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Baboons in Two Worlds

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The last stragglers have passed through the Zoo gates and are on their way home. As the 64 baboons on Baboon Island return their attention from the antics of visitors to the rhythm of baboon life, researchers from the Conservation Biology Department leave their computers to inobtrusively observe and record the intricacies of baboon society. A few hours later, the increasing chill and failing light send the researchers back to shelter and each baboon to a protected nook with a few friends or relations to huddle warmly through Chicago's cool autumn night.

At the same time, halfway around the world, another group of baboons and several other Chicago Zoological Society biologists are stirring in the chill of pre-dawn in Kenya's Amboseli National Park. The baboons will doze a bit more before starting the serious business of the day, but not their observers back at the base camp—an extra forty winks could result in arriving too late to find the baboons. It's relatively easy to find the animals when they are perched high in one of the group's dozen known sleeping groves, silhouetted against the dawn sky; it's quite another matter to locate them once they are on the ground and have spread out as they search for food through the scrub and tall grasses of their 40 sq km home range. Before the rising sun briefly bathes Mt. Kilimanjaro's snow in a pink glow, the researchers will have breakfasted by candlelight and readied vehicles and equipment. Outside, they sweep a flashlight beam across the thermometers and rain gauge for a quick morning weather recording. Then it's off to the field for a ten-hour day of following one of the baboon study groups until the animals settle again for the night in one of their scattered tree-top refuges.

On this day, the researchers hope to locate Alto's Group, a group of almost 70 baboons that has been the object of continuous studies since 1971. At approximately twenty years of age, Alto was the oldest female in her group when the research began; she was also one of the highest-ranking in the female dominance (fighting) hierarchy. The female dominance hierarchy is amazingly stable from one

generation to the next: although Alto died in 1976, the highest-ranking positions in the group have passed to her daughters and now her granddaughters. As with many other species of Old World monkeys, such as the mangabeys and macaques in Brookfield Zoo's Tropic World, baboon females spend their whole lives within the closely knit group into which they were born. As three-year old juveniles, they begin to challenge adult females who lost fights to their mothers. By the time they are four- or five-year-old adolescents, young females assume a place in the female dominance hierarchy that is adjacent to their mothers. Throughout adulthood, they remain in that same position relative to females from other families.

Male baboons experience a very different life course from that of the females. They usually leave their families and their group of birth as they reach adulthood, and they attempt to join other groups where they try to gain mating opportunities with fertile females. This they do through competition with other males or through developing 'friendships' with the females themselves. Little is known about what makes for fighting success (high dominance rank) in males, but it is known that males rarely remain in the top position for long. After a few months, or occasionally a year or more, another young male matures or enters the group and the dominance order changes. Usually males stay in the group after losing rank, basing their relationships more on alliances than on fights, but sometimes they leave and try their luck in another group. Life seems to be much more variable and unpredictable for males than for females.

In the years since Stuart Altmann and I began the Amboseli studies, researchers from Kenya, the United States, and other countries have conducted studies in Amboseli and helped maintain the continuity that is so vital to a project such as this. These have included studies of competition among juveniles by Jennifer Shopland and grooming behavior by Carol Saunders, both now education specialists at Brookfield. During the past ten years, two other baboon groups in Amboseli have been added to the study, and starting in 1985, Amy Samuels and I began a comparison of the group living on Baboon Island at Brookfield Zoo. Through detailed daily records on births, deaths, infant care, play, fighting among foes, and grooming among friends and family members, an understanding of the full lifecourse of the females is emerging. Current research by University of Chicago graduate student Susan Alberts complements the existing long-term records with an investigation that is focused on the complex male story.

Despite the long history of baboon research in Africa by our team and by researchers in other parts of Africa, studies at different sites have often focused on different aspects of behavior. Sometimes differing conclusions have been reported when the same topic has been examined, resulting in a somewhat puzzling picture. Baboons are long-lived, complex, and among the most adaptable of non-human primates. This adaptability has led to their presence in habitats from semi-desert in both very cold

and very hot regions to open grasslands, savannahs, and woodlands or forests along the edge of rivers. They live in groups that consist of as few as 10 individuals and as many as 100 or more. Little is known, for baboons or any other primate, about how these different conditions affect individuals, how they affect group life, and how adaptation to current conditions and preparation for future conditions are managed during development by mothers and by their maturing youngsters.

