

*Potos flavus*. By Linda S. Ford and Robert S. Hoffmann

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***Potos Geoffroy Saint-Hilaire and Cuvier, 1795***

- Potos* Geoffroy Saint-Hilaire and Cuvier, 1795:187. Type species *Viverra caudivolvula* Schreber, 1778:453.  
*Kinkajou* Lacépède, 1799:7. Type species *Viverra caudivolvula* Schreber, 1778:453.  
*Caudivolvulus* Dumeril, 1806:14. Type species "Le Kinkajou."  
*Cercoleptes* Illiger, 1811:127. Type species *Viverra caudivolvula* Schreber, 1778:453.  
*Kinkashu* Fischer von Waldheim, 1813:14. *Nomen novum* for *Kinkajou* Lacépède, 1799:7.  
*Kinkashus* Fischer von Waldheim, 1813:21. Emendation of *Kinkajou* Lacépède, 1799:7.  
*Aesurus* Rafinesque, 1815:59. *Nomen novum* for *Kinkajou* Lacépède, 1799:7.  
*Pottos* Gray, 1827:115. Emendation of *Potos* Geoffroy Saint-Hilaire and Cuvier, 1795:187.  
*Kinkojou* Gill, 1872:67. Emendation of *Kinkajou* Lacépède, 1799:7.  
*Mamcercoleptes* Herrera, 1899:19. Emendation of *Cercoleptes* Illiger, 1815:109.  
*Potus* Anónimo, 1923. Emendation of *Potos* Geoffroy Saint-Hilaire and Cuvier, 1795:187.  
*Cercoleptes* Quirós Amador, 1954:71. Emendation of *Cercoleptes* Illiger, 1815:109.  
*Petos* Rochereau, 1961:71. Typographic error?

**CONTEXT AND CONTENT.** Order Carnivora, Superfamily Canoidea, Family Procyonidae, Subfamily Potosinae, Genus *Potos*. Hernández-Camacho (1977) resurrected the monogeneric family Cercoleptidae Bonaparte, 1838, because of the autapomorphies possessed by this taxon, but Hall (1981) considered it a procyonid. The genus *Potos* is monotypic.

***Potos flavus* (Schreber, 1774)**

**Kinkajou**

- Lemur flavus* Schreber, 1774:188 (index). Plate 16, fig. 2 in Pennant (1771:135, 138); designated lectotype by Husson (1978:289). Type locality "Er ist, der Sage nach, auf den Gebirgen in Jamaica einheimisch" (Schreber, 1774:145). Corrected to "Surinam" by Thomas (1902:267). See Husson (1978:285) for discussion of problem.  
*Mustela potto* Müller, 1776:3 (not seen, cited in Cabrera, 1958:251).  
*Viverra caudivolvula* Schreber, 1778:453, Plate 125B. Type locality "Surinam."  
*Viverra prehensilis* Kerr, 1792:169. Type locality "Mexico and New Spain"; restricted to "Mexico . . . Atoyac, Veracruz" by Hershkovitz (1959:350). "Atoyac" probably refers to the town on the Río Atoyac (18°54'N, 96°46'W).  
*Cercoleptes lepida* Illiger, 1815 (1804-1811):109 (*Nomen nudum*).  
*Nasua nocturna* Wied[-Neuwied], 1826:298. Type locality "grossen Urwäldern der Ostküste von Brasilien"; designated "São Miguel dos Campos, . . . Estado de Alagoas" by Vieira (1952:35). Neotype [specimen 7.381; Departamento de Zoologia (=Museu de Zoologia, Universidade de São Paulo, Brasil)] designated by Vieira (1952:35).  
*Cercoleptes megalotus* Martin, 1836:82. Type locality unknown, designated "Santa Marta, [Department of Magdalena] Colombia" by Kortlücke (1973:29).  
*Cercoleptes brachyotus* Martin, 1836:82. Type locality unknown.  
*Viverra caudivolvula* Cuvier, 1839:Plate 2, fig. 1 (not Schreber, 1777 = Schreber, 1778 of Sherborn, 1891).

*Cercoleptes brachyotus* Schinz, 1844:311. Type locality "Brasilia, Guyana, Mexico?"

**CONTEXT AND CONTENT.** Context as above in generic summary. Eight subspecies of *P. flavus* are recognized—two in Middle America and six predominately in South America (Cabrera, 1958; Hall, 1981; Kortlücke, 1973). Cabrera (1958) questioned the validity of *P. f. modestus*, but did not synonymize the taxon because of lack of topotypic material:

- P. f. chapadensis* J. A. Allen, 1904:76. Type locality "Chapada, Mato Grosso, Brazil." "Chapada" probably refers to Chapada dos Guimarães (15°26'S, 55°45'W).  
*P. f. chiriquensis* J. A. Allen, 1904:72. Type locality "Boqueron, Chiriqui, Panama."  
*P. f. flavus* (Schreber, 1774:188), see above; *caudivolvula* Schreber, *potto* Müller, *brachyotus* Martin, and *brachyotus* Schinz are synonyms (Cabrera, 1958).  
*P. f. megalotus* (Martin, 1836:82), see above.  
*P. f. meridensis* Thomas, 1902:267. Type locality "Merida, Venezuela."  
*P. f. modestus* Thomas, 1902:267. Type locality "W Ecuador" restricted to "Montes Balzar, provincia de Guayas, Ecuador" by Cabrera (1958:251). Balzar, Guayas, is a town on the Río Daule at 100 m; it "has been erroneously called 'Balzar Mts'" (Paynter and Traylor, 1977:10).  
*P. f. nocturnus* (Wied[-Neuwied], 1826:298), see above.  
*P. f. prehensilis* (Kerr, 1792:169), see above.

