

# **PROTOCOLS FOR THE ESTABLISHMENT OF A NATIONAL REPOSITORY OF CAMERA TRAP PHOTOGRPHS OF TIGERS (NRCTPT)**

## **PART-I: WORK TO BE DONE AT RESERVE AND STATE LEVEL BEFORE IMAGES ARE SENT TO THE NATIONAL TIGER CONSERVATION AUTHORITY(NTCA)**

### **1. INTRODUCTION**

Photographic images of tigers are accumulating rapidly across India as a result of camera trap surveys, general photography, forensic work and other activities by multiple agencies. If these images are systematically collected and compiled in a retrievable and useful manner, they can be of immense assistance to the protection, management and rigorous monitoring of wild tiger populations in India. The purpose of this note is to outline the establishment of such a NATIONAL REPOSITORY OF CAMERA TRAP PHOTOGRPHS OF TIGERS (NRCTPT) under the direct control of National Tiger Conservation Authority (NTCA) with facilitation for instant sharing of information with States and other participants.

Intensive camera trapping has been now mandated as the main methodology for annual monitoring of tiger populations in key source populations and tiger reserves ([http://projecttiger.nic.in/whtsnew/Protocol\\_Phase\\_IV\\_Monitoring\\_r.pdf](http://projecttiger.nic.in/whtsnew/Protocol_Phase_IV_Monitoring_r.pdf)). Additional tiger photographs may be made available by individual reserve or through any other ad hoc camera trapping efforts as well as from photographs of dead tigers, skin seizures and photographs of wild tigers obtained by tourists, forest officials and other individuals. All statistical information about tiger populations in the country will be derived from these individual identifications based on rigorous analysis conducted by NTCA / outside experts at NRCTPT.

The first January of 2006 will be treated as the starting date for accumulating these tiger identifications in a rigorous, secure national database. Given the maximum life span of about 15 years for wild tigers, the database will have to be continually accrued over the years. An initial capacity for 99,999 individual tiger ID records is suggested.

Although the tiger photo-ID database can be a powerful tool, the possibility of problems arising from accidents, errors, and deliberate manipulation is substantial. Therefore, a carefully designed protocol to regulate and validate the inflow of photographs right at the establishment stage of NRCTPT is crucial. Furthermore, to use the software program '*ExtractCompare*' (Hiby et al. 2010) with its associated standard MS Access data-base, it is imperative to establish strict quality control regimes right at the inception to maintain high levels of data integrity. This document contains details on how such a reliable National Repository of Camera Trap Photographs of tigers (NRCTPT) can be established and maintained.

This document also contains five data forms which are used to ensure authentic recording of tiger photo data from Field level to the State level. ONLY '*Data Form - C*' is filled by hand in the field by survey personnel. Other four data forms are filled by authorized official / researcher at Reserve / State level.

### **2. RESPONSIBILITIES OF THE CENTRAL DATABASE MANAGEMENT FACILITY AT THE NTCA, NEW DELHI, AFTER THE DATABASE IS ESTABLISHED**

- 1) Receiving tiger photographs and ancillary information in a properly labeled, formatted and authenticated manner on hard copy forms and digital form together with authentication documents duly signed by authorized personnel certifying them.
- 2) Scrutinizing, selecting photos and entering the camera-trap photo-capture data and their associated photo-images into the database together with all the meta-data (including location, date, time, personnel involved, and other meta-data from storage media, camera traps, film rolls etc.).
- 3) Using software program *ExtractCompare* to perform batch level automated matching followed by visual examination to identify unique individuals and assign the unique ID numbers.
- 4) Documenting and archiving all received images (including those not entered into the database) for future reference, vouching, resolving disputes etc.
- 5) Generating all statistical analyses and interpretation of results.
- 6) Sharing these results with the respective states, parliament, participating scientific institutions/partners, etc.

The Regional Offices of the NTCA will facilitate the process by interacting with the States involved.

### **3. PROTOCOLS TO BE FOLLOWED AT THE STATE AND TIGER RESERVE LEVEL BEFORE COMMENCING FIELD DATA COLLECTION**

Each state with help from technically qualified persons/institutions will develop a SURVEY DESIGN for each Tiger Reserve or Source Site, keeping in view requirements specified under Phase IV of National Tiger Estimation and the **ladder process** of moving from Section 2 to Section 3 provisions therein.

