



Monthly variation in group size of cheetal deer (*Axis axis* Erxleben, 1777) in Jim Corbett National Park Uttarakhand, India

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Abstract

Cheetal deer (*Axis axis* Erxleben, 1777) is the most abundance species of deer found in Corbett National Park. The Bijrani and Jhirna, two zones of Corbett Park (with abundance of wildlife) are selected for the study of Cheetal. The primary data for this study is mainly based on direct observation by field visits in the study area. The largest group of Cheetal deer was 252 and the highest mean group size was 79.6 found in March 2019 in Jhirna zone. While in Bijrani zone the largest group of Cheetal deer was 172 individual and the highest mean group size was 56.4 found in March 2019. According to this study there is a variation in monthly group size of Cheetal deer and number of groups in both Bijrani and Jhirna zone of Corbett National Park. The group aggregation of Cheetal deer depends upon maximum and minimum temperature, food availability, visibility in park and number of more babies in group (fawning season). In March (spring) there is sufficient food available in the grassland and shrub area (new sprouting grass) so the population of Cheetal deer is found highest and also group size is found largest in Corbett National Park

Keywords: Cheetal; Bijrani; Jhirna; Direct Observation; Mean group size

1. Introduction

Jim Corbett National Park (520.82 sq. km) is a major part of Corbett Tiger Reserve (1288.32 sq. km) the other parts includes Sonanadi Wildlife Sanctuary (301.18 sq. km) and Reserve Forest (467.32 sq. km) [1]. The Corbett National Park is located in the foothills of the Himalayan geographical area of India [2]. The Himalayan and peninsular flora and fauna both are found in the Reserve on account of their location in the foothills [3]. Corbett National Park is famous for the presence of a good number of Royal Bengal Tiger (*Panthera tigris*). The four species of deer, including Cheetal (*Axis axis* Erxleben, 1777), Sambar (*Cervus unicolor* Kerr, 1792), Barking deer (*Muntiacus muntjak*), and Hog deer (*Axis porcinus*) is also present in Corbett Park [4]. The maximum number of Cheetal is found in grassland with its sympatric species, which attracts tourists in Corbett Park. In Corbett National Park Cheetal deer are found in herds of 10-50 individuals and its herd consists of females with their young and 1-2 stags (males). Seasonally, the mean group size and density of Cheetal varied differently in the forest, scrubland, and grassland. The group composition of the Cheetal was observed to change frequently during feeding periods [5][6]. The size of the available habitat is proportional to the richness of wild animals [7]. According to official figures of Corbett, the number of Tigers in Corbett was 215 in 2014; it has increased to about 250 in 2020. There are about 20/100 sq. km Tigers in the Corbett Tiger Reserve [8]. The Cheetal deer density is also increased with the increase of Tiger density in Corbett Park.

2. Material and methods

2.1. Study area

The Bijrani and Jhirna, two zones of Corbett Park (with abundance of wildlife) are selected for the study of Cheetal. The latitude and longitude of the Bijrani zone are 29.4613 N and 79.1478° E respectively and its total area is 117.77 sq km.

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Jhirna zone is quite a thick and dense zone of Corbett Park; it has a mixed type of forest with large grasslands, riverside, monsoon water-streams, hilly terrains, and dense shrub areas. The latitude and longitude of the Jhirna zone are 29° 26'N and 78° 56'E respectively and its total area is 56.99 sq. km [9]. Jhirna zone is the intermediate zone between the Dhela and Bijrani zone of Jim Corbett National Park.

Common vegetation in Sal-mixed forest, Sal, Rohini, Shisham, Kanju, Khair, Amla, Bael, Haldu, Jamun, Semal, Gular, Mahua, Tendu, Serus, Bakli, Arjun, Bahera, Harad, Amaltas, Khabad, Badh, Pipal etc. are prominently found during the study period. In dense shrub areas, prominently Kari plant, Peelu, Bhanua, Ber (Jujube), Vasaca, Maror-fal, Kuri, Makoi, and Lisora are commonly found. In the grassland area (Chaur area), grasses like Dub, Kush, Sabai, Munj, Ganeria, Narkul, Elephant-grass, Kumeria, Bhuri, Ulla, Gori, Bans, Sirav, Sarkanda, Kansa, Ballu, Broom-grass, Khas, Crabgrass and Sonkadi grass are commonly found during the study period.

