

“A Preliminary Survey on Comparison on feeding behaviour of *Rhesus macaque* in Navagraha and Basistha temple.”

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ABSTRACT

The present study was carried out from August 2018 to April 2019 to record the food habit and to compare it in between the temple of Navagraha and Basistha in the Guwahati city. Around 4 to 8 troops has been studied and observed in both the temples. As the *Rhesus macaque* is a diurnal animal, so mostly they are day time eaters. Where they feed on natural food like leaves, coconut, banana, sprout and on provisioned food like finger papad, biscuits, cakes and chips. The *macaque* has developed the preference for the human provisioned food during the day hours and sometime it leads to the conflict between human and primates. In the study the highest feeding activity found in Basistha temple is in the month of February 2019 i.e., 57.29% with the lowest feeding activity of 30.21% in the month of October 2018. On the other hand in Navagraha temple's feeding activity reached up to 56.94% in the month of January 2019 and the lowest feeding activity comprises of 30.21% in the month of October 2018. So from the record it is observed that maximum time the Basistha temple's *macaque* feed in the month February 2019.

Index term: Navagraha and Basistha temple, *Rhesus macaque*, Food, Provisioned food.

INTRODUCTION

Among the mammals, *Rhesus* monkey, an old world monkey. It is listed as least concern in the IUCN Red list of Threatened species in view of its wide distribution, presumed large population, and its tolerance of a broad range of habitats. In the state Assam, *Rhesus macaque* is found in different habitats including villages, road side forests, towns, temples and near agricultural fields (hunger, 2004). The *Rhesus macaque* is dusty brown in colour with little or no fur on their reddish-pink faces. The *Rhesus macaque* has 32 teeth with a dental formula of 2.1.2.3/2.1.2.3 and bilophodont molars. The species is sexually dimorphic. *Rhesus macaque* are diurnal animals, and both arboreal and terrestrial. They are quadrupedal and, when on the ground, they walk digitigrades and plantigrade. They are mostly herbivorous and feeding mainly on fruit, but also eating seeds, roots, buds, bark, and cereals. They drink water when foraging and gathering around streams and rivers. Mostly temple primates are depends on mixed food stuffs primarily leave, twigs, fruits and seeds. The diet of the primates are region specific (Gogoi and Das, 2018). The taste of *macaque* change habitat to habitat. As temple primates are mostly seen adapting or depending upon provisioned food during the day hours. They mostly can be seen with the fancy food like biscuit chips finger papad as offered by visitors. Some of the supplied food may be highly nutritious, at the Same time it may contain various chemicals which may alter their metabolic activity of the body. It may change their nutrition absorption rate, time and behaviour. *Macaques* are also encountered to be insectivorous in nature but in case of temple primate it is seen to be less as they busy with provisioned food supplied by the temple visitors. These results in the less uptake of energy

among the primates due to insufficient nutrition supplied. Hence, results in highly declination of number of the *Rhesus macaque*. So it became very important to increase the food plant of the temple primate. To observe the feeding behaviour of temple primates, the proposed study was planned in Navagraha and Basistha temple.

AIM and OBJECTIVES

“Ethology” is the study of animal behaviour. One way to quantify behaviour is by watching an animal over an extended period and making an “Activity budget”. Basically, an activity budget shows how much time an animal spends in various activities such as eating, resting, grooming, playing and moving.

To consider the above behavioural aspects of *Rhesus macaque* in temples we have chosen the two temples of Guwahati City and observe their behaviour. For the study our main aims and objectives are as follows:

1. To compare activity budgeting of *Rhesus macaque* in Navagraha temple and Basistha Temple.
2. To observed the diets of *Rhesus macaque* in Temple.
3. To calculate the feeding behaviour in different season.

REVIEW OF LITERATURE

A good health is always proportional to the good nutrition. The nutrition is the food which reflects the maintenance, growth, reproduction, health and disease of an organism. Likewise each species has their respective feeding zone right from herbivore to carnivore and to omnivore. This creates a food chain in the ecosystem. In studies, no species behavior is found to be identical to another and even within a species there is usually a variation in diet between individuals, social groups, and populations (Oates, 1987). Major differences in diets and feeding ecology of primates are determined by variables such as body size energetic. (Demes et al., 1984; Smith, 1984 and Maier, 1984). Age or sex specific nutrient requirements and anatomical specializations. (Chivers and Hladik, 1984), different types of food they are eating are also the part of their growth pattern. (Ripley, 1970). The Feeding behavior of many species also changes seasonally in response to short term fluctuations in the availability of preferred food items and/or recourses.(Terborgh, 1983). The weed macaque (*Macaca mulatta*, *M. fascicularis*, *M. radiate*, *M. sinica*) live in urban areas are to some extent dependent on human cooked food (like Indian bread, roasted grains ,ground nut, and even splashed item). (Fooden, 1980). To study daily feeding time schedule and food and feeding habits of Rhesus monkey, direct contact method (Barwer, 1971). Was followed. Where the troops of monkey were scanned on the diurnal period. The food habit of *Rhesus* monkey varies from place to place. The food habit of a *Rhesus* monkey depends on the availability of the food resource on that particular area. However *Rhesus* monkey who live in human contact area or the temple areas are often get the provisioned food by the people. Where the forest *macaque* won't get the same and so what they have to live on natural resource.

