

Study on Troop Size and Troop Composition of Rhesus Monkey, *Macaca mulatta* (Zimmermann, 1758) in Saraswati Plantation Wildlife Sanctuary and Bir Sonty Reserve Forest, Kurukshetra, Haryana (India)

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Abstract: Rhesus monkey (*Macaca mulatta*) is an old world monkey belongs to family- cercopithecidae. Rhesus monkey has a major role in biodiversity and in medical biological study such as surrogate mother, immunodeficiency disease, captive breeding, blood grouping and sequence of genome etc. (Zahn *et al.*, 2007). The present study was carried out from February, 2008 to July, 2008 to record various troop size and troop composition of rhesus monkey in Saraswati Plantation Wildlife Sanctuary and Bir Sonty Reserve Forest, Kurukshetra, Haryana (India). Three troops (T-I, T-II, T-III) of rhesus monkey in Saraswati Plantation Wildlife Sanctuary and three troops (T-IV, T-V, T-VI) in Bir Sonty Reserve Forest were selected. The sighted individuals were categorized based on age-sex ratio viz., infants, juveniles, adult male and adult female followed by Singh (1981). The results indicated that the number of adults (males and females) remained constant during study period in all six selected troops of rhesus monkey. However, troop size swelled from 25 to 29 of troop-I, 35 to 38 of troop-II and 49 to 55 of troop-III. Similarly, in Bir Sonty Reserve Forest, troop size swelled from 45 to 49 of troop-IV, 48 to 54 of troop-V and 42 to 45 troop-V due to addition of newly born young ones during breeding period of rhesus monkey. The average age-sex ratio varied from a minimum of 2.40 in troop I to a maximum of 3.16 in troop II.

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1. Introduction

Among mammals Primates, are the most complex creatures, which appeared on the planet Earth around 63 million years ago in Eocene period of Coenozoic era (Moody, 1962). Rhesus monkey, *Macaca mulatta* is an old world monkey and belongs to Order- Primates, Family- Cercopithecidae, Genus- *Macaca* and Species- *mulatta* (Wilson, 2007). Rhesus monkey is distributed ubiquitously throughout mainland Asia, from Afghanistan to India and Thailand to Southern China, Bangladesh, Bhutan, Nepal and Pakistan (Ferris *et al.*, 1980; Groves, 2001; Smith and Mc Donough, 2005). In India, it is found in good numbers in peninsular region (Assam, Madhya Pradesh and West Bengal), North region (Jammu and Kashmir, Himachal Pradesh, Punjab, Haryana, Uttar Pradesh, Rajasthan, Gujrat) and central region (Orissa, Bihar) (Seth *et al.*, 2001). In Haryana, rhesus monkey is found in different habitats including villages, road side forest, towns, temples and near agricultural fields (Hunger, 2004). Rhesus macaques characterized by dusty brown in color with little to no fur on their reddish-pink faces. Male and female are sexually dimorphic. Male have more red color on rump than female resemble with their faces. Average body length for female 207.6 mm and for male 227.9 mm. and average weight for male is

7.70 kg and for female is 5.34 Kg. Infants are normally less than one year (period before weaning and may be extend if sibling is not born at 1 year of age). Juveniles are also more than one year and less than two years (period between weaning and menarche). They have a vulvar perineal skin and spent much time in same sexes (Singh, 1981; Fooden, 2000; Singh and Sinha, 2004).

Materials and Methods

2.1 Study area

To study troop size and troop composition of *Macaca mullatta*, Saraswati Plantation Wildlife Sanctuary and Bir Sonty Reserve Forest were selected as study sites. Saraswati Plantation Wildlife Sanctuary (76° 27' -76° 33' E latitude and 29° 56'- 30° 01' N longitude) is located in between two districts (Kurukshetra and Kaithal) of Haryana (India) with an area of 11,003 acres. The climate of area is subtropical, semi arid type and contain alkali soil. The vegetation of the Saraswati Plantation Wildlife Sanctuary is categorized as "Sub-group 5B tropical deciduous forest" (Champion and Seth, 1968) (fig. 1a). Bir Sonty Reserve Forest (30° 0' E latitude and 77° 1' N longitude) is also located on Kurukshetra-Ladwa link road around 20 km. East of Kurukshetra University campus and

spread over an area of 474.50 acres. It is an artificial forest and contains majority of the cultivated plants. The area has dark colored, alluvial soil rich in organic matter and having high water retention capacity (fig. 1a).

