

Update on Manipur Brow-Antlered Deer or "Sangai" (*Cervus eldi eldi*) in Keibul Lamjao National Park in Manipur

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Introduction

Cervus eldi eldi (Maclelland, 1842) locally known as "Sangai" and nationally known as Manipur Brow-antlered Deer, is one of the three confirmed species of Eld's Deer in the world confined to South and South East Asia from Manipur, eastern India to Indochina and southern China. *Cervus eldi thamin* or Thamin Deer, is now restricted to Myanmar. *Cervus eldi siamensis* is restricted to Indochina, including an isolated population on Hainan Island, which is described as a distinct subspecies by some authors, *Cervus eldi hainanus* (Decoux, 1993) (Wang et al., 2001).

Cervus eldi eldi or "Sangai" is restricted to Keibul Lamjao National Park, Manipur, a unique ecosystem consisting of a floating biomass locally called "Phumdi" in the southeastern part of Loktak Lake. *Cervus eldi eldi* was listed in the IUCN Red Data Book in 1975 as numbering only 14. Subsequent to the declaration of this area as a National Park and with strict conservation measures taken up by the Forest Department, the threat of extinction was reduced for a time and the population increased. Currently, however, deterioration in the ecosystem of the Park owing to high water level resulting from the Loktak Hydro-electric Project provides much cause for concern.

General Morphology of Sangai

The Brow-antlered deer is a medium-sized cervid, with distinctive antlers, measuring 100-110 cm in length. The extremely long brow line which forms the main beam and the antlers together form a continuous curve at right angles to the closely set pedicels. This forward protruding beam appears to come out from the eyebrow, thus signifying its name, the Brow-antlered deer. The beams are unbranched initially but as the curvature and length increase, they get forked. The height and weight of a full-grown stag may be approximately 115-125 cm at shoulder and 95 to 110 kg respectively. The sexes are moderately dimorphic in body size and weight, the female being shorter and less heavy as compared to her male counterpart. The length of the body from the base to the ear upto the tail is about 145 to 155 cm. in both sexes. The tail is short and rump patch is not pronounced.

The body of Sangai is covered with coarse hairs, the colour of which (particularly that of the male) varies with respect to season. In winter, the hair colour is dark brown and in summer, a lighter brown. This is reportedly not the case with other subspecies. Its legs are slender and adorned with a number of elongated transverse grooves. The hooves are hard and black on the dorsal side and tough and rubbery on ventral side. Further, the hooves are splayed, representing -- along with grooved patterns, adaptations of Sangai for movement in the swampy habitat of phumdi.

Distribution and habitat

Keibul Lamjao National Park (KLNP) in Loktak Lake is a unique natural heritage site in Manipur. It is the only habitat of *Cervus eldi eldi*, making the subspecies endemic to this



small area. KLNP also may be the only floating Wildlife Reserve in the world. It is located between 24°27'N and 24°31'N latitude and 93°53' E and 93°55' E longitude. The Park covers an area of 40 sq. km. and is situated in the south-eastern side of Loktak Lake, a Ramsar site and the biggest freshwater lake in NE India.

A unique feature of Keibul Lamjao National Park is the floating mass of entangled vegetation formed by an accumulation of organic debris and biomass with soil particles, concentrated into a solid or semi-solid form. It makes up two-third to three-fourths of the total park area.

Table 1: General Information on KLNP

1. Area :	40 sq. km.
2. Latitude :	24°27' N and 24°31' N
3. Longitude :	93°53' E and 93°55' E
4. Ann. rainfall :	125 cm.
5. Temperature :	4° C (January) and 32° C (June)
6. Humidity :	45% (March to 80% August)
7. Legal status :	Declared as National Park on 28 th March 1977
8. Climate :	Moderately cold Sub-tropical Monsoon
9. Ecosystem :	Aquatic, wetland and terrestrial

Flora: Notable aquatic flora are *Zizania latifolia*, *Saccharum munja*, *Saccharum bengalensis*, *Eiranthus procerus*, *Dioscorea bulbifera*, *Cynodon dactylon*, *Alpinia galanga*, *Eichornia crassipes*, *Hedychium coronatum*, *Nelumbo nucifera* and *Phragmites karka*.