A large number of primates live permanently in temple in Assam. As in association between monkeys and humans that is an age-old phenomenon in the region. The people of Assam have a long-standing culture of interacting with *macaque*. Earlier studies have identified habitat loss as the primary threat for the natural populations (choudhury 1989, 2002; Srivastava et al.2001; Chetry et al.2002; Das et al.2003). Along with habitat loss, hunting is another major threat to be primates of the region (Choudhury 1989; Chetry et al.2003; Das et al.2003). For temple primates it isnot hunting but increased human-primate conflict, that is the most

critical threat. The threat is because of the insufficient supply of natural food and food plants nearby temples. It is now very important understand the Diet and feeding behavior of the species to conserve the species for future. Provisioning may also be inadvertent when farms, plantations, home, gardens, waste food dumps and kitchens become sources of food for animals (Becker et al., 2015). Provisioned food resources tend to be high-calorie, easily digestible, Spatio-temporally predictable and available in greater proportion than natural resources in a given area (Saj et al., 1999; Becker and Hall, 2014). Human provisioning of wildlife with food is a widespread global practice that occurs in multiple socio cultural circumstances. Provisioning may indirectly alter the ecosystem functioning through changes in the eco-ethology of animals, but few studies have quantified this aspect. Provisioning of primates by humans is known to impact their activity budgets, diets and ranging patterns. Primates are also keystone species in tropical forests through their role as seed dispersers; yet there is no information on how provisioning might affect primate ecological functions. The *Rhesus macaque* is a major human-commensal species but is also an important seed disperser in the wild. In this study, we investigated the potential impacts of provisioning on the role of *Rhesus macaque* as a seed disperse in Buxa Tiger Reserve, India (Sengupta et.al2015). Studying the behavioral flexibility and adaptability of *macaque* to different habitats is one approach to designing a conservation plan. To determine the activity budget and feeding behavior and evaluate the effects of seasonally in wild and human-altered habitats of Assamese macaques (*Macaca assamensis*), the activity budget and diet composition varied in response to the season. These results indicate that provisioning alters the activity and feeding behavior of *macaques*, and can also increase human- macaque conflict and disease transmission (koirala et al., 2017). The crisis in the food plants nearby temples and increasing hunger leads to more and more serious conflict between *macaque* and humans as increasing day by day. The *Rhesus macaque* started to depend upon the provisioned food. As primates may moves towards feeding on food from anthropogenic sources for one or more reasons that they develops a preference of human food, secondly, natural resource availability is too low to meet the demands of a population of their group size and lastly, provisioned food is nutritionally richer and easier to access. However, an excess consumption of the provisioned food leads to the declination of macaque's health. Therefore, a balance dietary composition between natural and provisioned food is important for the *macaques* for their survival and health. It is the peak time to act upon the temple authorities and the government to check the deforestation nearby temples inhabitant by these group of temple primates. Also, it will reduce the consumption percentage of human provisioned food during dry season i.e., February to march. So, precautionary measure should be taken to provide natural food to macaques living in temples to save them for future. (Das and Gogoi 2018).

MATERIALS AND METHODOLOGY

Primary source

- 1) Data collection of diet and feeding behaviour of *Rhesus macaque* was conducted from August 2018 to April 2019.
- 2) Observation of *Rhesus macaque* having number of 4 to 8 numbers in a troop by visual counter method.
- 3) Dietary composition was studied by observing the type of food eaten by *Rhesus macaque*.

Secondary source

Journals, Internet and Research Publications.

STUDY AREA :

Navagraha temple: The Navagraha temple, or the temple of the nine celestial bodies, is situated on top of Chitrachal hill in the south eastern part of the city of Guwahati. Coordinates: N26°19'18'' E91°76'26''

BASISTHA TEMPLE: And the Basistha temple is located in the Guwahati city. Coordinates: N26°5'38'' E91°47'4.30''



Fig: guwahati city map showing navagraha and basistha temple.

RESULT AND FINDINGS:

TABLE .1: DIET CHART OF *macaque* IN NAVAGRAHA TEMPLE FROM AUGUST'18 TO APRIL'19

DIET CHART OF <i>macaque</i> OF NAVAGRAHA TEMPLE		
SL. No.	FOOD TYPE	TYPES OF FOOD SUPPLIED
1	Banana	Natural
2	Jujube seeds	Natural
3	Coconut	Natural
4	Biscuit and cakes	Supplied
5	Chips	Supplied
6	Groundnut	Supplied

TABLE.2. DIET CHART OF *macaque* IN BASISTHA TEMPLE FROM AUGUST'18 TO APRIL'19

DIET CHART OF <i>macaque</i> IN BASISTHA TEMPLE		
SL.NO.	FOOD TYPE	TYPES OF FOOD SUPPLIED
1	Banana	Natural
2	Sprout	Natural
3	Flower petal	Natural
4	Finger papad	Supplied
5	Rice	Supplied

Fig 1.-Fig 18: ACTIVITY BUDGETING OF *Rhesus macaque* FROM AUGUST'18 TO APRIL'19.

