Individual and Social Behavioral Responses to Injury in Wild Toque Macaques (Macaca sinica)

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Toque macaques (Macaca sinica), inhabiting natural forest at Polonnaruwa, Sri Lanka, are frequently injured in fights with conspecifics. The behavior of known individuals when they were injured was compared to that after they had recovered their health. Thus, injured animals rested and alloand autogroomed more, but they foraged less and initiated fewer aggressive episodes. They spent most time being sedentary in the safety of arboreal refuges and reduced acrobatic movements by locomoting more often terrestrially. Other group members showed no special tolerance (or altruism) toward injury victims during the costly and highly competitive activity of foraging for food. In fact, some injured animals received more aggression, or lost dominance rank, and thereby had their competitive abilities further impaired. Care for the injured was manifest mostly by grooming and wound cleaning. All hair in the area surrounding a wound, as well as dirt, scabs, and fly larvae, were removed, and saliva was applied by licking the wound (wounds so treated healed with no obvious signs of infection). (1) Injured macaques sought and received significantly more grooming (owing to wound care); (2) the amount so received increased with the severity of the injury; and (3) the initiative of other group members often compensated for a victim's inability to solicit care. Juvenile males were especially attentive to injured adult males, suggesting that they were investing in a social bond with these adults, which might reciprocate altruism toward their juvenile caregivers in the future. Injured juvenile females received most care from their mothers.

KEY WORDS: *Macaca sinica;* injury; wound care; activity budget; competition; altruism; grooming.

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INTRODUCTION

In this paper we examine the behavior of wounded wild toque macaques (Macaca sinica) and the response of other group members to an injured individual. This topic has been addressed only rarely and peripherally in relation to defective or injured infants (Berkson, 1970, 1973; Fedigan and Fedigan, 1977; Nakamichi et al., 1983; Chapman and Chapman, 1987). Natural wounds, such as punctures and lacerations of the skin and muscles, resulting from intraspecific fighting, have been reported widely among primates for more than two decades, however. Bite wounds have been noted, for example, among rhesus macaques, Macaca mulatta (Vandenbergh and Vessey, 1968; Wilson and Boelkins, 1970; Lindburg, 1971; Hausfater, 1972; Drickamer, 1975), bonnet macaques, M. radiata (Simonds, 1965), toque macaques (Dittus, 1977a), stumptail macaques, M. arctoides (Whitten and Smith, 1984), Japanese macaques, M. fuscata (Kurland, 1977), baboons, Papio anubis (Hall and deVore, 1965) and Theropithecus gelada (Dunbar, 1984), gray langurs, Presbytis entellus (Hrdy, 1977), lemurs, Propithecus verreauxi (Sussman and Richard, 1974) and Lemur catta (Jolly, 1966), howler monkeys, Alouatta palliata (Chivers, 1969) and A. seniculus (Neville, 1972; Crockett and Pope, 1988), and chimpanzees, Pan troglodytes (Goodall, 1986).

Excepting infanticides (e.g., Hrdy, 1977), adult males have been injured most commonly and seriously, owing to male-male fights during the mating season (Wilson and Boelkins, 1970; Dittus, 1977a; Whitten and Smith, 1984; Ruehlmann *et al.*, 1988). Although the distribution of wounds on the body and among group members was considered by Whitten and Smith (1984), most reports have emphasized some aspect of aggressive behavior, and wounding has been mentioned as an incidental outcome.

Wounding has not received much attention, perhaps because of its low frequency in relation to aggression and to usually short periods of study. For example, during 60 hr of observation focusing only on the behavior of toque macaques during the mating season (when the rate of aggression doubles), 373 threats were transacted, some being intense. Yet only 0.6% of these involved actual body contact, and considerably fewer resulted in wounding (Dittus, 1977a). Bernstein *et al.* (1983) also indicated that biting had the lowest incidence of all aggressive acts in several Old World primates held in captivity. Notwithstanding, these facts should not cloud the importance of wounding in primate life histories. In wild toque macaques, which have been studied for two decades, most individuals have received at least one wound before they reach their prime at about 10 years old (Dittus, unpublished data).

Although the state of injury may involve only a fraction of an individual's lifetime, it is a critical phase. The behavior of the wounded and of their caregivers, who might influence the victim's ability to recover and to sur-