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RACCOONS OF NORTH AND MIDDLE AMERICA

NORTH AMERICAN FAUNA 60

UNITED STATES DEPARTMENT OF THE INTERIOR
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RACCOONS OF NORTH AND MIDDLE AMERICA

BY
EDWARD A. GOLDMAN

With
Foreword, Appendix, and Revision
of Bibliography
By
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FOREWORD

The present monograph, The Raccoons of North and Middle America, was completed by its author, Edward Alphonso Goldman, in December 1940, and early in 1941 was submitted for publication in the North American Fauna series. Advent of World War II delayed its printing, and at the time of the death of Major Goldman, September 2, 1946, he had been so engrossed in the preparation of his manuscript on Biological Investigations in Mexico that he had not revised the raccoon manuscript. In the meantime one new subspecies *Procyon lotor megalodous* Lowery had been described and several papers relating to raccoons had been published. Since Major Goldman's death another subspecific name *Procyon lotor maritimus* Dozier has appeared and a few other papers have been published.

In this final review and analysis of the manuscript it is believed desirable to leave Goldman's views and expressions as little changed as possible. Accordingly all editing has been done with this in view and only such changes made as would clarify and collate the text, or make consistent abbreviations and citations. Some important items to be noted have been indicated and explained in footnotes. No deletions of pertinent matter have been made. The bibliography (p. 87) has been extended to include literature published to date. The two subspecies, *Procyon lotor megalodous* Lowery (1943, p. 225) and *Procyon lotor maritimus* Dozier (1948, p. 286), descriptions of which may be found in the appendix (p. 84), have been included in the distributional map of species and subspecies of the subgenus *Procyon* (fig. 1) but have not been included in the list of North American species and subspecies, with type localities (p. 27), in the key to species and subspecies (p. 29), or in the general discussion throughout the text.

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THE RACCOONS OF NORTH AND MIDDLE AMERICA

By EDWARD A. GOLDMAN, *Senior Biologist, Biological Surveys, Branch of Wildlife Research*

INTRODUCTION

The raccoons, genus *Procyon*, colloquially known as "coons," belong to the carnivorous family Procyonidae, which also includes the American genera *Nasua*, *Nasuella*, *Bassaricyon*, and *Potos*, and the Old World genera *Ailurus* and *Ailuropoda* of the subfamily Ailurinae.

The members of the *Procyon lotor* group (subgenus *Procyon*), with a transcontinental range from southern Canada to Panama, except in parts of the Rocky Mountain region, and including those inhabiting several distant islands, are among the most familiar and characteristic of North American mammals. This group is not known to occur south of Panama. It is overlapped in the Isthmian region by the so-called crab-eating raccoons of the subgenus *Euprocyon*, which range from that northern limit as far south as Paraguay in South America. The raccoons have been greatly reduced in numbers or have disappeared in many formerly wooded sections, owing to clearing and intensive human occupation. Despite adverse conditions, however, they have maintained themselves in many places with remarkable tenacity. Trapping for other fur bearers may have reduced the northern fringe to some extent, but the general range of the group has been little diminished. At the present time raccoons reach their northern limit in regular occurrence on Vancouver Island, B. C.

The continental forms of the subgenus *Procyon* constitute a compact assemblage of closely allied geographic races all assignable to *Procyon lotor*. Complete intergradation is evident in numerous cases and the relative value and combination of characters presented indicate such close relationships that it can safely be assumed where lack of material leaves gaps in the known ranges.

In the present revision of the raccoons are treated the North American continental species as far as the eastern border of Panama and the

PLATE 1

Pacific Northwest Raccoon (*Procyon lotor pacificus*).

species on outlying islands along both the Atlantic and the Pacific coasts. Thirty species and subspecies are recognized. Twenty-nine of these are assigned to the subgenus *Procyon* and one to the subgenus *Euprocyon*.

The revision is based mainly on a study of raccoon material in the collection of Biological Surveys, Fish and Wildlife Service, and in other collections in the United States National Museum. These and 358 specimens borrowed from other museums make a total of 1,337 examined. The assemblage included the types or topotypes of most of the known species and subspecies.

For the loan of specimens the writer is especially indebted to Dr. Thomas Barbour, Museum of Comparative Zoology, Cambridge, Mass.; the late Dr. Joseph Grinnell, Museum of Vertebrate Zoology, Berkeley, Calif.; Dr. W. H. Osgood, Chicago Natural History Museum, Chicago, Ill.; Dr. H. E. Anthony, American Museum of Natural History, New York City; Dr. R. M. Anderson, National Museum of Canada, Ottawa, Canada; the late Oldfield Thomas of the British Museum (Natural History); Francis Kermode, Provincial Museum, Vancouver, British Columbia; Dr. L. R. Dice, Museum of Zoology, University of Michigan, Ann Arbor, Mich.; and the late D. R. Dickey, Pasadena, Calif. Grateful acknowledgment is also due to Percy Shufeldt, La Cueva, N. Mex., for the generous donation of specimens collected by him in Campeche, Mexico. Notes on his examination of specimens in the British Museum have been kindly furnished by Dr. Remington Kellogg, United States National Museum, Washington, D. C. Stanley P. Young, Fish and Wildlife Service, Washington, D. C., generously supplied the photograph for the frontispiece.

Dr. E. W. Nelson became keenly interested in the raccoons, as shown by his work on those inhabiting the Florida Keys (1930a).[1] During the same time and in the following year new subspecies were described jointly by Nelson and the writer in preparation for a revision of the group; but other projects claimed attention and our collaboration could not be carried beyond this preliminary stage.

HISTORY

The raccoons represent a highly successful branch of a well-developed phylogenetic tree. Their ancestry has been traced far back to the genera *Phlaocyon* and *Cynodictis* of the Lower Miocene or Oligocene periods. Early progenitors of these animals probably also gave rise to such divergent modern families as the Canidae, the Ursidae, and the Mustelidae. For detailed discussion of the phylogenetic relationships of the raccoons see the authors listed in the Bibliography (p. 87), especially Wortman and Matthew (1899, p. 109), Matthew (1930, p.

[1] Publications referred to parenthetically by date are listed in the Bibliography, pp. 87–106.

129), and Gregory (1933, p. 83). The genus *Procyon* was well represented in the early Pleistocene of North America, when it already ranged across the present United States from the Atlantic to the Pacific. Among Pleistocene species described were *Procyon priscus* Le Conte (1848, p. 106) from Illinois, *Procyon simus* Gidley (1906, p. 553) from California, and *Procyon nanus* Simpson (1929, p. 575) from Florida.

The name "raccoon" is derived from Indian appellations of the animal, which have been variously rendered as "aroughcun," "arathkone," and "arakun." The familiar abbreviation "coon" is in general colloquial use in the United States. An animal as common and conspicuous and possessing such peculiar and interesting traits as the raccoon could not remain long unobserved by explorers and settlers in its country, and as it became better known it was accorded a prominent place in the folklore of the United States.

The earliest reference to a raccoon found in the literature is by Captain John Smith (1612, p. 13), who in describing the animals of Virginia says: "*There is a beast they call Arougheun, much like a badger*, but vseth to live on trees as Squirrels doe." This reference was closely followed by that of Purchas (1614, p. 761) in describing the same region.

Under the name "Mapach," and apparently as "Tepe Maxtlatou," and perhaps under others, the raccoon was recorded by Hernandez (1651, tract 1, pp. 1, 9) in southern Mexico. The voyager around the world, Dampier (1729, p. 276), mentions the abundance of these animals on the Tres Marías Islands, off western Mexico, which he visited in 1686. The early systematic term *Vulpi affinis Americana* was applied by Ray (1693, p. 179), in connection with a generalized description of animals probably representing both the subgenera *Procyon* and *Euprocyon* then undifferentiated and very imperfectly known from both North and South America. Quaint descriptions of the raccoon in the Carolinas were published by Lawson (1718, p. 121), and by Catesby (1743, p. XXIX). Hans Sloane (1725, p. 329) credits the animal to Jamaica as follows: "The Racoons are commonly here in the mountains, and live in hollow fiddlewood Trees, from whence they make Paths to go to seek Sugar Canes, which is their chief, if not only Sustenance." No specimens are available from Jamaica, and if this record was well founded it seems strange that it has not been supplemented by others.

Evidently noting the general resemblances, Linnaeus closely associated the raccoon with the bear in the 1740 edition of his Systema Naturae (p. 35) as *Ursus cauda elongata* in contradistinction to the true bear, *Ursus cauda abrupta*. Under the same name in 1747 (pp. 277–289, table 9, figs. 1 and 2) he published a lengthy description of

the raccoon accompanied by the earliest illustrations seen by the author. Of these, figure 1 is a sketch of the entire animal. In figure 2 attention is directed to the strongly developed and peculiarly formed os penis, or baculum.

The accounts of the raccoon in Pennsylvania and New Jersey by Peter Kalm in 1753 (Benson 1937, pp. 52–53, 111, 242–243) formed a part of the basis for Linnaeus' short description of *Ursus lotor* in the tenth edition of his Systema Naturae (1758, p. 48). Recognizing distinctive characters, Storr (1780, p. 35) used *Procyon* as the generic name for the group typified by *Ursus lotor* Linnaeus. G. Cuvier (1798, p. 113) described *Ursus cancrivorus*, the crab-eating raccoon from Cayenne which later became the type of the subgenus *Euprocyon* Gray (1864, p. 705). Only a few new North American species or subspecies were added during the nineteenth century by Wagler (1831, p. 514), Gray (1842, p. 261), Baird (1857, p. 215), Bangs (1898a, p. 219; 1898b, p. 92), and Merriam (1898, p. 17; 1899, p. 107). Short papers descriptive of new forms by Merriam (1900, p. 151; 1901, p. 101), Miller (1911, p. 3), Mearns (1914, pp. 63–66), Hollister (1914, p. 142), Goldman (1913, p. 15), Nelson (1930a, pp. 7–10), and Nelson and Goldman (1930a, p. 82; 1930b, pp. 453–459; 1931a, pp. 17–20; 1931b, p. 308) have since appeared.

RACCOON NAMES NOT CLEARLY ASSIGNABLE

The following names that have been proposed for species of the raccoon are unrecognized or unassigned owing to the author's inability to associate them with any particular region, or because of some obvious defect in status. If the type specimens of any of these are extant, it is possible that any such accompanied by skulls, may afford clues to their identity; because of the range of individual variation in subspecies, however, there is likely to be considerable uncertainty. Skins subject to fading over a period of many years are of very limited value for comparative purposes, beyond the determination of the subgenus.

Procyon nivea Gray, Charlesworth's Mag. Nat. Hist., vol. 1, p. 580, 1837. "Inhabits North America, Texas." "Fur soft, silky, white. Tail one-colored." No type specimen designated. Doubtless based upon an albino, as suggested in the original description. At least two subspecies occur in Texas. Name unidentifiable.

Procyon brachyurus Wiegmann, Archiv für Naturgesch., dritter jahrgang, erster band, p. 369, 1837. "Patria: Antillae?" Based on two specimens said to have come from the West Indies (see pp. 354–355), but their place of origin was regarded as uncertain by the describer, as shown by the notation. Figured by Wagner in Schreber's Säugthiere (p. 143 C). The plate illustration is of two brownish animals, the tail shown in one as quite short.

Procyon obscurus Wiegmann, Archiv für Naturgesch., dritter jahrgang, erster band, p. 370, 1837. "Patria ignota." Figured by Wagner in Schreber's Säugthiere (p. 143 D). The plate illustration is of a very dark-colored animal. This seems to be unidentifiable.

[*Procyon brachyurus*] var. *fusca* Burmeister, Verzeichniss Zool. Mus. Univ. Halle-Wittenberg Säugeth., Vögel Amphib., 1850, p. 13. Based on *Procyon obscurus* Wiegmann and *Procyon obscurus* Wagner, in Schreber's Säugthiere, Suppl., vol. 2, p. 159, 1841, without description.

[*Procyon lotor*] var. *melanus* Gray, Proc. Zool. Soc. London, 1864, p. 704. No type locality indicated. No type specimen designated. "Nearly black." Unidentifiable.

[*Procyon lotor*] var. *albina* Gray, Proc. Zool. Soc. London, 1864, p. 704. (Nomen nudum.)

Pr[*ocyon*] *hernandezi castaneus* de Beaux, Zool. Anzeiger, vol. 35, p. 624, April 26, 1910. From Mexico. Based on a specimen (No. 357) which had been in the Royal Zoological Museum, Florence, Italy, since 1857. According to the description in part (p. 621), "Die Korperfarbe ist ein echtes und rechtes Kastanienbraun mit prachtvoll silbrigem Glanze." The color of raccoons is so variable that a single specimen does not afford reliable differential characters. The color described is unusual for a raccoon and might be due to fading or to erythrism. If the skin is accompanied by a skull, comparison of the latter with those of the several geographic races known to occur in Mexico might afford a clue to identity.

Pr[*ocyon*] *lotor rufescens* de Beaux, Zool. Anzeiger, vol. 35, p. 625, April 26, 1910. Type locality unknown ("?Heimat"). Type specimen not designated. About 10 specimens said to have been examined. Body color more or less suffused with rich red brown. Apparently not identifiable.

Pr[*ocyon*] *l*[*otor*] *flavidus* de Beaux, Zool. Anzeiger, vol. 35, p. 626, April 26, 1910. Type locality "Southern United States?" Type specimen not designated. Only one skin examined. Color dirty yellow. Hairs of back neither ringed nor tipped with black. Apparently not identifiable.

Pr[*ocyon*] *hudsonicus* Brass, Aus dem Reiche der Pelze, p. 564, April 1911. No type designated. Described as "sehr gross und graubraun." Apparently based upon commercial skins assumed by the describer to be from Hudson Bay where no raccoons occur. The name is therefore unidentifiable.

HABITS

Few North American animals are endowed with more interesting or attractive ways than the raccoons. The general habits, as recorded by many observers, seem everywhere to be very similar for the members of each of the two subgenera. In Panama, *Procyon* and *Euprocyon* share to some extent the same local habitat, both favoring the vicinity of swamps and streams and both being addicted to the crab-eating habit as shown by stomachs examined. But *Procyon* seems to be more arboreal than *Euprocyon*, and the two probably depart materially in general behavior. Dr. Thomas Barbour informed the author that the local representatives of both subgenera have been kept in captivity at the biological station on Barro Colorado Island

in Gatun Lake, Canal Zone, and that he has noted that *Procyon* "washes" its food in the characteristic manner while *Euprocyon* does not. The writer's own general observations indicate that under natural conditions *Procyon* does not regularly wash its food and suggest that washing may be limited mainly to food supplied to animals in captivity. As *Euprocyon* has a very restricted range in North America, the present discussion is limited chiefly to the members of the typical subgenus *Procyon*.

Much has been written on the life history of the raccoon of the eastern United States which may be assumed to apply, with some reservations, to all members of the *Procyon lotor* group. The peculiar habits of the raccoon began to attract the attention of the settlers during the early colonial period, as is shown by the following quaint and somewhat fantastic account of this animal in the Carolinas by Lawson (1718, p. 121):

> The Raccoon is of a dark-gray Colour; if taken young, is easily made tame, but is the drunkenest Creature living, if he can get any Liquor that is sweet and strong. They are rather more unlucky than a Monkey. When wild, they are very subtle in catching their Prey. Those that live in the Salt-Water, feed much on Oysters which they love. They watch the Oyster when it opens, and nimbly put in their Paw, and pluck out the Fish. Sometimes the Oyster shuts, and holds fast their Paw till the Tide comes in, that they are drown'd, tho' they swim very well. The way that this Animal catches Crabs, which he greatly admires, and which are plenty in Carolina, is worthy of Remark. When he intends to make a Prey of these Fish, he goes to a Marsh, where standing on the Land, he lets his Tail hang in the Water. This the Crab takes for a Bait, and fastens his Claws therein, which as soon as the Raccoon perceives, he, of a sudden, springs forward, a considerable way, on the Land, and brings the Crab along with him. As soon as the Fish finds himself out of his Element, he presently lets go his hold; and then the Raccoon encounters him, by getting him cross-wise in his Mouth, and devours him. There is a sort of small Land-Crab, which we call a Fiddler, that runs into a Hole when any thing pursues him. This Crab the Raccoon takes by putting his Fore-Foot in the Hole, and pulling him out. With a tame Raccoon, this Sport is very diverting. The Chief of his other Food is all sorts of wild Fruits, green Corn, and such as the Bear delights in. This and the Possum are much of a Bigness. The Fur makes good Hats and Linings. The Skin dress'd makes fine Womens Shooes.

More accurate early descriptions of the animal in Pennsylvania and New Jersey are those of Kalm (Benson 1937, pp. 52–53):

> The quadruped, which Dr. Linne in the memoirs of the Royal Academy of Sciences has described by the name of *Ursus cauda elongata*, and which he calls *Ursus Lotor*, in his Systema Naturae, is here called a raccoon. It is found very frequently and destroys many chickens. It is hunted by dogs, and when it runs up a tree to save itself a man climbs up after it and shakes it down to the ground, where the dogs kill it. The flesh is eaten and is reputed to taste well. The bone of its male parts is used for a pipe cleaner. The hatters purchase their skins and make hats of them, which are next in quality to those of beavers. The tail is worn round the neck in winter and therefore is likewise valuable.

And quoting Kalm further (Benson 1937, pp. 242–243):

I have already mentioned something of the raccoon; I shall here add more of the nature of this animal and its mode of living in its habitat, in a place which is properly its native country [vicinity of the then village of Raccoon at or near the present town of Swedesboro, N. J.]. The English call it everywhere by the name of raccoon, which name they have undoubtedly taken from one of the Indian nations; the Dutch call it *hespan*, the Swedes, *espan*, and the Iroquois, *attiqbro*. It commonly lodges in hollow trees, lies close in the daytime, never going out except on a dark, cloudy day; but at night it rambles and seeks its food. I have been told by several people that in bad weather, especially when it snows and blows a storm, the raccoon lies in its hole for a week without coming out once; during that time it lives by sucking and licking its paws. Its food consists of the several sorts of fruit, and corn, while the ears are soft. In gardens it often does a great deal of damage to the apples, chestnuts, plums, and wild grapes, which are its favorite food; to the poultry it is very cruel. When it finds the hens on their eggs, it first kills them, and then eats the eggs. It is caught by dogs, which trace it back to its nest in hollow trees, or by snares and traps, in which a chicken, some other bird, or a fish is put for bait. It generally brings forth its two or three young in May when it prepares its nest. Some people eat its flesh. It leaps with all its feet at once; on account of this and of several other qualities many people here reckoned that it belonged to the genus of bears. The skin is sold for eighteen pence at Philadelphia. I was told that the raccoons were not nearly so numerous as they were formerly; yet in the more inland parts they were abundant. I have mentioned before the use which the hatters make of their furs, that they are easily tamed, and that they like sweetmeats, etc. Of all the North American wild quadrupeds none can be tamed so easily as this one.

In regard to the duration of life in the raccoons under natural conditions, no information is now at hand. Such data should become available in the future through the tagging or otherwise marking of animals captured and liberated. According to Flower (1931, p. 177), a male raccoon lived in the Rotterdam Zoological Garden from September 30, 1890 to May 6, 1900, 9 years, 7 months, and 6 days, and an albino was in the London Zoological Garden from May 6, 1884, to February 27, 1898, 13 years, 9 months, and 21 days. He also mentions a crab-eating raccoon that lived in the London Zoo 15 years, 10 months, and 5 days. Lowery (1936, p. 19) quotes Claude Odum of Bernice, La., who said that he kept a raccoon in captivity 14 years.

FOOD AND GENERAL ACTIVITIES

Throughout the vast range of the group, raccoons favor the vicinity of water in forested regions; but they also occur along streams traversing open desert areas. Although raccoons are truly omnivorous, feeding to a considerable extent on a great variety of plant substances such as acorns, beechnuts, berries, persimmons and other fresh fruits of many kinds, and corn in the "milk" stage, most of their food is obtained in or near shallow water in swamps and marshes, and along

the shores of streams, lakes, and brackish lagoons, and even along the sea coasts, as in the Florida Keys and other islands. In such places, frogs, small fishes, crayfish, crabs, clams, oysters, insects, small mammals, reptiles, and other animal foods are sought, as shown by the characteristic telltale footprints revealing the course of nocturnal wanderings and by stomach examinations.

As water recedes to lower levels and pools become detached, fish, of which raccoons are very fond, are more readily captured by them. Referring to some water holes near Lake Drummond, Dismal Swamp, Va., in October 1895, A. K. Fisher reported: "Judging from the tracks about these pools, as many as a dozen must have come every night to feed on the fish imprisoned therein. The heads of catfish, pike, eels, and perch were found in abundance under the bushes and along the edges where the raccoons had dropped them." According to Mary J. Rathbun (1918, p. 401), the fiddler crab (*Uca pugilator*) is the main food of the raccoon on the bay shores next to the Gulf in Texas. Young birds and eggs in the nest are often taken, and departing from the usual aquatic habitat, the raccoons occasionally make raids on the farmer's poultry.

A complete list of the miscellaneous items composing the diet of raccoons would be exceedingly long and would vary in accordance with the season and with local conditions. On Key Largo, Fla., E. W. Nelson found the raccoons feeding extensively on the ripening fruit of the marlberry (*Icacorea paniculata*) in March. The taking of dry berries may be resorted to when more acceptable food supplies are insufficient. Examination of stomach contents has revealed the hard seeds of the hackberry and juniper berries in Texas raccoons and Vernon Bailey found these animals feeding upon manzanita (*Arctostaphylos*) berries in California. The eating of grasshoppers has been reported in Texas.

Although raccoons enter the water freely, much time is spent in patrolling the muddy shores. Closely crowded tracks, suggesting the imprints of human baby hands and feet, often mark the lines of least resistance up and down the banks of streams or through swamps, and well worn trails are gradually formed, disappearing in places at the edge of the water where it was necessary for the animals to wade or swim, and reappearing again on the farther side. In addition to water, trees, especially hollow ones affording shelter, are almost indispensable for the well-being of most raccoons. There seems to be evidence that the clearing of timber, especially the cutting of the large shelter trees needed for refuge and hibernation, has been an important factor in reducing the numbers of these animals in the northern part of their range. In the warmer southern territory, where hibernation does not occur, shelter trees are evidently not so essential. Mangrove

swamps, with no large trees within many miles, are regularly inhabited by large numbers of raccoons that seem able to forego supplies of fresh water. Although hollow trees are favored for the shelter afforded, holes in banks and rocky ledges are also occupied, especially in localities where such trees are few or absent. Raccoons are mainly nocturnal in their search for food, but they sometimes come out during the day, and are especially fond of sunning themselves, usually sprawled in a variety of postures on the larger upper limbs of trees.

SENSES AND INSTINCTS

The sensory organs in raccoons are evidently highly developed. Many observers accord these animals a reputation for great curiosity and cunning, and a cleverness or adroitness, involving a high order of general intelligence. As a result of experiments Cole (1907, p. 261) concluded that "in the rapidity with which it forms associations the raccoon seems to stand midway between the monkey and the cat. In the complexity of the associations it is able to form it stands nearer the monkey." It is remarkable, as pointed out by Stock (1929, p. 288), that although *Procyon* occurred in California during the Pleistocene, no member of the family has been found in the Rancho La Brea deposits. This is probably due to the caution of raccoons in approaching and investigating water holes or such natural traps as the miry, sticky tar pits presented.

The senses and instincts of raccoons, as exhibited by animals in captivity, have been carefully studied and well described by Cole (1912), who concluded that although most of the senses are strongly developed, that of smell is less utilized than the others. His results seem worth quoting at length:

> The most conspicuous behavior of the raccoon seems to be associated with the sense of touch, which is highly developed in the palm of the forepaw and the tip of the nose. During their hours of activity the animals were most often busy in exploring with their paws the floor and objects on the floor of the room in which they were kept. . . . Dark places, as your pocket or a knothole, are explored by touch hundreds of times. . . . Notwithstanding the strength of the raccoon in clinging and climbing, no touch is softer or more gentle than that of his forepaws when engaged in this investigating activity.
>
> An evidence that the nose is sometimes used for pure touch is the fact that these animals frequently investigated the experimenter's hands, and even his face, with the nose. This also seemed to be an affair of pure curiosity and quite breathless. . . . Occasionally they would both touch a strange object with the nose and sniff at it also. . . .
>
> The raccoon's taste for sweets is especially marked. All other foods were promptly deserted for cane sugar by my animals. . . . My raccoons avoided all food which had a purely sour taste, yet ripe apples and peaches were eaten which have for human taste a slightly acid tang along with the sweet flavor. Unlike herbivorous animals the raccoon refuses to taste salt. . . .

Next to sugar the raccoons preferred boiled beef and they were almost equally fond of uncooked apples, peaches, plums, and cherries. My animals never ate the raw beef which we offered them a few times. Some raccoons have been forced to eat it but they do not appear to thrive on such food. My raccoons were often seen to catch and eat flies. They would eat grains of corn, even when dry and hard, if they were hungry. Bread made of either corn-meal or flour was readily accepted. It seems evident, therefore, that the raccoon in his native haunts lives upon forest fruits and buds, and upon flies, beetles, minnows, etc. . . .

So far as I could observe the raccoons did not often employ the sense of smell, though this may have been due to their captive condition. In no case did they seem to find pieces of meat on the floor by means of smell. If one of them saw a small piece of meat dropped in the hay on the floor he would search for it carefully but beyond a distance of a few inches he did not seem to smell it. They found small pieces of loaf sugar on the floor quite as promptly as they did meat, yet from the standpoint of the human sense of smell sugar has no odor.

In one case smell was evident. When the animals were to be fed the basin of food was usually placed on the step while the door was being unlocked. During this time all of the raccoons sniffed noisily at the crack beneath the door. When it was opened, however, they *looked* for the food basin. So in this case smell was evident only when sight could not be used.

The studies of Cole indicated that the raccoon has a keen sense of sight. In regard to hearing he says:

This appears to be the special protective sense of the raccoon. The slightest sound produced (1st) perfect immobility, and (2d) fear and scurrying to the highest part of their place of confinement. . . .

Every sound at a distance was listened to intently for several seconds after the experimenter had ceased to hear it. On one occasion all the raccoons became still and yet the observers could hear no sound. Investigation showed that a man was trundling a wheelbarrow over the grass plot at least 100 yards distant from the house in which the raccoons were kept.

The sound caused by dropping on the floor a piece of meat, one-half the size of a grain of corn, was often heard by each of the animals. They turned directly toward the source of the sound. Hence they not only hear faint sounds but localize them well. Localization was further tested by putting raccoon No. 3 in a large box with a solid back. The experimenter then scratched on the outside of the back of the box with a small stick. The raccoon turned directly to the spot. The place was changed some two feet. He turned instantly to the new place and grasped with both forepaws at the exact spot. He did this repeatedly. His behavior suggests that localization of sound is much more definite than that of the human ear. His grasping at the spot might indicate that the raccoon catches some small prey partly by the aid of hearing. . . .

On the principle that animals which make sounds hear sounds we may, in connection with hearing, mention the sounds which the raccoon is capable of making. A warning growl always accompanied eating when they were fed. When hungry they sometimes emit a sound about midway between a whine and a purr, "a whimpering cry." This sound is well-known to woodsmen and is far more characteristic of the young than of the adult animal. . . . When forcibly held their whining and growling is somewhat similar to that of a dog. In fighting the animal gives short, sharp barks as he snaps.

Turning once more to the whining-purr, there is less and less of it (in captivity) as the animals grow older and only long waiting for food produces it. In the

forest it may be used as a call to others. A very young raccoon, making this cry from loneliness or in search of its mother, will cease to make it if gently stroked or scratched.

Of the climbing habit Cole says:

This instinct involves the sense of support, which is present before the raccoon possesses either the strength or the muscular co-ordination necessary for climbing, and the impulse to cling to any support. The sense of support is best described by an example. When raccoon No. 5 was probably not more than two weeks old I placed him one day upon the top of a small closed box six inches high. He groped over the top of this box . . . with his forepaws extended, feeling the way. But the moment his paws felt the edge of the box the animal shrank back and began to grope in another direction. Again he would find the edge and again shrink back and start anew. Apparently at this age vision did not serve to show him that he might safely drop to the floor. It seems likely that this impulse enables the young raccoon to remain safely in a high nest, even though it were not enclosed. . . .

When the raccoon is a month old it is able to sustain its weight by clinging to a support by any one of its paws and this it does instinctively. . . . As soon as the young raccoon can walk well any bush or tree arouses his impulse to climb. At first there is some awkwardness and two of our animals were seen to fall from a small tree, when about eight weeks old. A little later they could hardly be dislodged at all. . . . As Brehm states, the raccoon often climbs along a branch with his back down "like a sloth or an ape". . . . My raccoons always laid hold of one bough before releasing the other. They go from one bough to another very quickly yet they rely much more on their strength than on their agility.