**DIAGNOSIS.** The genus *Potos* differs from other genera of procyonids in having small, rounded ears, presence of two ventral (sternal and mid-abdominal) cutaneous glands, a prehensile tail, long and narrow extensible tongue, and unique baculum that ends in four short, radiating, round-tipped branches. The general external appearance (Fig. 1) of the kinkajou is superficially similar to the olingo, *Bassaricyon*; Huet (1882), based on this similarity, placed *Bassaricyon* as a subgenus of *Cercoleptes* (= *Potos*). However, the kinkajou has a more woolly pelage and a tapering prehensile tail. The philtrum of the nose is broader; the digits are united by webbing for only one-third of their length beyond the plantar pad, and the teeth are larger (except M<sup>2</sup>), flatter, lower crowned, and less tuberculated than in *Bassaricyon* (Hollister, 1915; Pocock, 1921). The kinkajou has been compared with primates, because of its large, forwardly directed eyes, prehensile tail, and the wide, flat angular process of the mandible. It differs from primates in dentition and possessing heavy fur on the posterior part of the sole of the foot (Hall, 1981; Pocock, 1921). Although *Potos* resembles the ursoid *Ailurus* on the basis of dental and bullae characteristics (Hollister, 1915; Pocock, 1928), the kinkajou can be distinguished from ursoids by its lack of an alisphenoid canal (Flower, 1869). The kinkajou convergently resembles the Asian viverrid, the binturong (*Arctictis binturong*), in form (limb proportion, prehensile tail), adaptation, and habits (arboreal, nocturnal; Flower, 1869; Mivart, 1885; Nowak and Paradiso, 1983).

**GENERAL CHARACTERS.** Pelage thick, soft, and woolly; form elongated; head rounded; muzzle short, pointed; tail long, prehensile; ears short, rounded; posterior half of soles densely furred; claws short, sharply pointed; digits partially webbed; limbs short (Fig. 1). Skull short, rounded, and highly arched at braincase; rostrum short and broad; postorbital process of frontal well developed; postorbital process of jugal not as well developed as that of frontal; braincase large, strongly constricted in postorbital region; prominence of sagittal crest variable; well-developed occipital crest extending anterolaterally to prominent squamosal crest; squamosal crest continues anteriorly to expand and form the zygomatic process; zygoma only slightly arched dorsally (Fig. 2). Palate flat, short,



FIG. 1. Adult female kinkajou (captive) from Panama. Photo by E. Young, courtesy of D. MacClintock.

extending and angling slightly dorsally a short distance posterior to plane of maxillary tuberosities; pterygoid with sharp ventral flange; auditory bullae ossified completely and flat; paraoccipital processes small and posteriorly projected. Mandible heavy; ramus high and straight; coronoid process prominent and angled slightly posteriorly; mandibular condyle well developed; angular process heavy, extending ventrally to ramus, and forming 90° angle between mandibular condyle and ramus (Hall, 1981; Hollister, 1915; Hough, 1948; Pocock, 1921).

Teeth low-crowned, weakly tuberculate; incisor-canine diastema short; incisors heavy, broad; molars, premolars, and especially canines, large. Adult dentition  $i\ 3/3$ ,  $c\ 1/1$ ,  $p\ 3/3$ ,  $m\ 2/2$ , total 36. The first premolar and last molar are absent (Hall, 1981; Hollister, 1915). The baculum is robust, subcylindrical, and straight to slightly sinuous. The distal end terminates in four rounded processes, two directed laterodorsally and two directed anteriorly (Didier, 1950; Kortlucke, 1973).

Combined ranges of measurements (in mm) for subspecies in Middle America for males and females, respectively, are (Kortlucke,