To study, troop size and troop composition of rhesus monkey Direct contact method (Barwer, 1971) was followed. Three troops of *Macaca mulatta* in Saraswati Plantation Wildlife Sanctuary (T-I, T-II, T-III) and in Bir Sonty Reserve Forest (T-IV, T-V, T-VI) were selected (fig. 1b and 1c). Periodic fortnightly visits were conducted in each study site from February, 2008 to July, 2008. The individuals of selected troop were counted to record the troop size. The sighted troops of *Macaca mulatta* were categorized as infants, juveniles, adult male and adult female followed by Singh (1981). The collected data was later on statically analyzed.

3. Results

Periodic visits were conducted from February, 2008 to July, 2008 to record troop size and composition of rhesus monkey in Saraswati Plantation Wildlife Sanctuary and Bir Sonty Reserve Forest, Kurukshetra, Haryana (India). During periodic visits six troops of rhesus monkey of variable sizes were recorded. In these six troops the number of adults (males and females) remains constant throughout the year. However, variation was witnessed in number of Juveniles, to some extent, and in the number of infants, to a large extent (Fig. 2 and 3).

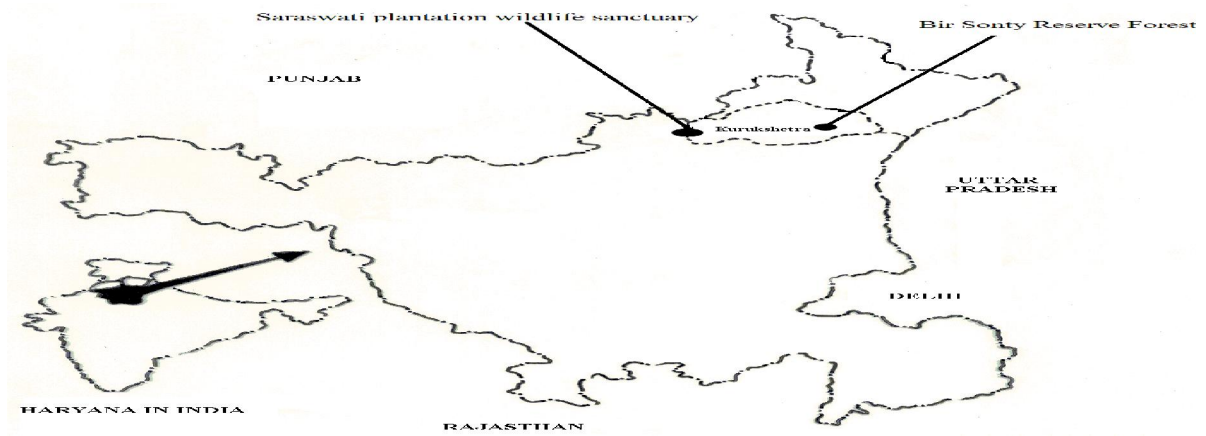
In Saraswati Plantation Wildlife Sanctuary, troop-I (T-I), troop-II (T-II) and troop-III (T-III) were located. T-I (troop-I) was residing near the rest house. In this troop, the number of adult male and adult female rhesus monkeys remained constant during the study time and the troop size swelled from 25 (5 adult male, 12 adult female, 4 juvenile and 4 infants) to 29 (5 adult male, 12 adult female, 4 juvenile and 8 infants) in six months of study due to addition of 4 newly born individuals early March to late April. Similarly, T-II (troop-II) was active near the entry gate of Saraswati Plantation Wildlife Sanctuary. This troop was composed by 35 rhesus monkeys of different age groups (6 adult males, 19 adult females, 6 juveniles and 4 infants) at the start of the study and the number swelled to 38 (6 adult male, 19 adult female, 6 juvenile and 7 infants) due to birth of 3 infants in the month April, 2008. T-III (troop-III) was located in the center of the Saraswati Plantation Wildlife Sanctuary having troop size 49 comprising of 10 adult males, 26 adult females, 9 juveniles and 4 infants. During study period, its troop size increased from 49 to 55 (10 adult male,

26 adult female, 10 juvenile and 9 infants) with the addition of 6 infants in early April to late July, 2008 (fig. 2 and 3).

