ANALYSIS OF TIGER CONSERVATION IN PROJECT TIGER RESERVES

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Introduction

The Royal Bengal Tiger (*Panthera tigris tigris*), a charismatic megavertebrate, is the centre of attraction among the Indian wildlife due to its shining golden coat with conspicuous black stripes, illusive appearance and formidable features which justify its role as the mighty ruler of the Sylvan Kingdom. The enchanting morphology and befitting courage made this animal the most challenging trophy for crazy hunters/poachers, since man developed the sense of bravery as a status symbol. The increasing demands for the tiger and its parts in the international market for precious medicines, wines and aphrodisiacs, has made it a profitable business leading to large scale poaching during recent years.

The developmental planning of India has always been driven by an obsession to catch up with the developed nations making the national economic development antagonistic to conservation priorities, till recent past, causing the depletion of biodiversity at an astronomical pace. Being positioned at the zenith of the biological pyramid, the tiger not only regulates the natural balance of the biodiversity complex, it also signifies the overall status of the forest ecosystem. The quantum of the stress on this national animal first surfaced when the census report of 1972 recorded only 1827 animals, revealing the average rate of decline to the alarming tune of 530 tigers per year since the onset of the present century (as the number of tiger was around 40,000 at the beginning of the present century). The precarious condition of this magnificent cat alerted conservationists to take urgent and effective steps for recovery of its viable population.

The concern for tiger lead to establishment of special national project: Project Tiger in 1973. The then Prime Minister of India Late Shrimati Indira Gandhi regarded it as truly National endeavour and observed: "The Tiger can not be preserved in isolation. It is the apex of a large and complex biotope. Its habitat, threatened by human intrusion, commercial forestry and cattle grazing, must first be made inviolable".

Tiger reserves were established on the principle of Core-Buffer strategy. The core areas were to be declared absolutely disturbance-free where as the buffer zones were meant for the conservation oriented land-use only. Management plans were prepared on the following three basic objectives:

1. Elimination of human exploitation and disturbances from core areas and rationalisation of such activities in buffer zones.
2. Limitation of habitat management to repair damage done by man with aim of restoring the ecosystem as close to its natural form as possible.
3. Researching facts about habitat and wild animals and carefully monitoring change in fauna and flora.

Observations and Discussion

A perusal of details of Tiger Reserves (Table 1) reveals that only nine Tiger Reserves were established initially in the most important tiger lands, covering a geographical area of 16,259 km^2. The area was gradually increased to 25 Tiger Reserves, to cover a total area of 33,064 km^2 of tiger habitats in the entire country. The expansion of area under Reserve during last 25 years by 49.17 per cent reflects the grave concern as well as the quantum of threats to this species. A keen perusal of Table 2 reflects that only 8.97 per cent of the total reserve forest of the country has been kept under Tiger Reserves, which appears to be too small to meet the growing threats on the existing tiger population. Table (2) clearly shows the inadequacy of the area of the Tiger Reserves in all the states, except West Bengal and Bihar where quite sufficient area (47.4 per cent and 36.94 per cent respectively) is available for Tiger Reserves. The observations made during this investigation have been discussed under the following main headings:

Overview of Tiger Reserves (Year: 1996)

The Tiger Reserves were established to facilitate a safe haven of viable populations of tigers in India. However, recent reports on expected extinction of this magnificent cat by 2000 AD, has prompted an urgent investigative movement to review the performance of Tiger Reserves. Reports of such investigations have revealed that the Project Tiger has some how failed to achieve the desired level of success, to the extent many critics calling it a quixotic project. The following remarks project the inadequacy of the Tiger Reserves to meet the growing challenges on this species.