Once the Survey Design is approved by the Chief Wildlife Warden (CWLW) of the State and necessary logistical needs, personnel and other resource needs are identified, the steps listed below will be required to implement field surveys for reliable data collection.

- 1) Each Tiger Reserve or Source Site will identify a “supervisor” to oversee the entire field survey operations. The supervisor can be either a Forest Department officer at the rank of Range Forest Officer or above, or a qualified scientist authorized by the state Chief Wildlife Warden to implement Phase IV protocols.
- 2) The supervisor at the Tiger Reserve or Source Site level will assign a unique LOCATION LABEL to each TRAP LOCATION where camera traps will be deployed in the field FOLLOWING THE SURVEY DESIGN APPROVED BY NTCA.
- 3) The supervisor will record and list all such TRAP LOCATIONS with their GPS co-ordinates as well as a GEOREFERENCED DESCRIPTIVE NAME associated with a map at 1:50,000 scale using the ‘*Data Form – A*’.

- 4) Each camera trap unit and film roll or electronic disk used for gathering camera trap data will get a unique, non-repeated identification number which should be inscribed on it.
- 5) The supervisor will prepare a deployment plan and schedule covering all trap locations identified in the approved survey design. Using the '*Data Form – B*', he/she will track the deployment of units at all locations in Tiger Reserve or Source Site.

#### **4. PROTOCOLS TO BE FOLLOWED BY FIELD SURVEY TEAMS**

The field protocols outlined below will be strictly followed and adequate checking / validation and supervision will be in place to ensure data integrity:

- 1) Each “double sided camera trap” (hereinafter called camera trap) consists of two cameras and tripping systems, each one with its own unique ID numbers.
- 2) While setting up camera traps ‘Date’ and ‘time’ settings of both the cameras at a trap location will be synchronized.
- 3) Only image storage device (e.g. memory card or film roll) which have unique ID inscribed on them, will be loaded into the cameras.
- 4) While out in the field, camera traps will be set up initially, checked routinely and removed systematically according to the deployment plan prescribed in *Data Forms A* and *B*. The set up and checking activities for camera traps will be carried out with all relevant ancillary data being recorded exactly as shown in '*Data Form – C*'.

It is important that all field survey personnel, supervisory personnel and others write their names legibly, sign and date the filled forms exactly as shown above. This will form the basis of authenticity of the entire exercise and will be diligently done. The supervisor will ensure authentication of the data forms and associated data received from the field and ensure its safe keeping.

#### **5. PROTOCOLS TO BE FOLLOWED AT THE TIGER RESERVE LEVEL**

The carefully stored data and storage media (films, disks) will be handled by the Tiger Reserve or Source Site level supervisor authorized by the Field Director or the qualified researcher appointed by the Chief Wildlife Warden. He/she will ensure that the following steps are implemented:

- 1) The data to be integrated at reserve level will include: The raw camera trap data (on memory cards from digital cameras or film rolls from film cameras) each with its own Individual ID, imprinted meta-data and associated data forms.
- 2) **Downloading and storing images as 'field copy' at Tiger Reserve or Source Site level:** Create a new folder on the computer hard disc, and name it by joining the 'name of the field technician' from whom the images were received, and the 'date of receiving data'. For example, images received from Mr. Santosh Naik on 8<sup>th</sup> October 2012 (this will be on *Data Form - C*) is copied into a computer drive with a specific folder name that identifies it as below:

Example folder name: *SantoshNaik -8-10-2012*

Each data form received from Santosh Naik on 8<sup>th</sup> October 2012 should also be tagged/filed under the same name (Example: *SantoshNaik-8-10-2012*).

- 3) Create sub-folders within this folder that is named by pairing the ‘camera ID’ and ‘memory card ID’ (or Film roll ID).

Example sub-folder name: *KA-CAM192-MC003*

Download images from the memory cards into these respective folders. Do not rename them, so they retain their original names as generated in the camera.

