Operational Manual for SatelliteTelemetry on Royal Bengal Tiger

Ministry of Forests and Environment
Department of National Parks and Wildlife Conservation
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Cover photo: Field camera photo of Royal Bengal tiger in Chitwan National Park, 2010.

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Foreword

The tiger (*Panthera tigris*) is an apex predator species with important ecological and socio-economic values. Their habitats are changing rapidly and the species still faces many existing and new threats for their survival. Scientific research is crucial to advance our understanding of the animal's complex ecology and interactions to aid their conservation.

Nepal is one of the 13 countries in the world where tigers are found in their natural habitat. As mandated by the Tiger Conservation Action Plan and Terai Arc Landscape Strategy and Action Plan, research and conservation interventions are being implemented to secure the species throughout the Terai lowlands within the country.

Adopting latest technological advancements such as satellite telemetry greatly aids our understanding of the species. This document provides general guidelines covering preparations for the study, information on telemetry equipment, as well as step-by-step procedures on site selection, trap placement and capture, immobilization, collaring and monitoring of collared tigers in Nepal. It aims to facilitate further research on tiger in other tiger habitats in the country and help overall understanding of the species.

I would like to acknowledge the International Union for Conservation of Nature and Natural Resources (IUCN) Nepal and National Trust for Nature Conservation, as well as researchers and reviewers who assisted in preparing and reviewing this guideline. I appreciate their efforts and express thanks to their contribution to enhancing tiger research in Nepal.

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Deepak Kumar Kharal, PhD
Director General

Abbreviations

DoFSC	Department of Forests and Soil Conservation
DNPWC	Department of National Parks and Wildlife Conservation
GPS	Global Positioning System
IUCN	International Union for the Conservation of Nature and Natural Resources
KET	Ketamine
MED	Medetomadine
MoFE	Ministry of Forests and Environment
NTNC	National Trust for Nature Conservation
PA	Protected Area
UHF	Ultra high Frequency
VHF	Very high Frequency

1. Background

Tigers are one of the world's most iconic wild species, but today they are endangered throughout Asia. They once roamed across much of this region, but widespread habitat loss, prey depletion and poaching have reduced their numbers to only about 4,000 individuals. Protecting tigers is a global conservation priority, exemplified by a landmark international initiative to double global tiger numbers (called "Tx2") from 2010 to 2022.

Nepal is one of the 13 tiger range countries. The tiger occurs in the Nepal Terai lowlands – a biodiversity hotspot that is home to 4.5% of all the world's mammals, including other globally important populations of iconic species like the one-horned rhinoceros and Asian elephant. The tiger is an apex predator that plays a crucial role in those ecosystems. Tigers are also a conservation umbrella species, which means that their conservation helps protect many other flora and fauna species. The tiger attracts huge numbers of tourists from around the world, helping support local economies.

Nepal has been conducting various research and conservation interventions across the tiger's distribution range in the country to feed into global understanding of the tiger and to aid its effective conservation. However, tiger conservation in Nepal still faces major challenges, including habitat degradation by human development, linear infrastructure such as roads and railways, poaching of tigers and their prey, and conflict between tigers and humans. As humans encroach into tiger habitats, new threats will likely emerge such as disease transmission between pets and tigers and climate change impacts to habitats and wildlife communities.

GPS collars are an advanced technology that can reveal new information about tiger ecology and inform country-wide efforts to increase (or maintain) tiger numbers and habitat connectivity. GPS collars can provide new, crucial data that cannot be obtained using camera traps or other traditional field methods. For example, GPS collars can: (1) assess fine-scale tiger behaviors and movements near roads, railways, and human settlements at all times of the day; (2) estimate energy use by tigers and wild prey needs to meet energy demands in different habitats; (3) enable rapid response to real-time events and issues, such as injury, illness, human-tiger conflict, or poaching; and (4) promote new areas of future research and conservation activities. Therefore, satellite telemetry using GPS collar can provide evidence-based solutions to land planners and conservation organizations to minimize threats to tigers now and in the future. This document is prepared by a team of experts (Appendix V) to act as a guideline for carrying out GPS collaring of tigers in Nepal.

