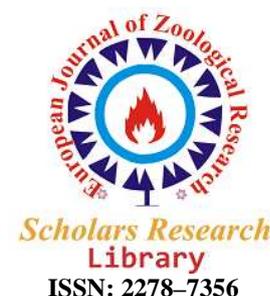




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Changing scenario of the leopard, *Panthera pardus fusca* (Meyer, 1794) population in ghod project forest division, Junnar, Maharashtra, India

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ABSTRACT

This paper outlines the importance of exploring people's perspectives of human – leopard conflicts as people's perceptions and expectations shape their attitudes and responses to conflicts with leopard. The need to work beyond protected areas for sustaining viable population of wildlife is recognized by the conservationists. The leopard is having peaceful co – existence with human since historical times. This article explores the social, cultural and conservational aspects of human – leopard conflict in Junnar Forest Division from Northern Western Ghats. Traditionally, humans respond by killing the “problem” animal and transforming wild habitats to prevent further losses. This traditional response though illegal and socially unacceptable in many areas, leading a simple competitive relationship between society and leopard. This also results in a chain of multifaceted problems. Thus a strategy for mitigating human – leopard conflicts based on a participatory methods and co – management of both leopard and safeguarding human and livestock security. The changing scenario of leopard population and possible shifting of his habitat to agricultural field is needed a long term strategies development. Incorporating local stakeholders in planning and execution will certainly help to win space for leopard beyond protected area boundaries. We also show why systematic study of leopard population and local people's perceptions of risk and participant planning of interventions are irreplaceable components of such problem. This will avoid the further deterioration of conservation efforts for leopard.

Key words: Northern Western Ghats, Leopard, Conflict, Population estimation, Behavior, Conservation.

INTRODUCTION

The human - wildlife conflict has become a globally important issue. The Ghod Project Forest Division, Junnar, Dist. Pune, Maharashtra is having the jurisdiction of four tehsils viz., Junnar, Ambegaon, Khed (Rajgurunagar) & Shirur. Out of the four tehsils, the first three i.e. Junnar, Ambegaon & Khed are located in the close vicinity of Northern Western Ghats & more than half of the total forest area from them is a part of ecologically important ranges of Western Ghats including number of endemic species of flora and fauna. Of the 15000 plant species recorded so far, 4000 are endemic to the region. 'Red data' plants of the region had 586 species. 75% of animal species found are reptiles and amphibians. The numbers of animals from the endangered list are consisting of ten mammals [24].

The total geographical area of four tehsils is 5813.86 Km². The total forest area is 574.45 km² comprising the reserve forest area of 546.52 km² & unclassified forest area is 27.93 km². The average total forest area to

geographical area is only 9.88%. In comparison with the total geographical area of Pune District which is 15642 km² having dense and open forest cover in Western Ghats is of 217 and 562 km² respectively making a total forest area of 779 km². There are in total 606 villages having 94.38% of average rural population to total population from all the 4 tehsils. The tribal population is also considerably high in this area. In Pune district, Ambegaon, Junnar & Khed tehsils ranks 1st (20.91%), 2nd (19.16%) & 3rd (12.15%) respectively in the tribal population and ranks 2nd (79.41%), 3rd (78.79%) & 7th (56.08%) respectively when the number of villages having forest area is taken into consideration. The ratio of average cultivable area to total geographical area from Junnar is 71.55% (Irrigated 37.74%), Ambegaon 53.24% (Irrigated 12.68%), Khed 59.20% (Irrigated 9.98%) and Shirur 73.43% (Irrigated 12.61%) (Table 1).

Table 1 : Statistical information of the jurisdiction of Ghod Project Forest Division, Junnar

Sr. No.	Particulars	Tehsils				Total
		Junnar	Ambegaon	Khed	Shirur	
1	Total geographical area (Km ²)	1607.05	1156.95	1398.55	1651.31	5813.86
2	Reserve forest area (Km ²)	196.59	143.89	155.49	50.55	546.52
3	Unclassified forest area (Km ²)	8.33	11.74	4.14	3.72	27.93
4	Total forest area (Km ²)	204.92	155.63	159.63	54.27	574.45
5	Total forest area (%) to geographic area (Km ²)	12.75	13.45	11.41	3.29	9.88
6	Number of villages	167	136	190	113	606
7	Total rural population (%)	92.95	100	96.38	92.31	94.38
8	S.T. Population (%) to total population	19.16	20.91	12.15	2.16	13.60
9	Number of villages having forest area (%)	78.79	79.41	56.08	43.36	64.41
10	Villages having cultivable area to total area (%)	71.55	53.24	59.20	73.43	64.36
11	Villages having irrigated area to total cultivable area (%)	37.74	12.68	9.98	12.61	18.25

