Activity of White Royal Bengal Tiger (*Panthera tigris tigris*) in captivity at Sajjangarh Biological Park, Udaipur, Rajasthan

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ABSTRACT

The present study examined the activity pattern of the White Royal Bengal Tiger at the Sajjangarh Biological Park, Rajasthan (India), from November 2016 to April 2017. Seventeen target behaviours were observed using Focal–animal sampling method under 5-minute sample periods. These behaviours were further classified under active, passive and stereotypic behavioural categories. It was found that the tiger spent $30.22 \pm 9.61\%$ of its time in active behaviour, $55.38 \pm 16.71\%$ of its time in passive behaviour and $14.37 \pm 13.86\%$ of its time in stereotypic behaviour. Significant differences in the pattern of the above mentioned categories were observed between summer and winter.

Key words: *Panthera tigris tigris*, captivity, albino, activity pattern, seasonal variation.

INTRODUCTION

Activity is defined as the state of being active which involves engagement in physically energetic pursuits. Activity pattern is animal's daily rhythm of activity and inactivity, while the activity budget is the allocation of time among different behaviours and most often documented as percentage of activity (MacHutchon 2001; Koli & Bhatnagar 2016). An individual's need and interaction with members of the same species or those of other species are the two major factors that influence their daily activity. Other intrinsic and extrinsic factors that affect the activity of an animal are age, mass, reproductive status, circadian rhythm, temperature, precipitation, habitat, food availability, status in a food chain, social status and humidity (Gese et al.1996; Lucherini et al. 2009; Koli & Bhatnagar 2016).

The various biological processes and behaviours of animals can be closely studied through focal observation in zoos. Behavioral studies are useful methods to assess the welfare of animals in captivity as they reflect an animal's first attempts to cope with a stressor and thus may indicate a situation where welfare is at risk earlier than any known measure of physiology or pathology (Manning & Dawkins 1998). In addition, animals are increasingly being bred and reared in captivity for release into free-ranging wild habitats (Carlstead & Shepherdson 1994). The survival and reproduction of such animals is dependent on behavioural research to assess the influence of very specific aspects of captive environments on the development and performance of natural behaviours (Shepherdson 1993).

The present study includes assessment of the activity pattern and its budget of the albino tiger *Panthera tigris tigris* and their seasonal comparison. Behaviours displayed by the animal are broadly classified as active, passive and stereotypic as this will facilitate comparison with

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the captive as well as wild conspecifics. Since, the Bengal Tiger is listed as Endangered by IUCN Red List criteria (IUCN 2011); it is of utmost importance to ensure its welfare in captive conditions with a thorough understanding of their species-specific activity based requirements. Thus, objectives of this study were: 1) to assess the activity pattern of *P. tigris tigris*, 2) activity budget and 3) their seasonal comparison.

STUDY AREA
The study was carried out at the Sajjangarh Biological Park ($24^0$35'41.04" N, $73^0$38'55.75" E), located at the foothills of Sajjangarh Wildlife Sanctuary, Udaipur (Rajasthan). It has total geographical area of 520.31 hectares. The climate of the area is sub-tropical with extremely hot summer and relatively moderate winter (Master Plan 2015–2016 of Sajjangarh Biological Park).

The total perimeter of the enclosure of tiger is 698.81 m^2 and the total area of the enclosure is 22774 m^2 (Master Plan 2015–2016 of Sajjangarh Biological Park). The holding area measures 70 m^2 and constructed behind the main display area on the uphill side. The back, sides and front half (beginning from right side of the enclosure) are covered by five m high chain-link fence. A high rock wall of 1.3 m with thickly cemented upper surface lines the other half of the front. A pit is at the inner surface of the front with 20 ft. maximum depth at the middle portion. Two waterholes are provided at a distance of approximately 40 m from the extreme left and right of the enclosure, and at about 20 m from the front. The waterhole at the left is also covered above with metal sheets to provide shady environment for bathing, drinking, resting and other similar activities. As tigers prefer shady environments and sufficient cover, many large tree species including Bans *Dendrocalamus strictus*, Neem *Azadirachta indica*, Siris *Albizia lebbeck*, Kachnar *Bauhinia variegata* and Imali *Tamarindus indica* along with shrubs and bushes are planted in the enclosure. A metal shade is constructed at about 20 m distance behind the left waterhole. A wooden table is also constructed for animal shade. The land of the enclosure is uneven with slopes, uplands, plain and pits.