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Table 1. Tiger Reserves of India

Sl. No	Tiger Reserve	Area in Km^2	Year of Creation	State
1	Bandipur	866	1973-1974	Karnataka
2	Corbett	1,316	1973-1974	Uttar Pradesh
3	Kanha	1,945	1973-1974	Madhya Pradesh
4	Manas	2,840	1973-1974	Assam
5	Melghat	1,597	1973-1974	Maharashtra
6	Palamu	1,026	1973-1974	Bihar
7	Ranthambore	1,334	1973-1974	Rajasthan
8	Similipal	2,750	1973-1974	Orissa
9	Sunderbans	2,585	1973-1974	West Bengal
10	Periyar	777	1978-1979	Kerala
11	Sariska	866	1978-1979	Rajasthan
12	Buxa	759	1982-1983	West Bengal
13	Indravati	2,799	1982-1983	Madhya Pradesh
14	Nagarjunasagar	3,586	1982-1983	Andhra Pradesh
15	Namdapha	1,985	1982-1983	Arunachal Pradesh
16	Dudhwa	811	1987-1988	Uttar Pradesh
17	Kalakad	800	1988-1989	Tamil Nadu
18	Valmiki	840	1989-1990	Bihar
19	Pench	758	1992-1993	Madhya Pradesh
20	Tadoba-Andheri	620	1993-1994	Maharashtra
21	Bandhav Garh	1,162	1993-1994	Madhya Pradesh
22	Panna	542	1994-1995	Madhya Pradesh
23	Dumpha	500	1994-1995	Mizoram

Source: MoEF (1998)

"I give ten years for Tiger to be virtually extinct". Peter Jackson (1992), Chairman, Cat Specialist Group, SSC, IUCN.

"You have to put an end to the eastern medicines or the tiger will end up in peoples stomach". Valmik Thapar (1994), Ranthambore Tiger Foundation.

The inadequacy of the Tiger Reserves have been highlighted by Thapar (1996a), who after conducting a survey of 16 major Tiger Reserves of the country has recorded the following shortcomings:

▶ Seventy-five per cent of the Reserves do not have an effective armed strike force for anti poaching.
▶ Sixty-three per cent do not have a large vehicle for the mobility of strike force.
▶ Sixty-three per cent do not have adequate funds for intelligence gathering.
▶ Seventy-five per cent do not have sufficient legal aid to deal with offences and counter them.
▶ Eighty-two per cent do not have legal status in terms of final notification of the park completed.
▶ Thirty-eight per cent do not have claim compensation on the death of staff from the centre.
▶ Eighty-one per cent do not have forest guard welfare scheme.
▶ Sixty-nine per cent do not have a early award scheme.
▶ Thirty-eight per cent do not have any serious research program going on.
▶ Seventy-five per cent do not have a bilingual interpretation centre for local communities and tourists.
▶ Fifty per cent do not have unitary control of the area. They share control with other forest divisions.
▶ One-hundred per cent have adjacent territorial divisions where tigers are found.
▶ Ninteen per cent do not have good relationship with the district authorities.
▶ Sixty-three per cent do not receive their budget on time.
▶ Fifty-six per cent do not monitor daily movement of tigers.
▶ Thirty-one per cent are not able to provide any jungle kits to their staff, others are not able to provide kits for all their staff.

Table 2. State-wise Reserve Forests under Tiger Reserve Area (1997)

Sl. No	State	Reserve Forest Area (Km^2)	Tiger Reserve Area (Km^2)	No.of Tiger Res.	T.R / R.F. %Area
1	Andhra Pradesh	50,479	3,586	1	7.1
2	Arunachal Pradesh	15,321	1,985	1	12.9
3	Assam	18,242	2,840	1	15.56
4	Bihar	5,051	1,866	2	36.94
5	Karnataka	28,611	866	1	3.02
6	Kerala	11,038	777	1	7.03
7	Madhya Pradesh	82,700	7,206	5	8.71
8	Maharastra	48,373	2,217	2	4.5
9	Mizoram	7,127	500	1	7.01
10	Orissa	27,087	2,750	1	10.1
11	Rajasthan	11,585	2,200	2	18.99
12	Tamil Nadu	19,486	800	1	4.1
13	Uttar Pradesh	36,425	2,127	2	5.83
14	West Bengal	7,054	3,344	2	47.4
	Total	368,579	33,064	23	8.97

Source:MoEF (1998) & F.S.I. (1997)

▶ Eighty-eight per cent have vacant posts that have not been filled.
▶ Sixty-nine per cent do not have any registration of arms in a 10 km. radius of the reserve.
▶ Fifty per cent have not been given any format for inquiry into major death cases of tigers.
▶ Thirty-one per cent do not have an appropriate and approved management plan for the tiger reserve.
▶ Sixty-nine per cent are not getting any special allowance for the Project Tiger staff.
▶ Seventy-five per cent face the problem of forest fires.

