

“Sustaining Tiger Population and Managing Human-Animal Interaction”

Future Challenges in Panna Tiger Reserve, MP

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1) Introduction

Increasing population of tigers in Panna Tiger Reserve (PTR) will throw management challenges in future which need to be anticipated and dealt with proper prior planning. As analysed in previous article (“A brief note on Tiger population dynamics and its future projection in Panna Tiger Reserve”) that if 33 cubs are added every two years, these new recruits can be absorbed in the current tiger population by replacing the area occupied by the old individuals, re-adjusting the territories and spread in to buffer areas.

- The shift in the territory of old tigers from core area towards periphery indicates that young generation of tigers is pushing older generation to the periphery and themselves occupying central stage. It is discussed in detail in para 2 ‘Replacement and Re-adjusting of territories of tiger’.
- For sustaining this increase in population, one also has to keep an eye on sex ratio and distribution of male/female tigers in PTR to assess population stress, if any. It is discussed in para 3 ‘Assessment of Population Stress’ in detail.
- The tiger population dynamics predicts exponential growth in the Tiger population in next 3-5 years. Considering such a growth it is imperative to study the prey base supporting this population and the future dynamics of the same so that necessary strategy can be drawn to attain the required prey density. At the same time to sustain such a healthy number of tigers the other ecological factors like availability of water etc needs to be assessed. Readjusting the territories requires increase in prey density in the currently occupied core area. Similarly, tiger spread into buffer areas also require improvement in the ecology of buffer areas. It is discussed in para 4 ‘Prey Dynamics in PTR’ in detail.

2) Replacement and Re-adjusting of territories of tiger

PTR is collecting radio collared data (movement data) of all the translocated tigers and also few Panna progeny. This historical movement data provides valuable information not only regarding territory of different tigers but also shift in territory over a period of time (Territory of a tiger here has been taken as an area where its movement has happened over a year or more). Here, analysis has been done for three translocated tigers namely T1(female), T3(male) and T7(male). T1 and T3 were introduced in PTR in year 2009, T7 was introduced in year 2014 and one Panna progeny namely

P142(female). Following charts have been prepared with the movement data collected for the following periods for analysed tiger:

- i) Chart 1- Tiger T1 (female): from 2009 to 2019
- ii) Chart 2- Tiger T3 (male): from 2009 to 2019
- iii) Chart 3- Tiger T7 (male): from 2015 to 2019
- iv) Chart 4- Tiger P142(female): from 2015 to 2019

