MAMMALIAN SPECIES No. 119, pp. 1–8, 4 figs.

Procyon lotor.

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Published 8 June 1979 by the American Society of Mammalogists

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Procyon Storr, 1780

Procyon Storr, 1780:35. Type species *Ursus lotor* Linnaeus, by monotypy.

Campsiurus Link, 1795:87. Type species *Ursus lotor* Linnaeus (see Hollister, 1916:146).

Lotor Geoffroy and Cuvier, 1795:187. Type species *Ursus lotor* Linnaeus, by monotypy.

Euprocyon Gray, 1864:705. Type species *Ursus cancrivorus* Cuvier, by monotypy. Proposed as subgenus, recognized as genus by Goldman, 1913:16.

Mamprocyonus Herrera, 1899:18 (cited by Goldman, 1950:25, not seen).

CONTEXT AND CONTENT. Order Carnivora, Family Procyonidae, Genus *Procyon*, Subgenus *Procyon*. Within the subgenus *Procyon*, Goldman (1950) recognized six living species, the transcontinental *P. lotor* and five insular species: *P. insularis, P. maynardi, P. pygmaeus, P. minor*, and *P. gloveralleni*. The relationships of these species need further study (Lazell, 1972); *maynardi* (Koopman *et al.*, 1957), *minor*, and *gloveralleni* in particular may be conspecific with *lotor*. Goldman (1950) used geography in his key. Without geography it is not feasible to write a key to species, so we do not include one here.

Procyon lotor (Linnaeus, 1758)

Raccoon

Ursus Lotor Linnaeus, 1758:48. Type locality "Americae maritimis," restricted to Pennsylvania (Thomas, 1911:140).

L(otor) vulgaris Tiedemann, 1808:380. Renaming of *U. lotor* Linnaeus.

Procyon annulatus G. Fischer, 1814:177. Renaming of *U. lotor* Linnaeus.

Procyon Hernandezii Wagler, 1831:514. Type locality "Mexico," by implication Valley of Mexico.

Procyon brachyurus Wiegmann, 1837:369. Type locality unknown ("Antillae?").

Procyon obscurus Wiegmann, 1837:370. Type locality unknown.

Procyon nivea Gray, 1837:580. Type locality "Texas."

Procyon Psora Gray, 1842:261. Type locality "Sacramenta [Sacramento Co.,] California."

Procyon gularis Smith, 1848:222. Type locality "State of New York."

Procyon maynardi Bangs, 1898*a*:92. Type locality "Nassau Island, Bahamas."

Procyon pallidus Merriam, 1900:151. Type locality "New River, Colorado Desert [Imperial Co.] Calif."

Procyon simus Gidley, 1906:553. Type locality "'Cave Bear' Cave, McCloud River, California."

Procyon proteus Brass, 1911:564 (cited by Goldman, 1950:58). Type locality West Coast from Puget Sound to Cascade Mountains.

Pr[ocyon] hudsonicus Brass, 1911:564. Type locality unknown.

Procyon pumilus Miller, 1911:3. Type locality "Ancon, Panama."

CONTEXT AND CONTENT. Context as above in generic summary. Twenty-five subspecies of *P. lotor* were recognized by Hall and Kelson (1959, following Goldman, 1950), and changes have been made by Paradiso (1969), Koopman *et al.* (1957), and Wright and Lundelius (1963).

P. l. auspicatus Nelson, 1930:9. Type locality "Marathon, Key Vaca, [Monroe Co.,] Florida."

P. l. crassidens Hollister, 1914:142. Type locality "Talamanca, [northeastern] Costa Rica."

P. l. dickeyi Nelson and Goldman, 1931*a*:18. Type locality "Barra de Santiago, Department of Ahuachapam, southwestern Salvador."

P. l. elucus Bangs, 1898*b*:219. Type locality "Oak Lodge, east peninsula, opposite Micco, Brevard County, Florida."

P. l. fuscipes Mearns, 1914:63. Type locality "Las Moras Creek, at Fort Clark, Kinney County, Texas" (*nivea* Gray possibly a synonym).

P. l. grinnelli Nelson and Goldman, 1930*a*:82. Type locality "La Paz, Lower California, Mexico."

P. l. hernandezii Wagler, 1831:514, see above (*castaneus* de Beaux a synonym).

P. l. hirtus Nelson and Goldman, 1930*b*:455. Type locality "Elk River, Sherburne County, Minnesota."

P. l. inesperatus Nelson, 1930:8. Type locality "Upper Matecumbe Key, [Monroe Co.,] Florida."

P. l. incautus Nelson, 1930:10. Type locality "Torch Key, Big Pine Key Group, [Monroe Co.,] Florida."

P. l. litoreus Nelson and Goldman, 1930*b*:457. Type locality "Saint Simon Island, Glynn County, Georgia."

P. l. lotor (Linnaeus, 1758:48), see above (*annulatus* Fischer, *vulgaris* Tiedemann, *gularis* Smith, *fusca* Burmeister, *melanus* Gray, *maritimus* Dozier, *rufescens* de Beaux synonyms; *obscurus* Wiegmann, *brachyurus* Wiegmann, *hudsonicus* Brass perhaps synonyms).

P. l. marinus Nelson, 1930:7. Type locality "near Chokoloskee, [Collier Co.,] Florida."

P. l. maynardi Bangs, 1898*a*:92, see above.

P. l. megalodous Lowery, 1943:225. Type locality "Marsh Island, Iberia Parish, Louisiana."

P. l. mexicanus Baird, 1857:215. Type locality "Espia, in Sonora" [now Chihuahua, Mexico].

P. l. pacificus Merriam, 1899:107. Type locality "Kechelus Lake, Cascade Mountains [Kittitas Co.], Washington" (*proteus* Brass a synonym).

P. l. pallidus Merriam, 1900:151, see above (*ochraceus* Mearns a synonym).

P. l. psora Gray, 1842:261, see above (*californicus* Mearns a synonym).

P. l. pumilus Miller, 1911:3, see above.

P. l. shufeldti Nelson and Goldman, 1931*a*:17. Type locality "La Tuxpeña, Champoton, southeastern Campeche, Mexico."

P. l. simus Gidley, 1906:553, see above (type locality outside range of living representatives, *excelsus* Nelson and Goldman a synonym).

P. l. solutus Nelson and Goldman, 1931*b*:308. Type locality "Hilton Head Island, Beaufort County, South Carolina."

P. l. vancouverensis Nelson and Goldman, 1930*b*:458. Type locality "Quatsino Sound, Vancouver Island, British Columbia," Canada.

P. l. varius Nelson and Goldman, 1930*b*:456. Type locality "Castleberry, Conecuh County, Alabama" (*flavidus* de Beaux perhaps a synonym).

DIAGNOSIS. The subgenus *Procyon* differs from the subgenus *Euprocyon* by the generally longer pelage, normal posterior direction of the hairs of the nape, the presence of underfur, and by the greyish (not blackish) outer surface of the forearms and thighs (Goldman, 1950). In comparison with those of *Euprocyon*, the claws of *Procyon* are narrower, sharper, and more compressed laterally; are strengthened by a greater vertical depth at the base; and are thus more adapted for arboreal habits. In comparison with those of *Procyon*, the molariform teeth of *Euprocyon* are more massive; have broader, more rounded, and blunter cusps; have connecting ridges between principal cusps that are less trenchant; and are thus better adapted for crushing. The bony palate extends behind the posterior molars for a distance of more than one fourth the total length of the palate in *Procyon*, but less than that in *Euprocyon*.

Within the subgenus *Procyon*, the insular species (*P. gloveralleni, P. insularis, P. minor*, and *P. pygmaeus*) are to varying degrees distinguished from immediately adjacent mainland subspecies of *P. lotor* by a combination of minor quantitative differences (Goldman, 1950). Apparently, these species are rare on their respective islands; some may be extinct or on the verge of extinction (Lazell, 1972).

FIGURE 1. Above, raccoon on the beach of St. Catherines Island, Georgia; photograph by William Berliner. Below, raccoon in characteristic pose, with weight on hind limbs while forelimbs are used to manipulate food; photograph from files of American Museum of Natural History.

