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Antler Phenology of Chital (*Axis axis*) in Kota Zoo and in Mukandra hills Tiger Reserve

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Abstract

Comparative study of Antler Phenoloy of Chital (*Axis axis*) in Kota Zoo (Captivity) and in Mukandra Hills Tiger Reserve (Wild) was conducted in different time intervals from October 2017 to June 2018. Antler cycle represents breeding season of the Chital population. Road transects were monitored monthly to gather information on Antler cycle of Chital in MHTR and observations were recorded in Kota Zoo also. In Both the study area though hard antlered males occurred in both season majority of Chital males were seen in hard antlered condition in summer i.e. during the rutting season, whereas in winter about less then half of Chital males were seen in hard antlered condition. Ratio of hard antlered males of more than two feet in length was approximately doubled in summer as compared to winter. The peak breeding season was summer when majority of the male Chital were observed in hard antlered condition. The peak was fawning observed in winter. In both the study area Chital was seasonal breeder.

Key words: Deer, Stag, Breeding, Antler

Introduction-

Chital is the third largest deer in the Indian subcontinent**.** Adult Chital have a set of three tined antlers, each composed of a beam forked at the top of which outer one is always large and a brow tine that grow at right angles with the beam. Yearling male have a set of simple spike antlers not more than 6 inches. The size of antler is also an important parameter in male sexuality (Chandra, 2013). It has been known for Chital that they do not have a precise breeding season and breed throughout the year (Schaller, 1967; Sankar, 1994). Antler formation starts with the appearance of velvet antlers and as the antlers velvet shed, antlers appear as shining hard antlers which is a hard solid bony structure. Antlers are temporary structures which are grown and shed every year. Hard antlers along with sexual behavior indicate the breeding season (Schaller, 1967). Yearling males row their set of spikes on attaining puberty and then grow successive sets of antlers in the coming year. Antler phenology of Chital has been studied in few studies (Graf and Nicholas, 1966; Raman, 1998; Schaller, 1967; Sankar, 1994; Fuchs, 1977; Johansingh, 1983; Mishra, 1982). Chital antler cycle is related to environmental conditions such as availability of food, photoperiod and rainfall (Raman, 1998). Till now no study has been conducted in Kota Zoo and in

Mukandra Hills Tiger Reserve on antler phenology. Present study aims at filling this gap and investigates antler phenology in relation to environmental conditions, breeding and group size.

Study area-

Study area for research work in captivity was Kota Zoo. It is among one of the five Zoos of Rajasthan. It was established in1954. It is situated in 2.2 hectare area near Kishor Sagar Lake at Kota city in Rajasthan. Another present study area for research work in wild includes Mukandra Hills Tiger Reserve (MHTR) which is notified third Tiger Reserve of Rajasthan vide S. No: F3 (8) FOREST 2012 dated 09/04/2013 under WPA 1972. It lies between 24°38´ to 25°7´ N Latitude and 75°26´ to 76°12´ E Longitude and include Mukandra National Park, Dara Sanctuary, Jawahar Sagar Sanctuary and Chambal Sanctuary. It is located in the south east part of Rajasthan of India, at the junction of Kota, Bundi, Chittorgarh and Jhalawar District of Rajasthan. MHTR is approximately 80 Km in length and 2-5 km in width. MHTR includes core area (417.17 square km) and buffer area (342.82 square km) with a total 759.99 square km area. There are 16 villages inside core area and 14 villages in buffer area of MHTR. As for boundary information Chambal, Ahu and Kalisindh River situated at west, south and east boundary of MHTR. MHTR comprise of fairly dense Forest. MHTR is a densely wooded dry deciduous forest with Foliage many rare medicinal herbs and trees and is spread over a hilly terrain. It is rich in various wild herbivores and carnivores animals. Some of the resident ungulate species of this mysterious forest are Chital, Sambar, Blue Bull, Chinkara and Wild Boar. MHTR has rich wild life population including carnivores such as Leopards, Hyena and Sloth Bears (Nama et. al., 2013).

Materials and Methods-

Antler Phenology of Chital was recorded while moving along road transects and sitting by waterholes in MHTR and the same were recorded at Kota Zoo with the help of data sheet. Male Chital (Stags) were divided in three categories based on their height, coat colour and presence/condition or absence of antler i.e.

i. Adult male: Colour - Darker; Height at shoulder - around 3ft for Chital; antler length - above 1ft when full grown.

ii. Sub adult male: Colour - lighter; Height at shoulder - around 2½ ft for Chital; antler length - arond 1 ft. when fully grown.

iii. Yearling male: Colour - lighter; Height at shoulder - 2ft for Chital; antler length - around 5 to 6 inches long spike antler for Chital when fully grown.

Chital males were further divided in five categories depending upon their antler condition whether in hard, velvet or shed.

