Long-Term Field Studies—Africa

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Social Systems

Long-term studies of social systems is an area where primate research has made a significant contribution. Theory suggests that different types of feeding competition will lead to differences in social organization. The nature of the spatial and temporal distribution of food governs the level and type of feeding competition. Scramble competition involves the depletion of food resources, while contest competition includes aggression, displacement, and avoidance within and between groups over access to monopolizable food sources (Janson and van Schaik 1988). Animals must compete for food when it is limited, patchy, and depletable, variable in quality, or monopolizable (Chapman, Wrangham, and Chapman 1995). Whenever only scramble competition occurs, or if there is no competition for food and food is not monopolizable, females are not expected to engage in agonistic interactions over food (Snaith and Chapman 2007), leading to an absence of linear dominance hierarchies, which co-occurs with female dispersal because coalition partners are not required in feeding competition. In contrast, when food resources are limited, patchy, depletable, and monopolizable, contest competition will occur, it becomes advantageous for females to have kin as allies in food defense, and female dispersal should not occur. Stemming from the assumption that leaves are superabundant in forest systems, folivores were considered not to be food- limited. However, studies have recently demonstrated that folivores are very selective in what they eat (Chapman and Chapman 2002). These studies indicate that these primates have different competitive regimes than previously thought (Snaith and Chapman 2007).

Both long-term variation in ecological variables and change in social factors influence social systems. For example, short-term studies may yield correlations between variables relevant to fitness, but such studies do not demonstrate if the correlations remain over the long-term. The classic example concerns the observation that dominance is generally positively correlated with short-term measures of reproductive success. However, do these snapshots accurately depict lifetime reproductive success—especially among species where tenure of alpha male status may be short lived? It may be that longevity is more important than dominance.

Population and Community Processes

Primates primarily influence community-level interactions through three mechanisms: (1) seed dispersal, (2) causing the mortality of preferred food trees, and (3) competition with other species. Early studies of tropical fauna recognized that primates constitute a large proportion of the frugivore biomass (Eisenberg and Thorington 1973), they eat large quantities of fruit, and defecate or spit out a large number of undamaged seeds (Leiberman et al. 1979). For example, in Kibale National Park, Uganda, 98.5 percent of chimpanzee defecations contain seeds, with an average of 22 large seeds per defecation (Wrangham, Chapman, and Chapman 1994); thus chimpanzees disperse approximately 369 large seeds per km^2 per day. Frugivorous red-tail monkeys, blue monkeys (*Cercopithecus mitis*), and mangabeys (*Lophocebus albigena*) in Kibale disperse 446 seeds per km^2 per day

The International Encyclopedia of Primatology. Edited by Agustín Fuentes.

(Lambert 1997). Similarly, the primate community of northern Costa Rica disperses 5,600 large seeds per km^2 per day (Chapman 1989).

Some species are influential in modifying the environment by changing, maintaining, and/or creating new habitats, and researchers have called them ecosystem engineers. Frugivorous primates likely do this through seed dispersal, but primates can play an important role by killing trees by foraging on tree leaves or stopping fruiting by foraging on flowers (Chapman et al. 2013).

Conservation

Nearly 50 percent of primate species are at risk of extinction and 11 percent are classified as critically endangered (IUCN 2015). One of the most important threats is habitat loss. In tropical countries, agricultural land uses have increased by 48,000 km^2 per year between 1999 and 2008 (Phalan et al. 2013), and global forest loss was estimated to be 2.3 million km^2 between 2000 and 2012 (Hansen et al. 2013). Given the predicted increase in human population size and consequent higher consumption rates, it is expected that by 2050, the conversion of an additional approximately 1 billion ha of land will be necessary to meet the increasing demand (Laurance, Sayer, and Cassman 2014). Climate change is also threatening primate populations. Understanding responses to climate change requires long-term monitoring. For example, it took 15–30 years for researchers in Kibale to demonstrate that leaf nutrient quality for folivorous would decline as predicted by greenhouse experiments (Rothman et al. 2015). With long-term field projects, positive spin-offs often result (i.e., potential work opportunities, education, outreach, and health care). Moreover, the expertise of field assistants ensures standardization of methods over time and increasingly reliable and powerful databases.

SEE ALSO: Hominoidea (Apes); Guenons, Arboreal; Guenons, Semiterrestrial

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ABSTRACT

Primates are long-lived animals with complex life histories, which slowly impact their environment through seed dispersal and herbivory. As a result, short-term studies only provide a snapshot of a primate's life and poorly represent their environmental effects. Therefore long-term studies are needed. The need for long-term studies has taken on urgency because humans are changing the environment, particularly in Africa. For example, assessments suggest that global temperatures could increase by 5.8°C this century. Our ability to predict primate responses to climate change is poor. In areas becoming hotter and drier, food trees will die and primates will die along with them, or move. All forests occupied by primates are changing, either representing succession resulting from previous anthropogenic disturbance or because of climate change.

KEYWORDS

behavioral ecology; ecology; habitat; primate