Does body mass dimorphism increase male–female dietary niche separation? A comparative study of primates

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Summary
Body mass plays an important role in shaping an individual’s behavior, especially with respect to dietary behavior. Larger animals tend to consume higher quantities of low quality foods. In contrast, smaller individuals, with relatively higher metabolic rates require a high quality diet. Therefore, species that exhibit high amounts of sexual dimorphism in body mass should also display high levels of male–female dietary differentiation. This study investigated the relationship between body mass dimorphism and dietary sex differences for 38 primate species. We conducted multiple regressions using female body mass and body mass dimorphism as independent variables. We found that body mass dimorphism was significantly negatively correlated with male–female differences in fauna consumption using species values as well as phylogenetically independent contrasts. In addition, body mass dimorphism was positively related to male–female differences in percent time feeding using phylogenetically independent contrasts. Body mass dimorphism was not significantly related to male–female differences in the percent of fruit and leaves in the diet. The results suggest that, as body mass dimorphism increases, there is some degree of dietary niche separation between the sexes of primates. These results will be discussed in the context of existing studies of intersexual niche separation.

Keywords: sex differences, feeding ecology, sexual selection, phylogenetically independent contrasts.

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Sex differences in feeding ecology have been observed in a variety of taxa and may range from subtle variations in diet and feeding technique to more extreme degrees of sexual segregation in terms of sociality and habitat use (Clutton-Brock et al., 1987; duToit, 1995; Main et al., 1996; Thirgood, 1996; Stokke, 1999). Such differences are most commonly attributed to three major factors including (1) variation in costs of reproduction, (2) avoidance of competition between the sexes and (3) differences in body size/mass (sexual dimorphism) (Clutton-Brock, 1977). Among primates, sex differences are often observed in both diet and feeding behavior (Gautier-Hion, 1980; Harrison, 1983; Cords, 1986; Boinski, 1988; Mitani, 1989; Rose, 1994; Doran, 1997), yet there does not appear to be consistency in terms of factors driving these distinctions. In particular, despite the varying degrees of sexual dimorphism throughout the primate order, the effect of body size in relation to intraspecific differences is still uncertain. Moreover, studies that do cite sexual dimorphism as an influence on primate feeding behavior are often referring specifically to effects of body size on positional behavior rather than energetic and nutritional demands (Cant, 1987; Rose, 1994; Doran, 1997).

Sexual dimorphism is most often considered in reference to sexual selection, with large male body size being selected for due to competition among males for access to females (Trivers, 1972; Plavcan & van Schaik, 1997). Yet in addition to social implications, the resulting size difference is expected to influence dietary characteristics. The influence of sexual dimorphism on male–female ecological differences may result from the interplay between morphology and access to dietary resources. Larger bodied individuals are expected to be more constrained in terms of arboreal habitat use and are often more terrestrial than smaller individuals who are more adept at exploiting terminal branches (Fleagle & Mittermeier, 1980; McGraw, 1998). Masticatory morphology differences may also exist between small and large individuals, particularly in terms of canine size, musculature, and gape, leading to differences in bite size and food choice (Wheatley, 1982; Ginnett & Demment, 1997).

The importance of digestive morphology and body mass may also be observed in the general energetic and nutritional requirements of an animal. While gut capacity/retention times increase with body size (Jarman, 1974), relative energetic requirements per unit mass decrease with body size