Cole agrees with other observers in the conclusion that raccoons are very playful:

One would sit for a long time and play with his hind feet or the tip of his tail. Three were observed to play in this fashion for one and a quarter hours, with almost no pause. While my animals had to work twice a day for their food I observed only momentary play, or perhaps curiosity, as the tendency to pick up a straw or bit of cornhusk and roll it for a moment between their forepaws. In some degree, therefore, their play seems to depend on the possession of surplus energy. When well rested they played roughly with each other in mock fights, running and seizing each other gently with the teeth, rolling over and over in their tussles. In this play they would often climb to the shoulder of the observer, whereby he may learn both the strength of their grip and the sharpness of their claws. They also make a pretense of biting your hand in play, a characteristic reaction of the pet raccoon.

In this connection Cole quotes Beckmann, as follows:

"In the numberless leisure hours which every captive raccoon has he does thousands of things in order to dispel the tedium. Now, he sits upright in a secluded corner, and with a most earnest expression he is busied in trying to tie a straw around his nose. Now, he plays thoughtfully with the toes of his hind foot, or snatches after the wagging end of his long tail. At another time he lies on his back and has a whole heap of hay or dry leaves hugged against his belly and he tries to tie down this loose mass by drawing his tail tightly over it with his forepaws."

The impulse to follow which seems to be inherent in young animals of many kinds was noted by Cole, who says:

> After learning to walk, the raccoons would all follow me, or anyone else, with the utmost eagerness. If I ran they struggled through the grass at their best rate, giving the instinctive cry more and more shrilly as I got further away from them, and ceasing to give it when they overtook me. In the middle of the seventh month this instinct to follow began to wane. When released from their place of confinement each one tended to go on an exploring tour of his own and to make for a nearby tree. At this time they would still follow if called. A month later no one of the four would follow at all, and their period of infancy was past.

Although Cole regards the raccoon as especially good-natured, ". . . yet anger or ferocity was observed in these animals at about the twelfth week of their age. Though scrupulous care was taken to keep the animals tame they became fierce if they were left without being handled for a few days. In the fighting attitude the ears are laid back, the head lowered and the posterior portion of the body sharply humped up. Growling and unfleshing the teeth accompany this fighting attitude and, when provoked the raccoon is an ugly fighter." He found that his raccoons showed fear by starting at sounds, and the sudden darkening of the room caused by the door blowing shut produced in young animals a panic for a moment. Indifference to each other's behavior was marked. No certain evidence of the sexual instinct was noted by Cole until the twelfth month.

In regard to the practice of washing food that caused Linnaeus to apply the name *lotor*, and the Germans *Waschbär*, Cole says: "My raccoons did not always dip their food in water. No doubt this was partly due to their being fed together so that they formed the habit of eating rapidly. . . . Nevertheless, I do not believe that the raccoon in his native state will carry food very far for the purpose of 'washing it'." Whitney (1931, p. 35) comments on this point as follows: "Unquestionably the most common error into which writers have fallen in regard to the habits of raccoons is that the raccoon washes most of the food that he eats . . . in the wild state the raccoon washes almost nothing that he eats." He regards the error as due to observations made on animals in confinement. It is obvious that the washing of many kinds of food taken by raccoons, especially at a distance from water, would be impracticable. It is probable that under natural conditions raccoons wash only shellfish and other food gathered in or about water, the washing being often necessary to remove sand or other gritty matter.

Concerning the sleep of raccoons, Cole writes:

> There are two rather characteristic positions in sleeping. In one the animal lies on his back with his forepaws placed over his eyes. A young raccoon, when

held and somewhat frightened, also puts both forepaws over his eyes, thus giving a somewhat comical appearance, suggestive of "hiding its face in its hands." Another position in sleep consists in rolling the body almost into a ball with the top of the head placed flat on the floor between the forelegs. In this position even the ears are hardly visible. Though the animal does sleep in other positions these two are most common. It would seem that the raccoon sleeps best, therefore, with his eyes not only closed but covered, and for protection he depends most upon his lofty nest and its concealment from enemies.

Among mental attributes of the raccoon, both Davis (1907, p. 486) and Whitney (1933, p. 112) regard curiosity as an outstanding characteristic.

BREEDING

The period of gestation in *Procyon lotor*, at least in the northern part of its range, has been determined by various authorities to be about 9 or 10 weeks. One of the more definite records is that of Gander (1928), relating in a single instance to *Procyon lotor psora* in southern California. An animal kept in captivity was mated January 27 to 29 and the young were born April 3. Another record is that of Brown (1936) of 69 days from first coition.

A litter of small young was collected by E. A. Preble at Tuckerton, N. J., June 23; one taken by B. V. Lilly at Abbeville, La., suggests that in southern localities the season may be more irregular. Raccoons breed but once a year and four young are usually produced at a birth, but the number may vary from two to six. In regard to breeding in the Adirondacks of northern New York, Merriam (1884, p. 94) says:

> The Raccoon makes its home high up in a hollow of some large tree, preferring a dead limb to the trunk itself. It does little in the way of constructing a nest, and from four to six young are commonly born at a time, generally early in April in this region. The young remain with the mother about a year.

The act of copulation, rarely recorded in raccoons under natural conditions, was witnessed by the author on Blackbeard Island, Ga., April 19, 1939. From a point of vantage on high ground in the woods a mated pair, unconscious of his presence, was observed in short grass in the open marsh about 75 yards away. With a pair of field glasses a very clear view of the animals in bright sunshine was obtained at short range. When first seen at 2:05 p. m., the female, surmounted by the male, was in a standing position and sexual conjunction appeared to be already complete. Rhythmical movements of the hind quarters of the male were interrupted by periods of quiet. Several times he shifted position slightly from one side to the other, but remained most of the time with his head resting near the median line of the back of the female. The latter remained passive until at the end of about half an hour by the watch she laid her ears back and turned

her head, showing her teeth and apparently snarling at the male, although even at the short distance no sound was heard. The male quietly slipped from her, and both animals moving only a few feet immediately resumed their search for small crabs that were numerous in the marshy ground. The fur on the lower part of the back of the female had become considerably rumpled, but this was ignored by her in the search for food.

HIBERNATION

The winter activities of raccoon vary in southern and northern latitudes. In the southern United States and southward the raccoons are active throughout the year. In the North these animals become torpid, and there is a kind of hibernation or partially suspended animation, similar to that of the bears and only approximating the deep lethargic winter sleep of some other northern animals. In describing behavior in winter in Canada, Wesley Mills (1892, sec. 4, p. 50) refers to W. Yates, of Hatchly, Ontario, and says: "This observer has made some very interesting observations on a tame raccoon (*Procyon lotor*). This creature lived in a hollow log lined with straw and drowsed away the greater part of December and January, leaving any food placed before him unnoticed. The raccoon is known to spend the greater part of the winter in hollow elm trees in this part of the country, and Mr. Yates points out that the cutting down of most of these trees resulted in the raccoons betaking themselves to underground burrows including those once occupied by foxes." According to Seton (1929, p. 252): "In the Red River Valley [Canada], the sleep lasts from mid-November to early March." Concerning hibernation in the Adirondacks of northern New York, Merriam (1884, p. 93) writes: "The Raccoon hibernates during the severest part of the winter, retiring to his nest rather early, and appearing again in February or March, according to the earliness or lateness of the season. Disliking to wade through deep snow he does not come out much till the alternate thawing and freezing of the surface, suggestive of coming spring, makes a crust upon which he can run with ease."

ECONOMIC STATUS

Raccoons are naturally prolific, and owing to very extensive geographic range and adaptability the forms of *Procyon lotor* constitute a wildlife asset of major recreational and economic importance. In the extreme scarcity of money in pioneer days raccoon skins supplied an important element in helping the people to maintain their existence. In 1788 (Chase 1911) the residents of a mountain section in Tennessee organized the local "State of Franklin." Money was scarce, and the

salaries of public officials were paid in animal skins, including the following: ". . . secretary to his excellency, the governor, 500 raccoon [skins]; . . . clerk of the house of commons, 200 raccoon [skins]; members of assembly, per diem, 3 raccoon [skins]; . . ." Throughout the pioneer days raccoon skins were regular articles of barter. The skins were especially popular for making caps and coats, the latter use extending to the present time as garments for both men and women. Although their original numbers have greatly decreased, owing to the reduction or elimination of suitable habitat incident to human encroachment, raccoons have persisted where many other native animals have become extinct. Aside from the fur produced, their value in providing excellent nocturnal sport for an army of hunters and exercise for the "coon" dogs nearly throughout the forested sections of the country is well known. This hunting asset is becoming better appreciated by State game commissions and sportsmen's associations, and the liberation of raccoons in suitable places is a regular part of the annual program of wildlife management.

The meat, especially of young raccoons, is an accepted article of food in some parts of the country and is very palatable. During the early days in California, according to Newberry (1855, p. 47), raccoons in considerable numbers were sold in the San Francisco market, commanding a price of one to three dollars each.

Raccoons are destructive to human interests in some places to a limited extent. Of the economic status of the animal in its typical region, Pennsylvania and New Jersey, Rhoads (1903, p. 182) says:

> Dr. Warren reports answers from correspondents which condemn this animal as a stealer of fish, especially trout. Others say it does not catch many of these but is after crayfish chiefly. His raids on nesting turkeys I can vouch for, the eggs being sucked. His destruction of poultry is occasionally severe and he likes green maize ears dearly. No doubt he is a destroyer of birds' nests, eggs and young, both terrestrial and arboreal. He catches some mice, but being a slow sort of fellow, prefers more leisurely employment. On this account, he is quite a vegetarian, grapes, nuts, fruits and certain vegetables falling to his share. His furs for warmth and his carcass for food about compensate for the direct losses sustained by humanity in his depredations.

In the Gulf Coast Region, where raccoons still abound, conditions are described by Kopman (1921, p. 28) thus:

> One of the principal foods of the raccoon in Louisiana is crayfish. Among vegetable foods, corn in the milk, persimmons, wild grapes, and palmetto berries are very acceptable to the "coon." As a destroyer of poultry the raccoon is often a great nuisance, and it takes many wild birds. These animals are established on many of the bushy islands of the coast, and they eat the eggs and young of the seabirds and other aquatic species breeding there On Marsh Island and other bird and game preserves on the coast owned by the State, the Department of Conservation has had to provide for systematic trapping of the raccoon. . . .

In considering the natural enemies of birds, Forbush (1916, pp. 24–25) discusses the raccoon as follows:

> There is some evidence to the effect that the raccoon robs birds' nests, but it is not numerous enough now in settled regions to be very destructive. Its fondness for green corn has not endeared it to the farmer, and the sportsman and angler believe that it destroys game and fish. Add to these alleged reasons for its destruction the increasing price for its skin in the market and we can see why the "coon" is not destined long to be a great factor as an enemy of birds, except possibly on lands where all animals are protected.

An early mention of the raccoon in New England is by Josselyn (1672), who says: "The Raccoon liveth in hollow trees, and is about the size of a Gib Cat; they feed upon Mass, and do infest our *Indian* Corn very much; they will be exceeding fat in Autumn; their flesh is somewhat dark, but good food roasted."

Corn is grown extensively throughout much of the range of the raccoon, and perhaps more complaints are lodged against the animal for damages to this staple crop than to any other human interest. Cornfields adjoining woodland inhabited by raccoons may be invaded, usually for only a short distance, about the time that the ears reach the "milk" stage. The stalks are pulled down, or the ears stripped off and partly eaten and left scattered over the ground. In some of the most serious instances noted by the writer more than one-half of the corn was destroyed on areas several acres in extent. Other grain crops (as, for example, kafir corn) and fruits and vegetables of many kinds are also subject to some injury. Personal observations have shown that raccoons sometimes become nocturnal despoilers of the nests of waterfowl.

General observations over a wide range indicate that the depredations of raccoons are sporadic in relation to human interests, involve few individuals, and are usually so limited and local in extent that they are quite negligible. The removal of one or two offenders by trapping or shooting will put a stop to the raids in most cases. In a very few instances systematic trapping may be necessary to reduce a local raccoon population that has become too numerous and destructive. The isolated cases of damages sustained are, in general, far outweighed by the asset value of the species.

The northern subspecies of *Procyon lotor* are among the most important fur bearers, but pelts of the forms of the crab-eating raccoon, *Procyon* (*Euprocyon*) *cancrivorus*, are of little value, owing to the short, thin, bristly character of the pelage.

Some idea of the numbers of raccoon (*Procyon lotor*) pelts that have been handled as furs may be gained from estimates based upon statistical studies made in 1925 by Frank G. Ashbrook of the then Bureau of Biological Survey, United States Department of Agriculture (now part of the Fish and Wildlife Service, Department of the In-

terior), and Horace J. McMullen, of the then National Association of the Fur Industry (Ashbrook and McMullen 1925). The data gathered from the principal fur auctions in the United States and in London, and from raw fur receiving houses indicated that the average yearly production of raccoon pelts for the 10 years preceding 1925 was 600,000 to 1,000,000. These figures were also taken to represent the average yearly consumption for the period stated. [The most recent (1948) information compiled by the Fish and Wildlife Service indicates an annual take of from 1 to 1½ million pelts in the United States.]

The raccoon has an assured place as one of the more important American fur-bearing animals and will continue to hold this position so long as it can be maintained in suitable numbers. [It is outnumbered only by the muskrat, opossum, and skunk in pelts taken.]

The natural supply of raccoon furs is being gradually reduced through the general encroachment of civilization upon the range of the animal. Aside from trapping for the fur, hunting for sport without adequate regulations, and harassment by dogs, the drainage of water areas and the cutting of timber, especially the older trees affording convenient sheltering hollows, have resulted in conditions unfavorable for raccoons. Displaying wonderful adaptability, raccoons still maintain themselves even in many well-settled areas, often in the vicinity of human habitations or even large cities, with a persistence truly remarkable. Experiments have been conducted on raising raccoons in captivity. Much should be done, however, to further better management of the raccoon in the wild, not only as an important fur bearer and for the sport afforded in its chase, but as a characteristic American animal of outstanding general interest owing to its peculiar and attractive habits.

GENERAL CHARACTERS

The raccoons as a whole present a narrow range of variation in external appearance. The general color pattern, including the black facial mask and the barred tail, is everywhere very similar, even for the two subgenera. The subgenus *Procyon*, embracing the numerous forms of the typical North American group, is, however, easily distinguished by the normal, or backward direction of the hair on the nape, by the presence of underfur, and by the grayish forearms and thighs. In *Euprocyon*, on the other hand, the pelage of the nape is reversed, underfur is absent, and the forearms and thighs are usually blackish instead of grayish.

The normal number of mammae seems to be six in both *Procyon* and *Euprocyon*, but has been found to vary to eight in the latter subgenus. Cranial and dental subgeneric distinctions are pointed out in the treatment of subgeneric characters.

In both subgenera the plantigrade structure of the feet is an outstanding feature. The fore feet somewhat resemble tiny hands, with long fingers opposable to a high degree, possessed of great strength, and yet capable, in *Procyon* at least, of being used with a remarkable deftness and delicacy of touch. The digits of the hind feet are much less opposable, and the imprints of the broad flattened soles along muddy shores may be likened to those of a small child's feet. Although the favorite haunts of the members of both subgenera are in the vicinity of water and much time is spent upon the ground, *Procyon*, as compared with *Euprocyon*, is provided with claws that are narrower, sharper, more compressed laterally, and strengthened by greater vertical depth at the base, better adapting this subgenus for climbing and a more arboreal life. In Panama, where the two subgenera occur together, the crab-eating habit is shared in common, but may be indulged in to a greater extent by *Euprocyon* than by *Procyon*. The broader, less trenchant cusps in the molariform teeth of *Euprocyon*, as compared with those of *Procyon*, are better fitted for crushing hard substances. Along the coast of Salvador, mangrove swamps are inhabited by a local form, *Procyon lotor dickeyi*, which feeds extensively, perhaps principally, upon crabs. The abrasive effect of such a diet on the teeth of a member of the typical subgenus is there strikingly shown by the early wear and rapid shearing off of the crowns of the molars, leaving the premolars comparatively little affected. In some of the older specimens of *dickeyi* the molar crowns are reduced until a mere shell remains near the roots. This may, however, be due to some unusual local condition as such rapid or extensive wear has not been observed anywhere else.

The black mask varies somewhat in extent, and some forms are paler than others, but owing to general uniformity in pattern of coloration in each subgenus, recourse must usually be had to size and to cranial and dental modifications in tracing the relationships of species and subspecies.

In the subgenus *Procyon* most of the sutures of the skull are easily traced at birth. Among the earliest sutures to close are those of the basicranial segment surrounding the foramen magnum. The supraoccipital, exoccipitals, and basioccipital are all firmly united, and the sutures have disappeared before the permanent dentition is fully in place. The union between these bones and the remainder of the skull, however, remains distinctly visible until finally closed later with advancing age. The jugals unite with the maxillae earlier than with the squamosals. Progressive obliteration extends to the maxillopremaxillary sutures and to the median line between the frontals, while the parietal sutures remain distinct. The closure of the parietal sutures may be taken as an indication of maturity. In old age all the

bones of the skull become coalesced, among the last to unite firmly being the nasals and the mandibles. A well-developed, sometimes high and trenchant, sagittal crest commonly present in the older males is less frequent and less prominent in the females; but in many old adults of both sexes the temporal impressions do not unite to form a crest. The deciduous dentition is retained only a short time. The permanent middle incisors appear before the molars.

In the continental forms of the subgenus *Procyon* subspecific distinctions rest upon combinations of relatively slight characters, indicating close relationships. Although the characters do not stand out very conspicuously as a rule, and due allowance must be made for individual variation, they are maintained with a fair degree of constancy over areas often of considerable extent. Some of the more extreme forms of the intergrading series are very similar in external appearance, but are differentiated by well-marked details of cranial structure. Skull characters, rather than color, must therefore be relied upon in determining systematic relationships. In dental sculpture all the forms are very similar, but they vary greatly in the size of the teeth and, to some extent, in the form of the molar crowns.

In tracing the relationships of the numerous forms of the subgenus *Procyon* the principal characters of taxonomic value are the following: General color, whether light or dark, plain grayish, or suffused with ochraceous buff, or varying shades of rusty rufous; relative development of the black mask, whether continuous across middle of face, extent of black postauricular spots, and of white facial markings; general form of the skull (especially of the brain case and the frontal profile), massiveness, development of postorbital processes and of zygomata, width of palate, size of auditory bullae; size and relative length and breadth of large molariform teeth. The males are usually decidedly larger than the females in all dimensions, but the sexes agree closely in details of cranial structure.

PELAGE AND MOLT

The pelage differs widely in the subgenera *Procyon* and *Euprocyon*, as pointed out in the treatment of subgeneric characters. In the subgenus *Procyon* it is longer, softer, and much denser than in *Euprocyon*, the denseness being largely due to the fine underfur, which differs in texture from the longer overfur or guard hairs, and which is absent in *Euprocyon*. Owing to the differences in density and texture of the hairs, *Euprocyon* is of little value for the fur.

The annual molt in the subgenus *Procyon* extends over a lengthy period during the summer, at least in the more northern and more heavily furred subspecies. The new pelage, rather short in the fall,

becomes longer in the winter. In the subgenus *Euprocyon*—inhabiting tropical countries—no definite seasonal molt seems apparent.

VARIATION

Variation in the raccoons is assignable to several categories, of which perhaps the most obvious are geographic and individual.

GEOGRAPHIC VARIATION

The raccoons are believed to intergrade throughout the vast range of the species *Procyon lotor* on the North American mainland, and the component subspecies are the expression of geographic variation in size, weight, color, and minor details of structure in response to environmental and genetic influences. Some of the insular forms present a greater degree of differentiation, evidently due to isolation, and are regarded as distinct species. The largest form of the genus, *Procyon lotor excelsus*, inhabits interior valleys, principally the Snake River Valley in southeastern Washington, eastern Oregon, and southern Idaho. Large, but less extreme, geographic races occupy the other Western States and the mainland of Middle America. These give way to smaller subspecies in the eastern United States, the minimum size being reached by those living on the Florida Keys. María Madre and María Magdalena of the Tres Marías Islands Group off western Mexico are occupied by *Procyon insularis*, a large form regarded as specifically distinct from the mainland animal. Small species of raccoons inhabit New Providence Island in the Bahamas, and Guadeloupe and Barbados Islands of the Lesser Antilles. The smallest species of raccoon known was well named *Procyon pygmaeus* from Cozumel Island, Yucatan.

Geographic variation in color in the raccoons is limited mainly to the general tone and to the relative development of the black mask and other facial markings. The paler subspecies, such as *Procyon lotor pallidus*, inhabit the thinly timbered desert areas in the Colorado River Valley and adjoining territory, while darker races have developed in the eastern United States and in densely forested regions of heavy precipitation in Central America. In considering the pallid coloration of raccoons from desert areas, as along the Colorado River, it should be understood that these animals are restricted to the vicinity of water, yet they share the general pallor that is a marked characteristic of the mammals of the region as a whole.

INDIVIDUAL VARIATION

By individual variation reference is made to all the degrees of divergence from a typical mean exhibited by large series of conspecific skins and skulls from any given locality. In the raccoons the range of this variation in size, color, and cranial details is about the same as

that for which due allowance must be made in other groups of carnivores. Since the subspecies of *Procyon lotor* are geographic races with confluent geographic ranges, an unusually large individual of a small form may be similar in size to an unusually small individual of a large form, and color and cranial details may vary in comparable ratio. Owing to individual variation, some specimens, especially from unknown localities, may be difficult to identify subspecifically. They may usually be distinguished, however, by the combination of characters presented.

Apparently, abnormal individual variations in general color are common in the raccoons. A half-grown example (No. 253823, U. S. Natl. Mus.) from Nelson County, Va., exhibits an apparent case of erythrism. The usual black facial mask, postauricular spots, dark bands on the tail, and the normally dark tips of hairs are light yellowish brown; the usual white areas tend toward creamy white. In a specimen from Santee, S. C. (No. 178391, U. S. Natl. Mus.), the usual black tips of the hairs over the back and the dark tail rings are light brownish. The dark facial markings are also inclined toward brown instead of black, and the basal color of the fur in general is lighter than normal.

No definitely melanistic raccoons have been examined, but in a specimen from Red Bluff, Calif. (No. 14466, U. S. Natl. Mus.), there is an intensification of the overlying black on the upper parts, due to the unusual extent of the black on the tips of the hairs and the corresponding reduction of the light subapical zone on these hairs. As a result the back appears to be almost solid black. The usual light bars are present on the tail, and the white facial markings are normal. The occurrence of albino raccoons is reported from time to time. An adult male from Paducah, Ky. (No. 151657, U. S. Natl. Mus.), is pure white except on the nape where the white is suffused with yellowish.

The weight of the northern raccoons undoubtedly varies considerably according to the season; the animals become very fat in the fall, especially in regions where they must hibernate. The more southern raccoons that are active throughout the year do not accumulate so great a store of fat, and even their shorter pelage would weigh less. The weight differs, of course, in accordance with size in animals of comparable age, sex, and condition in the various species and subspecies. Comparatively few weights, however, appear to have been reliably recorded and are available for comparison. Whitney (1931, p. 31) reports the taking of more than 300 raccoons (*Procyon lotor lotor*) in Massachusetts and Connecticut during a 7-year period. Of the 300, every one that appeared to be uncommonly large was weighed on accurate scales. The largest weighed 22 pounds and 10

ounces. Whitney believed, however, that the average would be about 13 pounds as the weights included those of a good many animals taken in the fall that had been born in the spring of the same year and had not been able to attain a weight of much more than 10 pounds. Eighteen raccoons regarded by Whitney as of uniformly greater weight were taken by him in the fall near Brunswick, Maine. Eight of these weighed more than 23 pounds each, the largest, 27 pounds, including, a sack estimated to weight three-fourths of a pound.

A large, fat, adult male raccoon (*Procyon lotor hirtus*) collected by Vernon Bailey (1923, p. 124) at Elk River, Minn., November 5, 1886, was recorded by him as weighing 30½ pounds. Another male of the same subspecies taken at Fargo, N. Dak., by O. J. Murie, November 9, 1919, weighed 24 pounds. Average animals from the same localities would undoubtedly weigh much less.

Weights of specimens of *Procyon lotor elucus*, which is active throughout the year and does not become so fat as the more northern subspecies, were obtained in winter by E. A. Mearns on Saw Grass Island, Catfish Creek, Polk County, Fla. Five adult males from the island ranged from 10 to 12 pounds in weight, the average being 11 pounds. The weight of three adult females from the same locality ranged from 7.7 to 10 pounds, the average being 9 pounds. Weights of the diminutive raccoon *Procyon lotor auspicatus*, of Key Vaca, one of the Florida keys, were obtained late in winter by E. W. Nelson. Five adult males were found by him to range in weight from 4 to 6 pounds, with an average of 5.3 pounds. Two adult females from the same locality weighed 4 and 5 pounds, respectively.

Individual variation in cranial and dental development is extensive in scope and may render difficult the determination of some specimens, especially if from unknown localities. The variations are noticeable especially in the form of the brain case and frontal profile, relative prominence of postorbital processes, size of auditory bullae, and size of large molariform teeth. Dental abnormalities are presented in a few cases. In two individuals, one of *Procyon lotor litoreus* from Saint Simon Island, Ga., and the other of *Procyon gloveralleni* of Barbados, Lesser Antilles, the first premolars in both jaws are absent. Supernumerary teeth sometimes suggest early division of the dental matrix. In a skull of *Procyon lotor hernandezii* from Colima two canines are present on one side in the upper jaw, one somewhat smaller being posterior to the normal canine in the space usually occupied by the first premolar which is absent. On the side opposite the double canines the first premolar is also absent, there being a hiatus between the canine and second premolar. The mandible is normal.

EXPLANATIONS

MEASUREMENTS

All measurements of specimens are in millimeters. The weights given are in pounds. Adult males usually exceed adult females in dimensions, and the measurements are, therefore, presented according to sex. In some cases so few nearly typical examples are available that the measurements given may not represent the normal range of individual variation, and too broad generalizations, therefore, should not be based on them.

The external measurements, unless otherwise stated, were taken in the flesh by the collector, as follows:

Total length.—Nose to end of terminal tail vertebra.

Tail vertebrae.—Upper base of tail to end of terminal vertebra.

Hind foot.—Heel to end of longest claw.

The following cranial measurements were taken with a vernier caliper by the author:

Greatest length.—Length from anterior tip of premaxillae to supraoccipital in median line over foramen magnum.

Condylobasal length.—Length from anterior tip of premaxillae to posterior plane of occipital condyles.

Zygomatic breadth.—Greatest distance across zygomata.

Interorbital breadth.—Least distance between orbits.

Least width of palatal shelf.—Width between outer sides of palate at constriction behind posterior molars.

Maxillary tooth row.—Distance from front of canine to back of posterior molar at alveolar border.

Crown length of upper carnassial.—Greatest length of crown of upper carnassial along outer side.

Crown width of upper carnassial.—Greatest transverse diameter of crown of upper carnassial.

COLORS

Owing to the banding of the individual hairs, raccoons present coarsely blended colors difficult to segregate. For this reason very limited use has been made, in quotation marks, of names of colors from Ridgway's "Color Standards and Color Nomenclature, 1912." In the description of colors generally understood, modifying or comparative terms have been employed in naming tones, many of which are not well defined.

SPECIMENS EXAMINED

Specimens examined, unless otherwise indicated, are in the collections of the United States National Museum, including the Biological Surveys collection.

USE OF KEY TO SPECIES AND SUBSPECIES

The key to the species and subspecies of the subgenus *Procyon* is based largely on the geographic ranges, as trenchant characters cannot be assigned to intergrading geographic races, and most of the insular forms treated as species are imperfectly known. The key supplements the map (fig. 1) in affording a clue to the identification of particular specimens from known localities.

FIGURE 1.—Distribution of species and subspecies of the subgenus *Procyon*.

1. *P. lotor lotor.*
2. *P. l. hirtus.*
3. *P. l. varius.*
4. *P. l. litoreus.*
5. *P. l. solutus.*
6. *P. l. elucus.*
7. *P. l. marinus.*
8. *P. l. inesperatus.*
9. *P. l. auspicatus.*
10. *P. l. incautus.*
11. *P. l. fuscipes.*
12. *P. l. mexicanus.*
13. *P. l. pallidus.*
14. *P. l. psora.*
15. *P. l. pacificus.*
16. *P. l. excelsus.*
17. *P. l. vancouverensis.*
18. *P. l. grinnelli.*
19. *P. l. hernandezii.*
20. *P. l. shufeldti.*
21. *P. l. dickeyi.*
22. *P. l. crassidens.*
23. *P. l. pumilus.*
24. *P. insularis insularis.*
25. *P. i. vicinus.*
26. *P. maynardi.*
27. *P. pygmaeus.*
28. *P. minor.*
29. *P. gloveralleni.*
30. *P. l. maritimus.*
31. *P. l. megalodous.*

Genus PROCYON Storr

Procyon Storr, Prodr. Meth. Mammal., p. 35. 1780. Type *Ursus lotor* Linnaeus.
Campsiurus Link, Beytr. Naturg. 1 (2): 87, 1795. Type *Ursus lotor* Linnaeus (see Hollister, p. 146, 1915).
Lotor Geoffroy and Cuvier, Mag. Enc. 2: 187, 1795.
Lotor Oken, Lehrb. Naturg., 3ter Theil., 2te Abth., p. 1080, 1816.
Euprocyon Gray, Zool. Soc. London Proc. 1864: 705 (subgenus). Type *Ursus cancrivorus* Cuvier.
Mamprocyonus Herrera, Sin. Vulg. Cient. Vert. Mexicanos 1899: 18.
Euprocyon Goldman, Smithsn. Misc. Coll. 60 (22): 16, Feb. 28, 1913 (genus).
Euprocyon Hollister, U. S. Natl. Mus. Proc. 49 (2100): 146, Aug. 13, 1915 (subgenus).

