

# **A brief note on Tiger population dynamics and its future projection in**

## **Panna Tiger Reserve**

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### **1. Introduction**

The process of restoration of tiger population in Panna started in March 2009 when it was discovered that the last male tiger from the Panna Tiger Reserve (PTR) has disappeared. Initially two female tigers (T1 and T2) and a male tiger (T3) were introduced under 'Species Recovery and Reintroduction Project'. From the times when restoration efforts were started, every tiger reintroduced in the PTR as well as further addition to tiger population are numbered and monitored. Breeding started in 2010 and on 16 April 2010, T1 gave her first litter and immediately after that in October 2010, T2 gave her first litter. The population since then has shown a continuous increase and today PTR has 42 adults/sub adults tigers along with 15+ cubs. PTR is a unique example where the population has been restored to its carrying capacity of past from zero. Presently, continuous increase in population has led to some tiger deaths due to territorial fights. This has stirred up discussion on carrying capacity and future tiger population in PTR. In this note we have tried to analyze tiger population dynamics, starting from 2010 and expected growth rate and population in coming times.

### **2. Recent population dynamics**

- a) Breeding Status: Ideal male to female sex ratio for the tigers is said to be 1:3. If there are more male tigers then there will be more competition for the females and in turn, it will result into conflict with other male tigers and killing of cubs of the other male tigers by the dominant male tigers. The adverse sex ratio was also one of the major reasons behind wiping out the tiger population from PTR before 2009. Even after re-introduction in the F1 progeny of the Panna some turbulence in the population has been observed due to adverse sex ratio. But eventually the sex ratio has become very healthy and at presently it is 1:2 which favours increasing tiger population.

Phase IV camera trap monitoring exercise of January 2020 has captured 42 individuals (adult and sub adult) tigers, of which 14 are male, 26 are female and sex of two individuals are unknown. Apart from the 42 individuals identified by camera trap in Phase IV, there are 3 more sub-adult tigresses and about 16+ cubs which have not been captured by camera trap during the Phase IV but reported during continuous camera trap

monitoring system. Based upon the Phase IV data and continuous camera trap monitoring data, all the tigresses have been listed according to their age group in **Table 1**.

**Table 1**

Breeding Status of Tigresses			
Sr No.	Tigress	Aproximate Age	Age at the start of breeding
1. Tigress breeding currently			
1	T1	14	-
2	T2	14	-
3	T6	10	-
4	P222	8	3
5	P234	7	3
6	P433	7	4
7	P141	6	3
8	P142	6	4
9	P151	4	3
10	P213-32	4	3
2. Tigress expected to breed within a year			
11	P152	4	
12	P641	3	
13	P642	3	
14	P643	3	
15	P234-22	3	
16	P234-23	3	
3. Tigress expected to breed within next two year			
17	P213-62	2	
18	P213-63	2	
19	P213-64	2	
20	P222-32	2	
21	P433-22	2	
22	P433-23	2	
23	P141-12	2	
4. Tigress expected to breed within next three year			
24	P652	1.5	
25	P653	1.5	
26	P272	1	
27	P273	1	
28	P234-33	1	
29	P151-11	1	

Above table lists 29 tigresses presently inside the Park area which indicates a very healthy number. Of the total 29 tigresses, 10 tigresses have already given litters and are in breeding stage. There are 6 tigresses in the age group 3-4 years which are yet to breed and produce cubs. By looking at the past data and tiger biology, it is evident that a tigress starts breeding at about 3-4 years of age. Considering this, it would add up 6 tigresses to the breeding group and total breeding population would be around 15 by mid of 2021. “Tiger Reintroduction and Recovery Program for PTR and Landscape Complex - Phase II Project Document” prepared jointly by Madhya Pradesh Forest department and WII, had set a target of 12 breeding females by the end of 2020 which can be taken as achieved. Also there are 13 tigresses in the age of 2-3 and 1-2 year age group, which eventually will start breeding in next 2-3 years. Hence on average, it can be expected that PTR will have at least 12 breeding Tigresses each year for next 4-5 years at least.

