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Captive behavior activities of Indian wild ass (*Equus hemionus khur*) at Rajkot zoological park, Rajkot, Gujarat, India

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Abstract
Behavioral observations of species *Equus hemionus khur* were carried out at Rajkot zoological park, Rajkot in captivity to investigate preliminary behavior of male and female both. Pair was observed for 136 hrs throughout the whole year. Focal animal sampling method was used for observations. The species was observed daily at morning and evening for one hour. There were numerous notable differences between activities of male and female were observed. The results of time budget indicates that the species spends more than 35 % on feeding, about 34% standing and 31% for other activities (Defecation, Urine, Cuddling, Flehmen, sniffing, Running etc).

Keywords: captive behavior, *Equus hemionus khur*, cuddling, flehmen, sniffing, running

Introduction
Indian wild ass (*Equus hemionus khur*) is the one of the five species of genus Equus which are venerable to extinction. (Dave, C.V 2010) [4] *Equus hemionus khur* is listed as Near Threatened (NT), but is close to being listed as Vulnerable (VU D2) due to occurrence in only one population in and around the Little Rann of Kutch (*Kaczensky,p. et al.2016)* [10] The Little Rann of Kutch in Gujarat State in India is a unique saline desert and is synonymous with the Indian Wild Ass (*Equus hemionus khur*). The Wild ass population was estimated to be 4000 in 1946 which declined to 700 in early 1970s due to disease (Surra) and consecutive severe droughts. Since then population have shown increasing trend, 720 in 1976 to 4000 in 2004. The protection of the Wild Ass habitat in form of Sanctuary has helped build-up the population. (parashary D. et al. 2015) [5] Dry land farming, salt works and seasonal fishing are main occupations of people of the region;
about 22 percent of India's salt is produced here (Shah 1993, Sinha 1993) The change in economic scenario in the region is largely attributed to increase in human population thereby also accelerating the resource requirement leading to changes in land use from dry land farming to irrigation. (N. Shah et al. 2007)

Habitat ecology
The sub-species inhabit arid and saline thorn scrub in the Little Rann of Kutch (LRK) (Dr. P. Nigam 2018) [11]. Scrubland with low to medium density of shrubs primarily Prosopis juliflora an introduced exotic and Rann grassland were the most preferred habitat, providing thermal cover during the hot day, and foaling ground for gravid mares (M/s Gujarat State Petronet Limited).

Habitat Region
Temperate

Terrestrial Biomes
Desert or Dune

Distribution
The subspecies khur was once widely distributed across the arid region of north-west India (including present day Pakistan) and westwards through much of central Asia towards Syria (Srivastav, A., et al. 2010) [14]. The Indian wild ass or ghor - khar Equus hemionus khur is endemic to the Indian subcontinent. Although some people suspect that it still occurs in the Sind and Baluchistan regions of Pakistan, there are no data to confirm this and its only known wild population lives in the Little Rann of Kutch Desert on the Kathiawar Peninsula in northern Gujarat State, western India. (Jan M. smielowski et al. 1988) [15]

Diet and nutrition
He wild asses feed mainly on Cyperus capillaris, Andropogon sp, Dichanthium annulatum, Aristida alscansiovis and Iseilema prostratum, along with leaves of pilu, tooth brush tree or salt bush Salvadora persica and leaves and pods of mesquite tree Prosopis juliflora According to Shah (1981), between September and March the wild asses invade cotton fields to eat the green cotton fruit (Jan M. smielowski et al.1988)

Method and methodology
The main material for this case study was research paper within wild and captive behavior of Indian wild ass. I used to go from Bhavnagar to Rajkot zoological park, (220 17'56.86" N, 700 50;22.44" E) Rajkot at 5 am every Saturday and Sunday and get down at aazi dam chowkadi and reach Rajkot zoological park (pradhyuman zoological park) by rickshaw and start taking data of Indian wild ass (Equus hemionus khur) at 9 am. In addition, we made visual observation of Indian wild ass behaviour inside the enclosure using binocular, mobile stop watch, pen & paper. Zz About 136 hours of observation were made.