Source : 1) A Statistical Outline : Current Silent Forest Statistics 2000. Forest Department, Maharashtra State,
2) The State of Forest Report FSI 1993 and Western Ghats regional plans prepared by Ministry of Works and Housing, Government of India, 1993.

There were increased incidences of cattle and other live stock depredation by the leopard, *Panthera pardus fusca* as well as conflicts with human beings. The total number of human attacks by the leopards in the three tehsils viz., Junnar, Ambegaon and Khed from March, 2001 to March, 2003 were 51, while the cases of cattle's and other live stock animal depredation since March, 2000 to March, 2003 were 795. Taking in to consideration the urge, it was the need of the hour to estimate the total population of the leopard, *Panthera pardus fusca* in the jurisdiction of this division office. Thus the wild animal census from 17th April to 23rd April in 2001 was performed. In succession of this, the first special census of leopards from 21st May to 27th May, 2002 was worked out. Again from 10th May to 16th May, 2003, second special census was undertaken. The all eight range wise data from four tehsils was collected and analyzed to determine the population number of leopards. From February, 2001 to June, 2003, as much as 101 leopards were trapped using cage trapping method and were re released / translocated for a considerable distance from the jurisdiction of this Division office, which was a unique example in the history of Wild Life Management in the world. Thus all this had provided the detailed information on the changing scenario of leopard population over a period of 10 year (Table No. 2 & 3).

Table 2 : Range wise statistical information of the Ghod Project Forest Division, Junnar

Sr. No.	Particulars	Tehsils								Total
		Junnar			Ambegaon		Khed		Shirur	
		Ranges			Ranges		Ranges		Range	
		Junnar	Otur	Narayangaon	Ghodegaon	Manchar	Khed	Chakan	Shirur	
1	Total geographical area (Km ²)	646	475	486	585	572	700	702	1651	5817
2	Number of villages	67	25	31	50	28	46	47	49	343
3	Reserved forest (Km ²)	78.71	69.71	48.17	82.62	61.27	76.08	79.41	50.55	546.52
4	Unclassified forest (Km ²)	0.19	0.14	8.00	10.92	0.82	2.70	1.44	3.72	27.93
5	Total Forest area (Km ²)	78.90	69.85	56.17	93.54	62.09	78.78	80.85	54.27	574.45
6	Total number of leopards trapped in the cage									
	a) Before 2000	1	3	2	0	0	0	0	0	6
	b) 2001	4	1	32	12	5	4	0	0	58
	c) 2002	2	1	29	0	2	0	0	0	34
	d) 2003	1	0	0	0	0	2	0	0	3
	Total	8	5	63	12	7	6	0	0	101
7	Probable forest area in 2001 available per leopard (Km ²)	19.73	69.85	1.75	7.80	12.42	19.70	-	-	-

In the context of tremendous threat to human life and his live-stocks, this study is focused on the present status of leopard population [4, 15, 18] from the area of Ghod Project Forest Division, Junnar which is an important part of ecologically fragile & delicate ecosystem of Western Ghats, one of three hot spots in India and having 6th rank in the world from the biodiversity point of view.

Study Area

The study area of the present research work was four tehsils *viz.*, Junnar, Ambegaon, Khed and Shirur of Pune district as shown in figure 1.



Fig. 1 Location of the study area of four tehsils from Pune district, Maharashtra state of India