Individuals of *P. lotor* are often difficult to distinguish to subspecies, especially if collection localities are unknown.

GENERAL CHARACTERS. A brown-black facial mask is sharply delimited from adjacent areas of whitish hair. This "bandit" mask and a tail with five to seven conspicuous brown-black rings (sometimes interrupted below) that alternate with lighter hairs are characteristic. The pelage of the raccoon has a grizzled appearance, varying from iron greyish to blackish, perhaps with a brownish or reddish tinge, especially on the nape of the neck. The underparts are only thinly overlaid with greyish or brownish guard hairs that barely conceal the dense brownish underhairs. The palest subspecies are found in the hot arid regions in the southwestern United States and northern Mexico while the darkest subspecies are found in tropical Central America in regions of heavy rainfall. Goldman (1950) gave detailed descriptions of subspecific variation of the pelage of raccoons. Abnormal color variations occur; albinism is most often documented (Johnson, 1970; Whitney and Underwood, 1952*a*).

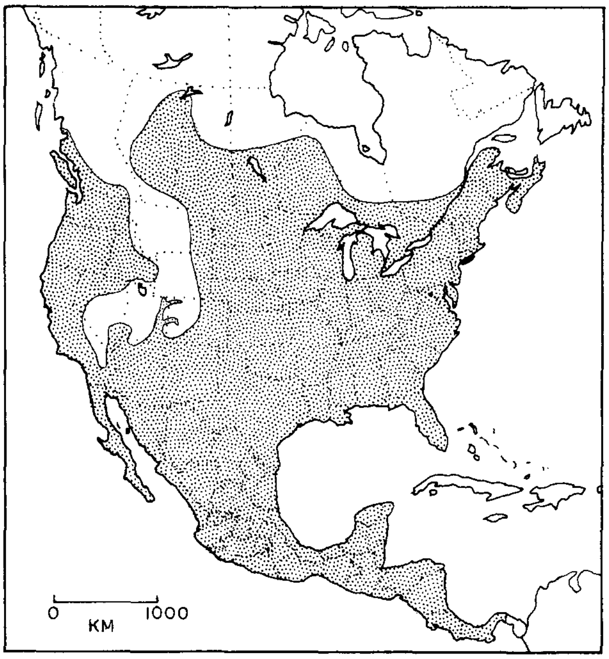

FIGURE 2. Map of North America showing the range of the raccoon (adapted from Hall and Kelson, 1959).

The largest raccoons are from Idaho and vicinity. The smallest adult raccoons are in the Florida Keys. Hall and Kelson (1959:884) reported the following ranges of measurements (in mm) for males and females, respectively: total length, 634 to 950, 603 to 909; length of tail, 200 to 405, 192 to 340; length of hind foot, 96 to 138, 83 to 129; greatest length of skull, 99.9 to 136.5, 93.6 to 122.5; condylobasal length, 94.3 to 125.8, 89.4 to 115.9; zygomatic breadth, 60.2 to 89.1, 58.3 to 81.2; and alveolar length of maxillary tooth row, 36.4 to 47.4, 35.0 to 45.7. In Missouri, the mean weight of 5371 males was 6.76 kg and of 2809 females was 5.94 kg, and there was a close correlation between weight and soil fertility (Nagel, 1943). Johnson (1970) noted considerable geographic variation in raccoon weights in Alabama, but did not find close correlation with soil fertility. An average weight of 6.17 kg was determined for 47 adult male raccoons from Michigan (Stuewer, 1943*a*). Five adult males of *P. l. auspicatus* from the Florida Keys had an average weight of only 2.40 kg (Goldman, 1950). Raccoons may gain weight very rapidly (8 kg by seven months of age) under natural conditions if food is plentiful (Dorney, 1953).

The feet of raccoons each bear five digits, with no webbing between the digits, a condition unusual among carnivores (Pocock, 1921). The claws are short, compressed, and recurved, but not retractile. The gait is semiplantigrade to plantigrade. The soles are not haired. The hands are well adapted for grasping and manipulating objects while the hind legs support the weight of the body (as shown in figure 1).

DISTRIBUTION. The transcontinental range of *Procyon lotor* extends from southern Canada to Panama and includes islands near the coasts (figure 2). Recent range extensions in the Canadian provinces have been noted: Alberta (Smith, 1972), Manitoba (Sutton, 1964), Ontario (Simkin, 1966), and Saskatchewan (Houston and Houston, 1973). Raccoons have been introduced, both deliberately and by the escape of captives help for fur production, in France (DeBeaufort, 1968), Germany (Röben, 1975), and the Soviet Union (Aliev and Sanderson, 1966); see figure 3. Within the United States, legal and illegal displacements of hundreds of raccoons from one region to another are occasionally carried out to restock hunting areas. Scheffer (1947) reported that raccoons from Indiana are thriving on two Alaskan islands.

FOSSIL RECORD. The earliest known *Procyon* is from the upper Pliocene of North America (Simpson, 1945). Remains are known from Pleistocene and Holocene deposits from many parts of North America (Goldman, 1950:3; Wright and Lundelius, 1963). Some post-Pleistocene remains of raccoons from central Texas (Wright and Lundelius, 1963) resemble living *P. lotor* from the northwestern United States, indicating an earlier much wider range for these massively built raccoons.

FORM. The annual molt of *Procyon lotor* lasts through much of the summer, particularly in the more northern subspecies (Goldman, 1950:19). Stuewer (1942) found that molting began in late April in southwestern Michigan and that by late August, the new coat was distinctly visible. Stains (1957) found hair in the scats (feces) of raccoons throughout the year and noted that there

FIGURE 3. Map of Eurasia showing release sites of raccoons (adapted from Aliev and Sanderson, 1966).

was a large increase in March, during the spring molt. The fewest hairs were present in scats from December through January when pelts were in prime condition.

Pocock (1921) compared the external ear, facial vibrissae, muzzle and rhinarium, feet, cutaneous glands, anal glands, and external genitalia of *P. lotor* with those of other Procyonidae.

The adult dentition is i 3/3, c 1/1, p 4/4, and m 2/2, total 40. First premolars may be absent and extra teeth have been reported (Goldman, 1950:22).

Subspecific cranial and dental variations were described by Goldman (1950). The skull is illustrated in figure 4. Of other parts of the skeletal system, the large and recurved penis bone is well known and has been used in determining the age of males (Sanderson, 1951). An *os clitoridis* has also been reported (Rinker, 1944).

Other morphological studies have dealt with muscles of the limbs (Allen, 1882), arteries of the forearm (Davis, 1941), and carotid circulation (Story, 1951). Heine (1973) discussed the functional morphology of the heart of the raccoon. The somatic sensory-motor area of the cerebral cortex devoted to the forepaws is both absolutely and relatively larger than in other species of Procyonidae studied (Welker *et al.*, 1964) and tactile acuity is evidenced also by the density and diversity of types of cutaneous nerve end organs (Zollman and Winkelmann, 1962). In a detailed morphological study of the living giant panda, Davis (1964) made frequent references to *P. lotor*.

The structure and number of blood elements of captive raccoons in Canada were reported by Kennedy (1935). Biochemical parameters of urine and blood serum have been studied (Lotze and Fleischman, 1978; Hardin, 1978; and earlier authors cited by them).

Sanderson and Nalbandov (1973) described in detail the reproductive systems of both male and female raccoons from Illinois. Creed and Biggers (1963) described the development of the raccoon placenta.