MATERIAL AND METHODS

The study was carried out from November 2016 to April 2017. Weekly observations were taken beginning from 1000 hours in the morning till 0500 hours in the evening. Focal-animal sampling method (Altmann 1974) was used to observe that activity at 5 minutes interval. The behaviours, their categorical listing and description have been provided in Table 1. Activities were broadly categorized into active, passive and stereotypic behaviours (Table 1).Temperature, humidity, moisture, rainfall and other environmental variants

are important determinants of the activity pattern of any animal and these determinants are most variable in different seasons. Therefore, in the study, all the observations taken in the month of November, December and January were considered under the winter activity, and all observations taken in the month of March and April were considered under summer activity as per study area climate.

Active period was defined by calculating the proportion of time when the tiger was not resting and sleeping excluding the stereotypic pacing. Frequencies of behaviors were summed (for all the 7 hours of study on each day of observation) on a daily basis for each behaviour and behavioural category, and these frequencies were converted to the proportion of time spent in that behavior (percentage of time spent) (Mohapatra et al. 2014). The mean percentage of time spent (±standard deviation) was calculated for three behavioural categories separately for winter and summer. All calculation was done using PAST (Version 3.18) statistical software.

RESULTS AND DISCUSSION

A total of 17 behaviours of albino tiger were observed during the study. It spent 30.22 ± 9.61% of its time in active behaviour, 55.38 ± 16.71% of its time in passive behaviour and 14.37 ± 13.86% of its time in stereotypic behaviour. The mean percentage of time spent (±standard deviation) for active, passive and stereotypic behaviours (in hourly time) have been given in Table 2. The similar calculations were also made separately for the winter and summer which has been presented in figure 1 to 3 for passive, stereotypic and active behavioural categories respectively. It was seen that the tiger was more active during the morning and evening and showed peaks in the passive behaviours during the midday. But, a slight increase in active behaviour was also observed in the midday during the winter. The stereotypic behaviour showed a rise from morning to evening with a slight fall during midday in winter. Whereas, during the summer, a constant drop was observed from morning to midday and then a constant increase was observed during evening in the stereotypic activity. Pacing was the only stereotypic behaviour shown by the tiger which is similar to the study of Mohapatra et al. (2014) on the activity pattern of 19 captive tigers at Nandankanan Zoological Park, Odisha, India, which is indicating that the tigers spend most time on sleeping or pacing (Bashaw et al. 2007).

During the study, tiger was found the most active during 1000–1100 hours (55.32± 20.34)and most inactive during 0200-0300 hours (77.43 ± 27.92). Stereotypic behaviour was observed with the highest frequency during 0400−0500 hours (37.11 ± 32.31). The tiger showed a greater

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Table 1: A list of behaviours of White tiger observed during the study period.

S.No.	Category	Behaviour	Description
1.	Active	Standing	Tiger stand on its four feet at a specific location
2.		Walking	Moving from one place to another quadrupedally
3.		Feeding	Intake of leaves either green or dried
4.		Drinking	Intake of water
5.		Bathing	Immersing the body in water (in the waterhole)
6.		Urine marking	Spraying of urine on the plants and trees
7.		Climbing	Moving up the tree trunk or chain-link fence
8.		Roaring	Loud, low-frequency vocalizations
9.		Digging	Making a hole on the ground with its paws
10.		Defecating	Excretion of fecal matter
11.		Running	Moving more rapidly than at a walk
12.		Panting	Breathing noisily with mouth visibly open
13.		Regurgitating	Discharging semi-liquid matter from mouth
14.		Jumping	Pushing itself off the surface using leg muscles
15.	Passive	Resting	Lying down or sitting with eyes open
16.		Sleeping	Lying down with eyes closed
17.	Stereotypic	Stereotypic pacing	Moving on a set path with at least three repetitions

Table 2: Percentage of time spent (mean±standard deviation) in active, passive and stereotypic behaviours.

Time slot (hours)	Passive	Stereotypic	Active
1000-1100	41.82± 21.66	2.84± 9.42	55.32± 20.34
1100-1200	73.64± 25.75	4.71± 8.58	21.64± 21.51
1200-0100	74.09± 28.22	10.74± 22.73	15.15± 14.89
0100-0200	76.91± 34.76	10.31± 18.28	12.78± 17.46
0200-0300	77.43± 27.92	9.91± 18.61	12.64± 13.99
0300-0400	40.03± 32.86	20.92± 27.04	39.04± 18.73
0400-0500	27.45± 31.26	37.11± 32.31	35.43± 31.15

preference towards passive behaviour during the midday hours when the temperature was comparatively higher than morning or evening hours.