2.2. Methodology used for primary data collection

The primary data for this study is mainly based on direct observation by field visits in the study area. For direct observation, the field visits were conducted from November 2017 to June 2019. In this two years study, field visits have been done in eight months each year including the winter and summer seasons. Corbett National Park remains closed in monsoon season. The line transects sampling method has been used during direct observation to collect data [10]. The five transects of 1.0 sq. km were randomly selected from the grassland area with mixed tree boundary area, waterside area, Sal-dominated area, dense shrub area, and large grassland (Chaur area) in both Bijrani and Jhirna zone. The groups of Cheetal deer were counted in each transect and recorded to further data analysis. The term, 'group' applies to all units of animals seen in the sighting [11]. The population (group size) was derived from the data obtained, and related tables were made.

3. Results

In Bijrani zone the largest group of Cheetal deer was 138 individuals and the highest mean group size was 51.6 found in March 2018 (31/17°C). The lowest mean group size of Cheetal deer was 3.2 in June 2018 at day temperature (42/28°C) in first year of study (Table 1). In second year of study, the largest group of Cheetal deer was 172 individual and the highest mean group size was 56.4 found in March at temperature (29/16°C). The lowest mean group size of Cheetal was 5.8 in June 2019 at temperature (38/22°C) in Jhirna zone (Table 2).

Table 1 Monthly group size of Cheetal deer in the Bijrani zone (From November 2017 to June 2018)

| Month | Number of herds | Total of individuals (in groups) | Mean group size | Maximum no. of individual | Minimum no. of individual |
|---------------|-----------------|----------------------------------|-----------------|---------------------------|---------------------------|
| November 2017 | 3 | 115 | 38.33 | 78 | 2 |
| December 2017 | 4 | 64 | 16.0 | 52 | 2 |
| January 2018 | 4 | 104 | 26.0 | 65 | 2 |
| February 2018 | 4 | 154 | 38.5 | 82 | 3 |
| March 2018 | 5 | 258 | 51.6 | 138 | 4 |
| April 2018 | 5 | 174 | 34.8 | 98 | 4 |
| May 2018 | 5 | 44 | 8.8 | 18 | 2 |
| June 2018 | 5 | 16 | 3.2 | 8 | 2 |

Table 2 Monthly group size of Cheetal deer in the Bijrani zone (From November 2018 to June 2019)

| Month | Number of herds | Total of individuals (in groups) | Mean group size | Maximum no. of individual | Minimum no. of individual |
|---------------|-----------------|----------------------------------|-----------------|---------------------------|---------------------------|
| November 2018 | 3 | 118 | 39.33 | 82 | 7 |
| December 2018 | 3 | 95 | 30.66 | 72 | 2 |
| January 2019 | 4 | 126 | 31.5 | 70 | 3 |
| February 2019 | 5 | 158 | 31.6 | 114 | 2 |
| March 2019 | 5 | 282 | 56.4 | 172 | 5 |
| April 2019 | 5 | 195 | 39.0 | 102 | 8 |
| May 2019 | 5 | 65 | 13.0 | 17 | 4 |
| June 2019 | 5 | 29 | 5.8 | 15 | 2 |