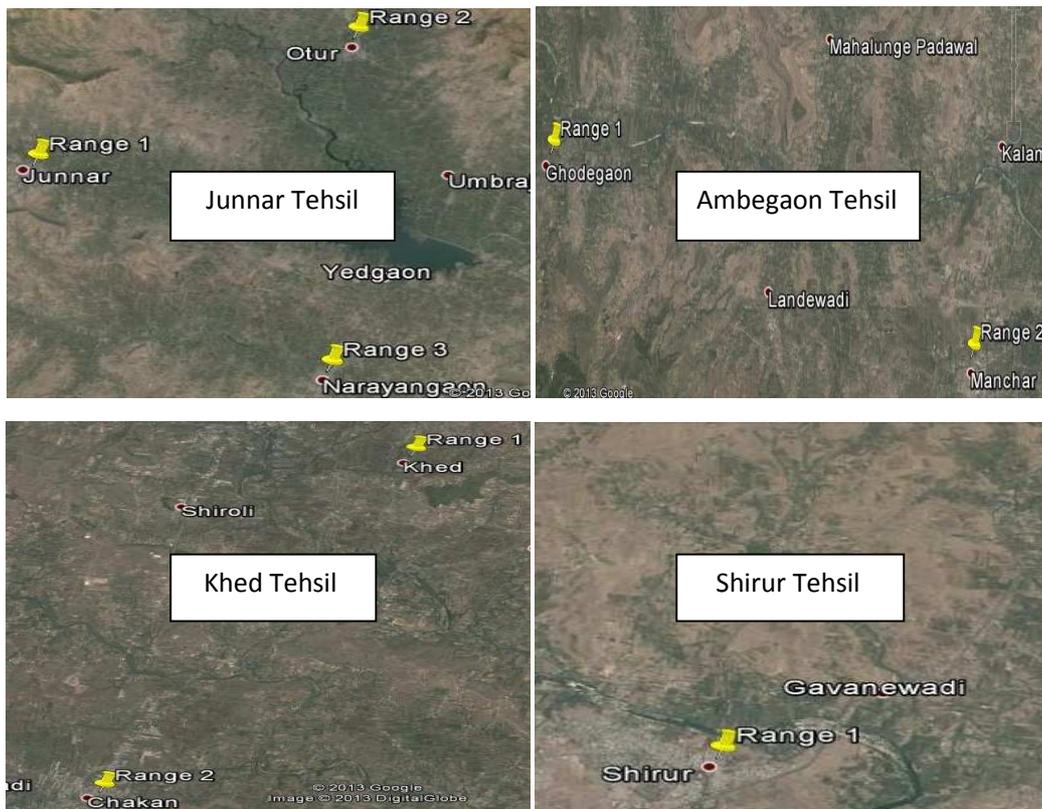


Fig. 2 Satellite images of location of ranges from respective tehsils

For the Junnar tehsil there are three ranges i. e. Junnar (Range 1) situated between 19° 12' N and 73° 52' E, Otur (Range 2) situated between 19° 15' N and 73° 58' E and Narayangaon (Range 3) situated between 19° 07' N and 73° 59' E. For the Ambegaon tehsil there are two ranges i. e. Ghodegaon (Range 1) situated between 19° 02' N and 73° 49' E and Manchar (Range 2) situated between 19° 00' N and 73° 56' E. For the Khed tehsil there are two ranges i. e. Khed (Range 1) situated between 18° 50' N and 73° 54' E and Chakan (Range 2) situated between 18° 45' N and 73° 51' E. For the Shirur tehsil there is only one range i. e. Shirur (Range 1) situated between 18° 49' N and 74° 22' E as shown in figure 2.

MATERIALS AND METHODS

The census of leopards was performed by the usual method of sighting associated with Pug—Marks tracing and plaster casts method [17] for seven days from 17th April to 3rd April, 2001. Special census for seven days from 21st May to 27th May, 2002 and 10th May to 16th May, 2003. The daily range – wise observations and animal sightings were recorded on a printed form and pug – marks were traced and collected with the help of plaster casts. Later on, this field data was carefully consolidated, tabulated and summarized for determining the total population of leopards [9, 10, 3, 11, 16] and to arrive at the census estimates in the jurisdiction of this Division Office.

The pug – marks were observed near water holes in the forest and adjoining forest areas, which were collected during early morning and evening. At first, the total number was estimated at the division office level by collecting and analyzing reports of tracings and plaster casts of pug – marks from all eight ranges by taking into consideration all the approved and authenticated criterias and protocols for the said census. Then the reports were put before the committee formed for the evaluation of leopard's number in this area. Subsequently the committee had estimated the population of the leopards in the area of this division office in April, 2001, April, 2002 and May, 2003.

RESULTS

The population number of leopards from this division office area after performing the census from 17th April to 23rd April, 2001, followed by the special census of leopards from 21st to 27th May, 2002 and 10th May to 16th May, 2003, are depicted in Table No. 3. The usual census reports of leopards in 1993 and 1997 are also given in Table No. 3.