Distribution.—Southern Canada to southern Brazil and northern Argentina, and some of the outlying islands.

Generic characters.—Form robust; head broad, with short, pointed muzzle; ears medium-sized, pointed; upper lip hairy across median line; soles of feet naked, smooth, without well-developed digital pads; digits free, very long, the first more than half the length of the second; claws nonretractile; tail shorter than body, cylindrical, distinctly annulated; baculum long, curved and bilobed distally; mammae 6, arranged in three pairs, as follows: pectoral, 2; abdominal, 2; inguinal, 2.

Skull broad and massive; rostrum broad; brain case broad posteriorly, tapering gradually anteriorly; interorbital and postorbital constrictions moderate; postorbital processes of maxillae usually more developed than postorbital processes of frontals; sagittal crest high and trenchant in some old adults, absent in others, the temporal ridges not uniting along median line. Mastoid processes long, stout, strongly everted, rounded distally; hamular processes rounded, with knob-like ends; auditory bullae large, inflated on inner side, the outer side sloping gradually to external auditory meatus. Mandible heavy, inferior border evenly rounded; symphysis short; coronoid process rising high and curving backward over condyle.

Dental formula: *i* 3/3 *c* 1/1 *pm* 4/4 *m* 2/2=40.

Dentition heavy; molar crowns moderately high, with prominent cusps; first and second upper premolars simple unicuspids; third upper premolar with a high conical principal cusp and a postero-internal shelf-like cingulum sometimes bearing a small cusplet; crown of fourth upper premolar subquadrate, about as long as broad, with five principal cusps; crown of first upper molar usually slightly broader than long, with four principal cusps; second upper molar subtriangular, with three principal cusps; crown of first lower molar elongated, subrectangular, with five distinct cusps. First upper premolar with a single root; second and third upper premolars 2-rooted; fourth upper premolar 3-rooted. Incisors heavy, the crowns more or less distinctly grooved when unworn. Canines oval in cross section at alveoli,

conical, without distinct grooves, the upper canines not strongly everted.

Remarks.—The genus *Procyon* is readily distinguished from the other living genera of Procyonidae. It is most closely allied to *Nasua*, but differs strikingly in external appearance as well as internal structure. It shares with *Nasua* the general pattern of white and black facial markings, hairy mid-section of upper lip, and annulated tail, but departs in more robust form, shorter snout, pointed ears, free digits, short front claws, and short, cylindrical instead of tapering tail. Important similarities in cranial structure and dental details, especially the molar cusps, are apparent, but the skull diverges notably in its short and broad, instead of narrow and elongated outlines. Among other cranial characters that distinguish *Procyon* from *Nasua* are the greater breadth of the palate between the molars in relation to breadth of bony palate behind molars (palate nearly parallel-sided throughout its length in *Nasua*); upper molariform tooth rows curved posteriorly, instead of being nearly straight; mastoid processes much more prominent; and canines more rounded and conical, instead of flattened and saber-like, with trenchant anterior and posterior edges. The genus *Procyon* differs from the genus *Nasuella* in about the same characters as from *Nasua*.

The genus *Procyon* is more distantly related to the genus *Bassaricyon* which it approaches in general type of dentition, but with which it contrasts strongly in color and in many important structural details. *Procyon* is a much larger, more heavily built animal than *Bassaricyon*, which also exhibits a departure in color, pelage, and other external features. In *Bassaricyon* the color is more uniform, the face somewhat grayish but lacking the black mask and white markings of *Procyon* and the general body color ochraceous tawny. The general pelage is much denser, softer, and has a silky quality very unlike that of *Procyon*. The tail is longer in *Bassaricyon*, flattened instead of cylindrical, and is indistinctly annulated. The ears are more rounded in *Bassaricyon* than in *Procyon*, and a median projection of the rhinarium extends across the lip to the mouth. The skulls of *Procyon* and *Bassaricyon* are somewhat similar in general form, but differ in many important features. Contrasted with that of *Bassaricyon*, the skull of *Procyon* presents points of difference including the following: Much larger, more massive (thin-walled and delicate in *Bassaricyon*); brain case less inflated; orbits relatively smaller; postorbital processes much less, and mastoid processes much more, developed; canines without distinct grooves (canines with two distinct longitudinal grooves on inner, and two on outer, surfaces in *Bassaricyon*).

Compared with the genus *Potos*, the most aberrant American member of the family as currently recognized, the genus *Procyon* differs so

widely that the commonly accepted family alignment seems open to some question. *Potos* contrasts strongly in nearly uniform coloration, rounded ears, and long, tapering, short-haired, prehensile tail. The rhinarium in *Potos* traverses the upper lip more as in *Bassaricyon*. In the skull of *Potos* similarly striking contrasts with *Procyon* are evident. The teeth may be regarded as somewhat similar in general form but there the resemblance ends. The molar crowns in *Potos* are lower and much simpler than in *Procyon*, being nearly flat and without well-developed cusps at any age, the posterior molars almost completely opposed, above and below. Anterior premolars, present in *Procyon*, are absent in *Potos*, a condition correlated with the shortening of the rostrum in the latter genus. The canines, normally rounded and without distinct grooves in the adult stage in *Procyon*, are flattened and saber-like, with deeply grooved sides in *Potos*. The mandible in *Potos* is remarkable for its depth and long, early-fused symphysis, the space between the rami anteriorly U-shaped instead of V-shaped, as is usual in the group. The lower border of the ramus, convex in *Procyon*, is concave in *Potos*, owing to lateral compression and downward expansion of the angle. Among other differential cranial features of *Potos* are the parallel-sided palate, peculiar flat bullae, and complete absence of the mastoid processes so well developed in *Procyon*.

The genus *Procyon* requires no close comparison with the Old World procyonid genera *Ailurus* and *Ailuropoda* of the subfamily Ailurinae. The characters of the Old World genera and their relationship to the other procyonids have recently been discussed by Gregory (1936) and by McGrew (1938). Among other important references bearing on the classification of the Procyonidae are Hollister (1915), and Pocock (1921).

KEY TO SUBGENERA

a^1. Pelage of two kinds, long guard hairs and short, soft underfur; hair on nape normal, not directed forward; palate extending behind posterior molars a distance of more than one-fourth length of palate ..... *Procyon* (p. 28)

a^2. Pelage coarse and wiry, without underfur; hair on nape directed forward; palate extending behind posterior molars a distance of less than one-fourth length of palate ..... *Euprocyon* (p. 80)

LIST OF NORTH AMERICAN SPECIES AND SUBSPECIES, WITH TYPE LOCALITIES

Subgenus **PROCYON** Storr

Procyon lotor lotor (Linnaeus)	Pennsylvania (p. 33).
lotor hirtus Nelson and Goldman	Elk River, Minn. (p. 37).
lotor varius Nelson and Goldman	Castleberry, Ala. (p. 38).
lotor litoreus Nelson and Goldman	Saint Simon Island, Ga. (p. 40).
lotor solutus Nelson and Goldman	Hilton Head Island, S. C. (p. 41).
lotor elucus Bangs	Oak Lodge, Brevard County, Fla. (p. 42).
lotor marinus Nelson	Chokoloskee, Fla. (p. 44).

LIST OF NORTH AMERICAN SPECIES AND SUBSPECIES, WITH TYPE LOCALITIES—Continued

Subgenus **PROCYON** Storr—Continued

Procyon lotor inesperatus Nelson	Upper Matecumbe Key, Fla. (p. 46).
lotor auspicatus Nelson	Marathon, Key Vaca, Fla. (p. 47).
lotor incautus Nelson	Torch Key, Fla. (p. 48).
lotor fuscipes Mearns	Fort Clark, Tex. (p. 49).
lotor mexicanus Baird	Espia, Chihuahua, Mexico (p. 52).
lotor pallidus Merriam	New River, Colorado Desert, Calif. (p. 54).
lotor psora Gray	Sacramento, Calif. (p. 56).
lotor pacificus Merriam	Lake Keechelus, Wash. (p. 58).
lotor excelsus Nelson and Goldman	Owyhee River, Oreg. (p. 60).
lotor vancouverensis Nelson and Goldman.	Vancouver Island, British Columbia (p. 61).
lotor grinnelli Nelson and Goldman	La Paz, Baja Calif. (p. 62).
lotor hernandezii Wagler	Valley of Mexico, Mexico (p. 64).
lotor shufeldti Nelson and Goldman	La Tuxpeña, Campeche, Mexico (p. 65).
lotor dickeyi Nelson and Goldman	Barra de Santiago, Salvador (p. 67).
lotor crassidens Hollister	Talamanca, Costa Rica (p. 69).
lotor pumilus Miller	Ancon, Panama (p. 70).
insularis insularis Merriam	María Madre Island, Tres Marías Islands, Mexico (p. 72).
insularis vicinus Nelson and Goldman	María Magdalena Island, Tres Marías Islands, Mexico (p. 73).
maynardi Bangs	New Providence Island, Bahamas (p. 75).
pygmaeus Merriam	Cozumel Island, Yucatan (p. 76).
minor Miller	Pointe-à-Pitre, Guadeloupe Island, Lesser Antilles (p. 77).
gloveralleni Nelson and Goldman	Island of Barbados, Lesser Antilles (p. 79).

Subgenus **EUPROCYON** Gray

Procyon cancrivorus panamensis (Goldman)	Gatun, C. Z. (p. 82).

Subgenus **PROCYON** Storr

[References under Genus *Procyon* Storr, p. 25]

Distribution.—Nearly transcontinental from southern Canada to Panama; occurring also on some of the outlying islands.

Subgeneric characters.—Contrasted with the subgenus *Euprocyon:* Pelage longer and of two kinds—long coarse guard hairs and short, soft underfur; hair on nape normal, not directed forward; claws narrower, more compressed laterally, of greater vertical depth at base, and more sharply pointed. Bony palate extending behind posterior molars a distance of more than one-fourth the total length of palate. Molariform teeth, except first premolars, smaller, with narrower, more sharply pointed cusps; connecting ridges between principal cusps higher, more trenchant.

Remarks.—The subgenus *Procyon* overlaps the range of the subgenus *Euprocyon* in Panama, but the characters pointed out are quite distinctive.

Key to Species and Subspecies of the Subgenus PROCYON

[Typical adults]

a^1. Geographic range continental.

b^1. Geographic range eastern United States and southern Canada, west to near longitude 90°.

c^1. Size smaller; hind foot usually less than 120 mm.; geographic range excluding greater part of Florida.

d^1. Color darker; geographic range southeastern Canada and the Northeastern States, mainly north of latitude 35°—*P. l. lotor* (p. 33).

d^2. Color paler; geographic range Southeastern States, mainly south of latitude 35°—*P. l. varius* (p. 38).

c^2. Size larger; hind foot usually more than 120 mm.; geographic range greater part of Florida—*P. l. elucus* (p. 42).

b^2. Geographic range not including eastern United States far beyond longitude 90°.

c^1. Geographic range mainly east of longitude 105°, and north of latitude 22°.

d^1. Color darker, more suffused with buff; pelage longer; geographic range mainly upper Mississippi and Missouri River drainage—*P. l. hirtus* (p. 37).

d^2. Color paler, more suffused with gray; pelage shorter; geographic range mainly Texas and northeastern Mexico—*P. l. fuscipes* (p. 49).

c^2. Geographic range not mainly east of longitude 105° and north of latitude 22°.

d^1. Geographic range mainly west of the Sierra Nevada and Cascade Range.

e^1. Color darker; geographic range mainly southwestern British Columbia, western Washington, and western Oregon—*P. l. pacificus* (p. 58).

e^2. Color paler; geographic range mainly California—*P. l. psora* (p. 56).

d^2. Geographic range not mainly west of the Sierra Nevada and Cascade Range.

e^1. Size larger; geographic range mainly Snake and Humboldt River drainage in Idaho, Oregon, and Nevada—*P. l. excelsus* (p. 60).

e^2. Size smaller; geographic range not including Snake and Humboldt River drainage in Idaho, Oregon, and Nevada.

f^1. Color paler; geographic range Colorado River drainage *P. l. pallidus* (p. 54).

f^2. Color darker; geographic range not including Colorado River drainage.

g^1. Geographic range southern Baja California—*P. l. grinnelli* (p. 62).

g^2. Geographic range not including southern Baja California.

h^1. Geographic range mainly north or west of Isthmus of Tehuantepec.

i^1. Color paler; geographic range northwestern Mexico south to about latitude 22°—*P. l. mexicanus* (p 52).

i^2. Color darker; geographic range high tableland and coastal regions of Mexico from about latitude 22° to Isthmus of Tehuantepec *P. l. hernandezii* (p. 64).

h^2. Geographic range mainly south or east of Isthmus of Tehuantepec.

i^1. Color paler; geographic range mainly north of latitude 14°, including Yucatan Peninsula—*P. l. shufeldti* (p. 65).

i^2. Color darker; geographic range mainly south of latitude 14°.

j^1. Skull less massive; known geographic range southwestern coast of Salvador—*P. l. dickeyi* (p. 67).

j^2. Skull more massive; known geographic range excluding southwestern coast of Salvador.

k^1. Skull longer and narrower; dentition heavier; known geographic range Costa Rica, Nicaragua, and Honduras *P. l. crassidens* (p. 69).

k^2. Skull shorter and broader; dentition lighter; known geographic range Panama *P. l. pumilus* (p. 70).

a^2. Geographic range insular (at least in part).

b^1. Geographic range off Pacific coast.

c^1. Georgaphic range Vancouver Island *P. l. vancouverensis* (p. 61).

c^2. Geographic range off west coast of Mexico [*P. insularis* and subspecies].

d^1. Color paler; geographic range María Madre Island, Nayarit *P. i. insularis* (p. 72).

d^2. Color darker; geographic range María Magdalena Island, Nayarit *P. i. vicinus* (p. 73).

b^2. Geographic range off Atlantic coast (at least in part).

c^1. Geographic range far offshore islands (Bahamas and Lesser Antilles).

d^1. Geographic range Bahama Islands (New Providence Island) *P. maynardi* (p. 75).

d^2. Geographic range Lesser Antilles.

e^1. Color darker; upper carnassial longer than broad; geographic range Barbados Island *P. gloveralleni* (p. 79).

e^2. Color paler; upper carnassial shorter than broad; geographic range Guadeloupe Island *P. minor* (p. 77).

c^2. Geographic range coastal islands (at least in part).

d^1. Size larger; hind foot more than 90 mm.; geographic range southern Florida Keys and islands and coasts of Georgia and South Carolina.

e^1. Geographic range southern Florida Keys (at least in part).

f^1. Color darker; geographic range very close to or extending to Florida coast.

g^1. Size larger; total length (adult male) more than 700 mm.; geographic range Upper Matecumbe and other keys near base of main Florida chain *P. l. inesperatus* (p. 46).

g^2. Size smaller; total length (adult male) less than 700 mm.; geographic range keys of Ten Thousand Islands group and adjacent coast *P. l. marinus* (p. 44).

f^2. Color paler; geographic range outer half of Florida Keys.

g^1. Size larger; hind foot (adult male) more than 110 mm.; palatal bridge extending on median line beyond plane of last molars more than 12 mm.; geographic range Big Pine Key group, near extreme end of Florida chain *P. l. incautus* (p. 48).

g^2. Size smaller; hind foot (adult male) less than 110 mm.; palatal bridge extending on median line beyond plane of last molars less than 12 mm.; geographic range Key Vaca *P. l. auspicatus* (p. 47).

e^2. Geographic range islands and coasts of Georgia and South Carolina.

f^1. Dentition heavier; crown length of upper carnassial usually more than 9 mm.; geographic range Saint Simon Island, neighboring islands, and coast of Georgia *P. l. litoreus* (p. 40).

f^2. Dentition lighter; crown length of upper carnassial usually less than 9 mm.; geographic range Hilton Head Island, neighboring islands, and coast of South Carolina *P. l. solutus* (p. 41).

d^2. Size smaller; hind foot about 90 mm. or less; geographic range Cozumel Island, east coast of Yucatan *P. pygmaeus* (p. 76).

PROCYON LOTOR GROUP

Distribution.—Transcontinental (except in parts of the Rocky Mountain region) from southern Canada to Panama, and islands as far distant as the Tres Marías off the west coast of Mexico and the Bahamas and Lesser Antilles, West Indies. Altitudinal range is from sea level up along streams to about 5,000 feet in parts of the Rocky Mountain region (a few animals reaching as high as 8,500 feet elevation), and to more than 9,000 feet in the mountains near Ajusco south of the Valley of Mexico. It occupies the Tropical, Austral, Transition, and lower part of Canadian Zones.

Characters.—Contrasted with *Procyon cancrivorus* and related forms: Pelage of nape inclined backward; pelage consisting of two distinct kinds of hairs—soft, dense, velvety underfur, and longer, stiffer, projecting overlying hairs; throat and postauricular areas blackish; cusps of larger molariform teeth relatively high and trenchant, with distinct connecting ridges.

Remarks.—The *Procyon lotor* group includes *P. lotor* and subspecies of the mainland from Canada to Panama and closely adjacent islands. To the group may also conveniently be referred several more distant insular forms regarded as specifically distinct, but closely allied, as shown by similarity in important characters. These inhabit the Tres Marías Islands off the west coast of Mexico, Cozumel Island off Yucatan, and several rather widely separated islands of the West Indies. How the particular West Indian islands now inhabited were reached by raccoons and why these animals do not occur on many other islands of the archipelago where conditions seem similarly suitable are interesting subjects for speculation. Sloane (1725, p. 329) referred to the occurrence of the animal in Jamaica, as follows: "The Raccoons are commonly here in the Mountains, and live in hollow fiddlewood Trees, from whence they make paths to go to seek Sugar Canes, which is their chief, if only Sustenance." As there appear to be no later records and as Sloane referred vaguely to various authors who described raccoons elsewhere, he probably confused Jamaica with some other island.

The members of the group as a whole differ among themselves in tone of coloration, but the pattern of color markings is essentially the same, and all forms are much alike in general external appearance. They require close comparison as a group only with the crab-eating raccoon, *Procyon (Euprocyon) cancrivorus*, the range of a northern representative of the latter being overlapped in Panama. The characters that have been mentioned, however, readily separate the two groups.

PROCYON LOTOR (LINNAEUS)

[Synonymy under subspecies]

Distribution.—Transcontinental (except in the Rocky Mountain region) from southern Canada to Panama, and islands near mainland coast. The altitudinal and zonal ranges have been given under the distribution of the various subspecies.

General characters.—Size variable, general color of upper parts ranging from iron grayish to blackish, more or less suffused with ochraceous buff, especially on nape and lighter caudal rings; pelage long, full, and soft in the northern subspecies, much shorter, thinner, and stiffer in the more southern forms. Similar in external appearance to, but differing in cranial characters from, distant insular animals recognized as belonging to distinct species.

Color.—Upper parts in general varying from iron grayish to blackish, more or less suffused with buff, rusty, or "orange rufous," especially on nape, the general tone depending much upon the relative width and distribution of light subapical bands and black tips of long hairs; dorsum more or less heavily overlaid with black, tending to thin out and become grayer along sides; top of head varying mixtures of black and white or gray, producing a grizzled effect; face with a sharply delimited black mask usually reaching from cheeks across eyes and muzzle, with median extensions downward to rhinarium and upward on forehead, more or less interrupted between the eyes, however, in some forms; facial mask bordered above by conspicuous white lines extending from near middle of forehead backward under ears or to sides of neck; sides of muzzle, lips, and chin white; tufts of stiff, whitish vibrissae 50 to 100 millimeters in length, arising from sides of muzzle, and smaller, less conspicuous tufts arising, one on each side over eyes and sides of cheeks; under parts, in general, thinly overlaid with long grayish or buffy over hairs, only partially concealing the dense brownish underfur; throat crossed by a distinct blackish or brownish area, separated from facial mask by narrow white lines extending posteriorly from muzzle; ears clothed with short grayish or buffy hairs, with black areas varying in size and distinctness at posterior base; forearms and thighs similar to under parts, but hind legs more or less distinctly blackish near heels; fore feet whitish; hind feet usually whitish, but dusky of ankles sometimes extending down on metatarsus; toes of hind feet with a few grayish or dusky bristles usually extending beyond ends of longest claws; tail above with five to seven conspicuous black rings and a black tip, alternating with broader grayish or buffy rings, the black rings less sharply defined and sometimes interrupted below.

Remarks.—*Procyon lotor* is divisible into 25 geographic races which on the mainland form a closely intergrading series. The species attains its largest size in *P. l. excelsus* of the Snake River Valley in southeastern Washington, eastern Oregon, and southern Idaho, and the smallest forms are from the Florida Keys. The palest subspecies inhabit the hot arid delta of the Colorado River and adjoining regions, and the darkest have developed in the regions of heavy precipitation in Central America.

PROCYON LOTOR LOTOR (Linnaeus)

Eastern Raccoon

[*Ursus*] *lotor* Linnaeus, Syst. Nat. (ed. 10) 1: 48, 1758.

[*Meles*] *lotor* Boddaert, Elenchus Animal 1: 80, 1784. "Habitat in America."

L[*otor*] *vulgaris* Tiedemann, Zoologie. Zu seinen Vorlesungen entworfen, erster band, Mensch und Säugthiere, p. 380, 1808, (part). From North America, Mexico, and the Antilles.

Procyon annulatus G. Fischer, Zoognosia 3: 177, 1814 (part). "Habitat in Americae maritimis."

Procyon lotor Illiger, Abhand. König Akad. Wissensch. Berlin, 1804–1811, pp. 70, 74, 1815.

Procyon gularis Hamilton Smith, Jardine's Nat. Lib. 15: 222, 1848. From State of New York.

Type locality.—Pennsylvania.[2]

Type.—Not known to exist.

Distribution.—Nova Scotia, southern New Brunswick, southern Quebec, and southern Ontario south through the eastern United States to North Carolina, and from the Atlantic coast west to Lake Michigan, Indiana, southern Illinois, western Kentucky, and probably eastern Tennessee. Lower Austral to Canadian Zones.

General characters.—A rather small, dark form with long, full, soft pelage; skull with moderately high, narrow frontal region, and weak or obsolescent postorbital processes. Similar to *P. l. hirtus* of Minnesota, but much smaller; pelage less extremely long, and less suffused with ochraceous buff; skull smaller. Differs from *P. l. solutus* of Hilton Head Island and the coastal region of South Carolina in darker, less grayish coloration, more elongated skull, and other cranial details. Resembles *P. l. litoreus* of Saint Simon Island and the coastal region of Georgia, but pelage longer and softer, and cranial characters, especially the much smaller molariform teeth, distinctive. Much like *P. l. varius* of Alabama, but larger, usually darker, and pelage much longer; skull larger and of heavier proportions.

Color.—Upper parts, in general, varying shades of buffy grayish (becoming ochraceous buff or rusty rufous on nape and across shoul-

[2] Type locality fixed by Thomas, Proc. Zool. Soc. London, 1911, p. 140.

ders in some individuals) overlaid with black, the general tone due mainly to black-tipped hairs with a lighter subterminal zone, the dark brownish underfur showing through to some extent; sides of body somewhat lighter, the black tips of hairs shorter or black-tipped hairs less numerous than on median dorsal area; top of head mixed black and white or grayish, giving a coarsely grizzled effect; black mask enclosing eyes, but more or less discontinuous on middle of face where a blackish median line is more or less distinctly isolated by lighter lateral lines; upper surface of muzzle usually brownish; facial mask bordered above by rather broad and conspicuous whitish lines extending posteriorly across cheeks to sides of neck; sides of muzzle, lips, and chin white; under parts, in general, thinly overlaid with long grayish or buffy overhairs only partially concealing the dense underfur, which varies from near wood brown to chestnut bown; throat crossed by a brownish or blackish area, separated from facial mask laterally by narrow whitish or buffy lines extending posteriorly from muzzle; ears densely clothed inside and out with short, whitish or buffy hairs, merging with the general pelage on external basal portion; black postauricular patches usually large and conspicuous; forearms and thighs similar to under parts, but hind legs more or less distinctly blackish near heels; fore and hind feet, including toes, whitish, the soles black and naked; tail above with five to seven narrow black rings and a black tip, alternating with broader grayish or ochraceous buffy rings, the black rings less sharply defined and sometimes interrupted below. *Young* (in first pelage): Color markings as in adults, but top of head, nape, and postauricular spots nearly pure brownish black, in contrast to the lighter, generally buffy, tone of dorsum, over which the black-tipped hairs beginning to appear are still inconspicuous.

Cranial characters.—Skull rather small, with moderately high, narrow frontal region; brain case depressed near fronto-parietal suture; postorbital processes of frontals small or obsolescent; postorbital processes of jugal well developed. Very similar to that of *P. l. hirtus,* but much smaller, less massive; sides of frontals behind orbits usually more deeply indented or constricted, the result being that sides of brain case are more rounded or bulging, less tapering anteriorly; dentition relatively the same. Not very unlike that of *P. l. solutus,* but longer and relatively narrower; frontal region usually narrower; palatal shelf longer, extending farther posteriorly beyond posterior molars; dentition usually somewhat lighter, the large molariform teeth rather narrow, but maxillary tooth row longer as a rule, owing to wider spacing of premolars. Similar in general form to that of *P. l. litoreus,* but smaller, and dentition relatively much lighter, the difference most marked in the molariform teeth. Compared with that of *P. l. varius,*

the skull of *P. l. lotor* is larger and heavier; jugal broader; sides of frontals behind orbits usually more deeply indented or constricted; maxillary tooth row longer; posterior upper premolar and upper carnassial usually distinctly larger.

Measurements.—Adult female from Liberty Hill, Conn.: Total length, 832 millimeters; tail vertebrae, 247; hind foot, 118. Adult female from Minerva, N. Y.: 805; 225; 105. Adult male from Granville, Nova Scotia: 837; 240; 116. Two adult males from Dismal Swamp, Va., respectively: 800, 860; 245, 285; 115, 110. Adult female from Dismal Swamp, Va.: 800; 250; 115. *Skull:* Adult female from Liberty Hill, Conn.: Greatest length, 114.4; condylobasal length, 109.8; zygomatic breadth, 74.1; interorbital breadth, 23; least width of palatal shelf, 14.8; maxillary tooth row (alveoli), 41.7; upper carnassial, crown length, 8.8, crown width, 9.2. Male and female from Adirondack Mountains, N. Y., respectively: Greatest length, 117, 110.9; condylobasal length, 112.9, 107.4; zygomatic breadth, 71.8, 67.9; interorbital breadth, 22.7, 23.3; least width of palatal shelf, 16.2, 16.2; maxillary tooth row, 42.4, 41.9; upper carnassial, crown length, 8.3, 8.3, crown width, 8.9, 9.3. Male and female from Dismal Swamp, Va., respectively: Greatest length, 116, 111.6; condylobasal length, 109.2, 105.7; zygomatic breadth, 76.4, 68.5; interorbital breadth, 25, 23.3; least width of palatal shelf, 16.2, 16.5; maxillary tooth row, 41.9, 39.7; upper carnassial, crown length, 8.8, 8.5, crown width, 9.2, 9.1.

Remarks.—Although individual variation is considerable, and due allowance should be made for it, the general characters of *P. l. lotor* are maintained with a fair degree of constancy throughout its range. Specimens from the northern part of the area have somewhat longer pelage and average somewhat darker than those from the southern part, but individuals contrasting strongly in color, some very dark and others light in tone, may be found at the same locality. Intergradation with *P. l. hirtus*, *P. l. solutus*, *P. l. litoreus*, and *P. l. varius* is evident, but the transition from one geographic race to another seems to be rather abrupt. [See also appendix, p. 84.] Specimens of *P. l. lotor* from Belleville, Ill., and New Richmond, Mich., approach *hirtus* and might be referred to that form. Those from Dismal Swamp, Va., and eastern North Carolina are variable; some being near-typical *lotor*, while others grade toward *solutus*.

[*Meles*] *lotor* Boddaert, *L*[*otor*] *vulgaris* Tiedemann, and *Procyon annulatus* G. Fischer are substitute names for [*Ursus*] *lotor* Linnaeus. *Procyon gularis* Hamilton Smith was based on a live individual "in the State of New York," in which the "whole throat was black." There is no reason to assume that the animal differed from the typical form of the region, in which the amount of black on the throat is quite variable.

Specimens examined.—Total number, 181, as follows:

Connecticut: Liberty Hill, 3;[3] West Greenwich, 2 (skulls only); exact locality unknown, 1 (skull only).

District of Columbia: Washington, 1 (skull only).

[3] Mus. Comp. Zool.

Illinois: Belleville, 2 (skulls only); Olive Branch, 2 (skulls only);[4] Rosiclare, 1.[4]

Indiana: Bicknell, 2 (skulls only); Culver, 1 (skull only); Pitcher Lake, Posey County, 1 (skull only);[5] Porter County, 1 (skull only); Russiaville, 1 (skull only); Salamonia, 1 (skull only).[4]

Kentucky: Mammoth Cave, 1; Paducah, 1.