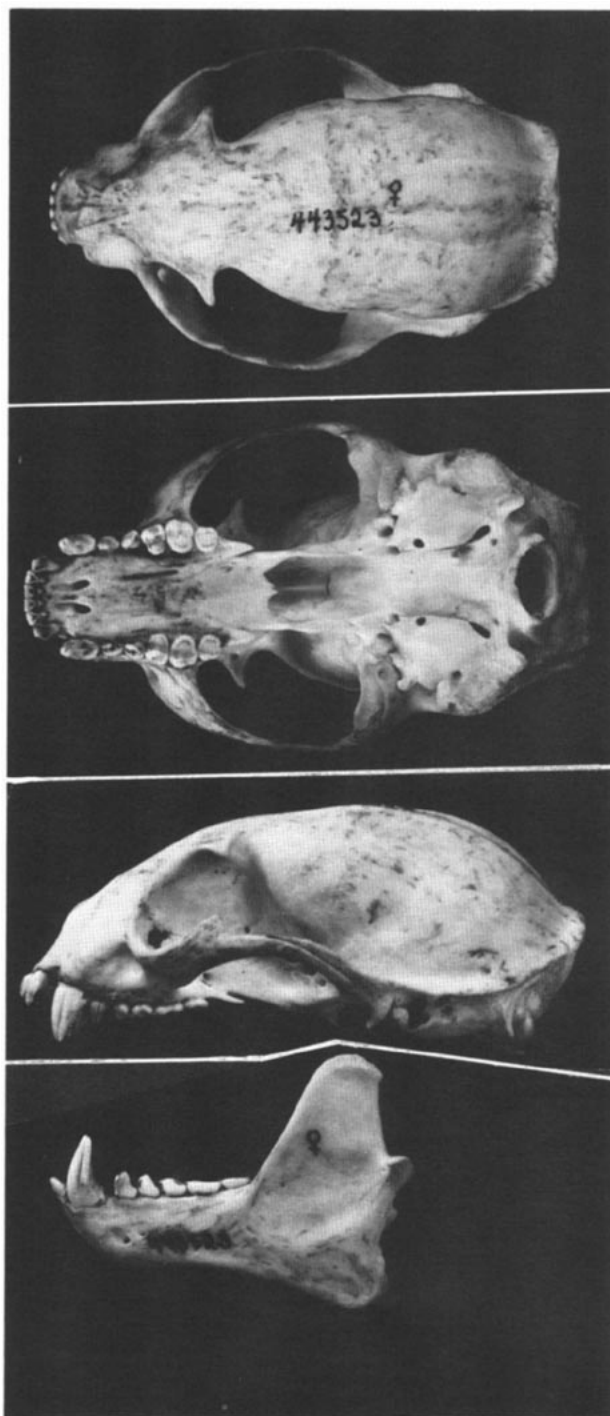


FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of mandible (from top to bottom) of adult female *Potos flavus* (U.S. National Museum of Natural History 443523) from Tachira, San Cristobal, 45 km N, 6 km E La Mesa (8°10'N, 72°10'W), 460 m. Condylbasal length is 78.3 mm.

1973); total length, 885 to 1,330, 820 to 1,051; length of tail, 420 to 570, 392 to 533; length of hind foot, 80 to 127, 85 to 140; length of ear, 36 to 55, 36 to 48; condylbasal length, 79.1 to 95.1, 76.8 to 91.6; zygomatic breadth, 54.4 to 69.3, 52.9 to 66.2; length of maxillary tooth row, 22.4 to 28.7, 22.9 to 28.5. The average for all measurements was greater predominately in males than in females in all subspecies. Other cranial measurements are given by Kortlucke (1972) and for animals from Colombia by Hernández-Camacho (1977). Nowak and Paradiso (1983) gave the range of body mass for the kinkajou as 1.4 to 4.6 kg, but did not specify the age or sex. A female kinkajou from Guatemala had a

body mass of 2.62 kg (Crile and Quiring, 1940). Seasonal and annual mass changes in a captive were reported to range from 2.5 to 3.7 kg (Bogdanovich, 1958).

Kinkajous examined from Middle America (295 specimens) were in a variety of colors at any given locality and any time of the year (Kortlucke, 1973). No seasonal trends were evident, but there was a geographical trend from paler in the north to darker in the south. Color variation reported from Middle America includes the upper parts to be tawny olive, yellowish tawny, clay color, or wood brown. A black mid-dorsal stripe is present in some animals. The underparts are deep fulvous yellow, buff or brownish yellow, and the muzzle dark brown to blackish. The tail usually is colored dorsally like the upperparts and ventrally like the underparts, but in some subspecies becomes dark brown distally (Hall, 1981). Markings and color of the pelage appear to change, depending on the lighting, because of differences in the hair type (Husson, 1978). The coloration of two juveniles was darker than the uniform golden-yellow pelage of their captive parents from Belize (Heller, 1932). The large eyes of kinkajous glow bright yellow (Hall and Dalquest, 1963; Hernández-Camacho, 1977) or green (Rabinowitz, 1986) when reflecting light.

Individual, age, sexual, and geographic variation contributed to the morphological diversity of *Potos* in Middle America (Kortlucke, 1973). Matson and Shump (1977) found less individual and sexual variation in cranial dimensions of a population in Ecuador than did Kortlucke (1973), and concluded that intrapopulational patterns may vary geographically.

**DISTRIBUTION.** The kinkajou probably occurs throughout tropical Middle and South America. Its known range is from Mato Grosso of central Brazil across central Bolivia, eastern Peru, northern Ecuador, and includes the Guianas, Surinam, Venezuela, and Colombia; northward throughout Central America to San Luis Potosi and southern Tamaulipas in eastern Mexico and Guerrero (and possibly Michoacan) in western Mexico (Fig. 3; S. Anderson, in litt.; Cabrera, 1958; Crespo, 1959; Hall, 1981; Husson, 1978; P. Myers, in litt.; Thomas, 1902). A sighting near Acuna, Tamaulipas, Mexico, by Leopold (1959) is the northernmost record of natural occurrence. Areas within these boundaries not occupied by kinkajous include the Andean highland plateaus (L. H. Emmons, in litt.), Caatinga and Chaco of Brazil (Redford and Fonseca, 1986), and apparently the dry states of Venezuela (Handley, 1976). The kinkajou was reported from the island of Trinidad (Allen and Chapman, 1893; Thomas, 1893); but Allen and Chapman (1897) considered this distribution incorrect or doubtful, because it was based on insufficient evidence. Kinkajous are found at altitudes from sea level to as high as 2,500 m (Grzimek, 1975); in Venezuela, 162 animals were collected from 24 to 1,750 m, but 97% were found below 500 m (Handley, 1976).

**FOSSIL RECORD.** Procyonids are among the rarest of known fossil carnivores, and there is no fossil record for *Potos* (Baskin, 1982). The poor fossil record is attributed to arboreal habits (Romer, 1966) and to the lack of fossil data from rain forests that appear to be their evolutionary centers (Baskin, 1982; Webb, 1985). *Potos* has been an independent lineage since approximately the Miocene (Simpson, 1945). The genus is postulated to be of Central or South American origin (Hershkovitz, 1972), or of North American origin with subsequent migration to South America during the Pliocene (Patterson and Pascual, 1972).