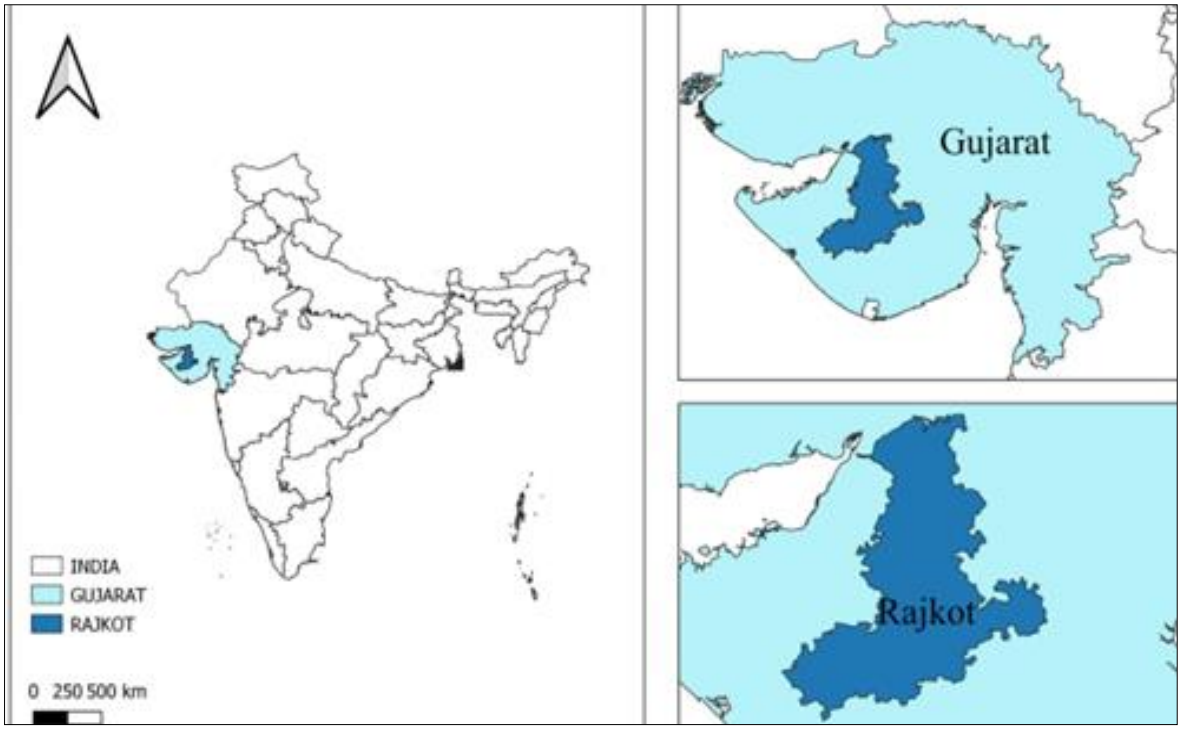

Fig 1: Study area (A. Map of India, B. Map of Gujarat C. Map of Rajkot)

Fig 2: Map of Rajkot zoological park

Study area

The observations were carried out at Rajkot zoological park during March 2022 to January 2023. The enclosures for both individuals of Equus hemionus khur (male & female) at Rajkot zoological park were localized side by side near the main alley designed for visitors. Pradhyuman Park covers about 55.37 hac areas which is undulating with ridges and valleys, rocky outcrops and well drained, surround by two big lakes - Lalpari and Randarda. In the Equus hemionus khur (male & female) enclosure there were several scattered trees and logs. In the enclosure both individual (male & female) could move on the grass covered rough surface floor. Additionally there is also watering trough in the Indian wild ass enclosure. The diet of both individuals was 30kg of alfalfa and zea maize at morning and standard and comprised nutritive Pallets with other ingredients and cicer arietinum at evening.

Data collection

One pair of wild ass was observed in Rajkot zoological park, Rajkot. Prior to the study observation period two pilot observations of 1h each were carried out. During this period observer has occupied determined the best possible view of animals. Each observation was taken at morning and afternoon time for 60 minutes when they are active and food was available for them.

Study design

The behaviour of Indian wild ass was observed using the focal animal sampling method. In focal-animal sample, the samplings of non-social behaviour are relatively straightforward (Altman 2014) during 2022. The distance for observation was usually approximately 10-20 m, it change with the object position. Observation period was restricted by daytime hours. Different behaviors are observed during this study where six major behavioral activities viz., walking, standing, feeding, running, grazing and not observed. Remaining sixteen minor behavioral activities includes Seating, Playing, Defecation, Urination, Scratching, Licking, Browsing, Rolling, Cuddling, etc.