Maine: Bethel, 4 (3 skulls without skins);[6] Bucksport, 2 (skulls only);[3] Ellsworth, 1 (skin only);[3] Greenville, 1;[3] Penobscot River, 2; Umbagog Lake, 1 (skull only);[3] Upton, 1.[3]

Maryland: Blackwater National Wildlife Refuge, Dorchester County, 5 (1 skull without skin) [referable to *P. l. maritimus*, see appendix, p. 85]; Bowie, 1 (skull only); Branchville, 1; Cabin John, 1; Jefferson, 2 (1 skull without skin); Laurel, 7 (skulls only); Marshall Hall, 1 (skull only); Patuxent River, 1 (skull only).

Massachusetts: Ayer, 1 (skull only);[3] Brookhaven, 1 (skull only); Pepperell, 1 (skull only);[3] Stockbridge, 1 (skull only).[3]

Michigan: Constantine, 1 (skin only);[4] Detroit, 1 (skull only); New Richmond, 1 (skull only).

New Hampshire: Ossipee, 1 (skull only).

New Jersey: Tuckerton, 3.

New York: Adirondack Mountains, 9 (skulls only); Essex County, 4 (skulls only); Fort Montgomery, 2 (1 skin without skull);[7] Hastings, 1;[4] Hastings on Hudson, 4 (2 skins without skulls);[7] Lake George, 1 (skull only); Lewis County, 1 (skull only); Leyden, 1 (skull only); Locust Grove, 1; Long Island, 1;[7] Monroe County, 1 (skull only);[4] Minerva, 3;[7] Netherwood, 1;[7] Piseco, 1; Saint Lawrence County, 2 (1 without skin and 1 without skull); Schoharie, 1 (skin only);[7] Schroon Lake, 1 (skull only); Severance, 8 (skulls only); Sing Sing, 16 (skulls only); West Point, 2 (skins only).

North Carolina: Asheville, 6 (5 skulls without skins); Coinjock, 1 (skin only); Highlands, 1 (skin only); Moore County, 1 (skull only); Pisgah National Forest (Bent Creek), 3 (skulls only); Raleigh, 1 (skull only).

Nova Scotia: Bridgetown, 1;[3] Digby, 1; Granville, 3.[4]

Ontario: Credit River, 1 (skull only);[8] Preston, Waterloo County, 1 (skull only).[8]

Pennsylvania: Allegheny County, 2 (1 without skin and 1 without skull); Carlisle, 7 (skulls only); Chester County, 1 (skull only).

Vermont: Newfane, 1 (skull only).

Virginia: Amelia County, 1 (skull only); Buckingham County, 2 (skins only); Chesterfield, 1 (skull only); Chesterfield County, 1 (skull only); Clarke County, 1 (skull only); Dismal Swamp, 5 (1 skull without skin); Fredericksburg, 4 (skulls only); Gunston, 2 (skulls only); Morrison, 1 (skull only); Nelson County, 1 (skin only); Smith Island, 2; Warwick County, 1 (skull only); Washington, 4 (1 skull without skin).

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[3] Mus. Comp. Zool.
[4] Chicago Mus. Nat. Hist.
[5] Univ. Michigan Mus. Zool.
[6] Mus. Vert. Zool.
[7] Amer. Mus. Nat. Hist.
[8] Natl. Mus. Canada.

PROCYON LOTOR HIRTUS Nelson and Goldman

Upper Mississippi Valley Raccoon

Procyon lotor hirtus Nelson and Goldman, Jour. Mammal. 11 (4): 455, Nov. 11, 1930.

Type locality.—Elk River, Sherburne County, Minn.

Type.—No. 187926, male adult, skin and skull, United States National Museum (Merriam collection); collected by Vernon Bailey, March 4, 1886.

Distribution.—Upper Mississippi and Missouri River drainage areas from the eastern slopes of the Rocky Mountains east to Lake Michigan, and from southern Manitoba and probably southwestern Ontario and southeastern Alberta south to southern Oklahoma and Arkansas. Overlapping divisions of Upper Austral and Transition Zones; entering Canadian Zone to a limited extent near Lake Superior.

General characters.—A large, dark subspecies with long, full, soft pelage, usually suffused with ochraceous buff; skull with high, narrow frontal region, and weak or obsolescent postorbital processes. Similar to *P. l. lotor* of the eastern United States, but much larger; pelage longer and usually more suffused with ochraceous buff. Size about as in *P. l. fuscipes* of Texas, but color darker, the pelage much longer and denser, more suffused with buff instead of grayish, the light subapical zone of hairs over upper parts less extensive and permitting the under color to show through; skull differing in slight details.

Color.—Similar to *P. l. lotor* but usually more suffused with ochraceous buff.

Cranial characters.—Skull very similar to that of *P. l. lotor* in general form, but much larger, more massive; brain case usually more tapering anteriorly, the sides of frontals diagonally below and behind postorbital processes less deeply indented or constricted; postorbital processes of frontals weakly developed, or obsolescent, as in *lotor*. About the same in size and in most important details as *P. l. fuscipes*, but interorbital and postorbital regions usually narrower; frontal area similarly high, but usually less flattened, with a narrower, more distinct, V-shaped median depression.

Measurements.—An adult male from Fargo, N. Dak.: Total length, 880 mm.; tail vertebrae, 265; hind foot, 125. *Skull*: Type: Greatest length, 127.1; condylobasal length, 122.2; zygomatic breadth, 80.5; interorbital breadth, 25.8; least width of palatal shelf, 15.8; maxillary tooth row (alveoli), 45.8; upper carnassial, crown length, 8.8, crown width, 9.

Remarks.—The raccoon of the upper part of the Mississippi Valley is readily distinguished from its eastern relative, *P. l. lotor*, by much larger size, especially of the skulls. It is less easily separated from *P. l. fuscipes* of Texas, which is of about the same size, but typical specimens differ in color and in cranial details as pointed out. Inter-

gradation is evident, but in the sum of characters presented these widely ranging forms are quite distinct.

Specimens examined.—Total number, 61, as follows:

Colorado: Arkins, 1 (skull only); Cherry Creek, Arapahoe County, 2 (1 skull without skin); Estelene, 1; Las Animas, 1; Loveland, 1; Tuttle, 1; Wray, 4 (1 skin without skull; 3 skulls without skins).

Illinois: Chicago (Jackson Park), 1; Henderson County, 1; Joliet, 1 (skin only).

Iowa: Keosanqua State Park, Van Buren County, 1.[9]

Kansas: Manhattan, 1 (skull only).

Minnesota: Beltrami County, 1; Elk River (type locality), 13 (6 skulls without skins).

Missouri: Independence, 1 (skull only); Marble Cave, 1 (skull only).

Nebraska: Beemer, 2 (skulls only); Haigler, 1 (skull only); Johnstown, 1 (skull only); Republican Fork, Platte River, 1 (skull only); Valentine, 1 (skull only); without exact locality, 1 (skull only).

New Mexico: Bear Canyon, Raton Range, 1 (skull only); Raton Range (mouth of Trinchera Pass), 1.

North Dakota: Fargo, 1; Grafton, 1 (skull only); Towner, 1.

Oklahoma: Fort Cobb, 1 (skull only); Frederick ("20 miles from"), 1 (skin only); Mount Scott, 4 (1 skull without skin); Redfork, 1 (skin only).

Texas: Canadian, 1 (skull only).

Wisconsin: Delavan, 6 (5 skulls without skins); Okee, 1 (skull only); without exact locality, 1 (skull only).

Wyoming: New Haven, 1.

PROCYON LOTOR VARIUS Nelson and Goldman

Alabama Raccoon

Procyon lotor varius Nelson and Goldman, Jour. Mammal. 11 (4): 456, Nov. 11, 1930.

Type locality.—Castleberry, Conecuh County, Ala.

Type.—No. 158246, female adult, skin and skull, United States National Museum (Biological Surveys collection); collected by A. H. Howell, October 10, 1908.

Distribution.—Extreme southwestern Kentucky, Tennessee, Mississippi, northern Louisiana, Alabama, northwestern Florida, and western Georgia. Mainly Lower Austral Zone.

General characters.—A small subspecies most closely resembling *Procyon lotor lotor*, but smaller, usually paler, pelage much shorter, and skull differing in detail. Differing from *P. l. elucus* of Florida in paler color, rather decidedly smaller size, and in cranial features. Similar to *P. l. fuscipes* of Texas in color, but much smaller, with a different skull.

Color.—Upper parts in general light buffy grayish, with a light ochraceous buffy suffusion along median dorsal area, becoming more intense on nape and shoulders, thinly overlaid with black; sides clearer gray, the black-tipped hairs of dorsum thinning out; top of head mixed brownish black and gray; facial mask brownish black,

[9] Iowa State College.

becoming rusty brownish on median line between eyes, and ochraceous buffy on upper surface of muzzle; sides of muzzle, lips, and chin white; under parts in general thinly overlaid with buffy grayish; throat patch brownish black; ears grayish with small black patches at posterior base; legs grayish, becoming whitish on feet; tail above with about five or six black rings and a black tip, alternating with light ochraceous buffy rings, the dark rings becoming buffy and less distinct below.

Cranial characters.—Skull small and slender, with weak or obsolescent postorbital processes of frontals; very similar to that of *P. l. lotor*, but smaller and more delicate in structure; jugal narrower; sides of frontals diagonally behind and below postorbital processes usually less deeply indented or laterally constricted; maxillary tooth row shorter; posterior upper premolar and upper carnassial usually distinctly smaller; very similar to that of *P. l. elucus* in general form, but rather decidedly smaller; brain case narrower, frontal region flatter, less "humped." Compared with that of *P. l. fuscipes* the skull is much smaller, more slender, with narrower frontal region, and postorbital processes of frontals (not very prominent in *fuscipes*) less developed.

Measurements.—Type: Total length, 720 mm.; tail vertebrae, 218; hind foot, 103. An adult male from Hurricane, Ala.: 772; 258; 109. *Skull*: Type: Greatest length, 104.8; condylobasal length, 98.6; zygomatic breadth, 64.4; interorbital breadth, 22.5; least width of palatal shelf, 14.6; maxillary tooth row (alveoli), 39.8; upper carnassial, crown length, 7.8, crown width, 7.9.

Remarks.—The Alabama raccoon agrees more closely in combination of characters with typical *lotor* than with any of the other known subspecies, although its distribution area constitutes a wedge, separating the ranges of *elucus*, *fuscipes*, and *litoreus*. [See appendix, p. 84.] Intergradation with these forms is evident, but the lines of demarcation between them appear to be fairly sharply drawn.

Specimens examined.—Total number 57, as follows:

Alabama: Ashford, 2 (1 skull without skin); Barachias, 5 (skulls only); Castleberry, 2; Huntsville, 1; Hurricane (4 miles north), 2; Orange Beach, 11 (9 skulls without skins); Perdido Bay, 1 (skull only); Sylacauga, 2 (skulls only).

Florida: Apalachicola, 5 (skulls only).

Georgia: Geneva, Talbot County, 1 (skull only); Juniper, Talbot County, 6;[10] Nashville, 2 (1 skin without skull); Talbot County, 5 (skulls only).

Kentucky: Hickman, 2.

Louisiana: Baton Rouge, 1;[11] Morrow, Saint Landry Parish, 1 (skull only); Mississippi River (mouth), 1 (skull only)[11] [referable to *P. l. megalodous*, see appendix, p. 84].

Mississippi: Bay Saint Louis, 1 (skin only); Saucier, 1;[12] Washington, 2.

Tennessee: Arlington, 1; Big Sandy, 1; Clarksville, 1.

[10] Mus. Comp. Zool.
[11] Louisiana State Univ. Mus.
[12] Southern Forest Expt. Sta. Collection.

PROCYON LOTOR LITOREUS Nelson and Goldman

Saint Simon Island Raccoon

Procyon lotor litoreus Nelson and Goldman, Jour. Mammal. 11 (4): 457, Nov. 11, 1930.

Type locality.—Saint Simon Island, Glynn County, Ga.

Type.—No. 2450, adult (probably male), skull only, United States National Museum; collected by Samuel W. Wilson; entered in museum catalog, August 7, 1856.

Distribution.—Coastal strip and islands of Georgia. Austroriparian division of Lower Austral Zone.

General characters.—Size medium and color dark, much as in *Procyon lotor elucus* of Florida; length and texture of pelage about the same; skull differing in detail, especially in the much heavier dentition. Similar to *P. l. lotor* of Pennsylvania in color, but pelage shorter, more bristly, and cranial characters distinctive. Differing from *P. l. solutus* of South Carolina in more buffy or brownish coloration and heavy dentition.

Color.—About as in *P. l. elucus.*

Cranial characters.—Skull similar in general form to that of *P. l. elucus*, but frontal region narrower and flatter, the sides usually more compressed or abruptly indented behind postorbital processes, leaving the brain case bulging laterally instead of tapering gradually into orbit as in *elucus*; dentition much heavier throughout, the difference being most noticeable in the large molariform teeth. Differing from that of *P. l. solutus* in larger size and much heavier dentition. Compared with that of *P. l. lotor* the skull is usually larger, with much heavier dentition; postorbital processes of frontal weak or obsolescent as in *lotor* and *elucus.*

Measurements.—Adult topotype: Hind foot (dry skin) 107 mm. *Skull:* Type: Greatest length, 116.6; condylobasal length, 109.4; zygomatic breadth, 72.9; interorbital breadth, 22.2; least width of palatal shelf, 15.8; maxillary tooth row (alveoli), 43.6; upper carnassial, crown length, 9.6, crown width, 9.9.

Remarks.—The remarkably heavy dentition readily distinguishes *P. l. litoreus* from all others of the group inhabiting the eastern United States. Its large teeth are equalled elsewhere in the group only in some of the larger subspecies of the Western States and southern Mexico and Central America. Specimens from Saint Simon Island appear to reach the maximum in dental development, but are closely approached by those from the adjacent mainland.

Specimens examined.—Total number, 25, as follows:

Georgia: Altamaha River (mouth), 5 (skulls only); McIntosh County, 2 (skulls only); Ossabaw Island, 1 (skin only); Saint Simon Island, 15 (2 skins, 13 skulls); Thunderbolt Creek, Chatham County, 2.

PROCYON LOTOR SOLUTUS Nelson and Goldman

Hilton Head Island Raccoon

Procyon lotor solutus Nelson and Goldman, Jour. Mammal. 12 (3): 308, Aug. 24, 1931.

Type locality.—Hilton Head Island, Beaufort County, S. C.

Type.—No. 256027, male adult, skin and skull, United States National Museum; collected by W. L. Brown, December 10, 1930.

Distribution.—Coast region and islands of South Carolina. Lower Austral Zone.

General characters.—Size rather small; color grayish; black mask uninterrupted across face in two of every three individuals; winter pelage rather long and dense. Similar, in general to *P. l. litoreus* of Saint Simon Island and the coast region of Georgia, but color clearer gray, less inclining toward buffy or brownish; skull characters, especially the much lighter dentition, distinctive. Differing from *P. l. lotor* in more grayish general coloration, less elongated skull, and other cranial details.

Color.—Upper parts in general grayish, rather heavily overlaid with black, especially on median dorsal area; rather small nape patch suffused with ochraceous buff; top of head mixed black and gray, the gray predominant; black mask usually continuous across middle of face, prolonged upward along median line to middle of forehead and downward over middle of muzzle to nose; sides of muzzle, lips, and chin white; under parts in general thinly overlaid with silvery gray, the dark brownish under color showing through; throat patch blackish; ears gray, with black patches at posterior base; limbs similar to under parts, becoming brownish gray on feet, the hind legs with pure black areas on outer side above heels; tail with about six black rings, narrowest near base, and a black tip, alternating with light ochraceous buffy rings.

Cranial characters.—Skull of medium size, rather broad, short, and light in structure. Similar in general to that of *P. l. litoreus* but smaller; dentition very much lighter. Compared with that of *P. l. lotor* the skull is shorter and relatively broader; frontal region usually broader and flatter; palatal shelf shorter; dentition usually somewhat heavier, but maxillary tooth row shorter as a rule, the premolars more closely crowded.

Measurements.—An adult male from Bulls Island, S. C.: Total length, 803 mm.; tail vertebrae, 244; hind foot, 117. Two adult females from Bulls Island, S. C., respectively: 635, 749; 193, 260; 105, 107. *Skull:* Type: Greatest length, 111.7; condylobasal length, 108.2; zygomatic breadth, 75.1; interorbital breadth, 24.1; least width of palatal shelf, 16.4; maxillary tooth row (alveoli), 42.1; upper carnassial, crown length, 8.8, crown width, 9.2.

Remarks.—The raccoon of Hilton Head Island and neighboring islands, and the adjacent mainland is readily distinguished from *P. l. litoreus* by much lighter dentition. Differentiation of this insular form is apparently due to isolation, its typical habitat being separated from the mainland by a broad and rather deep channel. Some skulls of this form closely resemble some of those of *P. l. varius*, the general size and dentition being very similar. Closely compared with those of *varius*, however, the skulls are usually shorter and broader, the frontal region broader and flatter, the brain case more rounded and inflated, and the cheek teeth somewhat larger. In addition, the longer pelage, grayer coloration, and more complete black facial mask appear to be distinctive.

Specimens examined.—Total number, 31, as follows:

South Carolina: Bulls Island, Charleston County, 11 (8 skins without skulls); Eddings Island, 1; Edisto Island, Charleston County, 5; [13] Hilton Head Island (type locality), 9 (6 skulls without skins); Hunting Island, 1; Saint Helena Island, 1; Santee, 2; Yemassee, Hampton County, 1 (skull only).[13]

PROCYON LOTOR ELUCUS Bangs

Florida Raccoon

Procyon lotor elucus Bangs, Boston Soc. Nat. Hist. Proc. 28 (7): 219, March, 1898.

Type locality.—Oak Lodge, on a peninsula opposite Micco, Brevard County, Fla.

Type.—No. 3502, old male adult, skin and skull, Museum of Comparative Zoology (Bangs collection); collected by Outram Bangs, February 15, 1895.

Distribution.—Peninsular Florida, except southwestern part inhabited by *P. l. marinus*, north to extreme southern Georgia; grading into *P. l. varius* in northwest Florida. Tropical and Austroriparian division of Lower Austral Zone.

General characters.—A medium-sized, generally dark-colored subspecies, with a deep, rusty rufous nuchal patch prominent in many typical examples; skull characterized especially by greatly inflated frontal vacuities usually giving the upper outline a decidedly "humped" appearance. Much like *P. l. litoreus* of Saint Simon Island, Ga.; general size, color, length and texture of pelage about the same; skull differing in detail, especially the much lighter dentition. Similar to *P. l. varius* of Alabama, but color usually darker, size decidedly larger, and cranial characters distinctive. Differing from *P. l. marinus* of the

[13] Mus. Comp. Zool.

Ten Thousand Islands and *P. l. inesperatus* of Upper Matecumbe Key in larger size, and the more elevated frontal region of skull.

Color.—About as in *P. l. litoreus*. Very similar to *P. l. lotor* but averaging somewhat paler, the hairs over median dorsal area with shorter black tips and the nape more regularly and deeply suffused with rusty or orange rufous.

Cranial characters.—Skull similar to that of *P. l. litoreus*, but frontal region broader, higher arched, or more "humped"; sides of frontals usually less compressed or abruptly indented behind orbits, leaving the brain case tapering more gradually anteriorly, instead of bulging laterally as in *litoreus*; dentition much lighter, the difference most noticeable in the molariform teeth. Decidedly larger than those of *P. l. lotor*, *P. l. varius*, *P. l. marinus*, or *P. l. inesperatus*, with brain case broader, and frontal region more "humped"; postorbital processes of frontals obsolescent or small as in other eastern forms.

Measurements.—Type (from original description): Total length, 892 mm.; tail vertebrae, 286; hind foot, 125. An adult male topotype: 800; 244; 120. Average of five adult males from Saw Grass Island, Catfish Creek, Polk County, Fla.: 812 (790–850); 259 (240–280); 126 (125–129); weight (pounds), 11 (10–12). Average of three adult females from same locality: 758 (745–770); 245 (235–255); 121 (117–123); weight (pounds), 9 (7.7–10). *Skull:* Average of five adult males from Saw Grass Island, Catfish Creek, Polk County, Fla.: Greatest length, 119.4 (113.7–123); condylobasal length, 114.5 (110.3–117.1); zygomatic breadth, 74.1 (72–76.6); interorbital breadth, 23.7 (22.3–24.8); least width of palatal shelf, 16 (14.9–17.3); maxillary tooth row (alveoli), 43.2 (41.7–44.6); upper carnassial, crown length, 8.7 (8.4–9.1), crown width, 8.9 (8.8–9.2). Average of three adult females from same locality: Greatest length, 113.6 (112.1–115.2); condylobasal length, 108.8 (106.8–110.4); zygomatic breadth, 68.4 (66.6–70); interorbital breadth, 24 (23.3–24.5); least width of palatal shelf, 16.4 (15.4–17.6); maxillary tooth row, 41.9 (41.3–42.7); upper carnassial, crown length, 8.8 (8.7–9), crown width, 8.8 (8.6–9).

Remarks.—In *P. l. elucus* the inflation of the frontal sinuses reaches its extreme development giving the skull a "humped" appearance in outline, a character shared to some extent with other forms including *P. l. lotor*. Typical examples of *elucus* are quite dark in color, and the rusty rufous suffusion of the nape, appearing irregularly in many subspecies, is more prevalent and of a deeper and richer tone than is usual in the group. Intergradation with *litoreus*, *varius*, and *marinus* is evident, and while not clearly indicated probably occurs with *inesperatus* which is known only from the mangrove-fringed islands along the southeast coast of the peninsula of Florida. Specimens from as far south as Naples on the west coast and Cutler, Dade County, are clearly referable to *elucus*.

Specimens examined.—Total number, 127, as follows:

Florida: Allenhurst, 1 (skull only); Aucilla River, 6 (skulls only); Black Point, Dade County, 1; Blue Cypress Lake, Osceola County, 1 (skull only); Blue Springs, 1 (skin only);[14] Buena Vista, 1 (skull only); Citronelle, 4;[14] Cutler, Dade County, 9 (1 skull without skin);[14] Englewood, Sarasota County, 1; Enterprise, 1 (skin only);[14] Fort Kissimmee, 18 (14 skulls without skins); Gainesville, 3;[15] Homosassa, 1 (skull only); Kissimmee, 1; Kissimmee River, 1; Lake Cypress, 1; Lake Harney, 5 (1 skin without skull); Lake Hatch-ne-haw, 15 (skulls only); Lake Kissimmee, 8 (7 skulls without skins); Lake Monroe, 1; Matanzas Inlet, 1 (skull only); Miami, 1; Micco, 1 (skull only); Naples, 3 (skulls only); New Berlin, 5;[16] Oak Lodge (type locality on peninsula opposite Micco), 2 (1 skull without skin);[14] Orlando, 1 (skin only);[15] Royal Palm Hammock, 1 (skull only); San Mateo (5 miles northeast), 1 (skin only); Saw Grass Island, Catfish Creek, Polk County, 12; Snapper Creek, Dade County, 2; Tarpon Springs, 3 (2 skins without skulls; 1 skull without skin);[15] Taylor Creek, 2 (skins only);[15] Wilson, 1; Welaka, 1 (skin only).[14]

Georgia: Fargo, 8 (5 skulls without skins); Okefenokee Swamp, 2 (1 skull without skin).

PROCYON LOTOR MARINUS Nelson

Ten Thousand Islands Raccoon

Procyon lotor marinus Nelson, Smithsn. Misc. Collect. 82 (8): 7, July 10, 1930.

Type locality.—Near Chokoloskee, Collier County, Fla.

Type.—No. 254989, male adult, skin and skull, United States National Museum; collected by E. W. Nelson, February 28, 1930.

Distribution.—Keys of the Ten Thousand Islands Group, and adjoining mainland of southwestern Florida from Cape Sable north through the Everglades to Lake Okeechobee (Ritta). Tropical Zone.

General characters.—A very small subspecies with heavy dentition. Not very unlike *P. l. elucus* and *P. l. inesperatus* in color, but smaller than either, and cranial characters, especially the relatively larger posterior upper premolar and carnassial, distinctive. Decidedly darker than *P. l. auspicatus* or *P. l. incautus* and cranial characters quite different.

Color.—Similar to that of *P. l. elucus*, but somewhat grayer, especially on the head, the back usually less heavily overlaid with black; rusty nape patch averaging less strongly marked, often obsolescent; under parts and light rings on tail paler, less ochraceous buffy; black mask more restricted.

Cranial characters.—Skull much smaller and more delicately proportioned than in *P. l. elucus*, frontal area much more depressed; brain case more rounded; posterior upper premolar and carnassial relatively, and sometimes actually, larger; palatal shelf about the same. Very similar in general form to that of *P. l. inesperatus*, but smaller, with

[14] Mus. Comp. Zool.
[15] Amer. Mus. Nat. Hist.
[16] Four in Chicago Mus. Nat. Hist.; one in Mus. Comp Zool.

relatively and often actually larger (especially broader) posterior upper premolar and carnassial. Differing from those of *P. l. auspicatus* and *P. l. incautus* mainly in usually broader frontal region and much larger posterior upper premolar and carnassial.

Measurements.—Type: Total length, 665 mm.; tail vertebrae, 222; hind foot, 105; weight (pounds), 7. Two adult male topotypes, respectively: 642, 655; 214, 200; 100, 98; weight (pounds), 7, 8. Two adult female topotypes: 610, 613; 200, 192; 93, 93; weight (pounds), 5, 5.5. *Skull:* Type: Greatest length, 105.9; condylobasal length, 101.8; zygomatic breadth, 64.8; interorbital breadth, 22.3; least width of palatal shelf, 13.9; maxillary tooth row (alveoli), 40; upper carnassial, crown length, 9, crown width, 9.1. Two adult male topotypes: Greatest length, 101.3, 106.7; condylobasal length, 98, 101.8; zygomatic breadth, 65.5, 69.5; interorbital breadth, 20.4 23.3; least width of palatal shelf, 14.9, 15; maxillary tooth row, 39.8, 40.5; upper carnassial, crown length, 8.9, 8.7, crown width, 9.7, 9.5. Two adult female topotypes: Greatest length, 93.7, 94.7; condylobasal length, 90.1, 91.8; zygomatic breadth, 58.3, 60.6; interorbital breadth, 20.5, 20.3; least width of palatal shelf, 14.2, 14.1; maxillary tooth row, 36.4, 38; upper carnassial, crown length, 8, 8.8, crown width, 9.2, 9.1.

Remarks.—*P. l. marinus* is one of the smaller subspecies of raccoons that have developed near the southern end of the peninsula of Florida, not differing much in size from *P. l. auspicatus* and *P. l. incautus*. It appears to be limited to the great maze of mangrove-covered or -bordered islands, or keys, known as the "Ten Thousand Islands" where raccoons are present in great numbers, and to parts of the adjoining Everglades region. Specimens from Ritta at the southern end of Lake Okeechobee appear to be referable to *marinus*. Most of the islets mentioned are covered by the sea to a depth of from 3 to 4 feet at each high tide, and are totally devoid of fresh water. As most of these keys have no large trees to afford hollows and no dry land the raccoons must make their homes on top of the mangrove roots where they are forced to retreat by the incoming tide. Specimens from Cape Sable show gradation toward *P. l. elucus*, which ranges south to the eastern part of Dade County along the eastern side of the peninsula. Although evidently closely related to *elucus*, which occupies a different, but adjoining habitat, *marinus* maintains its distinctive characters with remarkable constancy.

Specimens examined.—Total number, 49, as follows:

Florida: Cape Sable, 3; Chokoloskee (type locality), 38; Coon Key, Ten Thousand Islands, 1;[17] Flamingo, Monroe County (skulls only), 3;[18] Ritta, 4 (skulls only).

[17] Amer. Mus. Nat. Hist.
[18] Mus. Comp. Zool.

PROCYON LOTOR INESPERATUS Nelson

Matecumbe Key Raccoon

Procyon lotor inesperatus Nelson, Smithsn. Misc. Collect. 82 (8): 8, July 10, 1930.

Type locality.—Upper Matecumbe Key, Monroe County, Fla.

Type.—No. 255037, male adult, skin and skull, United States National Museum; collected by E. W. Nelson, March 19, 1930.

Distribution.—Key Largo Group, embracing fringing keys along the southeast coast of Florida, from Virginia Key south to Lower Matecumbe Key. Tropical Zone.

General characters.—Closely allied to *P. l. elucus* of adjacent mainland, but averaging smaller and grayer; skull flatter. Differs from *P. l. marinus*, *P. l. auspicatus*, and *P. l. incautus*, representatives of neighboring groups of Florida keys, in its larger, more robust form, and in the combination of color and cranial characters.

Color.—Much as in *P. l. elucus* but usually somewhat grayer, especially on head and face; black mask more restricted, the upper surface of muzzle paler; dorsum rather heavily washed with black, and rusty rufous nuchal patch well marked as in *elucus*; dark rings on tail distinct, and light rings often strongly buffy.