Fauna: Sangai is the most threatened species of the park. Other animals include Hog Deer, Wild Boar, Large Indian Civet, Common Otter, Fox, Jungle Cat, Golden Cat, Bay Bamboo Rat, Musk Shrew, Common Shrew, Flying Fox, Cobra, Water Cobra, Banded Krait, Asian Rat Snake,

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Python, Russels' Viper, Checkered Water Snake, Striped Keel-back Tortoise.

KLNP being a part of Loktak lake is home to a number of both migratory and resident birds. Prominent bird species are East Himalayan Pied King Fisher, Black Kite, Lesser Sky-lark, Northern Hill Myna, Burmese Pied Myna, North Indian Black Drongo, Lesser Eastern Jungle Crow, Yellow-headed Wagtail, Grey-headed Imperial Pigeon, Spot-bill Duck, Common Teal, Pintail, Blue-winged Teal, Ruddy Shell Duck, Red-crested Pochard, Lesser Whistling Teal, Assam Red-Whiskered Bulbul, Little Bustard Quail, T-hooded Crane, Burmese Sarus, Indian White-breasted Water Hen, India Purple Moorhen, Coot, Eastern Golden Plover, Eastern Large Egret, Chinese Pond Heron, Manipur Painted Bush Quail, Burmese Jungle Fowl, Burmese Francolin, Common Gray Quail, Large Falcon, Hume's Barred-back Pheasant, White Owl, Forest Eagle Owl, Manipur Crimson-breasted Pied Woodpecker.

Table 2 : Problems related with habitat management in KLNP :

1. High water level in the park
2. Decreasing thickness and fragmentation of the phumdi
3. Changing vegetation
4. Deterioration of water quality
5. Lack of higher level ground



Habitat management in KLNP :

The habitat of Keibul Lamjao National Park has been altered by the high level of water maintained by Ithai Barrage under Loktak Hydro-electric Project that is affecting the thickness of phumdi, which is becoming thinner and thinner day by day. As per record the water level is being maintained between 768 m to 768.5 m above sea level during the month of October to March from the year 1998-2001. Due to high water level, the roots of the floating biomass or "Phumdi" cannot absorb the nutrients from the soil under water. Before commissioning of the hydro-electric

project, the phumdi used to sink and float periodically which helped absorb nutrition and support vegetation. This is not the case now which has also caused a decline in the growth of phumdi. Also, no intertwining of its roots take place which leads to fragmentation of the biomass. The northern side of KLNP is connected with the Loktak Lake and the normal flow of water is from north to south. The water current runs from south to north due to Loktak Hydro-electric Project during August to March. During rainy season (April to July), the shutters of Ithai Barrage are opened and at this time the water current flows from north to south. During the months of August to March every year, however, the shutters of Ithai Barrage are closed and the water current reversed from south to north. This causes movement of phumdi which gets washed away towards the northern side as there is nothing to block its movement. Hence the area of phumdi is being reduced day by day. Earlier, there was only marshy land in the Park but after the commissioning of the hydroelectric project there are two ecosystems, i. water body (covering 1/3 area) and ii. phumdi (covering 2/3 area) with water quality deteriorating day by day. Its pH value ranges from 4-8.5. The reasons for poor quality are the increasing pollutants from surrounding towns draining into the Loktak Lake, use of pesticides and insecticides by villagers, accumulation of water on phumdi and rotting due to rotting vegetation, among other things.

Home range of Sangai at KLNP

The home range of Brow-antlered Deer in the Park is confined to 15-20 sq. km. in the south-western part of the lake. Due to non-availability of phumdi in the north-western part of the Park, there is virtually an absence of Sangai in that area. The weighted distribution on the basis of weights assigned to stag, hind and fawn in proportion to 4:2:1. It is known that Sangai population is high near Toyaching, Pabotching and Yang Kokchambi areas, thereby confirming the small range of Sangai. Their distribution is guided by shelter and availability of food.

Feeding and resting

The luxuriant vegetation of phumdi includes specialised food plants of Sangai. Many of the plants, eg. *Zizania latifolia*, *Saccharum munja*, *Saccharum bengalensis*, *Erianthus procerus*, *Erianthus ravermae* and others are the favorite food plants of Sangai. Feeding behavior of Sangai can be easily seen over new shoots on freshly cut fire-line area. It exhibits bimodal activity pattern. Sangai starts grazing usually early morning approximately 4:30 am and generally continues up to 8:00 am. On cloudy mornings, the period may extend to 10:00 am. In the evening it starts at 3:00 pm and continues up to 6:00 pm. After feeding, it takes rest under thick and tall reeds and grasses during the day. At night, some of them may even rest on the hillocks.