Statistical analysis

After the completion of the field work at Rajkot zoological park, Rajkot, data entry was done using Microsoft excel (2007) and Microsoft word (2007). Standard deviation (SD) and mean of behavioral activity of each category were calculated in minutes of each behavioral event.

Formula in Microsoft excel

Choose formula in excel= (STDEV)

Input the database

=STDEV.S([number 1]: [number 2])

Calculate

Formulation

$$\text{For MEAN, } \boldsymbol{m} = \frac{\boldsymbol{Sum\ of\ the\ activity}}{\boldsymbol{Number\ of\ activity}}$$

$$\text{For SD, } \boldsymbol{\sigma} = \frac{\sqrt{\Sigma(\boldsymbol{X_i} - \mu)^2}}{\boldsymbol{N}}$$

Where

σ = population standard deviation

N = the size of the population

x_i = each value from the population

μ = the population mean

Results and discussion

There were 222 observations, which were distributed throughout the observation period (80 in summer, 80 in monsoon, and 62 in winter season). The investigation took place generally around mid-morning and afternoon. In summer the animal *Equus hemionus khur* activities are lower than in the other season. The total data acquired was 222 hrs of behavior for 53% of the total time in the case of male and 46% in the case of female. The twenty different behaviors were observed during the entire study period. Various types of communications were observed in Wild Ass such as avoidance by female, Denies by stomping feet on the floor, etc. Among the twenty behaviors, the most common behavior is feeding and standing. Male showed highly aggressive behavior while female was pregnant. During March to June, the male bites and injured more than half of the female's neck. During these months aggression of male wild ass was too much against female

Seasonal variation in male behavior

During the study period of 120 hours of male, we observed the two most important activities of male, feeding, and standing had a covariance in summer and monsoon but it decreased with the winter season. We found, that the walking activity of male increased during the winter season compared to other seasons. In all the observations of the winter season, the male was mostly found in the night shelter especially in the afternoon. The activities of male in the afternoon time were decreased than morning time. Sometime male was seen with pacing behavior in backward side of the enclosure area and this kind of behavior mainly seen durng the winter season especially in afternoon