FUNCTION. Although raccoons are known to remain in hollow trees for extended periods during exceptionally cold weather (Stuewer, 1943*a*; Berner and Gysel, 1967; Schneider *et al.*, 1971), they do not hibernate (contrary to some early reports). Physiological observations of sleeping raccoons in winter by Folk *et al.* (1968) showed that heart rates (determined by implanted radio capsules) were higher rather than lower in colder weather. Abdominal body temperature remains above 35°C during dormancy, and the metabolic rate remains high (Thorkelson and Maxwell, 1974). The fat supply accumulated during the previous summer and fall is the major energy source during winter, when the weight loss may reach 50% and mortality may be appreciable, especially in more northern latitudes (Stuewer, 1943*a*; Mech *et al.*, 1968). Thorkelson and Maxwell (1974) simulated an overwintering raccoon in a closed tree den and found that 65% of the resistance to heat loss was due to insulation of the fur and 17% to the poor conductivity of air in the den cavity (provided that the fur was not in contact with the den wall). Small variations in den wall thickness were relatively unimportant. Stains (1961) simultaneously monitored temperatures on the inside and outside of two tree dens used by raccoons.

REPRODUCTION AND ONTOGENY. Examination of 241 raccoons from southwestern Georgia and northwestern Florida revealed that the breeding season extends from 10 February to 3 August, that a higher percentage of females mate in March than in any other month, and that approximately one half of all births occur in May (McKeever, 1958). Matings in Kansas occur from December to June, with a peak in February (Stains, 1956). Estimated conception dates of litters in Alabama range from 8 March to 26 June (average, 17 April) while birth dates range from 4 May to 27 August (average, 18 June) (Johnson, 1970). In Michigan, most births occur during March, April, or May (Stuewer, 1943*b*; George and Stitt, 1951).

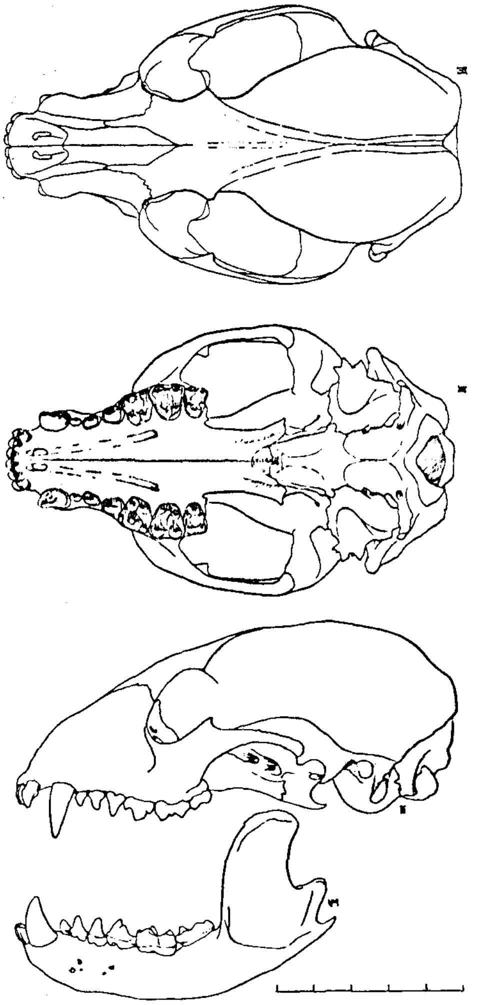

FIGURE 4. Skull of *Procyon lotor* (M.V.Z. No. 70003) from Marlette Lake, Nevada (adapted from Hall, 1955). From top to bottom, in dorsal, ventral, and lateral views of cranium, and lateral view of dentary. Scale represents 50 mm.

The duration of the breeding season has been determined from the development of the lining of the uterus, the degree of ovarian development, the weight of the testes, smears from the tails of the epididymides, and vaginal smears (Wood, 1955; Sanderson and Nalbandov, 1973). Fetuses of raccoons can be aged to determine approximate dates of conception (Llewellyn, 1953; Sanderson and Nalbandov, 1973). Michigan males may be capable of breeding all year (Stuewer, 1943*b*). The lowest testes weights occur in summer after most females had been inseminated (Sanderson and Nalbandov, 1973). Non-motile sperm may be present in winter. A less pronounced seasonal variation in testes weights was noted by Johnson (1970) for Alabama raccoons.

Male raccoons may breed in their first year (Pope, 1944; Sanderson, 1951; Wood, 1955) or not until their second year (Stuewer, 1943*b*; Whitney and Underwood, 1952*a*). Female raccoons also may breed in their first year (Stuewer, 1943*b*; Wood, 1955) or not until their second year (Bissonette and Csech, 1938). Raccoons occasionally give birth outside of the regular breeding season, either due to a late first conception or a second litter in one year (Johnson, 1970:44; Lehman, 1968; Bissonette and Csech, 1938). The contribution from raccoons less than one year old to the total productivity of a population is generally small (Johnson, 1970). Juveniles generally become sexually mature after the regular adult breeding season; late-born raccoons may thus be the offspring of these individuals (Sanderson and Nalbandov, 1973). However, if extremely cold weather restricts activities of raccoons during the first estrous cycle of the year, some adult females may not conceive until their second estrous cycle (Stains, 1956). Millard (1939) noted that the conditions of Wisconsin females were similar whether they had borne one or two litters in the year. The probability that late-born young will survive is very low, particularly in the north (Mech *et al.*, 1968).

Ovulation of raccoons probably occurs after copulation (Llewellyn and Enders, 1954*a*). Migration of raccoon blastocysts from one uterine horn to the other in two females a year after unilateral ovariectomy was noted by Llewellyn and Enders (1954*b*).

The onset of the breeding season in raccoons may be triggered by lengthening photoperiod (Bissonette and Csech, 1938, 1939) or by increases in temperature (Sanderson and Nalbandov, 1973). The gestation period of raccoons is approximately 63 days.

Litter sizes can be determined by counting embryos or placental scars (Sanderson and Nalbandov, 1973). Larger litter sizes tend to occur farther north (with some exceptions; Bissonett and Csech, 1937). This may compensate for higher mortality rates among young. The mean number per litter ranges from 1.9 to 5.0 in different samples (Johnson, 1970). Numbers of males and females at birth are approximately equal (Stains, 1956), although either males or females may predominate in a given sample of litters (Mech *et al.*, 1968; Wood, 1955).

Several aspects of the ontogenetic development of raccoons have been studied: pelage (Montgomery, 1968), tooth eruption in preweaned raccoons (Montgomery, 1964), suture closure between bones of the skull (Stains, 1956), eye lens growth rate (Sanderson, 1961*a*), fetal growth rate (Llewellyn, 1953), and ossification of the baculum and metaphyseal cartilages of ulnae and radii (Sanderson, 1950, 1961*b*). The above characters are useful in determining the age of raccoons, but other characters may also be examined: annual layers in the dental cementum (Johnson, 1970), extrusibility of the penis through the preputial opening (Sanderson, 1961*b*), wear on the teeth (Grau *et al.*, 1970), pigmentation of the nipples (Stuewer, 1943*a*; Johnson, 1970), weights of both juveniles and adults (Johnson, 1970), and fur characteristics (Sanderson, 1950).

Raccoons are weaned sometime between week 7 and month 4 (Montgomery, 1969). The social dispersal of young raccoons does not occur until approximately month 9 (Sharp and Sharp, 1956). Schneider *et al.* (1971) described how young raccoons run either ahead of or behind their mother while on forays during their weaning, how they eventually begin to den occasionally without their mother, and how relationships among siblings and between siblings and their mother take on a degree of independence just prior to winter. However, they did note that families begin to den together again as the winter becomes more severe. Dispersion of young from their natal areas will thus occur in the year following their birth (see also Fritzell, 1978*a*), if not in the fall of their first year (Stuewer, 1943*a*).

Longevity records for wild, free-ranging raccoons include 12 years 7 months (Haugen, 1954) and 7 years 9 months based on captures, and 13 to 16 years based on dental annuli (Johnson, 1970). For captive raccoons, longevity records include 17 years 27 days (Garret and Goertz, 1975) and 14 years (Rue, 1965). Most raccoons in the wild live less than five years. Means of 3.1 (Johnson, 1970) and 1.8 years (Sanderson, 1951) have been reported.

ECOLOGY. Raccoons eat a wide range of both plant and animal matter; are selective when food is abundant, but eat whatever is available when it is scarce (Hamilton, 1951; Wood, 1955; Johnson, 1970; Harman and Stains, in press).

