Non-territorial Macaques Can Range Like Territorial Gibbons When Partially Provisioned With Food

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**ABSTRACT**

Human food supplementation can affect components of animal socioecology by altering the abundance and distribution of available food. We studied the effect of food supplementation by comparing the ranging patterns and intergroup interactions of two groups of northern pigtailed macaques (*Macaca leonina*), a non-territorial primate species. One group was partially reliant on food provisioning, whereas the other group foraged wild food. We also compared the macaques’ movement with that of a group of white-handed gibbons (*Hylobates lar*), a territorial species inhabiting the same site. Home range, core area, and daily path lengths were significantly smaller for the semi-provisioned group than for the wild-feeding group. In contrast to wild-feeding macaques, supplemented macaques showed higher fidelity to home range, core area, and particularly to the region where human food was most accessible and abundant. The relationship of daily path length and home range indicated a low defendability index for wild-feeding macaques; the higher index for the semi-provisioned group was consistent with the territorial pattern found in gibbons. Semi-provisioned macaques showed further traits of territoriality with aggression during intergroup encounters. These findings indicate that human modification of food availability can significantly affect movement patterns and intergroup competition in macaques. The observed ranging dynamics related to food provisioning may decrease the efficiency of macaques as seed dispersers and increase predation on their home range, and thus have important consequences for plant regeneration and animal diversity.

Abstract in Thai is available with online material.

**Key words:** core area; home range; Khao Yai National Park; *Macaca leonina*; northern pigtailed macaque; site fidelity; socioecological models; white-handed gibbons.

**Southeast Asia has been one of the major zones of sympatry between human and nonhuman primates for at least the last 10,000 yr (Fuentes 2006), and this long interaction has created a form of co-ecology where both taxa affect one another significantly (Fuentes 2006, Riley et al. 2011). The particularly strong anthropogenic disturbance and consequent fragmentation of tropical landscapes during recent decades have generated many new areas where animals and humans are compelled to interact (Biquand et al. 1994, Woodroffe 2000, Hill et al. 2002, Lee & Pristoon 2005, Corlett & Primack 2011, Laurance et al. 2011). With this proximity, animals may lose their fear of humans while discovering the ease of feeding from garbage, leftovers, or crops (Sprague 2002, Lee & Pristoon 2005, Albert et al. 2011, 2013a,b). This is aggravated by deliberate feeding of animals by people in lodges, temples (Brennan et al. 1985, Else 1991, Fa & Lind 1996, Richter et al. 2009, Knapp et al. 2013), and even protected areas (Orams 2002, Sangjun et al. 2006, Albert et al. 2011, 2013a,b).

This human–animal coexistence provides an opportunity to explore animal socioecology models that link resource defensibility and predation pressures with social systems and intra- and intergroup interactions (Crook & Gartlan 1966, Wrangham 1980, Janson & van Schaik 1988, van Schaik 1989, Sterck et al. 1997). Living in groups has benefits, such as enhancing the likelihood of avoiding predators, but also increases the level of resource competition (van Schaik 1989, Janson & Goldsmith 1995, Chapman & Chapman 2000). Two basic competition regimes, contest and scramble, can be described based on the distribution of resources. Contest competition emerges when a resource can be economically defended, and thus, hierarchical relations and aggression are expected; scramble completion emerges when a resource is not