

SOCIAL ORGANIZATION OF ELEPHANTS IN SOUTHERN SRI LANKA

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Introduction

Elephants are a social species with a complex, sexually dimorphic social structure (Wilson, 1975; Moss and Poole, 1983). In elephants, social organization may play an important role in determining access to resources, reproductive success, and success in rearing offspring - hence in survival and recruitment. Social interactions between the sexes may also be important in prevention of inbreeding, hence maintenance of healthy populations. Elephants being large powerful animals, agonistic interactions between individuals due to resource competition may cause fatality and injury and be detrimental to their survival. Thus, maintaining populations with a normal social structure and social relationships is important for the long term conservation of Asian elephants. However, management initiatives such as translocation and restriction of movement by electric fences may cause major disruption of social organization. The long term effects of such perturbations are unknown, and could be detrimental to the long term conservation of elephants (Fernando 1997).

Asian elephants are forest animals and are difficult to observe and study in their natural environment. In addition, over most of their range, Asian elephants come into conflict with people and show behavioral adaptations such as avoidance and shifts in activity to be more nocturnal. While a wealth of information is available for African savanna elephants, and the social organization of Asian elephants has been assumed to be similar to them (Eltringham, 1982; Lee, 1991; Sukumar, 1989), considering the differences in ecological context, the social organization of Asian elephants is more likely to be similar to the African forest elephant (Fernando and Lande 2000).

This study was carried out in Ruhunu and Uda Walawe National Parks in Sri Lanka which provide a unique opportunity for studying the social organization of Asian elephants, due to areas of high visibility and habituation to visitors. The female social organization study was limited to the Ruhunu National Park, while the study of bull behavior was conducted in both Uda Walawe and Ruhunu National Parks.

Methodology

Study Areas

The Ruhunu National Park lies in the Southeast corner of Sri Lanka and forms part of the largest complex of protected areas in Sri Lanka. The vegetation is mostly scrub and thorn forest, interspersed with areas of short grass and some areas

of high monsoon forest and riverine forest. A large number of fresh water reservoirs provide water year round and elephants can be observed at close quarters in proximity to these water holes and in the short grass areas. The Uda Walawe National Park lies approximately 30 km inland from the Ruhunu National Park. In contrast to the Ruhunu National Park, Uda Walawe consists mainly of savannah type vegetation, with large areas of introduced elephant grass, secondary forest and some areas of tall mature forest. Uda Walawe lies in the 'intermediate zone' between the wet and dry zones and receives a greater amount of precipitation than Ruhunu National park.

Individual Identification

Individual elephants were identified by sex, size, and variation in ear and tail morphology, presence of tusks, tusks or lumps, and patterns of depigmentation. For the ear, the characters used were ear shape, folds, cuts, holes, and patterns of venation and depigmentation. Ear characters were recorded for both left and right ears, as it was common to find asymmetry of the two. The fold on the upper border (the rolled upper edge) of the ear was identified as the primary fold, the vertical fold towards the back (where the ear folds on itself) as the secondary fold. The presence and absence of the folds and the direction of the folds - inside or outside were taken as variables. Five ear lobe shapes were identified - point, curve, hook, long and square. For the tail, the presence or absence of a tail tuft, and the longer side of tuft hairs - inner, outer or equal, the fullness of the tuft and the length of the tail were considered.

Observational Data Collection

We studied the behavior of elephants in and around the Ruhunu National Park for approximately seven years. Beginning in 1995, four females from three groups were radio tracked using VHF radio collars for three years. Subsequently, a female in the largest resident group, and another female in the outskirts of the Park were radio-collared. The first few years focused on gaining an understanding of the ranging patterns, and building up a photographic catalogue of individual elephants. In subsequent years, radio-tracked individuals were used as focal animals in the study of social organization. Due to logistic reasons, the female in the resident herd was used as the main focus of the social organization study reported here. No animals were radio-collared in Uda Walawe, hence data collection on bulls was limited to opportunistic encounters.

As absolute estimation of age and size is not practical in the field, based on previous studies, we classified

individuals based on comparison with an adult female (Mc Kay, 1973).

Infant – can walk under the mother's belly

Class I Juvenile – cannot walk under belly - shoulder height reaching belly

Class II Juvenile – shoulder height between belly and bottom of ear lobe level of adult female.

Class III Juvenile – shoulder height between bottom of ear lobe and eye level of adult female

Class IV Juvenile – shoulder height between eye and top of ear level of adult female

Sub adult female – Shoulder height between top of ear and shoulder level of adult female

Sub adult male – Shoulder height equal to adult female

Adult male – Shoulder height greater than adult female

Bulls were categorized in to four classes based on body size.

Size A – Adult Male Larger than an adult female (shoulder height approximately over eight ft) with pronounced cranial prominences (secondary sexual characters).

Size B – Adult Male – Larger than an adult female (shoulder height approximately over eight ft) without pronounced cranial prominences (head structure similar to a female)

Size C – Sub Adult Male Equal in size to an adult female (shoulder height approximately seven to eight ft).

Size D – Juvenile Male Smaller in size than an adult female

Social Groupings

Social organization is the behavioral organization (type, temporal and spatial) of a society's members. Interactions between individuals serve as the basis for social relationships, which are then integrated into the social organization. (Lehner, 1996). In order to ascertain the social structures within the study population, the nearest neighbor analysis was applied to all encounters with female groups and also indices of association examined to define the extent of association between individuals.

