

Musth and Male-Male Competition in the African Elephant

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The phenomenon of musth in male Asian elephants, *Elephas maximus*, has long been recognized and in this study I have documented the occurrence of musth in African elephants, *Loxodonta africana*, in Amboseli National Park, Kenya. The most obvious manifestations of musth are a sharp rise in aggressive behaviour, copious secretions from and enlargement of the temporal glands, and a continuous discharge of urine. Males in musth show a positive association with female groups. In this thesis I have examined the evolutionary significance of musth from two perspectives: a) which selective pressures have favoured the evolution of musth and b) among males who come into musth, which social and ecological factors influence the timing and duration of musth periods.

Males in musth had higher levels of urinary testosterone and exhibited higher frequencies of aggression than did either sexually inactive or sexually active non-musth males. Musth males increased in dominance above their non-musth rank. Rival males retreated from threats given by musth males at a greater distance than they did from the same threat given by a non-musth male of the same size class. For these reasons males in musth were more successful at guarding oestrous females and obtaining matings than were non-musth males.

Although the reproductive benefits of being in musth in terms of male-male competition were apparent and the primary concern of this study, female preferences have probably also been a selective pressure in the evolution of musth. Observations suggested that females in oestrous purposely outran younger non-musth males and oestrous females were observed to maintain proximity only towards males in musth.

The duration of musth periods appeared to be related to a male's rank relative to other males simultaneously in musth. This pattern appeared to be particularly true among the lower ranking males who could be forced out of musth by older, higher ranking males. Among high ranking males musth duration may also be limited by a decline in body condition. The timing of musth periods in individuals appeared to depend on both the temporal and spatial availability of oestrous females and the temporal patterning of musth in other males.

The phenomenon of musth is compared with the physical and behavioural characteristics displayed by rutting ungulates. I argue that the discharge of urine by rutting males indicates body condition and functions in male-male assessment.