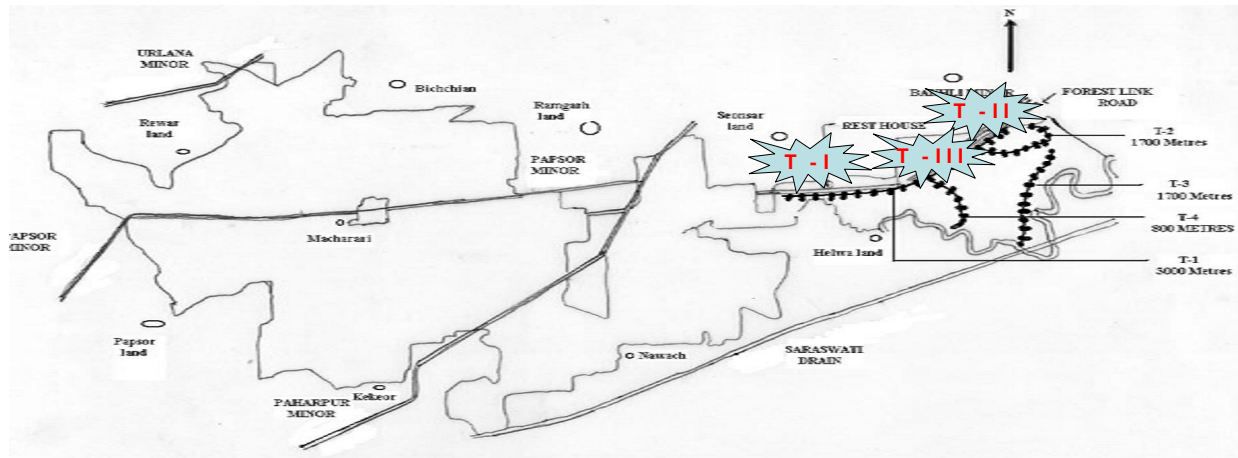
Similarly, in Bir Sonty Reserve Forest, T-IV (troop-IV) was residing near the entrance gate of the forest. It had a troop size of 45 comprising of 8 adult males, 23 adult females, 10 juveniles and 4 infants. By the end of July, 2008 it is swelled up to 49 comprising of 8 adult males, 23 adult females, 10 juveniles and 8 infants due to addition of 4 newly inborn infants in month of April, 2008. T-V (Troop-V) was observed highly active near agricultural land of village Sonty. This troop was composed of 9 adult males, 24 adult females, 8 juveniles and 7 infants. The troop size also increased from 48 to 54 (9 adult male, 24 adult female, 10 juvenile and 11 infants) during study period due addition of 6 newly infants in late March to early May, 2008. Also, T-VI (troop-VI) was to be found in the center of the forest, near the water source and this troop restricted its activities within the forest area. Its troop size, was 42 comprising of 9 adult males, 22 adult females, 5 juveniles and 6 infants at the time of initiation of study. However, in the end of July, 2008 this troop swelled 45 comprising of 9 adult males, 22 adult females, 5 juveniles and 9 infants by the addition of 3 newly infants in the month of early April to late July, 2008 (fig. 2 and 3). All the six troops has different average sex ratio, *i.e.*, 2.40 for T-I (troop-I), 3.16 for T-II (troop-II), 2.60 for T-III (troop-III), 2.87 for T-IV (troop-IV), 2.66 for T-V (troop-V) and 2.64 for T-VI (troop-VI). It varied from a minimum of 2.40 in troop I to a maximum of 3.16 in troop II (fig. 4).

4. Discussion

Troop size refers to number of individuals in troops while troop composition refers to sex ratio category of *Macaca mulatta* in a particular troop (Singh, 1981). Parkash (1962), Jay and Lindberg (1965) and Mukharjee and Gupta (1965) observed that the troop size of *Macaca mullatta* in forest, semi forest and urban areas (Uttar Pradesh, India). In the present study, troops of *Macaca mullatta* were observed in the scrubby forest areas. Mukharjee (1969) was observed that the troop size of rhesus monkey, *Macaca mulatta*, *i.e.*, 33 and 30 in two different villages in Uttar Pradesh. Troop size of rhesus monkey, *Macaca mullatta* increased from 6 to 98 in Chipara village of Uttar Pradesh (Lindberg, 1969). Seth and Seth (1983) presented data on troop size, troop composition and reproductive rates of free ranging rhesus monkey inhabiting in different habitats and suggested that there was a increases in troop size from 18 to 40.



