BI-MONTHLY OUTREACH JOURNAL OF NATIONAL TIGER CONSERVATION AUTHORITY
GOVERNMENT OF INDIA

stripes

Volume 3 | Issue 3 | Mar-Apr | 2012

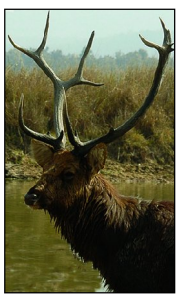
LANDMARKS

STRATEGIES

EVALUATION

ACHIEVEMENTS

PERSPECTIVES

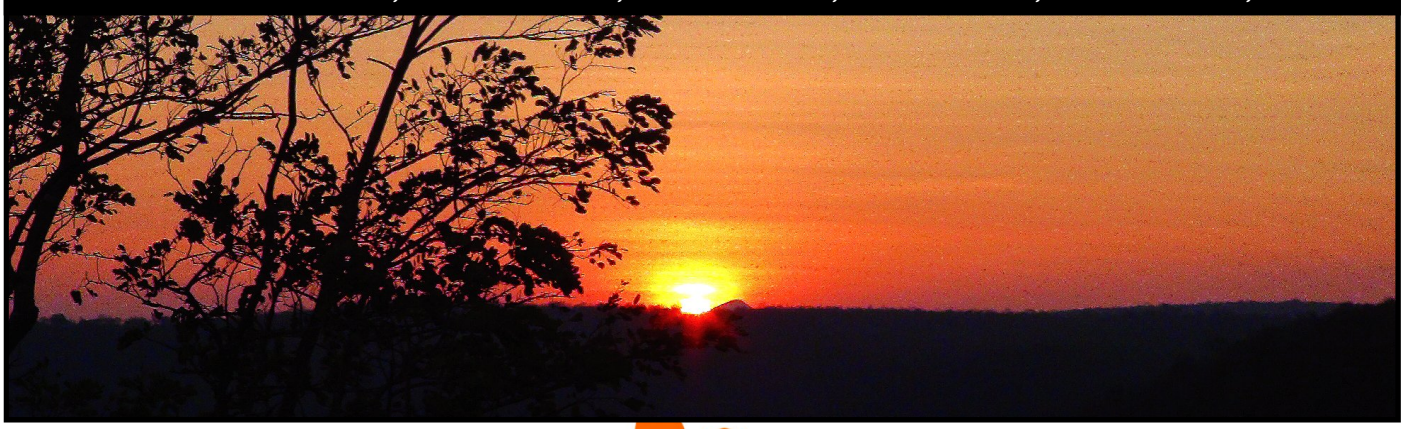


INITIATIVES

STATE-WISE RELEASE OF CENTRAL ASSISTANCE

During 11th Plan Period Under Centrally Sponsored Scheme Of Project Tiger (MoEF)

STATE	2007-08	2008-09	2009-10	2010-11	2011-12
Andhra Pradesh	73.918	56.983	138.254	155.645	154.406
Arunachal Pradesh	110.254	246.171	64.710	226.702	236.786
Assam	95.614	1092.379	194.290	1509.472	947.509
Bihar	98.321	49.673	8.856	158.355	172.193
Chhattisgarh	35.225	169.870	1383.502	1813.725	702.726
Jharkhand	45.160	115.377	117.139	130.616	156.347
Karnataka	1159.715	689.839	657.062	1660.050	1830.65
Kerala	153.245	267.090	311.4200	323.460	429.77
Madhya Pradesh	2975.941	6998.542	2,582.476	3962.730	5352.71
Maharashtra	295.719	411.125	373.517	2789.060	3622.342
Mizoram	82.900	241.450	2171.000	187.690	225.288
Orissa	43.280	625.990	221.740	815.290	555.076
Rajasthan	410.680	2708.950	10694.170	2368.925	67.21
Tamil Nadu	45.000	690.806	258.354	520.786	605.964
Uttarakhand	202.005	462.850	246.205	339.945	399.76
Uttar Pradesh	134.890	417.513	431.517	407.460	446.126
West Bengal	308.674	228.394	298.785	502.480	157.66
TOTAL	6,270.540	15,473.002	20,152.997	17,872.391	16,062.522



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note from the editor

THE mangrove habitat of Sundarbans is unique. The normal approaches to tiger density estimation from camera trap population estimates are not applicable here. It is not possible to derive the effectively trapped area calculations from the usual half mean maximum distance moved by recaptured tigers. Therefore, home ranges are estimated from tagged tigers. The radius of home range is used to determine the effectively sampled area from the camera trap polygon to calculate density estimates from camera traps, which is applied to all tiger-occupied areas of Sundarbans. The extent and relative abundance of tigers throughout the TR is found through sign surveys in channels.

Tiger continues to be a predator least understood! The only long lasting bondage in a tiger's lifecycle is the relationship between a mother and its offspring. However, there have been numerous instances of a resident male (which has sired the litter) sharing a kill with the mother and cubs. This issue carries an interesting feature on the bond between a resident male and orphaned cubs in Ranthambhore.

The North Eastern Hills and Brahmaputra Flood Plains is a vast landscape. This stretches across the flood plains of river Torsa in West Bengal, includes peaks of Khangchedzonga in Sikkim, besides Brahmaputra flood plains and hills of Assam and Myanmar. There are seven tiger reserves in the region — Buxa (West Bengal), Manas, Kaziranga, Nameri (Assam), Pakke, Namdapha (Arunachal) and Dampa (Mizoram). Several of these reserves share political boundaries with Bhutan, Myanmar and Bangladesh. The 2010 Assessment has estimated a tiger population of 148 (118 to 178) in this region. The independent Management Effectiveness Evaluation has highlighted the strengths and weaknesses of this cluster alongwith suggestions. These are being considered while firming up the respective Tiger Conservation Plans.

Dr Rajesh Gopal
Member-Secretary, NTCA

Sundarbans LANDSCAPE

Status of Tigers, Co-Predators & Prey In India, 2010

Sundarbans is the world's largest contiguous mangrove forest created at the confluence of the deltas of the Rivers Brahmaputra, Ganga and Meghna. The delta spreads across the countries of India and Bangladesh covering 80,000 sqkm (Chakrabarti 1992) with 38% (Mitra 2000) of it in India and the remaining in Bangladesh. It comprises mudflats, creeks, tidal channels and an archipelago of about 102 islands of which 54 are inhabited by human population (Bera and Sahay 2010).

To the north of Sundarbans are the Himalayas, Rajmahal Hills to the west and the Meghalaya plateau and Chittagong Hills to the east (Chakrabarti 1992). Geologically, this area was carved out in recent times by tidal action and silt deposition and is still under formation. As a result of neotectonic changes the Bengal basin has been tilting eastwards resulting in changes in the flow of River Ganga and subsequently the structure of this vast delta. With 1437.4 persons per sqkm (Qureshi et al. 2006) biodiversity conservation is a challenge, although the Tiger Reserve is free of human settlements.