The most important plant foods of raccoons are berries, nuts, and seeds of various plants and the most important animal foods are arthropods (in particular crayfish and crabs, when available) as determined from food habit studies in Alabama (Johnson, 1970), Georgia (Harman and Stains, in press), New York (Hamilton, 1936, 1951), Kansas (Stains, 1956), Washington (Tyson, 1950), Iowa (Giles, 1940), Texas (Baker *et al.*, 1945), Minnesota (Schoonover and Marshall, 1951), Illinois (Yeager and Rennels, 1943), Colorado (Tester, 1953), and in almost all other states.

Predation on vertebrates by raccoons in Alabama is infrequent (Johnson, 1970). Elsewhere, Yeager and Elder (1945) noted that raccoons fed on many waterfowl crippled during the hunting season and raccoon predation on other waterfowl has been reported (Llewellyn and Webster, 1960; Urban, 1970). Raccoons feed on adult freshwater turtles and their eggs (Erickson and Scudder, 1947). Predation on sea turtle eggs is widely reported but poorly documented. Seemingly bird eggs are not frequently eaten by raccoons (Johnson, 1970; Dorney, 1954), although Kadlec (1971) reported that the release of raccoons (and foxes) in herring gull colonies on islands off the coast of Massachusetts effectively eliminated production of young gulls, and that annual introductions caused major reductions in colony sizes or abandonment of colony sites. Schaff and Garton (1970) described predation on American toads. Crayfish and muskrat kits were principal summer foods of raccoons in a Wisconsin waterfowl marsh, and corn, berries, waterfowl crippled by hunters, and muskrats caught in steel traps were important fall foods (Dorney, 1954).

The major predator on the raccoon is man (Stuewer, 1943*a*; Stains, 1956; Johnson, 1970). A raccoon hunter's handbook was written by Whitney and Underwood (1952*b*). The bobcat (*Felis rufus*), red fox (*Vulpes vulpes*), coyote (*Canis latrans*), and owls (several species) are also known to feed occasionally on raccoons (Stains, 1956; Whitney and Underwood, 1952*a*). Giles and Childs (1949) found evidence of only four raccoons in 318 alligator stomachs. Because of the omnivorous feeding habits of the raccoon, there are many species that compete with it for food.

Movements of raccoons have been studied by a number of techniques. On the basis of footprints on sand transects, Bider *et al.* (1968) found that daily activity of raccoons involved movement toward feeding sites between hours 1600 and 2000, activity within a major feeding area between hours 2000 and 2400, activity within a minor feeding area between hours 2400 and 0300, and then return to a resting site. They also noted seasonal changes in activity. Also using trackways, Stains (1956) correlated activity of raccoons with environmental changes (snow cover, air temperature, phase of the moon) but noted that comparisons of activity between seasons were biased because of changes of uncertain magnitude in population size. Other studies also indicate that raccoons are predominantly nocturnal (Schneider *et al.*, 1971; Urban, 1970).

Many studies have used mark and recapture techniques. Hudson (1978) found that when the population density was high, raccoons were evenly distributed throughout all habitats, but that as population density decreased, ease of capture in more unfavorable habitats decreased more rapidly than in favorable habitats. Ivey (1948) indicated that raccoons were most active in Florida salt marshes at low tide, not at high tide, and that instead of retiring from marshes at high tide, the raccoons used platform beds composed of marsh plant material. However, Downing (1977), did not find a noticeable correlation with tidal cycles in a Georgia salt marsh. Stuewer (1943*a*) found that adult and juvenile male raccoons in Michigan had larger home ranges than females of corresponding ages, and that adults had larger home ranges than juveniles. Lotze (1979) summarized studies of home ranges of raccoons in the United States based on live-trapping.

Radiotracking techniques also have yielded much information about raccoon movement patterns. Schneider *et al.* (1971) described the behavior of five females and their young from the end of winter dormancy, through the period of birth, development of young, and until denning in fall and winter. Parturition and raising of a family had little effect on female movements except in respect to bedding patterns and circadian rhythms. Turkowski and Mech (1968) radiotracked a young male raccoon for four months and noted that daily activity began around sunset and ceased around sunrise (mean duration of activity was 9 hours and 5 minutes). The raccoon visited one cornfield on 87% of the nights but continued to explore new habitats throughout most of the study. Sunquist *et al.* (1969) noted that activity patterns, travel rates, length of movement periods, and size of home ranges were not different in a blind raccoon from these activities in normal raccoons.

In a study of nine radiotagged raccoons from a managed waterfowl marsh, Urban (1970) found an average home range of 49 ha (87% marsh, 8% woodlot, 4% wet meadows, and 1% farmland). He noted that movements of raccoons in the marsh did seem to change during the waterfowl nesting season, but that raccoons from adjacent areas did not move into the marsh. Ellis (1964) radiotracked seven raccoons and concluded that raccoons may move less and use smaller home ranges when population density is high. Hoffman and Gottschang (1977) studied raccoons in a suburban residential area near Cincinnati, Ohio; 160 raccoons were estimated to inhabit the area (1/1.46 ha). The average home range was 5.1 ha and was 5.5 times as long as wide. The largest known home ranges are those of raccoons from the prairies of North Dakota: a mean of 2560 ha and range of 670 to 4946 ha for adult males, and a mean of 806 ha and range of 229 to 1632 ha for adult females (Fritzell, 1978*b*). The home range of one raccoon was shown to change gradually from year to year (Lotze, 1979).

Long range movements of raccoons have been reported: 3.2 to 121 km (Giles, 1943), 266 km (Priewert, 1961), and 254 km (Lynch, 1967). The greatest known distance travelled for each of 91 raccoons in Ohio was less than 1.6 km, with an average of .4 km (Butterfield, 1944).

Raccoons in Kansas frequented the same ground dens used by striped skunks and opossums, though not necessarily at the same time. Average den occupancy for raccoons was 1.5 days and the average shift between dens was 436 m. Most resting sites were not reused on any regular or frequent basis. Winter dens and "litter trees" were more frequently reused by females with the approach of winter or time of parturition, respectively (Shirer and Fitch, 1970). Mech and Turkowski (1966) found 23 raccoons in one winter den, of which 14 were juveniles. Raccoons may use crevices in rock ledges for dens or escape cover (Giles, 1942). The absence of suitable natural den sites (tree dens in particular) does not seem to limit raccoon populations in marshes (Dorney, 1954) or in the prairies (Fritzell, 1978*b*). Raccoons commonly use barns, attics, and other human buildings when available.

Johnson (1970) found that juveniles accounted for 31 to 47% of samples obtained by different collecting techniques. His data suggested a bias towards juveniles in samples obtained by hunting. Older raccoons are wary and skillful at avoiding hunters (Whitney and Underwood, 1952*a*; Sharp and Sharp, 1956). However, Sanderson (1951) noted that the percentage of females and juveniles in a harvest of raccoons increased as size of the harvest increased. Urban (1970) noted a juvenile/adult ratio of 1.28. Females rarely outnumber males in a sample (Sanderson, 1951; Johnson, 1970).

Mortality among raccoons is caused by food shortages, hunting by man, disease, parasitism, and physiological stress arising under high population densities. There is little juvenile mortality in summer and fall (Johnson, 1970) but winter mortality may be great.

Raccoon populations fluctuate; they may increase rapidly or slowly over a number of years and then decrease. The highest population density reported was 167 raccoons from 41 ha (Twitchell and Dill, 1949). Population densities varying from one raccoon per 5 ha to one per 43 ha are more typical (Butterfield, 1944; Yeager and Rennels, 1943). In a managed waterfowl marsh (607 ha) Urban (1970) determined a spring population of 105 ± 16 individuals and fall population of 140 ± 82 individuals by the Lincoln index. Sonenshine and Winslow (1972) noted that raccoons in two natural areas of Virginia showed a clumped distribution related to the availability of food and water, thus complicating the assessment of raccoon numbers. The period required for the replacement of all raccoons in a population was estimated at 10 years in Alabama (Johnson, 1970) and 7.4 years in Missouri (Sanderson, 1951).