- 4) Images stored as above are considered as ‘**field copy**’ of images received from field survey personnel. Store **all** images like this and not just tiger images. As an example, the folder structure of storing this ‘field copy’ of image will be:

Example: *SantoshNaik-8-10-2012 > KA-Cam192-MC003 > {Img001.jpg, Img002.jpg, Img003.jpg, etc.}*

The next, and further subfolders for images received from Santosh Naik on 8<sup>th</sup> October 2012 will be:

Example: *SantoshNaik-8-10-2012 > Cam213-MC006 > {Img001.jpg, Img002.jpg, Img003.jpg, etc.}*

- 5) Now, leaving this ‘field copy’ of images as it is on the hard disc, create a **second ‘backup copy’ of these images** in a separate folder.
- 6) After downloading images from the memory card as two copies, format the memory cards. Always make sure the memory cards are formatted before giving the camera units back to the field survey personnel.
- 7) Documenting tiger capture details in ‘**Data Form – D**’: At the Tiger Reserve or Source Site level, examine all images carefully and enter details related to each tiger photo-capture in a fourth data-form.
- 8) The two images from two cameras of a trap location are linked as ‘complementary images’ of each other, as shown in the example ‘*Data Form - D*’ in Annexure 4.
  - a) When establishing the link between two images as the ‘right flank’ and ‘left flank’ of same individual through the same photo-capture event, take extreme care in using the date-time information from the meta-data of the image or time-stamp on the images.
  - b) Counter-check this ‘linking’ of images with information recorded in ‘*Data Form - C*’, and by looking at other images captured immediately before and after these tiger images.
  - c) The supervisor will also look at the ‘set-up time’ and the next ‘check time’ at a location to ascertain if a tiger capture in the image was from the same location using ‘*Data Form - C*’.

## **6. PROTOCOLS TO BE FOLLOWED AT THE STATE LEVEL**

The task of recording, compilation, authentication before submission of data to the NTCA will be performed at Chief Wildlife Warden’s office or at Head Quarters of the

scientific institution conducting the survey.

- 1) After camera trapping is completed for the season or for a pre-defined period, four data-forms (*'Data Form - A'*, *'Data Form - B'*, *'Data Form - C'*, and *'Data Form - D'*), all authenticated by and countersigned by the reserve director/head of research institution will be sent to the Chief Wildlife Warden as well as to NTCA (two identical copies) for further authentication.
- 2) Field Director will also send images collected at Tiger Reserve or Source Site level (**the 'field copy' of images**) on CDs/DVDs to the Chief Wildlife Warden for further authentication.
- 3) If any individual tiger can be identified based on preliminary visual comparisons, at Tiger Reserve or Source Site, 'Annual Temporary Tiger ID number' will be assigned by the Chief Wildlife Warden, using ***'Data Form - E'***.
- 4) Till this point all data will be in the form of paper **field data-sheets**, and **films or digital images** on CDs/DVDs. Entries in a MS Excel spreadsheet will be recorded at state level and sent to the NTCA.
- 5) At State level the data received from all Tiger Reserves or Source Sites will be thoroughly validated and authenticated.
- 6) Apart from *'Data Form - E'*, and an 'authenticated version' of data, no other new document is created at State level. Also, DO NOT rename or reorganize the images in any way. This data sent to the NTCA will be deemed as authentic and final.





**'Data Form – C':**

Note:

1. This form is filled by **Field survey personnel/technicians by hand while they are actually setting up or checking camera traps.**
2. This is the **ONLY** form to be filled in the field by survey personnel.
3. **Example data are in red color font in the specimen-form below only for illustration: THESE ARE FILLED BY HAND IN THE FIELD.**

Names of camera trapping field survey personnel <b>Santosh Naik and Naveen Kumar</b>				Name of supervisor: <b>Killivalavan Rayar</b>			Tiger Reserve/Source Site name and year of survey: <b>Nagarahole -2012</b>	
Signature of survey personnel: ..... and .....				Signature of supervisor: .....			Sheet No: <b>1 of 3</b>	
Date	Time	Camera Trap Location Label	Camera ID	Memory Card ID	Start image	End image	No. of images	Remarks
Setup: <b>02/10/12</b>	<b>0745</b>	<b>NH24</b>	<b>Karnataka-CAM 192</b>	<b>MC003</b>	<b>01</b>	<b>05</b>	<b>4</b>	<b>Tiger found in image 02</b>
Check: <b>03/10/12</b>	<b>0730</b>		<b>Karnataka-CAM 213</b>	<b>MC006</b>	<b>03</b>	<b>07</b>	<b>4</b>	<b>Tiger found in image 04</b>
Setup: <b>02/10/12</b>	<b>0815</b>	<b>NH24</b>	<b>KA-CAM 216</b>	<b>MC034</b>	<b>01</b>	<b>03</b>	<b>2</b>	<b>Leopard in image 02</b>
Check: <b>03/10/12</b>	<b>0800</b>		<b>KA-CAM 220</b>	<b>MC023</b>	<b>04</b>	<b>06</b>	<b>2</b>	<b>-</b>