Photos: H S Negi

ECOLOGICAL BACKGROUND

Human colonisation of this region happened relatively late due to the inhospitable conditions though some people did occupy the area even in the 6th century (Chakrabarti 1992). The present day district of the 24 Parganas was ceded to East India Company as part of the treaty of 1737 and thereafter became the jagir of Lord Clive (Chaudhuri 1989). However, it was only in 1770 that serious efforts were made to reclaim land for agriculture by Claude Russell, the then collector-general of the district (Bera and Sahay 2010). By 1878-79, 4856 km2 of this area was designated a Reserved Forest (Bera and Sahay 2010). In 1903, Sir Daniel Mackinnon Hamilton, a Scotsman, bought 40 sqkm of land which included the islands of Rangabelia, Satjelia and Gosaba where he established religious centres, dispensaries and cooper-

ative societies for tribals from the Chhotanagpur region belonging to tribes like the Bhumij and the Mundas (Chakrabarti 1992; Bera et al. 2010).

In 1978, many Partition refugees from Bangladesh escaped from the Dandakaranya government resettlement camp in central India and decided to establish themselves at Marichjhanpi in Sundarbans, an area that was until then free of human presence and categorised as a Reserved Forest. This act led to violent clashes between the new settlers and the Left government and resulted in mass deaths, brutality and disease in the region (Ghosh 2004).

In 1973-74, India declared 2,585 sqkm of this area as a Tiger Reserve with Bangladesh following suit, declaring 23.5% of the remaining Sundarbans as a Reserved Forest in 1977 by carving out three sanctuaries viz. Sundarbans West, Sundarbans East and Sundarbans South under the Bangladesh Wildlife (Preservation) (Amendment) Act, 1974 (Barlow et al. 2008).

CONSERVATION SIGNIFICANCE

The United Nations Educational, Scientific and Cultural Organisation (UNESCO) in 1987 placed the Indian Sundarbans on the World Heritage List for it being an outstanding example of ecological and biological processes in the evolution and development of coastal communities of plants and animals and for the importance of this region for biodiversity conservation. A decade later the Bangladesh part of Sundarbans was also added to the same list.

With respect to the tiger, this area is a tiger conservation unit (TCU) of level 1 importance and the only one in a mangrove habitat (Dinerstein et al. 1997). However, Sundarbans tigers of

Forest guard at Sundarbans, fully equipped to take on maneaters in the mangroves

India and Bangladesh form a single population, which is isolated from other tiger populations.

ECOLOGICAL STUDIES

While several studies have been conducted in this region to study structure and composition of mangroves (Prain 1903; Champion 1936; Bhattacharyya 2002), dependence of local communities on such systems (Naskar, Guha & Bakshi 1987), pollutant levels (Sarkara et al. 2002; Guzzella et al. 2005) effects of climate change and sea level on Sundarbans (Naskar and Guha & Bakshi 1987; Mukherjee 2002; Hazra 2002) and geology of the area (Bhattacharya and Das 1994; Bhattacharya 1999; Sanyal 1999 (in Sen and Naskar 2003), few studies have been conducted to assess status of tigers and their prey in the Indian Sundarbans.

Most studies on tigers and their prey have been conducted on the Bangladesh side of Sundarbans. In 1971, Hubert Hendrichs conducted a three month study to identify reasons for man-eating by Sundarbans tigers. However, the project could not be completed but the initial data indicated an association between man-eating behaviour amongst tigers with increasing salinity levels. In more recent times, a long term study was initiated in February 2005 by the Bangladesh Wildlife Department from a funding by Save the Tiger Fund and the US Fish and Wildlife Service to study tiger ecology and prey availability. Some other studies to assess prey density have also been conducted in this landscape by Reza et al. (2002). However, the most important contribution to information on tiger ecology in this region is an outcome of studies conducted by Adam Barlow in Bangladesh Sundarbans, which includes monitoring tiger populations in mangrove landscapes (Barlow et al. 2008), designing conservation framework to reduce human-tiger conflict (Barlow et al. 2010) and studying the impact of sea-level rise on Sundarbans (Loucks et al. 2010).

However, on the Indian side, while several books have been published on this region and man-eating tigers, scientific studies on the tiger are lacking. Until recent times tiger numbers were

determined using traditional methods like pugmark census, which have been considered error prone by scientific communities. Tiger census figures based on such methods produced estimates as high as 205 tigers in 1979 and 269 in 1989 (Chakrabarti 1992).

The inaccessible terrain of these habitats makes scientific research a challenge thus few such endeavours have been attempted in this zone. The first effort to assess tigers and their prey numbers in this region using more reliable scientific methods was made by Ullas Karanth and Nichols in mid 1990s followed by a more recent attempt at understanding tiger ecology using radio-telemetry by Jhala et. al. (current report and on-going).

CONSERVATION STATUS

This region is under intense human pressure with around 3.5 million people living within 20 kilometres of its northern and eastern borders and depending upon the forests for livelihood resources. Annually, around 35,330 people enter the forests of Sundarbans to collect timber, fish, honey and other products (Chakrabarti 1992).

Most of the unique flora and fauna of this region is anyway being affected by the increasing levels of salinity and sedimentation which is a consequence of reduced inflow of freshwater into the delta due to construction of dams and barrages (eg Farakka) upstream. Heritiera fomes, the plant that lends its name to the Sundarbans is most threatened along with others like Nypha fruticans and Phoenix paludosa.

The increasing sea level in the event of global climate change is also predicted to affect this region negatively with continuous submergence of pneumatophores of plants that would lead to asphyxiation and sand deposition. The increasing level of toxins and pesticides in the waters of rivers entering this area is also alarming with adverse effects on the biodiversity of the region. Other threats to the region exist in the form of mangrove conversion to paddy fields and shrimp farms and presence of oil and gas exploratory activities in the area.

Apart from all the above indirect threats to the tiger in this region, poaching of the species may also be prevalent with at least 17 seizures of tiger skins and body parts in areas around Sundarbans in the last decade alone (data obtained from TRAFFIC Report 2010 (Verheij et al. 2010)).

This region is under intense human pressure with around 3.5 million people living within 20km of its northern and eastern borders and depending upon the forests for livelihood resources. Annually, around 35,330 people enter the forests of Sundarbans to collect timber, fish, honey and other products

All these factors, along with the isolated tiger population in this zone, makes this an important tiger conservation unit with a high degree of threat requiring continuous monitoring and management inputs.

MONITORING METHODOLOGY

Due to the unique and hostile habitat of the Sundarbans the methodology used across India (Phase I) for monitoring tigers and their prey could not be applied. We adapted the methodology to suit the environment of the Sundarbans. Since it was not possible to walk in the mangrove forests for recording tiger sign encounter rates due to lack of proper animal trails as well as the ever-present threat of tiger attack, we used tidal channel searches across the Sundarbans to record sign and animal encounter rates. One hundred and twenty-six boat transects with an effort of 1,163 km were sampled across the entire tiger reserve. A similar approach has also been used in the Bangladesh Sundarbans as well (Barlow et al. 2008). The sign intensity data across the Sundarbans constituted the Phase I data set.

We then used a combination of satellite-telemetry and camera traps to estimate home range size, population and density of tigers (Phase III).

