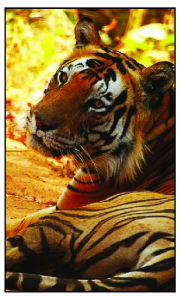
BI-MONTHLY OUTREACH JOURNAL OF NATIONAL TIGER CONSERVATION AUTHORITY
GOVERNMENT OF INDIA

stripes

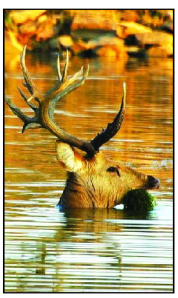
Volume 2 | Issue 6 | Sept-Oct | 2011

LANDMARKS



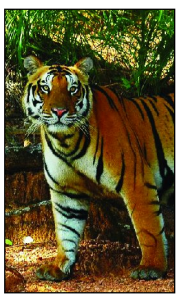
STRATEGIES

EVALUATION



ACHIEVEMENTS

PERSPECTIVES



INITIATIVES

FUND RELEASE TO TIGER RESERVES

(as on 31.10.2011)

All figures in Rs Lakh

TIGER RESERVE	STATE	REVALIDATED FOR 2011-12	UNSPENT BALANCE	RELEASE IN 2011-12	TOTAL
Nagarjunasagar	Andhra Pradesh	46.73	0	0	46.73
Namdapha	Arunachal	21.3746	0	0	21.3746
Pakke	Arunachal	12.308	0.2195	161.7857	174.3132
Kaziranga	Assam	0	8.598	426.9168	435.5148
Manas	Assam	0	0	479.62	479.62
Nameri	Assam	0	38.592	40.972	79.564
Valmiki	Bihar	0	44.4786	172.193	216.6716
Achanakmar	Chhattisgarh	0	0	233.776	233.776
Indravati	Chhattisgarh	0	0	106.13	106.13
Udanti-Sitanadi	Chhattisgarh	0	52.29	102.01	154.3
Palamau	Jharkhand	0	1.5375	156.3465	157.884
Bandipur	Karnataka	229.843	12.11	213.9504	455.9034
Bhadra	Karnataka	0	0.007	215.8822	215.8892
Dandeli Anshi	Karnataka	45.01	0	159.204	204.214
Nagarhole	Karnataka	35.722	0	154.296	190.018
BRT	Karnataka	0	0	118.48	118.48
Periyar	Kerala	0	1.13	211.37	212.5
Parambikulam	Kerala	0	4.25	133.71	137.96
Bandhavgarh	MP	0	53.885	243.247	297.132
Kanha	MP	0	17.71	361.67	379.38
Panna	MP	0	28.402	284.7956	313.1976
Pench	MP	0	40.09	191.53	231.62
Sanjay Dubri	MP	0	33.983	92.673	126.656
Satpura	MP	0	19.88	310.8056	330.6856
Melghat	Maharashtra	0	44.215	234.389	278.604
Pench	Maharashtra	13.792	0	280.818	294.61
Tadoba-Andhari	Maharashtra	330.12	74.2025	156.4135	560.736
Sahyadri	Maharashtra	0	0	47.396	47.396
Dampa	Mizoram	0	0	225.288	225.288
Satkosia	Orissa	0	8.792	118.408	127.2
Similipal	Orissa	33.43	33.43194	436.6681	503.53004
Ranthambhore	Rajasthan	2561.965	26.985	0	2588.95
Sariska	Rajasthan	1552.37	0	0	1552.37
KMTR	Tamil Nadu	25.3	25.324	149.128	199.752
Mudumalai	Tamil Nadu	0	0.0086	191.583	191.5916
Anamalai	Tamil Nadu	31.833	0	204.556	236.389
Corbett	Uttarakhand	0	2.095	319.389	321.484
Buxa	West Bengal	0	5.66	82.66	88.32
Sunderbans	West Bengal	0	168.46	0	168.46
Dudhwa	Uttar Pradesh	46.064	97.0265	337.4975	480.588
TOTAL		4985.8616	843.36314	7355.5579	13184.78264

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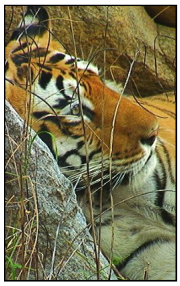

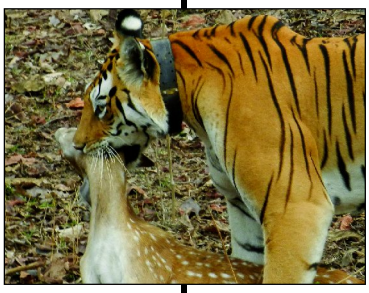

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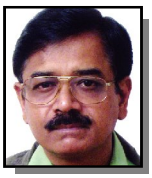
Cover photo
MP Ecotourism Board

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

s t r i p e s

n o t e f r o m t h e e d i t o r



THE Central Indian Landscape is crucial for in situ tiger conservation in the country. This encompasses tiger bearing forests of Madhya Pradesh, Chhattisgarh, Jharkhand, Maharashtra, parts of Rajasthan, Odisha and Andhra, with 19 tiger reserves and other protected areas. The status of tigers, co-predators and prey as assessed in 2010 is covered in this issue. The tiger population in the landscape thrives in important source areas like Kanha, Pench, Bandhavgarh, Ranthambhore, Nagarjunasagar Srisailam and Similipal, besides interspersed protected areas and forests. As the largest tiger occupied landscape in the country, it has tremendous conservation significance.

The Phase-IV monitoring is an important initiative which would complement the 'snap-shot' country-level tiger assessment done once in four years by NTCA, in collaboration with the Wildlife Institute of India, tiger States and outside experts. Under Phase-IV, the continuous monitoring of tigers and its prey would be done by field managers in their respective areas. The objective is to facilitate field managers to get a minimum number of tigers in a reserve, besides forecast/alert vis-a-vis their spatial presence/absence, while permitting a biologist to generate data for in-depth statistical analysis, including statistically explicit mark recapture analysis using SPACECAP/DENSITY and DISTANCE for prey density estimates.

The second round of independent Management Effectiveness Evaluation for tiger reserves has been carried out. The outcome has been communicated to states and is also being used in firming up the tiger conservation plan of each reserve.

This issue also carries an interesting write-up from a field manager on tackling disasters in protected areas. The ecological impact relating to the North Koel Dam in Palamau tiger reserve has also been highlighted.

Dr Rajesh Gopal
Member-Secretary, NTCA

Central India landscape

STATUS OF TIGERS, CO-PREDATORS AND PREY IN INDIA, 2011

The Central Indian landscape is bounded by the Aravalli Range in the north-west, the Satpura Range in the south, Chota Nagpur plateau in the north east and the Odisha hills in the south-east. Within this zone are located several hill ranges with elevations ranging between 200 m and 1000 m such as the Vindhyas, Mahadeo Hills and the Maikal Range. Much of the region is forested since the hills and plateaus with patches of shallow infertile soils do not permit extensive cultivation.