**'Data Form – D':**

Note:

1. *Photo-capture details* for each tiger image, and its *opposite flank image* is recorded in this form.
2. This form is filled at the Tiger Reserve or Source Site level after preliminary processing of images by referring to data given in 'Data Form - C'.
3. Example data in red color font in the specimen-form below is only for illustration.
4. **Only record FILE NAME OF THE IMAGE and FILE LOCATION in the 'FILED COPY' images folder are recorded. THE .JPG IMAGES ARE NOT TO BE PASTED ON THE FORM!** These are shown just to link them to file names used here as example.

Name of the Tiger Reserve / Source Site: Nagarahole Tiger Reserve

Supervisor's (Authorized official/Researcher) Name & Signature: Killivalavan Rayar

Camera Trap Location Label	Date	Time	Folder path and File name of the Left Flank	Folder path and File name of the Right Flank
NH24	02-10-12	20:13	SantoshNaik-8-10-2012 > KA-Cam192-MC003 > IMG0002.jpg 	SantoshNaik-8-10-2012 > KA-Cam213-MC006 > IMG0004.jpg 

**'Data Form - E':**

Note:

1. **YEARLY Temporary tiger ID, age-sex class details (if available)** for each photo-capture are recorded in this form, reserve/source site wise for the entire state.
2. **This form is filled by authorized representative of Chief Wildlife Warden for the whole State.**
3. **Example data are red color font in the specimen-form below is only for illustration.**

Name of the State: Karnataka

Name and Signature of authorized representative: Narendra Patil

Chief Wildlife Warden's Name & Signature: .....

Tiger Reserve / Source Site	Camera Trap Location Label	Date	Time	Folder path and File name of the Left Flank	Folder path and File name of the Right Flank	Temporary Tiger ID	Sex	Age
Nagarahole	NH24	02-10-12	20:13	SantoshNaik-8-10-2012 > KA-Cam192-MC003 > IMG0002.jpg	SantoshNaik-8-10-2012 > KA-Cam213-MC006 > IMG0004.jpg	NH2012-23	Male	Adult



# **PROTOCOLS FOR THE ESTABLISHMENT OF THE NATIONAL REPOSITORY OF CAMERA TRAP PHOTOGRAPHS OF TIGERS (NRCTPT)**

**PART-II :** COVERING WORK TO BE CARRIED OUT AFTER IMAGES ARE RECEIVED BY THE NTCA

## **1. RESPONSIBILITIES OF THE CENTRAL DATABASE MANAGEMENT FACILITY AT THE NTCA, NEW DELHI, AFTER THE DATABASE IS ESTABLISHED AND IMAGES ARE RECEIVED**

- 6) Receiving tiger photographs and ancillary information in a properly labeled, formatted and authenticated manner on hard copy forms and digital form together with authentication documents duly signed by authorized personnel certifying them.
- 7) Scrutinizing, selecting photos and entering the camera-trap photo-capture data and their associated photo-images into the database together with all the meta-data (including location, date, time, personnel involved, and other meta-data from storage media, camera traps, film rolls etc.).
- 8) Using software program *ExtractCompare* to perform batch level automated matching followed by visual examination to identify unique individuals and assign the unique ID numbers.
- 9) Documenting and archiving all received images (including those not entered into the database) for future reference, vouching, resolving disputes etc.
- 10) Generating all statistical analyses and interpretation of results.
- 7) Sharing the results in the form of unique Tiger IDs with the respective states, parliament, participating scientific institutions/partners and the public.

