

## **The African Elephant (*Loxodonta africana*)**

The largest of land mammals is also distinguished by one of the most advanced social organizations. The African elephant is remarkable in the closeness and intimacy of the ties formed between the females, the power of the matriarch who rules over the family group, and the length of time these individual associations endure. This conception of elephant sociobiology is of recent vintage. The essential facts were inferred by Laws and Parker (1968) from demographic data and confirmed in direct behavioral observations by Hubert and Ursula Hendrichs (1971), who devoted two years to studying a population on the Serengeti Plains. More recently Iain Douglas-Hamilton (1972, 1973) has conducted a four-and-a-half-year study at Lake Manyara National Park, Tanzania, during which he came to recognize 414 of the approximately 500 elephants present and recorded an impressive amount of detail on their individual relationships and the histories of family groups. The following account is based to a large extent on the Douglas-Hamilton study.

The African elephant occurs today through most of sub-Saharan Africa exclusive of the Cape, but as recently as Roman times it ranged north to the shores of the Mediterranean and Syria. Possibly several hundred populations now exist, each comprised of 1000 to 8000 individuals inhabiting an area of 1300-2600 square kilometers. Elephants are exclusively vegetarian, browsing on a great variety of plants. Within a 12-hour period one animal was seen to sample no less than 64 species of plants belonging to 28 families. As suitable vegetation grows scarce in a particular locality, the animals turn increasingly to the consumption of grass, but they cannot thrive indefinitely on this secondary food. Elephants can have a devastating effect on their environment. They strip trees of bark and branches, killing many. At higher population densities they eventually turn dry forests into parkland. A few bulls have the ability to push over larger trees, providing meals for themselves and their companions. The seeds of acacia and other trees and bushes pass through the digestive tract unharmed and sprout from the dung, so that in time an equilibrium is attained between the size of the elephant populations and the thickness of the vegetation on which they live.

Each population is organized into a two- or three-tiered hierarchy of social groupings. The most important grouping directly above the individual is the *family unit*, a tightly knit herd of 10-20 females and their offspring led by a powerful matriarch. At Manyara each unit contained an average of 3.4 female-offspring groups. Members appear never to wander from their unit for distances greater than a kilometer during intervals longer than a day. The matriarch is generally the oldest individual and hence the largest and strongest, since elephants continue growing past maturity. Because of her age, the adult females around her are likely to include not only her daughters but also her granddaughters, and the female-female bonds can be assumed to last as long as 50 years. The matriarch rallies the others and leads them from one place to another. She takes the forward position when confronting danger and the rear position during retreats. When she grows old and feeble a younger cow gradually takes her place. But in cases where the matriarch dies suddenly the effect is traumatic. The survivors mill around her body in panic, disorganized and seemingly unable to retreat or to mount a proper defense. Hunters have long known that when the leader is shot, the rest of the herd can easily be brought down in rapid succession. For this reason, Laws and Parker recommended that when culling is made necessary by population pressure, entire family units should be removed and not just individuals picked at random.

The second level in social organization is the *kinship* group, an ensemble of family units that remain near one another and whose members show some degree of personal familiarity. It is probable that such groups originate when family units divide by fission. That the units do split is indicated by the fact that few contain more than 20 individuals even though most are constantly growing. Douglas-Hamilton witnessed the process of division in the largest unit at Manyara which contained 22 members. Over a period of a year 2 young cows, an adolescent female, and 2 calves moved increasing distances from the remainder of the unit. After the adolescent female calved for the first time, the two subgroups remained apart for varying periods. Then one day the matriarch led the original family unit southward for a distance of 15 kilometers, the producing the first major spatial separation of the two groups. When the parental unit returned to the original site, the derivative group rejoined it and continued to stay nearby. If this case history proves to be typical, the description of such complexes as kinship groups will be justified.

It is possible that population growth, expanding the assemblages of ultra-stable female groups, produces even larger social complexes which are coextensive with the local populations themselves. Such "clans" contain perhaps 100-250 individuals. During migrations as many as a thousand elephants form mobile aggregations that are evidently unorganized above the level of the kinship group. At Manyara, family units occupied home ranges 14 to 52 square kilometers in extent, through which they wandered in irregular patterns. The ranges overlapped greatly and there was no overt territorial behavior, possibly a result of the kinship ties of adjacent groups.

The degree of cooperation and altruism displayed within the family group is extraordinary. Young calves of both sexes are treated equally, and each is permitted to suckle from any nursing mother in the group. Adolescent cows serve as "aunts," restraining the calves from running ahead and nudging them awake from naps. When Douglas-Hamilton felled a young bull with an anesthetic dart, the adult cows rushed to his aid and tried to raise him to his feet. Similar behavior has been observed frequently by elephant hunters. In its adaptive value the response is basically similar to the raising of injured dolphins by their fellow school members. Because of the great bulk of the animal, a fallen elephant will soon suffocate from its weight or overheat from lying still in the sun. Finally, the matriarch is exceptionally altruistic. She is ready to expose herself to danger while protecting her herd, and she is the most courageous individual when the group assembles in the characteristic circular defense formation (see Figure 24-4).

While still in the company of their mothers, young bulls anticipate their future roles by rushing at one another in mock charges and play-fighting. In adolescence they begin to be pushed away by the cows and at the age of 13 years, when almost grown, they are repeatedly chased away until they leave altogether. Adult males live alone or in loose bands and disperse more widely than the females. When in groups they compete for position in a dominance hierarchy, with the outcome usually being settled on the basis of size. The struggles become most strenuous in the presence of estrous females, but even then they result in serious injury. Coalitions of the kind seen in higher primates appear to exist among the male elephant groups. Hendrichs and Hendrichs observed a "protected threat" maneuver very similar to that reported independently in the hamadryas baboon by Kummer (see Chapter 26). That is, smaller bulls were able to dominate middle-sized ones by the mere proximity of senior bulls. The largest animals intimidated the small bulls less than they did the middle-sized animals, which were evidently more likely to be treated as rivals.