He further added that, "if this is the state of 16 Project Tiger Reserves which are supposed to be the best managed and financed Reserves in India, what might be the fate of 500 other protected areas in the Country? How are we going to resolve this nightmare?"

The tiger habitat covers almost all the forest types of the country: thorn, dry and moist deciduous, semi-evergreen and evergreen, forests of Assam, Western Ghats (up to 2500 m.), outer Himalaya (up to 1200 m.) as well as the mangrove forests of Sunderbans and except the western desert (Anon 1988a). All the habitats have been severely fragmented into either small 'islands' or 'strips' of highly degraded habitats without any 'corridor' in between them and the area of the coverage, under the reserves too, is very low i.e. just 8.97 per cent of the total reserve forest area (Table 2), with the adjoining habitats not being reserved (Thapar, 1996a). Such a scenario provides enough scope for poaching. Moreover, the large areas of adjacent tiger habitats which do not come under the control of the Tiger Reserves form a very vulnerable zone for the extant tiger populations.

Tiger number in Reserves

After 1972 national tiger census, the Tiger Reserves came into existence and since then regular census is being done at periodic intervals. The census data received from the director Project Tiger (MoEF, 1998) showing the population of tigers in the various reserves during 1979, 1984, 1989, 1993, and 1995 have been presented in Table 3, which can be taken as most appropriate index of the outcome of efforts made under project to save this rare animal. The trend of population along with the net change ('<'= decrease and '>'= increase) in populations with respect to the original population of the different reserves are recorded in Table 3. The cumulative population trend showing mean annual population trends of the Tiger Reserves, in terms of annual change in number of tigers as well as annual increment percentage, in the original population using '+' and '-' for increase and decrease respectively in the population, has been recorded in Table 4.

The population trend in the Tiger Reserves (Tables 3 & 4) reveals following main facts

▶ The trend of population change does not match well with the strength of respective parent populations *e.g.* a population of 69 animals of Manas Tiger Reserve increased by 54 animals during five years (1979-1984), where

Table 3. Tiger Population Trend In Tiger Reserves

Tiger Reserves	Tiger census data (Trend)					Net change
	1979	1984	1989	1993	1995	
1. Bandipur	39	53(>14)	50(<3)	66(>16)	74(>8)	>35
2. Corbett	84	90(>6)	91(>1)	123(>32)	128(>5)	>44
3. Kanha	71	109(>38)	97(<12)	100(>3)	97(<3)	>16
4. Manas	69	123(>54)	92(<31)	81(<11)	94(>13)	>25
5. Melghat	63	80(>17)	77(<3)	72(<5)	71(<1)	>8
6. Palamu	37	62(>25)	55(<7)	44(<11)	47(>3)	>10
7. Ranthambore	25	38(>13)	44(>6)	46(>2)	38(<8)	>13
8. Similipal	65	71(>6)	93(>22)	95(>2)	97(>2)	>32
9. Sunderbans	205	264(>59)	269(>5)	251(<18)	242(<9)	>37
10. Periyar	34	44(>10)	45(>1)	30(<15)	39(>9)	>5
11. Sariska	19	26(>7)	19(<7)	24(>5)	25(>1)	>6
12. Buxa	#	15	33(>18)	29(<4)	31(>2)	>16
13. Indravati	#	38	28(<10)	18(<10)	15(<3)	<23
14. Nagarjunasagar-Srisailam	#	65	94(>29)	44(<50)	34(<10)	<31
15. Namdapha	#	43	47(>4)	47(Nil)	52(>5)	>9
16. Dudhwa	#	80	90(>10)	94(>4)	98(>4)	>18
17. Kalakkad-Mundanthurai	#	20	22(>2)	17(<5)	16(<1)	<4
18. Valmiki	#	NA	81	49(<32)	NA	<32
19. Pench	#	#	#	39	27(<12)	<12
20. Tadoba-Andhari	#	#	#	34	36(>2)	>2
21. Bandhavgarh	#	#	#	41	46(>5)	>5
22. Panna	#	#	#	25	22(<3)	<3
23. Dumpha	#	#	#	7	4(<3)	<3
Total Tiger Population in Tiger Reserves (Trend)	711	1121 (>410)*	1327 (>206)*	1366 (>39)*	1333 (<33)*	(>622)**