The Regional Offices of the NTCA can facilitate the process by interacting with the States involved.

However, all the procedures below are implemented by technically fully qualified personnel.

## **2. PROTOCOLS FOR THE PROCESSING OF IMAGES, ARCHIVING AND ANALYSIS AT THE NTCA, NEW DELHI**

All images (including tigers), electronic meta data and ancillary data in hard copy forms, duly authenticated at Reserve and State level and countersigned by officials as mentioned on the forms will finally arrive at the NTCA from the office of the Chief Wildlife Wardens for further processing and assignment of National Unique Tiger IDs (UTID). The exact format in which these data are received will be as below:

- Images will be received on CDs or DVDs, or negative film rolls. These disks and rolls will contain images termed as original 'STATE COPIES'.
- These disks MUST HAVE linked authenticated Data Forms A, B, C, D and E.

These camera trap images will be processed for individual identification of tigers by fully following the protocols/steps as described below:

## I. RE-ORGANIZING AND RE-NAMING ALL CAMERA TRAP IMAGES IN WINDOWS EXPLORER

Authenticated 'STATE COPIES' of images are stored in folder structures already described in document 1. These images are required to be re-named / re-labeled in a standardized manner for the whole country before they can be entered into the National Tiger Photo Database. To maintain data integrity, and also to facilitate easy storing of data in the database, these images received as STATE COPIES must be re-organized as per steps below.

### STEP 1:

Retaining the same folder structure, make **A FRESH DUPLICATE COPY** of all the images and meta-data on the hard disk of a separate computer with adequate storage space. On the copy, the images get a new name (or label) by fixing a '**date-time stamp**' to the image number. This date-time information will be derived from *EXIF metadata* (Exchangeable Image File Format) embedded in images by the digital cameras. There are standard software tools for renaming images by stringing EXIF meta-information of images with their original image numbers.

Example:

Label of image received: *IMG0001.jpg*

New name after re-labeling: *2012-10-02\_20-13-37\_IMG0001.jpg*

### STEP 2:

CREATE A NEW FOLDER STRUCTURE. For each TIGER RESERVE OR SOURCE SITE create as many NEW folders as there are unique camera trap locations. EACH NEW FOLDER MUST have a label using the Camera Trap Location ID contained in Data Form A described in document 1.

Example: for location '*Mannina Katte Road 2.4*' create a folder by its Camera Trap Location ID NH24

1. Refer to 'Data Form – C' and 'Data Form – D' to identify TIGER images as captured at specific camera trap location, and then copy these images into appropriate Camera Trap Location folder.

Example: copy images from *SantoshNaik-8-10-2012 > KA-Cam192-MC003* into folder *NH24 > {images captured at MNKR 2.4}*, and images from *SantoshNaik-8-10-2012 > KA-Cam213-MC006* into folder *NH24 > {images captured at MNKR 2.4}*.

2. PLEASE NOTE THAT MOST CAMERA TRAP UNITS WOULD HAVE BEEN MOVED AROUND, SO PLEASE DO THE FOLLOWING TO TAKE CARE OF THIS ISSUE: If, a camera trap unit was deployed in more than one location before downloading images at tiger reserve office, one should be very careful in ascertaining the location for images because they will be downloaded

into a single folder in the field copy of images. For example, if the camera unit ‘KA-Cam192’ was deployed in two locations, the folder *SantoshNaik-8-10-2012 > KA-Cam192-MC003* will have images taken from these two locations. It is very important to refer to ‘Data Form - C’ (and cross-validate with ‘Data Form - B’) to ascertain the dates when the unit was shifted to a new location, and accordingly copy the images into two different folders.

Example: copy images captured in location NH24 from *SantoshNaik-8-10-2012 > KA-Cam192-MC003* into folder *NH24 > {images captured at Camera Trap Location ID NH24}*, and images captured in location NH25 from *SantoshNaik-8-10-2012 > KA-Cam192-MC003* into folder *NH25 > {images captured at Camera Trap Location ID NH25}*.

3. By stringing together the ‘Camera Trap Location ID’, ‘date-time of capture’ with the ‘original image number’, a unique reference image file name is created for all images received at NTCA.