This landscape covers a vast area encompassing the States of Madhya Pradesh, Chhattisgarh, Jharkhand and parts of Rajasthan, Maharashtra, Odisha and Andhra Pradesh. The western parts of Maharashtra are a part of the Western Ghats landscape, while parts of Andhra Pradesh form the Eastern Ghats landscape. However, for the sake of convenience and ease of applying conservation policy and management actions, these States are not split but discussed as part of the Central Indian Landscape.

With 19 Tiger Reserves and several other protected areas, 4.1% (Qureshi et al. 2006) of this area is under forest cover marked by rapid conversion of forests to other land-uses such as agriculture and mining operations.

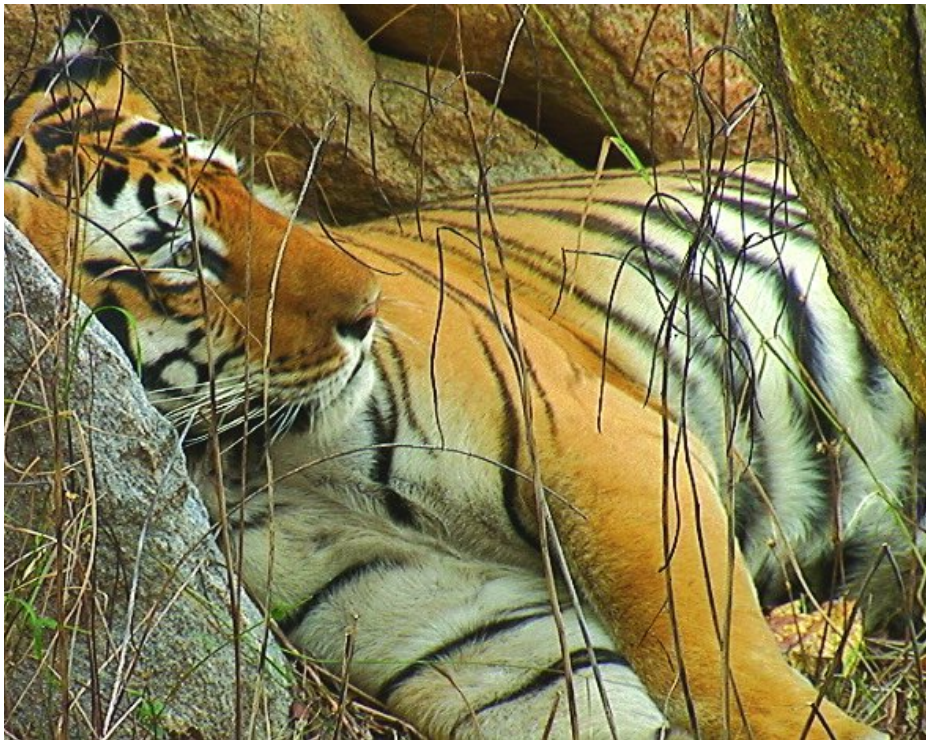
Within this landscape are located smaller sub-units of TRs that incorporate one or several Protected Areas that may or may not have the tiger, yet are essential for long term persistence of the species in the region. These include:

a) Sariska: Within the Aravallis of Rajasthan is located the Sariska Tiger Reserve. The isolated nature and inadequate protection levels in the Reserve led to local extinction of the tiger in 2004 (Narain et al. 2005). Thereafter, five tigers have been reintroduced in Sariska with the hope of re-establishing a breeding population of the species in future.

b) Ranthambhore-Kuno-Shivpuri landscape: The Ranthambhore Tiger Reserve in Rajasthan is connected to the Kuno-Palpur landscape in Madhya Pradesh through Keladevi Wildlife Sanctuary and forest patches in the north-east. This landscape unit has over 2500 km2 of potential tiger habitat within a forested area of over 4000 km2.

c) Panna: This Tiger Reserve is located in the Vindhya Range and formed a part of the Bandhavgarh-Sanjay-Guru Ghasidas-Palamau complex. However, in recent years, Panna has been isolated and forms part of a linear east-west forested patch of about 2000 km2. This site has also experienced extinction of the tiger and subsequently five tigers have been reintroduced of which two tigresses have littered. In 2011, a successful introduction was also done of a hand reared tigress that was taught to hunt wild prey.

d) Bandhavgarh-Sanjay-Guru Ghasidas-Palamau: This zone comprises of the Bandhavgarh Tiger Reserve located between the Vindhyas and Satpuras of Madhya Pradesh with a feeble connectivity to Sanjay-Dubri Tiger Reserve in Sidhi district of which the proposed Guru Ghasidas National Park in Chhattisgarh was a part in the undivided state of Madhya Pradesh. To the north-east, this zone is connected to Palamau Tiger Reserve of Jharkhand. This forested landscape is over 13,000 km2 and with good management has the potential of harbouring a viable tiger population along with populations of other wildlife of the region.



Anthropogenic disturbances such as livestock grazing, forest produce collection and the network of roads and railways are major threats to tiger conservation along with other seemingly benign activities like uncontrolled tourism

e) Kanha-Pench-Achanakmar: Located within the central part of this landscape these Tiger Reserves span across the States of Madhya Pradesh, Maharashtra and Chhattisgarh. The forested landscape covers over 20,000 km2 and has two major source populations of tigers (Kanha and Pench Tiger Reserves) existing as a metapopulation.

f) Pench-Satpura-Melghat: While Melghat Tiger Reserve is located on the Gawilgarh Ridge of the Satpuras on the Madhya Pradesh-Maharashtra border, the Satpura Tiger Reserve is located within the same Range to the north-east. Melghat-Satpura landscape covers over 12,700 km2 of forested habitat and exists as a metapopulation. Connectivity between Satpura and Pench Tiger Reserves is through stepping stone forest patches.

g) Nagzira-Indravati: This unit spans the insurgency prone areas of Maharashtra and Chhattisgarh covering some of the best forests of this landscape in Bastar. Some of the important Protected Areas in this sub-unit are Navegaon, Tadoba Tiger Reserve and Bhandara Forest Division. The forested landscape covers over 34,000 km2 and has the potential to sustain viable populations of endangered species including those of wild buffalo and tigers.

h) Isolated forests of Simlipal and Nagarjunasagar-Srisailam: Both these Tiger Reserves extend over large areas (3800 and 8000 km2 respectively) of tiger habitat, located along the Eastern Ghats in Odisha and Andhra Pradesh. However, the presence

of left wing extremism has undermined conservation efforts in this region.

Apart from the existing 17 Tiger Reserves in this zone, four new areas have been proposed as Tiger Reserves: Ratapani in Madhya Pradesh, Sunabeda in Odisha, Mukundara Hills (comprising of Darrah, Jawaharsagar and Chambal Wildlife Sanctuary) in Rajasthan and Kawal Wildlife Sanctuary in Andhra Pradesh. Proposals have also been invited from Bor, Nagzira-Navegaon Wildlife Sanctuaries and Guru Ghasidas National Park to be considered as Tiger Reserves.