COLLARING OF TIGERS

A total of five tigers, two adult females and three adult males were tagged with satellite radio collars as a part of an ongoing study on the Sundarbans tigers. The tigers were trapped in cages using bait and were anesthetized using 3mg/kg ketamine and 1.5mg/kg xylazene (Kreeger, 1996) administered intra muscularly using a blowpipe.

The satellite collars (VECTRONIX GPS Plus) weighed less than 1.5% of the body weight of the tigers. The collars were programmed to provide GPS fixes every 30 minutes during phases of intensive sampling and later remotely reprogrammed to provide five GPS fixes per day to conserve battery power.

Locations of tigers were analysed with ArcView v3.3 software (ESRI, Redlands, California) and Animal Movement extension v1.1 (Hooge and Eichenlaub 1997), to construct Minimum Convex Polygon (MCP) (Mohr and Stumpf 1966) and Fixed Kernel

(FK) (Worton 1989) home ranges. Activity time periods, frequency of crossing water channels of various widths, and distances moved within a day were also computed.

Due to the difficulty of walking in the mangrove forests and locating game trails for setting camera traps, we could not deploy camera traps in a systematic grid based approach used across India. Instead, we set up camera traps at strategic locations, near fresh and brackish water ponds, using attractants to lure tigers to our camera stations.

We also used fishing nets to orient the approaching tigers to get proper flank photographs for uniquely identifying each tiger from its stripe patterns. We estimated the tiger population in a mark re-capture framework with closed population estimators in an area of about 200 sqkm. This set-up allowed us to estimate population size reliably. But due to the small number of camera stations (12) and uneven geographical spread of camera traps, it was not possible to obtain a reliable estimate of mean maximum distance (MMDM) moved by recaptured tigers nor use the spatially explicit models (Efford et al. 2009) effectively.

Models estimating effective trapping area attempt to estimate home range radius either by estimating MMDM or through centres of activity, in the case of the Sundarbans we had direct estimates of home ranges based on telemetry data. We therefore used home range radius from 95% fixed kernel area estimates of tiger home ranges as a buffer to the camera trap polygon for estimating effectively trapped area.

Our telemetry data suggests that though tigers do cross wide channels, crossing of channels >1 km in width was rare. We therefore used a habitat mask wherein channels >1km in width were considered barriers to movement over the short term duration of the camera trapping exercise.

We photo-captured 10 adult tigers and two cubs. The best model selected by CAPTURE was model Mh (incorporating individual heterogeneity) and the population estimate was 11 (se 3) tigers. The home range radius of four satellite-radio tagged and camera trapped polygon, giving an area of 438 sqkm. After applying a habitat mask bounded by channels >1 km the effectively camera trapped area was 257 sqkm. Tiger density was computed to be 4.3 (se 0.3) tiger per 100 sqkm.

Since tiger occupied area of the Sundarbans Tiger Reserve was 1645 sqkm2 and the tiger signs were found throughout this area with a similar variation across the Tiger Reserve as found within the camera trapped area, it would be possible to extrapolate this tiger density across the reserve without much loss of accuracy.

Ideally, 2-4 additional camera trap replicate areas need to be sampled and additional data from radio collared tigers are needed to provide more accurate and precise estimates of tiger density. But till these are obtained, this first quantitative assessment estimates the number of tigers to be around 70 (64 to 90) tigers for the Sundarbans Tiger Reserve (in 1645 sqkm).

Further refinement in methodology, involvement of other institutions is needed and mention must be made that the 2010 estimate is subject to further study and by better methodology.

Playing Father

Venkatesh Sharma

Rajesh Kumar Gupta
CF & Field Director,
Ranthambhore Tiger Reserve

Tigers are solitary beasts rarely with social organisations except during matings or at sharing kills. Tigresses with cubs behave more socially than the male counterparts for the initial period of 19-20 months. There have been observations of adults of the first litter coming close to the mother tigress, signifying social behaviour which is more prominent in the initial two to three years.

What is now happening in Ranthambhore will denote the sheer complexity of tiger behaviour. The common belief that the tiger is solitary finds contradictions dictated by capacity of inviolate area or something innate in the tiger's mind — which we cannot scan!

Ranthambhore — an abode of the Royal Bengal Tiger, exhibits interesting behaviour of the tigers. George Schaller's observations in the 1960s puts on record kill shared by tigress and cubs with a male — an example of social organization.

He observed that tigers appear to socialize more at kills than on any other occasion. It is a well-conceived thought that adult tigers readily join for brief periods, particularly at a plentiful food supply, but their association rarely persists longer (Schaller 1964).

Schaller rendered some interesting observations in 1964 of a kill shared by a tigress with cubs an adult male: "I tied a buffalo to a stump at 1630 hours and waited in a blind 80 feet away. At 1940 hours, a tigress attacked the animal which died eight minutes later. Five minutes after the cubs (three) arrive at the kill, the tigress appears and right behind her is the male tiger. The male rises at 2250 hrs and walks to the kill. Two cubs nuzzle his face and neck..."

This gave the first probable glimpse of the strange "affectionate" behaviour of the male tigers. The role of the tigress in rearing the cubs for 19-20 months has always overshadowed the "fatherhood status of male tigers". Being a surreptitious species, such behaviour in male tigers, being hardly noticed or very less documented, the 'parental protection' provided by the males deserve special place in tiger behaviour.

Ranthambhore National Park with an area of 282 sqkm gave to the tiger lovers of the world a peculiar, astonishing and amazing breakthrough in the behaviour of male tigers.

The male tigers of Ranthambhore show peculiar ephemeral association with the cubs. Generally. the cubs are protected and reared by the tigress till 19-20 months and males share space with the cubs during kills.

In Ranthambhore National Park, T19 female with 3 cubs are in the bigger home range of their presumed father T28. The territory of T28 has increased or varies with the movement of T19 and her 3 cubs, signifying reach of parental protection by the males.

On 18 March 2012, I sighted the T19 female with 2 cubs. One of the cubs stood up and moved close to the male T28 and sat beside him to get affection.

On another occasion (29 March 2012), I was returning from night patrolling and was greeted by the T8 tigress with two cubs close to the father male T34. The cubs were seen with the tigress and the male again after a few days in the same area.

It has been noticed that T8 with her two cubs are resident within the home range of T34 male, in the Sawai Mansingh Sanctuary.

The T26 tigress with three cubs stay in close vicinity of T20, an old male. T31 with two cubs are frequently visited by T23, a male. T11 with three cubs are protected by the male T33. T30 with a litter of three cubs are being protected by T3. T9 with two cubs are protected by T33 male.

These associations signify social behaviour in tigers, especially considering the fact that 5 out of the 7 mother tigresses are with cubs 15-18 months old. Such a long association of the male tiger in each of the "families" shows affectionate behaviour in tiger, demanding fatherhood recognition to the male tigers.

Another possible explanation could be the apprehension of infanticide by unrelated males. The father of the cubs are providing parental protection to prevent infanticide of their siblings and gradually extending their supremacy with related ones.