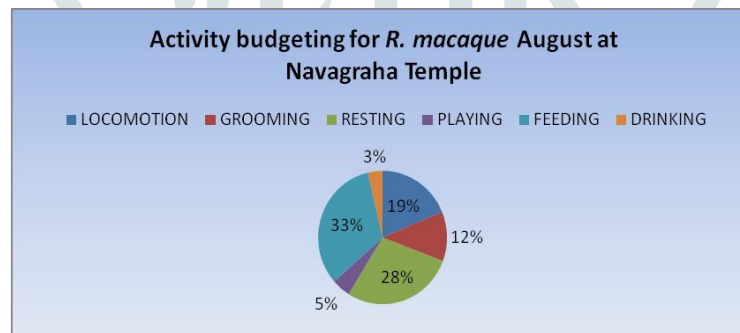


Fig 1: Pie diagram representing Activity budgeting in Navagraha Temple during August'2018

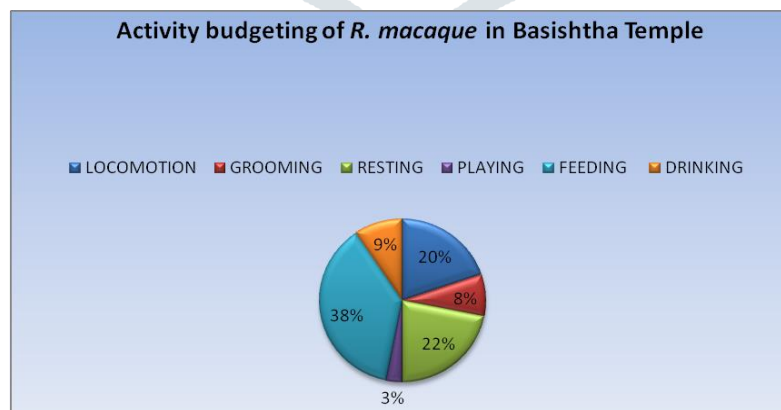


Fig 2: Pie diagram representing Activity budgeting in Basishtha Temple during August'2018

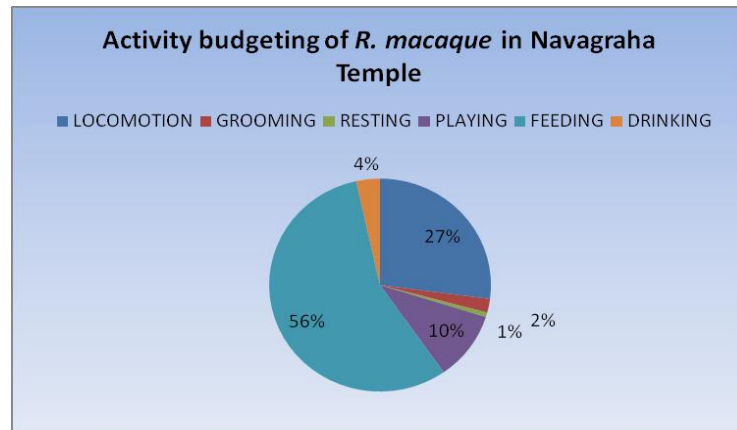


Fig 3: Pie diagram representing Activity budgeting in Navagraha Temple during September'2018

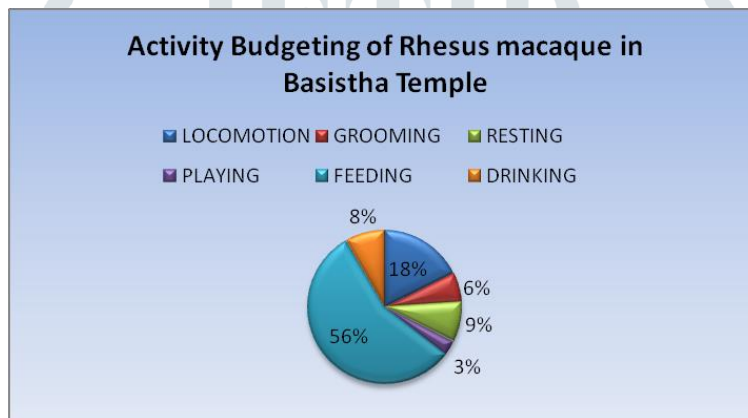


Fig 4: Pie diagram representing Activity budgeting in Basistha Temple during September'2018