- b) Status of successful cubs produced: Considering the available data of births of tiger cubs in Panna, it is evident that a tigress gives a successful litter around once in two years and average litter size can also be found. Following Table 2 gives details of cubs produced per year per tigress:

**Table 2: Details of cubs produced per year per tigress**

Year	T1	T2	T4	T5	T6	P 213	P 222	P 234	P 433	P 141	P 142	P 151	P 213-32
2010	4	4											
2011	0	0	2										
2012	4	3	0										
2013	0	4	3			4							
2014	2	0	Death	2		0							
2015	0	3		1	3	0	2						
2016	3	2		0	4	3	2	2					
2017	0	2		0	3	0	0	3					
2018	0	0		Death	0	4	3	0	3	3			
2019	0	3			3	0	0	3	0	0	1	1	4
2020	0	0			0	Death	3	0	0	2	0	0	0
Average cubs per year	1.2	1.9	1.7	0.8	2.2	1.6	1.7	1.6	1.0	1.7	0.5	0.5	2.0
Grand Average	1.4												

Following Chart 1 shows the increasing number of births with increasing number of breeding tigress in PTR.

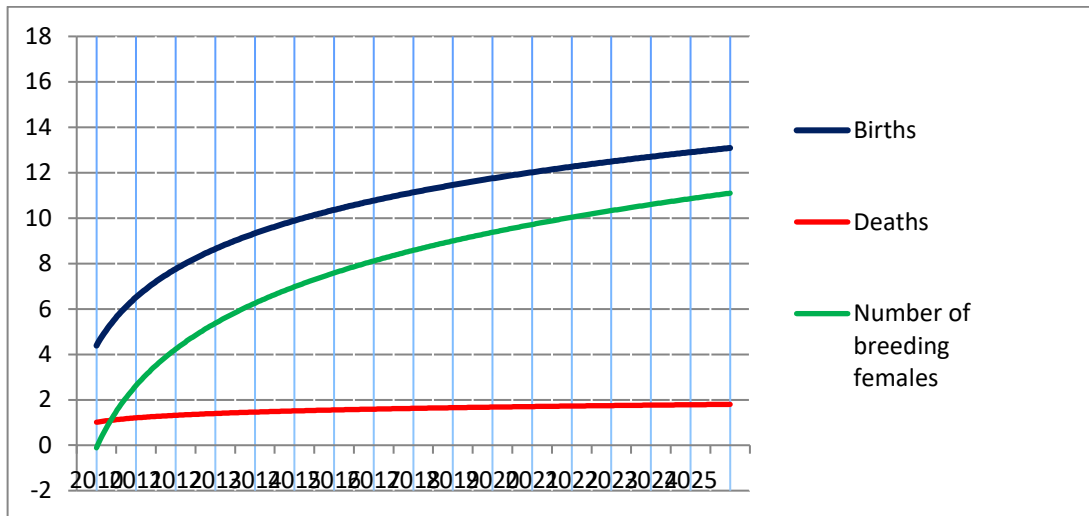
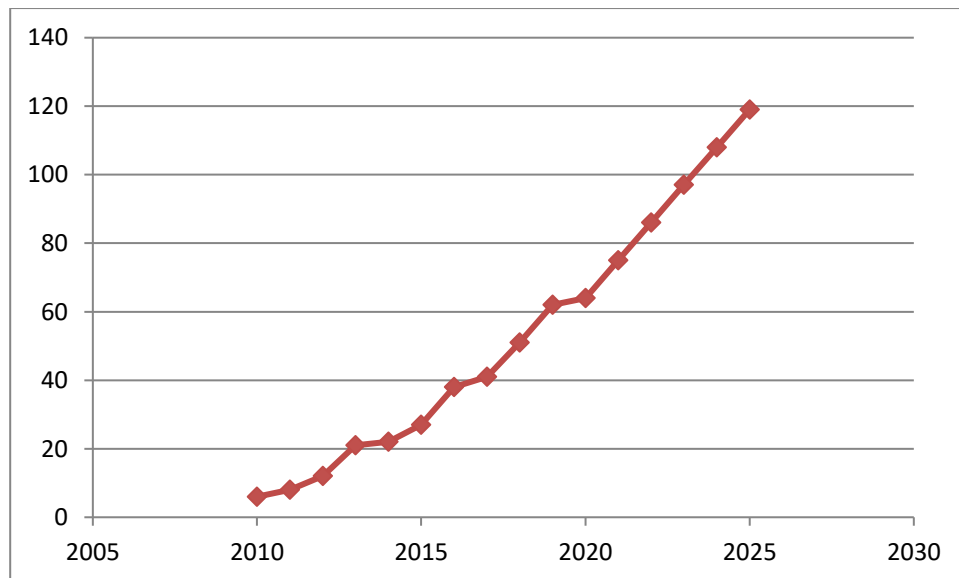