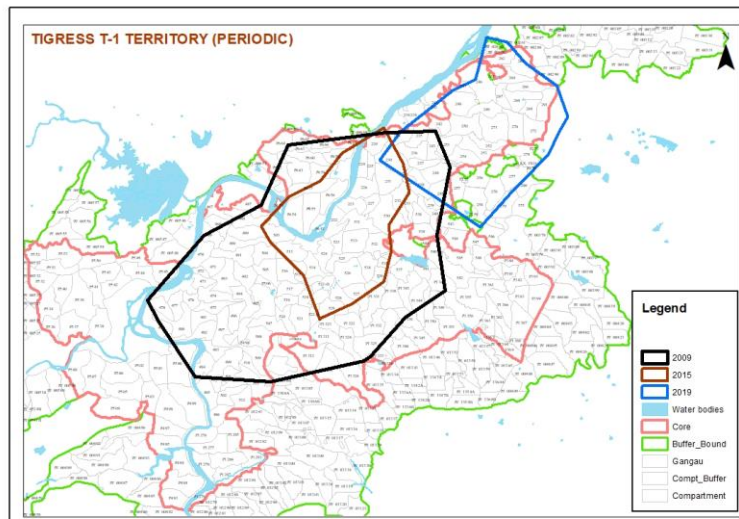


Chart 1- T 1 territory distribution

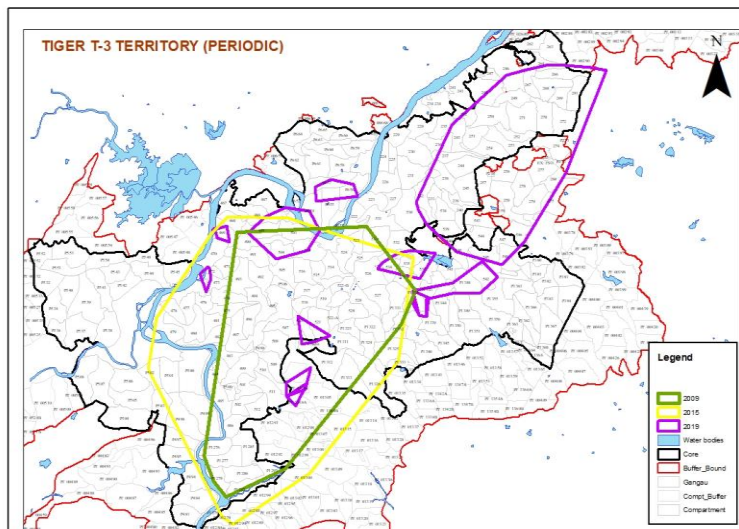


Chart 2- T 3 territory distribution

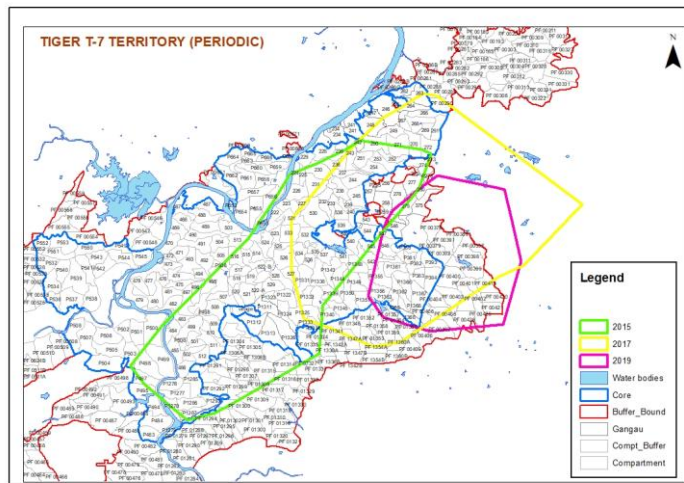


Chart 3- T 7 territory distribution

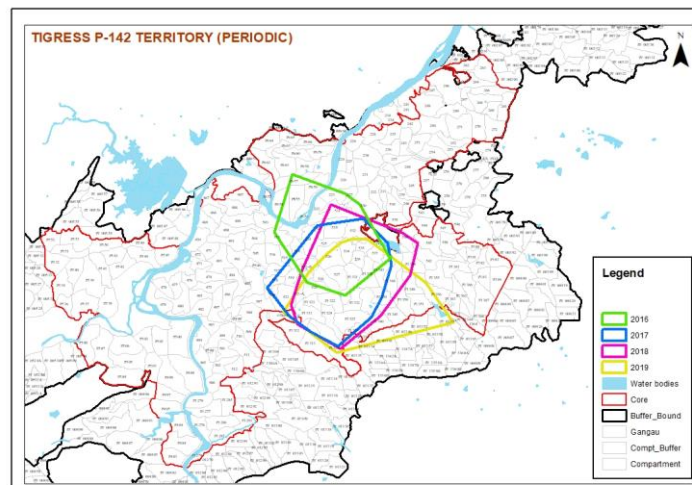


Chart 4- P142 territory distribution

Following results can be drawn conclusively from the above charts:

- i) There is shift in territory of all 3 translocated tigers from their introduction year to the present.
- ii) This shift in territory is from Core area of the reserve to peripheral areas.
- iii) Shift in territory has happened for both male and female translocated tigers.
- iv) Size of the territory has shrunk from introduction year to the present.
- v) Panna progeny being younger are occupying the Core area.