Leadership

Strong leadership roles have been defined for females groups in African elephants (Mc Comb *et. al.* 2001) The matriarch is generally described as the oldest individual in a female group. The role of the matriarch is thought to be pivotal in maintaining the group and decisive for the well being of the group. In order to study the role of the matriarch, animals displaying behavior indicating group leadership were recorded. Identified leadership behaviors were clustering to a focal individual when threatened, initiating group movement, initiating offensive displays when threatened, animal taking the forward position when

confronting danger and the rear position when retreating.

Results and Discussion

Social Behaviour of Female Groups in Ruhunu National Park

The study recorded 722 encounters over 252 hours of observation, of which repeated encounters were made of 117 individuals including 32 adult males. Based on the indices of association between adult females in the study population, six behaviorally exclusive female groups were identified, of which two female groups were encountered regularly and were identified as Basis's group (B) and Gemunu's (G) group. The ranges of group B and group G overlapped. However, individuals from group B were never observed in association with individuals from group G. As only a single level of social organization was observed, these groupings were defined as 'family groups'.

The largest group size observed was 38. However, such an aggregation was observed vary rarely. The most frequent categories were groups containing six to seven individuals, which were observed 40% of the time. The smaller groups consisted of varying combinations of females making up the larger group, but there no fixed alliances were observed between females within the family group. Most females associated with any other particular female less than 25% of the time, suggesting that social bonds were less strong than described for African savanna elephants. The complex hierarchy of associations radiating from family groups to bond groups to clans and sub populations described for African savanna elephants (Moss *et al.* 1983) were not evident in this study.

The relationship between adult females and juveniles indicated that nursing infants accompanied a single female, the mother 100% of the time. This relationship of mother-calf diads however is biological rather than social in nature. Once weaned, juveniles showed less fidelity to one particular female. Older juveniles were often encountered away from their mother and accompanying other members of the family group and spent less time in close proximity to their mothers, as they grew older.

Both groups G and B had one or more older females that were post-reproductive, hence could be matriarchs. However, observation of 'leadership behavior' failed to identify any of these females in a matriarchal role. When a group was threatened or was in retreat, it was usually one of the younger, reproductive females that displayed aggressive behavior. These displays were not associated with one particular female. Initiating group activity, change from one activity to another and lead animal behaviors were mostly displayed by sub adults and older juveniles.

The lack of a complex multi tiered social structure, the low extent of association between adult females within

the group, and the lack of an identifiable 'leader' to the group all suggest that the social organization of Asian elephants, is significantly different from that of African savanna elephants. The findings of this study correspond with the findings of Fernando and Lande (2000) on social organization of elephants in the same area, but differ from other studies (McKay 1973; Santiapillai et al. 1984; Santiapillai et al. 1992) reporting social behavior. Comparison of Asian elephant social organization in other parts of Sri Lanka and other parts of its global range with that of the Ruhunu animals will provide greater insights into the evolution of social organization in elephants and its importance for conservation and management.

Social Behavior of Bulls

Male groupings were a common feature in Uda Walwe, whereas they were rare in Ruhunu National Park. During the course of the study, 81 individual bulls were identified and 321 encounters of males were recorded in Uda Walawe. Of the total encounters in Uda Walawe NP, 59.6% were of bull aggregations with a minimum number of two animals and the maximum of seven animals. The average group size was 2.3. In contrast, of 172 encounters of bulls in Ruhunu National Park, 98.4% were of single bulls. The frequency of male observations was higher during the months of the monsoon rains in Feb - March. There was also a tendency to encounter larger groups during this period. While most encounters recorded animals of size classes A, B, and C, size class D was represented in low numbers.

Patterns of association indicated no clear alliances between individual males. Unlike the groups defined for females and offspring, the composition of male groups varied and associations appeared to be transient. Bulls of larger body size classes, A and B displayed behaviors indicative of leadership/dominance. In 185 encounters where leadership behavior was recorded, the majority of such behavior was recorded by animals of size A and B.

Thus it is clear that there is a significant difference in male social organization between Uda Walawe and Ruhunu National Parks. At present it is not known whether the formation of male groups is a natural phenomenon related to greater resource availability or a particular distribution or type of resource availability peculiar to Uda Walawe or whether it is an abnormal behavior brought about by overcrowding, restriction of movements or some other factor related to management interventions.

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Endangered Elephants

Past present and future

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Front cover depicts a stylized version of the '*Sandakadapahana*' or moonstone, an essential element of ancient Sri Lankan architecture. The moonstone is a form of stone sculpture unique to Sri Lanka. It was placed at the foot of steps leading to important royal and religious buildings. The level and intricacy of decoration on this half-moon shaped step depended on the era and the kingdom. The moonstone, archeologists say, symbolizes the endless cycle of birth and death and the path to nirvana.

Back cover carries an image of the elephant stone carving found at the entrance to the Temple of the Tooth in Kandy, Sri Lanka's last capital before the British colonized the entire country in 1815. Sri Lankans believe that a tooth relic of Lord Buddha is enshrined in the 400-year old temple, which has preserved its medieval rituals and carried them on even today. The temple is best known for the colourful pageant it holds during the full moon of August, where hundreds of heavily caparisoned elephants parade in the narrow streets of Kandy. The tooth relic is carried by an especially trained tusker.

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