs or other chemicals:

• The risks involved in using drugs for the capture and immobilization of wildlife must be identified and communicated to all project personnel.

• At least two people on the team should be trained in first aid and cardio-pulmonary resuscitation (CPR). First aid or CPR may be required in an accidental drug exposure emergency. A well-stocked first aid kit customized for each project should be kept within easy reach during fieldwork activities.

• An evacuation plan for an anesthetic drug related accident should be developed and communicated to all field personnel. Local medical authorities should be informed of the potential hazards of the field work and an evacuation plan to medical facilities should be discussed prior to beginning fieldwork.

• All drugs and chemicals used in field research should be handled in such a way as to prevent human exposure. Researchers or personnel authorized to use immobilization drugs should protect themselves against eye, respiratory
and cutaneous exposure to drugs and chemicals and accidental injection. The use of gloves, long-sleeve clothing, and protective goggles and/or face-shields may be indicated in some cases. There should be adequate quantities of reversal drugs on hand in the field if these exist.

- Those utilizing immobilization drugs for restraint of wild animals should have the appropriate training and information available to aid in their medical care should accidental contamination occur. It is advisable to always have drug manufacturer information for all medications in use as some human emergency facilities will not be familiar with drugs used for the immobilization of wildlife particularly in countries where such drugs are not available commercially.

- When darts are used to restrain animals, every reasonable attempt should be made to recover all darts that miss the target animal as they contain chemicals that could pose a public or animal health risk. As with syringes used to draw up medications, darts should be placed in a special container to avoid accidental exposure to personnel.

- National and local regulations with regard to drugs, specialized equipment (rifles, pistols), and liability issues concerning medical treatment of humans and/or human well-being should be clearly understood before fieldwork begins.

5. Biohazards and Zoonotic Diseases

Investigators and field workers are at risk for exposure to zoonotic diseases (diseases transmitted from animals to humans). The potential for zoonotic pathogen transmission varies depending on the animal species being handled. Pathogen transmission may occur through direct contact with contaminated dirty hands and equipment, bites and other direct exposure to animal fluids (blood, urine, saliva) or inhalation of contaminated dusts. The following precautions should be considered to prevent exposure to zoonoses when capturing or handling animals:

- Field workers should wash hands or use disinfecting hand wipes frequently. Frequent handwashing is the best defense against diseases transmitted through contact with contaminated animal saliva, other body fluids and wastes.

- Personnel should wear the warranted PPE, as indicated in a relevant protocol or as determined by the PREDICT field supervisor. PPE may be required to prevent bites or scratches. Protective eyewear and respirators may be needed to prevent exposure to pathogens transmitted by splashing of body fluids or secretions, or inhalation of contaminated aerosols.

- If injured by an animal or potentially exposed to a diseased animal, workers should immediately report to their supervisor and/or coordinator and seek the appropriate medical attention and follow-up.
• Investigators and supervisors should familiarize themselves with known biohazards specific to the species under study and with the procedures to avoid exposure to these agents.

• Prior to fieldwork, the Country Coordinator or field supervisors should provide training and information regarding all potentially hazardous biological or zoonotic agents that may be encountered in the field situation or that are relevant to the species under study.

• Field personnel should take precautions to avoid exposure to external animal parasites such as ticks, fleas, as well as to animal feces that may contain internal animal parasites (ova or larvae) infective to humans.

• Personnel handling vertebrate animals who become sick or show unusual symptoms should immediately report this to the supervisor and should contact medical authorities knowledgeable about the diseases and parasites associated with species in the region. Pathogens, that are potentially hazardous to humans (such as Nipah, Hendra, and hanta viruses), may be present in wild vertebrates.

• The Country Coordinator or field supervisor must ensure that safety procedures are established for the conduct of postmortem examination in the field and that appropriate protective equipment (e.g. aprons, gloves, face-masks, eye protection, etc.) is available and used correctly. The Country Coordinator is responsible for ensuring that all personnel be trained in the postmortem techniques appropriate for the species.

6. Immunizations and Pre-Exposure Screenings

The Country Coordinator or field supervisor should ensure that personnel have consulted with a human health worker with regard to the immunizations required prior to participating in fieldwork that involves handling animals.

Vaccines and immunizations will vary depending on the geographical area, animal species to be handled, and personal medical history. Only a human health professional can recommend and provide vaccination and immunizations to the staff.

Due to the significant risks of working with wild mammals (bats, rodents, etc.), field personnel should strongly consider pre-exposure rabies vaccination (before starting any field project) for themselves.

Tetanus immunization should be considered for all staff that will have any contact with wild animals.

Pre-exposure screening for tuberculosis is recommended for personnel that will be handling non-human primates. Depending on the geographic region, screening can
be done via intra-dermal testing or by chest radiographs or serology testing, the latter two if personnel have been previously vaccinated. Tuberculosis screening and interpretation of results should only be conducted by a human health professional.