Analysis of the result obtained as above gives value information regarding behaviour of tiger but more importantly about successful management of tiger population within the park since tiger reintroduction. Following points emerge from the analysis:

- (1) Shift in territory to periphery for these tigers indicates that core area is increasingly being occupied by younger tigers. It also matches with the field reality where young tigers have been regularly captured in camera traps in core areas. Establishment of young tiger population inside core area of the Reserve is a sign of healthy growth of population of tigers in the PTR.
- (2) Shrinking territory of all 3 translocated tigers indicates increasing number of tigers in the Reserve which is forcing each tiger to reduce its territory. As at the time of reintroduction of tigers in 2009, these translocated tiger (three namely T1, T2 & T3 translocated in 2009, two namely T4 & T5 translocated in 2011, T6 in 2014 and T7 translocated in 2015) were the only tiger population in the Reserve having whole core area of 576 sq km at their disposal, these translocated tigers maintained large territories. As tiger numbers are rising in the Reserve, all charts show shrinkage in territories. This process of shrinking territory is still going on and has not settled yet. Historical data of Panna National Park show that in past, tiger population in the Park seemed to have remained relatively stable between 20-30 tigers since its inception although the highest count recorded was 36 tigers including young ones in the year 1985. Year 2006 estimate by Wildlife Institute of India had estimated the population at 15-32 tigers in the entire Panna landscape comprising approximately 1000 sq km before it became zero in 2009. Taking the maximum population size of 36 (including young ones) in the past, in approximately 550 sq km forest area, the maximum density ever in PTR comes out to be around 6 tigers per 100 sq km. Currently the density is around 10 tigers per sq km. The current density has already breached the historical density figures and it seems it is still evolving in PTR. Hence actual size of the territory will be known only in future and it requires constant gathering and analysing the collected data.
- (3) As per the data depicted in chart 1, 2 and 3, shift of older animals is happening towards/into buffer area, which require attention of Reserve manager. Field data show that along with old tigers, due to increase in population of tigers, young tigers are also moving/ dispersing into buffer area. This will lead to more human tiger interaction and put habitat management in buffer area in to focus.

3) Assessment of Population Stress

The issue of stress in tiger population due to adverse sex ratio needs attention. It is not only sex ratio (a ratio of number of female to number of male tiger) which is important, distribution of male and female tiger in the area is equally important. Population stress due to improper distribution of male and female tigers was considered as one of the reasons for local extinction of tigers from PTR. The current distribution of male/female tiger in PTR has been assessed based on data collected by Reserve authorities by Continuous Camera Trap method and monitoring of collared tigers. The data for year 2019 for few tigers show the distribution of male / female tigers in PTR.