With a history of very low infanticide incidence rate in Ranthambhore, this behaviour of "parental protection" by males assumes very high significance in tiger ecology. Is it a strategy by the Ranthambhore tigers to establish their strong genes and consolidate 'genetic supremacy' ?

What was observed by Schaller in the 1960s and being seen in Ranthambhore for the past few years, surpassed all imagination in the tigerlands across the world with an incidence in 2011.

A male Tiger T25 is being seen to rear two orphan cubs in the wild, opening a new chapter of parental care and protection by male tigers. Is this the epitome of male affectionate behaviour in tigers where orphans are being reared by a male tiger?

On 29 January 2011,T5, a female tigress who was being tracked for the past few days was sighted with two cubs. The mother tigress died of a physiological problem within 10 days on 9 February, close to the Kachida chowki, leaving the 3-4 month-old cubs unfortunately christened "orphans". The cubs of 3-4 months were traced by the video camera specially installed in the home range of the mother T5.

A male Tiger T25 is being seen to rear two orphan cubs in the wild, opening a new chapter of parental care and protection by male tigers. A camera trap picture revealed T25 male closely following one of the cubs away from their home. Is this the epitome of male affectionate behaviour in tigers?

The management decided to rear the cubs in wild by supplying food supplement. The cubs disappeared in first week of May 2011 and rapid search teams were placed to track it. To the surprise of the world, a camera trap picture in May revealed T25 male closely following one of the cubs, 5-8km away from the home of the cubs. The staff had later obtained pugmarks of the two cubs along the movement of the male T25, also testified by direct sightings of the male with the two cubs.

In the context of prevalent concept of "infanticide" in tiger ecology, it was initially unacceptable that the male T25 would actually protect the cubs. With time, observations revealed that T25 was actually providing protection to the orphan female cubs in an area of other males (T6,T33) and female (T17).

Repeated camera trap pictures and direct field observations revealed that T25 has been roaming with the two orphan cubs and protecting them from the age of four months in a range of other tigers, panthers and hyenas. On one occasion, T25 has been sighted coming in direct confrontation with T17 female, to protect the two cubs. Such amazing behaviour of the male tiger in tiger ecology marks the unexplored area of behavioural ecology in tigers.

The cubs are now almost 17-18 months old and are surviving without bait for 15-20 days, suggesting sharing of kills of the male T25 or direct kills by the cubs. The cubs had made a chital kill a month back in March. Since the male T25 is playing the role of the mother, a definite lag period would occur for total independence but future observations will give a better picture.

With the observation of the male T25 marking the climax of male protection to its cubs, it has become amply clear that male tigers do display affectionate behaviour, resorting to parental care or protection to establish its strong genes. It may be a strategy of survival of its siblings but research and observations should continue to come to definite conclusion.

Cluster northeast

Management Effectiveness Evaluation Of Tiger Reserves In India | Process and Outcomes 2010-11

PAKKE TIGER RESERVE

Strengths | TR forms part of larger landscape with adjoining Sonai Rupai Sanctuary and Nameri TR and also reserve forests such as Tenga, Doimara and Pappum. The Sessa Orchid Sanctuary and Eagle Nest Sanctuary are also adjacent. Watershed with several streams originating from the landscape leading to Pakke and Kameng rivers. The area also forms part of the Kameng Elephant Reserve. Excellent protection mechanism, man management and interaction and local tribe interaction and participation. TR is free from human habitation and is protected rivers on three sides.

Weaknesses | Inadequate frontline staff, strength, working mostly as casual labour. Inadequate funding, late disbursal. Not enough support from Project Elephant. Very poor infrastructure and visitor service. No research and monitoring mechanism. Ethnic insurgency on the outskirts. No interpretation centre or organized awareness programme. Perceived threat from construction of 500MW power house at Kimi, adjacent to Pakke TR. Colonies of construction workers, machinery barring elephant movement. Perceived threat from construction of 24km road along Kameng river (TR boundary). Fringe area communities exert some pressure in the form of NTFP collection and traditional tribal hunting.

Suggestions | Timely fund release by state and enhanced support. Well-planned ecodevelopment programme to be initiated. Infrastructure support for patrolling vehicles, building repair, equipment etc. Support for grain for grain scheme (crop raiding compensation) from Elephant Project. Buffer of the TR is to be notified. DFO Pakke who is in charge of both TR and two WLSs must be relieved from additional responsibilities or at least two ACFs must be posted for wildlife sanctuaries and one for eco-development. At least 4 staff each for anti poaching camp striking force. More facilities for field camps. A gypsy placed inside would help faster movement in case of emergencies. Veterinary support.

NAMDAPHA TIGER RESERVE

Strengths | Bordered by Kamlang wildlife sanctuary in north, Miao RF, Nampong RF, Diyun RF in the west, forest areas of Kachin Province of Myanmar in south and USF areas of Gandhigram in the east, very rich in biodiversity. Inaccessible area with dense vegetation and almost no road communication, valleys with watershed of Noa-Dehing river. Immense ecological, educational, ethological, historical, scientific and ethnic values.

Weaknesses | Inadequate, untrained staff. Inadequate infrastructure. Low priority to wildlife

sector by state government. No substantial support from civil and judiciary on control of poaching. No ecodevelopment or activities to seek cooperation from various ethnic communities. Ecotourism on meagre scale. No buffer notified. Encroachment by 84 families of Lishu people settled in five villages within core. Road from Debang to Vijayanagar, now maintained by PWD, could be helpful in protection but could be a major threat.

Suggestions | More trained and motivated staff. Lisu settlement in core to be resettled/removed. Road connecting Miao to Vijayanagar must be under direct control of field director, NTR, for all purposes. Buffer to be notified. Ecodevelopment programme to be implemented. A mechanism for research and monitoring. Habitat management measures to be taken up and monitored. Ecotourism activities to be streamlined involving local communities.

KAZIRANGA TIGER RESERVE

Strengths | Kaziranga-Karbi Anglong landscape characterized by 15 vegetation types. Has only viable population of tiger in Assam with high density, world's largest population of great Indian one horned rhinoceros, a large population of Asiatic wild buffalo, last surviving population eastern swamp deer, a good population of elephants and significant population of endangered and vulnerable species like Gangetic river dolphin, Hoolock gibbon and capped langur. Area falls under Kaziranga Karbi Anglong Elephant Reserve. Core area free from human habitation. Very good stakeholder participation while preparing tiger conservation protocol. One of the best protection strategies. Strong NGO support for tiger population monitoring. New initiatives to provide opportunities for local communities to promote tourism.

Weaknesses | Habitat degradation due to invasive species. Wetland degradation and blockage of natural channels by water hyacinth choking and sedimentation. Lack of habitat and population monitoring mechanism. Biotic pressures in corridor and addition areas. Speeding traffic along NH 37. Lack of co-ordination/dialogue with adjacent tea estate management. Delay in release of funds.

Suggestions | Important to initiate steps for habitat and population monitoring. Initiate highway patrolling using vehicles in place of on foot patrolling. Tiger Conservation Foundation to be made functional. Compile all the research reports on the Reserve and adjacent areas. Promote research and initiate discussions with Research Institutions and Universities. Periodic review of tourism activities by referring to the feed back from the visitors.