(a)



(b)

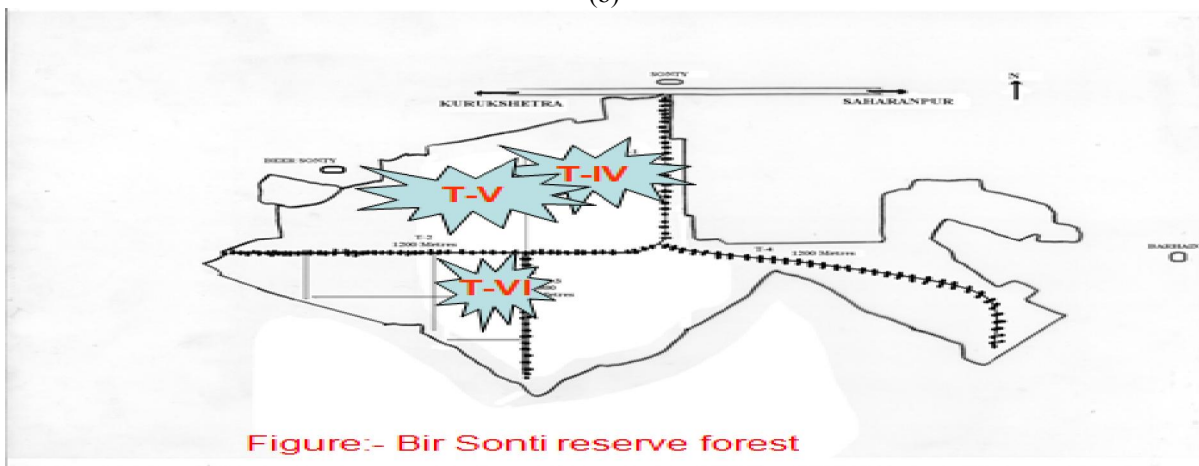


Figure:- Bir Sonty reserve forest

(c)

Fig. 1 (a) Map showing position of study sites, Selected three troops of rhesus monkey in (b) Saraswati Plantation Wildlife Sanctuary and (c) Bir Sonty Reserve Forest.

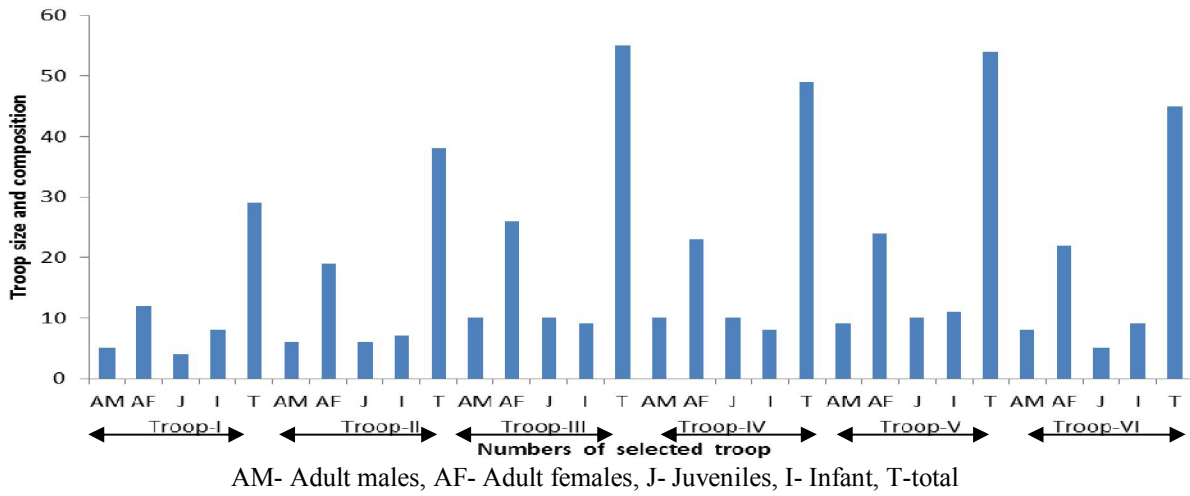


Fig. 2 Troop size and composition of rhesus monkey at initiation time of study periods in both study sites (Saraswati Plantation Wildlife Sanctuary and Bir Sonty Reserve Forest).