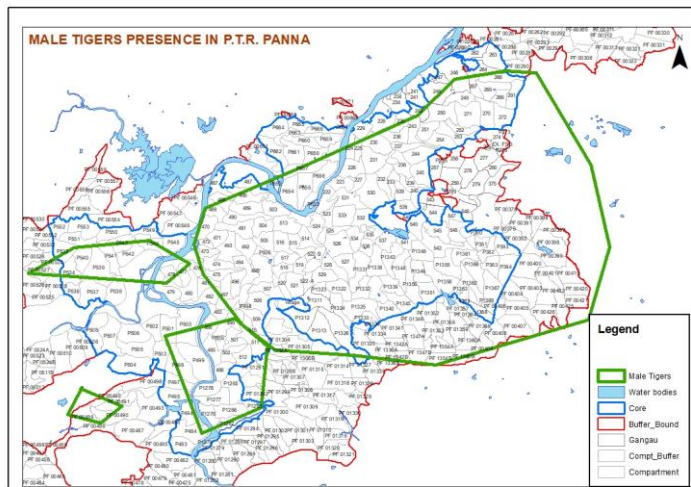


Chart 5- Distribution of Male tigers

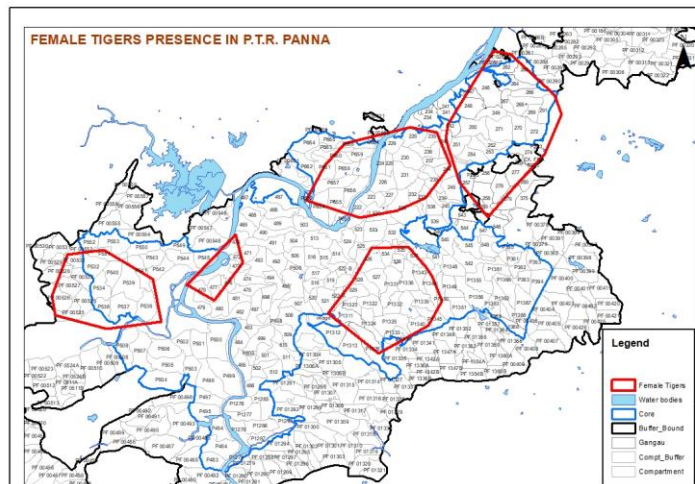


Chart 6- Distribution of Female tigers

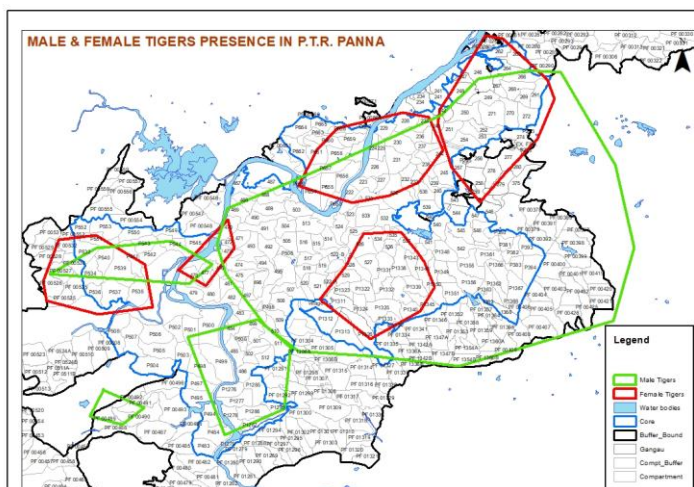


Chart 7- Distribution(overlap) of Female and Male tigers

Data represented in above Charts show that the distribution of male and female tiger in PTR is fairly wide spread and does not give any indication of any population stress. The situation needs to be assessed continuously every six months and any stress visible must be tackled.

4) Prey dynamics in Panna

While the territory of male tigers is determined by the number of female tiger's range it can hold, the territory of female tiger is primarily determined by the abundance of the prey and other habitat factors like availability of water sources. A female tiger kills about 40-45 ungulates prey per year consuming about 2000 kg of meat or 3000 kg of live prey, while a male tiger kills higher number of prey, about 50 ungulates a year, consuming 4000 kg a year. A tigress raising three cubs will consume about 65-70 prey animals in a year. Thus roughly, a tiger needs about 50 ungulates or 3000 kg of live prey annually. Tigers may crop roughly 10-15 percent of available prey in the area depending upon how much additional prey is consumed by co-predators like leopard and other carnivores. As PTR is having good leopard population, taking the lower limit of cropping rate at 10 percent for supporting a tiger, it would require minimum 500 ungulates in the area. Considering the latest estimate of 42 tigers (adult + sub-adults) as per January 2020 data, there should be 21000 ungulates in the Reserve, which translates to 36.46 ungulates per sq. km taking in to consideration only the core area of the Reserve. Currently prey density in PTR is around 40 ungulates per sq km which is sufficient for current level of tiger population. As the tiger population in PTR is increasing with high pace considering the favorable sex ratio and other age factors of female tigers, as discussed in earlier note, it is projected that the tiger population will be around 100 including cubs by year 2024. To support this population, there has to be increase in the prey population. The PTR management need to concentrate on increasing the population of the prey like Sambar, Chital and wild Boar, which are the major prey for tigers in PTR.

Comparative analysis of the available prey vis a vis ideal density required (assuming 10 percent cropping rate for tiger population in PTR) is shown in the chart 8.

