

Recent Advances in Primate Ecology and Evolution

The blue skies and warm weather of Tampa, Florida, provided the backdrop for the 73rd annual meeting of the American Association of Physical Anthropologists. Researchers from every discipline of physical anthropology gathered to present and discuss their work. Some of the results coming from research on primate behavior, ecology, and evolution will be presented here.

PRIMATE POPULATION DYNAMICS

Long-term demographic data are becoming available for an increasing number of primate populations. Two studies yielded intriguing results concerning the mechanisms of demographic changes in a growing population of a New World monkey and the declining population of an Old World monkey species. Karen Strier (University of Wisconsin) and her colleagues, who have studied the highly endangered muriqui monkey (*Brachyteles hypoxanthus*) in the Brazilian Atlantic forest for over 20 years, presented their long-term data regarding demographic patterns and processes of this population. Their main study group, consisting of only 22 individuals at the start of the project, now has 79 members. Preliminary observations of other groups in this population have exhibited similar growth patterns. This increase was largely due to a female-biased birth sex ratio. Currently, the majority of adults are female (57.3%), with about 47% of immature

individuals being female. Strier hypothesized that this reversal in immature sex ratio will lead either to future stabilization or a decline in population size. The latter scenario would be particularly unfortunate for this species since it is already at a high risk of extinction.

In contrast to the success of female muriquis in Brazil, the patas monkeys in Laikipia, Kenya, have not fared so well. Lynne Isbell and Truman Young (University of California, Davis) presented ten years worth of comparative demographic data from their study of vervets (*Chlorocebus aethiops*) and patas monkeys (*Erythrocebus patas*). They focused on the unusual pattern of mortality in the patas monkey group. Infant mortality among patas monkeys was lower than that among vervets, yet the mortality rate for adult female patas monkeys was significantly greater than that for adult female vervets. Isbell and Young hypothesized that the high adult mortality, with a mean age of death at ~4.7 years, could be an important selective pressure driving the early and more regular rate of reproduction in this population.

Another important factor shaping primate population dynamics in the world's current state is logging. Lisa Paciulli (University of North Dakota) studied the effect of logging on the population densities of four primate species on the Mentawai Islands, Indonesia. *Hylobates klossi*, *Macaca pagensis*, *Presbytis potenziani*, and *Simias concolor* were examined in three forests subjected to various degrees of logging. She discovered that the densities of gibbons and macaques were similar across all types of forests. In addition, the densities of the leaf monkeys were highest in forests that were logged 20 years ago, while *simakobus*

were most common in a forest that was free from any logging activity. Because different primates reacted to logging regimes in unique ways, Paciulli suggested that a heterogeneous habitat may be the best scenario to support the highest numbers of primates on the Mentawai islands.

PRIMATE PROMISCUITY AND DISEASE

Charles Nunn (University of California, Davis) tested social and ecological hypotheses related to explaining disease risk in primates. Nunn predicted that the primate disease risk would increase with increasing group size and population density, greater time spent being terrestrial, and a greater number of mating partners. Using comparative methods controlling for species' shared evolutionary history, he found the strongest evidence corroborating the third hypothesis. Specifically, many types of white blood cells positively correlated with the number of mating partners. The results of this analysis, as well as recent related studies, have interesting and important ramifications for the evolution of both human and nonhuman primate reproductive behavior and immune systems.

SEXUAL SELECTION: EXTANT AND FOSSIL PRIMATE INVESTIGATIONS

The importance of sexual selection in driving primate body-mass dimorphism has usually centered on male-male competition for access to females. J. Michael Plavcan (University of Arkansas) and Carel van Schaik (Duke University) examined the often-neglected female point of view, investigating the role of female mate choice

and its possible effects on the evolution of body-mass dimorphism. They postulated that promiscuous females that are indiscriminant in their choice of mates act to reduce male reproductive skew, whereas females that most often choose dominant males reinforce male reproductive skew. Their comparative analyses of nearly 100 primate species found that sexually dimorphic species are often those in which females prefer mating with the dominant male, while species having promiscuous females are usually less dimorphic. Based on these results, the authors stressed the need to consider female mating strategies when investigating dimorphism and sexual selection.