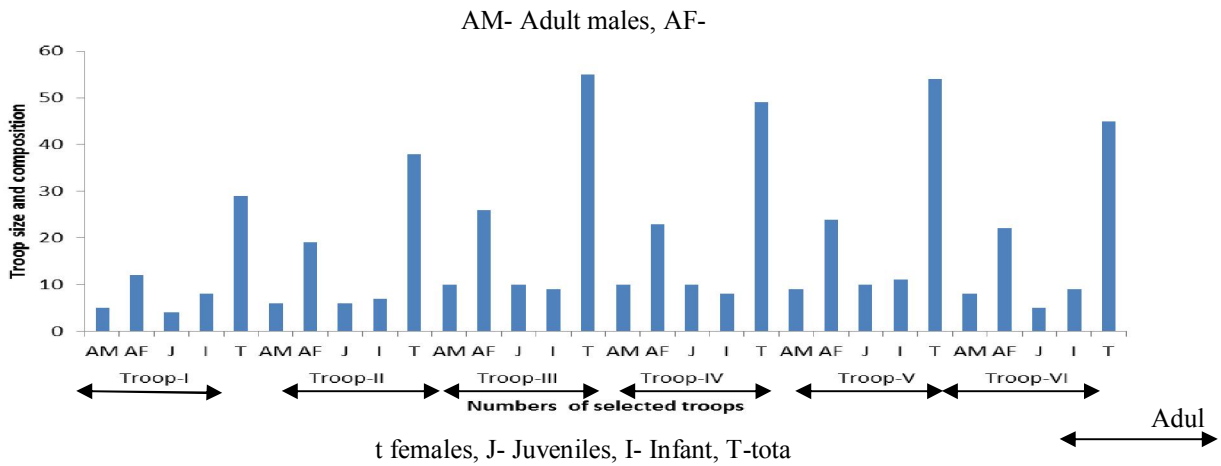


Fig. 3 Troop size and composition of rhesus monkey at after completion of study period in both study sites (Saraswati Plantation Wildlife Sanctuary and Bir Sonty Reserve Forest).

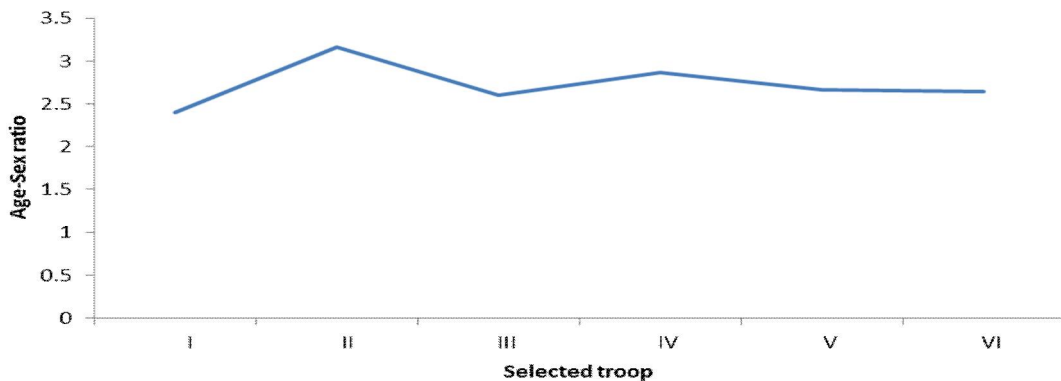


Fig. 4 Age- sex ratio of all selected rhesus monkeys troops in both study sites.

