

Final Detailed Report

Reproductive behavior of the Asian elephant in the wild, Kaziranga National Park, Assam

PhD Scholar: Karpagam Chelliah (CES). Email: kchelliah@ces.iisc.ernet.in

Research advisor: **Prof.R.Sukumar**

Professor and Chairman,

Centre for Ecological Sciences

Indian Institute of Science, Bangalore 560 012

Karnataka, India

Phone: 080-23600382. Fax: 080-23602280. Email: rsuku@ces.iisc.ernet.in

Executive summary

- A scientific study on the reproductive behavior of wild Asian elephant with special attention to female preference for tusked males was conducted from Oct, 2009 in Kaziranga National Park, till May 2010.
- Approximately 280 hours of elephant behavior in the context of reproduction were systematically sampled.
- 37 out of the 103 individually identified bulls were observed in musth (20 tuskers and 17 makhnas).
- 91 adult male-female interactions were observed out of which we are confident that 29 estrus occasions have been sampled.
- Out of the 29 estrus occasions elephants' mating was observed on 9 occasions. On one occasion and attempted mount was disrupted by a guarding musth bull. On yet another occasion the mounted female was submerged in water and therefore we are not sure of the success of the mount.
- Six out of the 9 successful matings were by musth bulls.
- Six out of the 9 successful matings were by tuskers (4 musth and 2 non-musth tuskers)
- One out of the three makhna-matings was by a non-musth makhna.
- Data does not support the hypothesis that females prefer tusked males over tuskless males.
- Females appear to be soliciting mating from multiple males. When guarded by a dominant musth male, some females have been observed to sneak mate with subdominant non-musth males. One of the theories in biology is that females may mate multiply to ensure fertility and it has a fancy term called "The fertility insurance hypothesis". The next step therefore would be to investigate this possibility.
- On 86 days we observed male-male interactions out of which 37 fall into the category of male-male competition and 47 maljuria (non-agonistic) interactions. On two occasions we have been unable to understand the interaction between the males and therefore left uncategorized.
- Male-male interactions were documented in order to determine whether tusks are used as weapons in male-male competition. A superficial scan of the data indicates that tusks are not as formidable a weapon in male-male competition as musth expression. Systematic analysis of behavior data is required to confirm this perception.

- On two occasions we have observed coalition between a musth-bull and a non-musth bull, while the musth bull guards an estrus female from sneaky rival bulls. The non-musth bull helped chase away sneaky rival bull. The musth bull tolerated the proximity of the “helper” bull to the estrus female. As of now we do not know the reason behind this coalition but to our knowledge this is the first observation of such elephant behavior in the wild to be reported.

Results

Objective 1: Estimating adult sex ratio

The adult male-female sex ratio is between 1:3 and 1:5.

Objective 2: Estimating adult tusker-makhna ratio (tusked versus tuskless males)

Out of the 103 adult males (20+ years of age) 50 are makhnas and 53 tuskers. The tusker-makhna ratio is approximately 1:1.

Objective 3: Estimating shoulder height and tusk length from photographs

103 adult males (20+ years of age) have been identified out of which shoulder height measurements were obtained only for 31 individuals. The remaining 72 individuals were out of range of the laser distance meter when they were photographed.

Table 1: Shoulder height measurements of adult males

	Date	Photo Number	Bull	Height (cms)	Remarks
1	17-Nov-08	PB171651	Makhna	225	
		PB171653			
2	10-Dec-08	PC104130	Tusker	196	
3	16-Dec-08	PC164694	Makhna	250	
4	16-Dec-08	PC164669	Tusker	180	Greater than
5	23-Dec-08	PC235338	Makhna	258	Greater than

6	24-Dec-08	PC245627	Makhna	245	Greater than
7	24-Feb-09	PC2240178	Tusker	268	
8	14-Jan-09	P1146218	Makhna	264	
9	17-Jan-09	P1166372	Makhna	276	
10	29-Jan-09	P1297519	Tusker	244	
11	17-Feb-09	P2179107	Makhna		
12	7-Mar-09	P3071989	Makhna	265	
13	9-Mar-09	P3092283	Makhna	275	
14	11-Mar-09	P3112421	Tusker	262	
15	14-Mar-09	P3142996	Makhna	257	Greater than
16	14-Mar-09	P3142998	Makhna	202	Greater than
17	17-Mar-09	P3173433	Makhna	261	
18	21-Mar-09	P3213572	Tusker	241	
19	19-Dec-09	PC192304	Makhna	249	
20	19-Dec-09	PC192306	Makhna	185	
21	22-Dec-09	PC222348	Makhna	268	
22	23-Feb-09	P2233390	Tusker	257	
23	26-Feb-10	P2263539	Makhna	312	
24	7-Mar-10	P3074243	Tusker	267	
25	9-Mar-10	P3094393	Tusker	212	
26	14-Mar-10	P3144932	Tusker	235	
27	18-Mar-10	P3185334	Tusker	288	
28	20-Mar-10	P305625	Tusker	244	
29	6-Apr-10	P4066793	Tusker	260	
30	4-Apr-10	P4046527	Tusker	262	
31	21-Apr-10	M2U07382	Makhna	280	

Objective 4: Behaviour observations of adult elephants in the context of reproduction

a) Musth bulls sampled

A total of 37 individuals were observed in musth (17 makhnas and 20 tuskers) and the temporal distributions of their sighting are shown in Figure 1.