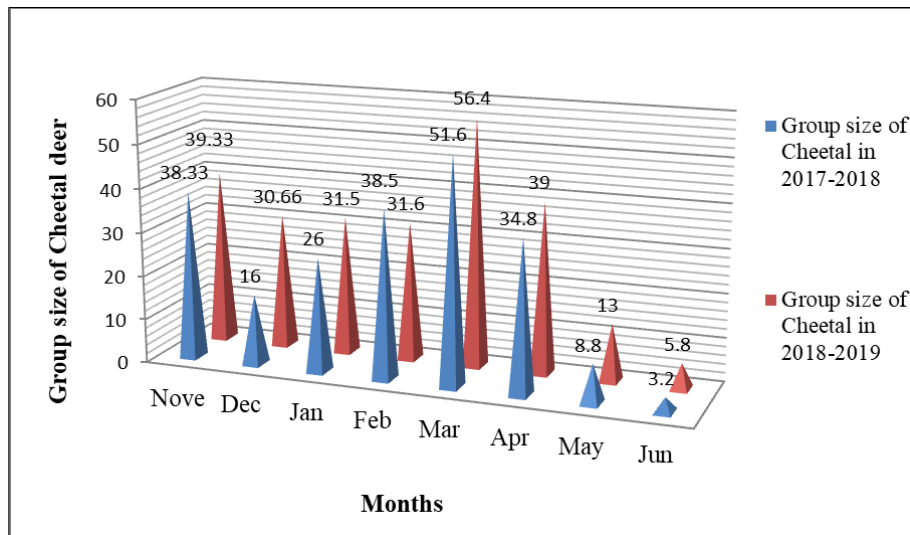


Figure 1 Monthly variation in Group size of Cheetal deer in Bijrani zone (from November 2017 to June 2019)

Table 3 Monthly group size of Cheetal deer in Jhirna zone (From November 2017 to June 2018)

| Month | Number of herds | Total of individuals (in groups) | Mean group size | Maximum no. of individual | Minimum no. of individual |
|---------------|-----------------|----------------------------------|-----------------|---------------------------|---------------------------|
| November 2017 | 4 | 137 | 34.25 | 84 | 3 |
| December 2017 | 4 | 45 | 11.25 | 33 | 4 |
| January 2018 | 5 | 146 | 29.2 | 94 | 2 |
| February 2018 | 5 | 208 | 41.6 | 152 | 2 |
| March 2018 | 5 | 344 | 68.8 | 202 | 5 |
| April 2018 | 5 | 305 | 61.0 | 170 | 9 |
| May 2018 | 5 | 102 | 20.4 | 48 | 5 |
| June 2018 | 5 | 39 | 7.8 | 18 | 3 |

In Jhirna zone the largest group was 202 individual Cheetal deer and the highest mean group size was 68.8 found in March 2018 at temperature (32/15°C). The lowest mean group of 7.8 with the maximum number of individuals was 18

found in June 2018 at a temperature (40/30°C) in first year of study (Table 3). In second year of study the largest group of Cheetal deer was 252 and the highest mean group size was 79.6 found in March 2019 at a temperature (31/26°C). The lowest mean group size was 11.5 and the maximum number of individuals was 29 in June 2019 at temperature (40/27°C) in Jhirna zone (Table 4).

Table 4 Monthly group size of Cheetal deer in the Jhirna zone (From November 2018 to June 2019)

| Month | Number of herds | Total of individuals (in groups) | Mean group size | Maximum no. of individual | Minimum no. of individual |
|---------------|-----------------|----------------------------------|-----------------|---------------------------|---------------------------|
| November 2018 | 4 | 182 | 45.5 | 126 | 3 |
| December 2018 | 4 | 78 | 19.5 | 60 | 2 |
| January 2019 | 5 | 198 | 39.6 | 114 | 2 |
| February 2019 | 4 | 302 | 75.5 | 196 | 5 |
| March 2019 | 5 | 398 | 79.6 | 252 | 4 |
| April 2019 | 4 | 306 | 76.5 | 192 | 5 |
| May 2019 | 5 | 143 | 28.6 | 55 | 14 |
| June 2019 | 4 | 46 | 11.5 | 29 | 2 |

Table 5 Group size of Cheetal deer in the Bijrani zone and Jhirna zone of Corbett National Park Uttarakhand (2017-2019)

| Year | Mean group size of Cheetal deer | | | |
|-----------|---------------------------------|---------------|---------------|---------------|
| | Bijrani zone | | Jhirna zone | |
| | Winter season | Summer season | Winter season | Summer season |
| 2017-2018 | 29.70±4.69 | 24.6±9.81 | 29.07±5.59 | 39.5±12.96 |
| 2018-2019 | 33.27±1.75 | 28.55±10.13 | 45.02±7.94 | 49.05±14.82 |