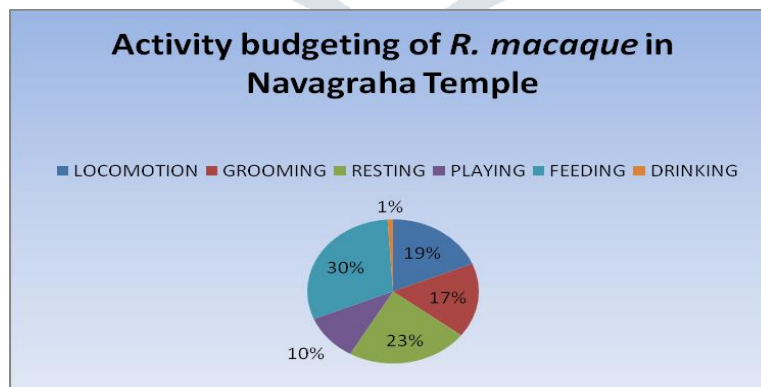


Fig 5: Pie diagram representing Activity budgeting in Navagraha Temple during October'2018

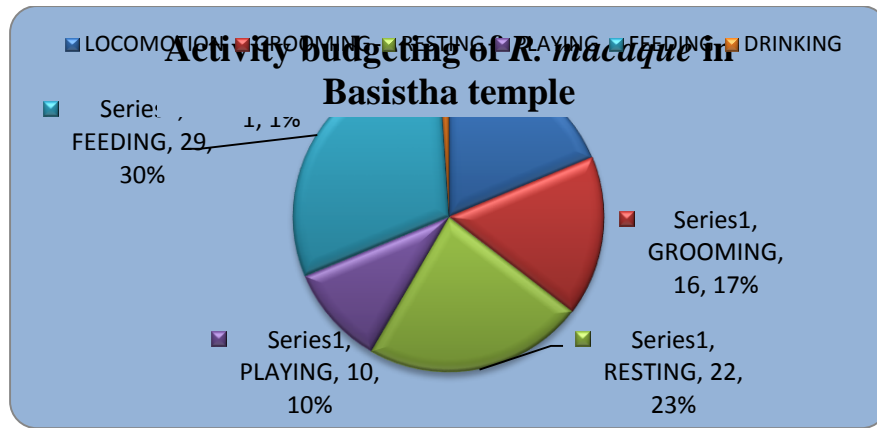


Fig 6: Pie diagram representing Activity budgeting in Basishta Temple during October'2018

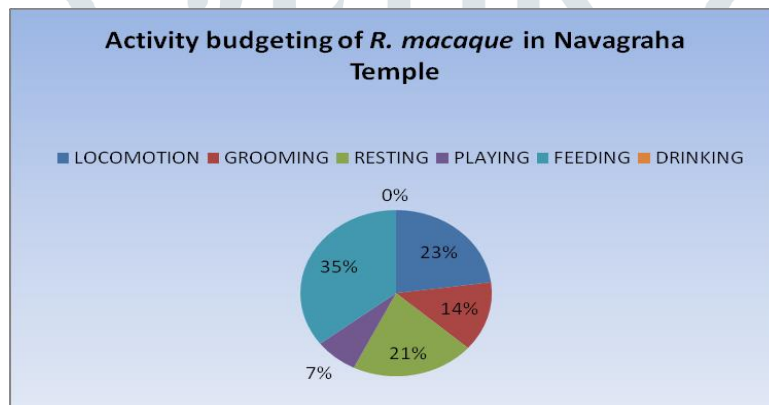


Fig 7: Pie diagram representing Activity budgeting in Navagraha Temple during November'2018

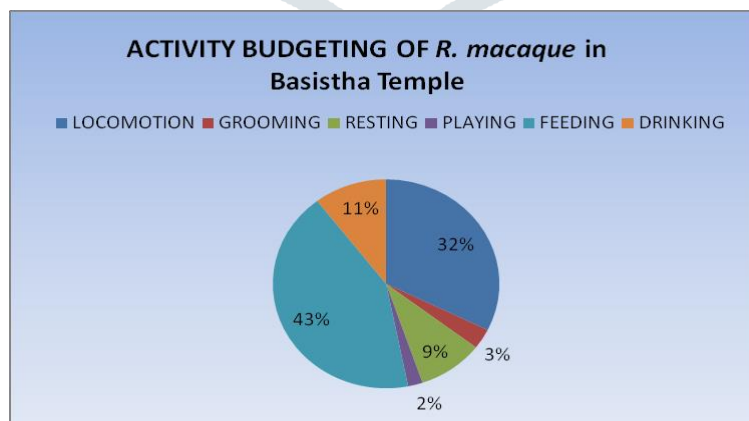


Fig 8: Pie diagram representing Activity budgeting in Basishta Temple during November'2018

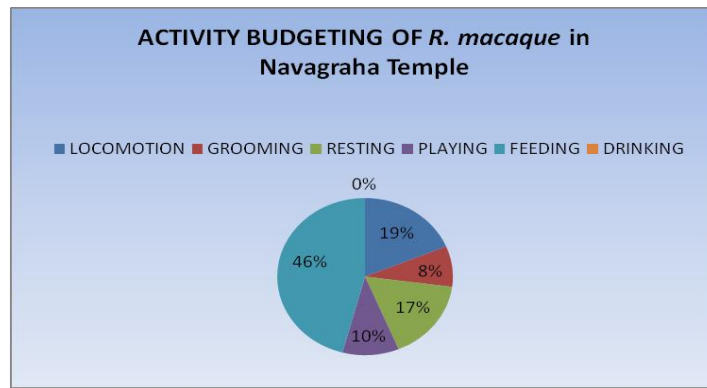


Fig 9: Pie diagram representing Activity budgeting in Navagraha Temple during December'2018