As per Rodgers and Panwar (1988) this landscape is covered by several bio-geographic zones, which include Semi-Arid (Punjab plains and Gujarat Rajputana), Western Ghats (Malabar plains and Western Ghats mountains), Deccan Peninsula (Central Highlands, Chota-Nagpur, Eastern Highlands, Central plateau and Deccan South) and Gangetic Plains (Upper Gangetic plains and Lower Gangetic plains) and Coasts (East coast and West coast).

While this landscape has amongst the finest tiger habitats of India, it also is a home to India's largest scheduled tribe population most of who are amongst the poorest in the country. Incidentally, this is also the area with the highest concentration of minerals and thus mining interests (Narain et al. 2005). This makes conservation a major challenge.

CONSERVATION SIGNIFICANCE

Apart from being the largest tiger occupied landscape in the country and having the largest number of tigers, this landscape also encompasses several biosphere reserves. Of the three biosphere reserves viz., Simlipal, Pachmarhi and Achanakmar-Amarkantak, the former two are also a part of the UNESCO's Man and Biosphere Programme (MAB).

In terms of tiger conservation, this area has been recognised as important with four level I tiger conservation units (TCUs), five at level II, 24 at level III and three sites as priority survey sites. Johnsingh and Goyal (2005) recognised the Satpura-Kanha-Bandhavgarh TCU as the second best in the country with 4000 sqkm protected area, comprising of Bori, Satpura, Pachmarhi, Pench, Kanha and Bandhavgarh Protected Areas with a population of about 350 tigers and capable of sustaining up to 500 tigers.

CONSERVATION STATUS

This zone comprises of the most threatened habitats of the tiger in India. The species has already faced extinction from two Protected Areas due to poaching while the existence of high levels of human-tiger conflict around other sites like Ranthambhore and Tadoba-Andhari jeopardise tigers at these sites as well.

Anthropogenic disturbances such as livestock grazing, NTFP collection and the network of roads and railways are major threats to tiger conservation along with other seemingly benign activities like uncontrolled tourism. Fragmentation of habitat due to developmental activities and those that add to the state ex-chequer such as mining are major threats.

S P Yadav

The Palamau-Kodarma and Indravati-Kangerghati-Papikonda landscapes despite having vast tiger habitats of 40,000 and 30,000 sqkm (Jhala et al. 2008) respectively are affected by left wing extremism, high livestock grazing, forest fires and poaching which makes tiger conservation challenging.

Similar issues exist also in Nagarjunasagar-Srisailam and Simlipal-Hadgarh landscapes even though they are very productive areas.

Jhala et al. (2008) identified four important landscapes in this region. These include Kanha-Pench, Satpura-Melghat, Sanjay-Palamau and Navegaon-Indravati. To strengthen such areas and reduce the impact of human disturbance in the tiger breeding zones (core areas of tiger reserves) would be necessary to

protect the biodiversity of these regions while reducing cases of human-wildlife conflict.

Several conservation organisations have been active in this zone, promoting research, conservation and spreading awareness regarding biodiversity conservation such as the Satpuda Foundation, Tiger Watch, Wildlife Conservation Trust, WWF and Wildlife Trust of India. Wildlife Trust of India has also developed a wild buffalo monitoring programme for the last remaining individuals in Bastar region. Similarly, several academic organisations such as Indian Institute of Forest Management (IIFM) Bhopal, Tropical Forest Research Institute (TFRI) Jabalpur, Zoological Survey of India (ZSI) and Botanical Survey of India (BSI) have been conducting studies in the region. The role of such local organisations is important in understanding and safeguarding these tiger landscapes.

TIGER OCCUPANCY

Out of 5553 (10x10 km) grids within potential tiger habitat that were surveyed, tiger signs were detected in 464 grids giving a naive estimate of tiger occupancy at 8.36%.

Of the total available tiger habitat covering 3,38,378 sqkm in these grids, 38,056 sqkm constituting 11.2% of the total habitat was occupied by tigers.

The major determinants of tiger occupancy in the landscape were:

a) amount of undisturbed forest area (had positive coefficients), Tiger habitat in the Central Indian Landscape showing

b) encounters of large prey and wild dung density (had positive coefficients) probability of tiger occupancy modelled by incorporating

c) human disturbance indexed by distance to major roads, human and livestock trails imperfect detections as well as covariates of landscape and livestock dung density (negative effect on tiger occupancy) characteristics, human disturbance, and prey availability. Least cost corridor pathways re-aligned on high resolution satellite image are also shown.

The delta AIC for the top two models was less than two. Therefore, we used the model averaged coefficients, based on AIC weights of these two models to estimate parameters.

The tiger occupancy estimate from the model averaged coefficients was 9.48 (se 0.17)%. With high detection probability (0.34) and number of surveys (5 kilometre spatially independent walks) ranging from 3 to 30 (proportional to the amount of tiger habitat in a grid) the increment in tiger occupancy (from 8.36 % naive estimate to 9.48 %) by incorporating imperfect detections and covariates was small. However, the coefficients of covariates used in the models provided good insight into factors that influence tiger occupancy in this landscape. The occupancy probability of a grid habitat was interpreted as a quantitative estimate of habitat suitability for tigers and was a useful tool for mapping source and corridor habitats.

TIGER POPULATION EXTENTS AND ABUNDANCE

Mark-recapture population and density estimates of tigers based on camera-trapping were obtained for Ranthambhore, Satpura, Pench, Kanha, Supkhar, Bandhavgarh, Achanakmar, Melghat, Tadoba and Srisailam Tiger Reserves. Tiger densities in this landscape ranged between 1 to 16 tigers per 100 km2. Non-camera trapped grids with tiger occupancy were assigned to tiger density categories using ordinal logistic regression.

S P Yadav

Based on contiguous occupied grids, 23 separate tiger populations could be identified within the Central Indian Landscape with some scattered tiger presence also recorded in-between some major populations.

Eight major tiger populations with over 30 adult individuals and several smaller populations were identified in the landscape.

Sporadic occurrences of tigers

were also recorded in the forests of Indore and Dewas, Jabalpur, Nauradehi and Damoh, Kuno-Sheopur and Madhav, Adilabad and Khammam, and within intervening forest corridors between Kanha and Pench, Kanha and Achanakmar, and within forested pockets across Odisha. Tiger populations that were exterminated from Sariska and Panna have been re-established by reintroductions. Two reintroduced tigresses have already littered within Panna. Indravati and parts of Chhattisgarh and Jharkhand could not be assessed due to Maoist insurgency within these states.

CORRIDORS, CONNECTIVITY & CONSERVATION

The Central Indian landscape currently has three functional metapopulations which include:

a) Pench-Kanha-Achanakmar
b) Satpura-Melghat
c) Tadoba-Chandrapur

Four more landscapes have the potential to harbour tiger metapopulations. However, their corridor connectivity has become fragile requiring intervention of policy and restoration for functioning as effective wildlife corridors. These include:

a) Pench–Satpura
b) Bandhavgarh–Sanjay–Dubri-Guru Ghasidas
c) Ranthambhore-Kailadevi–Kuno–Sheopur
d) Tadoba-Chandrapur-Garhcharoli-Adilabad-Indravati

Due to the small size of many source tiger populations in the Central Indian landscape, their long term future is bleak unless they are managed as functional metapopulations.