2. Objective:

The objective of this manual is to provide best practices and guidance for implementation of satellite telemetry on tigers in Nepal, to improve scientific information and understanding on the species. Specifically, this manual provides the framework for planning, execution, monitoring and reporting of tiger satellite telemetry research.

3. Considerations while collaring tigers in Nepal

Moral

Considering the invasive nature of telemetry projects, personnel engaged in such a study should handle the tiger with extreme care during all phases of telemetry operation including capture, immobilization and transmitter attachment procedures.

Capture techniques need to be designed in such a way to minimize stress to the animal. Selection of the appropriate technique will be based upon several factors.

a) An understanding of the behavioral, physical and physiological characteristics of the species to be restrained.
b) Field conditions under which the procedure will occur.
c) Knowledge and skills of persons handling the animal.
d) Purpose of the investigation.
e) Availability of appropriate drugs, equipment and facilities.

Additionally, the collaring team must adhere to local customary practices and religious rituals, during the collaring expeditions, in consultation with participating local community members.

Legal

The Ministry of Forests and Environment and the Department of National Parks and Wildlife Conservation (DNPWC) has the sole jurisdiction and responsibility for over all wildlife research and conservation activities in PAs in Nepal. The Ministry and the Department issue permits to researchers for carrying out operations regarding capture, handling and/or collecting samples of wildlife. Necessary permits must be obtained before commencing such a study.

For issuing permits, the MoFE and DNPWC will refer to the needs for such complex research using advanced technology, as portrayed in the management plans of the respective PAs. If not included in the management plan, but identified as critical, the plans may be updated accordingly.

All coordination, execution and reporting, on the research project will be led by the ecology section of DNPWC.

Technical Team Composition

Any conservation effort benefits from participation of local community. Other than technical experts, a team undertaking such expedition must include local community representatives to capitalize on their traditional knowledge of tigers and their habitat. The success of this project will depend greatly on identifying and including the appropriate local team members.

Therefore, core team members for such an exercise will comprise field biologists, veterinarian, wildlife technician, government authorities, and community representatives. Security personnel (Nepal Army/Police) may be included in the team as deemed necessary based on local conditions and circumstances. Photographer/Videographer may be included in

the team for documentation, as necessary. Support staff from the respective Park and conservation organizations may be included in the project operation.

Equipping the team with good quality field gear will be necessary for an efficient and smooth functioning in the difficult terrain.

Training should be provided to team members on details of the expedition, telemetry equipment, animal behavior, techniques of handing, capturing and immobilization prior to engaging them in the field operations.

Roles and Responsibilities of Team Members

S No	Team member	Roles and Responsibilities
1	Government authorities/team leader	Overall leadership in planning, execution and monitoring of the telemetry expedition including logistic management; and mainstreaming of the project learning into tiger protection programme in Nepal
2	Field Biologists	Technical planning, preparation and execution of collaring; data recording and analysis.
3	Veterinarian	Medical planning, preparation, sedation, examination, sample collection and revival of captured animal.
4	Wildlife Technician	Darting the animal and necessary assistance to veterinarian.
5	Local community representatives	Assist team in overall preparation and execution of capture and collaring including identifying sites and trap placement, monitoring traps, collaring procedure, etc.

Animal Behavior

Tigers are extremely shy felids. Perceived human presence can be a strong deterrent for the animals to avoid research sites. Trap designs therefore must be inconspicuous, free of any unnatural fragrance, and natural as much as possible. To ensure that all traps are functional while minimizing human scent in trap sites, monitoring of traps is recommended every day (daily). However, the frequency will be guided by local conditions; for instance, in areas with excessive vehicle movement and other anthropogenic activities, the frequency of checks will need to be increased to ensure functionality of the traps.