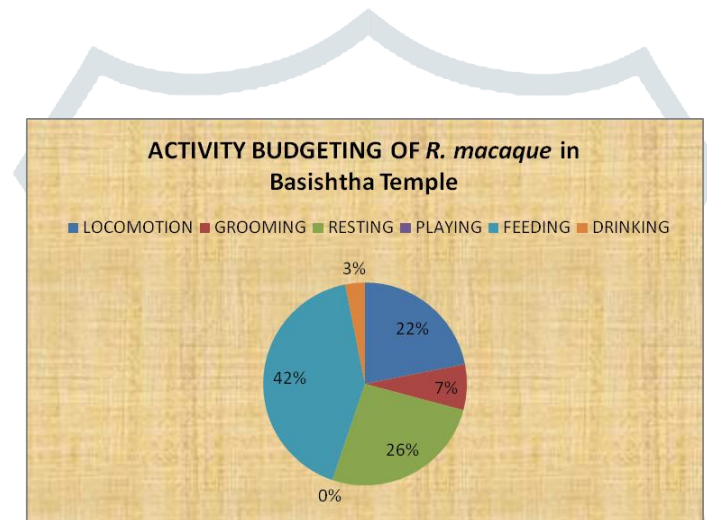


Fig 10: Pie diagram representing Activity budgeting in Basishtha Temple during December'2018

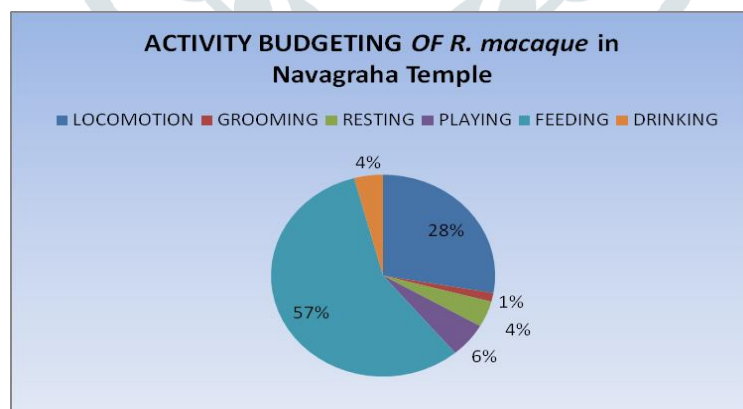


Fig 11: Pie diagram representing Activity budgeting in Navagraha Temple during January'2019

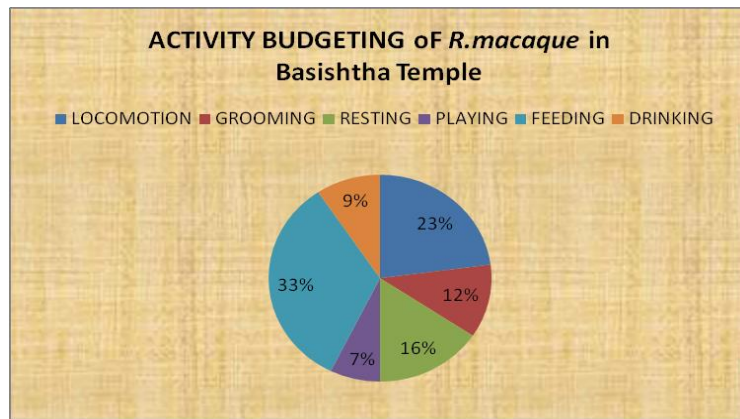


Fig 12: Pie diagram representing Activity budgeting in Basishtha Temple during January’2019

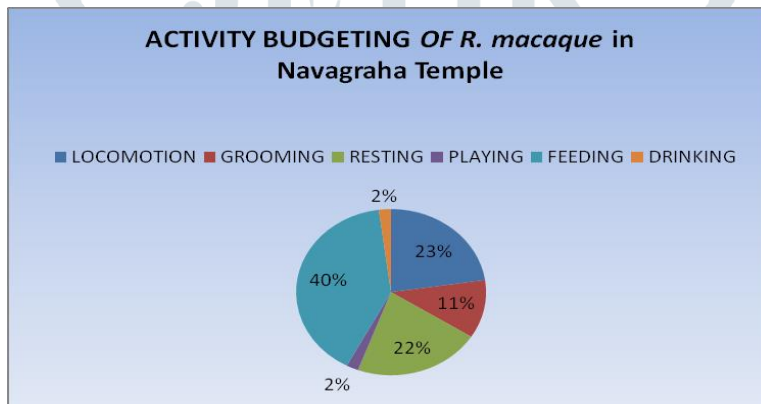


Fig 13: Pie diagram representing Activity budgeting in Navagraha Temple during February’2019