Therefore, developing a policy to legally ensure that the habitat matrix within these corridors remains friendly for movement of wildlife is essential. Herein, using probability of tiger occupancy as a base layer along with tiger habitat connectivity defined at a high resolution, we have identified potential corridors using "least cost pathway" analysis and Circuitscape in a GIS domain. Many of these corridors are known to be used by tigers and other wildlife such as the Kanha-Pench corridor.

Others, such as the Satpura-Pench corridor, need further field verification to define their exact boundaries on the ground, so as to minimize impacts on local and national economies while maximizing wildlife values.

The loss of peripheral tiger occupancy is a major conservation concern within this landscape where tiger poaching had eliminated two populations (Sariska and Panna) in the recent past (Check 2006; Gopal et al. 2010).

Good accessibility within tiger forests, prevalence of tribes known for their traditional hunting skills, combined with high poverty levels makes this landscape of conflicts vulnerable to commercial poaching.

S P Yadav

Phase IV Tiger Monitoring

Summary Record of Deliberations Held On Sept 7, 2011 at NTCA, Delhi

The Member Secretary of NTCA initiated the discussion by highlighting decisions taken in a country-level meeting of wildlife wardens and field directors in May 2011.

Dr K. Ullas Karanth, Member, NTCA and director of Centre for Wildlife Studies made a presentation on the minimum standards relating to the proposed monitoring protocol, while highlighting the country/state-level area details and cost implications based on minimum standards identified by NTCA earlier.

The deliberations focused on the following:

Consensus on monitoring protocol: The following minimum standards for monitoring were agreed upon:

Tiger monitoring

- Camera density: 25 double-sided cameras per 100 sqkm
- Sampling effort: 1000 trap-nights/100 sqkm
- Minimum area of 400 sqkm or entire Tiger Reserve, if area is smaller than 400 sqkm
- Closure period = 45 to 90 days – (site specific)

Prey monitoring | Systematic line transect sampling with random start, consisting 30 or more spatial replicates and 6-8 temporal replicates

Fund requirement: The following cost projection for country level source monitoring was made by Dr Karanth, based on area estimates presented in earlier NTCA and WII Reports:

- Total source area to be monitored = 40, 500 sqkm
- Annual operating costs per 10,000sqkm = 2.6 crore
- Total costs: 10.7 crore annual + Rs 15.4 crore capital = Rs 26.1 crore
- Line transect costs: Rs 5.6 crore annual + Rs 1 crore capital = Rs 6.6 crore

(One time investment for 5 years)

Ravi Singh, Secretary General, WWF, stated that his organisation may be able to provide around Rs 1 crore per annum. Dr Karanth said his organisation would contribute around Rs. 1.5 crore per annum in the form of capital equipment needed and technical supervisory capacity. Dr M. Firoz Ahmed, Member, NTCA from Aaranyak and Dr A.K. Singh from WTI informed of support to the tune of Rs. 50 lakh per annum from their organisations. The Member Secretary, NTCA stated that a final view on the cost implication would be taken after deliberating with the state authorities.

Roles / responsibilities of NTCA / WII / States / Outside Experts

NTCA : Providing funding support (100%) for the Phase-IV monitoring to tiger states, besides technical guidance in collaboration with the Wildlife Institute of India, while providing a format for agreed actions between State and outside experts.

WII: Collaborating with NTCA for technical guidance, capacity building through national / regional workshops, besides making available study material.

Tiger states : implementing the Phase-IV monitoring and complying with the reporting requirements, identifying outside experts, pooling of resources, issuing necessary advisories, organizing state-level capacity building initiatives.

Outside experts: Participating and collaborating with tiger states. Organizing national, regional capacity building workshops and providing study material. NTCA in collaboration with the Wildlife Institute of India and outside experts would organize the national / regional workshops, besides providing study material in English. Dr Karanth volunteered to circulate a draft of study materials and guidelines.

Selection of outside experts: It was decided that the state authorities should be requested for providing a panel of such experts/organizations.

Timeline, grid finalization for camera trapping etc: It was decided that the Phase-IV would commence from 1st November, 2011. After discussion with the state authorities, the reserve/ site-wise grids vis-à-vis camera trap locations would be finalized. The progress on the process would be reported by states after every three months, besides an annual report on the entire monitoring outcome. It was also decided that the outcome should be placed in the public domain.

Stocktaking at Reserve Clusters

Protected Areas (PAs) face many challenges to their integrity which, unless addressed can undermine the very objectives for which they were established. In recent years there has been a growing concern among PA professionals and the public that many protected areas are failing to achieve their objectives and, in some cases, are actually losing the values for which they were established (Hockings et al 2008).

Management effectiveness evaluation is the assessment of how well protected areas are being managed. But as important as reporting requirements are, the primary role of assessment of management effectiveness is to assist managers work as effectively as possible.

MP Ecotourism Board

CORBETT

Strengths | High profile, significant patronage and huge tourism revenues. The reserve has a well developed and supported protection plan and force so it can afford to look at conservation planning beyond its immediate boundary. Its location within the Terai Arc landscape makes it a part of significant tiger conservation landscape which can support a large enough population which will be genetically viable for long-term conservation.

Weaknesses | The park and its buffer still face anthropogenic pressures from settlements and gujar deras. Human wildlife conflict is significant in and around the buffer. There is little or no involvement of stakeholder in the PA or in its tourism revenue. Staff strength needs to be upgraded. Too much time and manpower is involved in managing tourism and tourist facilities.

Actionable Points | A systematic plan is needed to address human-wildlife conflict in the

SARISKA

Strengths | The tiger reserve has a limited window of time in which it will remain in the forefront of conservation effort due the loss and subsequent reintroduction of tigers. It needs to leverage this period to optimize all aspects of management including resettlement of villages, regulation of anthropogenic pressures, engaging the local communities and bringing in scientific conservation planning. The tiger reserve staff are not involved in tourism and focused on protection and management.

Weaknesses | The TR is highly fragmented and extremely poorly shaped which ensures that the bulk of the TR is exposed to anthropogenic pressures. The roads that cut through the TR and religious tourism add significantly to the problem. Cattle grazing is widespread and there are wildfires in the dry season. There is mining activity just outside the TR, which has not local communities. Monitoring of human-wildlife conflict is poor. Public participation and improvement of livelihood through EDCs is minimal so there is not much public support for conservation. There are limited trained (wildlife) staff.