Cranial characters.—Skull similar to that of *P. l. elucus*, but frontal area markedly depressed, instead of highly arched, or "humped." Differing from those of *P. l. marinus*, *P. l. auspicatus*, and *P. l. incautus* in larger size and more massive proportions; posterior upper premolar and carnassial actually, and therefore relatively, decidedly smaller than in *P. l. marinus*. Compared further with those of *auspicatus* and *incautus*, the palatal shelf extends farther behind the posterior molars than in the former and the frontal region is usually broader than in either.

Measurements.—Type: Total length, 730 mm.; tail vertebrae, 250; hind foot, 115; weight (pounds), 8.5. Adult male from Key Largo: 795; 222; 124; weight (pounds), 12. Adult female from Lower Matecumbe Key: 648; 228; 102; weight (pounds), 5. *Skull*: Type: Greatest length, 114; condylobasal length, 108.1; zygomatic breadth, 68.2; interorbital breadth, 23.1; least width of palatal shelf, 15.2; maxillary tooth row (alveoli), 41; upper carnassial, crown length, 9.1, crown width, 9.6.

Remarks.—Only a short distance separates the insular habitat of the present subspecies from the adjacent Florida mainland which is occupied by *P. l. elucus*. Nevertheless specimens from the various keys of the Key Largo Group differ somewhat in color as pointed out, and the skulls may at once be recognized by appreciably smaller size and more flattened frontals. The skulls of those from Key Largo and Virginia Key are larger than those from the more distant Upper and Lower Matecumbe Keys, and in this respect grade toward the

mainland animal. The motor highway from Miami to Key West, connecting keys by fills or viaducts enabling raccoons to pass from one key to another will doubtless result, through interbreeding, in the blending and obliteration of the interesting characters that now distinguish the various races of the island chain.

Specimens examined.—Total number, 25, as follows:

Florida (Key Largo Group): Elliotts Key, 7; [19] Key Largo, 5; [20] Lignum Vitae Key, 1; Lower Matecumbe Key, 7; Plantation Key, 2; Upper Matecumbe Key, 1 (type); Virginia Key, 2.

PROCYON LOTOR AUSPICATUS Nelson

Key Vaca Raccoon

Procyon lotor auspicatus Nelson, Smithsn. Misc. Collect. 82 (8): 9, July 10, 1930.

Type locality.—Marathon, Key Vaca, Monroe County, Fla.

Type.—No. 255080, male adult, skin and skull, United States National Museum; collected by E. W. Nelson, March 28, 1930.

Distribution.—Key Vaca and doubtless closely adjoining keys of the Key Vaca Group, a central section of the main chain off the southern coast of Florida. Tropical Zone.

General characters.—A very small, pale subspecies; skull with a narrow, but rounded brain case. Similar in size to *P. l. marinus* of the Ten Thousand Islands and *P. l. incautus* of the Big Pine Key Group, but decidedly paler than the former and differing in cranial details from both. Distinguished from *P. l. inesperatus* of Upper Matecumbe Key, by smaller size, much paler color, and by cranial characters.

Color.—Very pale, similar to that of *P. l. incautus*, but not quite so extreme, much paler throughout than *P. l. inesperatus* or *P. l. marinus*, the upper parts usually thinly overlaid with rusty brownish, and the underfur of a lighter brownish tone than in *inesperatus* or *marinus;* black facial mask more restricted; dark rings on tail narrower, more brownish, but usually distinct all around.

Cranial characters.—Skull very small, with a short palatal shelf and moderately heavy dentition. Similar to that of *P. l. marinus*, but somewhat smaller, with shorter palatal shelf, and lighter dentition. Smaller than that of *P. l. inesperatus*, with brain case relatively narrower, palatal shelf shorter, pterygoids less divergent posteriorly. Compared with that of *P. l. incautus* the skull is smaller, with shorter palatal shelf and narrower zygomata.

Measurements.—Type: Total length, 644 mm.; tail vertebrae, 214; hind foot, 99; weight (pounds), 5.5. Average of five adult male topotypes: 657 (634–700); 236 (214–275); 100 (96–107); weight (pounds), 5.3 (4–6). Two adult

[19] Mus. Comp. Zool.
[20] Two in Mus. Comp. Zool.

female topotypes, respectively: 603, 620; 212, 232; 83, 97; weight (pounds), 4, 5. *Skull:* Type: Greatest length, 100; condylobasal length, 94.7; zygomatic breadth, 64.5; interorbital breadth, 19.4; least width of palatal shelf, 13.9; maxillary tooth row (alveoli), 37.4; upper carnassial, crown length, 7.8, crown width, 8.6. Average of five adult male topotypes: Greatest length, 102.1 (99.9–105.9); condylobasal length, 97 (94.3–101); zygomatic breadth, 63.5 (60.2–66.2); interorbital breadth, 20 (18.8–22.7); least width of palatal shelf, 14 (13.4–15); maxillary tooth row, 38 (36.4–38.9); upper carnassial, crown length, 7.8 (7.6–8.1), crown width, 9 (8.7–9.3). Two adult female topotypes: Greatest length, 93.6, 97.5; condylobasal length, 89.4, 94; zygomatic breadth, 59.8, 58.7; interorbital breadth, 18.8, 19; least width of palatal shelf, 14, 13.8; maxillary tooth row, 35, 36.6; upper carnassial, crown length, 7.4, 7.7, crown width, 8.3, 8.6.

Remarks.—The Key Vaca raccoon is one of the most salient in characters of the subspecies inhabiting the Florida Keys. It resembles *P. l. incautus* in pale coloration, but departs from all in combination of cranial features. Its range is the most restricted of any of the Florida races.

Specimens examined.—Thirteen, from type locality.

PROCYON LOTOR INCAUTUS Nelson

Torch Key Raccoon

Procyon lotor incautus Nelson, Smithsn. Misc. Collect. 82 (8): 10, July 10, 1930.

Type locality.—Torch Key, Big Pine Key Group, Monroe County, Fla.

Type.—No. 255060, male adult, skin and skull, United States National Museum; collected by E. W. Nelson, March 24, 1930.

Distribution.—Big Pine Key Group, near southwestern end of chain of Florida keys. Tropical Zone.

General characters.—A small, very pale subspecies, palest of the Florida forms, with skull highly arched, and narrow between orbits. Closely resembling *P. l. auspicatus* of Key Vaca in color, but cranial characters, especially the narrower, high frontal region, distinctive. Decidedly paler than *P. l. marinus* or *P. l. inesperatus* of Upper Matecumbe Key, and skull differing in important details.

Color.—Very pale, similar to that of *P. l. auspicatus*, but averaging even paler, especially on head and face, the black mask more restricted, more distinctly interrupted between eyes, the whitish areas correspondingly extended and more completely isolating the dusky median streak; upper surface of muzzle light buffy; rusty nuchal patch conspicuous, inclining toward yellowish in worn pelages; dark rings on tail rusty brown, as in *auspicatus*, but usually broader.

Cranial characters.—Cranium small, with narrow, highly arched frontal region and light dentition. Averaging larger than that of *P. l. auspicatus*, with frontal region narrower, usually more highly arched; palatal shelf extending farther behind plane of last molars;

pterygoids more divergent posteriorly; molariform teeth smaller. Similar in general to those of *P. l. marinus* and *P. l. inesperatus*, but distinguished by narrower frontal region and smaller molariform teeth.

Measurements.—Type: Total length, 694 mm.; tail vertebrae, 263; hind foot, 118; weight (pounds), 8.5. Average of five adult males from Big Pine Key and No Name Key: 710 (656–738); 247 (216–273); 111 (108–113); weight (pounds), 8 (7.5–9.5). Average of four adult females from Torch Key (type locality), Boca Chica Key, and No Name Key: 688 (660–720); 240 (226–253); 105 (103–110); weight (pounds), 6.1 (5.5–6.5). *Skull:* Type: Greatest length, 111; condylobasal length, 104.7; zygomatic breadth, 66.7; interorbital breadth, 19.8; least width of palatal shelf, 14.9; maxillary tooth row (alveoli), 38.8; upper carnassial, crown length, 7.8, crown width, 8.5. Average of seven adult males from Big Pine Key and No Name Key: Greatest length, 109.8 (105–113.8); condylobasal length, 102.9 (97.8–106.2); zygomatic breadth, 69.4 (62.5–78.1); interorbital breadth, 21.8 (19.6–23.9); least width of palatal shelf, 14.8 (13.9–16); maxillary tooth row, 39.2 (38.1–10.4); upper carnassial, crown length, 7.8 (7.6–8), crown width, 8.6 (8–9). Average of four adult females from Torch Key, Boca Chica Key, and No Name Key: Greatest length, 104.9 (101–107.7); condylobasal length, 94 (96.5–100.5); zygomatic breadth, 61.9 (60.7–64.2); interorbital breadth, 21.1 (20–22.2); least width of palatal shelf, 14.4 (14–15); maxillary tooth row, 38 (37.4–38.5); upper carnassial, crown length, 7.5 (7.3–7.8), crown width, 8.3 (7.8–8.8).

Remarks.—The home of this race of raccoons is on the group of Florida Keys farthest from the mainland. As is the case with the other Florida Key raccoons they live mainly, and sometimes entirely, in mangrove swamps without access to fresh water except during rains. The brilliant light of their environment may have affected their general color more than the others, as suggested by their pale, faded tints. In general form and proportions the skull resembles that of *P. l. ducus* rather more closely than those of its geographically nearer insular relatives. It is much smaller, however, and suggests a miniature of that of the mainland animal.

Specimens examined.—Total number, 33, as follows:

Florida: Big Pine Key, 16;[21] Boca Chica Key, 2; Geiger's Key, 2;[22] Key West, 3 (1 skull without skin);[23] No Name Key, 5; Stock Island, 3;[23] Torch Key (type locality), 2.

PROCYON LOTOR FUSCIPES Mearns

Texas Raccoon

Procyon lotor fuscipes Mearns, Biol. Soc. Washington Proc. 27: 63, March 20, 1914.

Type locality.—Las Moras Creek, Fort Clark, Kinney County, Tex. (altitude 1,011 feet).

[21] Ten in Mus. Comp. Zool.
[22] Mus. Comp. Zool.
[23] One in Mus. Comp. Zool.

Type.—No. 63055, male adult, skin and skull, United States National Museum; collected by Edgar A. Mearns, February 6, 1893. Original number 2273.

Distribution.—Texas, except extreme northern and western parts, southern Arkansas, Louisiana, except delta region of Mississippi, and south into northeastern Mexico, including Coahuila and Nuevo Leon, to southern Tamaulipas, Austroriparian and Lower Sonoran divisions of Lower Austral Zone.

General characters.—A large, dark grayish subspecies, with pelage of medium length and texture; skull with high, moderately broad frontal region and weakly developed postorbital processes. Size about as in *P. l. hirtus* of Minnesota, but color grayer, less suffused with buff; mask more uniformly black and continuous across face and on upper surface of muzzle; pelage much shorter and less dense. Similar to *P. l. mexicanus* of Chihuahua, but decidedly darker, and cranial characters distinctive. Resembling *P. l. varius* of Alabama in general color, but somewhat grayer and much larger, with a different skull. Similar in size to *P. l. hernandezii* of the Valley of Mexico, but less grayish, the postauricular spots larger, more conspicuous; skull less flattened and differing in detail.

Color.—Similar to that of *P. l. varius*, but averaging somewhat grayer, less suffused with buff; mask usually more uniformly black and continuous across middle of face and on upper surface of muzzle to nasal pad.

Cranial characters.—Size and general proportions of skull nearly as in *P. l. hirtus*, but interorbital and postorbital regions usually broader; frontal region similarly high, but usually flatter, with a less distinct, V-shaped, median depression. Similar in size to that of *P. l. mexicanus;* frontal region similarly high behind plane of postorbital processes, but more elevated anteriorly, the upper outline more convex; brain case more depressed near fronto-parietal suture; interorbital and postorbital regions usually narrower; postorbital processes of frontals shorter, the upper margin of orbit less deeply concave. Compared with that of *P. l. varius* the skull is much larger and heavier, with broader frontal region. Not very unlike that of *P. l. hernandezii*, but less flattened, the frontal region more elevated; brain case usually more depressed near fronto-parietal suture; postorbital processes of frontals less prominent, the upper margin of orbit less deeply concave; posterior upper premolar and upper carnassial usually smaller.

Measurements.—Type: Total length, 900 mm.; tail vertebrae, 290; hind foot, 132. Two adult males from Laredo, Tex., respectively: 860, 850; 298, 275; 136, 131. An adult male and female from Sabinas, Coahuila: 922, 760; 330, 260; 136, 116. *Skull:* Type: Total length, 130.2; condylobasal length, 125; zygomatic

breadth, 84.4; interorbital breadth, 26.9; least width of palatal shelf, 16.2; maxillary tooth row (alveoli), 47.4; upper carnassial, crown length, 8.5, crown width, 9.6. An adult male and female from Sabinas, Coahuila: Greatest length, 130.6, 117.7; condylobasal length, 123.9, 112.1; zygomatic breadth, 82.8, 75.5; interorbital breadth, 24.4, 24; least width of palatal shelf, 18.1, 15.9; maxillary tooth row, 46.9, 43.3; upper carnassial, crown length, 8.9, 8.7, crown width, 10, 9.4.

Remarks.—*P. l. fuscipes* requires rather close comparison with *P. l. hirtus* to the north and *P. l. hernandezii* to the south, but typical specimens differ in combination of characters as pointed out. It is readily distinguished from *P. l. varius* by much larger size and from *P. l. mexicanus* by darker color. Intergradation with all of these may safely be assumed. In typical *fuscipes*, however, the facial mask usually extends as a broad, uniformly black area across the face as in *P. l. mexicanus* and western subspecies in general, instead of being more or less distinctly interrupted by whitish longitudinal lines, one on each side near inner angle of eye, tending to isolate a narrow, elongated black median patch as in *hirtus*, *varius* and other eastern continental forms. In *fuscipes* the brain case, on the other hand, is somewhat depressed near the fronto-parietal suture and the postorbital processes of the frontals are very short or obsolescent, characters shared with *hirtus*, *varius* and the eastern subspecies in contrast with *mexicanus* and the more western and southern continental forms in which the depression of the brain case is less evident, and the postorbital processes of the frontals are well developed.

Specimens examined.—Total number, 100, as follows:

Coahuila: Muzquiz, 1; opposite Langtry, Texas, 3; Sabinas, 3.

Louisiana: Abbeville, 8 (3 skins without skulls); Abbeville (24 miles southwest), 3; Iowa, 1 (skull only); Lake Ridge, 1; Morgan City, 1; Tallulah, 12 (10 skulls without skins). [All specimens except those from Lake Ridge and Tallulah probably are referable to *P. l. megalodous*.]

Nuevo Leon: Monterrey, 1.

Tamaulipas: Alta Mira, 1 (skull only); Bagdad, 1; Camargo, 3; Marmolejo, 1;[24] Matamoros, 3 (2 skulls only).

Texas: Angleton, 1; Aransas National Wildlife Refuge, Refugio County, 2; Aransas County, 2 (skulls only); Broome, 1 (skin only); Brownsville, 1; Canyon, 2; Carlsbad (10 miles east), 3; Columbia, 1 (skull only); Corpus Christi, 2; Dickinson Bayou (opposite Galveston), 1; Eagle Pass, 1; Fort Clark, 2 (including type); Grady, 1 (skull only); Kerrville, 2 (skulls only); Kountze, 1; Langtry, 1; Laredo, 5 (3 skins without skulls); Liberty, 1 (skull only); Lomita Ranch, 2 (skulls only); Long Point, 1 (skull only); Los Ratones, Zapata County, 1; Mason, 4; Matagorda, 6 (5 skulls without skins); Padre Island, 1 (skull only); Port Lavaca, 1 (skull only); Rankin, 2; Sour Lake, 4 (3 skulls without skins); Texarkana (10 miles northwest), 2; Washington County, 1 (skull only); Water Valley, 2 (skulls only).

[24] Univ. Michigan Mus. Zool.

PROCYON LOTOR MEXICANUS Baird

Mexican Raccoon

Procyon lotor, varieté mexicaine I. Geoffroy–Saint Hilaire, Voy. sur la Venus, Zoologie, p. 125, pl. VI, 1855. From Mazatlan, Sinaloa, Mexico.

Procyon hernandezii var. *mexicana* Baird, Mammal. North Amer., p. 215, 1857.

Procyon lotor mexicanus Mearns, Biol. Soc. Washington Proc. 27: 65, Mar. 20, 1914.

Type locality.—Espia, northwestern Chihuahua, Mexico.

Type.—No. 2018, probably female, adult, skull only (originally accompanied by skin which cannot now be found), United States National Museum; collected by C. B. R. Kennerly, April 1855.

Distribution.—New Mexico, except northeastern and northwestern parts, southeastern Arizona, western Texas, and south through Chihuahua, eastern Sonora, Sinaloa and Durango to northern Nayarit, Mexico. Lower Sonoran to Transition Zone.

General characters.—One of the palest subspecies of the group; skull with broad frontal area highly arched behind plane of well-developed postorbital processes. Color and general size about as in *P. l. pallidus* of the Colorado River Valley, but skull usually broader, especially between orbits, and differing in other slight details. Decidedly paler than *P. l. fuscipes* of Texas, or *P. l. hirtus* of Minnesota, and combination of cranial characters quite different. Similar in general to *P. l. hernandezii* of the Valley of Mexico but paler, the upper parts less extensively overlaid with black; skull more highly arched and presenting other distinctive features.

Color.—Upper parts in general coarsely grizzled iron grayish and under parts light buffy about as in *P. l. pallidus*; black mask broad and uninterrupted across face; rusty nuchal patch usually absent, but faintly indicated in occasional specimens.

Cranial characters.—Skull most closely resembling that of *P. l. pallidus*, but brain case, frontal area and palatal shelf usually broader; frontals rather high behind plane of postorbital processes as in *pallidus*; tooth rows usually shorter. Compared with those of *P. l. fuscipes* and *P. l. hirtus* the frontal region is similarly high behind plane of postorbital processes, but less elevated anteriorly, the frontal outline descending in a more nearly straight line with nasals; brain case less depressed near frontoparietal suture; interorbital and postorbital areas usually broader; postorbital processes of frontals longer, the upper margin of orbit more deeply concave. Contrasted with that of *P. l. hernandezii* the skull is of similar size, but less flattened, the frontal region more elevated behind plane of postorbital processes;

interorbital and postorbital areas usually broader; maxillary tooth row shorter; posterior upper premolar and carnassial smaller.

Measurements.—Adult male from Lochiel, Santa Cruz River, Ariz.: Total length, 895 mm.; tail vertebrae, 365; hind foot, 121. Adult female from Deming, N. Mex.: 840; 305; 125. Adult male and female from Fort Lowell (near Tucson), Ariz., respectively: 890, 820; 325, 305; 131, 125. *Skull:* Adult male from Lochiel, Ariz., and adult female from Deming, N. Mex.: Greatest length, 121.1, 120.6; condylobasal length, 114.6, 115.4; zygomatic breadth, 77, 78; interorbital breadth, 24.2, 24.2; least width of palatal shelf, 55.7, 55.9; maxillary tooth row (alveoli), 42.5, 42.7; upper carnassial, crown length, 8.7, 8.6, crown width, 9.7, 9.7. Adult male and female from Fort Lowell, Ariz.: Greatest length, 123.3, 116.2; condylobasal length, 115.6, 110.9; zygomatic breadth, 83.5, 78.8; interorbital breadth, 28.8, 25.3; least width of palatal shelf, 17.6, 16.4; maxillary tooth row, 42.7, 43.6; upper carnassial, crown length, 8.5, 8.8, crown width, 9.5, 9.6.

Remarks.—*P. l. mexicanus* shares extremely pale coloration with *P. l. pallidus* of the Colorado River Valley, typical examples of the two being externally indistinguishable. They are evidently very closely allied, some specimens being practically identical, but the combination of cranial characters pointed out usually serves to separate them as geographic races. The specimen described by Baird and regarded as the type of *mexicanus* is a fully adult, but undersized individual, probably a female (greatest length of skull, 113) which does not properly reflect the true characters of the subspecies as shown by other specimens from the type region. The type locality was originally given as Espia, Sonora. Examination of Boundary Survey reports and statements by C. B. R. Kennerly, the collector, show that it was taken at Espia, shown on modern maps in extreme northwestern Chihuahua. The error was doubtless due to lack of information in regard to the exact location of the Sonora-Chihuahua boundary. To this subspecies are referred specimens from Mazatlan, Sinaloa. A specimen from Mazatlan formed the basis of the detailed description by Geoffroy–Saint Hilaire (1855, p. 125) of a Mexican raccoon, "variete mexicaine," which, however, he did not name. A specimen from northern Nayarit is referred to *mexicanus*, but those from localities farther south seem more properly assignable to *P. l. hernandezii*. Specimens from the upper part of the Gila River Valley grade toward and might be referred to *pallidus*. The series of 47 specimens from Escuinapa, Sinaloa, affords an unusual opportunity for the study of individual variation.

Specimens examined.—Total number, 87, as follows:

Arizona: Fort Huachuca, 1; Fort Lowell, 2; Lochiel, 1; San Bernardino Ranch, Cochise County, 1; Santa Catalina Mountains, 1 (skull only); Santa Rita Mountains (McCleary's Ranch), 1.

Chihuahua: Casas Grandes, 1; Colonia Diaz, 1; Espia, 1 (type, skull only); San Luis Mountains, 1.

Durango: Rancho Santuario (northwestern Durango), 1 (skull only).[25]
Nayarit: Acaponeta, 1.
New Mexico: Alcalde, 7 (skulls only); Central, Grant County, 1 (skull only); Chloride, 1; Deming, 1; Gila National Forest, 2 (skulls only); Magdalena Mountains, 1; Redrock, 1; Rinconada, 1; Santa Rosa, 2; Velarde, 3 (skulls only).
Sinaloa: Escuinapa, 47 (12 skins without skulls; 10 skulls without skins); [25]Mazatlan, 2; Rosario, 1.
Sonora: "N. Sonora, Lumholtz Expedition", 1 (skin only); [25] Oputo, 2.
Texas: El Paso, 1 (skull only).

PROCYON LOTOR PALLIDUS Merriam

Colorado Desert Raccoon

Procyon pallidus Merriam, Biol. Soc. Washington Proc. 13: 151, June 13, 1900.
Procyon lotor ochraceus Mearns, Biol. Soc. Washington Proc. 27: 64, Mar. 20, 1914. Type from Sonoyta River, Sonora, Mexico, near Quitobaquito, Pima Co., Ariz., No. 59900, male subadult, U. S. Natl. Mus.; collected by Edgar A. Mearns, February 7, 1894.

Type locality.—New River, Colorado Desert, Imperial County, Calif.

Type.—No. 99272, female adult, skin and skull, United States National Museum (Biological Surveys collection); collected by Frank Stephens, October 16, 1899.

Distribution.—Colorado and Gila River Valleys and adjoining territory from the delta north to northeastern Utah, and east to western Colorado and northwestern New Mexico. Mainly Lower Sonoran division of Lower Austral Zone, but ranging up along streams into Transition Zone.

General characters.—One of the palest subspecies of the group; skull with narrow frontal area highly arched behind plane of postorbital processes. Color and general size about as in *P. l. mexicanus* of Chihuahua, but skull usually narrower, especially between orbits, and differing in other slight details. Decidedly paler, more ashy gray than *P. l. psora* of the Sacramento Valley; skull with upper outline rising more prominently behind plane of postorbital processes. Similar to *P. l. grinnelli*, but slightly paler, and cranial characters, especially the more abruptly sloping frontal profile from apex behind plane of postorbital processes, distinctive.

Color.—About as in *P. l. mexicanus.*

Cranial characters.—Skull closely resembles those of *P. l. mexicanus* and *P. l. psora* but brain case, frontal area and palatal shelf usually narrower; frontals high behind posterior plane of postorbital processes as in *mexicanus* (flatter and rising less prominently in *psora*); tooth

[25] Amer. Mus. Nat. Hist.

rows usually longer than in *mexicanus*. Compared with *P. l. grinnelli* the brain case and interorbital region are narrower, and the anterior frontal outline descends in a more nearly straight line from apex immediately behind the postorbital processes—upper outline of frontals a more evenly convex curve in *grinnelli*.

Measurements.—Type: Total length, 855 mm.; tail vertebrae, 295; hind foot, 128. Two adult males from Colorado River, Mexican Boundary, Ariz., respectively: 950, 875; 405, 340; 135, 126. An adult female from same locality: 845; 305; 128. *Skull:* Type: Greatest length, 117.6; condylobasal length, 111.1; zygomatic breadth, 77.8; interorbital breadth, 25.5; least width of palatal shelf, 13.5; maxillary tooth row (alveoli), 43.4; upper carnassial, crown length, 8.8, crown width, 9.6. Two adult males from Colorado River, Mexican Boundary, Ariz.: Greatest length, 133, 126.6; condylobasal length, 122.4, 120.6; zygomatic breadth, 79.1, 78.6; interorbital breadth, 25.3, 24.8; least width of palatal shelf, 15.4, 16.8; maxillary tooth row, 46.6, 43.7; upper carnassial, crown length, 9.7, 8.6, crown width, 10.4, 9.5 An adult female from same locality: Greatest length, 119.6; condylobasal length, 114.1; zygomatic breadth, 77.1; interorbital breadth, 23.4; least width of palatal shelf, 14.6; maxillary tooth row, 41.7; upper carnassial, crown length, 8.7, crown width, 9.3

Remarks.—As the name indicates the present subspecies is characterized by light coloration, a feature shared with *P. l. mexicanus*. The close alliance of *P. l. pallidus* and *P. l. mexicanus* is obvious but differing combinations of cranial characters seem to warrant their recognition as distinct, but not strongly marked forms. The type of *pallidus* is an unusually pale specimen as shown by comparison with others from localities so near that they must be regarded as typical. The type of *P. l. ochraceus* is a subadult male in rather faded pelage to which the name is doubtless due. It is not satisfactorily separable from *P. l. pallidus*.

Specimens examined.—Total number, 29, as follows:

Arizona: Colorado River, Mexican Boundary, 3; Fort Apache (25 miles southeast), 1; Lakeside, 1 (skull only); Mellen, 1;[26] Phoenix, 1; Springerville (3 miles northwest), 2; Tempe, 1; Topock, 1; Wupatki National Monument, Coconino County, 1.

Baja California: Calexico (11 miles southeast), 1; Cocopah Mountains, 3 (skulls only); New River (5 miles south of Mexicali), 1 (skin only); Pascualitos Laguna, 1; exact locality unknown, 1 (skull only).

California: Colorado River (5 miles below Needles), 1;[26] Colorado River (near Pilot Knob), 1;[26] Colorado River (20 miles north of Picacho), 1;[26] New River, Colorado Desert, 1 (type); Pilot Knob, 1; Potholes, 1.[26]

Colorado: Navajo River, Archuleta County, 1 (skin only).

Sonora: Sonoyta River, near Quitobaquito (type of *ochraceus*), 1.

Utah: Pine Valley, 1 (skull only); Saint George, 1.

[26] Mus. Vert. Zool.

PROCYON LOTOR PSORA Gray

California Raccoon

Procyon psora Gray, Ann. Mag. Nat. Hist. 10 : 261, Dec. 1842.

Procyon lotor californicus Mearns, Biol. Soc. Washington Proc. 27: 66, Mar. 20, 1914. Type from ocean beach near last Mexican Boundary Monument (No. 258), San Diego County, Calif., No. 60675, female subadult, U. S. Natl. Mus.; collected by Frank Xavier Holzner, July 16, 1894.

Type locality.—Sacramento, Sacramento County, Calif.

Type.—Perhaps in British Museum; collected by Captain Belcher.

Distribution.—California, except extreme northwest coastal strip, the northeastern corner and southeastern desert region, ranging south through northwestern Baja California to San Quintin; extreme west-central Nevada (Wilson Canyon, east slope of Sierra Nevada). Lower Austral, Upper Austral, and Transition Zones.

General characters.—A large, moderately dark form with a broad, rather flat skull. Very similar to *P. l. pacificus* of Washington, but averaging paler; skull usually more elongated and differing in detail. Decidedly darker, less ashy gray than *P. l. pallidus* of the Colorado River Valley, and cranial characters distinctive. Similar in general to *P. l. excelsus* of the Snake River Valley, but much smaller and usually darker; skull relatively narrower.

Color.—Similar in general to that of *P. l. lotor*, but upper parts grayer, less suffused with buff under the overlying black-tipped hairs; light rings on tail less buffy; rusty nuchal patch usually absent or less prominent; black mask continuous across face, as in western forms in general, instead of more or less distinctly interrupted on either side of median line as in *lotor*.

Cranial characters.—Skull closely resembles that of *P. l. pacificus* but usually more elongated, the brain case less fully expanded, especially anteroexternally; interorbital region narrower; upper profile rather flat and postorbital processes of frontals well developed as in *pacificus*. Similar to that of *P. l. excelsus*, but smaller, relatively narrower. Compared with that of *P. l. pallidus*, the skull is of similar size, but relatively broader, with flatter frontal region.

