

Male dispersal in patas monkeys (*Erythrocebus patas*)

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Summary

Potential influences on natal dispersal of wild male patas monkeys (*Erythrocebus patas*) were investigated in Laikipia, Kenya, over a four-year period. Changes in variables were assessed over the six months prior to dispersals. Dispersers left at between 24 and 42 months of age; 60% left at >36 months of age (= the 'large juvenile' age class). Most dispersals coincided with the presence of extra-group males in the study area. Large juvenile males (LJMs) reduced time in proximity to other group members prior to dispersal, driven primarily by less time in proximity to adult females. Aggression involving LJMs was typically rare, mild, and conducted at a distance. Overall aggression bout frequency did not change over time although mild aggressive interactions with the adult male increased in the weeks before LJMs left, suggesting LJMs forestall more serious aggression by leaving. Aggressive interactions with adult females decreased over time. Aggressive bout rates involving other immatures were consistently low. Our data most clearly support the conclusion that LJMs left of their own volition rather than being actively driven out by other group members. Relationships with other males, both inside and outside the natal group, seemed to influence the timing of LJMs' departures.

Keywords: male dispersal, primates, patas monkeys.

Introduction

What compels individuals to disperse from their natal groups has been actively debated over the last 30 years. Theoretical work divides factors into genetic causes such as inbreeding avoidance and outbreeding depression, or somatic causes, predominantly competition for reproductive resources

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(Greenwood, 1980; Shields, 1987). Distinguishing between these two types of influences has presented considerable difficulty because interpretation of data on dispersal requires strong evidence of differences in reproductive success of individuals that either did or did not disperse (Greenwood, 1980; Moore & Ali, 1984; Shields, 1987; Johnson & Gaines, 1990); such evidence is frequently lacking. Further, as Dobson (1982) indicates, genetic and somatic factors may be intertwined. Although some studies of mammals, including primates, have been interpreted as supporting the hypothesis that natal dispersal reduces inbreeding costs (reviewed by Packer, 1979, 1985; Alberts & Altmann, 1995), others have questioned the costs of inbreeding and argued that available evidence more strongly supports the competition hypothesis (e.g., Moore & Ali, 1984). A more recent review of the available literature, however, indicates that inbreeding does exact a significant cost in primates (Charpentier et al., 2007).

Much of the theoretical literature on dispersal focuses on which sex disperses and why. While models that explain the evolution of sex-specific dispersal have proliferated, an element common to many is that a species' mating system and its form of resource competition strongly influences its dispersal pattern. Thus, monogamous species (including most birds) show male philopatry and female dispersal while polygynous mating systems and female philopatry predominate in mammals (Greenwood, 1980; Johnson & Gaines, 1990), although studies conducted since the 1980s document significant variation in both birds and mammals. Studies in a wide range of mammal species indicate a complex and confusing picture with many combinations of dispersal possibilities represented and with substantial intraspecific as well as interspecific variability (reviewed recently in Lawson Handley & Perrin, 2007). In banner-tailed kangaroo rats (*Dipodomys spectabilis*), for example, both males and females disperse but over distances too short to reduce inbreeding; this species' mating behaviours themselves function to reduce inbreeding (Winters & Waser, 2003).

Here we examine the behaviour of immature male patas monkeys (*Erythrocebus patas*) to identify factors influencing their dispersal from their natal groups. We use the term natal dispersal as defined by Greenwood (1980) to refer to individuals leaving the group of their birth to breed ultimately in other groups. Young male patas monkeys disperse from their natal groups before maturity and spend two to three years in all-male associations or as solitaries before they attempt to enter heterosexual groups as breeding