Biolatti et al. (2016) showed that tigers spent most of their time in sleeping (32.64%) and resting (27.50%), while the third most frequently observed behaviour was walking (17.30%). But, in our study, most time was spent in resting (32.24%) by the tiger followed by sleeping (22.4%) and walking (16.32%). Both studies highlight that the tigers in captivity are more involved in passive (inactive) behaviours than active behaviours.

Fedrianiet al. (1999) showed seasonal variation as a factor significantly affects the activity of carnivores and it found accordance to our seasonal observation. The distributions of time under different behaviours during winter and summer have been presented in table 3 and table 4 respectively. The time spent in passive behaviour was significantly greater in summer during the midday hours as compared to winter. All the active behaviours were performed with greater frequency in the morning and evening hours during the summer.

A large part of the activity budget comprised of pacing. A predictable feeding schedule resulted in increased levels of stereotypical behaviour (Quirke et al. 2012). The tiger spent maximum time pacing in front of the holding area entrance on the uphill side during 0400–0500 hours. The motivation for such behaviour was possibly due to the regular pre-determined supply of food between 0530 and 0600 hours. As Mason (1991) suggests that any occurrence of pacing should be investigated on the grounds of welfare, this study would prove beneficial in assessing the condition of the captive tiger.

Another important observation was the reduction in the time spent in stereotypic pacing during the course of the study. The tiger was

Table 3: Mean (± SD) percentage of time spent in different activities by the white tiger duringWinter season in captivity.

Activity	1000-1100	1100-1200	1200-0100	0100-0200	0200-0300	0300-0400	0400-0500
Resting	39.07 ± 17.74	29.64 ± 35.65	19.53 ± 18.29	16.42 ± 12.39	24.86 ± 4.47	5.34 ± 3.78	4.95 ± 3.38
Sleeping	17.85 ± 23.68	49.28 ± 44.55	31.25 ± 32.55	26.19 ± 49.25	28.78 ± 33.47	-	-
Walking	35.78 ± 23.93	4.64 ± 3.25	4.30 ± 5.02	9.95 ± 8.90	6.53 ± 6.22	16.24 ± 8.48	13.68 ± 14.33
Standing	7.27 ± 5.83	8.80 ± 13.54	15.73 ± 14.09	17.69 ± 12.34	11.13 ± 4.15	13.77 ± 9.14	12.29 ± 11.84
Stereotypic pacing	-	5.95 ± 11.9	27.97 ± 33.00	28.33 ± 20.81	25.86 ± 24.74	51.85 ± 16.92	65.86 ± 26.05
Feeding	-	-	-	-	-	-	-
Drinking	-	-	1.19 ± 2.38	-	-	2.17 ± 4.34	-
Bathing	-	-	-	-	-	4.95 ± 5.80	-
Urine marking	-	-	-	-	-	-	-
Climbing	-	-	-	-	-	-	1.38 ± 2.77
Roaring	-	-	-	1.38 ± 2.77	1.25 ± 2.5	1.08 ± 2.17	1.78 ± 3.57
Digging	-	-	-	-	-	-	-
Defecating	-	-	-	-	1.56 ± 3.12	-	-
Running	-	-	-	-	-	4.56 ± 5.51	-
Panting	-	-	-	-	-	-	-
Regurgitating	-	1.66 ± 3.33	-	-	-	-	-
Jumping	-	-	-	-	-	-	-

Table 4: Mean (± SD) percentage of time spent in different activities by the white tiger duringSummer season in captivity.