Measurement.—Adult male from Tehama, Calif.: Total length, 880 mm.; tail vertebrae, 277; hind foot, 138. Adult female from Wheatland, Calif.: 870; 300; 120. Adult male and female from Nicasio, Calif., respectively: 901, 820; 348, 312; 132, 121. *Skull:* Adult male from Tehama and adult female from Wheatland, Calif.: Greatest length, 124.8, 120.4; condylobasal length, 120, 113; zygomatic breadth, 82.6, 79.2; interorbital breadth, 26.3, 26.8; least width of palatal shelf, 17.6, 16.2; maxillary tooth row (alveoli), 44.2, 43.9; upper carnassial, crown length, 8, 8.6, crown width, 9.3, 9.6. Adult male and female from Nicasio, Calif.: Greatest length, 124.5, 118.7; condylobasal length, 116.6, 114.2; zygomatic breadth, 82, 78.4; interorbital breadth, 24.2, 25.8; least width of palatal shelf, 16.4, 16.1; maxillary tooth row, 43.2, 41.8; upper carnassial, crown length, 8.8, 8.6, crown width, 9.7, 9.3.

Remarks.—*P. l. psora* has commonly been treated by authors as specifically distinct from *P. l. lotor* of the eastern United States. This is not so surprising as direct comparison of the skulls of these widely separated subspecies reveals rather striking differences, especially the much larger general size, and broader, flatter frontal region with much more prominent postorbital processes of *psora*. These differences, however, are completely bridged by the intervening forms. *P. l. psora* passes gradually into *P. l. pacificus* in northern California and southwestern Oregon, and some specimens from those regions might with similar propriety be referred to either form. Some specimens from near the type locality of *P. l. californicus* suggest gradation toward *P. l. pallidus*, but general comparisons indicate that *californicus* cannot satisfactorily be separated from *psora*.

Specimens examined.—Total number, 198, as follows:

Baja California: Laguna Hansen, 1; [27] San Quintin, 1; San Ramon (mouth of Santo Domingo River), 2; [27] San Telmo, 1 (skin only); [27] Valle de las Palmas, 1 (skin only).[27]

California: Arcata, 2; [27] Baird, 1; Bakersfield, 1; [27] Banta, 1 (skull only); Berkeley, 4; [27] Bodfish, 1; Bradley, 3 (1 skull without skin, 2 skins without skulls); Camp Meeker, 1; Carbondale, 1; [27] Carlotta, 1; [27] Cassel, 4 (skulls only); Cazadero, 1 (skull only); [27] Chico, 4; Colusa, 2 (1 skull without skin); Covelo, 1 (skull only); Cuddeback, Humboldt County, 2 (skulls only); [27] Cuyamaca Mountains, 1; [27] Cypress Point, Monterey County, 1; [27] Dyerville (5 miles south), 1; Eel River (southwest of South Yollo Bolly Mountain), 2; El Portal, 2; [27] Eureka, 1; [27] Fort Tejon, 2 (1 skull only); Gazelle (5 miles east), 2 (skulls only); Glen Ellen, 1; Grass Valley, 3; [27] Grizzly Island, 1; [27] Gualala, 1; [27] Hay Fork, Trinity County, 1; [27] Helena, 3; [27] Hoopa Valley, 1; Humboldt Bay (Carson's Camp, Mad River), 1; Inverness, 1 (skull only); Isabella, 1; [27] Jolon, 3; Julian, 2; [27] Kern River (25 miles above Kernville), 1; Klamath River, Siskiyou County, 1 (skull only); Knight's Landing (near type locality), 1; La Jolla, 1; [27] Lake Merced, 1; [27] Lassen Creek, 1; Laytonville, 2; Lierly's Ranch, Mendocino County, 1; Little Browns Creek, Trinity County, 2 (skulls only); Little Shasta, 3; Lockwood, 2; Marysville Buttes, 2; [27] McCloud River (near Baird), 3 (2 skulls without skins); [27] Mendota, 1; Menlo Park, 1; [27] Mission, Santa Inez, 1; Mohave River, 1 (skull only); Monterey, 2; Mount Diablo, 1; [27] Mount Saint Helena, 2; Mount Sanhedrin, 2 (1 skull without skin); [27] National City, 2; Nelson, 1 (skull only); Nicasio, 10 (5 skulls without skins); Orland, 1 (skin only); Ornbaun Spring, Humboldt County, 1 (skull only); [27] Pacific Ocean beach, near Monument 258, Mexican Boundary, 1 (type of *californicus*); Paine Creek (Dale's Ranch), Tehama County, 4 (2 skins without skulls); [27] Pescadero, 5; [27] Pine City, 2 (skulls only); Pitt River, Shasta County, 1 (skull only); Placerville, 2 (skulls only); [27] Pleyto, 2 (skulls only); Point Pinois, 1; Point Reyes, 4 (2 skulls without skins); Portola, 2; [27] Portola Lake, San Mateo County, 1; [27] Posts, 1; Red Bluff, 1 (skin only); Rio Dell, 1 (skull only); Rockport, 1 (skull only); Round Mountain, 3 (skull only); Rumsey, 1; [27] Saint John, Glenn County, 2; San Emigdio, 3; San Francisco, 1 (skin only); San Luis Obispo, 3; Sausalito, 1 (skull only); [27] Shasta County, 1; Shasta Valley (6 miles east of Edgewood),

[27] Mus. Vert. Zool.

1; Snelling, 3; [27] Soquel Mill (40 miles east of Raymond), 1; South Yollo Bolly Mountain, 1; Spalding, Eagle Lake, 3; [27] Spenceville, 1; [27] Stockton, 14; [27] Suisun Marsh, 1; [27] Tehama, 1; Three Rivers, 1; Tower House, Shasta County, 1; [27] Trinidad, 1; [27] Union Island, 1; Vacaville, 1; [27] Victorville, 1; [27] Wawona, 1 (skull only); Weaverville, 2 (skulls only); [27] Wheatland, 1; Willow Lake, Plumas County, 1; [27] Winthrop, 1 (skull only); Wolf, 1.[27]

Nevada: Wilson Canyon, east slope of Sierra Nevada, 1.

PROCYON LOTOR PACIFICUS Merriam

Pacific Northwest Raccoon

Procyon psora pacifica Merriam, North Amer. Fauna 16: 107, Oct. 28, 1899.

Procyon proteus Brass, Aus dem Reiche der Pelze, p. 564, 1911. West coast from Puget Sound to the Cascade Mountains. (Not *Procyon proteus* Allen, 1904.)

Type locality.—Lake Keechelus, Kittitas County, Wash. (altitude 8,000 feet).

Type.—No. 93137, adult [female], skin and skull, United States National Museum (Biological Surveys collection); collected by C. Hansen, January 15, 1898.

Distribution.—Southwestern British Columbia, except Vancouver Island, northern, central, and western Washington, western Oregon, and extreme northwestern California. Upper Austral and Transition Zones.

General characters.—A dark subspecies with a relatively broad, flat skull. Most closely resembling *P. l. psora* of the Sacramento Valley, Calif., but darker; skull relatively shorter and broader. Similar to *P. l. excelsus* of the Snake River Valley, southeastern Oregon, but much smaller, darker, and cranial characters distinctive. Decidedly larger than *P. l. vancouverensis* of Vancouver Island, and skull differing in detail.

Color.—As in *P. l. vancouverensis*. Much as in *P. l. psora*, but darker, the top of head and long guard hairs over upper parts in general more extensively black; subapical light bands of hairs somewhat narrower, tending to permit the basal color, which is of a darker tone (near dark cinnamon brown), to show through; mask unmixed black continuous across face and over upper surface of muzzle; rusty nuchal patch usually absent or inconspicuous.

Cranial characters.—Skull comparatively short, broad and flat; interorbital space very broad; postorbital processes of frontals well developed. Resembling that of *P. l. psora*, but usually less elongated, the brain case more fully expanded, especially anteroexternally; interorbital region broader. Similar to that of *P. l. excelsus*, but smaller, with brain case more rounded. Very similar in general form to that of *P. l. vancouverensis*, but much smaller throughout; brain case

[27] Mus. Vert. Zool.

relatively larger, more inflated; nasals broader, narrowing more abruptly to a point posteriorly; pterygoids longer, more diverging posteriorly; maxillary tooth rows longer, the individual teeth much larger.

Measurements.—Adult female from Steilacoom, Wash.: Total length, 830 mm.; tail vertebrae, 270; hind foot, 129. *Skull:* Type (♀) and an adult female from Steilacoom, Wash., respectively: Greatest length, 113.8, 114.2; condylobasal length, 106.8, 109.2; zygomatic breadth, 79.9, 81.2; interorbital breadth, 26.8, 27.3; least width of palatal shelf, 14.9, 16.9; maxillary tooth row (alveoli), 41.4, 41.3; upper carnassial, crown length, 8.6, 7.9, crown width, 9.4, 10. Average of five adult males from Lake Cushman, Wash.: Greatest length, 119.5 (116.1–123.1); condylobasal length, 112.6 (109.5–116.5); zygomatic breadth, 81.7 (78.8–84.7); interorbital breadth, 26 (25.1–27.1); least width of palatal shelf, 16.8 (16.2–17.6); maxillary tooth row, 43.6 (42.8–44); upper carnassial, crown length, 9.1 (8.8–9.4), crown width, 9.8 (9.5–10).

Remarks.—The present subspecies is the raccoon of the Pacific Northwest coastal and Cascade Range regions, extending in small numbers into the interior along the Columbia River Valley to northeastern Washington. Like the regional representatives of other groups of mammals it is characterized by dark coloration. Compared with *P. l. lotor* of the eastern United States, which is also dark in color, the upper parts in *pacificus* are more heavily overlaid with black, the light subterminal bands of the longer hairs and the light rings of the tail are grayer, less buffy or yellowish, the top of the head is blacker, and the mask is more uniformly black and continuous across the face. *P. l. pacificus* intergrades with *P. l. psora* in southwestern Oregon and northwestern California, and with *P. l. excelsus* east of the Cascade Mountains in Washington and Oregon. *Procyon proteus* Brass was assigned to the raccoon of the west coast from Puget Sound to the Cascade Mountains, which is within the range of typical *P. l. pacificus*. The name is also preoccupied by *Procyon proteus* Allen, applied to a crab-eating raccoon in South America.

Specimens examined.—Total number, 82, as follows:

British Columbia: Hastings, 1; Port Moody, 3 (skulls only).

California: Crescent City, 5 (4 skulls without skins).

Oregon: Big Summit Prairie, Ochoco National Forest, 1 (skull only); Blue River, 1 (skull only); Bridge, 1; Collywash Burn, 1; Estacada, 3 (2 skulls without skins); Glendale, 3 (skulls only); Glide (24 miles east), 1; Glide (14 miles northeast), 1; Grant's Pass, 7 (32 miles south, 5 [1 skull without skin]; 43 miles northeast, 2 [1 skin without skull]); Hardman, 2; Pistol River (North Fork), Curry County, 1; Port Orford, 5 (skulls only); Remote, 1 (skull only); Riverside, 2.

Washington: Easton, 1; Hoodsport, 4 (skulls only); Lake Cushman, 10 (skulls only); Lake Keechelus, 1 (type); Mount Vernon, 2 (skulls only); Orcas Island, 1 (skull only); Skokomish River, Olympic Mountains, 2 (skulls only); Steilacoom, 5 (1 skin without skull); Tieton, 1; Toppenish, 3; Trout Lake, south base of Mount Adams, 5 (skulls only); Whidby Island, 1 (skull only).

PROCYON LOTOR EXCELSUS Nelson and Goldman

Snake River Valley Raccoon

Procyon lotor excelsus Nelson and Goldman, Jour. Mammal. 11 (4): 458, Nov. 11, 1930.

Type locality.—Owyhee River, Oreg., 10 miles west of Fairylawn, Owyhee County, Idaho.

Type.—No. 236214, old male adult, skin and skull, United States National Museum (Biological Surveys collection); collected by J. W. Fisk, April 15, 1920.

Distribution.—Snake River drainage in southeastern Washington, eastern Oregon, and southern Idaho, the Humboldt River Valley, Nev., and river valleys of northeastern California. Mainly Upper Sonoran Zone.

General characters.—Size largest of the group; color rather pale, similar in color to *P. l. psora* of California, but usually paler, and much larger, with skull differing in detail. Closely allied to *P. l. pacificus* of Washington, but much larger, decidedly paler, top of head much grayer, and cranial characters distinctive.

Color.—Upper parts of body in general very light buffy grayish, with a light ochraceous buffy suffusion along median dorsal area, becoming pronounced on nape, moderately overlaid with black; sides clearer gray, the overlying black-tipped hairs less numerous than on dorsum; top of head a grizzled mixture of black and gray; face with the usual black mask and white markings; under parts in general thinly overlaid with buffy grayish, the light brownish undertone showing through; throat patch dark brownish; ears grayish with black patches at posterior base; limbs grayish, the hind legs with small, unmixed brownish areas on outer sides near heels; tail above with about six black annulations and a black tip, alternating with somewhat broader, light buffy rings, the dark rings usually becoming indistinct below.

Cranial characters.—Skull similar to that of *P. l. psora*, but larger and more angular; frontal region broader, generally flattened, and postorbital processes well developed, as in *psora*. Compared with that of *P. l. pacificus* the skull is larger, with brain case relatively more elongated; frontal region broad as in *pacificus*.

Measurements.—No skin measurements available. *Skull*: Type: Greatest length, 136.5 mm.; condylobasal length, 125.8; zygomatic breadth, 89.1; interorbital breadth, 30.1; least width of palatal shelf, 17.2; maxillary tooth row (alveoli), 47; upper carnassial, crown length, 9, crown width, 10.6.

Remarks.—The present form is easily distinguished from all others of the group by the large size and massive development of the skull. No close cranial comparisons with forms east of the Rocky Mountains are necessary as this race differs notably in the much larger size, and

broad, flat frontal region, with prominent postorbital processes—frontal region generally high and narrow, and postorbital processes weak, or obsolescent, in forms east of Rocky Mountains.

Specimens examined.—Total number, 32, as follows:

California: Parker Creek, Modoc County, 1.[28]

Idaho: Bruneau, 1 (skull only); Emmett, Gem County, 1; Forest (Deer Creek), 1 (skin only); Hagerman, 4 (1 skull without skin); Lost Valley Reservoir, head of Wieser River (altitude 5,000 feet), Adams County, 1 (skin only); Preuss Mountains, 1 (skull only); Stanley Lake, Custer County (altitude 8,500 feet), 1 (skin only); Three Creek, 2 (1 skin without skull; 1 skull without skin).

Nevada: Golconda, 1 (skull only); Montello, 1.

Oregon: Adel, 2; Dry Creek, Malheur County, 1 (skull only); Enterprise, 1 (skin only); Harper (8 miles east), 1 (skull only); Huntington, 1 (skull only); Imnaha, 1 (skull only); Owyhee River (type locality, 10 miles west of Fairylawn, Idaho), 2; Rome, 1; Tupper, 1 (skull only); Vansycle, 1 (skull only).

Washington: Alpowa, 1 (skull only); Garfield County, 1; Touchet, 1; Wallula, 1; Washtucna, 1.

PROCYON LOTOR VANCOUVERENSIS Nelson and Goldman

Vancouver Island Raccoon

Procyon lotor vancouverensis Nelson and Goldman, Jour. Mammal. 11 (4): 458, Nov. 11, 1930.

Type locality.—Quatsino Sound, Vancouver Island, British Columbia, Canada. Transition and Canadian Zones.

Type.—No. 135457, male adult, skull only, United States National Museum (Biological Surveys collection); collected by Charles Sheldon, November 1904.

Distribution.—Known only from Vancouver Island.

General characters.—A dark subspecies most closely allied to *P. l. pacificus* of Washington, but decidedly smaller, and cranial details distinctive.

Color.—An adult (winter pelage) from Beecher Bay, Vancouver Island: Upper parts in general grayish, heavily overlaid with black; small nape patch suffused with ochraceous buff; top of head mixed black and gray, the black predominating; face with brownish black mask, the dark color extending down along middle of muzzle to nose; sides of muzzle, lips, and chin white; under parts, in general, thinly overlaid with buff gray, the dense brown underfur showing through; throat patch brownish, mixed with gray along median line; ears grayish, with black patches at posterior base; limbs similar to under parts, becoming soiled whitish on feet, but hind legs with unmixed, dark brownish areas on outer sides above heels; tail with six narrow black rings and a black tip, alternating with broader grayish rings, the black rings interrupted on under side near base.

[28] Mus. Vert. Zool.

Cranial characters.—Skull rather small, short, low, broad, and flat, with well-developed postorbital processes. Very similar in general form to that of *P. l. pacificus*, but much smaller throughout; brain case relatively smaller and less inflated; nasals narrower and more attenuate posteriorly; pterygoids shorter, less diverging posteriorly; maxillary tooth rows shorter, the individual teeth much smaller.

Measurements.—An adult from Beecher Bay, Vancouver Island: Hind foot (dry skin), 112 mm. *Skull:* Type: Greatest length, 116; condylobasal length, 108.9; zygomatic breadth, 77.5; interorbital breadth, 25.4; least width of palatal shelf, 16.5; maxillary tooth row (alveoli), 40.2; upper carnassial, crown length, 8.3, crown width, 8.9.

Remarks.—The Vancouver Island raccoon is a well-marked subspecies. It requires close comparison only with *P. l. pacificus* of the adjacent mainland.

Specimens examined.—Total number, 40, as follows:

Vancouver Island, B. C.: Alberni Valley (Hall's Ranch), 1;[29] Beecher Bay, 3 (2 skulls without skins);[30] Cadboro Bay, 1 (skull only);[30] Errington, 1;[29] Fort Rupert, 1 (skull only);[31] French Creek, 1;[29] Little Qualicum River, 1;[29] Mount Tolmie, 1 (skull only);[30] Parksville, 2;[29] Quatsino Sound (type locality), 21 (skulls only); San Josef River Valley, 1 (skull only); Sooke, 2 (skulls only);[30] Victoria, 1 (skull only);[30] exact locality unknown, 3 (skulls only).[30]

PROCYON LOTOR GRINNELLI Nelson and Goldman

Baja California Raccoon

Procyon lotor grinnelli Nelson and Goldman, Jour. Washington Acad. Sci. 20 (5): 82, Mar. 4, 1930.

Type locality.—La Paz, Baja California, Mexico.

Type.—No. 147181, male adult, skin and skull, United States National Museum (Biological Surveys collection); collected by E. W. Nelson and E. A. Goldman, February 15, 1906.

Distribution.—Southern Baja California from the Cape region north at least to San Ignacio. Tropical and Lower Sonoran Zones.

General characters.—A large, pale subspecies with a rather broad, high, evenly arched skull. Similar to *P. l. pallidus* of the Colorado Desert, but slightly darker and cranial characters, especially the more evenly arched profile of skull, distinctive. Compared with *P. l. psora* of the Sacramento Valley, general color paler, more grayish, less deeply suffused with buff, the long black guard hairs over dorsum less in evidence; top of head grayer, less heavily mixed with black; black areas at posterior base of ears smaller; skull with frontal region more highly arched.

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[29] Mus. Vert. Zool.
[30] Provincial Mus., British Columbia.
[31] Amer. Mus. Nat. Hist.

Color.—Upper parts in general coarsely grizzled iron grayish, the median dorsal area faintly suffused with pale buff, becoming pronounced on back of neck, rather thinly overlaid with black; top of head gray, mixed with black, producing a grizzled effect; face with solid black mask; white facial markings as usual in the group; under parts in general overlaid with very pale buffy grayish, the brown undertone showing through; throat patch blackish; ears grayish, with rather small black patches at posterior base; limbs similar to under parts, but becoming whitish on feet; hind legs with small, pure brownish areas on outer side near heels; tail with the usual annulations and black tip, the light rings pale cream buff and the narrower dark rings (6 to 7) consisting of black-tipped hairs with an underlying buffy suffusion; dark rings less evident on under side of tail and scarcely complete, tending to fade out on median line, except near tip.

Cranial characters.—Skull similar to that of *P. l. pallidus*, but brain case and interorbital region broader; frontals rising higher anteriorly, the upper outline a more evenly convex curve—anterior frontal outline descending in a more nearly straight line from apex immediately behind postorbital processes in *pallidus*; dentition about the same. Compared with that of *P. l. psora* the skull is less flattened, the frontal region more highly arched; brain case rather broad and other cranial details much as in *psora*.

Measurements.—Type: Total length, 913 mm.; tail vertebrae, 335; hind foot, 132. *Skull:* Type: Greatest length, 122.1; condylobasal length, 115.5; zygomatic breadth, 77.9; interorbital breadth, 24.3; least width of palatal shelf, 16.7; maxillary tooth row (alveoli), 44.1; upper carnassial, crown length, 8.8, crown width, 9.3.

Remarks.—Raccoons are dependent upon water for existence, and owing to exceedingly arid conditions in the central section of Baja California their general range is interrupted for considerable distances. The form here described, which occupies the southern half of the peninsula, differs rather markedly in combination of characters from both of the more northern subspecies, *P. l. psora* and *P. l. pallidus*. It requires no very close comparison with *P. l. mexicanus* of the adjacent mainland of Mexico, which in general, is paler, with the black postauricular spots obsolescent, and skull notably depressed in frontal region.

Specimens examined.—Total number, 11, as follows:

Baja California, Mexico: La Paz (type locality), 3;[32] Mount Miraflores, 3;[33] San Ignacio, 5.

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[32] One (skull only) in Mus. Vert. Zool.
[33] Two in Amer. Mus. Nat. Hist.

PROCYON LOTOR HERNANDEZII Wagler

Mexican Plateau Raccoon

Pr[ocyon] hernandezii Wagler, Isis 24: 514, 1831.
Procyon lotor hernandezii Allen, Amer. Mus. Nat. Hist. Bull. 3: 176, Dec. 10, 1890.

Type locality.—Valley of Mexico, Mexico (specimens from Tlalpam regarded as typical).[34]

Type.—Not designated.

Distribution.—Southern part of tableland or plateau region of Mexico and adjoining coasts, from Nayarit, Jalisco, and San Luis Potosi, south to near the Isthmus of Tehuantepec. Altitudinal range from sea level to about 8,000 feet. Tropical to Transition Zone.

General characters.—A large, dark grayish subspecies; skull somewhat flattened, with narrow frontal region and slender, wide spreading zygomata; dentition heavy. Similar in general to *P. l. fuscipes* of Texas, but upper parts grayer; skull flatter and differing in detail. Decidedly darker than *P. l. mexicanus* of Chihuahua, the upper parts more extensively overlaid with black, and cranial characters distinctive. Differing from *P. l. shufeldti* of Campeche in longer pelage; top of head darker and back more heavily overlaid with black; skull more slender.

Color.—Very similar to that of *P. l. fuscipes* but still grayer, less buffy beneath overlying black; black postauricular spots smaller. *Young* (in first pelage): Similar to *lotor* of corresponding age, but top of head and postauricular areas less extensively brownish black, and black mask continuous across face (mask more or less interrupted between eyes in *lotor*); feet dark brownish instead of buffy.

Cranial characters.—Skull size about as in *P. l. fuscipes* but more flattened above, the frontal region less elevated, and brain case less depressed near fronto-parietal suture; postorbital processes of frontals usually longer, narrower, more acutely pointed; upper margin of orbit usually more deeply concave; posterior upper premolar and upper carnassial usually larger. Similar to that of *P. l. mexicanus*, but flatter, the frontal region less elevated; interorbital and postorbital regions usually narrower; maxillary tooth rows longer; posterior upper premolar and upper carnassial larger. Compared with that of *P. l. shufeldti* the skull is more slender, less massive; interorbital and postorbital regions narrower; dentition about the same.

Measurements.—Adult male from Tlalpam, Valley of Mexico, Mexico: Total length, 905 mm.; tail vertebrae, 283; hind foot, 122. Two adult males from Jalpan, Queretaro, and Patzcuaro, Michoacan, respectively: 894, 872; 340, 308; 129, 127. Two adult females, Tetela del Volcan, Morelos, and El Chico, Hidalgo: 860,825; 300, 264; 120, 122. *Skull*: Adult male from Tlalpam, Mexico: Greatest

[34] Type locality fixed by Nelson and Goldman, Biol. Soc. Washington Proc. 44: 17, Feb. 21, 1931.

length, 122.9; condylobasal length, 116.9; zygomatic breadth, 86; interorbital breadth, 25.2; least width of palatal shelf, 16.8; maxillary tooth row (alveoli), 45.7; upper carnassial, crown length, 9.2, crown width, 10.3. Two adult males from Acambaro, Michoacan, and Jalpan, Queretaro: Greatest length, 128.3, 123.7; condylobasal length, 124.8, 116; zygomatic breadth, 86.2, 83.1; interorbital breadth, 24.2, 23.9; least width of palatal shelf, 16.4, 16.4; maxillary tooth row, 45.2, 44.2; upper carnassial, crown length, 9.3, 9.1, crown width, 10, 9.3. Two adult females from Tetela del Volcan, Morelos, and El Chico, Hidalgo: Greatest length, 118.1, 114; condylobasal length, 114.8, 109.3; zygomatic breadth, 79.3, 76.8; interorbital breadth, 24.7, 22.1; least width of palatal shelf, 16.4, 15.8; maxillary tooth row, 44.2, 42.3; upper carnassial, crown length, 9.4, 8.2, crown width, 10, 9.4.

Remarks.—The range of *P. l. hernandezii* in southern Mexico is transcontinental, and while mainly at 4,000 to 6,000 feet on the tableland of the interior it extends from sea level along the tropical coasts to 8,000 feet altitude on the slopes of the mountains bordering the Valley of Mexico. It intergrades on the north in eastern Mexico with *P. l. fuscipes* and in western Mexico with *P. l. mexicanus*. Toward the southeast its range meets that of *P. l. shufeldti*.

Specimens examined.—Total number, 50, as follows:

Colima: Armeria, 1; Colima, 5 (3 skulls without skins); Manzanillo, 8 (3 skulls without skins).
Guerrero: Papayo, 2; Tlapa, 1.
Hidalgo: El Chico, 1.
Jalisco: Arroyo de Plantinar, 1;[35] Atemajae, 3 (1 skull without skin); Barranca Ibarra (Canyon de Oblatos), Rio Grande de Santiago, 1; Garabatos, 1;[35] Las Canoas, 2;[35] Zacoalco, 1; Zapotlan, 2 (1 skull without skin).
Mexico: Ajusco, Distrito Federal, 1 (skull only); Tlalpam, Distrito Federal, 1.
Michoacan: Acambaro, 2 (skulls only); Patzcuaro, 2 (1 skull without skin); Querendaro, 3 (2 skulls without skins).
Morelos: Tetela del Volcan, 1.
Nayarit: San Blas, 1.
Oaxaca: Cuicatlan, 1.
Queretaro: Jalpan, 2 (1 skull without skin).
San Luis Potosi: Hacienda la Parada, 1; San Luis Potosi, 1.
Veracruz: Jico, 3; Mirador, 2 (1 skin without skull).

PROCYON LOTOR SHUFELDTI Nelson and Goldman
Campeche Raccoon

Procyon lotor shufeldti Nelson and Goldman, Biol. Soc. Washington Proc. 44: **17,** Feb. 21, 1931.

Type locality.—La Tuxpeña, Champoton, Campeche, Mexico.

Type.—No. 177546, male adult, skin and skull, United States National Museum (Biological Surveys collection); collected by Percy W. Shufeldt, April 20, 1911.

Distribution.—From the Isthmus of Tehuantepec east through Chiapas, Tabasco, Campeche, Yucatan, Quintano Roo, British

[35] Amer. Mus. Nat. Hist.

Honduras, and Guatemala to western Honduras; limits of range unknown. Tropical Zone.

General characters.—A large, rather pale, short-haired subspecies, with massive skull. Similar in general to *P. l. hernandezii* of the Valley of Mexico, but pelage shorter, color duller, top of head grayer and back less modified by black-tipped hairs; black postauricular spots (small in *hernandezii*) still less distinct; skull more massive and differing in detail. Size about as in *P. l. crassidens* of Costa Rica, but color decidedly paler and grayer, the upper parts less heavily overlaid with black, and the subterminal light zone of longer hairs more extended and thus affecting the general tone; skull less flattened. Differing from *P. l. dickeyi* in larger size, much grayer color, and in cranial characters.

Color.—Upper parts in general usually light buffy gray, with rather thinly distributed overlying black-tipped hairs resulting in a coarsely grizzled blend; nape patch rusty rufous; sides lighter, the black tips of hairs inconspicuous; top of head clearer gray, mixed with black, lacking the light buffy tone suffusing the back; black mask across face extending downward along median line of muzzle to nose and upward to middle of forehead; lines bordering mask above, sides of muzzle, lips, and chin white as usual in the group; under parts in general thinly overlaid with very light buffy hairs, the light brownish underfur showing through, but short and scarcely concealing the skin; throat patch brownish; ears grayish; black postauricular spots small and inconspicuous; limbs similar in color to under parts, but over hairs denser, becoming dull whitish on feet; hind legs with outer sides of ankles brownish; tail above with seven to eight narrow blackish rings and a black tip, alternating with light ochraceous buffy rings, less distinct and tending to become confluent below, especially near base. Varying in some specimens from paler and grayer to darker, with dorsum more profusely overspread with black, and rusty rufous nape patch indistinct or absent. *Young* (in first pelage): Similar to *P. l. hernandezii*, but paler above, especially the top of head, which is scarcely differentiated from back.