Example: *NH25\_2012-10-02\_20-13-37\_IMG0002.jpg*

Where,

Source site code	Location ID	Date/time stamp of image	Image number
<i>NH (Nagarahole)</i>	<i>25</i>	<i>2012-10-02_20:13:37</i>	<i>IMG0002</i>

Note: Each image gets linked to a Tiger Reserve (of possible and nearest source site) in India. We have used the list of Tiger Reserves (current and potential source sites identified by NTCA) to generate codes for each of the Tiger Reserves (see Appendix 1).

Referring to Data Forms C, D and E, select all tiger images and copy them into a new folder. Label this new folder by site and year of trapping.

Example: Bandipur 2012

Establish and validate opposite flanks for each photo-capture by looking into Data Forms C, and D.

**THOROUGHLY CROSS CHECK TEMPORARY IDs** assigned to individual tigers **BY STATE CWS in Data Form E**, by **VISUALLY COMPARING** all tiger images received.

## **II. INSERTING THE CAMERA TRAP DATA TO NATIONAL TIGER PHOTO DATABASE USING MS ACCESS FORM**

Finally ALL images of camera trapped tigers from all source sites/tiger reserves, and their capture details are consolidated into NTPD. This is done in two stages.

- 1) First, the camera trap data from a single TIGER RESERVE OR SOURCE SITE is appended to a carrier database ‘tiger\_append’. A final validation of the data can be performed at this stage, and if there are any irregularities they are resolved. **PLEASE NOTE THAT ALL TIGER IMAGES RECEIVED FROM FIELD GET INCLUDED IN THE DATABASE.**
- 2) In the second stage, data from ‘tiger\_append’ database are imported into the

central database. A subset of these tiger images is tagged for extracting patterns in *ExtractCompare* software. These patterns are then compared with all other images using the *ExtractCompare* software and the tigers that do not find a match with any tiger in the database get a new ID. The scheme of naming the tigers is defined in the next part of this document.

- 3) This comprehensive database from all tiger reserves/source sites and from all previous years also records National Unique Tiger ID.

### **III. ASSIGNMENT OF UNIQUE NATIONAL TIGER IDs (UTIDs) USING ExtractCompare SOFTWARE**

Establishing the identity of each the tiger, and then to have unambiguous NATATIONAL identifications to all photographed tigers is central to maintaining a reliable national database from camera trap data.

The general naming scheme outlined below reflects two important aspects about the individual tiger identity: first the landscape from where the individual was captured, and second the ‘strength’ of the identity of the individual tiger based on its photos (so as to be able to separate out ambiguous identities from unambiguous identities).

1. To avoid multiple counting and controversies it is essential for each tiger to have one PERMANENT national ID (UTID). It is logical and ecologically meaningful to have these IDs linked spatially to one of the five disjunct tiger landscapes as well as to the year of First capture. These IDs SHOULD NOT BE ASSIGEND TO STATES OR TIGER RESERVES because tigers often move across these boundaries either permanently or temporarily. We propose the following general scheme for UTID:

Example: *WG-* stands for *Western Ghats*, followed by a unique running serial number that is nationally assigned and continued over the years.

WG-12387, CI-19680, NE-3427 etc

Each individual tiger is spatially coded to the landscape from where it was first captured. We have used the list of landscapes identified by NTCA to generate the codes for each landscape (see Appendix 2)

2. Based on the quality of photos and the number of photos in each capture there can be four types of names or “IDs” for each tiger: (a) IDs for unusable images, (b) IDs for ‘unidentifiable’ individuals, (c) Partial IDs, and (d) Permanent IDs.

#### **a) Not-usable image (NUI)**

Photos that are merely recognizable as that of a tiger but without any necessary and sufficient stripe patterns available for individual identification should be described as ‘unusable’ images. Following ID format will be used for such images.

Example: *WG-12-NUI0001*,

Where ‘WG’ indicates the landscape and ‘12’ indicates the year of capture

#### **b) Unassigned image (UAI)**

There will be cases of camera trap images of a single flank that cannot be compared with all the same flank images in the dataset, even when stripe patterns are visible in the image. For example, a left hind leg image cannot be compared with an image that has only left front leg visible in it.

Such images are temporarily labeled as ‘unidentified’, and can potentially match images in the ensuing season. An unidentified individual during the camera trap survey in year 2012 can be named as follows.