(i) More than two feet
(ii) Between one and two feet
(iii) Less than one feet
(iv) Spike antler
(v) Shed antler

Results and discussion-

Overall, a total of 986 male chital were classified in to different age classes. In Both the study area though hard antlered males occurred in both season majority of

Chital males were seen in hard antlered condition in summer i.e. during the rutting season, whereas in winter about less then half of Chital males were seen in hard antlered condition. In winter more then half of Chital males were seen in velvet antlered condition, whereas in summer only very few Chital males were in velvet antlered condition. Chital males in shed antlered condition were rare in winter and summer (Table 1 and 2). Ratio of hard antlered males of more than two feet in length was approximately doubled in summer as compared to winter (Table 3 and 4). A high percentage of Chital was noticed in hard antlered condition when low fawning was observed. In both the study area Chital was seasonal breeder. The peak breeding season was summer when majority of the male Chital were observed in hard antlered condition. The peak fawning season observed in winter was supported by breeding season also (Chappel, 1989).

Reproductive success of males in polygynous species changes according to age of animal. The prime aged adult males with big hard antlers involved in most of the conceptions (Raman, 1998). In the present study Chital males increased its breeding activity in response to increased day length. Adult male Chital influenced mean group size as they join female groups during rutting season (Sankar, 1994).

Table1. Antler cycle- hard, velvet and shed antlers observed in Kota Zoo

Season	**Hard**		**Velvet**		**Shed**		**N**
	No.	**%**	**No.**	**%**	**No.**	**%**	
Winter	45	36.00	74	59.20	6	4.80	125
Summer	89	89.00	9	9.00	2	2.00	100

Table2. Antler cycle- hard, velvet and shed antlers observed in MHTR

Season	**Hard**		**Velvet**		**Shed**		**N**
	No.	**%**		**%**	**No.**	**%**	
Winter	173	49.86	171	49.28	3	0.86	347
Summer	546	85.45	76	11.89	17	2.66	639

Table3. Percentage of Stags in hard and in velvet antlers in three different antler classes in Kota Zoo

Season	**> 2 feet**		**1-2 feet**		**< 1 feet**		**Spike**		**N**
	Velvet	**Hard**	**Velvet**	**Hard**	**Velvet**	**Hard**	**Velvet**	**Hard**	
Winter	5.04	13.45	15.13	11.76	18.49	5.88	23.53	6.72	**119**
Summer	0	26.53	0	28.57	0	16.33	9.18	19.39	**98**

Table4. Percentage of Stags in hard and in velvet antlers in three different antler classes in MHTR

Season	**> 2 feet**		**1-2 feet**		**< 1 feet**		**Spike**		**N**
	Velvet	**Hard**	**Velvet**	**Hard**	**Velvet**	**Hard**	**Velvet**	**Hard**	
Winter	5.81	14.54	12.5	10.17	15.70	14.24	15.70	11.34	344
Summer	0.00	30.39	0.32	25.72	1.13	14.31	10.77	17.36	622

Hard antlered male are seen during dry hot season and early monsoon which reflects the breeding season (Khan, 1992; Graf and Nicholas, 1966; De and Spillet, 1966; Schaller, 1967; Eisenberg and Lockhart, 1972; Johansingh, 1983; Dinerstein, 1980; Sharatchandra and Gadgil, 1975) and some times in winter (Srinivasulu, 2001; Mishra, 1982; Eisenberg and Lockhart, 1972; Chandra, 2013; Prater, 1971). Adult

males are more involved in breeding than Sub adult male (Raman, 1998; Ramesh et. al., 2013). Antler shadding occurs mostly in monsoon and winter (Prater, 1971; Ramesh et. al., 2013; Graf and Nicholas, 1966; Schaller, 1967; Eisenberg and Lockhart, 1972; Sharatchandra and Gadgil, 1975; Mishra, 1982) and rarely in summer (Chandra, 2013). Velvet antlered males are common in winter and early summer (Prater, 1971; Graf and Nicholas, 1966; Schaller, 1967; Sharatchandra and Gadgil, 1975; Mishra, 1982). Most fawning is seen in winter and early summer (Srinivasulu, 2001; Raman et. al, 1996; Raman, 1998; Raman, 2013; Ramesh et. al., 2013; Tak and Lamba, 1984; Graf and Nicholas, 1966; Schaller, 1967; Sharatchandra and Gadgil, 1975; Mishra, 1982; Johansingh, 1983; Dinerstein, 1980; De and Spillet, 1966; Eisenberg and Lockhart, 1972) and rarely in monsoon (Chandra, 2013). This study adds the knowledge of antler cycle in relation to group size, age of male Chital, antler condition and environmental factors which assists in the sustainable management and conservation of the study species.

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