NAMERI TIGER RESERVE

Strengths | Part of a larger landscape contiguous with Pakke TR and adjacent areas. Nameri is rich with elephant, tiger, gaur, White Winged Wood Duck, Great Hornbill, Rufous necked Hornbill, Wreathed Hornbill, Oriental Pied Hornbill, Assam Roofed Turtle etc. Core area free of human habitations. The River Jia-Bhoreli, constituting the Western boundary of the National Park is the abode of the Golden Mahsheer, Silgharia etc. The PA is also worth for its scenic landscape

Weakness | Buffer not under the TR and there is no field director

though the DFO in charge of Nameri is redesignated. Very poor funding and the meager fund is released very late. Severe shortage of field staff and most are in the age group 40-48 years. Lack of training. Core area is managed by one Range at Potasali. Another Range is needed at Seijosa to control the eastern flank of the area. Buffer areas do not have anti-poaching camps or the staff and thus have no protection mechanism to check the activities of unscrupulous elements. Degradation of the habitat especially the grass lands by Bombax and choking of water bodies by aquatic weeds. Lack of a proper Tiger Conservation Plan. Severe degradation and encroachment of buffer areas of Tiger Reserve: A major portion of the buffer areas of the Tiger Reserve has become severely degraded and encroached upon by organized groups. Silting up of water bodies due to soil erosion in the upper reaches. Manifold increase in population of forest villages and encroachment upon adjoining forest land. Emergent law and order situation due to ethnopolitical upsurges. Passage of Balipara-Bhalukpong road through the buffer area, which will have negative impact on the corridors of elephants and confine them to the national park. Very poor tourism and ecodevelopment initiatives.

Suggestions | A review of the situation by NTCA with the state authorities for addressing the immediate requirement. Buffer area to be brought under TR and both under a field director of CF rank with DFO for its core and buffer area with adequate field staff and ACF for monitoring and eco-development. Preparation of a Tiger Conservation Plan. A mechanism in the state for timely release of funds and better state support. Immediate funding support for anti poaching, ecodevelopment, research and monitoring, visitor facilities and staff facilities. Identifying the habitat related issues and addressing and monitoring. Separate funding for elephant depredation control. Trainings on legal, modern equipment handling, format reporting and field exercises.

S P Yadav

Post ethnic strife, the recovery of habitats and species in Manas Tiger Reserve is reported to be remarkable. Home to the golden langur, pygmy hog, hispid hare, Assam roofed turtle, marbled and golden cats and clouded leopard, Manas in an exclusive category of PAs harbouring significant numbers of unique species

MANAS TIGER RESERVE

Strengths | Except for 16.30 sq km in Panbari Reserve in the fringe and 20 ha. at Betbari in North Kamrup Reserve used only for cultivation, which were encroached during 1996 (peak of ethnic strife), the core area of the Manas TR is free from human settlement. Relocation of these settlements is being addressed through negotiations with the local people. Excellent availability of water in the reserve. Part of a larger landscape, the TR is contiguous with the forests of Bhutan in the north and Buxa TR in the West. It also links forests of Arunachal Pradesh through Bhutan, thus becoming a significant unit in a large landscape. Dynamic ecosystem. Post ethnic strife, the recovery of habitats and species is reported to be remarkable. Home of large number of Schedule I and endemic species like golden langur, pygmy hog, hispid hare, Assam roofed turtle, marbled and golden cats, clouded leopard, Bengal florican and white wing wood duck place Manas in an exclusive category of Protected Areas harbouring significant numbers of these unique species. World heritage site, globally recognized biosphere reserve. Good support from NGOs.

Weaknesses | Multiplicity of management in buffer area. Buffer forests fall within the

jurisdiction of Forest Chief of Bodoland Territorial Council, and core area is under the control of CWLW, Assam. Occasionally professional fishermen sneak into the reserve taking advantage of unprotected southern tip of the river Manas at Narayanguri. Apart from illegal fishing, such intrusions threaten protection of reintroduced rhinos. Absence of forested buffer along the southern boundary.

The villagers are poor and in the absence of forest areas and commons in their vicinity, depend upon the fringe of the core for their resource requirement, which primarily includes grazing spaces, fuel wood and small timber and NTFP collection. On the other hand, due to absence of buffer forests, the wild animals frequently enter village lands and cause conflict. Poor infrastructure. Lack of clarity in the role of volunteers. Dependency of forest villages and fringe dwellers. Apprehension on Forest Right Act 2006. Societal lack of awareness, compounded by poverty, poor physical infrastructure. The fringe area is also infested by malaria. Lack of interpretational venues. Staff is untrained and is coming out of a very turbulent time. Absence of a well written TCP make it prone to acceptance of any programmes mooted by others. The state government release even the NTCA funds at the end of February.

Suggestions | Discuss with the Forest Chief of Bodoland Territorial Council for placing buffer areas under the unified command of Field Director. Prepare a volunteer deployment programme and create administrative structure, whereby they become part of the beats and work under the supervision of regular staff. Provide training on ecodevelopment, ecotourism, wildlife monitoring and interpretation to staff and volunteer and build up interpretation programme to increase awareness. Develop habitat monitoring protocols to assess the direction of change that suggests recovery of habitats and species. Initiate dialogue with district administration and local councils to channel funds for ecodevelopment activities. Train some of the volunteers in ecodevelopment, so that they could be the link between MTR and local villages. Promote relationship with the NGOs for eliciting wider support for conservation of MTR. The Bodoland Territorial Council and the state government should ensure timely release of funds. There could be a motorable road along the southern boundary for effective protection.

DAMPA TIGER RESERVE

Strengths | Habitat for species of high conservation value: Dampa Tiger Reserve is a representative example of eastern Himalaya harbouring several species of non human primates of the north-east Himalaya and clouded leopard, marbled cat, golden cat, Malayan sun bear etc. No human settlements in the core area. Seven perennial rivers. Legally protected. Gradual attitudinal change in the local communities supporting conservation.

Weaknesses | Poor infrastructure, poor funding, including that of NTCA, which seldom reach on time. Vulnerable areas do not have appropriate infrastructure to support protection and inadequacy of arms, ammunition, field equipment affect effective protection of BTR. Inadequacy of field staff. Long international border, so possibility of tribal people moving into DTR from border areas. Poor connectivity, very few trails which hampers movement of staff for protection duties. Shifting cultivation in around 19 villages in buffer area. Buffer not under administration of field director.

Suggestions | CWLW must ensure funding is timely. An interpretation facility may be opened at FD's office at West Fialeng for increasing opportunities of outreach. The draft TCP proposes for a number of staff, vehicles, arms and ammunition, field equipment and physical infrastructure. On a time-bound basis, the proposed

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facilities should be made available. The FD must immediately start short training courses on wildlife management, ecotourism and ecodevelopment for the staff. MoU with Bangladesh on regular exchange of information between forests and civil administration may be helpful in protecting the border areas and improving corridor values.