**FORM.** The dentition of *Potos* is similar to, but less tuberculated than in the olingo, *Bassaricyon* (Hollister, 1915; Husson, 1978). The short muzzle, large forwardly-directed eyes, and squared angular process of the jaw give the head of the kinkajou the appearance of a primate rather than a carnivore (Hough, 1948; Husson, 1978; Kortlucke, 1973; Mivart, 1885). The auditory region of *Potos* resembles members of both the mustelids (such as extension of the tympanic cavity, position of posterior carotid foramen, presence of transverse ridges on the floor, shape of head of the malleus) and the procyonids (projecting ridge on the posterior wall, position of the sinus in the posterior and superior walls of the external meatus, shape of lower articulation facet of malleus), and considered an intermediate form between the two families (Segall, 1943). The posterior projection of the paraoccipital process from the auditory bulla is greater than in other procyonids, but similar to the ursoid *Ailurus* (Pocock, 1928).

The origins, insertions, and functions of the muscles and the bone structures, such as crests, tuberosities, and foramina, were

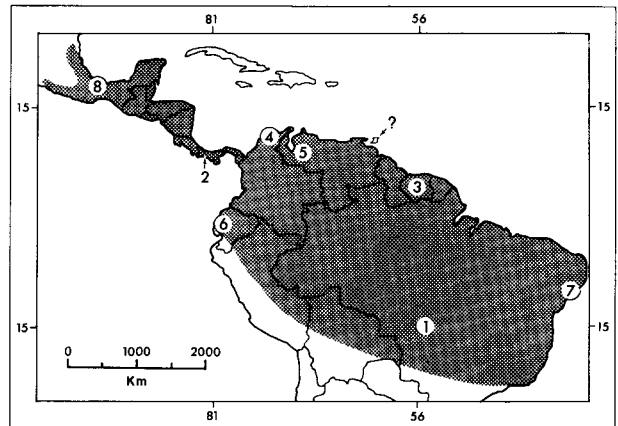


FIG. 3. Distribution of *Potos flavus* in Middle and South America. Northern range boundary taken from Hall (1981) and southern boundary derived from Cabrera (1958), S. Anderson (in litt.), and P. Myers (in litt.). Type localities of subspecies are as follows: 1, *P. f. chapadensis*; 2, *P. f. chiriquensis*; 3, *P. f. flavus*; 4, *P. f. megalotus*; 5, *P. f. meridensis*; 6, *P. f. modestus*; 7, *P. f. nocturnus*; 8, *P. f. prehensilis*. Symbol "?" = questionable distribution in Trinidad. The shading of the map is generalized; details of distribution are lacking for most of the range and a consistently detailed map is not possible at this time.

described and illustrated for the extremities, including the tail, pectoral and pelvic girdle by Julitz (1909). The biceps and the coracobrachialis muscles are two-headed as in primates and not monogastric as in the domestic dog (*Canis*), caracal (*Felis caracal*), and civet (*Paradoxurus hermaphroditus*; Beswick-Perrin, 1871). The calcaneum of *Potos* in most characteristics resembles that of the olingo (*Bassaricyon*), but its posterior articular surface distinguishes it from other procyonids and ursids (Stains, 1973).

The kinkajou resembles the ursoid *Ailurus* in carotid arterial pattern (Story, 1951), and exhibits mustelid features in the arteries of the forearm (Davis, 1941). The relative placement and description of the internal organs was noted by Mivart (1885) and Owen (1835). The loss of anal glands in kinkajous is considered unique among the procyonids (Pocock, 1921), but Mivart (1885) reported their presence. The weights of the brain, thyroid, adrenal, heart, liver, eyes, and lungs were recorded for a female kinkajou from Guatemala (Crile and Quiring, 1940). The brain was found to be the smallest, least voluminous, and simplest when compared with the coatimundi (*Nasua narica*) and raccoon (*Procyon lotor*; Anthony and Botar, 1933). Brodmann (1925) divided the brain into 11 regions and described the areas and sulci of each region at the gross and cellular level.

In kinkajous, 94% of the skin surface lipids are composed of squalene (Lindholm and Downing, 1980). The presence of squalene as a major skin lipid component is found only in kinkajous, otters (*Lutra canadensis*), beavers (*Castor canadensis*), and human sebum (Lindholm et al., 1981).

**FUNCTION.** Kinkajous are tropical carnivores that do not hibernate. Daily temperature fluctuations are correlated with nocturnal activity; mean body temperature during the night is  $38.1 \pm 0.4^\circ\text{C}$  and during the day is  $36.0 \pm 0.6^\circ\text{C}$  (Müller and Kulzer, 1977). Kinkajous are well adapted physiologically for stable climatic conditions, such as those of a tropical environment. Adaptations include a basal heart rate that is 66 to 70% of the expected mass-specific value, a minimal oxygen consumption from 23 to 33°C, a resting body temperature that is often more than 2°C lower than in "normal" mammals, and an overall basal metabolic rate (heat production) that is 65 to 70% of the mass-specific value (Müller and Kulzer, 1977:161; Müller and Rost, 1983). The lower metabolic rate saves approximately 50 kcal day<sup>-1</sup> animal<sup>-1</sup>. Based on other data, the low basal rate of the arboreal kinkajou was suggested to be related to diminished activity and consequent reduction in muscle mass (McNab, 1978). In spite of this low rate, thermogenesis is well developed. Mild cold stress (down to 5°C) can be tolerated for long periods (at least 5 h). Factors such as shivering and insulation by the dense, woolly coat contribute to this tolerance. However, the ability to dissipate heat through evaporation is limited, and high

ambient temperatures (in excess of 33°C) elicit behavioral signs of heat stress (Müller and Kulzer, 1977; Müller and Rost, 1983).