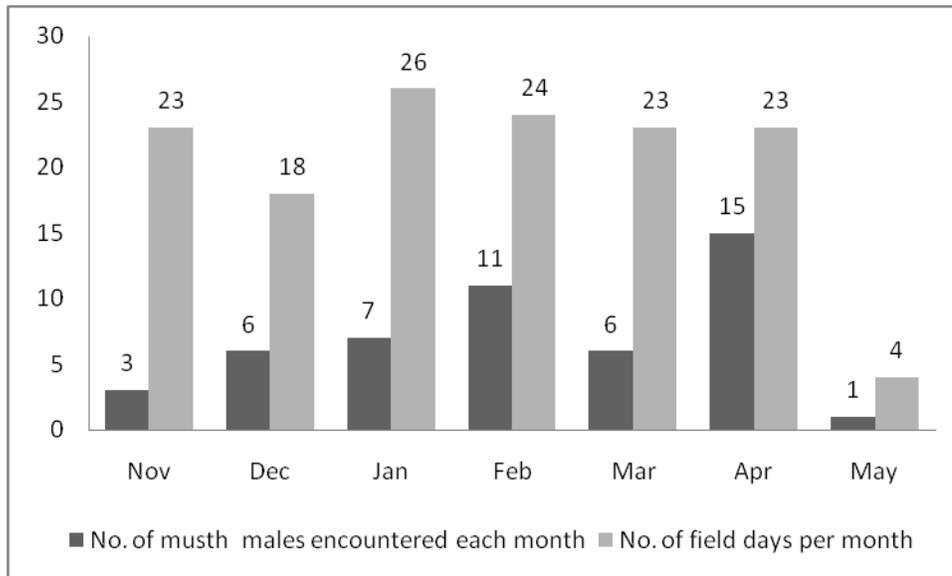


Figure 1: Musth male sightings by month

February and April show relatively high frequency of musth male sightings because of the following reasons:

In February controlled burning flushes elephants from tall grass towards open water bodies thus improving visibility. Shortly after burning most elephants appear to spend more time in the woodland and elephant sightings in general came down in March. Good rains in early March resulted in a flush of new grass in April that attracted the elephants back to the grassland. Visibility is excellent (even up to 3 kms) in meadow like landscape and therefore conducive for locating and tracking elephants easily.

However it is also likely that number of males coming into musth may peak during April but it is difficult to infer this because of the confounding effect of variability in visibility over the months.

b) Estrous female and adult male interactions

We opportunistically sampled adult male-female interactions and generally they can be categorized into five broad categories

1. Adult bull found in the presence of a female-lead herd
2. Adult bull following or chasing an estrous female
3. Adult bull mate guarding an estrous female
4. Adult bull and an estrous female exhibiting consortship behavior
5. Adult bull mating with a female

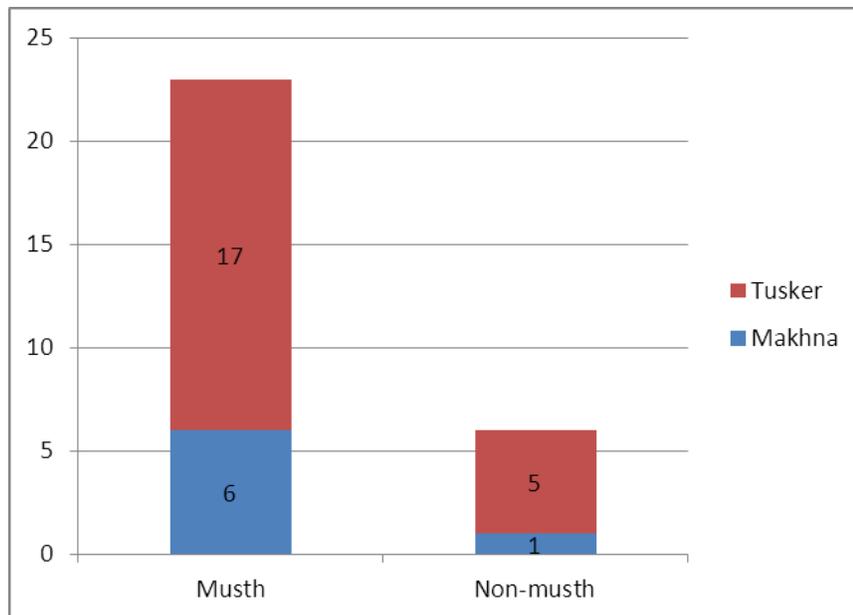


Figure 2: Estrous female-male associations categorized by male type and musth status (N=29)

Figure 2 shows the frequency of associations according to male morph (tusker or makhna) and musth condition. Out of the 91 adult-male female associations only 29 involved an estrus female or females that we could identify. Figure 3 shows the frequency of estrus females and adult male associations and Figure 4 the number of observed mating for each male phenotype.