Another project focusing on female mating tactics was presented by Rebecca Stumpf (Stony Brook University and Max Planck Institute) and Christophe Boesch (Max Planck Institute). They examined the ability of female chimpanzees at the Tai National Park to mate with preferred males while avoiding copulations with non-preferred males. They found that male mating success did not correspond with male rank but instead covaried with female chimpanzee mate preference, particularly during the peri-ovulatory period, suggesting that female choice may be an important component of chimpanzee sexual selection.

Gary Schwartz (Northern Illinois University) and colleagues presented an elegant study spotlighting the potential that fossils have for the study of development in evolution. Comparative studies of primate canine dimorphism have suggested that dimorphism ratios are the result of sexual selection and strongly correlate with intrasexual aggression and mate competition among anthropoids. (Strepsirrhines are generally found to have very weak dimorphism patterns.) Schwartz and his colleagues compared the rate of canine dental development in *Cantius*, a notharctine adapiform, and extant primate taxa, and made an intriguing discovery. Among extant anthropoids, the process of canine dimorphism is found to be by the process of bimaturation,

where both sexes grow at the same rate, but the duration of growth is extended in males, thereby resulting in larger teeth. However, the findings in *Cantius* suggest that male canines in adapiforms formed at significantly faster rates than those in females, a process that has not previously been documented in primates. The implications of these results are that two distinct developmental processes have arisen during primate evolution, regardless of whether or not canine dimorphism in adapiforms evolved as the result of sexual selection for mate competition, as is believed to be the case for anthropoids.

EARLY PRIMATE EVOLUTION

Erik Seiffert (Oxford) and colleagues presented a reinterpretation of the late Eocene primate *Wadilemur elegans* based on newly discovered fossil specimens from quarry L-41 in Egypt. Based on incomplete mandibular specimens, *Wadilemur* was first described as an anchomomyin adapiform. New fossils include additional mandibular material as well as some of the upper dentition. An exciting aspect of the new mandibular specimens is the shape and orientation of the incisal alveoli, which suggest the presence of a toothcomb much like that of living strepsirrhine primates. Also important is the cusp morphology of the upper molars, which are very similar to those of the Eocene *Saharagalago* and more recent galagoes. When *Wadilemur* is included in a comprehensive cladistic analysis, it is found to be part of a *Saharagalago* galagonid clade. This reinterpretation of *Wadilemur* only makes more impressive the recent additions to the loriform fossil record discovered by Elwyn Simon's Fayum Paleontological Research group. As recently as the turn of the new millennium, the fossil record of loriforms before the early Miocene was unknown. Now, with these recent discoveries, there is fossil evidence that the divergence between lorises and galagoes dates to at least the late middle Eocene, as well as evidence supporting recent molecular

estimates relating to the origins of several strepsirrhine groups.

Jon Bloch (South Dakota School of Mines & Technology) and colleagues addressed a current controversy in the debate about the phylogenetic and adaptive origin of primates. Their new cladistic analysis of primates, plesiadapiforms, and other archontans combined and included craniodental and postcranial data on more archontan taxa than did their previous studies. Their results suggest, as did their earlier studies, that plesiadapiforms (in the strict sense) are paraphyletic, whereas plesiadapoids such as plesiadapids, carpolestids, saxonellids, and *Chronolestes* are members of a monophyletic sister taxon to primates. The implications of those findings with respect to the debate about the origin of primates are significant and controversial. Bloch and his colleagues interpret character evolution based on their phylogeny as suggesting that postcranial adaptations for terminal branch arboreality, such as a grasping hallux with a nail, evolved in plesiadapoids and preceded the origin of many visual adaptations that not only are often used to define primates, but also are the focus of many adaptive scenarios for the origin of the group. The authors suggest that this sequence of morphological character evolution is most consistent with Robert Sussman's hypothesis that primates first evolved as fruit-and-nectar specialists in a terminal branch niche. This, like the other research described, as well as the many posters and presentations offered at the meeting, illustrates the exciting directions that primate ecology and evolution are headed toward.

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