

## SPECIES ACCOUNTS

*Alouatta palliata* (Congo, Howling  
Monkey, Howler Monkey)

K. E. Glander

This large New World primate is best known for the stentorian vocalizations of the adult males (fig. 9.1a). These loud calls can be heard for more than 1 km in dense forests and are often given at sunrise and sunset as well as in response to such stimuli as people, airplanes, rain, thunder, and other howlers. The vocalizations are believed to be a spacing mechanism (Jolly 1972), and they may also serve as a means of communication within a social group (Jones 1978).

An adult male Costa Rican howler weighs 6 to 7 kg. Adult female howlers (fig. 9.1b) weigh 4 to 5 kg. Adults are black with brown or blond saddles and have long guard hairs on their flanks. These guard hairs give them their common name, mantled howling monkeys. At birth infants weigh about 0.4 kg and are silver to golden brown. They acquire the adult pelage by 12 weeks of age and begin to move away from their mothers about the same time.



FIGURE 9.1 *Alouatta palliata*. a, Adult male, Barro Colorado Island, Panama (photo, J. H. Kaufmann). b, Adult female with juvenile, Finca La Pacifica, near Canas, Guanacaste Province, Costa Rica (photo, K. E. Glander).

Female mantled howling monkeys become sexually active when they are about 36 months old and have their first infant at between 40 and 46 months of age (Glander 1981). Before impregnation the females experience a regular estrous cycle averaging 16 days, demonstrate sex skin changes, and participate in multiple matings. Gestation takes 6 months; births have been scattered in some years and clustered in others. The interval between births averaged 23 months, and lactation may last 18 months. (Glander 1980)

Mantled howler groups usually consist of several adult males, several adult females, and associated juveniles and infants. The average group size for La Pacifica howler groups is eleven animals (Glander 1975), with eighteen the average for Barro Colorado groups (Carpenter 1934). Linear dominance hierarchies exist, with all adult males being dominant to all females (Glander 1975). Rank and age are negatively correlated—that is, the youngest adult of either sex occupies the alpha position for that sex (Jones 1978; Glander, pers. obs.). Both juvenile males and females usually leave their maternal group (Glander 1980). The males leave earlier than the females (15 to 36 months compared with 24 to 40 months).

Howling monkeys are considered to be leaf-eaters made up 63.6% of the diet of Costa Rican howlers (Glander 1975). Fruit and flowers composed 30.7%. More specifically, the average yearly diet consisted of 19.4% mature leaves, 44.2% new leaves, 12.5% fruit, 18.2% flowers, and 5.7% petioles and piths (Glander 1975). It is important to separate mature and new leaves as dietary items because they are very different types of food. Compared with mature leaves, new leaves are short-term occurrences, contain more water, less fiber, and fewer secondary compounds, and require more time to harvest (Glander 1981).

Yearly averages for ingested tree parts, such as those above, mask a great deal of variability in the daily diet. Howlers are extremely selective, ingesting certain tree parts from certain tree species. For example, the study group ate new leaves of *Andira inermis*, *Ficus glabrata*, and *Hymenaea courbaril* but never ate mature leaves from any of these tree species. In some cases they ate the mature leaves of certain individual trees but not the mature leaves from other trees of the same species (*Gliricidia septum*, *Bursera simaruba*) (Glander 1975). The mature leaves of *Andira inermis*, *F. glabrata*, and *H. courbaril* all contained condensed tannins, while the new leaves of these tree species contained either no tannins or hydrolysable tannins (Glander 1981). A similar situation occurred within a tree species. Mature leaves of *G. septum* and *B. simaruba* that were ingested contained either no tannins or hydrolysable tannins, while those

that were not eaten contained condensed tannins. In addition, mature leaves that were not eaten contained alkaloids, while those that were eaten did not contain alkaloids (Glander 1981).

Nutritional analyses show that mature leaves that were eaten contained significantly more protein, more methionine, and less fiber than those that were not eaten (Glander 1981). Further, mature leaves that were eaten did not differ significantly from new leaves that were ingested.