BUXA TIGER RESERVE

Strengths | TR is located at the confluence of 3 major biogeographic zones — lower Gangetic plains, central Himalayas and Brahmaputra valley, resulting in presence of unique and rare species. Potential site for long term conservation of not only tiger and its prey base, but also the elephant. Many rivers, such as Sankosh, Rydak, Jainti, Dima. Compact forests within one administration. Both core and buffer managed under unified command of the field director. Meticulous historical records of forest management. Financial support from state government.

> High population density in the fringe areas and their high resource dependence are a major threat to Sundarbans, adding to poor protection, the lack of research and monitoring of ecological processes and the unrestricted number of tourists and unplanned growth of tourist lodges in the mangroves

Weaknesses | Present core area of 390.58 sq km is grossly inadequate for a viable breeding population of tiger. Nine human settlements within core. Influx of villagers from buffer and fringe areas. Surrounded by numerous villages and tea gardens. Around 30 forest villages inside reserve and 4 fixed demand holdings, leading to degradation of forests. Strained relationship between TR management and locals. Inadequacy in habitat management. Inability to relocate villages from within core. Inadequate staff amenities. Non functional Foundation, inadequacy of training in wildlife management for staff.

Suggestions | Dialogue with owners of tea gardens to make

arrangements for fuel wood production for their own labourers. Design forestry operations for habitat management and local livelihood security. Prepare microplans for utilization of NREGS funds for watershed management, water harvesting, pasture development etc. Develop ecotourism as community-centric activity and prepare community members to manage ecotourism. Finalize Special Tiger Protection Force (STPF) deployment in helping management against illegal activities, especially poaching. Institutionalized mechanism for coordination with the neighbouring Bhutan for protection.

SUNDARBANS TIGER RESERVE

Strengths | Absence of villages, settlements in TR. One of the largest standalone tiger populations in the country in a unique habitat of mangroves. Ecological contiguity of habitat (mangrove forests) on all three side of the area ie Bangladesh Sundarbans on the east, adjoining forest division 24-Parganas South on the West and Sajnekhali Wildlife Sanctuary and adjoining Reserve Forest area in the north. Extremely rich in biodiversity, especially populations of many endangered animals like horseshoe crabs, estuarine crocodile, Irrawady and Gangetic dolphins, Olive Ridley turtles, King cobra etc. Largest contiguous patch of mangrove forest in the world.

Weaknesses | Porous international border with Bangladesh. High population density coupled with poor socio-economic condition of people living in the fringe areas and proper infrastructure leading to high resource dependence. Inadequate number of protection camps at strategic locations, coupled with old weapons and slow moving boats. Absence of drinking water at most places. Lack of proper research and monitoring of ecological processes and population dynamics of key species. Inadequate inter-agency coordination. Unrestricted number of tourist, unplanned growth of tourist lodges in the vicinity. Man eating propensity of the tiger within forest areas.

Suggestions | System of registration of private tourist boats, so that reserve is aware of the number of boats and their movement. Daily sighting records should be converted into occupancy statements using elementary statis-

A mouse deer caught on camera trap in Kanha

tics. improve monitoring of vegetation changes, introduce mechanisms to liaise effectively with rural development departments, revenue departments, tourism departments etc. Upscale livelihood security programmes into integrated area development programmes. Work for MoU with Bangladesh to ensure prevention of smuggling of timber, NTFPs and wildlife articles.

Recommendations | An institutionalized mechanism for at least bi-annual meetings with officials of adjoining countries — exchange of information. MoUs with SSB & NTCA to control trafficking with Bangladesh, Bhutan & Myanmar. More inputs to make Tiger Reserve Foundation functional. Mechanism in the states (except West Bengal) for timely release of funds to the TRs. A review of the functioning of state- level steering committee. Critical assessment of the TCPs to help have a proper plan. Close monitoring of/technical assistance by NTCA for implementation of TCPs — form a compatible team depending on the area and report to NTCA — include expert and good and capable NGO representative. Regional level meetings of TR managers to exchange ideas and discuss problems. One TR director to co-ordinate and an observer from NTCA Initiation of ecodevelopment activities involving some partner NGOs for better planning, implementation and reciprocal commitment support — an ACF exclusive for EDC Involving selected stake holders in planning and implementation to mitigate the threats. Monitoring mechanisms to be in place for selected indicator species and habitat and technical support to be provided by NTCA, wherever necessary. Crash training programmes (site level/state level/regional) on various aspects at least for the senior/field level managers.

Special recruitment drive for the TR (exclusive with no transfer) — preferably from the local/regional. Experience in Dampa brings goodwill and stay in place. There are Tiger Reserves with several status (Biosphere Reserve, Elephant Reserve and World Heritage Site). Such reserve can have one composite Plan with different budget provisions. The landscape comprising of more than one Tiger Reserve and a number of forest areas with different status and connectivity may be treated as a landscape and brought under common management strategy and action plan (Eg. Manas, Buxa and the adjoining forests). Upload a copy of the TCP on website for better transparency.

Kawal: A New Tiger Reserve

S P Yadav

The state government of Andhra Pradesh notified the Kawal Wildlife Sanctuary as a tiger reserve in April 2012, making it the 41st tiger reserve in the country.

Kawal Wildlife Sanctuary, with an area on 893.23 sq km, is located in the northern region of Andhra Pradesh and it spreads over territorial divisions of Jannaram and Nirmal in Adilabad district. It is one of the oldest sanctuaries in the state and is considered to be the best habitat for tiger conservation in the north of Andhra Pradesh.

The Kawal Wildlife Sanctuary was managed as a Protected Area by the erstwhile Nizam of Hyderabad state and was used for shikar by the Nizam. After the formation of Andhra Pradesh state, this area was notified as Game Reserve in 1965.

The government of Andhra Pradesh later declared the Kawal Wildlife Sanctuary under Section 26 (A) of Wildlife (Protection) Act 1972 in 1999.

FOREST TYPE, FLORA & FAUNA

Kawal is the largest sanctuary in North Telangana and is known for rich tropical dry deciduous forests with predominance of teak, bamboo and abundance of wild fauna. The landscape in this area is mosaic of dense forests, patches

of open grassy plains and water bodies. A number of streams and rivulets like Cheekamanu vaagu, Pavurala vaagu, Pedda vaagu etc which are tributaries of rivers Kadem and Godavari flow through the sanctuary area making it excellent habitat for the wildlife. The important faunal species include tiger, panther, wolf, wild dogs, sloth bear, Gaur (Indian Bison), Sambar, Chital, mouse deer, Neelgai, Chowsinga, blackbuck, Chinkara etc

MANAGEMENT OF SANCTUARY

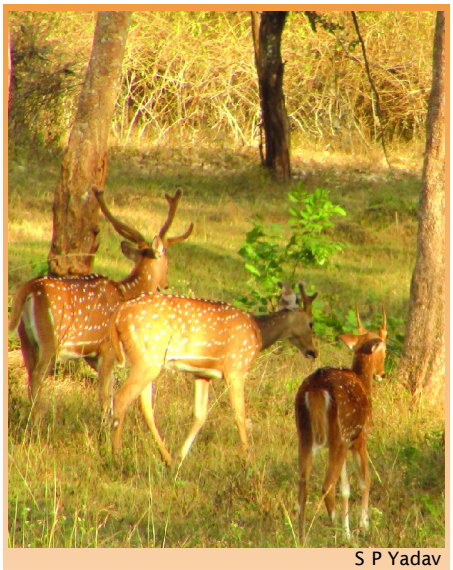
For scientific management of the sanctuary, a Management Plan was prepared and is under implementation with plan period 2003 to 2013. As per the plan, extraction of bamboo, collection of beedi leaf etc have been stopped in the sanctuary area. Only habitat improvement works and protection measures are being implemented. The funding support is from Centrally Sponsored Schemes, 13th Finance Commission, Normal State Plan and CAMPA duly following the Management Plan in force.