Cranial characters.—Skull similar in size to that of *P. l. hernandezii*, but more massive; interorbital and postorbital regions broader; dentition about the same. Similar in size and angularity to that of *P. l. crassidens*, but less flattened, the frontal region higher arched behind postorbital processes; dentition and other cranial details about as in *crassidens*. Compared with that of *P. l. dickeyi* the skull is decidedly larger, more massive; sagittal and lambdoid crests heavier, thicker and less trenchant; palate broader; auditory bullae usually larger.

Measurements.—Type: Total length, 874 mm.; tail vertebrae, 292; hind foot, 116. An adult female topotype: 909; 296; 128. *Skull*: Type: Greatest length,

126.1; condylobasal length, 118.7; interorbital breadth, 26.8; least width of palatal shelf, 16.8; maxillary tooth row (alveoli), 45.1; upper carnassial, crown length, 9.6, crown width, 9.8.

Remarks.—The general range of the present subspecies embraces the peninsula of Yucatan and adjoining territory as far south and west as the Isthmus of Tehuantepec. Like the representatives of other widely ranging subspecies inhabiting the general region it is characterized by pale colors. Occasional specimens, however, as one from Huilotepec (near Tehuantepec), Oaxaca, have the upper parts more heavily overlaid with black, indicating gradation toward the darker Central American forms. It is closely allied to *P. l. hernandezii*, but the characters pointed out are distinctive.

Specimens examined.—Total number, 23, as follows:

British Honduras: El Cayo (near San Lorenzo), 1.[36]
Campeche: La Tuxpeña (type locality), 3.
Chiapas: San Vicente, 1 (skull only).
Guatemala: El Espino, 1; northern Guatemala (exact locality unknown), 1.
Honduras: Santa Barbara, 1.[37]
Oaxaca: Huilotepec, 7; San Mateo del Mar, 1 (skull only); Tehuantepec, 4.[38]
Tabasco: Montecristo, 1.
Veracruz: Minatitlan, 1.
Yucatan: Chichen Itza, 1.

PROCYON LOTOR DICKEYI Nelson and Goldman

Salvador Raccoon

Procyon lotor dickeyi Nelson and Goldman, Biol. Soc. Washington Proc. 44: 18, Feb. 21, 1931.

Type locality.—Barra de Santiago, Department of Ahuachapam, Salvador.

Type.—No. 12796, male adult, skin and skull, collection of Donald R. Dickey; collected by G. D. Stirton, April 14, 1927.

Distribution.—Coast region of southwestern Salvador and probably of southeastern Guatemala; limits of range unknown. Tropical Zone.

General characters.—A dark-colored subspecies (one of the darkest of the group) of medium size; skull short and light in structure. Color about as in *P. l. crassidens* of Costa Rica; size similar, but skull of lighter proportions, and differing in important details. Similar in general to *P. l. shufeldti* of Campeche, but smaller, and much darker, the upper parts more heavily overlaid with black; cranial characters distinctive.

Color.—Upper parts in general grayish, heavily and rather uniformly overlaid with black extending well down along sides; light subterminal zone of longer hairs narrow and dark undercolor showing through in-

[36] Univ. Michigan Mus. Zool.
[37] Amer. Mus. Nat. Hist.
[38] One skin without skull, one skull without skin, Amer. Mus. Nat. Hist.

tensifying general dark tone; top of head clearer gray, heavily mixed with black, producing a somewhat grizzled effect, the black predominating; black facial mask extending downward on median line to nose and upward to middle of forehead; white supraorbital lines short and narrow, ending under ears instead of continuing posteriorly to sides of neck as in *shufeldti* and more northern forms; sides of muzzle, lips, and chin white; under parts in general thinly overlaid with buffy white, the underfur light brownish, sparse and only partially concealing the skin beneath; throat patch brownish black; ears grayish; black postauricular spots small, tending to blend with dark tone of back; forearms dull grayish, becoming soiled whitish on feet; outer surfaces of hind legs similar to sides of body, becoming brownish black near heels and soiled whitish on feet; tail above with about seven blackish rings, rather indistinct near base, and a black tip, alternating with rich ochraceous buffy rings, tending to blend along median line below.

Cranial characters.—Skull characterized by thin-walled, delicate structure, with weakly developed sagittal and lambdoid crests. Most closely resembling that of *P. l. crassidens*, but of lighter proportions; frontal region less flattened; palate much narrower, a character very noticeable in the lesser distance between cheek tooth series; jugal more slender; dentition heavy, much as in *crassidens*. Compared with that of *P. l. shufeldti* the skull is decidedly smaller and less massive; frontal region of similar elevation; sagittal and lambdoid crests weaker, thinner and more trenchant; palate narrower; auditory bullae usually smaller; dentition about the same.

Measurements.—Type: Total length, 840 mm.; tail vertebrae, 310; hind foot, 115. Average of four adult male topotypes: 840 (800–870) mm.; 297 (300–340); 114 (110–120). Average of eight adult female topotypes: 782 (730–790); 300 (280–340); 110 (105–120). *Skull:* Type and an adult male topotype, respeetively: Greatest length, 114.7, 108.3; condylobasal length, 108.4, 102.7; zygomatie breadth, 79.3, 76.2; interorbital breadth, 23.9, 22.5; width of palate between last molars, 19.5, 20.9; least width of palatal shelf, 16, 15.3; maxillary tooth row (alveoli), 41.7, 40.7; upper earnassial, erown length, 7.7, 8.5, crown width, 9, 8.9. Average of seven adult female topotypes: Greatest length, 116.1 (113–122.5); condylobasal length, 109.7 (107.5–115.9); zygomatie breadth, 74 (70.2–80); interorbital breadth, 23.9 (22.9–25.3); width of palate between last molars, 19.7 (18.4–21); least width of palatal shelf, 15.2 (14.7–15.7); maxillary tooth row, 43.7 (42.7–45.7); upper earnassial, erown length, 9.2 (8.7–10), erown width, 10 (9.5–11).

Remarks.—*P. l. dickeyi* is the most northern of the known Central American subspecies, all of which are characterized by darker color than their more northern relatives. It appears to be a highly specialized mangrove-inhabiting race as specimens from the interior only a short distance away are markedly different and nearer to *crassidens*. In external appearance this subspecies is similar to *P. l. crassidens*, but the cranial features are quite distinctive. The rusty rufous nape

patch often present in more northern forms is absent or only faintly indicated in some individuals. In the type locality it was found by the collector living among mangroves where specimens were obtained by shooting. Examination of stomach contents revealed crabs, which appear to be the principal food. In all of the skulls, including that of a young individual about two-thirds grown, the large cheek teeth are much more worn than is usual in raccoons of corresponding ages. This excessive wear, greatest on the molars, is due evidently to the abrasive character of the food. The delicate cranial structure and rapid reduction of the molars also suggest that malnutrition resulting from an imperfect diet, or incomplete mastication of food, may have been responsible for the development of the peculiar characters of this localized race.

Specimens examined.—Total number, 22, as follows:

Guatemala: Exact locality unknown, 5.

Salvador: Barra de Santiago, Department of Ahuachapam (type locality), 17 (4 skins without skulls).[39]

PROCYON LOTOR CRASSIDENS Hollister

Costa Rican Raccoon

Procyon lotor crassidens Hollister, Biol. Soc. Washington Proc. 27: 142, July 10, 1914.

Type locality.—Talamanca, northeastern Costa Rica.

Type.—No. $\frac{12191}{14191}$, adult [male?], skin and skull, United States National Museum; collected by William M. Gabb. Original number 14.

Distribution.—Costa Rica, Nicaragua, Salvador, except southwestern coast region and probably Honduras, except western part; probably extending into western Panama. Tropical Zone.

General characters.—One of the darkest known forms of the group; closely resembling *P. l. pumilus* of Panama and *P. l. dickeyi* of Salvador externally, but cranial characters distinctive.

Color.—About as in *P. l. dickeyi*, the dorsum heavily overlaid with black extending well down the sides; white supraorbital lines distinct, but short and disappearing under the ears as in *dickeyi*.

Cranial characters.—Skull similar to that of *P. l. dickeyi*, but more massive; frontal region more flattened; palate much broader, the tooth rows more widely separated; dentition heavy much as in *dickeyi*. Compared with that of *P. l. pumilus* the skull is larger, relatively longer, narrower, and less extremely flattened; interorbital and postorbital regions narrowers; postorbital processes of

[39] Donald R. Dickey collection.

frontals shorter, broader and more obtusely pointed; dentition similar but usually heavier.

Measurements.—An adult male from Jalapa, Nicaragua: Total length, 950 mm.; tail vertebrae, 310; hind foot, 120. An adult male from San Rafael del Norte, Nicaragua: 880; 250; 110. *Skull:* Type: Greatest length, 125.5; condylobasal length, 122.9; zygomatic breadth, 75.8; interorbital breadth, 25.8; width of palate between last molars, 24.1; least width of palatal shelf, 17.3; maxillary tooth row (alveoli), 47.3; upper carnassial, crown length, 10, crown width, 10.7.

Remarks.—*P. l. crassidens* is similar to *P. l. pumilus* and *P. l. dickeyi* in external appearance, all sharing an extremely dark coloration. While closely allied to the forms mentioned, the cranial characters presented are quite distinctive. Some specimens from the interior and southeastern coast region of Salvador, quite near the restricted range of *dickeyi*, are distinctly grayer than typical *crassidens*, and in this character, as in cranial details, grade toward *shufeldti*.

Specimens examined.—Total number, 18, as follows:

Costa Rica: El Sauce Peralta, 1; Talamanca, 1 (type); exact locality unknown, 1.

Nicaragua: Jalapa, 2;[40] San Rafael del Norte, 2;[40] Vijagua, 1.[40]

Salvador: Barrios Mine, Morazan, 1;[41] Colima, Cuscatlan, 1;[41] Lake Guija, 1;[41] Puerto del Triunfo, Usulutan, 1;[41] Rio Goascoran, La Union, 1;[41] Rio San Miguel, 3;[41] San Pedro Mine, Morazan, 1;[41] Volcan San Miguel, 1.[41]

PROCYON LOTOR PUMILUS Miller

ISTHMIAN RACCOON

Procyon pumilus Miller, Biol. Soc. Washington Proc. 24: 3, Jan. 28, 1911.

Type locality.—Ancon, Panama.

Type.—No. 171983, young adult [female?], skin and skull, United States National Museum; collected by Allan H. Jennings, 1910.

Distribution.—Panama and the Canal Zone from Porto Bello west to Boqueron, Chiriqui, limits of range unknown. Tropical Zone.

General characters.—Closely allied to *P. l. crassidens* of Costa Rica; color very similar; skull shorter, relatively broader and flatter.

Color.—Very dark, the upper parts heavily overlaid with black about as in *P. l. crassidens*, but white supraorbital lines usually less distinct, somewhat obscured by dusky hairs.

Cranial characters.—Skull smaller, shorter, relatively broader, and still flatter than that of *P. l. crassidens;* interorbital and postorbital regions broader; postorbital processes longer, narrower, more acutely pointed; dentition lighter, especially the cheek teeth distinctly smaller.

Measurements.—Adult male from Porto Bello, Panama: Total length, 920 mm.; tail vertebrae, 350; hind foot, 125. Adult female from Gatun, Canal Zone: 831; 292; 123. *Skull:* Adult male from Porto Bello, Panama and adult female from Gatun, Canal Zone, respectively: Greatest length, 113.5, 113.2; condylo-

[40] Amer. Mus. Nat. Hist.

[41] Donald R. Dickey collection.

basal length, 110.8, 110.5; zygomatic breadth, 81.1, 80.6; interorbital breadth, 26.8, 24.8; least width of palatal shelf, 15.1, 14.8; maxillary tooth row, 44, 41.9; upper carnassial, crown length, 8.9, 7.6, crown width, 9.6, 9.

Remarks.—The range of *P. l. pumilus* marks the known extreme southern limit of the *Procyon lotor* group. Its distribution area overlaps that of *Procyon cancrivorus panamensis*, the so-called crab-eating raccoon, the two occurring in the same localities in the Canal Zone and vicinity. From the latter it is easily distinguished externally by its smaller size, more slender proportions, grayish instead of blackish forearms and thighs, presence of underfur, and the normal inclination backward of the pelage of the nape which in the crab-eating raccoon is reversed. The skull is recognizable especially by the smaller molars, with more pointed instead of rounded cusps. Although the dentition of *pumilus* is not so well fitted as that of the crab-eating raccoon for crushing hard substances such as crabs, it shares with it the crab-eating habit, at least to some extent, as shown by the examination of stomach contents.

P. l. pumilus is most closely allied to *P. l. crassidens*. In external appearance some specimens of the two are practically indistinguishable, although the white supraorbital lines are usually less distinct in *pumilus;* but the skull is notable for its shortness; and in the general flatness, and length of the postorbital processes it reaches the extreme development presented in the group. Material now available, including a series of six topotypes (Balboa and Ancon, the type locality, are contiguous), shows that this raccoon is not so very small as the type, an unusually under-sized and not fully adult individual, seemed to indicate.

Specimens examined.—Total number, 15, as follows:

Canal Zone: Ancon, 1 (type); Balboa, 6;[42] Gatun, 4.
Panama: Boqueron, 1;[43] Pedregal, 1;[44] Porto Bello, 2.

PROCYON INSULARIS Merriam

[References under subspecies]

Distribution.—Tres Marías Islands, off west coast of Nayarit, Mexico.

General characters.—A large, pale species, with short, coarse pelage and massive skull. Similar to adjacent mainland forms of *P. lotor* (*P. l. mexicanus* and *P. l. hernandezii*), but pelage shorter, more bristly, color inclining toward buffy instead of iron grayish, the back less overlaid with black; black postauricular spots much smaller, less conspicuous; skull more angular and differing in important details.

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[42] Chicago Mus. Nat. Hist.
[43] Amer. Mus. Nat. Hist.
[44] Mus. Comp. Zool.

Color.—Upper parts in general light cream buff, the dorsal area thinly overlaid with black; nuchal patch undifferentiated or faintly indicated by a very pale buffy line; sides lighter, the black-tipped hairs inconspicuous; top of head grizzled gray and black; black mask extending across face and along median line from nasal pad to middle of forehead; white supraorbital lines continuous to sides of neck; sides of muzzle, lips, and chin white; under parts, in general, thinly overlaid with very pale creamy buff, the light brown underfur showing through; throat patch brownish flecked with gray; ears grayish, the black patches at posterior base, usual in the group, obsolescent; limbs about like sides, becoming dull whitish on feet; hind legs brownish on outer sides near ankles; tail above with about seven black rings and a black tip, alternating with broader cream buffy or light ochraceous buffy rings, the dark rings interrupted below.

Cranial characters.—Skull large, angular, and massive, with remarkably heavy zygomata, the squamosal arm, especially, very broad anteriorly and extended vertically (as apparent when viewed from the side). Similar in general to that of *P. lotor*, especially , *P. l. mexicanus* and *P. l. hernandezii*, but more angular; zygomata broader and heavier, the squamosal arm broader anteriorly, more extended vertically; transverse squamosal portion of zygoma bearing a more conspicuous process on anterior border near posterior end of jugal; palatal shelf relatively narrower, the lateral borders more deeply concave; postorbital processes of frontals well developed as in *mexicanus* and *hernandezii;* large molariform teeth narrower; crown of second upper molar subquadrate, instead of subtriangular, the inner border more evenly rounded.

Remarks.—*P. insularis* is clearly allied to *P. l. mexicanus* and *P. l. hernandezii* of the adjacent mainland and was regarded by its describer as a subspecies of the widely ranging continental animal. The characters pointed out are so trenchant, however, that its position in the group is better expressed by according it specific rank. It is subdivisible into two closely related insular forms.

PROCYON INSULARIS INSULARIS Merriam

María Madre Island Raccoon

Procyon lotor insularis Merriam, Biol. Soc. Washington Proc. 12: 17, Jan. 27, 1898.

Type locality.—María Madre Island, Tres Marías Islands, off west coast of Nayarit, Mexico.

Type.—No. 88978, old male, skin and skull, United States National Museum (Biological Surveys collection); collected by E. W. Nelson and E. A. Goldman, May 10, 1897.

Distribution.—Known only from María Madre Island. Tropical Zone.

General characters.—Closely resembling *P. i. vicinus* of María Magdalena Island, but dorsum less conspicuously overlaid with black, and top of head grayer; cranial characters distinctive.

Color.—About as set forth for the species as a whole, differing only slightly from *P. i. vicinus* in the somewhat lesser amount of overlying black.

Cranial characters.—Skull very similar to that of *P. i. vicinus*, but brain case less highly arched; lambdoid crest more broadly spreading, not rising so high over foramen magnum; basioccipital, basisphenoid, and palatal shelf broader; palatal ridges (extending posteriorly to pterygoids) more widely separated; pterygoids thicker, the posterior ends more strongly everted and knob-like; maxillary arm of zygoma with lower external border projecting as a distinct process separated from outer alveolar border of molars by a deep notch (process absent in *vicinus*); zygomata very broad and heavy as in *vicinus;* foramen magnum more decidedly wider than high (more nearly circular in *vicinus*); dentition about the same.

Measurements.—Type: Total length, 854 mm.; tail vertebrae, 286; hind foot, 132. An adult male topotype: 840; 264; 128. *Skull:* Type and an adult male topotype, respectively: Greatest length, 121.8, 119; condylobasal length, 114.6, 114; zygomatic breadth, 86.4, 82.5; interorbital breadth, 27.8, 27.2; least width of palatal shelf, 15.4, 14.3; maxillary tooth row, 43.6, 42.2 (alveoli); upper carnassial, crown length, 8.6, 8.6, crown width, 9.3, 9.1.

Remarks.—*P. i. insularis* requires close comparison only with *P. i. vicinus* of María Magdalena Island. While cranial details appear to be quite distinctive these insular forms are much alike in external appearance. In the few specimens available, however, the black overlying the dorsum—rather thin in *vicinus*—is further reduced in *insularis*, leaving a coarsely grizzled effect.

Specimens examined.—Six, all from the type locality.

PROCYON INSULARIS VICINUS Nelson and Goldman

María Magdalena Island Raccoon

Procyon insularis vicinus Nelson and Goldman, Biol. Soc. Washington Proc. 44: 20, Feb. 21, 1931.

Type locality.—María Magdalena Island, Tres Marías Islands, Nayarit, Mexico (altitude 250 feet).

Type.—No. 88982, male adult, skin and skull, United States National Museum (Biological Surveys collection); collected by E. W. Nelson and E. A. Goldman, May 27, 1897.

Distribution.—Known only from María Magdalena Island. Tropical Zone.

General characters.—A pale subspecies with short, coarse pelage. Closely resembling *Procyon i. insularis* of María Madre Island, but dorsum more conspicuously overlaid with black, and top of head somewhat darker; cranial characters distinctive.

Color.—Upper parts in general light cream buff, the dorsal area rather thinly overlaid with black; sides lighter, the black-tipped hairs inconspicuous; top of head gray mixed with black, giving a grizzled effect; black mask across face extending downward to nose and upward on median line to middle of forehead; white supraorbital markings normal; sides of muzzle, lips, and chin white; under parts in general thinly overlaid with very pale creamy buff, the light brown underfur showing through; throat patch brownish flecked with gray; ears grayish, the black patches at posterior base, usual in the group, obsolescent; legs about like sides, becoming dull whitish on feet; hind legs brownish on outer sides near ankles; tail above with seven black rings and a black tip, alternating with broader cream buff rings, the dark rings interrupted below.

Cranial characters.—Skull very similar to that of *P. i. insularis*, but brain case more highly arched; lambdoid crest rising higher over foramen magnum; basioccipital, basisphenoid, and palatal shelf narrower; palatal ridges (extending posteriorly to pterygoids) less widely separated; pterygoids thinner, the posterior ends less everted; maxillary arm of zygoma normal, the lower external border not projecting and forming a distinct process separated from outer alveolar border of molars by a deep notch; zygomata very broad and heavy, as in *insularis;* foramen magnum more nearly circular (more decidedly wider than high in *insularis*); dentition about the same.

Measurements.—Type: Total length, 904 mm.; tail vertebrae, 313; hind foot, 135. *Skull:* Type: Greatest length, 120; condylobasal length, 115.2; zygomatic breadth, 84.6; interorbital breadth, 27.7; least width of palatal shelf, 14.1; maxillary tooth row (alveoli), 42.6; upper carnassial, crown length, 8.7, crown width, 9.2.

Remarks.—As might be expected *P. i. vicinus* is closely allied to its near geographic neighbor, *P. i. insularis* of María Madre Island, and requires no very close comparison with any other form. It is distinguished externally from adjacent mainland forms, *P. l. mexicanus* and *P. l. hernandezii*, by shorter, coarser pelage, the general color inclining toward buffy instead of grayish, and the black postauricular spots obsolescent; the skull differs in numerous important details, especially the higher arched brain case, much broader, heavier, zygomata, narrower palatal shelf, and narrower carnassials.

Specimens examined.—Two, from the type locality.

PROCYON MAYNARDI Bangs

Bahama Raccoon

Procyon maynardi Bangs, Biol. Soc. Washington Proc. 12: 92, Apr. 30, 1898.

Type locality.—New Providence Island, Bahamas.

Type.—No. 7750, male young, skin and skull, Museum of Comparative Zoology (collection of E. A. and O. Bangs); collected by Herbert L. Claridge, August 1897.

Distribution.—Known only from New Providence Island, Bahamas. Tropical Zone.

General characters.—A small, medium dark-colored species with a slender, delicate skull, narrow palatal shelf, and light dentition. Similar in general to *P. l. incautus* of the extreme southern Florida keys, but color darker, and cranial characters, especially the small teeth, distinctive. Somewhat similar in size to *P. minor* of Guadeloupe Island, Lesser Antilles, but apparently somewhat paler in color and skull differing notably in the narrowness of the palatal shelf.

Color.—Upper parts in general grayish, becoming ochraceous buffy on nape and over shoulders, moderately overlaid with black, thinning out along sides; top of head a grizzled mixture of gray and black; black mask interrupted between eyes, a dusky median patch extending to forehead somewhat isolated by lighter lateral lines, as in *P. l. lotor*; upper surface of muzzle ochraceous buffy; supraorbital lines, sides of muzzle, lips, and chin white; ears grayish, with black patches at posterior base; under parts thinly overlaid with grayish; limbs similar to under parts, the hind legs blackish near ankles; tail with five or six black rings and a black tip, alternating with ochraceous buffy rings.

Cranial characters.—Skull very similar in outline and general proportions to that of *P. l. incautus*, but palatal shelf narrower, the sides distinctly concave (sides more nearly parallel in *incautus*); nasals narrower posteriorly; auditory bullae slightly larger, more inflated; posterior upper premolar and carnassial slightly smaller. Similar in size to that of *P. minor*, but brain case narrower, less flattened above; palatal shelf decidedly narrower, the sides more concave; nasals narrower between anterior processes of frontals; auditory bullae slightly larger; dentition similar, but molariform teeth broader.

Measurements.—Adult Male topotype: Total length, 713 mm.; tail vertebrae, 240; hind foot (dry skin), 100. *Skull:* An adult male and an adult female (topotypes), respectively: Greatest length, 105.9, 103.5; condylobasal length, 101.7, 101; zygomatic breadth, 79.3, 64.6; interorbital breadth, 21.9, 22.1; least width of palatal shelf, 12.2, 13.3; maxillary tooth row (alveoli), 38.7, 38.9; upper carnassial, crown length, 7.6, 7.6, crown width, 8.4, 8.5.

Remarks.—The Bahama form is closely related to the raccoons of the Florida Keys as shown in the skull by agreement in form and general proportions, especially the height of the frontal region, with slight

development of postorbital processes, and the depression of the brain case near the fronto-parietal suture. The differential characters, however, warrant its recognition as a distinct species. In describing *P. maynardi* Bangs (1898b, p. 92) says: "There is no tradition among the inhabitants of Nassau that the raccoon was ever introduced upon the island. . . . The raccoon is abundant upon Nassau [New Providence] but Mr. Maynard believes that it does not exist upon any of the other islands of the Bahama group." According to the Acting Colonial Secretary Charles P. Bethel, the raccoons on New Providence Island have decreased during recent years owing to the destruction by hurricanes of fruit trees that afforded a food supply.

Specimens examined.—Three,[45] all from New Providence Island.

PROCYON PYGMAEUS Merriam

Cozumel Island Raccoon

Procyon pygmaeus Merriam, Biol. Soc. Washington Proc. 14: 101, July 19, 1901.

Type locality.—Cozumel Island, Yucatan, Mexico. Tropical Zone.

Type.—No. 108511, male subadult, skin and skull, United States National Museum (Biological Surveys collection); collected by E. W. Nelson and E. A. Goldman, April 14, 1901.

Distribution.—Known only from Cozumel Island.

General characters.—Smallest known species of the genus, with short, bristly, grayish pelage; skull with short, posteriorly rounded nasals and very small teeth. Somewhat similar in color and texture of pelage to *P. l. shufeldti*, of the adjacent mainland, but so much smaller and cranial characters so distinctive that close comparison is not required.

Color.—Upper parts in general light buffy gray, the median dorsal area suffused with pale buff, becoming more pronounced and approaching ochraceous buff on a narrow nuchal patch in some specimens, rather thinly overlaid with black; top of head clearer, grizzled gray and black, lacking light buffy tone suffusing back; black mask becoming brownish and usually more or less mixed with gray on middle of face, the gray admixture invading also the dark median streak extending to the forehead; upper surface of muzzle brownish; lines bordering mask above, sides of muzzle, lips, and chin white; under parts, in general, thinly overlaid with light buffy hairs, the light brownish underfur showing through; throat patch dark brownish, clearly defined; ears grayish or light buffy; postauricular spots brownish, small and inconspicuous; legs similar to under parts, becoming dull whitish on feet, the hind legs with outer sides of ankles clearer brownish; tail with six or seven narrow, brownish or blackish rings and a black tip, alternating with broader ochraceous buffy rings, the dark rings ill-defined on under side.

[45] One in Amer. Mus. Nat. Hist.; one in Mus. Comp. Zool.

Cranial characters.—Skull small, short, and flattened, with relatively short, narrow rostrum, short nasals, broad frontal region and brain case, and light dentition. Somewhat similar in general form to that of *P. l. shufeldti*, but departing widely in the smaller size; rostrum relatively shorter and narrower; frontal region relatively broader; nasals relatively shorter, more rounded, less acutely pointed posteriorly; postorbital processes of frontals well-developed and upper border of orbit distinctly concave as in *shufeldti;* teeth similar in sculpture, but relatively much smaller, the first and second upper premolars more widely spaced, and the last molar with a narrower internal lobe. Compared with those of *P. maynardi* and *P. minor,* the skull is smaller, with rostrum shorter, frontal region flatter and relatively broader than in either; nasals shorter, broader and more rounded posteriorly; palatal shelf narrow much as in *maynardi* (much narrower than in *minor*); auditory bullae smaller than in either; postorbital processes of frontals more developed; dentition similar but lighter.

Measurements.—Type: Total length, 667 mm.; tail vertebrae, 230; hind foot, 90. Adult femalet opotype: 665; 250; 97. *Skull:* Type and adult female topotype, respectively: Greatest length, 100, 96.7; condylobasal length, 93.7, 91.9; zygomatic breadth, 58.8, 60.8; interorbital breadth, 19.5, 19.8; least width of palatal shelf, 12.5, 12.3; maxillary tooth row (alveoli), 35.3, 35.5; upper carnassial, crown length, 6.8, 7, crown width, 7.8, 8.

Remarks.—*P. pygmaeus*, as the name suggests, is distinguished by its small size. The general flattening of the cranium, especially the flatness and breadth of the frontal region, the development of the postorbital processes of the frontals, and the slight depression of the brain case near the fronto-parietal suture, indicate relationship to the raccoon of the adjacent mainland as might be expected, rather than to any of the West Indian species. Striking differences from the mainland animal in size and in other more important characters, however, point to long isolation in its insular habitat. The teeth are remarkably small, the second upper premolar especially, being reduced in size and separated from the third upper premolar by a distinct gap.

Specimens examined.—Five, all from the type locality.

PROCYON MINOR Miller

Guadeloupe Island Raccoon

Procyon minor Miller, Biol. Soc. Washington Proc. 24: 4, Jan. 28, 1911.

Type locality.—Pointe-à-Pitre, Guadeloupe Island, Lesser Antilles.

Type.—No. $\frac{38417}{15481}$, male young (permanent canines not quite fully in place), skin and skull, United States National Museum; collected by L. Guesde. Received from the l'Herminier Museum.

Distribution.—Known only from Guadeloupe Island. Tropical Zone.

General characters.—A small, rather dark species with a slender, delicate skull, remarkably broad palatal shelf, and very light dentition. Similar to *P. maynardi*, of the Bahamas, but apparently somewhat darker in color, and cranial characters, especially the much broader palatal shelf, distinctive.