Kill sites provide greater capture chances than usual trails. However, the carcass (more than 20% biomass) and the surrounding must not be tampered with, as the animals are known to discard kills under such circumstances.

An animal when trapped is likely to be highly aggressive and would vigorously struggle to free itself. The trap sites therefore must be selected and traps set in areas where chances of the animal injuring itself is minimal.

Season

Climatic conditions vary in the Nepal Terai. Generally, best seasons for field work in the lowlands are late winter and spring (Feb-April) and autumn (September – November). However, the expedition team needs to evaluate the appropriate time understanding the climate trends and micro-climate conditions.

4. Field procedure

STEP 1: Preparatory Work

- Consultation meetings with the Division Forest Office, PA Office, and concerned stakeholders will be organized at the field level.
- Reconnaissance survey will be conducted for site selection.
- A team of experts will make a reconnaissance visit to the survey area a month prior to the actual collaring operation. This needs to be undertaken mainly to select appropriate collaring sites and to assess the performance of the GPS collars.
- Existing information on tiger activity centers obtained through camera-trap and sign-based surveys will be used to identify potential collaring sites. In addition, automatic cameras will be deployed to monitor tiger movement across the study area during the reconnaissance visit. Potential tiger individual will be identified for collaring which is residential in the area. Duration of camera trap survey is usually 15-20 days before deploying the traps for collaring operation.
- Prior to collaring, the device will be tested to determine the rate of successful uplinks, background radio noise and the degree and magnitude of errors pertaining to location data (GPS fixes). These tests can be carried out by fitting the units open under the sky in and around the survey sites.

STEP 2: Tiger Capture

- The first option is to use the traditional tiger capturing method. Once the location and target animal are identified, bait of buffalo will be set at multiple sites within the target location. When tiger makes a kill, the tiger will be located and captured following the traditional method using elephants and white sheets (Sunquist 1981). The field team has extensive experience using this method and it is very effective.
- The second option is to use customized foot-hold snares adopted from foot snares used in Thailand. A list of capture equipment is given in Appendix I.
- When using the second option, the traps will be placed in tiger activity centers of the targeted individual tiger, close to a fresh kill, or along trails frequently used by the animals, identified based on their signs. However, trapping sites will be carefully selected in order to ensure the safety of the animal. Sites close to water bodies or areas near human habitations, etc., will be avoided. A format to record the details of trap sites is given in Appendix II.
- Each snare will be connected to trap-site VHF or satellite transmitter, which will be remotely monitored from a nearby location using a VHF receiver and antenna. Message will be received in smart phones via satellite system as and when the traps get triggered. This system will help significantly reduce the time that a tiger spends in the snare.

STEP 3: Immobilization

- A complete set of equipment for crating, collaring, handling emergencies, collecting samples, and any other procedures must be in place before the animal is darted. See Appendix III for the list of items needed for immobilization.
- Best practices will be utilized to immobilize and anesthetize tigers with a combination of Medetomadine and Ketamine, using Atipamezole as the antidote. Medetomadine (MED) and Ketamine (KET) will be mixed with dose rate of 0.07 mg/kg body weight (BW) and 3 mg/kg BW respectively.

- The drugs will be administered in the rump of tiger by darting 3-5 ml syringes fitted with a 1.5-2.0 mm X 38-40 m collared needle.
- Air powered dart gun equipped with advanced sighting device and powerful light will be used to fire the dart. The distance to captured tiger will be maintained at 7-15m during the operation.
- Immediately after successful darting, the capture site will be vacated (to reduce noise and other disturbances) to minimize stress to the animal. If at night, lights will be turned off after darting.
- The animal will be approached in about 10-15 minutes to check the effect of sedation, and to ensure that its position is not obstructing respiration.
- The depth of anesthesia will be assessed by either tapping on tail or ears with the help of long pole; it is considered optimum if the jaws can be opened and tongue exteriorized with little or no resistance. Other indicators include responses to stimulation of body, feet, cornea, ears and tongue.
- If the animal is found active even 15 minutes after darting, sedation will be considered unsuccessful. The animal will be re-darted with required dosage as estimated by the authorized veterinarian, based on the level of sedation brought about with the previous dose.
- A complete immobilization record, particularly including each drug given, amount given, time of administration and physiological parameters will be maintained during the procedure. These details will be recorded in the datasheet (Appendix IV). The filled datasheet will be provided for official documentation and kept for necessary analysis in the future.