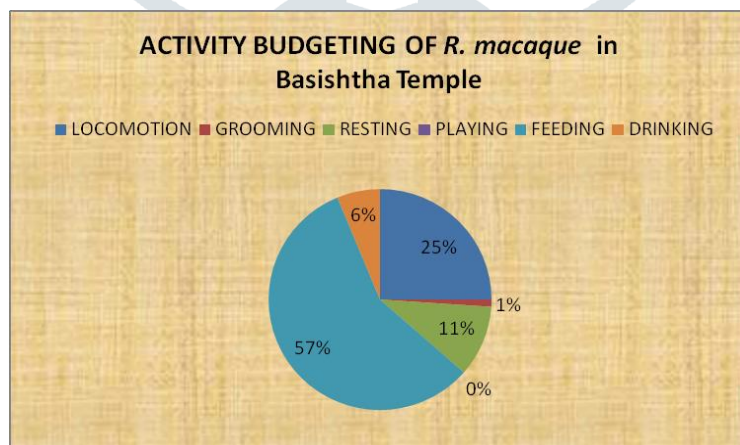


Fig 14: Pie diagram representing Activity budgeting in Basishtha Temple during February’2019

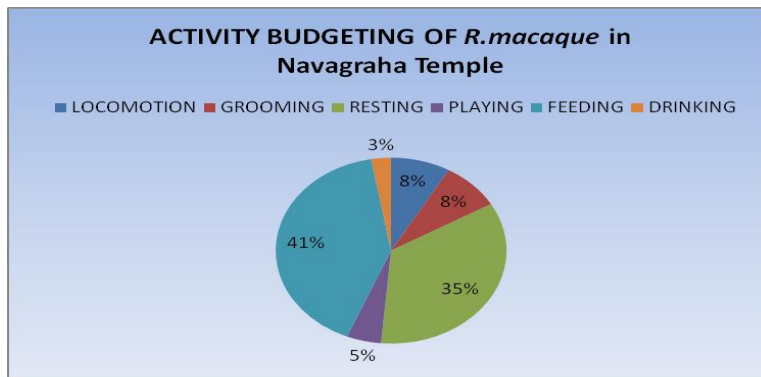


Fig 15: Pie diagram representing Activity budgeting in Navagraha Temple during March'2019

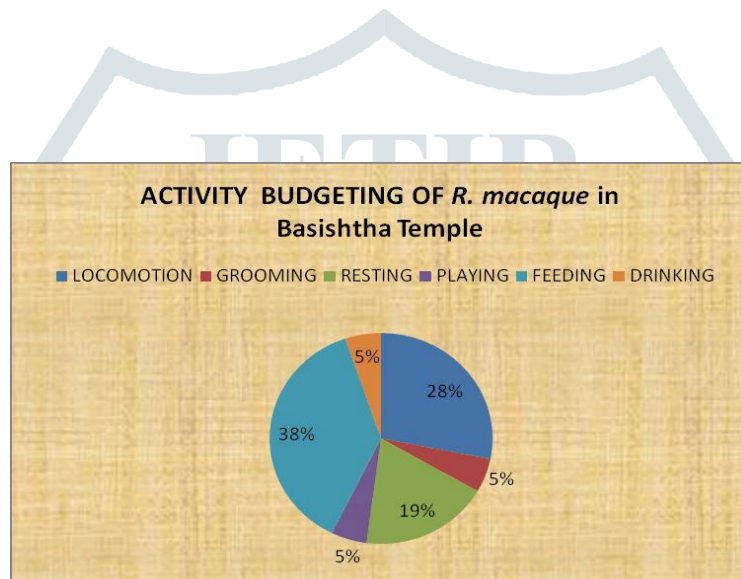


Fig16: Pie diagram representing Activity budgeting in Basishtha Temple during March'2019

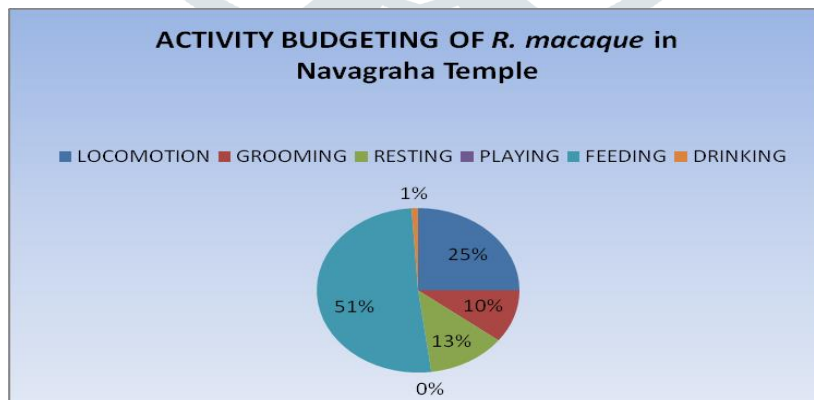


Fig 17: Pie diagram representing Activity budgeting in Navagraha Temple during April'2019