7. Records

A record must be kept of all training given to PREDICT personnel and reported to PREDICT Management. For each training activity (On-the-job, self study, small group training, workshop) the following information should be reported in the Training Report:

- Date of training
- Type of training (workshop, on-the-job, simulation, field or lab training)
- Where trained (what town, country)
- Topics covered
- Instructor(s)
- Trainees’ names, phone, email, title, organization, and sector

Country Coordinators and field supervisors should maintain a record (on the PREDICT report form) of any injuries or illnesses incurred while handling wildlife (whether in the field or laboratory). Such information should accompany the individual when examination or treatment by a medical practitioner is needed.

Applicable local regulations regarding the documentation and reporting of workplace injuries should be consulted and followed.

Field supervisors should also maintain a record and pertinent product information of all immobilization drugs in their possession and as well as their usage.
SECTION 4. PRINCIPLES & GUIDELINES FOR ANIMAL CARE AND SAFETY DURING CAPTURE

All appropriate measures should be taken to minimize injury or harm to animals during capture and handling. Animals can sustain injuries or develop pathologic conditions during capture that could put their life in danger or decrease their chances of survival in the wild. Appropriate handling and restraint techniques should be used, and training in how to apply them should be provided to avoid injury to animals.

The investigator also must ensure that all workers fully understand and are trained in the techniques to be used for restraint and handling of wild animals. Improperly trained individuals or improperly applied techniques could harm the animal during the capture and handling.

Capture and handling can be accomplished using physical or chemical restraint or a combination of both.

Several factors must be considered to determine what type of restraint will be used on a specific project:

- Animal species and condition (sick, stressed, nursing, etc)
- Safety for the staff to carry out the capture
- Animal safety
- Feasibility of accomplishing the capture’s objective with the type of restriction
- Availability of drugs and specialized equipment to carry out the capture procedure
- Ability to protect, observe, and assist an animal until it has fully recovered after the procedure

1. Physical Restraint

Physical restraint may be most appropriate for some species and/or for short procedures. Animal handlers must ensure that physical restraint is performed in such a way that the animal will not suffer excessive stress or any injury during the process.

Physical restraint may be accomplished with latex or nitrile gloves only or with specialized equipment such as leather gloves, nets, rabies-poles, etc. The capture team must be capable of correctly using and operating such equipment to avoid animal injuries during capture.

Disposable gloves must be worn during handling and during the operation of specialized equipment. Researchers must be trained and capable of using and operating all equipment used for capture to avoid injuring the animal.
When using leather gloves to restrain an animal, the operator must ensure that excessive pressure is not applied to avoid suffocating the animal.

When using nets to capture wild animals, removal from the net should occur immediately to avoid further entanglement and possible fatal and non-fatal injuries to the animal.

The risk of causing trauma to an animal when using a snare or rabies-poles is high, thus the benefits should outweigh the risks when considering their use. If using a snare-pole, it is important that the snare be placed around the neck AND one of the front legs of the animal to prevent the risk of asphyxiation.

In certain cases and with species that are vulnerable to stress, chemical restraint may be more appropriate.

2. Chemical Restraint

Chemical restraint should be considered when physical restraint is not safe for either the personnel or the animal being captured. Chemical restraint should be performed by personnel with experience and training in the use of anesthetic drugs and field anesthesia procedures.

The following considerations should be taken into account when deciding to chemically restrain an animal:

**Drug selection**
- Investigators should be familiar with the different drugs and drug combinations that can be used to safely capture a particular wild animal species.
- All drugs have intrinsic cardiovascular effects. The supervisor veterinarian must be familiar with these effects and how to respond to any complications caused by these effects.
- Supervising veterinarians must be aware of any contraindication for the use of particular drugs on target species under the existing conditions.
- Investigators and supervising veterinarians should be aware of the availability (or lack of) of certain anesthetic drugs and the regulations in place to import them into the country.

**Drug administration**
- During field captures, drugs that are often administered by injection can be administered by either hand, pole-syringe (manual, spring-loaded) or darts (dartgun or blow darts).
- Staff should be familiar with the use of equipment (darts, pole-syringes) to avoid harming the animal during drug administration and immobilization.
- When hand injection is elected, the correct size needle should be used to avoid excessive trauma to the muscle or a penetrating wound in vital organs.
• Staff using darts to administer drugs should be trained on the use of the equipment required for the species and field setting.
• Darts have the potential to cause trauma if projected with excessive force or injected into a non-targeted area. Practice is the best way to assure that appropriate force is used when darting an animal.

Sites of injection
• Anesthetic drugs should be injected into large muscle masses.
• Excessive force should be avoided when firing a dart as this could result in broken bones or perforation.
• Darts placed into the abdominal or thoracic areas are potentially fatal for the animal. Personnel should take great care to avoid placing a dart into one of these body areas.

Monitoring anesthesia
• Anesthesia should be kept as brief as possible to minimize risks.
• When an animal is under chemical restraint, it should be monitored constantly to detect possible complications during anesthesia.
• An anesthetized animal should never be left unattended.
• Anesthetized animals cannot regulate their body temperature. Measures should be taken to prevent hyper- or hypothermia.
• Monitoring should include at least temperature, heart rate, respiratory rate and partial saturation of oxygen using a portable pulse-oxymeter.
• The staff should be trained to respond properly to any emergency or complication occurring during anesthesia (e.g. how to treat hyperthermia)
• If necessary, the anesthesia should be reversed or terminated to avoid fatal complications.