STEP 4: Handling and Monitoring

- Remove the dart.
- The animal will be blindfolded to protect the cornea from direct sunlight, dust and injury, as well as reduce stress in the animal.
- The animal will be properly positioned (sternal or lateral recumbancy) to maintain patent airways and ensure normal breathing and circulation.
- Physiological parameters such as rectal temperature, heart rate, respiration and oxygen saturation (SpO_2) will be recorded at every 5-minute interval throughout the period of sedation.
- Monitor level of sedation by assessing the muscle tone-jaw tone and eye reflexes.
- If the capture site is unavoidably located in sites deemed unsafe for recovery, the animal will be moved to a safer 'pre-determined' handling and awakening location.
- Standard body measurements will be taken. Blood, hair, and ear swabs will be collected for serologic, genetic, and parasitological analysis.
- Approximate age of the tiger will be determined based on body weight, size, and tooth wear. Female tigers will be visually inspected for any current and previous lactation.
- Any wounds (either capture-related or from pre-capture events) will be treated by applying 2% iodine solution. A dose of antibiotic (500-mg amoxicillin) can be administered intramuscularly, if deemed necessary.

STEP 5: Collaring and Monitoring

- Captured tigers will be fitted with satellite GPS collars based on appropriate communication platform. For example, the Vectronic PLUS collars will be used in conjunction with Iridium satellites.

- Collar belt must not be too tight nor too loose. The fitting can be checked by inserting a finger (usually thickness of one finger) between the collar and neck. It is also important to ensure that the transmitter is on the dorsal portion of the neck and battery in the ventral portion. (Considering the study objectives, the collars will be pre-programmed to collect fixes at 1-2 hour intervals. They will also be monitored via VHF (Very High Frequency) as required. The data will be used to determine tiger behavior, movement, response to infrastructure and human settlements. Data will be stored onboard which will be retrieved after the collar drops off from the animal. In addition, it will also be sent to work stations via the network of satellites.
- The telemetry system can also be fitted with UHF (Ultra High Frequency) communication system so as to enable two-way communication between the transmitter and receivers over a shorter distance. The collar will be programmed for both automatic and radio-controlled drop off. Technical details of the telemetry system can be found in Appendix I.
- UHF ID street tags will be used to connect with the GPS collars. The tags will be placed in trees along the linear infrastructures such as road at approximately ~500m intervals. When a tiger gets within 500m of the highway, the tags will communicate with the collar, and the collar will then begin recording GPS locations much more frequently (i.e., 15 min). This ensures the frequent GPS fixes when the tiger is near the road, while not draining the battery the rest of the time.
- In order to ensure successful retrieval of collar after the drop-off, the automatic drop-off should be timed in such a way that there will be adequate battery power to communicate with collar after the drop-off.

STEP 6: Revival Procedure

- Estimated duration of anesthesia is about 45-60 minutes, which should be adequate to fit the collar, record biological data, and collect blood, tissue, hair, and swab samples.
- The collared animal will be revived by administering the antidote of atipamezole hydrochloride (Antisedan Vet 5 mg/ml) intramuscularly in the quadriceps or triceps with a dose five time higher than medetomadine. It is advisable to administer the antidote dose even if the animal recovers spontaneously.
- Under the influence of anesthesia, traversing stream beds can be risky for the animal. Therefore, extreme care will be taken to ensure that sedated animal recovers in a safe terrain.