African elephants communicate mostly by visual signals produced with the forward part of the body. Hostility is expressed by a graded series of composite postures and movements. At lowest intensity the animal "stands tall", increasing its apparent size by lifting its head up to the peer over its tusks, with its ears cocked forward. According to the Hendrichs, elephants convey a higher-intensity threat by moving toward the enemy, lifting the ears with a loud crack, and extending the trunk jerkily forward. When displaying toward a smaller rival the elephant may employ the "forward trunk swish," in which the trunk is rolled up and then

suddenly unfurled toward the opponent. At the same time it emits a blast of air or trumpet call. A few individual hurl bunches of grass, branches, and other objects in the direction of the rival. The use of the trunk illustrates the importance of context in elephant communication. When accompanied by an erect stance and a forward posture of the ears, a trunk extension is almost certainly a signal of hostility. But the trunk can also be held out simply to test the air or as a friendly gesture. When two elephants meet after a temporary separation they perform a greeting ceremony closely similar to that of the wolf and African wild dog. Each places the tip of its trunk into the mouth of the other, with the smaller animal ordinarily taking the initiative. The behavior could be a ritualized feeding movement. Calves often probe the mouths of their mothers to sample the food being eaten.

The ultimate aggressive act by an African elephant is the full charge, one of the awesome spectacles of nature. It is probably directed only at dangerous predators, including man. In a serious attack hostile displays are minimal and little warning of any kind is given.

One unknown young female with new-born calf disappeared to the right. After a 60 seconds interval, a large female (size category 5), with ears fully extended, charged silently out of the bush into which the young female and calf had vanished. She forced one tusk into the side of my landrover behind the cab without checking her stride. The vehicle was turned through 90°. Now other elephants appeared, which prevented any observation of the first cow, but from the damage it appears that she had withdrawn her tusk and dealt one more blow. The new elephants, with a calf of about 3 years among the foremost, came running from the righthand side and went straight into the attack without any hesitation, but this time the action was mingled with loud continuous trumpeting. A second fully adult female used her head to butt and afterwards press down upon the roof of the cab. She leaned heavily sideways against the vehicle and her tusks scraped the bodywork behind the door. A third female charged from the front and drove her left tusk through one of the headlights. She withdrew it rapidly and thrust again penetrating past the radiator until 3½ feet of the tusk was buried in the car. She jerked up her head, let it return, and began to push. The car was moved backward for about 35 yards until it hit a small tree. The third cow and the other now retired for about 30 yards where they stopped and formed a tight circle, still trumpeting, and facing outward with ears spread out and heads lifted. Within the next minute the group dissolved into the bush. (Douglas-Hamilton, 1972)

The hearing of elephants is evidently about as acute as that of human beings, and in captivity they can easily be trained to respond to the human voice. Fully trained Indian elephants are able to obey as many as 24 separate verbal commands from their mahouts. In the free-living African elephant, vocal communication is as rich and frequent as visual communication, The sounds can be roughly classified as growls, trumpets, squeals, and shrieks, but these vary greatly in intensity and the context in which they are emitted. Growling, which sounds like a deep, rolling *r*, is one of the commonest and most versatile elephant sounds. A growl can carry as far as a kilometer, and its usual function seems to be the maintenance of contact between individuals and families. But it also serves as a mildly aggressive signal between cows and calves when the young animals try to push their way to water holes dug by the adults. Calves growl while play-fighting. Another form of growling is combined with trumpeting during the more serious aggressive displays between adults. Some anecdotal evidence suggests that individual members of a group are able to recognize one another by minor variations in the quality of the sounds.

Chemical communication is also well developed, which is perhaps surprising in such a gigantic mammal. Douglas-Hamilton saw a separated individual track its family unit by following a two-hour-old trail with the tip of its trunk. Bulls frequently check the sexual condition of cows by putting the tips of their trunks to the females' genital openings. A major mystery is provided by the temporal gland, which is located between the ear and eye and periodically secretes a viscous, strongly smelling liquid. The secretion is released in greatest

quantities when the animals are excited or under stress, which suggests that the gland may be under autonomic control. It is functional in both sexes, whereas in the Asiatic elephant it is functional only in the male. Like Asiatic elephants, *Loxodonta* rub the secretion against trees and on the earth, but the purpose is unclear. There is no evidence that males mark and defend territories, even though the flow of the liquid does seem to increase with population density. On the basis of numerous field observations, Douglas-Hamilton has hypothesized that the secretion serves multiple communicative functions – in trail marking, individual recognition, alarm, and perhaps social spacing.

The studies of Eisenberg, McKay, and their associates in Ceylon indicate that the social behavior of the Asiatic elephant (*Elephas maximus*) is basically similar to that of the African elephant. In particular, the stable groups are family units containing 8 to 21 cows and young; the units are led by a matriarch; calves nurse from any lactating female in the group; and males begin to depart when they are about 5 to 7 years old. Some differences have been noted, however. Males over 14 years of age exhibit the phenomenon of musth, a temporary state in which they become exceptionally aggressive and sexually active while secreting large quantities of temporal gland liquid. The males rub the secretion on tree trunks, evidently as a means of signaling their presence and mood. Bull elephants can breed when not in musth, but the condition clearly increases their chances of achieving dominance among rivals and permits more ready access to estrous females. It would be interesting to know whether the secretions vary enough to impart individual odor "signatures."