OBJECTIVES

- To improve the tiger habitat by consolidating the boundary and the habitat within the sanctuary this is fragmented due to encroachments & habitations
- To manage wild animal population including tiger as source population and for improving their numbers which can then disperse into adjacent areas
- To strengthen protection in interior areas by deploying staff, improving communication and mobility
- To monitor the habitat and wild animal densities with periodic estimation on scientific lines including camera trapping.
- To create awareness among people for conservation
- To establish biodiversity research centre for bringing out the floral and faunal wealth of the sanctuary
- To promote community-based ecotourism on a sustainable basis with involvement of local communities as a tool for achieving the objective of involving general public in conservation of the biodiversity of the area.

JUSTIFICATION FOR PROPOSAL

The forests of Kawal Wildlife Sanctuary form a corridor with forest tract of Tadoba National Park in the Maharashtra which is a Tiger Reserve with good population of Tigers. The declaration of Kawal Wildlife Sanctuary as a tiger reserve will be most beneficial not only to Kawal but also to Tadoba as the tigers are known to disperse between the two forest tracts which share a similar forest landscape. The tiger population of Tadoba can be a source population for dispersing into Kawal tiger reserve which has a habitat capable of supporting good many tigers.



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Along with the entry of rhinos, the frontline staff seems more motivated and local communities are involved. Rebuilding is on and assured funding from government sources is helping the park take bigger strides

In the recent past, this sanctuary along with the vast adjoining forests tract covering over 6500 sqkm was supporting a healthy tiger population numbering 20 to 25. Between 1990 and 2005, when the extremists' problem was at its peak in the state, particularly in North Telangana, protection in the sanctuary was hampered. The field staff members did not have the freedom to move in the forest areas due to extremists' threat. The arms and ammunition and wireless sets available with the field staff were also withdrawn and kept with Police department for security reasons. During this period the tiger habitat suffered greatly from encroachments, habitat fragmentation, illicit felling of trees, uncontrolled grazing etc. The tiger population as a result declined this period.

IMPROVED GROUND SITUATION

But the situation changed after 2005 when the extremists' problem totally came under control because of the measures taken by the government. Today, the field officers are able to move freely in the sanctuary area and visit even the most remote locations. The protection has improved and the area is showing definite signs of recovery from wildlife point of view. The annual census of tiger/panther and the estimation of prey species taken every year indicate that Kawal and its surrounding forests still support around 7 to 10 tigers. This population can be built upon with intensive protection and habitat improvement measures.

It is also important to note that Kawal has forest areas contiguous with forests of other divisions like Adilabad, Mancherial, Nirmal and Bellampally measuring 6637 sqkm. All these forest divisions have

dense forests which are ideal habitat for the tiger. In fact, the entire North Telangana forest landscape right from Adilabad to Khammam upto river Godavari has continuous forests which can support a healthy tiger population. The acceptance of Kawal Wildlife Sanctuary as a Tiger Reserve will enable the government of Andhra Pradesh to manage the surrounding forest areas as buffer to the Kawal Wildlife Sanctuary and will give a boost to conservation of tiger in the entire North Telangana landscape. It would not be out of place to mention here that Kawal is the last hope in North Telangana for building a viable tiger population and that in turn will help manage the landscape as a conservation unit and build a healthy ecosystem with a lot of biodiversity value.

ADMINISTRATIVE ISSUES

The Kawal tiger reserve spreads over Jannaram and Nirmal divisions. There is need to bring the entire sanctuary under a unified PA manager by merging the two ranges of Nirmal Division with Jannaram Division. The notification of Kawal Wildlife Sanctuary as tiger reserve will help in bringing the entire sanctuary area under a unified command to facilitate management and administration. Already the department has taken measures to post wildlife trained officer as DFO wildlife management Jannaram. Steps are being taken to post trained officers at the level of ACFs and range officers. Training of field staff in wildlife management has been launched with the help of NGOs like WWF, WTI, Hyderabad Tiger Conservation authority etc.

PROTECTION MEASURES

- Six base camps established at key locations with 6-8 persons per camp to patrol interior areas
- Two strike forces with fast moving vehicle in sanctuary area falling in jurisdiction of Jannaram and Nirmal Divisions
- 12 wild animal trackers to monitor movement of wild animals on daily basis
- Three checkposts at key locations to check offences and restrict movement of vehicles in the sanctuary at night
- Night traffic closed from 9pm to 6am on road from Birsaipet to Jannaram by erecting checkpost

HABITAT IMPROVEMENT

- Uprooting obnoxious weed and encouraging local vegetation and grass
- Improvement of natural water sources and creating artificial sources in areas with scarcity
- Development of new fodder plots and maintaining existing ones to build herbivore population
- New fire lines to manage fire

WIRELESS NETWORK

It is proposed to improve communication through wireless as large part of sanctuary area does not have mobile phone coverage by:

- Setting up 7 fixed wireless stations at division and range headquarters.
- Installing 13 mobile wireless sets on vehicles with DFO, FROs, Strike Force
- Providing handsets to all officials from DFO to FBO.

ESTIMATION/CENSUS

- Permanent carnivore trail and herbivore transects for estimation work
- Camera traps for estimation and monitoring
- Digital cameras and handheld GPS for all officers up to beat level.

PROPOSED RESEARCH, EDUCATION AND EXTENSION

- Establishing a biodiversity laboratory to document flora and fauna and further research on species, habitat & evaluation in the sanctuary
- Engaging two research assistants to conduct research and carry out special studies on habitat quality, carrying capacity etc
- Improving existing environmental education centre
- Creating awareness about wildlife conservation among local people
- Capacity building among staff, more so at field level.

