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SOME INFERENCES ON THE BIOLOGY OF TIGER AND LEOPARD IN SIMILIPAL TIGER RESERVE

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S U M M A R Y

The details of pug marks census data on tigers and leopards were used to draw the inferences on their biology in Similipal. The population curve showing the numbers of tigers in different classes of pug length indicated the disappearance from the study area of animals in size classes 9.0-10.9cm and 13.0cm onwards. Similar disappearances were seen with the leopard pug length classes of below 7.0cm and above 8.9cm. For each species the stated smaller class is considered to be of those young who have separated from mother but are yet to establish their territories. The larger class is of those which have been displaced out of their territories. Polygamy, and therefore the numbers of females superimposing over the male territories, is more pronounced in tiger than leopard. The female:male ratio for tiger was 2.2 ± 0.2 S.D., and for leopard was 1.8 ± 0.3 S.D. The adult population of tiger and leopard during four consecutive years from 1989 to 1992 appear to be stable, 23:50 tigers and 29:50 leopards (male:female). 72.2% of tiger cubs were with mothers having 12.0-13.9cm pug size. About 12% of the female tigers litter in a season. There is scope to refine the census technique for Similipal Tiger Reserve to account for all the cubs with their mothers.

I N T R O D U C T I O N

Most data on tigers (*Panthera tigris*) are limited to a few locations in its distributional range. Important among these are from Kanha (Schaller 1967, Panwar 1979), Chitwan National Park (Mc Dougal 1977, Sanquist 1981), and Sundarbans (Hondrichs 1975, Choudhury and Chakrabarty 1979). Data from the wild in Similipal Tiger Reserve have largely been on predatory-aberrations (Choudhury 1979). In the following note we present some of our observations related to tiger's biology in Similipal.

M E T H O D S

In Similipal Tiger Reserve census of tiger and leopard were carried out consecutively for four years during 1989 through 1992. The census period extended over six days each during winter, December-January, when the routes for examinations were minimal in numbers as the ground covers are still intact. As a standard practice, over 3700 soft soil pads, called PIPs (pad/pug Impression,pads) were laid down each season to make the ground along tiger movement routes suitable for registering the pug-marks.

Census data from each season were analysed to prepare distribution maps and tables showing sex, size and movement areas of each large cat, namely the tiger and the leopard.

RESULT

TIGERS:

(1) The population of tiger appears to be fairly stable in Similipal Tiger Reserve (Tables 1 and 2). The population is at 94 ± 2 .

(2) Considering the tiger cubs to have pug-mark lengths between 7.0 and 9.9cm, the size class 8.0 to 8.9cm were more frequently recorded.

(3) The size class of lengths 10.0-10.9cm were with the representation. The size classes higher to it showed higher representation till 12.0-12.9cm, which then gradually declined.

(4) The distribution curves for male and female tigers followed similar patterns with low numbers represented at the first and last size classes and the maximum numbers seen in the middle of the curve (Table-2, Fig-1).

(5) Among all females with the size classes 12.0-12.9cm and 13.0-13.9cm were 13 of the 18 nos. of tiger cubs (Table-3). That is 72.2% of the cubs were seen with mothers having pug-mark lengths 12.0-13.9cm.

(6) On an average 18 out of 50 females (36%) had cubs (Table-4).

(7) Usually single cubs could be identified with the mothers. The mean number of cubs per attending female was 1.23 ± 0.19 .

LEOPARDS:

(8) The maximum length of a leopard pug-mark was 9.9cm (Table-5). In the pug-mark size class 9.0-9.9cm, for 41 measurements the mean pug-mark length was $9.1 \text{cm} \pm 0.2 \text{cm}$.

(9) The pug-mark size class 7.0-7.9cm was the most abundant class with slopes to either sides of a N-curve.

(10) The size class 8.0-8.9cm showed the most stable representation, with low standard deviation among adults (Table-5).

(11) Through different size classes both male and female leopards exhibited normal distribution curves with peak at 7.0-7.9cm pug length (Table-6).

(12) The mean male:female ratio was one male for 1.8 ± 0.3 nos. of females.

(13) The nos. of young leopards were very few to draw any biological inferences.

DISCUSSION

The population of tiger and leopard in Similipal appears to be fairly stable according to the results of census conducted during four consecutive years from 1989 to 1992. The numbers of tigers plotted against different size classes of pug length indicated a curve ascending from 7.0cm-7.9cm class to 8.0cm-8.9cm class, then descending to 10cm-10.9cm class, then ascending to 12.0cm-12.9cm class, and finally descending down to negligible representation in 16.0cm-16.9cm class (Fig.1). The first furrow in the curve give indication of the approach of sub-adult hood when the young have separated from the mother but is yet to establish its own territory. This phase in the life-cycle of the tiger is considered to be a wandering phase (Sunquist, 1989; Karanth undated) hence, the tigers may have disappeared from the standardised routes of census.

The final descent of the curve after peak breeding phase (Tables-1 and 3, Fig-1) suggest the approaching old age and shifting away from the standardised routes of census. From these it appears that inadvertently our standardised routes of census superimpose the territories which are normally covered by the prime breeding adults. It may be mentioned that the census routes radiating out of the headquarters of each census unit extend to about 12-15km, and very often inaccessible deeper forest areas remain unscanned during census. Such deeper areas may be the retreats for the young ones separated from the mother and for the old adults.

The above explanation also applies to account for 72.2% of the tiger cubs seen with mothers having pug length 10.0-13.9cm. The 36% of adult females which had cubs include mothers which littered in the same season, about four months back to about 28 months at the most. Therefore, about 12% of the adult female population are expected to be cubbing every year. The main cubbing month is known to be August and the census months are December-January.