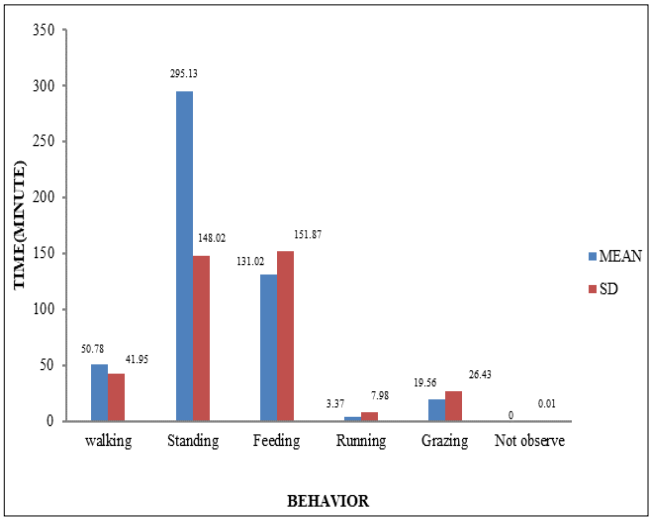

Fig 1: Major activities of male time budget

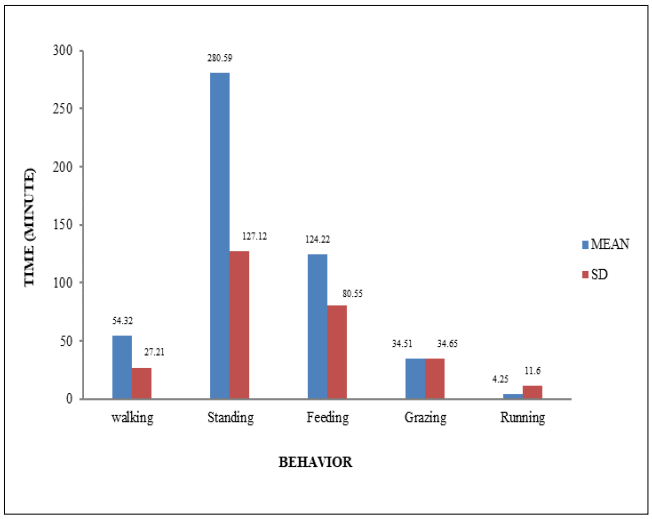

Fig 2: Major activities of female time budget

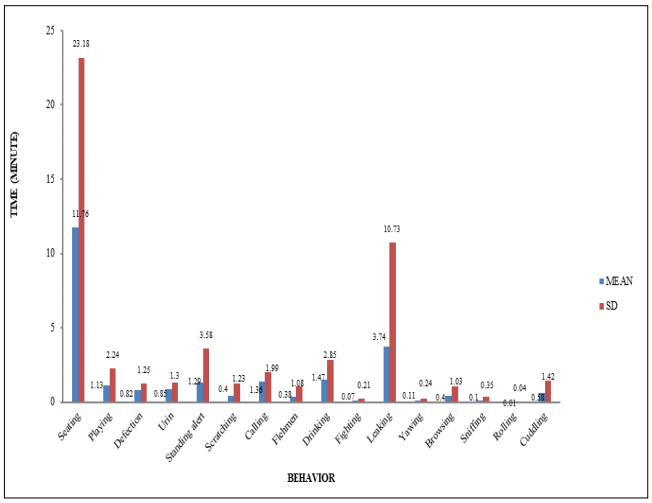

Fig 3: Major activities of male time budget

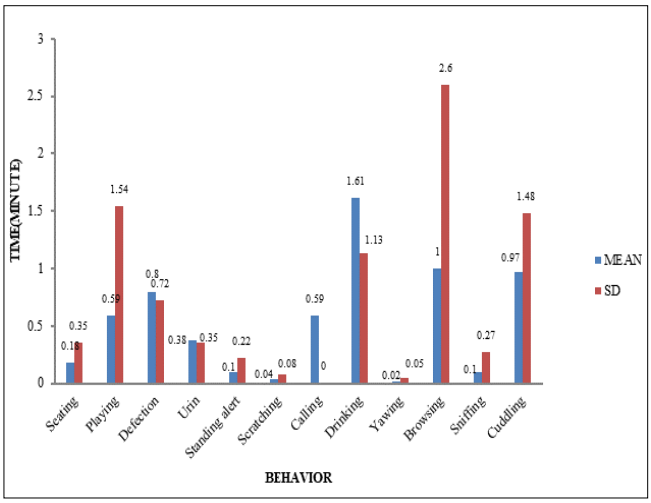

Fig 4: Major activities of female time budget

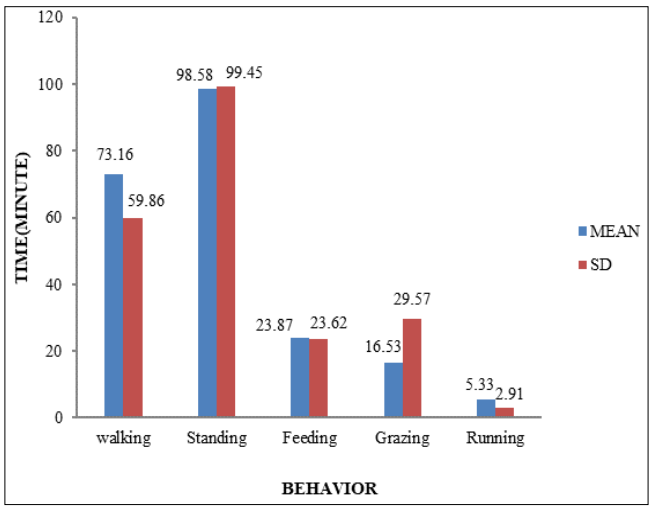

Fig 5: Major occurrence of activity of male

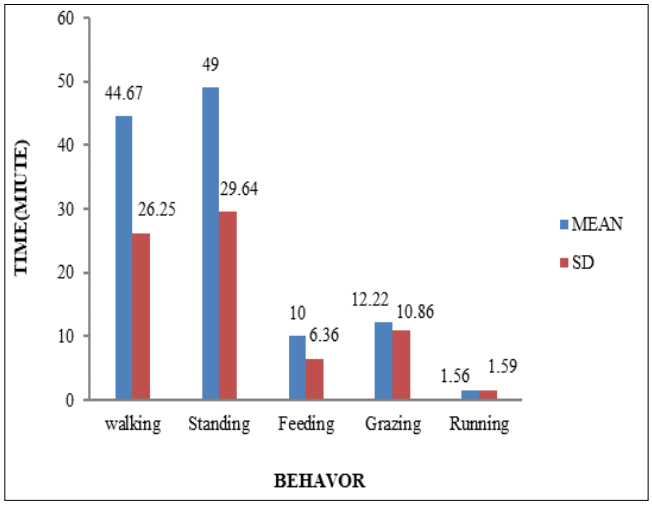

Fig 6: Major occurrence of activity of female

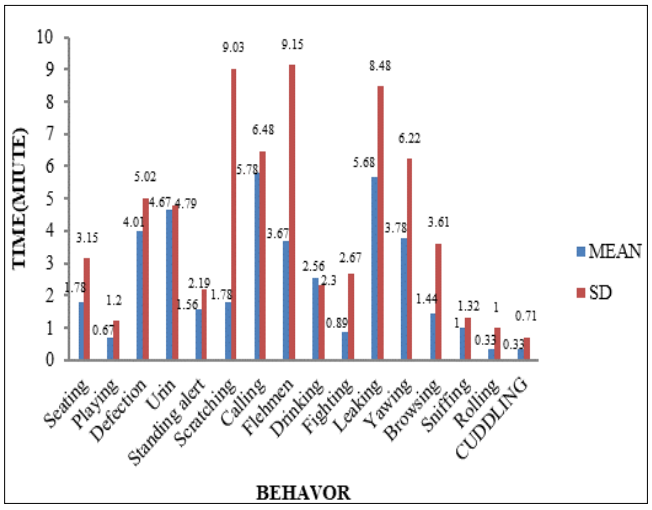

Fig 7: Minor occurrence of activity of female

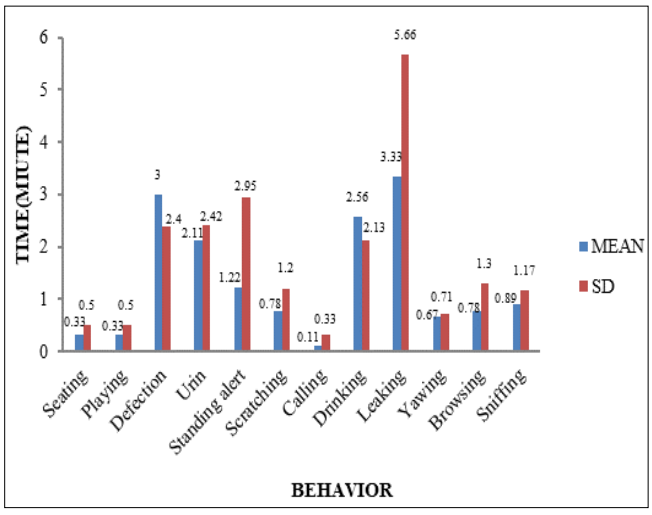

Fig 8: Minor occurrence of activity of female

Behavioral change in male

It was observed that after the death of a female, the male showed some stereotypic behavior such as pacing, twirling, over-grooming, head weaving, scratching, etc. During the study period of 120 hours, we observed the two most important activities of male, feeding, and standing had a covariance in summer and monsoon but it decreased with the winter season. We found, that the walking activity of male increased during the winter season compared to other seasons. In all the observations of the winter season, the male was mostly found in the night shelter especially in the afternoon.