Source: MoEF (1998).
# = Reserve was not established;
NA = Census data not available.
* = Total increment during successive census
** = Increment with respect to 1979 population.

as the population of 84 animals in Corbett Tiger Reserve recorded an increase by only six (6) animals during the same period which appears to be quite an anomalous situation. If the population figures are not to be questioned then field situations and management inputs appear to have experienced sizeable fluctuations.

▶ A clear positive impact of projects has been reflected during initial phase of implementation by upward trend of the population, during which there had been a population increase in the reserves @ 82 tiger/year (11.56 per cent per year) which gradually shifted to the alarming declining trend @ 16.5 tigers/year (-01.2 per cent per year) during the last census of 1993-1995 (Table 4).

▶ The data (Table 3) reflects that the Corbett, Sunderbans, Bandipur, Simlipal, Ranthambore, Sariska and Kanha Tiger Reserves are the best where the net increment in population with reference to 1979 ranged the highest (25-44), where as in all other reserves like Indravati and Nagarjunasagar have recorded alarmingly high net decline to the tune of 23 and 31 tigers respectively since their last sixteen years of existence prior to 1995, which calls for urgent thorough investigation to illuminate the responsible factors.

The highly dynamic trend with very unpredictable changes should have reasonable explanations, based on thorough analysis conducted by experts, but unfortunately no such report is available except for Simlipal (Prusty & Singh, 1996; Srivastava & Singh, 1997). Such a record of the population trend (Tables 3 &

Table 4. Successive population trends in Tiger Reserves

Census Durations	Period (Years)	Annual population trends Number	Percent
1979-1984	5	82	11.56
1984-1989	5	41.4	3.71
1989-1993	5	7.8	0.58
1993-1995	2	16.5	1.2

4) clearly suggests that the Tiger Reserves had been successful in affording protection to the tiger population during the initial phase but gradually the growing threats have surpassed their efficiency and they are no more effective. Further the census methodology also needs urgent review for improvement to ensure better precision of the results. The existing tiger census being done by 'Pug Mark' method has already been challenged by various experts (Karnath, 1996; Thapar, 1996a) and some measures for improvement of precision level have also been suggested by Paranjpe *et al.* (1989), Karnath (1989) and Mishra (1998) with an intention to make the exercise uniform, a guideline has been issued by WWF-India recently (Singh, 1999).

Major threats

The precarious condition of this magnificent cat alerted conservationists to take urgent steps for restoration of conducive conditions in order to avert the threat of extinction. Out of the three most important factors responsible for the overall acceleration of rate of extinction of wild animals, listed earlier by Quli (1992), the present investigation emphasises the following two main factors as major threats responsible for causing severe damage to the population of Indian tigers, viz. poaching for illicit international trade, and, habitat fragmentation and shrinkage.

Poaching for illicit international trade

The period after implementation of Project Tiger should have been safer for this species, but the review of overall situation reflects that the rate of killing perhaps grew faster than the growing concern for this species. Although there had been some better response during the initial period, it did not sustain for long (Quli *et al.*, 1996). The number of poaching evidences as recorded are alleged to be as high as one tiger per day (Anon, 1998a; Thapar, 1996b).