Actionable Points | There is need to rationalize the TR boundaries as fringe projections take disproportionately more resources and time to protect and manage. Resettlement will be a challenge especially as land prices are high. Poaching was the reason for the local extinction of tigers and although protection has improved there is need to strengthen this effort as other problems like grazing still remain. There is a need to increase staff strength, capacity and infrastructure.

buffer. There is great opportunity to divert a significant part of the tourist revenue towards community based eco-tourism. The Gujar Deras (181 families) must be resettled from the core area and biotic pressures created by 21 villages and 15 Gujar Deras in the buffer must be addressed.

DUDHWA

Strengths | This TR is the only representative of Terai-bhabar biogeographic subdivision of the Upper Gangetic Plains. It is also unique in supporting 5 of 7 deer species found in India and also endangered species like the Bengal florican and hispid hare. The great Indian one horned rhino has been successfully re-introduced.

Weaknesses | There are settlements in the core and buffer which need to be resettled. The three PAs (core areas) are fragmented and separated by agricultural lands and rivers with some encroachments in the corridor areas. The porous international border with Nepal brings in problems of illegal entry, poaching and wildlife trade. Human-wildlife conflict is a major problem. Roads and a railway line pose problems for wildlife movement and also increased mortality due to accidents. Staff shortages due to vacancies and also insufficient sanctioned staff strength are a problem.

Actionable Points | There is a need to secure the TR by resettling the village within the core and also focus on ensuring that the connectivity between the three PAs besides clearing encroachments in the corridor areas. Study needed to assess the impact of the road, railway line. Tourism must be developed to address livelihood needs of local communities.

RANTHAMBORE

Strengths | Extremely good protection strategy that involves multiple departments, one of the few TRs in the country to do so. Response of revenue and police departments is very good as is NGO support and involvement. Lessons learned from experimental translocation of tigers from here to Sariska will form the basis of meta population management in future. Very high profile, attracts a lot of tourists. Locals benefiting and supportive of the TR. Tourism is almost entirely managed by private and community based facilities, leaving the TR staff free for protection and management duties.

Weaknesses | As this TR largely represents an insular population it may not be able to support a genetically viable population suitable for long-term conservation. Large number of settlements within the core and these along with villages on the periphery exert huge biotic pressure.

Actionable Points | Resettlement of villages will secure undisturbed habitat. Human-wildlife conflict must be addressed. Communities must be more direct beneficiaries from tourism.

MELGHAT

Strengths | This is a large TR and has great potential for long-term

conservation. The protection mechanism has been revamped and is very systematic despite shortage of trained and good staff; management has motivated and got the staff organized into an effective patrolling unit. Villages within the core are willing to resettle outside. The TR is (in the process of) handing over tourism management to the communities and this will significantly help in improving livelihoods and thus increasing public support. This will also allow departmental staff to focus on protection and management. Malnutrition deaths in the largely tribal area have generated significant government funding of tribal schemes thus making them less dependent on the TR.

Weaknesses | There are a large number of villages in the TR and these need to be resettled to reduce biotic pressure. The road network within the TR will see reduced traffic if the villages are resettled outside the park. However, there will be some traffic as these roads also connect areas outside the TR and additional mitigation efforts are needed to ensure these roads are not a serious threat to the TR. Inadequate staff strength and lack of wildlife training are a problem. Human wildlife conflict is a significant problem and needs to be addressed.

Actionable Points | Resettlement of villages from the core will be critical as these village areas have the potential of becoming excellent habitats for herbivores and will significantly increase the carrying capacity of the TR. There is a need to improve staff strength and capacity; there is also a need for upgrading and increasing infrastructure for improved protection and management. As the terrain and living conditions make this area a very difficult place to patrol and live in, special funding is needed to give extra incentives to staff, including improved living conditions for staff and families and extra staff to allow adequate rest for frontline staff through a quick rotation of field shifts. Continue with the engagement of local communities in protection and tourism which will generate greater support for the TR.

PENCH (MAHARASHTRA)

Strengths | There is only one village in the core area and there is very little direct anthropogenic pressure on the TR. Pench TR is largely enclosed in a large buffer and hence is quite well protected. Pench is relatively free from weed but lantana needs to be tackled. This TR has connectivity to Pench TR in MP and onwards to Kanha TR so it exists in a relatively large tiger conservation landscape. The TR has already initiated efforts to shift management of tourism facilities to community based enterprise.

Weaknesses | The buffer area has a large number of villages and forests here are under tremendous anthropogenic pressures. There is human-wildlife conflict in the buffer but the TR is not addressing these at present as there is no clarity about management of the buffer. Staff strength is insufficient. Capacity building with a focus on wildlife protection and management is required urgently. At the landscape level there has been no serious attempt to identify corridors to the east (to the north it is secure) and this appears to be the most fragmented area.

Actionable Points | lThe single village in the core needs to be resettled immediately and options for shifting villages in the buffer (at least those close to the TR core area) also need to be considered. There is an urgent need to increase staff strength, capacity and protection infrastructure. Vehicles for patrolling and other activities are insufficient. Buffer area management needs to be planned and this will require significant inputs (money and effort). There is a need to re-evaluate the corridors/connectivity to the east. The buffer areas take the brunt of the anthropogenic pressures and addressing these will be a major challenge.

The TR is directly connected to Pench TR in MP and from there onwards till Kanha TR (the intervening corridors need to be secured) hence it lies within a much larger tiger conservation landscape.

SAHYADRI

Strengths | The TR has a large assemblage of flora and fauna of conservation interest and as such it makes a valuable addition to the TR network. This is a newly declared TR. A large number of villages (48) have been shifted out of the area when the dams for irrigation and hydro-electricity were built in this area. This TR has forest connectivity to Dandeli TR and further beyond all the way to the Nilgiris Eastern Ghats Landscape (Mudumalai TR, Bandipur TR and many protected areas).

Weaknesses | There are 15 villages in the core and additional anthropogenic pressure from the surrounding villages is also there. Mining outside the TR is a major source of disturbance and pollution. Setting up of windmills also damages the landscape. Malki lands (private forests) pose a special threat as the loss of these areas will cause disturbance to those wildlife species still occupying these forests. There is felling in these Malki land. Kumri cultivation is another threat to the landscape. Staff strength and capacity is poor and needs to be strengthened urgently. There is some resentment towards the TR, apparently due to new regulations.

Actionable Points | Notification of the core and buffer needs to be done at the earliest and a comprehensive TCP needs to be prepared. Resettlement of villages in the core needs to be addressed on a priority basis. Mitigating anthropogenic pressures from the surrounding villages needs to be handled sensitively as the local people are apprehensive. Mining close to the TR is a major source of disturbance to the park. Suitable Ecologically Sensitive Area (ESA) should be demarcated around the TR so that these activities are contained beyond that zone.

MP Ecotourism Board

Staff strength (including capacity) and infrastructure are inadequate and need to be augmented urgently. Given the huge conservation landscape that stretches across Maharashtra, Karnataka, Tamil Nadu and Kerala, there is need for higher level planning to ensure that the connectivity within this landscape is not broken. Issues like tree felling in Malki lands need to be addressed at the state level.