Sangai census

Since 1975 the population estimation of Sangai is carried out annually as illustrated in Table 3. The population of Sangai has been consistently increasing over the years after declaration of the area as a National Park.

The issues

The natural habitat of Sangai in Keibul Lamjao National Park is seriously threatened due to the permanent flooding

of the Park and its resultant effect on the thickness of phumdi, which varies from a few centimeters to two metres. The humus of phumdi is black in colour and very spongy with large number of pores. It floats with 1/5 and 4/5 part above and under water respectively.

Prior to commissioning of the Loktak multi-purpose project in the year 1983, water in the lake exhibited large seasonal changes. Correspondingly, the phumdi floated during flooding by backflow from Khordak River and discharge from other streams and nullahs, then settled down on the lake bed during dry season when water is drawn out through the same river. Thus during the dry period nutrients and minerals were drawn by the phumdi vegetation from the bottom of the lake. This natural cycle of floating and sinking of phumdi used to be maintained consistently but maintenance of high water level for the hydro-electric project has broken this annual cycle, leading to a decrease in the biomass. It is feared that after some time the phumdi may not be able to support the weight of the animal.

The 40 sq. km. area of the Keibul Lamjao National Park in Loktak Lake has been the main source of income for the people in the surrounding villages in the past. Some of the local people are still dependent on the Park for fishing and collection of vegetables of economic importance. The effect of the hydro-electric project on phumdi in the lake has not been assessed properly by the National Hydro-Electric power corporation (NHEPC).

Threats

Since Keibul Lamjao National Park is the only natural habitat of Sangai, it must have a viable population. For achieving the objective of increasing the population of Sangai to a minimum of 500 for long term conservation, protection of the animal as well as protection and improvement of habitat is crucial. The condition of habitat

should be constantly monitored so that timely corrective measures particularly with reference to the water level due to Loktak Hydro Electric Power Project can be taken. There is urgent need to have high ground with adequate protection and food material to provide a refuge for the animals in case of flash flood. The area under phumdi in the park needs to be increased. Theft of phumdi and flow or part of phumdi towards northern side also needs to be checked as well as collection of firewood, food, fodder, non-timber forest products and fishing should be stopped completely. The area of the entire Park has to be increased at strategic places. Finally, an environment needs to be created in which local people may volunteer as natural custodians of Sangai and other animals in the Park.

Suggested measures for tackling the problems

- Providing effective protection
- Improving the habitat
- Encouraging eco-tourism and nature education
- Carrying out eco-development works
- To undertake, aid, promote and co-ordinate research works
- Building infrastructure
- Human resource development planning
- Preparation of detailed management plan of KINP
- Capacity building, training, awareness and extension activities
- Ethnic information and exhibition
- Active involvement of surrounding population in management and conservation of Sangai

References

- IUCN Red Data Book, 1975.
Balakrishnan, C. N., S. L. Monfort, A. Gaur, Lalji Singh, & M. D. Sorenson (2003). Phylogeography and conservation genetics of Eld's deer (*Cervus eldi*), *Molecular Ecology* 12: 1-10.

Table 3 : Record of Annual Census of Sangai

No.	Year	Type of Census	No. of animals			Total
			Stag	Hind	Fawn	
1.	1975	Aerial	-	-	-	14
2.	1977	-do-	6	8	4	18
3.	1978	-do-	9	10	4	23
4.	1979	-do-	9	13	8	30
5.	1984	Ground	20	25	6	51
4	1985	-do-	22	33	5	60
7.	1986	-do-	44	45	6	95
8.	1987	Aerial	11	17	7	35
9.	1988	-do-	20	25	7	52
10.	1989	-do-	25	29	12	64
11.	1990	-do-	29	35	12	76
12.	1991	Ground	37	51	16	104
13.	1992	Aerial	21	32	9	62
14.	1993	-do-	38	48	12	98
15.	1994	Ground	36	65	16	137
16.	1995	-do-	58	69	25	152
17.	1996	-do-	57	65	21	143
18.	1997	-do-	58	72	17	147
19.	1998	-do-	56	62	28	146
20.	1999	-do-	63	61	25	149
21.	2000	-do-	54	76	32	162
22.	2003	-do-	65	74	41	180