LETTERS TO THE EDITOR
(I)

To
The Hony. Editor,
Indian Forester,
P.O. New Forest,
Dehra Dun (Uttarakhand).

***Sub* : Skill to trace tiger pugmark from different substratum**

Sir,

It is known that because of different ground conditions the pugmark of the same tiger will vary. For example, in mud the pug impression will be clear but large and splayed; and in deep sand the pugmark will be splayed with ill-defined edges. In a substratum with a thin layer of dust, the pugmark impression will be nearly equal to the actual size of the pugmark. Critics of pugmark technique say that substratum conditions may generate error in the exercise related to tiger census from Tiger Tracking.

In the field, a few procedural norms are followed to eliminate or reduce error. These include the following :

- Laying of standard Pug Impression Pads (PIPs)
- Tracing of pugmarks by trained persons
- Preparation of plaster casts where proper tracing is difficult to get
- Retracing the pugmark from plaster cast by Census Coordinator who is a trained person.

In a quick appraisal mode, an experiment was designed to ascertain the efficacy of tracing pugmarks of tigers from different substratum and conclude from that the number of tigers.

In the 'White Tiger Encl. No. 20' in Nandankanan Zoological Park the experiment was conducted on 17.04.2008. The enclosure houses two male white tigers namely, Rishi and Sitesh, both about three and a half years old. Three distinct substratum were created as PIPs. The substrata were thick sand, deep-mud and thick soil. On both eastern and western sides of the enclosure and within the compound, two sets of three such PIPs, were laid close to the chainlink mesh barrier. Besides these six PIPs, normal ground of the enclosure also had a thin layer of sandy soil at patches capable of producing pugmark impression.

Thus, four types of substratum were available in two locations for obtaining tracks of

two male tigers of same age and size. The tigers were released in the open-roof enclosure for about 20 minutes and then brought back to the crawls. During the time the tigers were free, they walked all over and produced pugmark impressions on all substratum.

A few pugmarks were selected at random and the Assistant Conservator of Forests, Nandankanan (Sri Arun Kumar Mishra) prepared all plaster casts and traced/retraced all pugmarks using standard procedure on Form-D, as per normal prescription. Four pugmarks were directly traced from the substratum and six were traced from plaster casts. Out of total ten tracings, there was one from 'normal ground', 3 from 'thick sand', 4 from 'mud' and 2 from 'thick soil'. The details of data obtained and the results of analysis are presented in Table 1. During analysis, that involved comparing tracings and eliminating overlaps, suggestions were taken from Dr L.A.K. Singh, Senior Research Officer. The following procedure was adopted during analysis and drawing conclusion.

1. Right-angled quadrangles were drawn to fit each pugmark within it by demarcating the Pugmark Length (PML) and Pugmark Breadth (PMB). By using a rightangled setsquare, care was taken to ascertain the direction of movement and enable the basal PMB touch the pug-pad over as much distance as possible. Similarly, the PML-line touched the extreme toe over as much distance as possible.

2. In case of those tracings where the tip of the two middle toes remained at almost the same level, the tracings were identified as belonging to the front pug. There were five front-pug tracings. In all these five, PMB exceeded PML. Hence they confirmed the sex of the animal as 'Male'.

3. All five front pug tracings were matched and found that they were found to be from the same tiger.

4. In the five remaining tracings, which were the hind pug tracings, the difference between PML and PMB was less than 1.5cm in each case, confirming sex of the animal as 'Male'. Upon matching the tracings with each other, it was found that in spite of minor vibrations (variations) on the edges, all hind pug tracings belonged to one tiger.

In the above observations, in spite of four different types of substratum, it was possible to correctly assess the pugmark size and assign these to front-hind category, and confirm the sex from pugmark.

From the above quick-appraisal exercise, it got clear that with proper tracing and the application of one's judgment, while retracing from plaster casts, there is very little scope to commit error and overestimate tiger number in the wild. On the other hand, it is rather possible to underestimate the number when two tigers of same age and sex are still attached to mother's territory or are in adjoining territories of their own.

The pugmark tracking method continues to stand as the time tested method.

Table 1

Data and results of a quick-appraisal experiment on tiger tracking from four types of substrates in Nandankanan

Sl. No.	Page reference	Substratum	Location	PML (cm)	PMB (cm)	Direct Tracing or redrawn from plaster cast	Front or Hind	Sex	Remarks
1.	1	Normal ground	West	12.6	11.5	Tracing	Hind	Male	Overlapping paw of hind and front minor confusion. So PIP is necessary.
2.	2A	Thick soil	West	13.5	13.0	Tracing	Hind	Male	Hind pug overlapping and ahead of front
3.	28=5A	Thick soil	West	12.5	14.7	Tracing	Front	Male	-do-
4.	3	Thick sand	East	14.9	14.0	Tracing	Hind	Male	
5.	4A=68	Mud	West	14.0	13.8	Plaster cast	Hind	Male	Parallel to 48
6.	48	Mud	West	14.4	17.2	Plaster cast	Front	Male	Parallel to 4A
7.	5A=28	Thick sand	West	13.5	14.2	Plaster cast	Front	Male	Overlapping toes of 58
8.	58	Thick sand	West	13.6	14.0	Plaster cast	Front	Male	Distorted toe
9.	6A	Mud	East	14.0	15.6	Plaster cast	Front	Male	6A overlapping 6B but because of mud toes of 6B can be made out
10.	6B=4A	Mud	East	13.1	13.1	Plaster cast	Hind	Male	As above

All Hind pugs are from same animal. All front pugs are from same animal.

We need to use it properly. It is necessary that staff should be properly trained to prepare good plaster casts and good tracings in Form-D where all field data are also recorded for use during analysis [Singh, L.A.K. (2000). *Tracking Tigers: Guidelines for estimating wild tiger populations using the pugmark technique,* rev. edn. WWF-Tiger Conservation Programme, New Delhi. 38pp]. Without data on field conditions, as prescribed in the proforma, it will be erroneous to carry out analysis and arrive at tiger numbers. The user's sincerity can prove or disprove the worthiness of any technique in any terrain. We should adopt a method that every field person can use, interpret and conclude from, without going too much or at all into the statistical jargons at the cost of traditional skill.

Yours faithfully,
Sd/-
B.K. Pattnayak
PCCF (Wildlife) and
Chief Wildlife Warden, Orissa