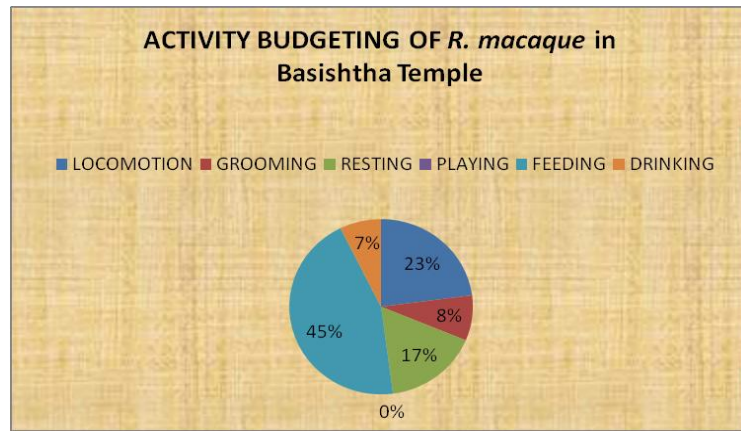


Fig 18: Pie diagram representing Activity budgeting in Basishtha Temple during April'2019

Table No.3: Feeding % of Navagraha & Basistha during 2018-19

Comparison of Feeding (%) behaviour during 2018-19		
Month	Navagraha	Basistha
August	32.81	37.5
September	56.25	56.25
October	30.21	30.21
November	35.42	42.71
December	45.83	41.67
January	56.94	33.33
February	40.63	57.29
March	40.9	37.5
April	51.04	44.79

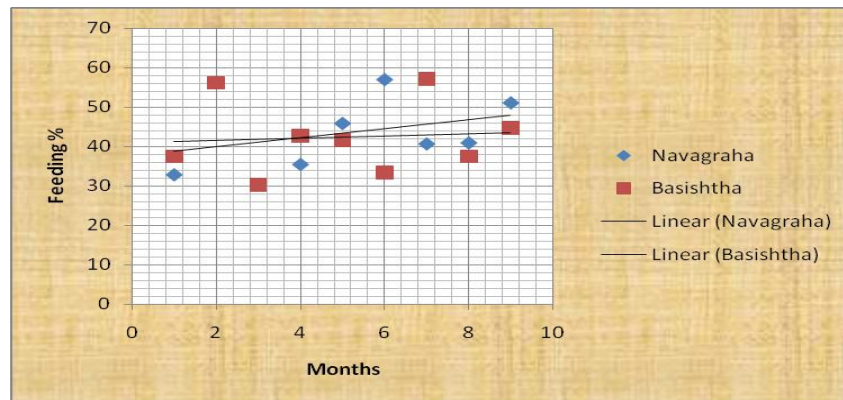


Fig .3:Showing Correlation & regression between the feeding behaviour of Navagraha & Basishtha Temple

Total	9 observations
Correlation	0.34327
r²	11.80%
Regression	
Slope(b)	0.32564
y-intercept(a)	28.2488
Regression Eqn.	28.249+0.326 x

DISCUSSION

Rhesus monkey is considered as omnivorous in its feeding habits as it was reported to feed on eggs, termites and moulds in addition to plants (Lindburg, 1971). In human influenced areas, *macaques* focus on fruits, flowers. Leaves, seeds, gums, buds, clover, roots, bark and also they supplement their food diet with termites, grasshopper, ants, beetls and mushroom (Fooden, 2000; Wolfe, 2002). In some areas, *Rhesus macaques* depend, directly as well as indirerectly, on parts of their diet from human activities (Rishard et al. 1989; Southwick and Siddiqi, 1994). In the present study no extra species is recorded in terms of feeding behaviour of *Rhesus macaque*. Tress (leaves, twigs, branch) surrounding the temple and inside the temple are important source of food for *Rhesus macaque*. Rather than that they also depend on the food offered by the visitors of that temple. Throughout the study some peculiar habit has been spotted i.e., In Basishtha temple maximum quantity of food is wasted by the *macaque* due to continuous supply of foods by temple visitors. They left the food half eaten. At the same time in Navagraha temple fully consumed of supplied food is observed. Also in both the temple the *macaque* used to smell and rub the food items before they take in. in both of the temple the Activity budgeting of *Rhesus macaque* was carried out. The different types of food component of *Rhesus macaque* is recorded in respective months of the year 2018 and 2019.