The flexibility and dexterity of kinkajous have been compared to those of a lemur (Gray, 1865). The callosity on the sole of the front paw was hypothesized as a substitute for an opposable thumb for holding food (Felten, 1955); however, the kinkajou has an opponens pollicis muscle and a reasonably good prehensile grip (D. McClearn, in litt.). The number of caudal vertebrae, robustness of vertebral processes, and other osteological and myological features are considered to be arboreal adaptations (Julitz, 1909). The kinkajou has a mechanism for reversal of the hind foot that allows it to descend headfirst or hang upside down. This hind foot reversal, which involves the crurotalar, subtalar, and transverse tarsal joints, also is seen in sciurids, felids, viverrids, tupaiids, and prosimians (Jenkins and McClearn, 1984). Other distinctive locomotor patterns in the kinkajou (for example, restricted anterior swing of the tibia, diagonal sequence, diagonal couplets gaits) are seen as adaptations for an arboreal habitat and are also convergent with other highly arboreal animals (McClearn, 1985).

The manipulating ability and general dexterity of the kinkajou are associated with the type of fiber connections of the motor and sensory cortex (Petras, 1969), the extent of penetration of the corticospinal projections, and the depth of the termination point of the projection (Harting and Noback, 1970; Heffner and Masterton, 1975). The cortico-motoneuronal connection of the tail is more similar to raccoons (*Procyon*) than to some simian primates (Petras, 1968). Various indices of cerebral development (such as brain size) were correlated with the learning abilities of the kinkajou and 21 other species of mammals (Riddell and Corl, 1977).

**ONTOGENY AND REPRODUCTION.** Male kinkajous reach sexual maturity at approximately 1.5 years and females at 2.25 years (Grzimek, 1975). Captive kinkajous of 12.5 (male and female) and 17 (male) years were fertile and produced young (Heller, 1932; Nowak and Paradiso, 1983; Poglayen-Neuwall, 1973). The number of litters per female is unknown, but a captive female produced six single young by the age of 5.5 years (Poglayen-Neuwall, 1973). Longevity in captive kinkajous has ranged from 19 years to 23 years and 7 months (Crandall, 1971; Goodwin, 1946; Heller, 1932).

Data on the breeding season of wild kinkajous are extrapolated from the capture of pregnant females. Postulated birth months ranged from May to September in Guerrero, Mexico (Davis and Lukens, 1958), and April to May in Surinam (Husson, 1978). Pregnant females were captured in December and January in Veracruz and Chiapas, Mexico (Hall and Dalquest, 1963; Villa-R., 1944, 1948), April in Panama (Enders, 1935), and September in Surinam (Genoways et al., 1981). Birth dates reported from animals in captivity are in January, February, August, and September (Bhatia and Desai, 1972; Clift, 1967; Goodwin, 1946; Heller, 1932; Poglayen-Neuwall, 1962). The species was suggested as polyestrous with no particular breeding season (Grzimek, 1975; Poglayen-Neuwall, 1966). All reported pregnancies noted only one embryo, with the exceptions of a female captured in Veracruz, Mexico carrying two embryos (Hall and Dalquest, 1963), and the captive birth of two young to a pair from Belize (Heller, 1932). Goodwin (1946) reported this species to have two to four young, but females only have two mammae (Grzimek, 1975; Hall and Dalquest, 1963; Leopold, 1959).

Reported gestation times are between 98 and 120 days (Bhatia and Desai, 1972; Leclerc-Cassan, 1976; Nowak and Paradiso, 1983; Poglayen-Neuwall, 1962, 1973). Extensive behavior from pre-parturition restlessness to the female-young interaction after the birth was documented for 3.5 h in a captive female (Poglayen-Neuwall, 1973). Young kinkajous start taking solid food at approximately 8 weeks (Bhatia and Desai, 1972; Clift, 1967; Poglayen-Neuwall, 1962, 1976). Physical mobility and development is nearly complete by 3 months (Bhatia and Desai, 1972; Heller, 1932; Poglayen-Neuwall, 1962, 1976). Juveniles increase their mass 12 times and triple their length of body (including the tail) during the first 6 months (Bhatia and Desai, 1972; Clift, 1967; Heller, 1932; Poglayen-Neuwall, 1962).

**ECOLOGY.** Kinkajous are found in rain forests in Surinam, Mexico, and Peru (Estrada and Coates-Estrada, 1985; Husson, 1978; Janson et al., 1981), tropical evergreen forests in Mexico and Venezuela (Handley, 1976; Leopold, 1959), tropical dry forest in Guatemala (Walker and Cant, 1977), forests of the savannah region in

Surinam (Husson, 1978), secondary forest in French Guiana (Charles-Dominique et al., 1981), and the Amazonian rain forest, Atlantic coastal forest, and evergreen gallery forests of the Cerrado in Brazil (Redford and Fonseca, 1986). The animals rarely were found in palm jungle in Veracruz, Mexico (Hall and Dalquest, 1963) or cloud and thorn forests in Venezuela (Handley, 1976).