| Time	1000-1100	1100-1200	1200-0100	0100-0200	0200-0300	0300-0400	0400-0500
Resting	33.18 ± 12.62	54.34 ± 24.04	46.35 ± 30.47	40.76 ± 30.73	28.07 ± 26.03	43.37 ± 17.98	34.75 ± 27.32
Sleeping	-	16.28 ± 22.61	41.05 ± 25.11	55.73 ± 33.78	62.95 ± 35.38	16.47 ± 20.63	5.55 ± 9.70
Walking	40.74 ± 9.96	12.08 ± 11.72	7.26 ± 9.48	3.49 ± 5.99	1.50 ± 2.57	20.75 ± 14.36	25.28 ± 26.08
Standing	15.12 ± 7.50	8.52 ± 9.32	3.59 ± 4.79	-	0.79 ± 2.09	5.79 ± 6.86	4.11 ± 8.78
Stereotypic pacing	4.46 ± 11.81	3.98 ± 7.09	0.89 ± 2.36	-	0.79 ± 2.09	3.24 ± 8.58	20.66 ± 23.08
Feeding	0.79 ± 2.09	-	0.84 ± 2.22	-	1.42 ± 3.77	-	-
Drinking	-	-	-	-	-	0.59 ± 1.57	-
Bathing	2.65 ± 4.54	1.24 ± 3.28	-	-	1.58 ± 4.19	6.12 ± 8.24	5.18 ± 6.72
Urine marking	-	-	-	-	-	1.19 ± 3.14	1.50 ± 3.97
Climbing	0.79 ± 2.09	0.62 ± 1.64	-	-	-	-	1.42 ± 3.77
Roaring	0.75 ± 1.98	-	-	-	-	0.59 ± 1.57	1.50 ± 3.97
Digging	-	-	-	-	1.42 ± 3.77	-	-
Defecating	-	-	-	-	-	0.59 ± 1.57	-
Running	0.68 ± 1.79	2.90 ± 3.87	-	-	-	-	-
Panting	-	-	-	-	0.71 ± 1.88	0.59 ± 1.57	-
Regurgitating	-	-	-	-	-	-	-
Jumping	0.79 ± 2.09	-	-	-	0.71 ± 1.88	0.64 ± 1.71	-
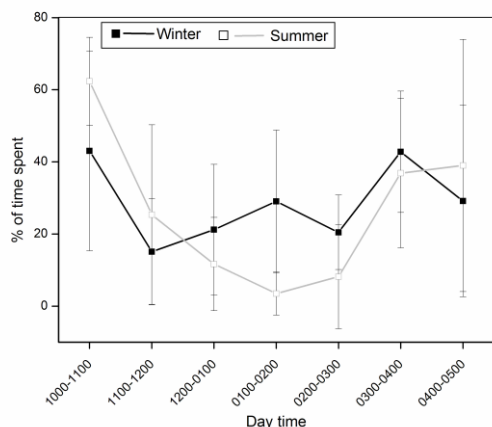
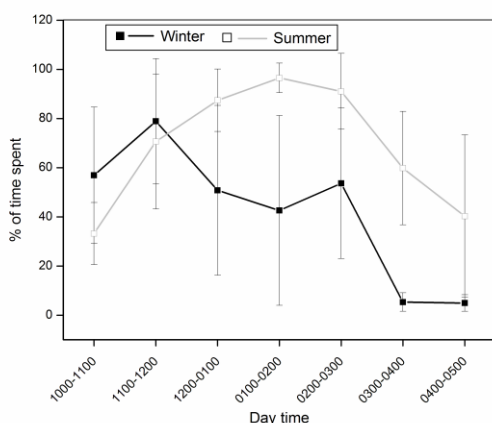**Fig 1.** Winter and summer active behavior of white tiger in captivity.

Fig 2. Winter and summer passive behavior of white tiger in captivity.
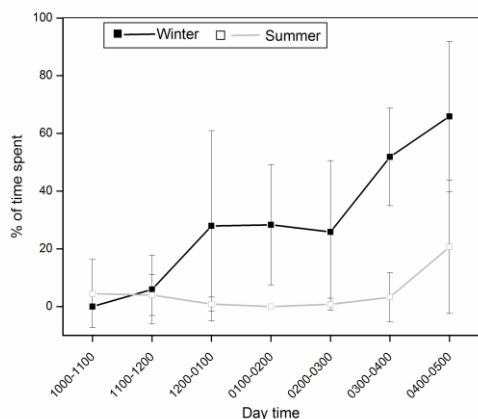

Fig 3. Winter and summer stereotypic behavior of white tiger in captivity.

brought to Park on 29th September, 2016 and released after 21 days of observation into the display area. The present study began just a month after its release. Thus, the time it spent in the enclosure increase its acclimatization and eventually many reduced stress. Stereotypies may develop as a response to physical restraint, lack of stimulation, or inescapable fear or frustration (Mohapatra et al. 2014). The tiger was also coped with these factors and led to decrease in pacing.

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