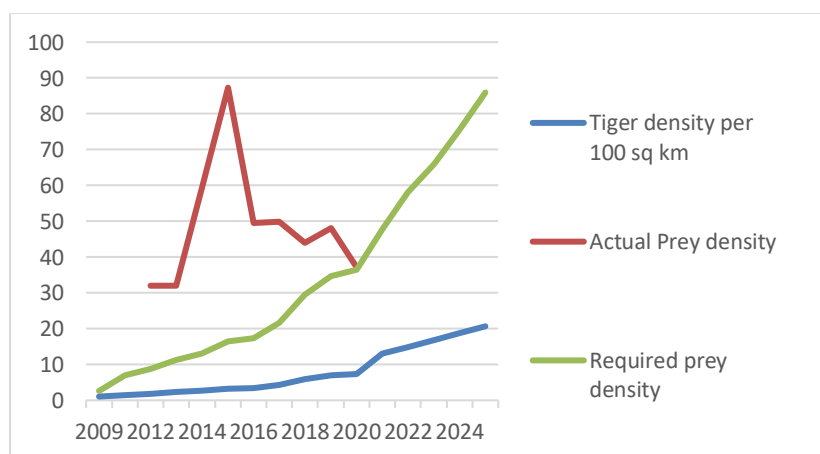


Chart 8- Comparative analysis of projected tiger densities and prey base required

It is evident that present prey density is equal to the required prey density. In future, gap between required prey density and available prey density (at current level) will be increasing as there will be increase in tiger density in PTR.

The comparative analysis of the tiger density per 100 sq km versus prey density per sq km for various tiger reserves in India from all India tiger estimation 2018 is shown in the Chart 9. The position of the PTR shows that the prey density to tiger density ratio is lower than the mean of the all other tiger reserves in India.

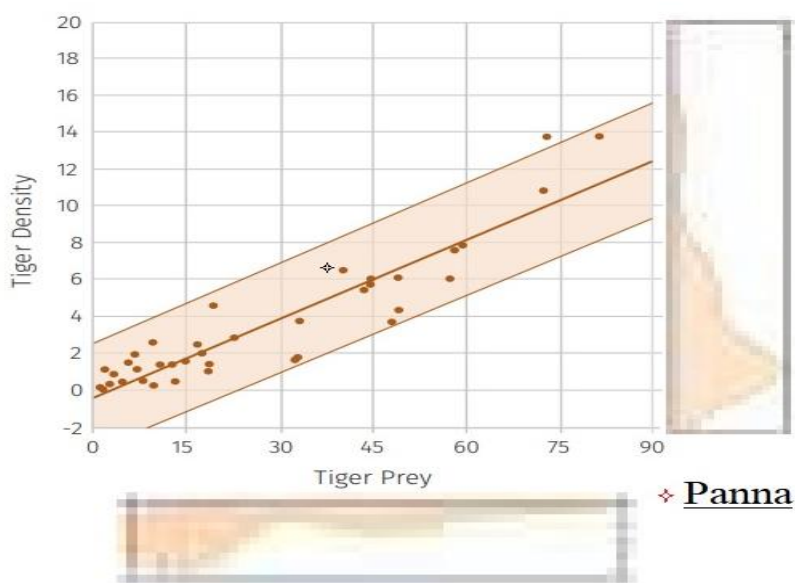


Chart 9: Comparative tiger and prey densities of other Tiger Reserves and PTR according to 2018 all India tiger estimation

Comparative analysis in Chart 8 of increase in the tiger density and projected prey density vis a vis ideal density required (assuming 10 percent cropping rate) clearly shows current prey density is inadequate to support the projected population density of tiger. With the current prey density at around 40 per sq km, prey population in the core area is approximately 23000. In addition to prey population in the core area, cattle at the fringe also serve as prey for tiger.

The trend in the cattle kill also indicate that with increase in the population of tiger, the number of cattle kill have increased since 2009 and stabilized at around 300 cattle killed per year for last 5 years (Chart 10). Proportion of cattle kill is a sizable prey for the tigers in Panna.