Table 3 : Scenario of population estimates of leopards in Ghod Project Forest Division, Junnar

Sr. No.	Census Year	Tehsils																Total	
		Junnar						Ambegaon				Khed				Shirur			
		Ranges						Ranges				Ranges				Range			
		Junnar		Otur		Narayangaon		Ghodegaon		Manchar		Khed		Chakan		Shirur			
		D	C	D	C	D	C	D	C	D	C	D	C	D	C	D	C		
1	1993	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	13
1.1	Found dead	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
2	1997	2	2	5	3	0	0	13	7	2	1	6	7	4	0	0	0	32	20
2.1	Found dead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	2001	21	8	23	12	12	8	15	7	2	3	16	9	10	10	0	0	99	57
3.1	Found dead	2	-	3	-	2	-	0	-	2	-	1	-	0	-	0	-	10	-
4	2002	9	5	5	6	22	16	16	11	4	4	17	11	5	2	1	0	78	55
4.1	Found dead	3	-	0	-	4	-	0	-	0	-	1	-	0	-	0	-	8	-
5	2003	0	2	3	3	13	9	5	3	0	2	14	6	2	2	0	0	37	27
5.1	Found dead	2	-	2	-	2	-	0	-	1	-	0	-	0	-	0	-	7	-

D – Leopard population number estimated at Division Office level,

C – Leopard population number estimated by the high level committee,

**Figures not available.*

Striking trends of leopard population were observed when the census reports of 1993, 1997 and that of 2001, 2002 and 2003 were compared. The total leopard population according to 1993 census was 13; while it was 32 in 1997 census comprising 21 males and 11 females only. But according to the census in 2001, the total number estimated at division office level is 99 showing more than 3 fold increases in the population. Strikingly, the number of cubs was almost equal to the number of males and females. Furthermore during the period of 1999 to 2000, 10 leopards were found dead in this area taking the total to **109**. Still the high level committee formed for the estimation of leopard had estimated the number to be only **57**.

In the special census of 2002, same trend in the population number had been exhibited. The total number estimated at division office level was 78 and further more 7 leopards were found dead during this period making the total of 85. Once again the high level committee formed had estimated the number to be only 55.