STEP 7: Monitoring and Data Acquisition and Sharing

- After the collared animal is released, the expedition team may need to wait a few days in the field to confirm successful satellite uplinks. The stress of collaring may cause the animal to avoid open spaces for some period of time, which may prevent data transfer from the satellite collar. Once the animal returns to its normal ranging behavior, the data uplink begins. This marks the successful end of the collaring procedure.
- Over the next months (as programmed), the collar provides information on the movement of the subject animal, over the internet. This data will be password-protected and accessible by few key personnel including team leader of expedition, field biologists involved in the expedition, research organization involved, ecology section of DNPWC, wildlife conservation section of DoFSC, and Biodiversity section of MoFE, and other relevant authorities. The movement data provided by the animal's collar will be closely and regularly checked by the authorized members and institutions.

- Occasional monitoring of the animal in the field may be necessary. The local PA authority and NTNC will mobilize their staff and/or local citizen scientists to carry out such field monitoring, as and when necessary.
- All information acquired from such study including geo-locations provided by the collar, photographs, videos, and other field data will be the property of DNPWC/ MoFE. If anybody wishes to use these data after completion of current project, prior permission must be taken from the DNPWC. In some cases, the DNPWC may consult with the respective donor regarding the permission. The priority for the use of these data will be given to the institutions, authorities and team members involved in planning and executing the current research project. Requestors of the data are encouraged to collaborate with those team members of the current research project.
- Ecology section - DNPWC, technical committee, focal point persons, and other government authorities will monitor the collaring procedure and post-collaring activity of the animal, either virtually or on field.

STEP 8: Reporting

- Field report of the completion of the collaring expedition (including background information, team involved, time-schedule and details of activities carried out and equipment used, along with photographs and videos of expedition, and all filled datasheet) will be submitted to DNPWC by the expedition team leader within 15 days of return from the expedition.
- Post-collar movement report of the animal (including geo-locations up to the time of reporting) will be submitted by the expedition team leader to DNPWC, as and when requested.
- Any authority assigned to monitor the collaring expedition and post-collar monitoring, need to submit their visit report to DNPWC and concerned authority.
- Half-yearly report on the overall progress of the project will be submitted by the ecology section of DNPWC to MoFE, in soft and hard copy, including waypoints, digital data in kml/excel format.
- The final report including all activities and results of the entire satellite telemetry research (in hard and soft copy) will be prepared by the technical committee, assisted by respective expedition team members and deputed assistants, and will be submitted to the MoFE.

5. Financial arrangement

Person involved in the field work and post collar monitoring must be fully equipped and capacitated. All the operational cost should be bared by the concerned telemetry project.

6. Emergency and Risk Management

S No	Emergency	Course of Action
1	*Hypothermia*	If the body temperature goes below 36.5°C, the animal will be covered in an insulated blanket. Hot water bottles can be placed in groin and axillaries of the animal.
2	*Hyperthermia*	The animal will immediately be moved to deep shade. If core body temperature is elevated, sprinkle water and fan the animal to cause vapor effect; in more severe cases, apply alcohol on foot pads, axilla and groin. If the temperature reaches 41°C (106°F) and continues to rise – a cold water enema (using stomach tube, funnel and lube) and/or IV

		fluids can be administered. The use of an enema will restrict the ability to monitor temperature during anesthesia, but can be a life-saving technique.
3	*Hypoxia*	Preferably, O_2 cylinders are to be included in the capture kit; if unavailable, doxapram can be administered for respiratory depression, but this is not a substitute for artificial respiratory support.
4	*Seizure*	Administer midazolam at initial contact to reduce occurrence of seizures. Treat seizures with Diazepam IV.
5	*Emergency reversal*	Atipamezole can be administered, if the animal needs to be reversed immediately.
6	*Mortality*	In case of incidental death of animal during collaring expedition, it will be informed to the concerned authority. The concerned authority will investigate the cause of incident. A detailed post-mortem report will be prepared and included and submitted to concerned authority.