The population density for kinkajous has been estimated at 12.5 individuals/km<sup>2</sup> in Veracruz, Mexico (Estrada and Coates-Estrada, 1985), and 20 to 30/km<sup>2</sup> in French Guiana (Charles-Dominique et al., 1981). Walker and Cant (1977) found 0.74/ha in Guatemala and estimated 0.44/ha in Surinam from data derived from Walsh and Gannon (1967). Kinkajous were reported at 0.4/ha in lowland rainforest in Belize (Rabinowitz, 1986). The estimated home range was 8 ha/individual in Veracruz (Estrada and Coates-Estrada, 1985). Kinkajous prefer the middle (10 to 20 m) to upper (20 to 30 m) canopy of the forest (Charles-Dominique et al., 1981; Estrada and Coates-Estrada, 1985; Hall and Dalquest, 1963). In French Guiana, kinkajous predominately use oblique branches that are  $\geq 1$  cm in diameter (Charles-Dominique et al., 1981).

Kinkajous seem to be mainly frugivorous, but supplement this diet. Reported feeding observations and stomach contents include a variety of fruit pulp and seeds, flowers, honey, whole small beetles, some insect larvae, and young leaves and buds (Charles-Dominique et al., 1981; Enders, 1935; Goldman, 1920; Hall and Dalquest, 1963; Janson et al., 1981; Villa-R., 1944). The diet of kinkajous from Veracruz, Mexico, was 52% fruit and 48% flowers, insects, and small vertebrates (Estrada and Coates-Estrada, 1985). Fischer (1874) described a captive eating meat from a bone, but Alvarez del Toro (1952) reported animals in Chiapas, Mexico, did not like meat. The dry weight of fruit (2.5 g) consumed by one kinkajou was calculated to be 3 kg/month, and the consumption of a population in Veracruz, Mexico, was estimated to be 5 kg ha<sup>-1</sup> year<sup>-1</sup> (Estrada and Coates-Estrada, 1985). Kinkajous were found feeding on the nectar of *Quararibea cordata* in Peru (Janson et al., 1981). Because they visited more than one tree per night, kinkajous potentially contributed to cross-pollination. Suggested uses for the long, slender tongue of the kinkajou are: an adaptation for a frugivorous diet (Goodwin, 1946), to break up the cone and remove honey from beehives (Leopold, 1959), and to capture insects or stingless bees from the hive (Heller, 1932; Hernández-Camacho, 1977). The kinkajou has a simple intestine with no caecum and must eat large quantities of fruit pulp because of its limited absorption (Charles-Dominique et al., 1981). Diets of kinkajous in captivity are predominately fruits (apples, bananas, figs, grapes, guavas, oranges, plums), and supplemented with vegetables (carrots, potatoes), cereals (rice) and breads, peanuts, raw or cooked meat (bird, horse), dog food, honey, eggs, and milk products (Bogdanovich, 1958; Clift, 1967; Crandall, 1971; Fischer, 1874; Heller, 1932).

Isidor's eagle (*Oroaëtus isidora*) is a predator on kinkajous in Colombia (Lehmann, 1959). Harpy eagles (*Harpia harpyja*) were observed bringing a kinkajou to their eaglet twice during a 4-month study (Rettig, 1978). These diurnal hunters probably snatched sleeping animals from a tree; Rettig (1978) witnessed such arboreal capture of a sloth by a harpy eagle. Although they are also occasionally eaten by jaguars (Rabinowitz, 1986), the major predators on the kinkajou are humans; kinkajous reportedly make good pets, and their thick pelage is valued for commerce (Felten, 1955; Hernández-Camacho, 1977; Leopold, 1959; Mivart, 1885; Nowak and Paradiso, 1983). More than 100 live animals per year, plus hundreds of skins (216 in 1966) are exported from Peru alone (Grimwood, 1968). Humboldt postulated that tropical Indians domesticated kinkajous for food (Cabrera and Yepes, 1960). The meat of kinkajous is considered to be of excellent taste (Husson, 1978; Mivart, 1885), though the flesh is lean and smells slightly rank (Hall and Dalquest, 1963); it is not eaten in Belize (Rabinowitz, 1986). Habitat destruction by humans has reduced the range and number of these animals (Felten, 1955; Walsh and Gannon, 1967). Kinkajous prefer unmolested forested habitats, only 3% of 162 animals collected in Venezuela were found in open areas such as yards, orchards, or croplands (Handley, 1976).

Ectoparasites found on wild-caught kinkajous include the chewing louse *Trichodectes potus* (Emerson, 1966), and nymphs of the tick *Amblyomma* (Fairchild et al., 1966), as well as cutaneous infections of *Leishmania braziliensis* (Herrer and Christensen, 1975; Thatcher et al., 1965). Endoparasites include the ascariid *Baylisascaris procyonis* (Overstreet, 1970), the coccidian *Sarcocystis* sp. (Takos, 1957), the haematozoans *Trypanosoma cruzi* and *T.*

*rangeli* (Wells et al., 1981), the bacteria *Salmonella typhimurium* (Sheldon and Savage, 1971), and a unique virus *Herpesvirus potos* (Barahona et al., 1973). Infections of canine distemper from a live virus, and of a primate coccidian (*Isoospora arcotopithecii*) have been induced in the laboratory (Hendricks, 1977; Kazacos et al., 1981). An induction of *Toxoplasma gondii* produced antibodies but no oocysts in kinkajous (Jewell et al., 1972), and an attempt to induce the human infection, *Onchocerca volvulus*, proved unsuccessful (Kozek and Marroquin, 1982). The predominant pathology of captive animals is pulmonary diseases (Leclerc-Cassan, 1976); Fischer (1874) detailed the coughing, scratching, and licking behavior of a sick captive.