Disease among raccoons is of interest for several reasons. Raccoons have been used as an indicator species for the monitoring of environmental zoonoses and pollutants (Bigler *et al.*, 1975*a*). In Florida, raccoon serum is routinely examined for evidence of St. Louis Encephalitis, Venezuelan Equine Encephalitis, and Eastern Equine Encephalomyelitis (Bigler *et al.*, 1975*b*). In the southeastern United States, raccoons carry at least 13 pathogens known to cause disease among humans (Bigler *et al.*, 1975*a*). Except for canine distemper (Robinson *et al.*, 1957), these diseases seem to be of minor importance in regulating raccoon populations (Johnson, 1970). Concern about raccoons as reservoirs of leptospirosis, rabies, Chagas' disease, and tularemia is greater than for other diseases. A recent spread of rabies northward from Florida has been noted (Kappus *et al.*, 1970; Scatterday *et al.*, 1960). In the southeastern United States, both leptospirosis and tularemia have their largest reservoirs in raccoon populations (Galton, 1959; McKeever *et al.*, 1958*a*; McKeever *et al.*, 1958*b*) and the pathogens causing these diseases are transmissible through direct contact with raccoons or by means of water contaminated with raccoon urine or feces (Johnson, 1970).

Raccoons have been examined for the presence of heavy metals in their livers (Sanderson and Thomas, 1961), kidneys (Hoff *et al.*, 1977) and hair (Cumbie, 1975) and for the presence of pesticides in their omental fat (Nalley *et al.*, 1975).

Extensive mortality due to canine distemper, respiratory disease, pneumonia, or chronic pleurisy, sometimes complicated by debilitating loads of ecto- and endo-parasites, apparently occurs periodically in raccoon populations (Johnson, 1970; Mangold, 1951; Mech *et al.*, 1968; Hudson, 1978).

Stains (1956) summarized published records of ecto- and endo-parasites and disease organisms from raccoons. In Alabama, Johnson (1970) noted 11 species of ecto-parasites and 19 species of endo-parasites. Raccoons from southwestern Alabama had both more parasites and more kinds of parasites than those in other parts of the state. In another major study, 39 species of helminth parasites were found in 320 raccoons from southeastern United States (Harkema and Miller, 1964). *Gnathostoma procyonis* (Chandler), when present in large numbers may be the most harmful endo-parasitic nematode of raccoons (Chandler, 1942). However, there are monthly variations in infestation rates and there may be a complete loss of infestation (Johnson, 1970). In southwestern Georgia, the most common ticks on raccoons were *Dermacentor variabilis* (Say) and *Ixodes texanus* Banks (Morlan, 1952). Tularemia is known to be transmitted by *D. variabilis* (Hays and Foster, 1966).

The economic importance of the raccoon has been extensively reviewed by Johnson (1970) and Stains (1956). The United States Department of Commerce (1966) estimated that one to two million raccoons are harvested each year for their fur and meat.

BEHAVIOR. Raccoons are perhaps best known for their food washing behavior. This is commonly observed in zoos but is not necessarily common among free ranging individuals (Lyall-Watson, 1963; Bierens de Haan, 1932; Gewalt, 1956; Löhmer, 1975). Whitney (1933) concluded that the raccoon is a "feeler" and not a "washer" because raccoons in dry enclosures also rub their food between their hands. They also rub dry food in the wild and rub their hands together even when no food is present (personal observations).

Direct observations of social interactions between free ranging raccoons have been largely anecdotal (Tevis, 1947:329; Sharp and Sharp, 1956). Barash (1973) captured raccoons, placed them in observation cages, and noted that agonistic encounters between pairs of individuals were more frequent if the two raccoons came from widely separated areas. This suggested to him a certain degree of neighbor recognition among raccoons. Indirect observations of raccoons by means of radiotelemetry suggest that males may be territorial in relation to other males but not to females, and that females are not territorial (Fritzell, 1978*b*). At a winter feeding station, Sharp and Sharp (1956) noted that 75 to 80% of the raccoons arrived in groups of two or more individuals and that these were not always obvious family groups. That female raccoons have the predominant or sole role in the care of the young has been established by both radiotracking (Schneider *et al.*, 1971) and direct observations of family groups (Tevis, 1947; Sharp and Sharp, 1956). In captivity, raccoons may be cannibalistic (Whitney, 1933). Associations of adult males and females may be largely restricted to the breeding season. A description of copulatory behavior of two free ranging raccoons was given by Stains (1956).

Raccoon behavior has also been studied in the laboratory (King *et al.*, 1974). Learning ability of raccoons was shown to be comparable to that of cats but inferior to that of primates (Shell and Riopelle, 1957). Thackray and Michels (1958) noted that the opportunity for manipulation may be sufficient incentive for learning. Cole (1907) noted that raccoons can discriminate small differences in brightness. Johnson and Michels (1958) concluded that raccoons can visually discriminate all test objects (of any practical size) within the spatial limits of their manual reach, but could not conclude anything about discrimination at greater distances.

GENETICS. *Procyon lotor* appears to be polymorphic for chromosome number. Hsu and Benirschke (1967) examined five specimens from Vermont and New Hampshire and found among the autosomes 30 metacentrics, submetacentrics, or subtelocentrics and 6 acrocentrics (2N = 38). The X chromosome is submetacentric and the Y chromosome submetacentric or subtelocentric. Raccoons of unknown origin (obtained in Europe and examined by Walknowska, 1961) had a diploid chromosome number of 42. Moore and Gillespie (1967) examined kidney cultures from "several raccoons" of unknown origin (possibly from the southeastern United States) and 92% of the cells had a diploid chromosome number of 38.

Albinism in raccoons is apparently inherited as a simple recessive allele (Allen and Neil, 1955).

LITERATURE CITED

Aliev, F. F., and G. C. Sanderson. 1966. Distribution and status of the raccoon in the Soviet Union. Jour. Wildlife Mgt. 30:497–502.

Allen, E. R., and W. T. Neil. 1955. Albinistic sibling raccoons from Florida. Jour. Mammal. 37:120.

Allen, H. 1882. The muscles of the limbs of the raccoon (*Procyon lotor*). Proc. Acad. Nat. Sci. Philadelphia, pp. 115–144.

Baker, R. H., C. C. Newman, and F. Wilke. 1945. Food habits of the raccoon in eastern Texas. Jour. Wildlife Mgt. 9:45–48.

Bangs, O. 1898*a*. A new raccoon from Nassau Island, Bahamas. Proc. Biol. Soc. Washington 12:91–92.

— 1898*b*. The land mammals of peninsular Florida and the coast region of Georgia. Proc. Boston Soc. Nat. Hist. 28:157–235.

Baird, S. F. "1857" [1858]. Mammals. *In* Reports of explorations and surveys for a railroad route from the Mississippi River to the Pacific Ocean. Washington, D.C., vol. 8, pt. 1, xlvii + 757 pp., pls. 17–28, 30–60.

Barash, D. 1973. Neighbor recognition in two solitary carnivores: the raccoon and the red fox. Science 185:794–796.

Berner, A., and L. W. Gysel. 1967. Raccoon use of large tree cavities and ground burrows. Jour. Wildlife Mgt. 31:706–714.

Bider, J. R., P. Thibault, and R. Sarrazin. 1968. Schèmes dynamiques spatio temporels de l'activité de *Procyon lotor* en relation avec le comportement. Mammalia 32:137–163.

Bierens de Haan, J. A. 1932. Über das sogenannte Waschen des Waschbären (*Procyon lotor*), nebst einigen Bemerkungen über die Formen und die Bedeutung der tierischen Spiele. Biol. Zentralbl. 52:329–343.

Bigler, W. J., J. H. Jenkins, P. M. Cumbie, G. L. Hoff, and E. C. Prather. 1975*a*. Wildlife and environmental health: Raccoons as indicators of zoonoses and pollutants in Southeastern United States. Jour. Amer. Vet. Med. Assoc. 167:592–597.