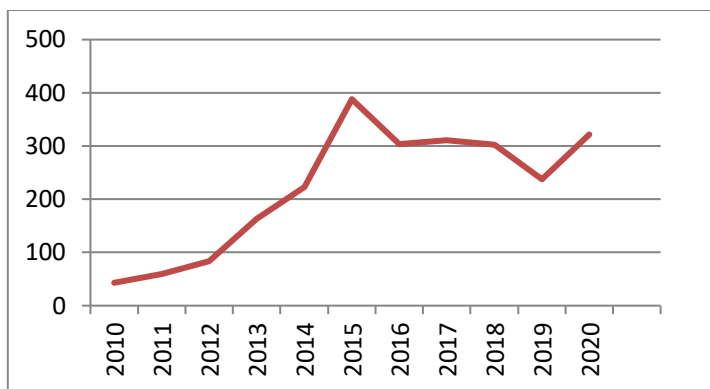


Chart 10- Number of cattle kills per year in Panna

If we do the range wise analysis of the cattle kill data it is evident that some of the buffer areas adjoining Panna Core range accounts for almost 70-80 percent of cattle kill indicating stress in the population and dependence on the cattle for prey. Cattle kill data of Range Amanganj Buffer shown in Chart 11 clearly indicates the occupation of the area by the tiger without having a sufficient prey base is leading to high number of cattle kills.

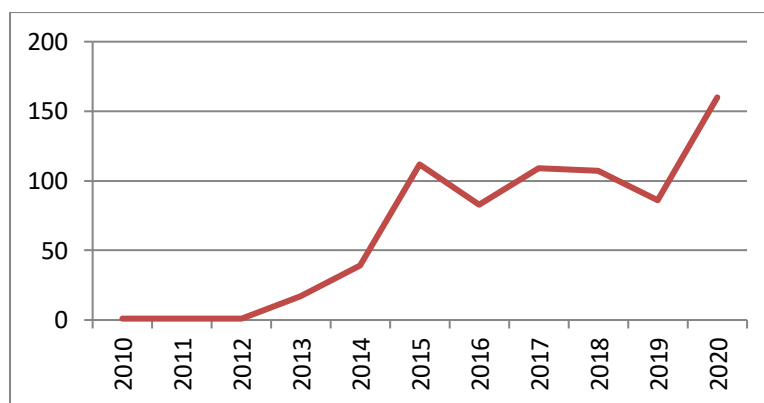


Chart 11- Cattle killed in Amanganj range

5) Strategy to support the increasing the tiger population

For a tiger population of 100 including cubs (80 adult + subadult), the requirement of prey population will be 40000. Availability of prey including cattle at present is 26000 (23000+3000 cattle). The deficit can be augmented in two ways: one, by increasing the density of the prey per sq km from the current level of 38 per sq km. Increasing it to the past highest of 45 per sq km will increase prey population by around 4000. That will still leave the deficit of 10000 prey. The other way forward is to take up the suitable areas in Buffer which are having low prey density and developing these suitably to support the prey population. To fulfil the deficit of around 10000 prey, Buffer area of 300-400 sq km with a low prey density of 25-30 per sq km will be needed. As PTR is having 1021 sq km of Buffer area, areas suitable for tiger can be identified by analyzing the camera trap data of phase IV monitoring and continuous camera trap data. Some of these areas includes Akola buffer area, most of the area of Amanganj buffer range, area of Kishangarh buffer range

adjoining to the Kishangarh Core and Chandranagar core range. Some of these areas are regularly frequented by tigers. The area of Gangau sanctuary adjoining to Manur circle of Mandla range and Panna buffer range area of Chapar and Ghurra also hold good potential for tiger population to spread in near future. These areas have varying prey density (excluding cattle) of about 22-30 per sq km (2019-20 Phase IV monitoring) which is low compared to prey density in Core. Cattle also form sizable prey for tiger in Buffer and peripheral areas. Cattle kills may also increase in intermediate period as increasing tiger population in fringe areas of Buffer will have more interaction with human-cattle surroundings.

The prey base in these areas (core as well as buffer area) can be augmented by grassland improvement/development along with habitat improvement for two important prey species namely Chital and Sambhar, development of water holes etc. Improving/developing habitats is a continuous process and both short term and long term strategies must be applied. At the same time as a short term strategy, the grazing pressure of the cattle in the surrounding areas can be reduced by dialogue with local communities and development of ecotourism facilities in these areas. In the long term the money generated by ecotourism facilities would compensate the communities for losing their grazing rights.