**BEHAVIOR.** Kinkajous are strictly nocturnal and usually sleep in dark retreats during the day (Enders, 1935; Goodwin, 1946; Hall and Dalquest, 1963; Husson, 1978; Skutch, 1960). An unspecialized nest found in a tree trunk has been described (Villa-R., 1944). Activity patterns studied in the laboratory were totally nocturnal. The specific time of retiring (ca. sunrise) was more variable for an individual than the specific time of emergence (ca. sunset; Kavanau and Ramos, 1972). Kinkajous, genets (*Genetta*), and ring-tails (*Bassariscus*) had the most nocturnal activity patterns among 16 species of canid, mustelid, procyonid, and viverrid carnivores (Kavanau and Ramos, 1975). Captive, tamed animals generally continue their nocturnal habits (Gaumer, 1917; Goldman, 1920; Heller, 1932; MacClintock, 1985; Poglayen-Neuwall, 1962).

The mobility and habits of kinkajous are reminiscent of various primates (Felten, 1955; Gray, 1865; Leopold, 1959; Sanderson, 1949). They are arboreal and rarely descend to the ground (Anthony, 1916; Enders, 1935; Goodwin, 1946; Handley, 1976). One individual was observed standing in a wagon track during the day (Leopold, 1959), but other reports of terrestrial movements are of captive animals (Felten, 1955; Poglayen-Neuwall, 1962). Cautious, careful, and non-saltatorial movements through and between trees have been documented by field observations (Enders, 1935; Gaumer, 1917; Hall and Dalquest, 1963; Skutch, 1960). The specialized, prehensile tail is used to hang upside-down during feeding and to swing for locomotion (Felten, 1955; Janson et al., 1981; Poglayen-Neuwall, 1962). The presence of prehensile-tailed animals has been correlated with certain vegetative structures, such as slippery palms, few lianas, and flexible trees, of the neotropical forest (Emmons and Gentry, 1983). Females were observed carrying their young dangling from their mouths when climbing, but holding them to their chest when resting (Poglayen-Neuwall, 1962; Skutch, 1960).

The kinkajou is considered basically solitary, especially while resting during the day, but occasionally can be found in pairs (Husson, 1978; Nowak and Paradiso, 1983; Walker and Cant, 1977). In Guatemala, 24 of 26 sightings of active animals were of solitary individuals (Walker and Cant, 1977). The pairs usually have been thought to be a male and female (Villa-R., 1944), or a female with her young (Hall and Dalquest, 1963; Hernández-Camacho, 1977). Kinkajous reportedly do not stay in close proximity to each other, even if they are members of a pair or in a densely populated area (Hall and Dalquest, 1963; Husson, 1978). They are found in groups of three or more only when feeding. This grouping is considered to be temporary, and probably is related to the utilization of common resources (Enders, 1935; Hernández-Camacho, 1977; Nowak and Paradiso, 1983) or a social feeding event (Gaumer, 1917; Goodwin, 1946; Poglayen-Neuwall, 1962). Anthony (1916) and Goodwin (1946) are the only ones to report groups consisting of 7 to 12 individuals. However, Hall and Dalquest (1963) and Hernández-Camacho (1977) reported extremely noisy movements, and considerable debris falling from a few individuals, that sounded misleadingly like a larger troop of animals. Individuals are postulated to travel along habitual feeding routes (Poglayen-Neuwall, 1962, 1966), and even return to the same feeding tree after being harassed by gunshot (Hall and Dalquest, 1963). Interspecific territories are not defended (Nowak and Paradiso, 1983), but captive males have been reported to fight if restricted to small quarters (Crandall, 1971). Agonistic encounters were reported seven times over a 9-week period between a group of kinkajous and a group of night monkeys (*Aotus*; Wright, 1978). Most encounters were on nights that were moon-bright and could last up to 60 min; otherwise the interactions were as short as 5 to 6 min.

Individuals scent mark, and this is considered a sexual signal, a trail marker, and a means of social contact (Fielder, 1957; Grzimek, 1975; Poglayen-Neuwall, 1966). Some of the skin scent glands are

reportedly used for sexual stimulation, but the mating behavior observed in captives is a non-ritualized courtship leading to copulation (Poglayen-Neuwall, 1962, 1966, 1976).

A wide variety of vocalizations are attributed to kinkajous. Descriptions of calls from field observations include barks (Davis and Lukens, 1958; Goodwin, 1946; Villa-R., 1944), shrill, penetrating screams (Dalquest, 1953; Rabinowitz, 1986; Skutch, 1960; Villa-R., 1944), short whistles (Enders, 1935), nasal grunts (Anthony, 1916), chirps (Tate, 1931), squeaks (Goldman, 1920), and sneezing sounds (Husson, 1978). Poglayen-Neuwall (1962, 1976) extensively described vocalizations in captivity and grouped them into seven categories; the twitter, bark, puff/sniff, chirp, spit, hiss, and scream. A captive female was reported making clicking sounds with her tongue while in heat (Bogdanovich, 1958).

Because kinkajous live in a relatively stable climate, extreme cold or hot environmental stimuli are met with predominately behavioral responses. Cold responses include shivering, and if non-active, lying on the side rolled up in a ball-like posture with the naked nose and paws protected from heat loss (Müller and Kulzer, 1977; Poglayen-Neuwall, 1962). Kinkajous are not tolerant of heat. Sleeping in dark retreats and nocturnal activity patterns help avoid the negative effect of direct sunlight. However, if the ambient temperature exceeds 33°C, the animal wakes up early enough to change to a more favorable retreat and position (Müller and Kulzer, 1977; Müller and Rost, 1983; Poglayen-Neuwall, 1962). Further responses to heat include wet paws (owing to sweating) and panting with the mouth open. Curiously, kinkajous have limited heat dissipation through these evaporative means (Müller and Rost, 1983). In the wild, these nocturnal animals have been observed emerging during the day from presumably hot retreats to take advantage of cool breezes (Hall and Dalquest, 1963) and to sleep exposed in a crotch of a tree (Skutch, 1960).