It appears that the study group was selecting an optimal diet, at least in terms of maximizing total protein and certain essential amino acids while minimizing the intake of fiber and plant secondary compounds (Glander 1981). Faced with a wide variety of mature leaves (ninety-six tree species were present in the 9.9 ha home range of one group of howlers) the howlers can and do select the best items available (in terms of highest nutrients and lowest content of secondary compounds). Phenophase availability changes throughout the year, and this is reflected in the daily diet composition. The study group preferred new leaves and flowers to mature leaves. Thus, during the late dry and early wet seasons when these phenophases are available new leaves and flowers may constitute 100% of daily diet. Similarly, during the late wet season fruit and mature leaves make up the bulk of the diet.

*Alouatta palliata* commonly inhabits both lowland and montane forests (up to 2,500 m) from southern Mexico to northwestern South America (Napier and Napier 1967). In Costa Rica they are the last remaining nonhuman primates in many relict patches of forest.

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## *Artibeus jamaicensis* (Murciélago) Frutero Jamaicano, Jamaican Fruit Bat

D. W. Morrison

The Jamaican fruit bat (fig. 9.2a) is one of the most commonly mist-netted bats in Central America. Adults are stout bodied, weighing about 50 g, with a wingspan of 40 cm (forearm 58-65 mm). Found in both wet and dry forests from Mexico to Brazil, these bats occasionally take pollen and insects (Heithaus, Fleming, and Opler 1975) but feed primarily on the fruits of large trees (Gardner 1977). Of 131 fecal samples collected from mist-netted *Artibeus jamaicensis* in Panama (Bonaccorso 1975), 104 contained *Ficus* spp. (figs), 11 *Calophyllum longifolium*, 8 *Quararibea asterolepis*, 6 *Spondias mombin*, 5 *Cecropia* spp., 2 *Dipteryx panamensis*, and 2 *Piper* spp. Unlike the smaller fruit bat *Carollia perspicillata*, *A. jamaicensis* only rarely takes *Piper* spp. or other widely

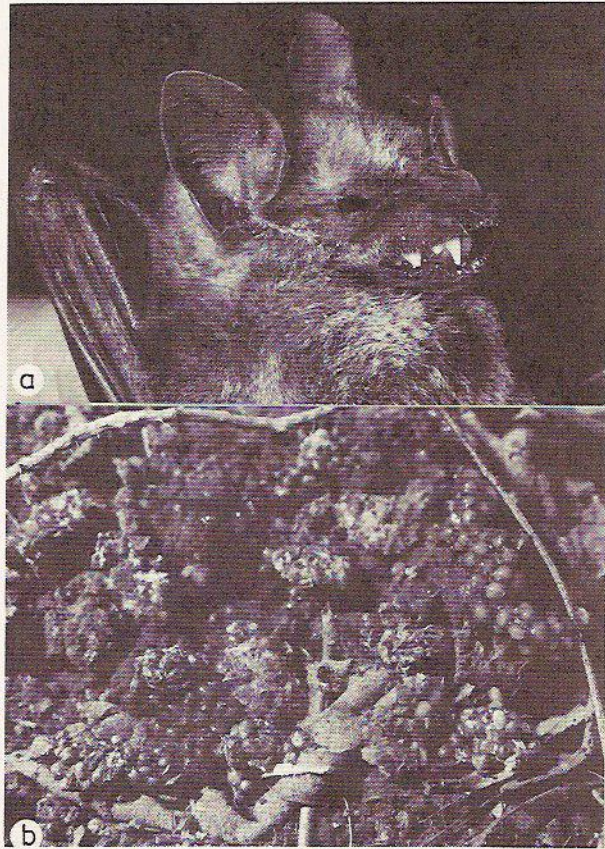


FIGURE 9.2. *Artibeus jamaicensis*. a, Adult bat. Finca La Pacifica, near Cañas, Guanacaste Province, Costa Rica. b, Ground beneath a presumed *Artibeus* feeding roost, littered with wads of chewed fig (e.g., dry lump in lower right with fig wasp exit hole in seed) and intact seed-rich feces (e.g., moist "rope" of intact seeds in upper right). Santa Rosa National Park, Guanacaste Province, Costa Rica (photos, D. H. Janzen).