These are important basic biological questions in themselves, but we are also convinced that they are critical to wise management of primates in captivity and in the rapidly changing conditions of traditional natural environments. Baboons might be more flexible than many other species, even many other primate species, but even they must have limits to their adaptability, and they must have techniques for adjusting successfully to differing conditions when they are able to do so. An understanding of the nature, limits, and processes by which this flexibility occurs should provide insights that we can apply to other species. With this somewhat ambitious goal as our focus, we began the series of comparative studies at Brookfield and in East Africa that are currently underway. Just as the background data from Amboseli resulted from contributions of a variety of students and colleagues who joined us in the years since they initiated the Amboseli baboon studies, both Kenyan and American students have joined in the present projects in Chicago and in Kenya. Some of the initial results are intriguing.



Within a single social group, animals form smaller clusters with family and special friends, such as these in Amboseli.

C. Saunders



Baboons, like humans, can be identified by individual physical characteristics; even among these large males, there are striking differences in the length and shape of their tails. Compare Max (upper left), whose long tail has a high hook and lies snugly next to his body with a sharp kink near the tip, with the other males who have tails that are shorter, held lower, are less hooked, or held away from the body.

Amboseli Identification File

One of the first things that strikes anyone who follows a group of baboons across the African savannahs is how much time and energy they spend just making a living: feeding, walking, avoiding predation. The animals travel almost 10 kilometers a day in the hot sun, seek increasingly scarce water sources as the dry season progresses, laboriously dig bulbs or grass corms from the ground, seek distant patches of choice flowers or fruit that might be ripe. Only about 25% of the daytime hours remain for the two completely wild-foraging groups in Amboseli to socialize and rest.

What happens when food is provided in quantity at a single, predictable place? This is the situation for the baboons on Baboon Island at Brookfield, and it is also the case for one of the groups, Lodge Group, in Amboseli. From these two groups half a world apart, the answer was the same: a life of leisure.

Lodge Group has a home range adjacent to those of the wild-feeding groups, and much of its own range is similar to those of the others; in addition, however, the range of Lodge Group includes one of the Park tourist lodges and there is a garbage pit that receives the daily leftovers and

food preparation scraps from this busy facility. After sitting around for most of the day, the baboons of Lodge Group make short daily forays to the pit where they busily feed just after the garbage has been dumped. University of Nairobi student Philip Muruthi observed the animals in Lodge Group while Amy Samuels and University of Chicago undergraduate Netzin Gerald studied the baboons at Brookfield. Then, we all met in Chicago to analyze data and compare the results.

Animals in both the Baboon Island group at Brookfield and Lodge Group spend less than a quarter of the daytime feeding, and spend almost half of it resting and another quarter in social activities. Instead of traveling 8-10 kilometers a day, the Lodge Group baboons descend from their sleeping trees later than the others, walk only a kilometer to the Lodge area, rest and socialize there until the garbage arrives, feed, and then reverse their route at sunset, probably not traveling a greater distance than do their Brookfield Zoo counterparts. In a detailed study of food

intake and energy expenditure, Philip found that the Lodge Group baboons didn't take in more nutrients than the wild-feeding ones did, but they expended much less energy than did the others.

What do the Baboon Island and Lodge Group animals do with their extra energy? The youngsters grow more rapidly and the females mature earlier and produce infants more often. At birth, infants of the several groups differ little in weight, but from the first months of life, the Brookfield animals grow at about double the rate of the wild-feeding Amboseli youngsters. While an infant in Alto's Group is still being carried and suckled for long periods by a mother who will not resume ovulatory cycles for almost a year, its peer on Baboon Island is independent and its mother is pregnant with her next infant! We



J. and S. Altmann

Wherever they live, most primates engage in grooming sessions with family members and special friends.

don't yet know whether the more rapid resumption of fertility is a simple and direct result of the mother's own improved nutrition or whether it is primarily a result of her infant's earlier nutritional independence which arises from the accessible and easy to eat foods that are provided. Understanding the extent and causes of this dramatic reproductive increase has obvious applications in both captive and wild populations.