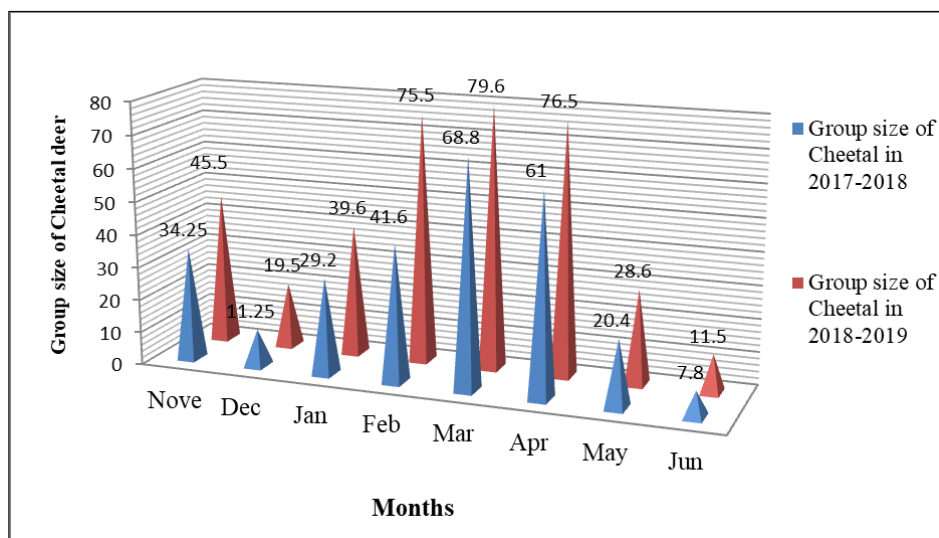


Figure 2 Monthly variation in Group size of Cheetal deer in Jhirna zone (from November 2017 to June 2019)

4. Discussion

According to the above data, there is a monthly variation found in the group size of Cheetal deer in both two study sites and the largest group was found in March. Due to the availability of rich food with grasses in one place, the Cheetal deer do not have to go outside in search of food and the group does not break up in March. The lowest mean group size was found in June. Green grass and bushes dry up in June, due to which Cheetal groups break in search of food. As a result, the lowest group size of Cheetal is obtained. The group composition shows that more babies are born from January to March in Corbett National Park. Therefore, while grazing in a group, all the fawns graze with their mother in the middle, along with them, yearling males and females also graze. The adult males with hard antlers also graze together to protect the group. Some of the large-sized adult males with hard antlers hide around the group to keep an eye on predators. In December, the temperature is lowest and the visibility is reduced due to the outgrowth of the green shrubs inside Corbett Park. At this time, Cheetal rarely comes out and the group size of Cheetal is obtained small. The largest group of Cheetal deer was found near its preferred food species i.e., in grassland (sprouting grass), under the jujube bushes, near the Peelu bushes, Kari leaves, under the trees of Bael, Semal, Tendu, Gular, Amla, Shisham, Rohini etc.

5. Conclusion

According to this study there is a variation in monthly group size of Cheetal deer and number of groups in both Bijrani and Jhirna zone of Corbett National Park. The group aggregation of Cheetal deer depends upon maximum and minimum temperature, food availability, visibility in park and number of more babies in group (fawning season). The population of Cheetal is also depends on preferred vegetation i.e., new sprouting grass, green leaves, tender flowers and fruits found in both two study zones. In March month there is sufficient food available in the grassland and shrub area so that the population is found highest and also group size is largest in this month. While in December there is less visibility so the group size is found small. In June there is extreme hot and grass is become dried so male deer move to other places in search of green food and group breaks.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Author's Contribution

Both authors contributed to this study.

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The authors have conducted field surveys for this study at their own expenses.

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