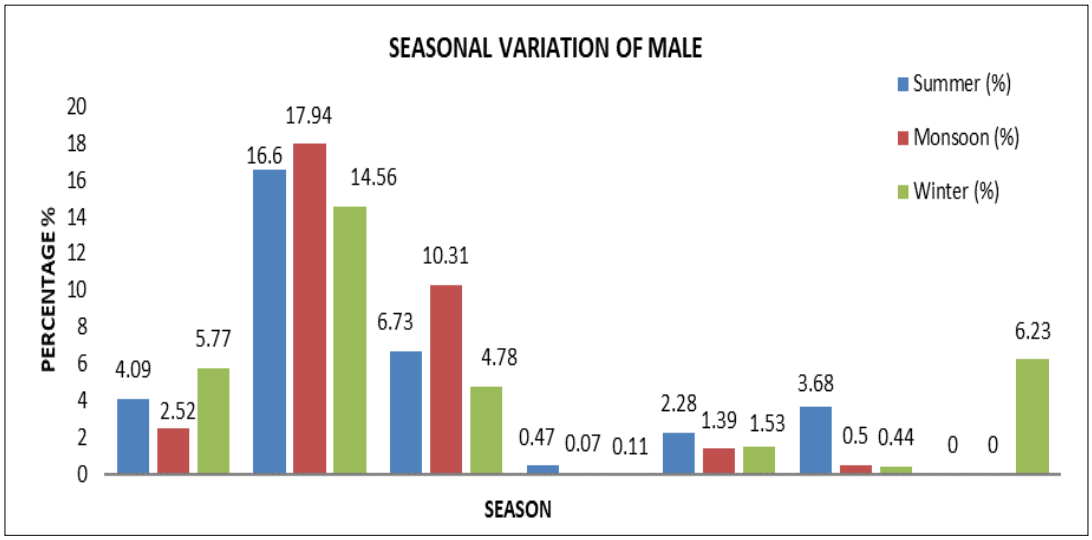

Fig 9

The activities of male in the afternoon time were decreased than morning time. Sometime male was seen with pacing behavior in backward side of the enclosure area and this kind of behavior mainly seen during the winter season especially in afternoon. In comparison, after the death of the female, the activity of the male showed a marked change, such as over-grooming, pacing, sudden running, excessive calls, repeatedly going into night shelters, etc. Major activities such as walking, standing, feeding, grazing was increased and other activities were reduced.

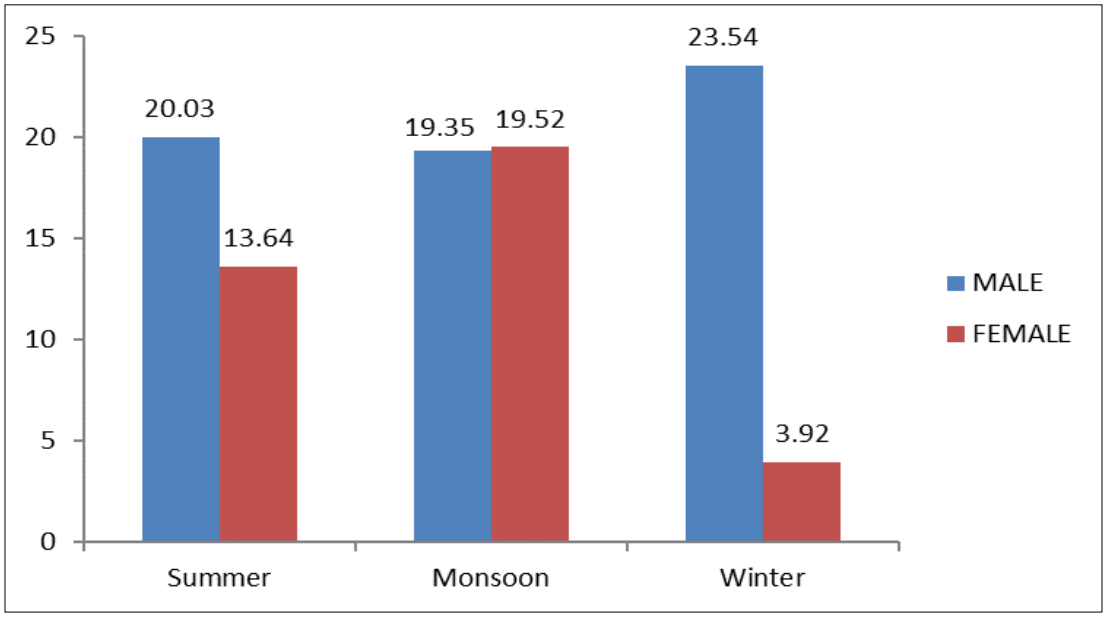

Fig 10: Seasonal variation of male and female activities

Conclusion

The study was aimed to observe behavioral activities of Indian Wild ass both male and female comparatively. During this study it was found that the male is more active than female during all seasons. Various types of behavioral activities were observed during the study period of March 2022 to January 2023. Based on observations the aggression behavior of male was dominant towards the female during the summer season. A major variation observed in the behavioral expression of both male and female Such as, walking, feeding, grazing, licking, etc. during the study period. In comparison, after the death of the female, the activity of the male showed a marked change, such as over-grooming, pacing, sudden running, excessive calls, repeatedly going into night shelters, etc. Major activities such as walking, standing, feeding, grazing was increased and other activities were reduced. Due to the high numbers of visitors to the zoo on certain days the different behavior pattern was observed in the afternoon as compare to morning time.

Acknowledgement

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