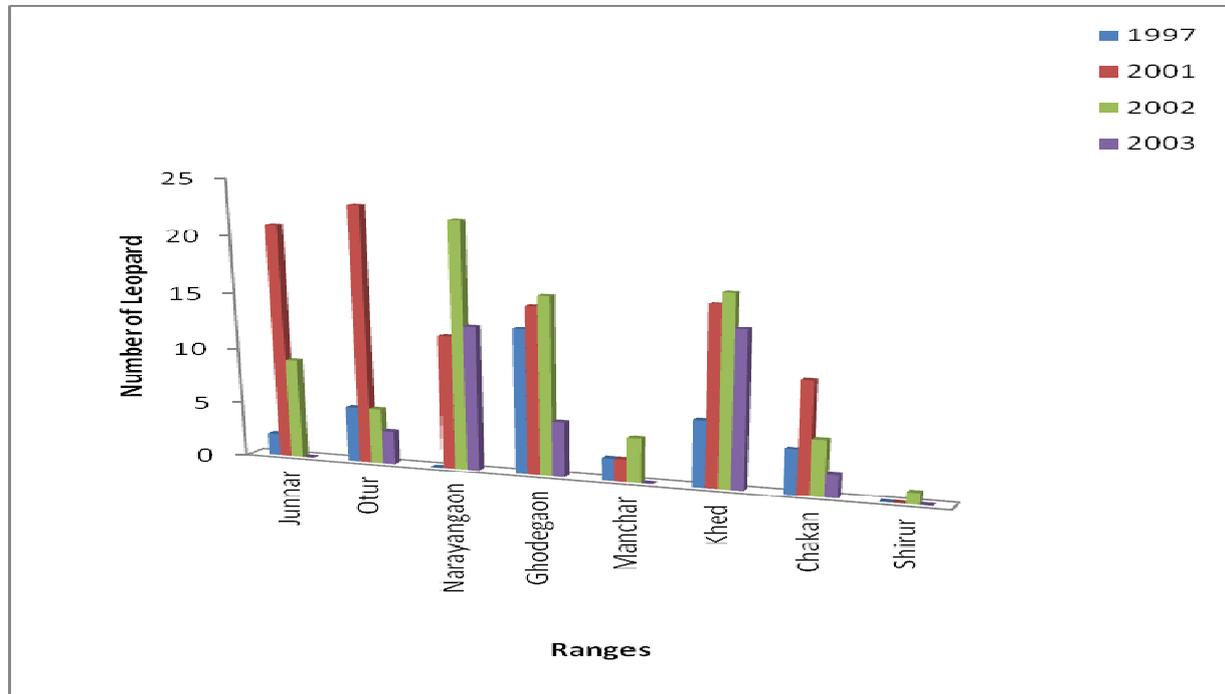


Fig. 3 Yearwise population estimates of leopards in Ghod Project Forest Division, Junnar

It is important to note that, in the period between 2001 census and first special census in 2002, 58 leopards including 21 males, 24 females and 13 cubs were trapped in the cage from the three tehsils of this Division Office and were Translocated in the area which is far away, rejecting all the possibilities of the leopards to return their home ranges again. The special census 2003 had depicted the leopard population to be 37 at division office level and in addition, 2 leopards were found dead, making a total of 39. The committee had estimated the number to be 27. While 34 leopards were trapped in the cage and translocated from this area during the period of June, 2002 to April, 2003. It is note worthy that, from the adjourned Shirur tehsil not even a single leopard is reported in the census of 1997, 2001 and 2003, while only one leopard was reported in the census of 2002, which may be temporarily migrated from the neighboring range.

DISCUSSION

It is striking and has thrown the light on the changing scenario of leopard's population estimation from the jurisdiction of this division office. Human disturbances have caused the leopard to wander over very large territories to satisfy their food requirements and they may not remain more than a few days in a given locality [2]. It also includes the disturbances caused by human settlements, developmental projects, collection of forest produce, etc. The clearing of low lying areas of the Western Ghats for rice and plantation crops. These agricultural activities also brought permanent settlers who required roads, bridges, electricity, schools, hospitals and many others. Since the Western Ghats receive high rainfall, the region has also become important for the construction of large and medium dams for power generation and irrigation. Since all the above factors resulted in increased human activities [1]. The construction of major irrigation projects and increased access into the habitat area due to the large network of roads that are built for development of the region has made habitat fragmentation making the situation more worst. Such fragmentation has a critical effect on an animal like tiger [5] and leopards and has taken its toll in the form of increased conflicts and depredation of live stocks [6, 21]. The same situations are present in this area.

Cattle, goats, other live stocks and dogs are most vulnerable to predation by leopard. Live stocks are the local people's only assets and majoritily there is no alternative but to graze them in the forest area, hence making them vulnerable to predation and causing economic loss [8, 12, 13, 22, 25]. According to the dispersion index, leopard is randomly distributed in its habitat and can occupy all sorts of available habitat. Thus attacks on live stocks become undetermined and due to increased attacks on live stock and occasional attacks on Man, the leopard is regarded as deadly enemy by the local inhabitants.

Estimates of more than 100 leopards in Junnar, Ambegaon and Khed tehasils consisting the total forest area of 520.18 Km², indicates over burden. The average total forest area available for each leopard is only 5.20 Km² in 2001 and 2002 against the recommended area of 25 Km² for female and male leopard utilizing larger ranges than females and incorporating more than one female [7]. The most worst situation was observed in 2001 in Narayangaon range, where the average forest area available for each leopard was only 1.75 Km² ! It is followed by Ghodegaon range 7.80 Km² and Manchar 12.42 Km².

The increased evidences of livestock predation and human conflicts indicates depleted natural resources with poor prey base [20, 23] and that urgent conservation measures by reducing habitat degradation & to restore the population of prey species are required. With the decrease in the game species in the natural habitat, the leopard's preference for particular set of habitat conditions has changed [14, 19]. Once again it is an alarm to avoid the further deterioration of conservation efforts in the near future and is necessary to adopt the strategies at war foot level. This scientific research of leopard population estimation in these situations focused the changing scenario of leopard population and possible shifting of his habitat to agricultural field, which can aid conflict prevention and mitigation on the local level. This also pinpoints the need of strategies for effective coordinated efforts on global, national and regional level.

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