Dhayni (1994), Jha (1995) and Mukherjee (1995) have held the 'illicit trade' of tiger and its body parts, responsible for large scale poaching. The news about the proposed legalisation of trade of tiger parts in China with a decision to open breeding farms for rearing tigers, for this purpose, is a matter of great concern as this is likely to promote large scale tiger smuggling from India through the vast Indo-Chinese border and the detection of offence on the other side of the border will become almost impossible (Jha, 1995). The increasing demands of viscera and hides of tiger for medicine, wines and aphrodisiacs have raised the value of these items exponentially during the last decade, making this a very lucrative business for international gangsters engaged in tiger poaching.

The seizure of skeletal fragments of around 40 tigers has cast aspertions on the success of Project Tiger (Thapar, 1996a). The report of the Wildlife Protection Society of India (WPSI) showing poaching of 63 and 73 Tigers during 1994 and 1995 respectively out of the existing population of around 2500-4000 tigers (Christie, 1997) also highlights well the inadequacy of Project Tiger in achieving its desired goal. Extremely concerned over the reports of growing incidences of poaching in the country, the famous Indian tiger expert Mr. Billy Arjan Singh recorded his concern as "The tiger will be virtually extinct in the wild by 1999, unless India and other range states declare an open war on poachers and illegal traders, and through all the resources required into the battle" (Anon, 1996).

The above observation clearly establishes that the increasing incidences of poaching form the most potent reason for the decline of tiger population in India. The comment of Mr. Billy Arjan Singh clearly suggests that we require intensive measures to fight out this threat, at all cost, if the tiger has to be saved.

Habitat fragmentation and shrinkage

Kothari (1996) has reported that more than three million people are living inside the protected forests and several million living outside are equally dependent on the forests for their essential goods and services such as fuel, fodder, small timber, non wood forest produce, fish and so on. There have been large scale destruction of tiger habitats for various other purposes. Dams and reservoirs have also submerged substantial areas of ideal tiger lands of the country. The habitat shrinkage *i.e.* the loss of forest cover, which was recorded to be just 507 km^2 during 1993-1995 (F.S.I., 1995) has increased to an alarming level of 5482 km^2 during 1995-1997 (F.S.I., 1997), reflecting an overall rate of increase to the tune of a little more than ten times during two successive assessments.

Encroachments by civilisation for agriculture and various other uses have led to severe fragmentation of tiger habitats in major six tiger lands of the country namely: Assam Valley, northern foothills and plains, western peninsula, central peninsular zones, Western Ghats and the Sunderbans (Shankhala, 1973), leading to the conversion of healthy tiger habitats to suffocated islands. Johnsingh and Panwar (1989) have regarded faulty land-use responsible for the large scale habitat destruction. The overall habitat fragmentation and shrinkage is the resultant of following two main factors: conversion of forests, and, biotic pressures.

Conversion of forests

The concept of forestry as hand maid of Agriculture, had been

mainly responsible for promoting the large scale conversion of forest areas for farming. Agricultural fields have encroached over forest land leading to rapid habitat shrinkage of many wild herbivores which support tiger populations. Mining is another important destructive factor which has been reported detrimental for the tiger population in India. Records (Anon, 1988b) show that only during the period of 11 years (1970 to 1980), the forest area cleared for mining operation has increased by 50 per cent. There are about 215 mines in operation within the core area of Sariska Tiger Reserve and 47 partly within it with more than 500 mines in the entire Sariska area (Dhyani, 1994). Deeply concerned over the rapid spread of mining areas over the protected forests during recent decade, Rao (1996) raised the question "If precious minerals are found under Taj Mahal or The Ajanta-Ellora Caves, will they be exploited?" A total of 3,24,116.67 ha. forest area is reported diverted for non forestry uses (MoEF, 1995) during the period of 1981 to 1994 and the average rate of deforestation in the country as per the latest data has been as high as 72 km^2 during 1990 to 1995 (Anon, 1998b).

Biotic pressure

Due to alarming rate of decline, to the tune of 36.36 per cent in the per capita forest area (from 0.11ha. in 1988 to 0.07 ha. in 1997) as reflected by F.S.I. (1989; 1997) during the last ten years, biotic pressure has become a serious threat for the existing tiger habitats.