Bigler, W. J., E. Lassing, E. E. Buff, A. L. Lewis, and G. L. Hoff. 1975*b*. Arbovirus surveillance in Florida: Wild vertebrate studies 1965–1974. Jour. Wildlife Dis. 11:348–356.

Bissonnette, T. H., and A. G. Csech. 1937. Modification of mammalian sexual cycles, VII. Fertile matings of raccoons in December instead of February induced by increasing daily periods of light. Proc. Royal Soc. London, ser. B 122:246–254.

— 1938. Sexual photoperiodicity of raccoons on low protein diet and second litters in the same breeding season. Jour. Mammal. 19:342–348.

— 1939. A third year of modified breeding behavior with raccoons. Ecology 20:156–162.

Brass, E. 1911. Aus dem Reiche der Pelze. 709 pp. (Not seen).

Butterfield, R. T. 1944. Populations, hunting pressure, and movement of Ohio raccoons. Trans. N. Amer. Wildlife Conf. 9:337–343.

Chandler, A. C. 1942. The helminths of raccoons in east Texas. Jour. Parasit. 28:255–268.

Cole, L. W. 1907. Concerning the intelligence of raccoons. Jour. Comp. Neurol. Psychol. 17:211–262.

Creed, R. F. S., and J. D. Biggers. 1963. Development of the raccoon placenta. Amer. Jour. Anat. 113:417–446.

Cumbie, P. M. 1975. Mercury in hair of bobcats and raccoons. Jour. Wildlife Mgt. 39:419–425.

Davis, D. D. 1941. The arteries of the forearm in carnivores. Publ. Field Mus. Nat. Hist. Zool. Ser. 27:137–227.

— 1964. The giant panda: a morphological study of evolutionary mechanisms. Fieldiana Zool. Mem. 3:1–339.

DeBeaufort, F. 1968. Apparition de raton laveur, *Procyon lotor* (L.) en France. Mammalia 32:307.

Dorney, R. S. 1953. Some unusual juvenile raccoon weights. Jour. Mammal. 34:122–123.

— 1954. Ecology of marsh raccoons. Jour. Wildlife Mgt. 18:217–225.

Downing, D. M. 1977. Raccoon (*Procyon lotor litoreus*) foraging on St. Catherines Island, Georgia. M.S. thesis, Southern Illinois University, Carbondale, vii + 46 pp.

Ellis, R. J. 1964. Tracking raccoons by radio. Jour. Wildlife Mgt. 28:363–368.

Erickson, A. B., and H. I. Scudder. 1947. The raccoon as a predator on turtles. Jour. Mammal. 28:406–407.

Fischer, G. 1814. Zoognosia Tabulis Synopticis. vol. 3, 694 pp. Moscow.

Folk, G. E., Jr., K. B. Coady, and M. A. Folk. 1968. Physiological observations on raccoons in winter. Iowa Acad. Sci. 75:301–305.

Fritzell, E. K. 1978*a*. Aspects of raccoon (*Procyon lotor*) social organization. Canadian Jour. Zool. 56:260–271.

— 1978*b*. Habitat use by prairie raccoons during the waterfowl breeding season. Jour. Wildlife Mgt. 42:118–127.

Galton, M. M. 1959. The epidemiology of leptospirosis in the United States with special reference to wild animal reservoirs. Southwestern Vet. 13:37–42.

Garrett, H., and J. Goertz. 1975. Longevity record for a captive raccoon (*Procyon lotor*). Trans. Missouri Acad. Sci. 9:44–45.

Geoffrey, I., and G. Cuvier. 1795. Memoir sur une nouvelle division des mammiferes. . . Mag. Encyc. 2:164–190. (Not seen).

George, J. L., and M. Stitt. 1951. March litters of raccoons (*Procyon lotor*) in Michigan. Jour. Mammal. 32:218.

Gewalt, W. 1956. Uber das "Waschen" von *Procyon lotor*. Z. Säugetierk. 21:149–155.

Gidley, J. W. 1906. A fossil raccoon from a California Pleistocene cave deposit. Proc. U.S. Nat. Mus. 24:553–554.

Giles, L. W. 1940. Food habits of the raccoon in eastern Iowa. Jour. Wildlife Mgt. 4:375–382.

— 1942. Utilization of rock exposures for dens and escape cover by raccoons. Amer. Midland Nat. 27:171–176.

— 1943. Evidences of raccoon mobility obtained by tagging. Jour. Wildlife Mgt. 7:235.

Giles, L. W., and V. L. Childs. 1949. Alligator management of the Sabine National Wildlife Refuge. Jour. Wildlife Mgt. 13:16–28.

Goldman, E. A. 1913. Descriptions of new mammals from Panama and Mexico. Smithsonian Misc. Coll. 60(22):1–20.

— 1950. Raccoons of North and Middle America. N. Amer. Fauna 60:1–153.

Grau, G. A., G. C. Sanderson, and J. P. Rogers. 1970. Age determination of raccoons. Jour. Wildlife Mgt. 34:364–372.

Gray, J. E. 1837. Description of some new or little known mammalia, principally in the British Museum collection. Mag. Nat. Hist. 1:577–587.

— 1842. Descriptions of some new genera and fifty unrecorded species of mammalia. Ann. Mag. Nat. Hist. 10:255–267.

— 1864. A revision of the genera and species of ursine animals (Ursidae), founded on the collection in the British Museum. Proc. Zool. Soc. London, pp. 677–709.

Hall, E. R. 1955. Handbook of mammals of Kansas. Misc. Publ. Mus. Nat. Hist., Univ. Kansas 7:1–303.

Hall, E. R., and K. R. Kelson. 1959. The mammals of North America. Ronald Press, New York, 2:viii + 547–1083 + *79*.

Hamilton, W. J., Jr. 1936. The food and breeding habits of the raccoon. Ohio Jour. Sci. 36:131–140.

— 1951. Warm weather foods of the raccoon in New York State. Jour. Mammal. 32:341–344.

Hardin, M. E. 1978. The raccoon (*Procyon lotor*) on St. Catherines Island, Georgia. 3. Presence of carotenoids in blood. Amer. Mus. Novitates 2649:1–10.

Harkema, R., and G. C. Miller. 1964. Helminth parasites of the raccoon, *Procyon lotor*, in the southeastern United States. Jour. Parasit. 50:60–66.

Harman, D. M., and H. J. Stains. 1979. The raccoon (*Procyon lotor*) on St. Catherines Island, Georgia. 5. Winter, spring, and summer food habits. Amer. Mus. Novitates, in press.

Haugen, O. L. 1954. Longevity of the raccoon in the wild. Jour. Mammal. 35:439.

Hays, K. L., and C. H. Foster. 1966. Man, animals and tularemia in eastern Alabama. Highlights of Agr. Res., Auburn Univ., Auburn, Alabama, 13:1–107.

Heine, H. 1973. Das Herz der Procyonidae, Ailuridae und Ursidae (Carnivora, Fissipedia). Z. Wiss. Zool. 186:1–51.

Herrera, A. L. 1899. Sinonimia vulgar y cientifica de los principales vertebrados Mexicanos. Mexico, 31 pp. (Not seen).

Hoff, G. L., W. J. Bigler, and J. G. McKinnon. 1977. Heavy metal concentrations in kidneys of estuarine raccoons from Florida. Jour. Wildlife Dis. 13:101–102.

Hoffman, C. O., and J. L. Gottschang. 1977. Numbers, distribution, and movements of a raccoon population in a suburban residential community. Jour. Mammal. 58:623–636.

Hollister, N. 1914. Descriptions of four new mammals from tropical America. Proc. Biol. Soc. Washington 27:141–144.

— 1916. The genera and subgenera of raccoons and their allies. Proc. U.S. Nat. Mus. 49:143–150.

Houston, C. S., and M. I. Houston. 1973. A history of raccoon in Saskatchewan. Blue Jay 31:103–105.

Hsu, T. C., and K. Benirschke. 1967. An atlas of mammalian chromosomes. Springer Verlag, New York, vol. 1, folia 25, pp. 1–3.