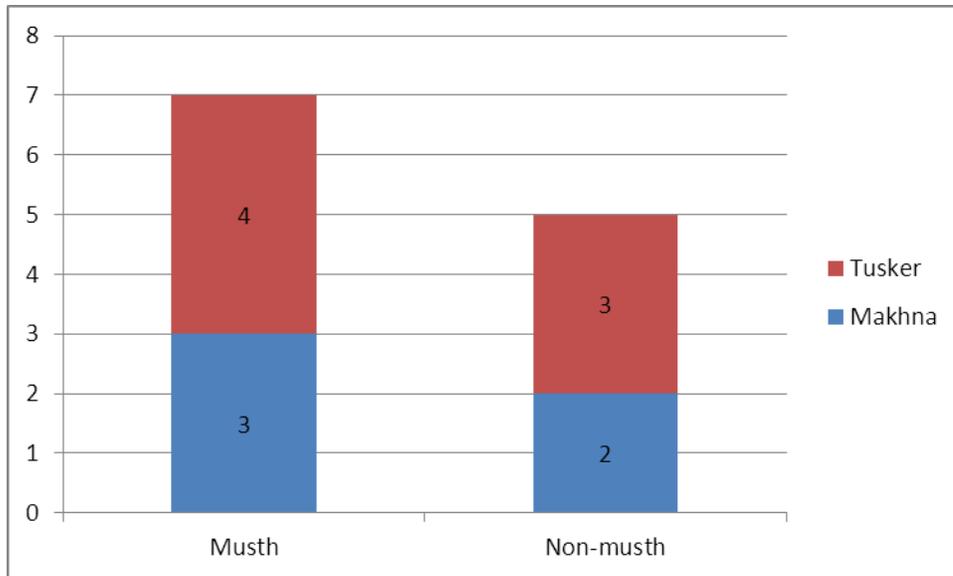


Figure 3: Observed elephant mating (N=12; pilot study + 2009-2010 field seasons)

Three most important outcomes

Female elephants appear to be soliciting mating from multiple males.

Currently prevalent hypothesis predicts that females should preferential mate with the best of all the courting males. The best male is expected to be the largest musth male with the longest tusk. However we have observed multiple matings and sometimes the female has to achieve this by sneaking away from a large, dominant, mate-guarding musth male in order to mate with a smaller, sub-dominant sneaky male. The females are not entirely indiscriminate either. They do avoid some males and solicit some other males. I have not been able to detect any consistent pattern in their choice. We do, however, have hypothesis as to why they may do so. One theory in biology states that multiple matings by females may be to ensure fertility (fertility-insurance hypothesis) especially in polygynous animals where males may suffer from sperm depletion.

2. Musth males are not indiscriminately aggressive. Aggression is tempered by social context.

Scientific literature on African elephants and captive Asian elephant records repeatedly state that when bulls enter the musth stage (a temporary sexually heightened state in male elephants where plasmas testosterone levels are 50 times higher than normal) they turn very aggressive.

However, what we found is that musth males are no more aggressive than non-musth males and that aggression if at all expressed was highly context dependent. We have observed adult musth males and non musth males exhibiting affiliatory behaviour in the presence of the estrous female. We have even observed musth bulls forming coalition with non-musth bulls to guard estrus females from other sneaky bulls. We have not been charged even once by any of the musth bulls we followed. Often we were plum in their way but they just take a detour around us. This is in complete contrast to what is reported in African elephants.

Therefore, the aggression observed in captivity, we believe is an artefact of captivity. A musth male in the wild, roves far in search of estrous females (as much as 10 to 15 kms per day). In captivity the musth male is unable to give vent to its natural instinct as it is kept chained to a spot and often kept semi starved to weaken its body condition. It is highly likely that when a goal driven instinct of an animal is frustrated, it could trigger extreme aggressive behaviour. One way to test this would be to allow captive musth males to rove freely in the forest to search for estrous females. Off course this is easier said than done but with careful research and planning it is not impossible either.

3. Mate-guarding

We have documented a rather puzzling behaviour by mate-guarding musth males. Often the musth male not only brings the estrous female to fairly open space such as the banks of large water body to guard against sneaky bulls but he also rounds up the entire herd of females and juveniles (like a cowboy rounding up cattle) and guards the whole bunch. We still do not have an explanation for this behaviour.