As with humans who grow up in very good nutritional conditions, the females on Baboon Island reach reproductive maturity (menarche) at a much younger age than those that depend entirely on foraging for wild foods—a three-year old in Alto's Group is very much a young juvenile, just beginning to assert her place next to her mother in the rigid female dominance hierarchy. Even menarche is almost two years away, and she won't become pregnant until she is almost six years old. In contrast, our rapidly growing Brookfield Zoo youngsters reach menarche as three-year olds, and by the age that an Amboseli youngster reaches adolescence, a female on Baboon Island is busy caring for her first infant!

As we further explore the effects of differing nutritional and ecological differences on growth and reproduction, it will also be important to learn whether there are unanticipated disadvantages of these apparently advantageous high reproductive rates or of growing up so fast. Does earlier reproduction adversely affect the growth or maturation of a young female? Does the shorter period of maternal care that Baboon Island youngsters receive have negative consequences for either the mother or her infant? These are questions for which the answers are not yet in.

The studies thus far demonstrate that major differences in food resources have dramatic effects on daily life, physical development, and reproduction. But do they affect other aspects of individual behavior, social structure, or



J. and S. Altmann

In Amboseli National Park, Kenya, as at Brookfield Zoo, Amy Samuels follows the maturation of the "teenage girls" in baboon society.

family relations? Are other aspects of development affected as much as weight and reproduction? If not, what are the consequences of maturing at a younger age in some aspects of life, such as reproduction, but not in others, such as in social relations? Recall, for example, the four year old on Baboon Island who is caring for her first infant at an age when she would be establishing her place in the social structure were she in Alto's Group in Amboseli. Does a Baboon Island female complete her social maturation as well as her reproductive maturation at a younger age or must she deal with both tasks at once? Questions such as these form the basis for the comparative studies of Brookfield and Amboseli 'teenagers' that are currently underway.

Survival of a species depends on maintenance of essential aspects of those animals' social structure and individual behavior as well as maintenance of genetic diversity. People used to take a very typological approach to behavior and social structure; they acted as if only a single form was normal for a species. Now there is increasing recognition

that behavior and social structure normally vary not only within the population, as is the case with genetic variability, but that these characteristics also vary within the lifetime of a single individual. We need a knowledge of the sources, uses, and limits of this natural variability in behavior, and an understanding of the consequences if behavioral variability and flexibility are lost. Only then can we prepare to make wise decisions for captive or wild populations. Because these issues are key ones for ecological and genetic characterizations as well, and because the three are inexorably linked, this scientific trilogy is the focus of the Conservation Biology program of the Chicago Zoological Society.

Baboons at Brookfield

Baboons organize themselves into large, complex social groups whether they live a life of leisure at Brookfield Zoo or a rugged one in their native African habitats. Studies at Brookfield on the Guinea baboon (*Papio papio*) and in Amboseli National Park in Kenya on the yellow baboon (*Papio cynocephalus*) shed light on baboon life when ecological pressures are removed.



M. Greer



A. Samuels



M. Greer



H. Greenblatt



H. Greenblatt

A Visitors can observe a wide range of natural baboon behavior at Baboon Island.

B University of Chicago student Netzin Gerald assists with studies of grooming by collecting data at Brookfield and helping analyze data from her co-workers in Kenya.

C Grooming is important for establishing and maintaining social bonds.
D Brookfield Zoo baboons can just pick a handful of food from an accessible pile.

E Youngsters develop rapidly at the zoo, and their mothers are soon pregnant again.

Amboseli National Park, Kenya



C. Saunders



J. and S. Altmann



J. and S. Altmann



A. Samuels



C. Saunders

A Soon after dawn, the Amboseli baboons descend from the safety of the trees for a day of travel and feeding on the sparse plants they seek across the savannas.

B Infants are often a focus of attention when the Amboseli animals take a mid-day rest from foraging.
C Wild baboons spend about 75% of their time foraging and feeding.

D University of Nairobi graduate student Philip Muruthi collects information on nutrition and social behavior by following the baboons during their long day-journeys.

E Mothers provide almost all their infants' grooming; as the youngsters mature, daughters and sometimes sons reciprocate in grooming sessions with their mothers.