Appendix

Appendix I – Equipment required

a. for capture

- Bear Lock
- Sodbuster 3lbs
- Extension cables (5'6" Long)
- Headlamps
- Walkie-talkie sets (>3 km range)
- Modified foot hold snare system from Thailand
- Trap-site VHF transmitter
- Omni Directional Antenna
- VHF receiver and Yagi Antenna

b. for telemetry

- GPS radio satellite collar (Eg. Iridium/GLOBSTAR uplink option) with battery life of multiple years
- VHF Beacon Transmitter
- Activity Logger
- Mortality Logger
- Temperature Logger
- Timer/Radio controlled Drop Off
- Wireless VHF/UHF bi-directional data communication
- Collar belt

Appendix II: Format to record trap site details

Form No		**Date**		**Elevation**	
Site Code		**Time**		**Latitude (N)**	
TT ESN		**WP No.**		**Longitude (E)**	
TT VHF		**Site name**		**Name of persons**	

Type of site:
Travel corridor: ☐ Scat site: ☐ Scrape site: ☐
Kill site: ☐
Others (specify): _____

Dominant substrate:
Rocky: ☐ Gravelly: ☐ Sandy: ☐
Fine-grained: ☐
Others (specify): _____

Habitat type:
Sal Forest: ☐ Mixed Forest: ☐ Riverine Forest: ☐
Tall Grassland: ☐ Short Grassland: ☐ Wetland:

Others (specify): _____

Terrain:
Foot hills: ☐ Flat: ☐ Churias: ☐
Others (specify): _____

Human presence:
Daily: ☐ Once a week: ☐
Once a month: ☐ Rarely visited: ☐

Tiger sign presence			
	Size/Number present	**Age class**	**Comments (include information on cubs, if found)**
Pugmarks			
Scrapes			
Scents			
Feces			

Prey species sign presence			
	Type of sign (footprint / feces / scrapes)	**Number**	**Age class**
Sambar Deer			
Spotted Deer			
Wild Boar			
Others*			

*Include details of other identified prey species

Other trap site observations:

Appendix III: Immobilization requirements

a. Drugs and supplies

- Medetomidine MED (Medetomadine 10 mg/mL, Kyron Laboratories (P) Ltd., South Africa)
- Ketamine KET (Ketamine – 1 Gram Powder)
- Eye gel (Viscotears, CIBA Vision AG, Hetlingen, Switzerland)
- Iodine solution (2%)
- Procaben LA (Intramuscular injection)
- Atipamezole hydrochloride (Antisedan vet 5mg/mL, Orion Pharma Animal Health)

b. Other equipment

- Dart syringe 3.5 mL with 1.5 X 30 mm collared needle
- CO2 powered rifle fitted with a red dot sight and powerful light
- O2 Cylinders
- Rubber hot-water bottles
- Hot and cold water
- Digital thermometer
- Spring balance
- Pulse Oximeter (Nellcor N65 Oximax handheld pulse oximeter, Nellcor Inc., Boulder, Colorado, USA) attached with sensor (etsat, Nellcor Inc.)
- Stop watch
- Stretcher
- Surgical pack - small sterile surgical pack in case of capture related injury along with sterile gloves, scalpel blade, absorbable suture, skin glue.
- Centrifuge - for spinning blood samples down.
- Ice pack with Styrofoam container to hold bloods (depending how long it takes to get to a refrigerator).
- Digital Camera
- Post-mortem kit (to be prepared in the unlikely event of mortality): scalpel, blade, knife, gloves, formalin pots, 10% buffered formalin, freezer bags. Proper permits in place for transport of animal (animal parts) if this occurs.
- Vernier caliper
- Weighing bag
- First Aid Kit

Appendix IV: Data Sheet for Recording and Monitoring Immobilized Tiger

Tiger ID .....
Date ..... Time of darting:.....

