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Troop composition of free-ranging Toque macaque in dry and wet zones of Sri Lanka: reviewed by a multivariate method using R

W. M. L. S. Weerasekara^{1,2*}, W. M. K. B. Wijesooriya³, C. S. A. Britto⁴ and K. B. Ranawana³

¹Postgraduate Institute of Science, University of Peradeniya, Sri Lanka

²Department of Zoology, Faculty of Science, Eastern University, Sri Lanka

³Department of Zoology, Faculty of Science, University of Peradeniya, Sri Lanka

⁴Department Statistics and Computer Science, University of Peradeniya, Sri Lanka
lakshaniw@esn.ac.lk*

Macaques are group-living primates, and their unit of reproduction and social life is the troop. The Toque macaque (*Macaca sinica*) found in Sri Lanka is the smallest macaque among the recognized 22 species and is endemic to the island. Studies on population, behaviour, and ecology have been carried out extensively but mainly on a single or few troops of Toque macaques. Thus, this study applied principal component analysis and discriminant analysis to the troop composition data for 42 troops using statistical software package R (Version 3.4.1). The findings of this study might act as an essential parameter of demography which summarizes the variation of troop compositions of Toque macaques in the dry and wet zone of Sri Lanka for wildlife management purposes. Troop composition data was obtained by extensive literature revisions (N=25) and ongoing fieldwork (N=17). Troop composition was represented by the five-dimensional vector $X = (X_1: \text{adult male}, X_2: \text{adult female}, X_3: \text{sub-adult}, X_4: \text{juvenile}, \text{and } X_5: \text{infant})$. The troops had a high sociogenic sex ratio (X_1/X_2). X_1-X_2 and X_2-X_5 were strongly correlated, indicating those variables 'shape' the troop size. X_1 , X_2 , and X_5 were probably isotropic due to the high positive correlation. Troops were sorted into the wet zone (N=35) and dry zone (N=12). The low sample size in the dry zone might lead to misclassification in the dry zone, yet a linearly independent discriminant function indicated 85.11% accuracy. However, this function might help categorize the climatic zone of a troop of Toque macaque. Further, the study can be developed by adding the montane subspecies *M. s. opisthomelas* troop data. This study revealed the correlation between macaque individuals within the troop. It can be helpful to regulate the troop structure of the Toque macaque for wildlife management purposes since they are considered both endangered species and a pest. Further studies on demographic data collection are needed to be carried out continuously to monitor the changes of wildlife, not only on Toque macaques but also on other endangered fauna or pests, to secure the welfare of wildlife and humankind.

Keywords: *Macaca sinica*, Multivariate method, Troop composition, Troop size.

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