Chart 1: Graph showing Births per year vis a vis number of breeding females and deaths

3. **Population Growth Prediction:** Considering the fact that a tigress gives a successful litter once in two years, average litter size is 2.8. **This makes 1.4 successful cubs per breeding tigress per year on average in PTR.** With this average rate, if we have 12 breeding tigresses (which is the most expected scenario at present in PTR as highlighted in last para), they will successfully produce 33 cubs every two years or 16 cubs per year successfully. Keeping the death rate of 2 tiger per year and assuming 3 tigers escape to landscape every year (looking at the past 5 years scenario), it will result in around 100 tigers in total in PTR by next three-four years. Following Table 3 and Chart 2 shows the past trend and future projection of population of tigers in PTR:

**Table 3: Future Growth Projection of Tiger Population**

Future Growth Projection of Tiger Population							
Year	Births	Deaths	abandoned	dispersed in Panna Landscape	sent to other TR	net addition	Total population (cumulative)
2010	8	2				6	6
2011	2	0				2	8
2012	7	1	1		1	4	12
2013	11	1			1	9	21
2014	4	2			1	1	22
2015	9	3			1	5	27
2016	16	1			1	11	38
2017	8	1		3	1	3	41
2018	13	0		3		10	51
2019	15	1		3		11	62
2020	9	4		3		2	64
2021	16	2		3		11	75
2022	16	2		3		11	86
2023	16	2		3		11	97
2024	16	2		3		11	108
2025	16	2		3		11	119



**Chart 2: Future population growth of tiger**

#### 4. Future Strategies:

As observed in Draft Tiger Conservation Plan of Core area of PTR, the carrying capacity of the core area is 30 adult individuals. The carrying capacity of the buffer is not estimated. The 2018 All India Tiger Estimation had reported 29 adults in core area which eventually rose to 42 in January 2020. It is interesting to note that Panna had incidents of deaths due to infighting (one case reported in 2013 itself) but it was more or less attributed to the adverse sex ratio. The recent 5 deaths which include 2 females and 3 males (sex identification was not conclusive, it is a guess from the missing tigers data) show that the infightings are not result of adverse sex ratio only. The cases of infighting are witnessed because of the increased population and limited out-migrations.

If 33 cubs are added every two years, there are four possibilities that these new recruits can be absorbed in the current tiger population:

- i. **By replacing the area occupied by the old individuals-** Old age tigers are eventually replaced by the new recruits this happens either by natural death of old male or displacement of resident tiger by another tiger.
- ii. **By re-adjusting the territories and spread in to buffer areas-** The buffer areas of the Amanganj, Kishangarh and Panna (Akola) are already being used by the tigers and they are coexisting along with human population,
- iii. **By dispersing in the landscape-** There are evidences of tigers moving out of PTR in to landscape. The Ranipur wildlife sanctuary in Uttar Pradesh, Sarbhanga forest of Satna division, Mohandra and Kalda of South Panna are the preferred destinations in Northern and Eastern side of Panna. In the South and West, Nauradehi wildlife sanctuary and territorial forest of Chattarpur division are preferred destinations.
- iv. **By deaths due to infighting-** Being territorial animal, tigers protect their territories aggressively and intruders are not tolerated generally. The territory of the female tiger is smaller than a male tiger and a male tiger generally covers territory of 2-4 tigresses. It is said that the tiger is solitary animals but there are instances where tiger has been seen living with female and cubs, helping cubs to learn the hunting. Increasing number of tiger will lead to more territorial fights which may cause death of tigers.

PTR authorities will have to take in to consideration all the four possible scenarios discussed above in the future management. Habitat improvement in Core as well as Buffer areas will play an important role in limiting the number of tiger in PTR. Core areas may sustain few more tigers than current number if habitat at crucial places is suitably amended and carefully managed. Buffer areas have large potential to accommodate more tigers but require immediate management intervention in terms of improving habitat. Landscape connectivity is an issue at present and require further study/research. Connectivity with nearby forest areas, National Park and Sanctuaries will take much longer time compare to habitat improvement in Core and Buffer areas. Increasing tiger population in PTR will put more pressure on Park Authorities in terms of deaths of tigers due to infighting, abandoning or early weaning of cubs and more human-tiger interaction and conflict. Managing all these challenges will be the priority of PTR authorities.