According to Seth *et al.* (1989) rhesus macaques live in troop of 8 to 180 individuals in diverse habitats such as temple, urban, village, village-cum-pond, pond, road sides, canal sides and in forests with human interactions. Ekwal *et al.* (2000) have also studied the rhesus monkeys troop in Varindaban (district Mathura, U.P.) and they observed 30 troops of rhesus macaques, comprising 1338 individuals and troop size varied from 14 to 142. In the present study, the troop size of *Macaca mullatta* varied from a minimum of 25 to a maximum of 49 in Saraswati Plantation Wildlife Sanctuary and from a minimum of 42 to a maximum of 48 in Bir Sonty Reserve Forest. These swelled in number due to addition of newly born individuals in the months of March to the end of July, 2008 and the troop size increased to minimum 29 to maximum 55 in Saraswati forest and minimum 45 to maximum 54 in the Bir Sonty Reserve Forest.

Southwick *et al.* (2001) observed that the rhesus monkey live in large, multi males and multi females groups and have average size of 10 to 80 individuals/troop. Troop size may be increased up to 100 in mountain areas, area of high human food provided and agriculture areas. Wolf (2002) also compared the troop size and ecology of two different troops of rhesus macaques in Jaipur (Rajasthan). He observed that there are 21 to 87 and 13 to 47 individuals in different troops. Kofard (1996) observed the troop composition of rhesus monkeys 96 males and 100 females in Cynosantigo colony. According to Seth and Seth (1989) rhesus macaques live in large, multi males and multi females troops with an average troop size of 8 to 180 individual regardless of habitat type. Troop may number in hundreds in mountain region and areas of high human food subsidization or agricultural habitats (Lindburg, 1971; Seth and Seth, 1989; Qu *et al.*, 1993; Southwick *et al.*, 1996; Kumar, 2007; Wilson, 2007). In present study troop size of rhesus monkey varied from 25 to 29 in troop-I, 35 to 38 in troop-II, 49 to 55 in troop-III in Saraswati Plantation Wildlife Sanctuary while it is varied from 45 to 49 in troop-IV, 48-54 in troop-V and 42 to 45 in troop VI in Bir Sonty Reserve Forest.

Troop composition is referred to as the number of individuals such as infants, juveniles, adolescents and adults species which is based on age and sex ratio. Santor *et al.* (2001) represented effect of percentage of sex ratio in troop composition in his study areas (Conginion, China). Bercovitch *et al.* (2003) also observed the troop composition in Sepkufe in north India and observed that during his study period the number of adult males and adult females were same while some change in infants, juveniles and adolescents. Koyama and Shekher

(2005) observed that the percentage of adults, sub adults, juveniles and infants with the adults constituted about 58 % of the total population in hanuman langur (*P. entellus*), however in rhesus monkey (*Macaca mulatta*), the adults accounted for about 48.3% of the total population. In present study, in Saraswati Plantation Wildlife Sanctuary, in the troop composition number of male and female remained constant during the period of study. The troop composition varied from minimum 25 (5 adult male, 12 adult female, 4 juvenile and 4 infants) to 29 (5 adult male, 12 adult female, 4 juvenile and 8 infants) in troop-I to maximum 49 (10 adult males, 26 adult females, 9 juveniles and 4 infants) to maximum 55 (10 adult male, 26 adult female, 10 juvenile and 9 infants). Similarly, in Bir Sonty Reserve Forest, troop composition varied from minimum 42 (9 adult males, 22 adult females, 5 juveniles and 6 infants) to 45 (9 adult males, 22 adult females, 5 juveniles and 9 infants) of troop-VI to maximum 48 (9 adult males, 24 adult females, 8 juveniles and 7 infants) to 54 (9 adult male, 24 adult female, 10 juvenile and 11 infants) of troop-V.

Jiang *et al.* (2005) observed that there were about 115 monkeys in 5 natural troops in 1981 while the number of troops increased from 5 to 19 in 1984 and total population increased at rate of 115 to 930 individuals from 1984 to 2005 (approximately 1200 monkeys in 20 troops). The sex ratio of new born in any one year varied from 0.3 to 3.5 males to females. Kumar (2007) has also monitored 32 individuals of rhesus monkey in a troop comprising 5 adult males, 16 adult females, 4 sub adults and 7 juveniles with a female and male ratio of 3:1. In present study, male and female sex ratio varying from 2.40 to 3.16 in six studied rhesus macaques troops. The sex ratio of all the six studied troops varied from a minimum of 2.40 in troop I to a maximum of 3.16 in troop II in both study sites i.e., Saraswati Plantation Wildlife Sanctuary and Bir Sonty Reserve Forest.

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