Conditions during darting		
Ambient temp (°C)	Day	Wind condition
	Cloudy ☐ Bright ☐ Other (specify).....	Strong ☐ Mild ☐ Still ☐

Physical condition during darting: .....

Behavior at the time of darting
(running, walking, standing, excited):
.....

Name of the immobilization drug(s) used: .....

Immobilization drugs	Name	Dose (mg)	Volume (ml)	Route	Time	Site	Person administering	Comments

Time when animal gets sedated (induction time): .....

Post-sedation physical evaluation			
Sex	Weight (kgs)	Approx. age (yrs)	Breeding status
Male ☐ Female ☐			Cub ☐ Juvenile ☐ Subadult ☐ Adult ☐ Senile ☐

Condition of animal (coat, ecto-parasite): .....

Respiration:
Shallow: ☐ Deep: ☐ Irregular: ☐

Regular: ☐

Physiological Condition Recording:

Observation occasion after darting		1st		2nd		3rd		4th		5th	
		Obs	Time	Obs	Time	Obs	Time	Obs	Time	Obs	Time
Vital signs	Temperature (C)										
	Heart rate (beats/min)										
	Respiration (breaths/min)										
	SPO_2 (%)										

Antibiotics and other supportive drugs:

Supportive drugs	Name	Dose (mg)	Volume (ml)	Route	Time	Site	Person administering	Comments (Antibiotics, etc)

Reversal

Name of the drug

……

Time when reversal drug administered

……

Reversal drugs used	Name	Dose (mg)	Volume (ml)	Route	Time	Site	Person administering	Comments

Time when animal recovered

……

Sample Collection:

Sample	***Yes / No***	***Comments***
Hair		
Scat		
Ear swab		
Nasal swab		
Blood		

Body Measurement:

Nose to head base: ..... Head base to tail base: .....

Tail base to tail tip: ..... Shoulder height: .....
Chest girth: ..... Neck girth: .....
Hind leg length:- Left:..... Right: .....
Fore leg length:- Left:..... Right: .....

Paw Measurement:

Paw	Length	Width
Front right		
Front left		
Hind right		
Hind left		

Claws missing: .....
Photos taken (if claws missing): Yes / No

Teeth Measurement:

Teeth	Length	Thickness at base
Upper right canine		
Upper left canine		
Lower right canine		
Lower left canine		

Photos taken (teeth): Yes/No
Photos taken (genitals): Yes / No

Collar Details
ID: .....
Make: ..... Model: .....
Supplier: Name:.....Address: .....
E-Mail:.....
Nominal collar circumference:
Belt width..... Thickness..... Color.....
Mortality Sensor settings:
Activity Sensor settings:
Magnet Removed:

Drop off
Relative release time: ... weeks ... days ...hours
Absolute release time: .... (dd/mm/yyyy) ... ... (hh/mm/ss)
VHF Frequency Used: ..... HST time: .....
Time format: UTC/LMT
VHF Beacon Schedule:
GPS Schedule:
Names and e-mail addresses of the persons to whom data will be forwarded:
1.
2.
3.

Appendix V: Methodology for Developing These Manual

These operational proceduces are the result of various forms of information, including insights from several experts in tiger biology and conservation as well as a literature review of methods in tiger capture and satellite telemetry. As such, these operational procedures consist of best practices for carrying out field expeditions for GPS collaring tigers in Nepal for research and conservation purposes.

The following individuals were key contributors to these manual: Mr. Hari Bhadra Acharya, Ecologist, DNPWC; Dr. Narendra Man Babu Pradhan, Program Coordinator, IUCN Nepal; Dr. Naresh Subedi, Conservation Program Manager, NTNC; Dr. Neil Carter, Professor, University of Michigan; Mr. Hem Raj Acharya, Assistant Ecologist, DNPWC; Dr. Babu Ram Lamichhane, Office In-Charge, BCC NTNC; Mr. Krishna Hengaju, Program Consultant, IUCN Nepal. These individuals met together regularly to develop the manual.

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