We have observed litter sizes of four cubs but during the census we have not been able to account for more than one cub with most mothers and just two cubs with a few. This is a reflection of limitations originating from PIP-based pug-mark census. The technique need to be further improved beyond the two improvements already made recently (Sagar and Singh 1990 and 1991).

The pug-mark of a leopard may rarely exceed 9.0cm. As seen with the tiger, in leopard populations too animals with pug-mark just below 7.0cm and above 8.9cm may constitute the unsettled and expelled-out phases, respectively, with respect to known territories. Because the female:male ratio is smaller in leopard (1.8 ± 0.3) in comparison to the tiger (2.2 ± 0.2), polygamy is more pronounced in the latter. Similarly, the numbers of female superimposing into the territory of males is less in the leopard.

The census technique calls for improvement in order to determine an improved estimation for the leopard cubs.

A C K N O W L E D G E M E N T S

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Table:1 Numbers of tiger evident during census in Similipal Tiger Reserve.

Pug mark (cm)	1989	1990	1991	1992	Mean± S.D.	% of males out of total males	% of females out of total females.	length
1	2	3	4	5	6	7	8	
7.0-7.9	4	8	4	4	5±2	0	0	
8.0-8.9	13	5	8	9	9±3	0	0	
9.0-9.9	4	8	10	9	8±3	0	0	
10.0-10.9	4	3	2	4	3±1	8	4	
11.0-11.9	9	11	31	18	17±10	33	20	
12.0-12.9	22	32	24	24	26±4	33	33	
13.0-13.9	23	22	9	19	18±6	17	31	
14.0-14.9	10	4	5	7	7±3	8	10	
15.0-15.9	1	1	2	0	1±1	0	2	
16.0-16.9	0	0	0	1	0±1	0	0	
Total : 90(+2)*		94	95	95	94±2			

* Known to exist but not counted during pug-mark census.

Table-2: Results of census of tiger (Male:Female:Cub) in Similipal Tiger Reserve during 1989-1992. There has been no distinction of male/female below pug mark size 10.0cm.

Pug mark length (cm)	1989	1990	1991	1992	Mean ± S.D.		
					Male	Female	Cub
7-7.9	0:0:4	0:0:8	0:0:4	0:0:4	0	0	5±2
8-8.9	0:0:13	0:0:5	0:0:8	0:0:9	0	0	9±3
9-9.9	0:0:4	0:0:8	0:0:10	0:0:9	0	0	8±3
10-10.9	2:2:0	2:1:0	1:1:0	2:2:0	2±1	2±1	0
11-11.9	2:7:0	6:5:0	14:17:0	8:10:0	8±5	10±5	0
12-12.9	8:14:0	10:22:0	7:17:0	7:10:0	8±1	16±5	0
13-13.9	4:19:0	4:18:0	1:8:0	5:14:0	4±2	15±5	0
14-14.9	4:6:0	0:4:0	0:5:0	2:5:0	2±2	5±1	0
15-15.9	0:1:0	0:1:0	0:1:0	0:0:0	0±1	1±1	0
16-	0:0:0	0:0:0	0:0:0	0:1:0	0	0±1	0
Total :	90(+2)*	94	93	93	24	49	22
Total Ratio	20:49(+2)*:21	22:51:21	24:49:22	24:29:22	-	-	-

* Known to occur but missed during census.

Table:3 Numbers of mother tiger seen with tiger cubs in the vicinity areas during census of 1989, 1990, 1991 and 1992 in Similipal Tiger Reserve.

Pug mark length of mother (cm)	Numbers of another mean ± S.D.
10.0-10.9	0 ± 1
11.0-11.9	3 ± 2
12.0-12.9	7 ± 2
13.0-13.9	6 ± 1
14.0-14.9	2 ± 1
15.0-15.9	0
16.0-	0 ± 1

Table:4 Rates of sighting of tiger cubs and mothers (Cub-attending mothers) in Similipal Tiger Reserve during 1989-1992.

Year	Total numbers of		Female with	Cub	Ratio of attending
	Male	Female	cub		female:cub
1989	20	31	14	21	1:1.5
1990	22	51	20	21	1:1.05
1991	24	49	18	22	1:1.22
1992	24	49	19	22	1:1.15
Mean ± S.D.	23±2	50±1	18±3	22±1	1:1.22

Table:-5 Similipal Tiger Reserve (1989-92): Representation of Leopard population in different size classes.

Pug mark length(cm)	1989	1990	1991	1992	Mean ± S.D.
4.0-4.9	0	0	0	1	0 ± 1
5.0-5.9	1	1	0	6	2 ± 3
6.0-6.9	2	10	9	19	10 ± 7
7.0-7.9	14	46	32	40	33 ± 14
8.0-8.9	24	29	28	25	27 ± 2
9.0-9.9	12	10	11	8	10 ± 2
Total:	-	-	-	-	82

Table-6 Similipal Tiger Reserve (1989-92):
Number of Male and Female Leopard.

Pug mark size classes (cm)

	4.0 4.9	5.0 5.9	6.0 6.9	7.0 7.9	8.0 8.9	9.0 9.9	Total

Male:							
1989	0	1	1	7	9	3	-
1990	0	0	0	17	11	6	-
1991	0	0	4	13	9	3	-
1992	0	0	7	17	8	1	-

Female:							
1989	0	0	1	7	13	9	-
1990	0	1	10	29	18	4	-
1991	0	0	5	19	19	8	-
1992	0	0	7	23	17	7	-

Mean ± S.D.							

Male :	0	0±1	3±3	14±4	9±1	3±2	29
Female:	0	0±1	6±4	20±9	17±2	7±2	50

Ratio							
M:F	0:0	0:0	1:2	1:1.4	1:1.8	1:2.3	1:1.7