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Date; April 30, 2012
Signature of Publisher
Sd

RESERVE-WISE RELEASE IN 11TH PLAN*

Tiger Reserve	State	2007-08	2008-09	2009-10	2010-11	2011-12
Nagarjunasagar	Andhra	73.92	56.983	94.91	155.645	154.406
Namdapha	Arunachal	30.00	136.852	14.62	96.875	75.00
Pakke	Arunachal	80.25	109.319	48.86	101.058	161.786
Kaziranga	Assam	0.00	306.792	165.00	1050.38	426.917
Manas	Assam	60.00	740.795	0.00	395.504	479.62
Nameri	Assam	35.61	44.793	21.59	63.588	40.972
Valmiki	Bihar	98.32	49.673	8.00	158.355	172.193
Achanakmar	Chhattisgarh	0.00	68.55	1193.5	1556.085	494.586
Indravati	Chhattisgarh	35.23	49.37	42.15	50.382	106.13
Udanti-Sitanadi	Chhattisgarh	0.00	51.95	103.05	207.258	102.01
Palamau	Jharkhand	45.16	115.377	110.735	130.616	156.347
Bandipur	Karnataka	974.53	114.565	164.197	367.656	213.950
Bhadra	Karnataka	185.19	158.067	128.087	154.114	215.8822
Dandeli Anshi	Karnataka	0.00	226.36	144.37	203.823	159.204
Nagarhole	Karnataka	0.00	190.847	210.818	934.466	1123.133
BRT	Karnataka	0.00	0.00	0.00	0.00	118.48
Periyar	Kerala	153.24	170.35	151.8	209.330	261.57
Parambikulam	Kerala	0.00	96.74	129.36	114.130	168.2
Bandhavgarh	MP	499.46	1814.949	159.96	2292.125	2313.237
Kanha	MP	270.42	1638.283	280.18	575.960	1969.67
Panna	MP	1822.85	2108.938	175.895	390.696	284.796
Pench	MP	220.85	169.091	158.32	236.430	191.530
Sanjay Dubri	MP	0.00	74.506	145.84	203.451	92.673
Satpura	MP	162.36	1192.775	1502.371	264.160	310.806
Kuno Palpur	MP	0.00	0.00	0.00	0.000	190.000
Melghat	Maharashtra	138.37	180.939	155.185	2137.088	973.579
Pench	Maharashtra	71.50	71.18	75.872	102.715	280.818
Tadoba-Andheri	Maharashtra	85.85	159.006	131.82	494.887	2320.549
Sahyadri	Maharashtra	0.00	0.00	5.00	54.374	47.396
Dampa	Mizoram	82.90	241.45	2171.00	187.690	225.288
Satkosia	Orissa	0.00	75.00	127.73	72.834	118.408
Similipal	Orissa	43.28	550.99	42.35	742.456	436.668
Ranthambhore	Rajasthan	223.45	808.86	10560	250.325	0.600
Sariska	Rajasthan	187.23	1900.09	134.17	2118.600	66.610
KMTR	Tamil Nadu	45.40	222.371	138.455	119.270	209.825
Mudumalai	Tamil Nadu	0.00	243.55	51.854	269.792	191.583
Anamalai	Tamil Nadu	0.00	224.885	50.245	131.725	204.556
Corbett	Uttarakhand	202.01	462.85	241.705	339.945	399.760
Buxa	West Bengal	106.79	67.64	38.58	120.873	135.660
Sundarbans	West Bengal	201.88	160.754	259.97	381.610	22.000
Dudhwa	UP	134.89	392.513	414.437	382.462	446.126
Mitigating man-tiger conflict (UP)		**0.00**	**25.00**	**0.00**	**25.000**	**0.0000**
Amount Released for 2nd All India Tiger Estimation		**0.00**	**0.00**	**401.012**	**28.77**	**0.0000**
TOTAL		**6270.94**	**15473.00**	**20153.00**	**17872.50**	**16062.522**

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All figures in Rs lakh; rounded off to 3rd decimal

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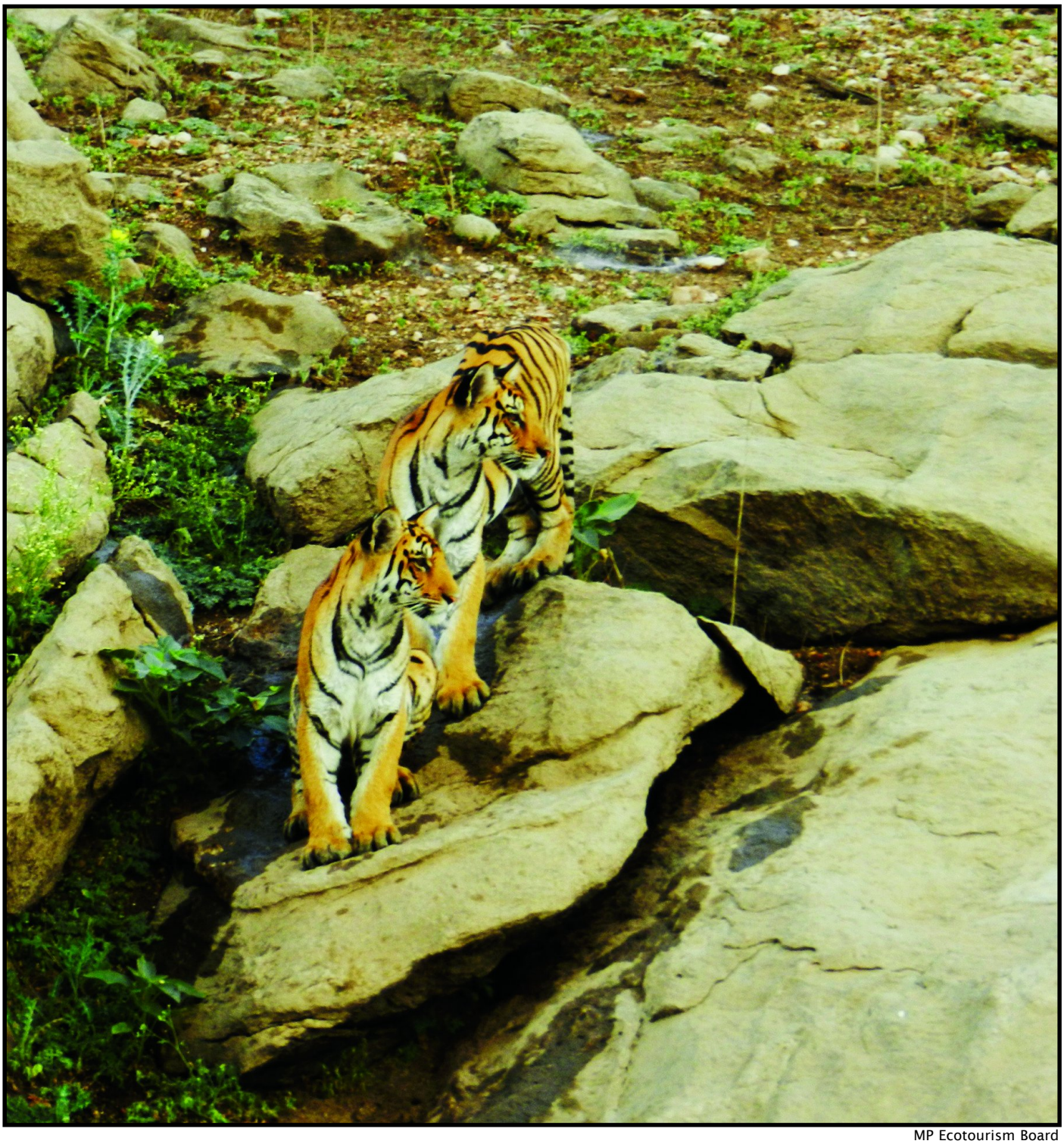

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