TADOBA-ANDHARI

Strengths | This is a large TR with a significant tiger and other wildlife populations and still has some fragile connectivity with additional habitats. The various forest divisions around this TR function in a complementary manner to the TR (with a focus on conservation) and this supports the TR significantly. Tourism is increasingly (and significantly) directed through the community-run facilities (established by the TR with state funding) and this reduces the burden of managing tourism on the TR staff. This is also generating significant support among locals and helps reduce the adverse impact of human-wildlife conflict. NGOs actively support this TR and there has been a fair amount of research.

Weaknesses | There are several villages in the core of the TR and these exert significant biotic pressure. Bamboo removal by these communities and some of those outside also cause significant disturbance. The corridors connecting this TR with other habitats are under significant pressure from mining and development. These activities are resulting in creation of fragmented landscape around the TR, leading to more conflict from tigers that disperse.

Actionable Points | Resettlement needs to be accelerated as there is threat of this TR getting isolated from the additional habitat patches outside the TR. Additional infrastructure to support protection and management is also needed in this TR. More attention is needed to ensure that the fragile corridors are secured. There is a need to engage the local communities more proactively and to provide or facilitate alternate sources of income to forest dependent people. Poaching is minimized but the current inadequate staff strength may not be able to hold up if there is a serious outbreak of poaching. Resettlement of villages is urgently needed.

Tackling Disaster

By R Hemanth Kumar, Conservator of Forests, Varanasi Circle, UP

What are disasters? There are many definitions, broadly extreme events, which result in widespread social disruption, trauma, property damage and loss of life.

Our forest ecosystems are facing many problems from climate change induced disasters. Spread of diseases, desertification, drought, cyclones, forest fires, flooding, landslides etc fall under the category of climate-induced disasters. Even though this problem has to be addressed largely at global level, we should be well-prepared for dealing with them at local level in order to minimize their consequences.

Some of the disasters/ crisis situations that we generally face in our parks are: forest fires, droughts (Keoladeo, Bharatpur), flash floods (Kaziranga), landslides (parks in Himalayas, the eastern and western ghats), rapidly spreading diseases, epidemics affecting health of our wild animals, man-animal conflicts, spread of invasive alien species (Kalakad-Mundanthurai), earthquakes, tsunamis, oil spills (Sunderbans), etc.

We must be well prepared for dealing with such exigencies. It can happen only through proper planning and training. Every emergency situation warrants a plan. For example, for dealing with a situation like poaching we must have a well documented anti-poaching plan for our park. Similarly park authorities must have well documented plans for facing exigencies like plan for dealing forest fires, plan for dealing with droughts, plan for dealing with Man-animal conflicts, plan for dealing with IAS, plan for dealing with bio-security issues of the park etc.

Lots of work is done in these fields and help can be taken while formulating such plans for parks. For example anti-poaching plans can be prepared on the lines of "Generic Guidelines for Preparation of Security Plan for Tiger Reserves" by TRAFFIC India and NTCA. While formulating plans, help can be taken from the concepts mentioned in my book titled "Model Disaster Management Plan for Zoological Parks of India" — a CZA publication.

Disasters mainly happen as we still follow the traditional approach, needed equipment (in many cases we don't have them adequately), need training, need funds and most of all, are complacent.

The word D-I-S-A-S-T-E-R itself gives us a fair amount of idea for dealing with it. D is for detection of exigency and need for communicating it to the chain of command and data collection; I is for incident command (chain of command) within the organization; S is for support system; A is for assessing hazards; S is for safety and security; T is for triage, a French word that means a process of prioritization; E is for

evaluation of the plan; and R is for rehearsal, redeployment and recovery.

Wilderness areas all over the world are susceptible (vulnerable) to a number of hazards like forest fires, floods, cyclones, earthquakes, landslides, epidemics, animal depredation etc.

These hazards are bound to take place and every park is vulnerable for these hazards. But if the institution has capability/ capacity to deal with these hazards; the consequences of the disaster will be minimized. Hazard takes the turn of a disaster only when the institution lacks capacity/ capability in dealing with it. For example all of our forests are vulnerable for fire (hazard) and if the park authorities have a capacity/ capability for dealing it, then the fire will be just an incident.

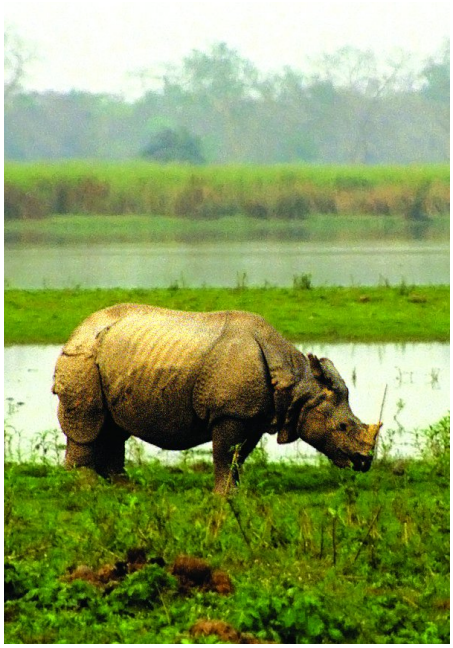
Conducting a hazard analysis will determine the hazards that the park is most vulnerable to. The disaster management plan becomes more realistic if we can determine the possible hazards that the park might have to face. For example, if the park is not in a coastal area, why should time be spent on developing procedures for a tsunami?

Researching old newspapers, gathering information from the old records of the park will give insights to the park manager about the possible emergencies. When once the exigencies are identified, put them in the form of a matrix.

By listing, on a scale of 1 to 3 each the possibility of each listed hazard, ecological impact, economic impact and socio-cultural impact, we can total the overall impact, which can help us prioritize the hazards. Dudhwa National Park, for instance, should plan for hazards like fire, bio-security and floods, rather than mudslides and tsunami.

After prioritizing, comes capacity building, which can be mainly in the form of toning up of the skills of employees and in building up required equipment.

The park authorities should identify the skills possessed by its employees, so that they can be used during emergency situations. Once the employees are identified it is better that they are asked for their participation in the emergency plan preparations.



Flash floods are a regular feature in Kaziranga sanctuary

If your institution doesn't have required skills then the authorities can try to impart required skills through training etc.

So the need of the hour is that the park authorities should have first hand knowledge about the skills possessed by their own employees. Once their skills are identified, measures can be taken up for toning them up through training.

For dealing with exigencies the park must have adequate infrastructure too. The authorities in their emergency plans must discuss about the issues related to equipment — like what are required and what they have? Once the requirement is assessed the authorities can plan for their procurement and upgrade, so that the capacity or capability of the park can be enhanced.

For example for dealing animal depredation from the park areas, the emergency plan for such exigency can have a chapter on the equipment, which can account for large carnivores (equipment needed: nets, pole syringes, snare, projectile guns and darts, blow dart equipment, crates, squeeze cages etc); small carnivores (nets, gloves, pole syringes, snare, crates, blow dart equipment, crates, squeeze cage etc); hoofed stock (projectile guns and darts, blow dart equipment, crates etc) and so on.