Hudson, E. M. 1978. The raccoon (*Procyon lotor*) on St. Catherines Island, Georgia. 2. Relative abundance in different forest types as a function of population density. Amer. Mus. Novitates 2648:1–15.

Ivey, R. D. 1948. The raccoon in the salt marshes of northeastern Florida. Jour. Mammal. 29:290–291.

Johnson, A. S. 1970. Biology of the raccoon (*Procyon lotor varius* Nelson and Goldman) in Alabama. Agric. Exp. Stat. Auburn Univ. Bull. 402:vi + 1–148.

Johnson, J. I., Jr., and K. M. Michels. 1958. Discrimination of small intervals and objects by raccoons. Anim. Behav. 6:164–170.

Kadlec, J. 1971. Effects of introducing foxes and raccoons on herring gull colonies. Jour. Wildlife Mgt. 35:625–636.

Kappus, K. D., W. J. Bigler, R. G. McLean, and H. A. Trevino. 1970. The raccoon: An emerging rabies host. Jour. Wildlife Dis. 6:507–509.

Kennedy, A. H. 1935. Cytology of the blood of normal mink and raccoon. III. Morphology and numbers of the blood elements in raccoon. Canadian Jour. Res. 12:495–507.

King, G., R. Schaeffer, and S. Pierson. 1974. Reinforcement schedule preference of a raccoon. Bull. Psychonom. Soc. 4:97–99.

Koopman, K. F., M. K. Hecht, and E. Ledecky-Janecek. 1957. Notes on the mammals of the Bahamas with special reference to the bats. Jour. Mammal. 38:164–174.

Lazell, J. D., Jr. 1972. Raccoon relatives. Man and Nature, September:11–15.

Lehman, L. E. 1968. September births of raccoons in Indiana. Jour. Mammal. 49:126–127.

Link, H. F. 1795. Beitrage zur Naturgeschichte. Stiller, Leipzig. vol. 1, 111 pp. (Not seen).

Linnaeus, C. 1758. Systema Naturae, ed. L. Salvii, Uppsala. vol. 1, 823 pp.

Llewellyn, L. M. 1953. Growth rate of the raccoon fetus. Jour. Wildlife Mgt. 17:320–321.

Llewellyn, L. M., and R. K. Enders. 1954*a*. Ovulation in the raccoon. Jour. Mammal. 35:440.

— 1954*b*. Trans-uterine migration in the raccoon. Jour. Mammal. 35:439.

Llewellyn, L. M., and C. G. Webster. 1960. Raccoon predation on waterfowl. Trans. N. Amer. Wildl. Conf. 25:180–185.

Löhmer, R. 1975. Vergleichende Untersuchungen über die Manipulier und Lernfähigkeiten von Waschbären und Krabben-Waschbären. Z. Säugetierk. 40:36–49.

Lotze, J.-H. 1979. The raccoon (*Procyon lotor*) on St. Catherines Island, Georgia. 4. Comparisons of home ranges determined by livetrapping and radiotracking. Amer. Mus. Novitates, in press.

Lotze, J.-H., and A. I. Fleischman. 1978. The raccoon (*Procyon lotor*) on St. Catherines Island, Georgia. 1. Biochemical parameters of urine and blood serum. Amer. Mus. Novitates 2644:1–5.

Lowery, G. H. 1943. Check list of the mammals of Louisiana and adjacent waters. Occas. Papers Mus. Zool. Louisiana State Univ. 13:213–257.

Lyall-Watson, M. 1963. A critical re-examination of food "washing" behavior in the raccoon (*Procyon lotor* Linn.) Proc. Zool. Soc. London 141:371–393.

Lynch, G. M. 1967. Long range movement of a raccoon in Manitoba. Jour. Mammal. 48:659–660.

Mangold, R. E. 1951. Raccoon (*Procyon lotor*) mortality in southern Iowa. Jour. Mammal. 32:218–219.

McKeever, S. 1958. Reproduction in the raccoon in the southeastern United States. Jour. Wildlife Mgt. 22:211.

McKeever, S., G. W. Gorman, M. M. Galton, and A. D. Hall. 1958*a*. The raccoon, *Procyon lotor*, a natural host of *Leptospira autumnalis*. Amer. Jour. Hygiene 68:13–14.

McKeever, S., J. H. Schubert, M. D. Moody, G. W. Gorman, and J. F. Chapman. 1958*b*. Natural occurrence of tularemia in marsupials, carnivores, lagomorphs, and large rodents in southwestern Georgia and northwestern Florida. Jour. Infect. Dis. 103:120–126.

Mearns, E. A. 1914. Descriptions of three new raccoons from the Mexican boundary region. Proc. Biol. Soc. Washington 27:63–68.

Mech, L. D., D. M. Barnes, and J. R. Tester. 1968. Seasonal weight changes, mortality, and population structure of raccoons in Minnesota. Jour. Mammal. 49:63–73.

Mech, L. D., and F. J. Turkowski. 1966. Twenty-three raccoons in one winter den. Jour. Mammal. 47:529–530.

Merriam, C. H. 1899. Results of a biological survey of Mount Shasta, California. N. Amer. Fauna 16:1–179.

— 1900. Descriptions of two new mammals from California. Proc. Biol. Soc. Washington 13:151–152.

Millard, C. 1939. Raccoon experiment. Wisconsin Cons. Bull. 4:28–29.

Miller, G. S., Jr. 1911. Descriptions of two new raccoons. Proc. Biol. Soc. Washington 25:3–6.

Montgomery, G. G. 1964. Tooth eruption in preweaned raccoons. Jour. Wildlife Mgt. 28:582–584.

— 1968. Pelage development of young raccoons. Jour. Mammal. 49:142–145.

— 1969. Weaning of captive raccoons. Jour. Wildlife Mgt. 33:154–159.

Moore, W., and L. J. Gillespie. 1967. Chromosomes of the raccoon. Jour. Hered. 58:172.

Morlan, H. B. 1952. Host relationships and seasonal abundance of some southwest Georgia ectoparasites. Amer. Midland Nat. 48:74–93.

Nagel, W. O. 1943. How big is a 'coon. Missouri Cons. 4:6–7.

Nalley, L., G. L. Hoff, W. J. Bigler, and W. Hull. 1975. Pesticide levels in the omental fat of Florida raccoons. Bull. Environm. Contam. Toxicol. 13:741–744.

Nelson, E. W. 1930. Four new raccoons from the keys of southern Florida. Smithsonian Misc. Coll. 82:1–12.

Nelson, E. W. and E. A. Goldman. 1930*a*. A new raccoon from Lower California. Jour. Washington Acad. Sci. 20:82–83.

— 1930*b*. Six new raccoons of the *Procyon lotor* group. Jour. Mammal. 11:453–459.

— 1931*a*. Three new raccoons from Mexico and Salvador. Proc. Biol. Soc. Washington 44:17–22.

— 1931*b*. A new raccoon from South Carolina. Jour. Mammal. 12:308–309.

Paradiso, J. L. 1969. Mammals of Maryland. N. Amer. Fauna 66:1–193.

Pocock, R. I. 1921. The external characters and classification of the Procyonidae. Proc. Zool. Soc. London 1921:389–422.

Pope, C. H. 1944. Attainment of sexual maturity in raccoons. Jour. Mammal. 25:91.

Priewert, F. W. 1961. Record of an extensive movement by a raccoon. Jour. Mammal. 42:113.

Rinker, G. C. 1944. Os clitoridis from the raccoon. Jour. Mammal. 25:91–92.

Röben, P. 1975. Zur Ausbreitung des Waschbären *Procyon lotor* (Linne, 1758) und des Marderhundes *Nyctereutes procyonoides* (Gray, 1834) in der Bundesrepublik Deutschland. Säugetierk. Mitt. 23:93–101.

Robinson, V. B., J. W. Newbeme, and D. M. Brooks. 1957. Distemper in the American raccoon (*Procyon lotor*). Jour. Amer. Vet. Med. Assoc. 131:276–278.

Rue, L. L. 1965. The world of the raccoon. J. B. Lippincott Co., New York, 145 pp.