In 2018 of August in Navagraha and Basishtha temple, the feeding behaviour of *Rhesus macaque* is estimated to be 32.81% and 37.50% with activity of resting comprising 28.13% in Navagraha and 21.88% in Basishtha temple (Fig:1 and Fig:2). In the month of September'18 similar feeding behaviour of 56.25% has been observed in both the temple with the highest activity budgeting of locomotion of about 27.08% in Navagraha temple (Fig:3). On the other hand, in the Basishtha temple; the highest activity budgeting is recorded as 17.71 %in again in locomotion (Fig:4). In the October'18 same feeding activity is recorded i.e.,

30.21% with remaining highest activity budgeting of resting 31.25% in both the temple of Navagraha and Basistha, (Fig:5 and Fig:6). In the month of November'18 the feeding activity of the Basistha temple has been observed more than the Navagraha temple, i.e., 42.71% >35.42% while the rest highest activity budgeting was locomotion 22.92% in Navagraha temple and 32.29% of locomotion in Basistha temple.(Fig:7 and Fig:8). Apparently In the month of December'18 the Navagraha temple has highest feeding behaviour of 45.83% as compare to Basistha temple i.e., 41.67%, also the highest activity budgeting of resting is 26.04% in Basistha temple and 18.75% of locomotion in Navagraha temple.(Fig:9 and Fig:10).

In 2019 of January, the feeding behaviour of *Rhesus macaque* in Navagraha temple happens to be more with 56.94% than in Basistha temple with 33.33%. And the highest activity budgeting of locomotion in both the temple comprises of 27.78% and 22.92% . (Fig:11 and Fig:12). Likewise in the month of February'19 the feeding behaviour of macaque gets higher in Basistha with 57.29% and 40.63% in Navagraha. While the highest activity budgeting in locomotion is 22.92% in Navagraha and in Basistha temple 25.00% respectively.(Fig:13 and Fig:14). In the month of March'19 alternate behaviour of feeding is recorded in regards to previous months with highest feeding behaviour of 40.97% in Navagraha and 37.50% in Basistha temple. And the rest highest activity budgeting i.e., resting and locomotion is 34.72% in Navagraha temple and 28.13% in Basistha temples. (Fig:15 and Fig:16). Lastly in the month of April'19 the feeding behaviour of *Rhesus macaque* is remain constant in comparison to the previous month with 51.04% in Navagraha and 44.79% in Basistha temple. This also comprises of the highest activity budgeting of locomotion being 25% and 22.92% in both the temple respectively. (Fig:17 and Fig:18).

So it is cleared that the Basistha temple comprises with highest feeding activity of 57.29% in the month of February and the lowest is 30.21% in the month of October. On the other hand the Navagraha temple has the highest feeding activity of 56.94% in the month of January and the lowest is 30.21% in the month of October. Hence all together it is compared and confirmed that the Basistha temple has the highest feeding activity than the Navagraha temple throughout the month of August 2018 to April 2019.

CONCLUSION

The temple primate has developed an extreme desire for the provisioned food. Whereas naturally occurring foods are said to be their own kind of food which includes twigs, leaves, flower, bark of tree. Temple *macaques* are gradually increasing the expectation of provisioned food supplied by the temple visitors day by day. The crises in the food plants nearby temples and increase of hunger leads to the serious conflict between human and *macaque*. The *macaque* are provisioned by many kinds of food, where some are highly rich in nutrition and on the other hand some are toxic to them. Due to their peculiar notorious activity, visitors often get their eyes stuck on them. *Rhesus macaque* are very interesting to look in their troops . Their activities makes people laughed, at the same time snatching of food from visitors makes the human aggressive which leads to human *macaque* conflict. The numbers of *Rhesus macaque* are decreasing day by day due to unhealthy food consumption. As they provisioned by biscuits chips and varieties of cooked and oily food stuff. As the result the metabolic rate of their body is decreasing. So this is a high time for the government and the temple authorities to check the deforestation nearby temples inhabitant by these group of temple primates. Also it will help macaque to reduce the consumption of human provisioned food during dry seasons. i.e, February and March. So, precautionary measures should be taken to provide natural food to macaque and spreading awareness to the temple visitors to stop providing junk food in the place of natural food. These will help *macaques* to save them for a better future.

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(A)PHOTO PLATES OF NAVAGRAHA



PHOTO PLATE NO:1. FORAGING



PHOTO PLATE NO:2. FEEDING NATURAL FOOD



PHOTO PLATE NO:3: GROOMING ACTIVITY



PHOTO PLATE NO 3: FEEDING PROVISION FOOD.

(B)PHOTO GALLERY OF BASISTHA TEMPLE



PHOTO PLATE NO.5: FEEDING NATURAL FOOD

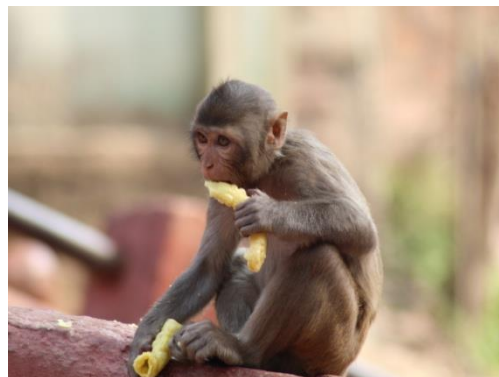


PHOTO PLATE NO.6: FEEDING FINGER PAPAD



PHOTO PLATE NO.7: FFEDING RICE



PHOTO PLATE NO.8: FEEDING FLOWER