Technology assisted emergency plans will have a definitive edge over traditional plans. Space technology, GIS etc are extensively being used by natural resource managers worldwide for disaster management. One such example is in forest fire planning. In India (in the states like Uttar Pradesh, Madhya Pradesh and Uttarakhand), fire alerts are sent directly to the field level through SMS alerts. Organizations like Forest Survey of India are helping the states in identifying the fire hot spots and incidence of fire in real time.

It's all happening because of the satellites, which from their vantage position have unambiguously demonstrated their capability in providing vital information and services for disaster management. The Earth Observation satellites provide comprehensive, synoptic and multi-temporal coverage of large areas in real time and at frequent intervals and 'thus' have become valuable for continuous monitoring of atmospheric as well as surface parameters related to natural disasters.

The conventional methods of fire protection in India cover an elaborate network of fire lines, fire watchtowers, block lines etc., with very minimum human resources, which at times end up with inefficient fire control and management strategies due to accessibility constraints in

forested regions. Satellite remote sensing with its synoptic and temporal coverage can augment the ground operations in terms of fire detection, damage assessment and mitigation planning in a time and cost effective way.

For getting information on forest fires in India in real time basis, FSI is using satellite data procured on daily basis by the Forest Fire group of University of Maryland, USA. Forest Fire Group in association with NASA uploads information on active forest fires of the whole world on the Web Fire Mapper (maps.geog.umd.edu) on the daily basis. The updated information for the current date is available at around 10.30am for India on this website.

In India we have our own space programme in place for detecting forest fires in real-time basis. Indian Space Research Organisation through its array of IRS satellites, Environment Satellite (ENVISAT) and through its Defence Meteorological Satellite Program Operational Line scan System (DMSP-OLS) — a programme that helps in detecting fires during night, is helping the field mangers in identifying forest fire recurrence zones, forest fire risk assessment, potential areas for fire line alignment, fire watch towers locations, fire recovery analysis, monitoring fire progression, assessing near real time damage and in mitigation planning etc issues.

A comprehensive Indian Forest Fire Response and Assessment System (INFFRAS) are invoked by this organization for forest fire protection in India. Information of fire locations on daily basis with in 1-2 hours of the satellite ground pass can be viewed on their web site www.nrsa.gov.in.

Isro has undertaken lots of initiatives in forest fire protection using satellite technology. It has helped authorities of Rajiv Gandhi National Park, Nagarhole, Karnataka in finding new locations for fire watch towers for better visibility based on information obtained from satellites and offered near real time fire damage assessment was done for Nagarjunasagar Srisailam Tiger Reserve in 2008.

S P Yadav

Field managers must have a vision and prepare the way to get there

So, if the best of training, capacity and technology is available, why we do generally fail?

In the traditional organizations we are always compartmentalized. People are "boxed up" in their own roles.

If we want to excel, we should bring people out from their boxes by promoting a culture of internal communication. Try to develop contact-full communication with the subordinates, and have a faith in meaningful communication which will help us in "losing of one's mind and coming to one's senses" and helps in nullifying "skilled in competency of organizations".

Increase the rate of innovation in your institutions (create knowledge), and document it (archive knowledge). Be touchy with your subordinates: according to Bentley, the word TOUCH stands for Trust, Openness, Understanding, Confidentiality, and Honesty. Make them partners of success, then only you can fathom the barriers.

If you want to make your institutions a class apart, you have to act like change agents (change enablers) but for it we have to work very hard, we should always keep in mind what Mahatma Gandhi aptly said "become the change that you are asking for" — a difficult but not impervious task.

In the words of Kaun Tzu, a Chinese poet, 500BC, "if you are thinking a year ahead, sow seed; if you are thinking ten years ahead, plant a tree; if you are thinking a hundred years ahead, educate people".

How apt these words are even after many centuries?

Finally, let us examine what the Australian commission for the Future (1995) says: "The future is not some place we are going to, but one we are creating/ The pathways to it are not found; but made/The making of those pathways changes both the maker and the destination".

The future is the one which we are planning to create, the pathways are to be made, and then only the makers of those pathways will be remembered. So what do you want— to be remembered and recognized as a visionary leader or as a just manager?

The answer to that lies with you only.

Eco-impact of North Koel dam on Palamau reserve

A committee was constituted by the National Tiger Conservation Authority, for the site appraisal of the North Koel Dam at Mandal vis-à-vis its ecological impact on the core area of the Palamau Tiger Reserve in Jharkhand. The committee visited the site on May 20, 2011 and met local people, stakeholders, NGOs, user agencies and officers of the forest department. The committee also met officers of the state government on May 21 in Ranchi. The committee also considered representations from the villagers of Latu and Kujrum as well as opinion of the Wildlife Institute of India and field director of Palamau Tiger Reserve.

The ecological impact is analysed under the following scenarios:

No closure of gate (status quo):

In this case there will be no impounding of the water in the dam hence no change in the ecological status of the core/ critical tiger habitat of the Palamau Tiger Reserve

Gates of the dam are allowed to be closed:

The total area of Palamau TR is 1,026 sqkm (414.08 sqkm is the core area). About 119 sqkm of the forest will be submerged (including substantial portion of the core area — 360.22 ha) which is about 11.5% of the total area. The submergence-area is prime tiger habitat and is very rich in wildlife and biodiversity. These forests are the breeding grounds of Schedule-I animals like tiger, leopards and elephants and these animals reside and move here regularly. Due to submergence, the traditional migratory routes of elephants will be blocked.

> Even if new territorial forest or revenue lands equivalent to the submergence area is added to the Palamau Tiger Reserve, the quality of habitat would be far inferior to that being submerged

The stretch of water at full reservoir level (FRL) and the period for which water is between FRL and dead storage level (DSL) would determine the nature of changes in floral composition and diversity. Generally periodic flooding and consequent availability of area between FRL and DSL lead to increased productivity of grasses and other vegetation thereby helping the herbivore population. However, it will happen only when there is no biotic pressure in the form of cattle grazing and human use of the area and its surroundings.

However, the availability of water may also open up avenues for other commercial activities like fishing which may adversely impact the ecological value of the area undergoing periodic flooding. Therefore, the benefit

of increased vegetation will be available only if human activities and interventions are prevented.

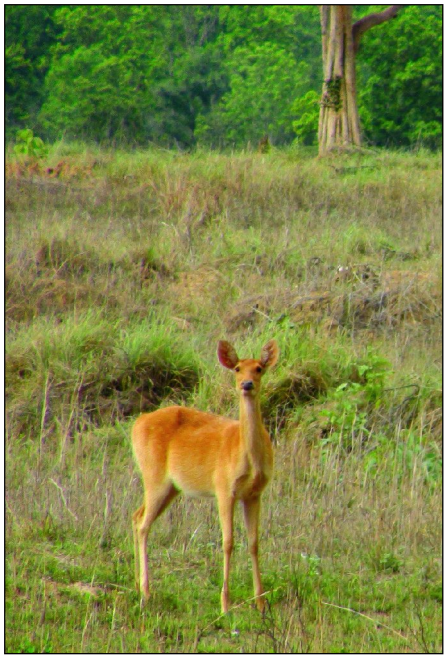
As per section 38 V (4) (i) of the Wildlife (Protection) Act 1972, as amended in 1006, the core/ critical tiger habitat has to be maintained as 'inviolate' for tiger conservation.