Sanderson, G. C. 1950. Methods of measuring productivity in raccoons. Jour. Wildlife Mgt. 14:389–402.

— 1951. Breeding habits and a history of the Missouri raccoon population from 1941 to 1948. Trans. N. Amer. Wildlife Conf. 16:445–460.

— 1961*a*. The lens as an indicator of age in the raccoon. Amer. Midland Nat. 65:481–485.

— 1961*b*. Techniques for determining age of raccoons. Illinois Nat. Hist. Surv. Biol. Notes 45:1–16.

Sanderson, G. C., and R. M. Thomas. 1961. Incidence of lead in livers of Illinois raccoons. Jour. Wildlife Mgt. 25:160–168.

Sanderson, G. C., and A. V. Nalbandov. 1973. The reproductive cycles of the raccoon in Illinois. Illinois Nat. Hist. Surv. Bull. 31:25–85.

Scatterday, J. E., N. J. Schneider, W. J. Jennings, and A. L. Lewis. 1960. Sporadic animal rabies in Florida. Publ. Health Rep. 75:945–953.

Schaff, R., and J. Garton. 1970. Raccoon predation on the American toad. Herpetologica 26:334–335.

Scheffer, V. B. 1947. Raccoons transplanted in Alaska. Jour. Wildlife Mgt. 11:350–351.

Schneider, D. G., L. D. Mech, and J. R. Tester. 1971. Movements of female raccoons and their young as determined by radiotracking. Anim. Behav. Monogr. 4:1–43.

Schoonover, L. J., and W. H. Marshall. 1951. Food habits of the raccoon (*Procyon lotor hirtus*) in northcentral Minnesota. Jour. Mammal. 32:422–428.

Sharp, W. M., and L. H. Sharp. 1956. Nocturnal movements and behavior of wild raccoons at a winter feeding station. Jour. Mammal. 37:170–177.

Shell, W. F., and A. J. Riopelle. 1957. Multiple discrimination learning in raccoons. Jour. Comp. and Physiol. Psych. 50:585–587.

Shirer, H. W., and H. S. Fitch. 1970. Comparison from radio-tracking of movements and denning habits of the raccoon, striped skunk, and oppossum in northeastern Kansas. Jour. Mammal. 51:491–503.

Simkin, D. W. 1966. Extralimital occurrences of raccoons in Ontario. Canadian Field Nat. 80:144–146.

Simpson, G. G. 1945. The principles of classification and a classification of mammals. Bull. Amer. Mus. Nat. Hist. 85:1–350.

Smith, C. H. 1848. The Ursidae. Pp. 213–246. *In* Jardine, The naturalist's library (William Jardine, ed.), vol. 15. Chatto and Windus, London. 313 pp.

Smith, H. C. 1972. Some recent records of Alberta mammals. Blue Jay 30:53–54.

Sonenshine, D. E., and E. L. Winslow. 1972. Contrasts in distribution of raccoons in two Virginia localities. Jour. Wildlife Mgt. 36:838–847.

Stains, H. J. 1956. The raccoon in Kansas: natural history, management, and economic importance. Misc. Publ. Mus. Nat. Hist., Univ. Kansas 10:1–76.

— 1957. A clue to spring molt in raccoons as revealed in analysis of scats. Illinois Acad. Sci. Trans. 50:257–258.

— 1961. Comparison of temperatures inside and outside two tree dens used by raccoons. Ecology 42:410–413.

Storr, G. C. C. 1780. Prodromus methodi mammalium. Reissian, Tübingen. 43 pp. + 4 tables.

Story, H. E. 1951. The carotid arteries in the Procyonidae. Fieldiana Zool. 32:477–557.

Stuewer, F. W. 1942. Studies of molting and priming of the fur of the eastern raccoon. Jour. Mammal. 23:399–404.

— 1943*a*. Raccoons: Their habits and management in Michigan. Ecol. Monogr. 13:203–257.

— 1943*b*. Reproduction of raccoons in Michigan. Jour. Wildlife Mgt. 7:60–73.

Sunquist, M. E., G. G. Montgomery, and G. L. Storm. 1969. Movements of a blind raccoon. Jour. Mammal. 50:145–147.

Sutton, R. W. 1964. Range extension of raccoon in Manitoba. Jour. Mammal. 45:311–312.

Tester, J. R. 1943. Fall food habits of the raccoon in the South Platte Valley of northeastern Colorado. Jour. Mammal. 34:500–502.

Tevis, L., Jr. 1947. Summer activities of California raccoons. Jour. Mammal. 28:323–332.

Thackray, R. I., and K. M. Michels. 1958. Externally aroused drives in the raccoon. Anim. Behav. 6:160–163.

Thomas, O. 1911. The mammals of the tenth edition of Linnaeus; an attempt to fix the types of the genera and the exact bases and localities of the species. Proc. Zool. Soc. London for 1910, pp. 120–158.

Thorkelson, J., and R. K. Maxwell. 1974. Design and testing of a heat transfer model of a raccoon (*Procyon lotor*) in a closed tree den. Ecology 55:29–39.

Tiedemann, D. F. 1808. Zoologie. I. Zu seinen Vorlesungen. vol. 1. De allegemeine Zoologie des Meuschen und der Säugethiere. Landshut. 610 pp. (Not seen).

Turkowski, F. J., and L. D. Mech. 1968. Radio-tracking the movements of a young male raccoon. Jour. Minnesota Acad. Sci. 35:33–38.

Twitchell, A. R., and H. H. Dill. 1949. One hundred raccoons from one hundred and two acres. Jour. Mammal. 30:130–133.

Tyson, E. L. 1950. Summer food habits of the raccoon in southwest Washington. Jour. Mammal. 31:448–449.

United States Department of Commerce. 1966. Fur facts and figures/A survey of the United States fur industry. U.S. Govt. Print. Off., Washington, D.C. 20 pp.

Urban, D. 1970. Raccoon populations, movement patterns, and predation on a managed waterfowl marsh. Jour. Wildlife Mgt. 34:372–382.

Wagler, J. G. 1831. Einige Mittheilungen über Thiere Mexicos. Isis von Oken 24(5):510–535.

Walknowska, J. 1961. Les chromosomes chez les carnivores. I. Le raton laveur, *Procyon lotor* L. Folia Biol. (Warsaw) 9:303–308.

Welker, W. I., J. I. Johnson, Jr., and B. H. Pubols, Jr. 1964. Some morphological and physiological characteristics of the somatic sensory system in the raccoon. Proc. 16th Int. Congr. Zool. 3:246–250.

Whitney, L. F. 1933. The raccoon—some mental attributes. Jour. Mammal. 14:108–144.

Whitney, L. F., and A. B. Underwood. 1952*a*. The raccoon. Practical Science Publ. Co., Orange, Connecticut, 177 pp.

— 1952*b*. The Coon Hunter's Handbook. Holt, New York, 210 pp.

Wiegmann, A. 1837. Ueber die Gattung *Procyon* von Herausgeber. Arch. f. Naturgeschichte, pp. 353–372.

Wood, J. E. 1955. Notes on reproduction and rate of increase of raccoons in the Post Oak Region of Texas. Jour. Wildlife Mgt. 19:409–410.

Wright, T., and E. Lundelius, Jr. 1963. Post-Pleistocene raccoons from central Texas and their zoogeographic significance. Pearce-Sellards Ser. Texas Mem. Mus. 2:1–21.

Yeager, L. E., and W. H. Elder. 1945. Pre- and post-hunting season foods of raccoons on an Illinois goose refuge. Jour. Wildlife Mgt. 9:48–56.

Yeager, L. E., and R. G. Rennels. 1943. Fur yield and autumn foods of the raccoon in Illinois river bottom lands. Jour. Wildlife Mgt. 7:45–60.

Zollman, P. E., and R. K. Winkelmann. 1962. The sensory innervation of the common North American raccoon (*Procyon lotor*). Jour. Comp. Neurol. 119:149–158.

The primary editor for this account was Daniel F. Williams. Bibliographic assistance was provided by Marie Lawrence.

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