Example: *WG-12-UA10001*

**c) Partial ID**

When only a single broad side profile image of either the right or the left flank of the tiger exists for a new individual tiger, its identity will be ambiguous because a *left-flank-only* image and a *right-flank-only* image may logically belong to either the same individual or two different individuals.

In such cases it is best to reflect the ambiguous identity of the individual in its ID, and such IDs will be considered as Partial IDs. If in the ensuing camera trapping season, these images with ‘ambiguous identity’ match images of a capture with both the flanks then the individual tiger will be assigned a Permanent ID.

Examples of Partial ID: *WG-L00335*, and/or *WG-R00333*

Where, ID series with ‘L’ refers to individuals with only usable left-flank photos, and ‘R’ series to individuals with only usable right-flank photos.

**d) Permanent ID**

The identity of a tiger is unambiguous only when there is at least one capture with clear broad side profiles of *both flanks* in the data set. Only for tigers with both flank images, a permanent ID is assigned. The permanent ID has a spatial component (a code for the landscape) and a serial number which is national.

Example of a permanent ID: *WG-2875*

Once these National Unique Tiger IDs are assigned at the NTCA, they SHOULD BE COMMUNICATED TO THE to each STATE (Chief Wildlife Warden) to replace temporary IDs assigned by them earlier in the process.

#### IV. Additional information in the database

This database can be used to record sightings from naturalists who have taken clear photos amenable for individual identification, as well as to record tiger mortalities with images of either their carcasses or pelts seized, to establish / ascertain reliable identity of the individual tiger. In all such cases, pattern matching software *ExtractCompare* can be effectively used to match these images with camera trapped individuals in the database that will greatly enhance tiger conservation. But such images from other sources should be included in the database ONLY when reliable information on the location and date of photograph taken is available.

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## **APPENDIX 1**

### List of source sites that include tiger reserves and proposed tiger reserves

Sl.No.	Source Site Name	Source Site Code
1	Achanakmar	AK
2	Anamalai	AM
3	Bandhavgarh	BG
4	Bandipur	BP
5	Bhadra	BD
6	Biligiri Rangaswamy Temple	BR
7	Bor	BO
8	Buxa	BX
9	Corbett	CB
10	Dampa	DM
11	Dandeli-Anshi	AD
12	Dudhwa-Kishanpur	DK
13	Gundla Brahmeswaram	GB
14	Guru Ghasidas	GG
15	Indravati	IV
16	Kalakad-Mundanthurai	KK
17	Kanha	KN
18	Katerniaghat	KG
19	Kawal	KW
20	Kaziranga	KZ
21	Kudremukh	KM
22	Manas	MA
23	Melghat	MG
24	Mhadei-Cotigao-Netravali	MD
25	Mudumalai	MM
26	Mukandara Hills	MH
27	Mukurthi-Nilambur	MN
28	Nagarahole	NH
29	Nagarjunsagar	NS
30	Nagzira-Navegaon	NN
31	Namdapha	NM
32	Nameri	NR
33	Pakke	PK
34	Palamau	PL
35	Panna	PA
36	Parambikulam	PB
37	Pench (Maharashtra)	PM
38	Pench (MP)	PN
39	Periyar	PY
40	Pilibhit	PI
41	Rajaji	RJ
42	Ranthambore	RB
43	Ratapani	RP
44	Sahyadri	SH
45	Sanjay-Dubri	SD
46	Sariska	SK
47	Satkosia	ST
48	Satpura	SP
49	Satyamangalam	SM
50	Shendurney	SN
51	Similipal	SI

52	Suhelwa	SW
53	Sunabeda	SU
54	Sunderbans	SB
55	Tadoba-Andhari	TD
56	Udanti-Sita Nadi	US
57	Valmiki	VM
58	Wayanad	WY

## **APPENDIX 2**

### **Tiger landscapes in India**

Sl. No.	Tiger landscape	Tiger landscape Code
1	Central India	CI
2	Eastern Ghats	EG
3	North East Hills and Brahmaputra Flood Plains	NE
4	Shivalik Hills and Gangetic Plain	SH
5	Sunderbans	SU
6	Western Ghats Complex	WG