Seventeen villages will be submerged due to closure of dam. If these people not resettled taking into consideration the instant policy and the Forest Rights Act, they might encroach further on the forest areas of the reserve. Another 13 villages would be landlocked and resettlement of these villages would also be required

Even if additional new land/area (territorial forest/ revenue lands) equivalent to the submergence area is added to the Tiger Reserve, the quality of habitat would be far inferior to that being submerged. Moreover, such a move would also mean new villages (of the territorial/ revenue areas) becoming a part of the Palamau Tiger Reserve.

The submergence and ensuing displacement of tribal villagers would be detrimental towards the relationship between the forest department and local villagers throughout the reserve; and a good rapport between the forest department and local villagers is absolutely critical in the Left-wing extremism affected Palamau Tiger Reserve.

All large mammals are highly territorial, and in case of sudden destruction of their territory due to submergence, they are much more likely to stray into adjoining areas which include human habitations; and this will increase the man-animal conflict exponentially. The effect of destruction of such centuries-old wildlife-migration routes, to which these animals have become accustomed and familiar with over hundreds of years would be disastrous for Palamau's wildlife. The elephants of Palamau rarely venture outside



All large mammals are highly territorial and submergence of their territory will affect centuries-old wildlife migration routes

the boundaries of the reserve, and just migrate within the reserve area, moving on fixed intra-reserve migration-routes, of which Kutku-submergence area is a very vital part.

The project aims at generation of 24MW of electricity. For evacuation of this, electricity transmission lines will be needed. This transmission line will pass through Project Tiger forest. For this purpose, additional forest area will be required. This would further cause damage to the forest. Moreover, these transmission lines will be a potential fire and electrocution threat and a cause of disturbance to the wildlife.

The impounding of the water in the dam will change the ecosystem of the Tiger Reserve.

The benefits of closure of the gates of dam are as follows:

Irrigation benefit to roughly 1,11,800 ha of agricultural land in Aurangabad and Gaya districts of Bihar and 14,790 ha in Jharkhand which would justify the expenditure of approximately Rs 750 crore so far on the project.

The project would also be helpful in providing drinking water to the people and water for industrial use.

The project would also generate 24MW hydro-electric power.

The impounded water would be available for the use of the wildlife of the Palamau Tiger Reserve.

Area of submergence, after receding of water, may develop into grassland and would benefit the herbivore population of the Tiger Reserve.

If closure of the gates in the dam is allowed, it has to be with additional mitigation measures like viable livelihood options to the affected people.

The state should notify the buffer area and further add double the area of submergence to the core area of Tiger Reserve, all vacant posts of the reserve needs to be filled up immediately.

Catchment area treatment plan and command area development plan need to be prepared and implemented at the cost of the project. Villages losing access to their community rights on the submerged forest land also need to be resettled.

Closure of the gate restricting the water impounding to the dead storage level of the dam:

- No adverse ecological impact on the tiger reserve and wildlife
- Water availability to the wildlife would be increased
- To some extent, would justify the expenditure done so far on the project
- Groundwater table in the Palamau district as well as in the down stream areas would be increased
- However, the benefits of the dam like irrigation and electricity generation would not be available.

RESEARCH ABSTRACTS

Papers presented in the Annual Research Seminar (2011) of the Wildlife Institute of India, Dehradun

Panna, MP

Reintroduction-based recovery of tiger population

Tiger (Panthera tigris) is an endangered species, facing extinction crisis from habitat loss, poaching and conflicts with human interests. In Panna Tiger Reserve, tiger population showed a steep growth from 2-3 tigers/100 sqkm to 7 tigers/100 sqkm between 1995 and 2002, but rapidly declined to a local extinction in early 2009. Reintroduction efforts were initiated between March and November 2009, with translocation of three tigers (two females and one male) from three distinct populations within Central India landscape.

Viability analysis suggested that for a viable population of 25 breeding individuals, a founder population of six individuals (two males and four females), with supplementation every three years for three consecutive terms, are required. Nevertheless, the three initial set of reintroduced animals established well, occupying the best available habitats and bred successfully.

Given the changed scenario of six cubs in the present population, further reinforcement to founder population was delayed, until March 2011, when a tigress raised in captive and semi natural environment in Kanha was released here as an experiment to rehabilitate this orphaned tiger.

Genetic viability of this small founder population in Panna is assured from the original stock from three different sources, such that the genetic trajectory of the re-established population would likely reflect the historical population features.

Post-release monitoring efforts through radio-telemetry and field sampling protocols provides spatio-temporal dynamics in habitat occupancy and behavior of these animals. The reintroduction of tiger in Panna Tiger Reserve has been achieved through intensive monitoring and proactive management efforts and sets an example, and offers credible scientific and management lessons for responding to future extinction crisis.

— K Ramesh, Scientist C

Kaziranga, Assam

Impact of NH-37 on wildlife movement between Kaziranga and Karbi-Anglong Hills

This component of the larger study assessed the nature of ecological effects associated with National Highway 37 aligned along the southern boundary of Kaziranga National Park and evaluated the efficacy of existing speed regulation measures constructed in different sections of the highway.

Maximum use of herbivores was recorded in Kanchanjuri and Haldibari corridors. Small carnivore use was high in Ghurakati and Panbari corridors, which are located along habitations. Large carnivores frequented the Haldibari corridor which offered better habitat connectivity between Kaziranga and Karbi Anglong hills. Highest number of road kills were recorded for reptiles (69%) followed by birds (23%) and mammals (8%). High traffic volume poses a major threat to wildlife movement between KNP and Karbi Anglong hills during floods and effective measures are needed to improve the functionality of movement corridors.

— A Pragatheesh, Senior Research Fellow

Population genetics & poaching prevention

Illicit poaching has been a major challenge for conserving wildlife globally due to high demand in traditional Chinese medicine and other purposes in the international market.

Regulation could be immensely improved by the ability to verify the geographic origin of parts and products seized under wildlife offences. We discuss combined genetic and statistical approach to determine the geographic origin based on commonly used approaches of multi-locus genotyping and unique haplotypes/ SNP observed in mtDNA.

We established multi-locus genotyping profile data for tigers from northern, western and central India and Sunderbans. The mean observed heterozygosity was 0.337-0.762 whereas mean effective number of alleles per locus (Ne) ranged from 1.91 to 3.49. Of the 48 tiger poaching cases referred, 43% and 14.5% cases were from Uttar Pradesh and Delhi. The remaining were from other regions (n=11). These cases were mainly of skins (50%) and bones (44%). Of the 24 skins seized, 71% were of males.

— S P Goyal, Scientist G

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