

CALCULATING DOMINANCE HIERARCHIES IN A DYNAMIC SYSTEM: RANK AND RANK CHANGES IN MALE CRESTED MACAQUES (*MACACA NIGRA*)

C. Neumann^{1,2,3}, A. Maulana Irvan^{1,4}, M. Agil⁴, D. Perwitasari-Farajallah^{5,6}, A. Widdig^{2,3}, A. Engelhardt¹

¹*Junior Research Group of Primate Sexual Selection, Dept. of Reproductive Biology, German Primate Centre, Goettingen, Germany,* ²*Junior Research Group of Primate Kin Selection, Max-Planck-Institute for Evolutionary Anthropology, Leipzig, Germany,* ³*Behavioral Ecology Group, Faculty of Biosciences, Pharmacy and Psychology, University of Leipzig, Leipzig, Germany,* ⁴*Faculty of Veterinary Medicine, Bogor Agricultural University, Bogor, Indonesia,* ⁵*Primate Research Center, Bogor Agricultural University, Bogor, Indonesia,* ⁶*Faculty of Mathematics and Natural Sciences, Bogor Agricultural University, Bogor, Indonesia*

Presenter's Email: cneumann@d pz.eu

Benefits of high social rank range from being preferred grooming or coalition partners to priority of access over food or mating partners and clearly indicate fitness advantages. Social hierarchies are a common feature of group living primates and the assessment of such hierarchies is important for understanding many primate behaviours. When hierarchies are dynamic, accurate determination of individual rank proves difficult with established techniques. Methodological improvement, taking such dynamics into account, is therefore needed. We have compared two fundamentally different approaches of computing dominance hierarchies based on three years data from males in three wild groups of crested macaques, a species with very dynamic male hierarchies. First, we applied two currently widely used static ranking methods based on interaction matrices to our data (I&SI: de Vries 1998 [Anim. Behav. 55, 827]; David's Score: Gammell et al. 2003 [Anim. Behav. 66, 601]) and accounted for putative changes in the hierarchies by means of creating time periods based on migration and maturing events (average period duration: 13 weeks). Second, we applied Elo-rating (Albers and de Vries 2001 [Anim. Behav. 61, 489]), which continuously calculates/updates individual dominance scores based on sequences of interactions, a method not yet used in primatology. Our data show that the three methods yield comparable rankings across time periods. Elo-rating, however, has the important advantage that rankings can be extracted at any point in time, allowing fine-tuned monitoring of rank changes. We will discuss the benefits of this approach when studying for example mechanisms of rank acquisition and maintenance.

Keywords: power asymmetries, ranking methods, crested macaque