Manipulating and learning abilities in kinkajous have been compared with raccoons, sciurids (*Sciurus vulgaris*, *Tamias sibiricus*), "monkeys," and "apes" (Dücker et al., 1982; Rensch and Dücker, 1969:112). Spatial learning was simpler than visual learning for the kinkajou; this pattern of learning was different than that for "cats" (Braveman and Katz, 1971:1120). In successive discrimination performance studies, kinkajous did not differ significantly from squirrel monkeys (*Saimiri*), raccoons, coatimundis, and striped skunks (*Mephitis mephitis*), but were significantly inferior to capuchins (*Cebus*) and ringtails (Gossette et al., 1968).

**GENETICS.** Kinkajous have a diploid number of 38 chromosomes (Chiarelli, 1966; Fredga, 1966; Todd et al., 1966). Hsu and Benirschke (1968) reported 34 metacentrics, submetacentrics, and subtelocentrics, and two acrocentric or telocentric chromosomes, but Chiarelli (1966) reported six small acrocentric or subacrocentric chromosomes. The discrepancy results from variability found in the length of the short arms of the submetacentric and subtelocentric autosome elements (Hsu and Benirschke, 1968). The X-chromosome is medium-sized and considered to be metacentric (Fredga, 1966) or submetacentric (Hsu and Benirschke, 1968). Fredga (1966) suggested that the Y-chromosome is subtelocentric or telocentric, but the Y is actually submetacentric; the difference owing to the chromosome being so small that its short arm is difficult to distinguish (Hsu and Benirschke, 1968).

Dutrillaux and Couturier (1983) compared the R-banded karyotype and the C-band-positive heterochromatin of *Potos* with five other species of carnivores, and postulated a diploid number of 44 chromosomes for the ancestral karyotype of carnivores. Heterozygosity in a population of kinkajous from Peru ( $\bar{H} = 0.1416$ ) was higher than in raccoons (*Procyon lotor*;  $\bar{H} = 0.0763$ ) and heterozygosity levels published for other small and large mammals (Forman, 1985).

**REMARKS.** The problems of specific name priority are discussed by Husson (1978) and Kortlucke (1973). Sherborn (1891) reported the dates for Schreber's publications as 1775 (*Lemur flavus*) and 1778 (*Viverra caudivolvula*), but Kortlucke (1973) disagreed with the 1775 publication date and discussed the problem.

In 1773, the then undescribed kinkajou was erroneously ascribed to Africa in a live animal exhibit at a fair in Paris (Cabrera and Yepes, 1960). The type locality in the original description by Schreber (1774) was associated with a London Zoo specimen that erroneously was reported from Jamaica. Thomas (1902) pointed out this error and corrected the type locality to Surinam (formerly Dutch

Guiana). Husson (1978) noted that Tate (1939) and Cabrera (1958) misinterpreted Thomas and reported "British Guiana" as the correct type locality. Cabrera and Yepes (1960), Hernández-Camacho (1977), and Honacki et al. (1982) also listed Guyana (formerly British Guiana) as the type locality for *Potos*, but because there is no explanation of the discrepancy, it is considered incorrect.

The common names for *Potos* in English are kinkajou, night ape, and honey bear, and in Belize, nightwalker (Rabinowitz, 1986). The most popular name, the kinkajou, is reportedly from a Brazilian Indian language (Grzimek, 1975). The German vernacular name is wickelbär. In Dutch, the names rolbeer, rolstaartbeer, and nachtaap are used to refer to *Potos* in Surinam (Husson, 1978). In the range of the kinkajou, many regional names are in Spanish, Portuguese, local native dialects, or a combination of those languages; these include: cuchicuchi, cuchumbi, cusumbi, huasa, godoy, guaynoches, jupara, jupura, kinkajoe, kinkaju, leoncillo, lobo, macaco de meia-noite, maco, macoleon, manteja, marta, marteja, martes, martica, martilla, martucha, mico de noche, micoleon, mico tute, montila, neti-keskesi, netty-o-metie, obingo, olingo, oso mielero, perro de monte, tancho, tutamono, yapara, and yapura (Anonymous, 1913; Anthony, 1916; Cabrera and Yepes, 1960; Felten, 1955; Goldman, 1920; Hall and Dalquest, 1963; Heller, 1932; Hernández-Camacho, 1977; Husson, 1978; Leopold, 1959; Quirós Amador, 1954; Sturm et al., 1970; Vieira, 1952; Villa-R., 1944; Walsh and Gannon, 1967). The names used in South America, including some native dialect names and their specific regions of use are discussed by Hernández-Camacho (1977). Native superstitions concerning the kinkajou have been recounted from Colombia (Hernández-Camacho, 1977); including the belief that a member of the family will die if a kinkajou barks during the day.

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- L. S. FORD AND R. S. HOFFMANN, DEPARTMENT OF SYSTEMATICS AND ECOLOGY AND MUSEUM OF NATURAL HISTORY, UNIVERSITY OF KANSAS, LAWRENCE, KANSAS 66045-2454. PRESENT ADDRESS OF HOFFMANN: SMITHSONIAN INSTITUTION, WASHINGTON, D.C. 20560.