A. Grassland improvement/development

The grasslands developed at the sites of the relocated villages in core area are affected by the weeds and tall grasses. PTR does not have population of any mega herbivore like gaur or wild buffalo. This is leading to increasing area of tall grasses like *Themada*, *Sacharum*, *Vetiveria* and *Sorghum spp* etc. Once these grasses grow tall, Chitals avoid these grasslands and shift to either woodland or places where there is short grasses like *Cynodon dactylon*, *lumpha* etc. The invasive weeds like *Sida acuta*, *Sida cordifolia*, *Tephrosia purpurea*, Van Tulsi, *Parthenium spp*, *Cassia tora* etc. are another menace in these grasslands. Manual removal of *Sida spp* and *Parthenium spp* can be taken up while Van Tulsi needs to be controlled by cool season burning and broadcasting the seeds of palatable grass species before monsoon.

Also the grasslands need to be demarcated and maintained to avoid the advancement of the tree-land. The grasslands which are being invaded by new regeneration of Teak, *Ziziphus mauritiana* etc. need to be saved by uprooting it. Some moist areas are seen with advancement of *Phoenix acaulis* which also needs to be uprooted. The grasslands can be demarcated by digging the trench which will trap the flow of tree seeds along the rainwater.

B. Habitat improvement for Chital

If we maintain these grasslands as low lying grasslands of species like *dicanthium*, *Cynodon dactylon* and *lumpha*, the population of Chitals will thrive. Also there may be a need for translocation of Chitals from the high productive areas

like Pipartola, Surajpura, Raipura - Chanari to higher grasslands like Bhadar, Badgadi. The area around Geharighat has a patch of grassland in Kishangarh core range area where population of Chitals is negligible, this area can be also be populated by introducing the founder population of Chitals. Other ungulates whose population are very low in PTR like chinkaras and chausinga, also require grassland with short grasses.

Apart from this, PTR has advantage of Ken river flowing through the Reserve and most of the grasslands are located along the river. These grasslands can be irrigated by using the solar pumps and sprinklers providing the green pasture in the hot summer season.

C. Habitat improvement for Sambar

Panna is said to be a sambar land because of its topography of undulating hills and cliffs at the edge of the three plateaus which runs through it. The edges of the plateau are marked by the heaps of till which are very productive and boasted with heavy vegetation. Sambars mostly occupy these areas where there is abundance of undergrowth of *Helecterus isora*, *Zizhiphus abyssinica* and native bamboo sp. These areas have a limited scope of intervention but the weeds like *Sida codifolia* is spreading and have started invading these areas and needs to be addressed on priority basis. Sambars also do grazing along with browsing but foothills of these cliffs are invaded by lantana. Even though lantana provide a good cover for tigers to facilitate grazing for the Sambars, lantana may be removed in patches at the edges of foothills as well as cliffs for allowing growth of grasses in this area. Removal of the lantana can also lead to increased browsing shrubs like *Helecterus isora*, *Zizhiphus abyssinica* etc.

6) Conclusion

The increasing tiger population of PTR throws a management challenge and a historical opportunity for Reserve authorities. Never before PTR had so many tigers which are currently present in the Reserve. Increasing in tiger population taking its own course in a very healthy manner without any visible stress on tiger population. Tiger population will stabilize in natural course after reaching its peak. The gradient in prey density from around 40-45 per sq km in Core to around 25-30 per sq km in Buffer to nearly zero in areas outside the Reserve need to be maintained and stabilized. This prey density gradient will stabilize the tiger population without coming into any conflict with villagers. At present, by improving habitats in both core and buffer areas with maintaining gradient in prey density, this increase in population can be absorbed without coming in conflict with surrounding villagers. In the intermediate period, Cattle kills may increase and safety of human life will be paramount which will put pressure on sensitive relation between villagers and Forest department. To tackle this challenge, eco-tourism must be promoted in Buffer areas to compensate for livelihood and other losses of villagers.