There are about 1500 villages in the nineteen Tiger Reserves of the country -- Buxa Tiger Reserve has 36 villages and Melghat Tiger Reserve has 58 villages and similar situation exists in Dudhwa, Sunderbans, Kanha, Palamu, Manas and other Tiger Reserves (Dhyani, 1994). The latest national forest cover assessment record (F.S.I., 1997) has revealed that the country has only 19.27 per cent of its geographical area under forest as against the prescribed minimum of 33.3 per cent. This gap in forest area has further been depleted severely by the exponential increase in human as well as cattle populations, which have enormous dependence load on the forest resources for their unfathomable multidimensional needs, resulting in acceleration of the drastic decline in the carrying capacity of the forests. This, in turn, contributes directly to the decline of the tiger population (Srivastava & Singh, 1997).

Observations regarding the role of habitat shrinkage and fragmentation make it very clear that this factor has not only reduced the tiger populations but also made the tiger population highly vulnerable to poaching. The increasing biotic pressure has affected the tiger population in two ways; by reducing the natural prey population due to livestock competition, introduction of livestock borne diseases, incidents of cattle lifting by tigers, which, ultimately lead to man and tiger encounters, and, such senario helping the poachers to carry out their operations in connivance with the local people.

The inadequate infrastructure and staffing deficiencies further add to the list of adversities. Lack of proper database related with the habitat as well as the faunal complex, poses real problem in conservation of this top carnivore. It is a matter of real concern that even after quarter century of establishment of Project Tiger, the census methodologies are yet to be fool proof. The peoples participation too is far from the desired level due to inadequate mass awareness programmes. International regulations, especially in this subcontinent, need reinforcements in order to stop illicit international trade.

Conclusion

The observations and discussions of this communication leads to the conclusion that in its present form tiger projects are alone inadequate in mitigating the growing stress on the tigers due to the following main reasons:

- ▶ The Project Tiger Reserves are not equipped adequately in terms of infrastructure and manpower, the finance too is not enough to meet the growing challenges of tiger conservation.
- ▶ The lucrative international trade of tiger and its viscera, which has flourished uninterrupted during recent past, has promoted tiger genocide in India.
- ▶ The conversion of forests for various non-forestry purposes has severely damaged tiger habitats in the country making the tiger population highly vulnerable to extinction.
- ▶ The lack of proper database regarding tiger population, doubted tiger census figures and other faunal associates of the tiger as well as unexplained enigmatic fluctuation trends have really made the task very tough.
- ▶ The fast growing live stock population and the simultaneous sharp decline in carrying capacity of habitats, in and around reserves act as major limiting factor for tiger conservation endeavours.

Keeping in view the facts discussed above, I strongly support the opinion of Mr. Billy Arjan Singh who has emphasised waging a war against poachers and illegal traders and feel that the responsibility of saving tigers should be given due importance in real sense of the term. It is now time to ensure that all the three basic principles of the Project Tiger are sincerely followed and nothing comes in way of implementation of the Sanctum-Sanctorum strategy in true spirit. Urgent sincere efforts are required to generate favourable public opinion through adequate publicity of the urgency to save the tigers from extinction. The desired level of success can only be achieved if this challenge is dealt through participatory approach, the forest departments have already pumped in all their sincere efforts for about quarter of a century but the results reflect that recent challenges have outweighed their capability and access.

It appears quite obvious that for saving this rare animal we must strictly follow the guidelines proposed by the then Prime Minis-

ter Late Shrimati Indira Gandhi, who had very correctly emphasised that in order to save the tiger "Its habitat, threatened by human intrusion, commercial forestry and cattle grazing, must first be made inviolable". The problems of human intrusion, commercial forestry and cattle grazing have to be tackled on war footing, if at all we are really serious about saving this rare cat. The international regulations which seem to be quite toothless, should be provided with sound jaws in order to crush the internationally patronised genocide of this species. All this, will be only possible if we successfully revolutionise the public opinion in favour of tiger conservation so that this movement really becomes a public movement.

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