Recovery
• Animals must be released as fully recovered from anesthesia as possible to avoid unnecessary risks.
• Animals should be allowed to recover in safe areas, away from hazards and areas where potential predators may be present.
• Once released, the animal must be observed for as long as is required to ensure it is awake, alert, and active.
• If the animal suffers an injury during capture, the injuries should be treated appropriately before releasing the animal.
• If the injury sustained is life-threatening or will render the animal incapable of surviving in the wild, humane euthanasia should be considered.
SECTION 5. GUIDE CHECKLISTS

Procedures Checklist -- Personnel working in the field with wild animals should follow these basic personal procedures:

☐ Coordinators should provide all personnel a “Useful Contacts” list with addresses and numbers of local medical and emergency response services.
☐ Researchers working with wild mammals should consider pre-exposure rabies vaccination.
☐ Rabies vaccination should be given to personnel who routinely handle high-risk species in the wild (bats, raccoons, etc.).
☐ Researchers and their assistants should also consider vaccination against tetanus in those situations where exposure to this pathogen is possible.
☐ Individuals who are exposed to potential vectors of rabies (e.g. animals with neurological signs) should immediately report the exposure to medical authorities and the supervisor.
☐ All animal tissues, fluids and excrement should be handled so that the potential for human contact is minimized.
☐ Staff should thoroughly wash or sanitize hands and any other contaminated skin surfaces with a germicidal skin cleanser immediately after handling wild animals or their samples.
☐ All personnel handling wild animals should practice good hygiene and avoid rubbing their eyes after animal handling.
☐ Appropriate planning and specific precautions (trained staff, equipment and tools in good working condition, PPE, etc.) should be taken in order to prevent injuries from bites, scratches and skin punctures from wild animals. Even minor wounds or scrapes may become infected and can potentially result in disease transmission.
☐ If an injury occurs, clean the wound with a disinfectant and immediately contact a coordinator/supervisor.
☐ Where there is a risk from aerosolized pathogens from saliva, feces or urine, protective gear such as gloves, eye protection, respiratory protection (masks, face-shields or respirators), foot protection and protective clothing should be used as necessary.
☐ Researchers should always wear gloves and facemask when handling sick or dead animals.
☐ Personnel performing post-mortem examinations in the field should wear at least a plastic apron, gloves and facemask or goggles.
☐ After any post-mortem examination is performed, staff should wash and disinfect hands and any other contaminated skin surface.
☐ All contaminated equipment should be cleaned and disinfected immediately after use.
☐ All drug containers, needles, scalpel blades, suture needles and other sharp instruments should be used and disposed of in a manner that prevents accidental human injury.
Physical restraint of wild animals should be kept as brief as possible.

Care should be exercised when using equipment such as nets, gloves, rabies-pole, etc to capture wild animals.

Staff should be familiar with dart equipment, sites of injection and drugs when chemical restraint is elected.

Anesthesia monitoring equipment and emergency drugs are available and staff should familiar with their use.

Staff will make sure each animal is fully recovered from anesthesia prior to release.

A list of the equipment and supplies needed to correctly implement the recommendations of this Safety Guide for Animal Capture for Sampling is available and checked prior to departing for the field.
Checklist for Supplies for Animal Capture Activities

Check as appropriate:

**PPE**
- Latex or non-latex (nitrile) gloves
- Leather or kevlar gloves
- Face-mask
- Goggles
- Face-shield
- Disposable (Tyvek) suit
- Sharp-container
- Closed-toed shoes

**Monitoring**
- Thermometer
- Stethoscope
- Pulse oxymeter with probes
- Penlight
- Warm-water bottles (to prevent hypothermia)

**Immobilization equipment**
- Dart equipment (rifle/pistol/blowpipe, CO₂ cartridges, and dart protectors)
- Drugs (sedatives, tranquilizers, anesthetic drugs, reversals or antagonists)
- Darts and dart needles
- Ropes
- Nets
- Pole-syringe
- Cargo-net
- Blindfold
- Ear-plugs
- Carrying bags
- Syringes and needles
- Towels
- Snare-pole

**Emergency**
- Emergency medications (doxopram/atropine/epinephrine antibiotics)
- IV catheters
- Fluids (NaCl, Ringer’s lactated, Dextrose)
- IV administration set
- Tongue swabs
- Vet wrap or tape
- Flashlight
- Minor surgery pack
- Euthanasia solution
- Alcohol (to treat hyperthermia)
- Tissue glue or super-glue
- Blanket/towel (to help treat hypothermia)
- Cold pack/hot pack

**Recovery and release**

- Crates/containers in which to place animal during recovery
- Binoculars
SECTION 6. REFERENCES

Sanchez, C. 2009. Anestesia y captura de animals silvestres. Presentation at the Universidad Austral, College of Veterinary Medicine. Valdivia, Chile.