Color.—Upper parts in general grayish, becoming "ochraceous buff" on nape and shoulders, the dorsum heavily overlaid with black; sides paler and almost silvery gray, the dark-tipped hairs thinning out; top of head whitish mixed with black, with the usual grizzled effect; black mask continuous across face in one specimen, somewhat interrupted between eyes in another; sides of muzzle, lips, chin, and supraorbital lines white; ears grayish, with large, conspicuous black patches at posterior base; under parts thinly overlaid with grayish, the light brown underfur showing through; throat patch blackish; forearms, hind legs and feet grayish, similar to sides, the ankles blackish; tail with about seven black rings and a black tip, alternating with ochraceous buffy rings.

Cranial characters.—Skull similar in size and general form to that of *P. maynardi*, but brain case broader and flatter; palatal shelf much broader, the sides forming nearly straight parallel lines (sides more concave in *maynardi*); nasals broader between anterior processes of frontals; auditory bullae slightly smaller; dentition similar, but molariform teeth narrower.

Measurements.—No reliable skin measurements available. *Skull:* Type and a subadult topotype, respectively: Greatest length, 101.6 mm., 104.5; condylobasal length, 94.5, 98.5; zygomatic breath, 55.3, 62; interorbital breadth, 18.1, 19.8; least width of palatal shelf, 16.5, 15.5; maxillary tooth row (alveoli), 38.5, 37.3; upper carnassial, crown length, 7.6, 7.6, crown width, 8.1, 8.1.

Remarks.—Although widely separated geographically, *P. minor* appears to be more nearly related to *P. maynardi* than to any other known form. The elevation of the frontal region, absence or slight prominence of the postorbital processes of the frontals, and the depression of the brain case near the fronto-parietal suture are characters denoting alliance with *maynardi* and the raccoons of the Florida region. It requires no close cranial comparison with *P. gloveralleni* of Barbados, the skull of which is distinguished at a glance by the larger molariform teeth.

Specimens examined.—Two, the type, and a topotype.[46]

[46] Mus. Comp. Zool.

PROCYON GLOVERALLENI Nelson and Goldman

Barbados Raccoon

Procyon gloveralleni Nelson and Goldman, Jour. Mammal. 11 (4): 453, Nov. 11, 1930.

Type locality.—Island of Barbados, Lesser Antilles, West Indies.

Type.—No. 18591, young male, skin and skull, Museum of Comparative Zoology; collected by Sir Francis Watts, 1920.

Distribution.—Known only from the Island of Barbados. Tropical Zone.

General characters.—A small, dark species, with a short, delicately formed skull. Similar in color to *Procyon minor*, of Guadeloupe Island, Lesser Antilles, but sides of body and limbs in type specimen darker, owing to more numerous black-tipped hairs (black-tipped hairs thinning out and sides of body and limbs more grayish in *minor*); cranial characters, especially the much heavier dentition, distinctive. Contrasting with *P. maynardi*, of New Providence Island, Bahamas, in darker general color and widely different skull.

Color.—Type: Upper parts in general near "light ochraceous buff" (most intense on nape and shoulders) rather heavily overlaid with black, becoming lighter buff, less obscured by black on sides of body and limbs; top of head buffy gray, mixed with black; face with solid black mask and usual white markings; the upper surface of muzzle black to nose; sides of muzzle, lips, and chin white; under parts thinly overlaid with buffy grayish; throat patch brownish black, thinly overlapped by ochraceous buffy hairs, here reversed as usual in the group; ears buffy grayish with black patches at posterior base; ankles dusky all around; feet soiled buffy whitish; tail with four narrow black rings and a black tip alternating with light ochraceous buffy rings, the subterminal black ring and tip nearly coalescent.

Cranial characters.—Skull similar in general to that of *P. minor*, but frontal region broader and flatter; postorbital processes more prominent; palatal shelf narrower; teeth very similar in sculpture, but crown of upper carnassial tending to be longer than broad, a condition unusual in the group. Compared with that of *P. maynardi* the skull differs in about the same characters as from *minor*, except that the palatal shelf is decidedly broader.

Measurements.—Type: Hind foot (dry skin), 89 mm. *Skull*: Type: Greatest length, 94; condylobasal length, 89.2; zygomatic breadth, 53.4; interorbital breadth, 18.7; least width of palatal shelf, 13.6; maxillary tooth row (alveoli), 37; upper carnassial, crown length, 9.8, crown width, 9. Two adult topotypes, No. 267380, female, and No. 267381, sex undetermined, United States National Museum, respectively: Greatest length, 113.2, 109.8; condylobasal length, —, 105.3; zygomatic breadth, —, 69; interorbital breadth, 24.3, 24.3; least width of palatal shelf, 15, 14.4; maxillary tooth row, 40, 39.8; upper carnassial, crown length, 8.6, 8.7, crown width, 8.9, 8.6.

Remarks.—Dr. Glover M. Allen (1911, p. 221) recorded the occurrenee of raccoons in Barbados and referred to Griffith Hughes (1750, p. 66) who, writing in the middle of the 18th eentury, mentioned a law of the Island providing a bounty for their destruction. In the absence of specimens for study the animal was tentatively referred by Allen to "*Procyon* (?) *cancrivorus* G. Cuvier." Subsequent efforts by him to obtain representatives resulted in the collection, in 1920, of the young individual later made the type of a new species bearing his name.

The type specimen was so young when collected that the permanent premolars and canines, although well advanced, are not in full functional position. In the type the first premolars, both deciduous and permanent, are absent in both jaws, an abnormality observed elsewhere only in the large-toothed form *P. l. litoreus*, inhabiting Saint Simon Island, Ga. Since the original description was published two specimens, in the exhibit collection of the United States National Museum, taken by the Reverend Barnett about 1867 have attracted attention and have been dismounted. The skulls show full maturity. One specimen, No. 267380, had been marked female, and the other, No. 267381, slightly smaller, is probably of the same sex. The molariform teeth are rather large, but not so large as in the type. In the upper carnassial a tendency toward equal to or greater length than width of the crown is exhibited, a condition sometimes presented in *P. l. pumilus* of Panama. In the broad frontal region and well-developed postorbital processes the relationship of *gloveralleni* to the raecoons of Central America is also suggested, but it differs widely in other respects.

Raccoons, formerly abundant, and said to favor a rugged region on the south side of the island, have apparently been redueed to or near extermination. In response to a formal inquiry the American Consul, Frederick W. Baldwin, wrote July 13, 1932: "Very few raeeoons now exist in Barbados and specimens would be extremely diffieult to obtain."

Specimens examined.—Three, all from the type locality.

Subgenus **EUPROCYON** Gray

[References under Genus *Procyon* Storr, p. 25]

Distribution.—Southern Costa Rica, western Panama, and northern Colombia to southern Brazil.

Subgeneric characters.—Contrasted with subgenus *Procyon*: Pelage shorter, underfur absent; hair on nape directed forward; claws broader, less eompressed laterally, of lesser vertical diameter at base, and more bluntly pointed. Bony palate extending behind posterior molars a distance less than one-fourth total length of palate. Molariform

teeth, except first premolars, larger and more massive, with broader, more rounded and bluntly pointed cusps; connecting ridges between principal cusps lower, less trenchant.

Remarks.—The subgenus *Euprocyon* overlaps the range of the subgenus *Procyon* in Panama, but the two differ so conspicuously in appearance that no very close comparison is necessary.

PROCYON CANCRIVORUS (G. Cuvier)

Ursus cancrivorus G. Cuvier, Tabl. Élém. de l'Hist. Nat. des Animaux, 1798, p. 113. Type from Cayenne, French Guiana.
Procyon cancrivorus Desmarest, Dict. Hist. Nat. 29: 93, 1819.

Distribution.—(See under subgenus *Euprocyon.*)

General characters.—(See subgeneric characters under subgenus *Euprocyon.*)

Color.—General dorsal area varying from ashy gray to ochraceous, more or less heavily overlaid with black; ears, supraorbital streaks, and sides of muzzle whitish; black mask, usual in the group, extending across face to cheeks, including orbits, and the median line from forehead to nose; under parts varying from pale gray to yellowish or ochraceous; outer surfaces of forearms and thighs usually blackish; feet varying from gray to brown; tail with about seven or eight alternating black and gray or yellowish rings and a black tip.

Cranial characters.—(See subgeneric characters under subgenus *Euprocyon.*)

Remarks.—Few specimens of *Procyon cancrivorus* have been available for study, but general comparisons indicate that the species has

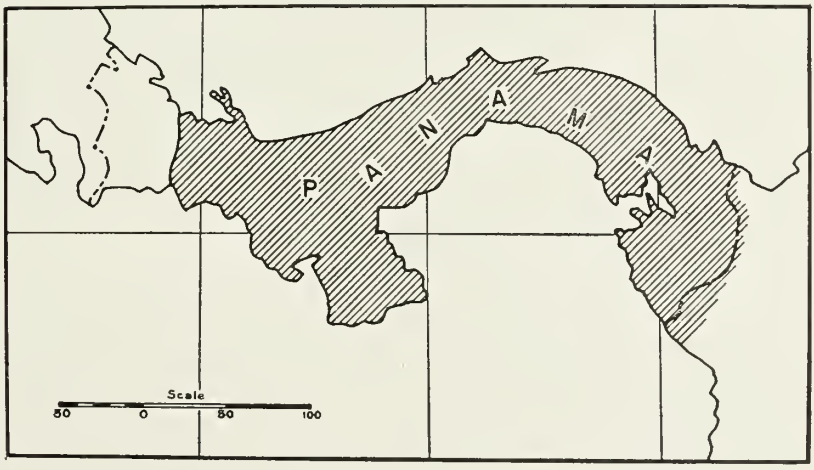

Figure 2.—Distribution of *Procyon cancrivorus panamensis* (subgenus *Euprocyon*).

a wide range in South America, somewhat paralleling the great range of *P. lotor* in North America. A single subspecies extends into the region under review.

PROCYON CANCRIVORUS PANAMENSIS (Goldman)

Panama Crab-Eating Raccoon; Mapachin

Euprocyon cancrivorus panamensis Goldman, Smithsn. Misc. Collection 60 (22): 15, Feb. 28, 1913.

Type locality.—Gatun, Canal Zone, Panama.

Type.—No. 171669, female adult, skin and skull, United States National Museum (Biological Surveys collection); collected by E. A. Goldman, June 21, 1911.

Distribution.—Southern Costa Rica, western Panama to near the Colombian boundary; doubtless reaching Colombia, but range in that country undetermined. Tropical Zone.

General characters.—A dark Panama representative of the species ranging widely in South America. Similar in size to *P. c. proteus* of northern Colombia, but general color less tawny; cranial details distinctive. Differing from *P. c. cancrivorus*, of Cayenne, in darker color and in cranial characters.

Color.—Ground color over dorsum varying from ashy gray to ochraceous buffy or yellowish ochraceous, heavily overlaid with black; top of head grizzled black and gray, the black predominating; sides of muzzle, and rather restricted supraorbital streaks, white or grayish white; facial area, including orbits, interorbital space, lower part of cheeks, and median line from forehead to nose, nearly clear black; under parts, including base of tail, varying from pale ochraceous buff to yellowish ochraceous, becoming more or less grayish white on throat, chin, and lips; ears well-clothed with whitish or yellowish hairs, darkening gradually on upper base by encroachment of body color; outer sides of hind legs and ankles all around deep glossy black; fore legs black or dark brownish all around; feet thinly clothed with short hairs varying from brownish to grayish; tail with seven or eight alternating black and grayish or yellowish rings and a black tip, the proximal rings more or less interrupted along median line below.

Cranial characters.—In general form the skull closely resembles that of *P. c. cancrivorus*, but palate more elongated, lower surface of basioccipital more convex, the lateral margins turning downward and partly covering auditory bullae; nasals broader; auditory bullae broader, more inflated posteriorly; dentition about the same. Contrasted with that of *P. c. proteus* the skull differs in longer palate, and anteriorly broader, posteriorly narrower nasals.

Measurements.—Type: Total length, 950 mm.; tail vertebrae, 350; hind foot, 142. *Skull*: Type: Greatest length, 130; condylobasal length, 125.8; zygomatic

breadth, 83.3; interorbital breadth, 25.7; least width of palatal shelf, 17.7; maxillary tooth row (alveoli), 48.3; upper carnassial, crown length, 10.2, crown width, 11.

Remarks.—Comparison of the Panama series and South American material from various localities, including a specimen from northern Brazil assumed to be near typical *P. c. cancrivorus* of Cayenne, and the type and two topotypes of *P. c. proteus*, of northern Colombia, indicates that the Panama animal is a well-marked geographic race. The close agreement in dentition and the other essential characters, however, point to probable intergradation of all forms of *cancrivorus*. *P. c. panamensis* overlaps the range of *Procyon lotor pumilus* in Panama where both occur at the same localities, but may readily be distinguished by the reversed pelage of the nape, absence of underfur, and the blackish instead of grayish forearms and thighs.

Specimens examined.—Total number, 7, as follows:

Canal Zone: Gatun (type locality), 3.
Costa Rica: Canas Gordo, 1.[47]
Panama: Boquete, 1 (skull only);[48] Cana, 1; Porto Bello, 1.

[47] Amer. Mus. Nat. Hist.
[48] British Mus. (Nat. Hist.).

APPENDIX

Descriptions of two subspecies that were not included in the Goldman manuscript are here abstracted or copied almost verbatim from the original accounts of the respective authors, but as nearly as possible in conformity of treatment with the Goldman manuscript.

PROCYON LOTOR MEGALODOUS Lowery

Mississippi Delta Raccoon

Procyon lotor megalodous Lowery, Occas. Papers Mus. Zool. Louisiana State Univ. 13: 225, November 22, 1943.

Type locality.—Marsh Island, Iberia Parish, Louisiana.

Type.—No. 2321, male adult, skin and skull, Louisiana State Univ. Mus. Zool.; collected by Ted O'Neil and prepared by George H. Lowery, Jr., October 24, 1943.

Distribution.—Coast region of southern Louisiana from St. Bernard Parish west to Cameron Parish.

General characters.—A medium-sized raccoon in which the pelage is strongly suffused above with black and pale yellow. Skull massive and with extremely large molariform teeth, by which characters it is separable from the two geographically adjacent subspecies *P. l. varius* and *P. l. fuscipes.*

Color.—Nearest to *P. l. varius,* but distinguished in its much more yellowish (less grayish) suffusion on upper parts and greater concentration of black along mid-dorsal line; ears, pale areas of face, legs, flanks and under parts decidedly yellowish, not grayish as in *P. l. varius.* Also much more yellowish (less grayish) than *P. l. fuscipes,* with black of dorsal midline more pronounced.

Cranial characters.—Skull differing from both *P. l. varius* and *P. l. fuscipes* in the larger size of the molariform teeth; also differing from that of *P. l. varius* in its more inflated frontal region, and lesser interorbital breadth.

Measurements.—Type: Total length, 804 mm.; tail vertebrae, 262; hind foot, 128. *Skull:* None available except a long table of measurements of molariform teeth (Lowery 1943, pp. 228–229).

In his discussion of *P. l. megalodous* Lowery (1943) has made the following comments:

Remarks.—This new race of raccoon, which is an abundant inhabitant of the Louisiana coastal marshes, is so clearly separable from all other races of *Procyon*

lotor that it is surprising it has not been described until now. Superficially, it resembles *varius* of northern and eastern Louisiana, Mississippi, and Alabama, but its much more yellowish pelage which is strongly suffused with black, and its massive skull and large molariform teeth clearly set it apart from that form. In coat color this new race bears no close similarity to *P. l. fuscipes* of Texas, being distinctive as outlined above. However, the two agree with respect to certain cranial characters. In both the skull is massive, the frontal "hump" distinct, and the postocular constriction evident, but the dentition of *megalodous* is so decidedly heavier that skulls of the latter are separable from *fuscipes* without much difficulty.

Three skins from Grand Terre Island are decidedly yellower than anything else examined in the present connection. The dark middorsal area is restricted to a narrow but heavily concentrated band of dark brown (no black); hence the yellowish pelage of the sides and flanks is less suffused with dark hairs than in other raccoon specimens. The pelage of these specimens lacks any vestige of gray or black, the hairs being either yellowish or brown. Although there is a definite tendency among marsh dwelling raccoons to assume a decided xanthochronistic appearance in late spring and summer, this condition is clearly associated with wear, stain, and fading. These latter factors are not at all evident in the Grand Terre Island specimens, which are in fresh fall pelage. Whether this island population merits taxonomic recognition is dependent upon how constant the above noted characters appear in additional material, which is not obtainable at present.

Specimens examined.—Total number, 20 skins and 41 skulls, as follows:

Louisiana: *Cameron Parish:* Rockefeller Refuge, 1 skin without skull; near Sabine Wildlife Refuge, 19 skulls. *Calcasieu Parish:* Lake Charles, 1 skin with skull. *Terrebonne Parish:* Timbalier Island, 1 skin with skull. *St. Bernard Parish:* Toca Village, 1 skin with skull; Belair, 9 skins and 10 skulls. *Plaquemines Parish:* Delta [National Wildlife] Refuge below Pilottown, 3 skins and 4 skulls. *Jefferson Parish:* Grand Terre Island, 3 skins with skulls and one miscellaneous skull. *Iberia Parish:* Marsh Island, skin with skull (type).

PROCYON LOTOR MARITIMUS Dozier

Coastal Marsh Raccoon

Procyon lotor maritimus Dozier, Jour. Mammal. 29 (3): 286, August 31, 1948.

Type locality.—Blackwater National Wildlife Refuge, Dorchester County, Maryland.

Type.—No. 275,290, female adult, skin and skull, U. S. Natl. Mus. (Biological Surveys collection); collected by Herbert L. Dozier, December 3, 1946.

In describing *P. l. maritimus* Dozier (1948) wrote:

Distribution.—Known only from marsh areas on the Delmarva Peninsula (Delaware, Maryland, and Virginia).

General characters.—A small to medium, pale subspecies. Readily distinguished from typical *Procyon l. lotor* by its paler coloration; longer but more sparse guard hairs; much smaller size; more slender legs and general build; narrower and more pointed head; decidedly shorter, more pointed, and less prominently banded tail; and relatively much shorter caudal vertebrae. In general color and length of the subapical band of the guard hair it is perhaps nearest to *Procyon l. mexicanus* of Arizona, New Mexico, and Mexico, but is only about half the size of the latter and its tail is decidedly shorter and less distinctly marked.

Color.—Upper portion in general pale buffy grayish, becoming light ochraceous buffy on shoulders, with rufous tinge on nape; the longer, black-tipped guard hairs over the median dorsal area are grouped on the back as unevenly colored streaks, somewhat undulating or serpentine in arrangement (in marked contrast to the darker general salt and pepper effect of typical *Procyon l. lotor*); light-colored subapical band of each guard hair extends a greater distance beyond the underfur tips than in *lotor* and results in a much paler or more yellowish cast to the outer pelage; guard hairs almost entirely white along the sides and lower parts, adding to the pale, shaggy general appearance of the animal; top of head a light grizzled mixture of gray and brownish-black; facial mask brownish-black and decidedly less prominent than in *lotor*; feet black, with gray hair dorsally, the claws dull black (description from live and freshly killed animals); tail with five rather narrow, brownish-black rings and a black tip, alternating with wider light ochraceous buffy rings, less clearly defined below.

Pelage.—An uneven spread of hair with respect to average guard hair length is apparent, that of the middorsal area being in general slightly shorter than in the rest of the pelt, due probably both to sparser distribution of hair and to variation in fiber length. The very long, coarse guard hair is typical of this race and unique among eastern races of raccoons. Due to the length and sparseness of the guard hairs, coupled with possible decreased density of the underfur, there is a slight backward slant to the direction of the hair flow. In *lotor* the hair is more dense, shorter, erect, and more fluffy in appearance than in *maritimus*.

Skull.—Of medium size, rather narrow and elongate. Compared with that of *lotor*, the skull is slightly smaller, less heavily built, distinctly narrower, and more elongate; interorbital portion more elongate, postorbital processes of frontals rather weakly developed or obsolescent, frontal area relatively narrow, flatter, markedly more sloped or depressed, and somewhat concave; palatal shelf decidedly narrower; posterior part of zygomata less arched dorsally.

Measurements.—Type: Total length, 718 mm; tail vertebrae, 210; hind foot, 111. Adult male topotype (No. 275,296, U. S. Natl. Mus.): Total length, 762; tail vertebrae, 254; hind foot, 102. *Skull:* Type: Greatest length, 112.2; condylobasal length, 107.9; zygomatic breadth, 68.8; interorbital breadth, 23.6; least width of palatal shelf, 15.1; maxillary tooth row, 41.7.

To quote Dozier further:

Remarks.—This form appears well adapted for survival under the rather exacting requirements of our eastern tidewater, coastal marsh conditions. The medium size and slender build fit it for fast traveling in the marsh; the pale coloration blends well with the vegetation of its habitat during most of the season; and the long, coarse-haired pelage can withstand a lot of abrasive action from sharp-edged sedges and coarse grasses. In *Procyon l. maritimus* the length of the pale subapical band is the greatest yet recorded, nearest that in some western races of *Procyon lotor*, namely, *excelsus, pacificus, psora,* and *mexicanus*. The guard hairs are the longest of any known race except *hirtus* of the Upper Mississippi Valley, in which the hairs average slightly longer.

Specimens examined.—Total number, 34, as follows:

Delaware: Rehoboth Bay, 1.

Maryland: Blackwater National Wildlife Refuge, 29 (6 skins only); Crocheron, 1 (skin only); Vienna, 1 (skin only).

Virginia: Saxis Island, 2 (skins only).

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PLATES

PLATE 2

A. *Procyon* [*Procyon*] *lotor lotor* (Linnaeus); male adult; Lake Drummond, Dismal Swamp, Va. (No. 75255, U. S. Natl. Mus., Biological Surveys collection.) Note long pelage, uniformly directed backward.

B. *Procyon* [*Euprocyon*] *cancrivorus panamensis* Goldman; female adult; Gatun, Canal Zone, Panama. (No. 171229, U. S. Natl. Mus., Biological Surveys collection.) Note short pelage, reversed on nape.

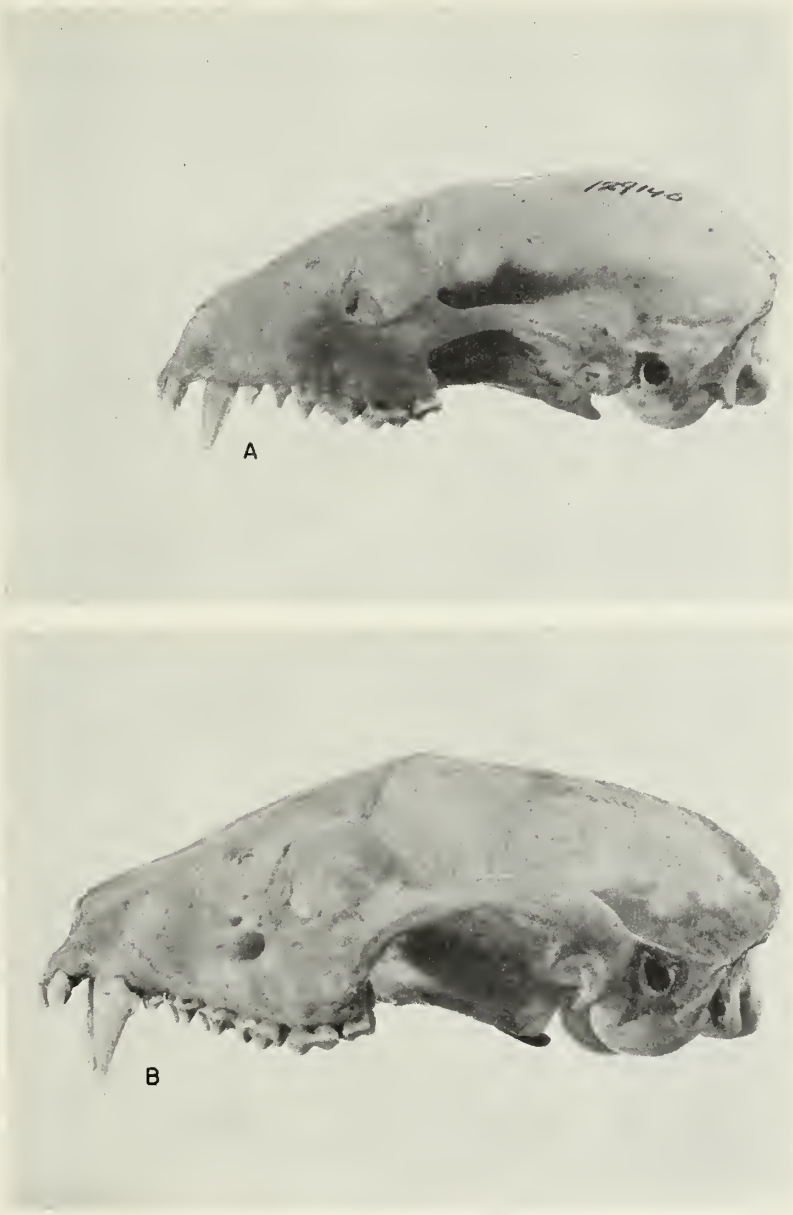
Skins of the subgenera *Procyon* and *Euprocyon*.

PLATE 3

[Two-thirds natural size]

A. *Procyon* [*Procyon*] *lotor lotor* (Linnaeus); [male] adult; Sing Sing, N. Y. (No. 129146, U. S. Natl. Mus., Biological Surveys collection.)

B. *Procyon* [*Procyon*] *lotor hirtus* Nelson and Goldman; male adult; Elk River, Minn. (No. 187926, U. S. Natl. Mus., Merriam collection.)



Skulls of *Procyon*, subgenus *Procyon*.

PLATE 4

[About three-fourths natural size]

A. *Procyon* [*Procyon*] *lotor litoreus* Nelson and Goldman; type; [male] adult; Saint Simon Island, Ga. (No. 2450, U. S. Natl. Mus.)

B. *Procyon* [*Procyon*] *lotor elucus* Bangs; male adult; Fort Kissimmee, Fla. (No. 64002, U. S. Natl. Mus., Biological Surveys collection.)

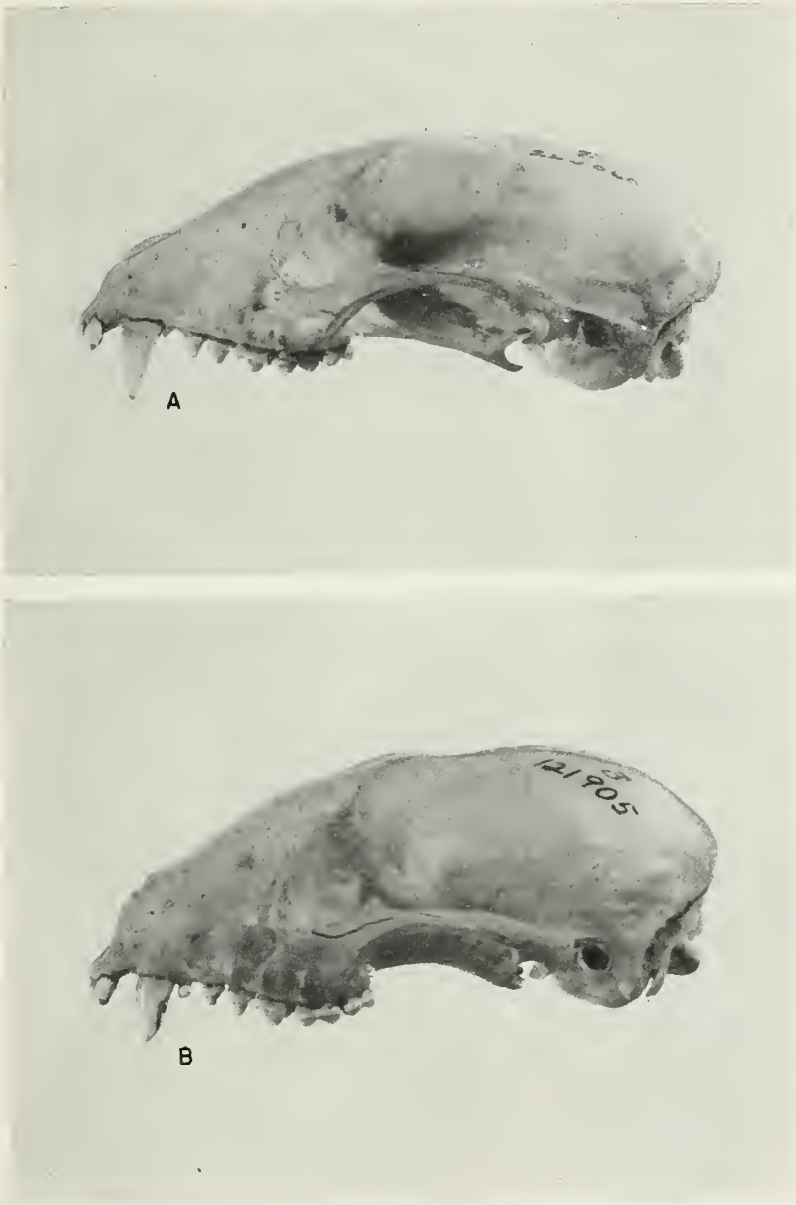
Skulls of *Procyon*, subgenus *Procyon*.

PLATE 5

[About three-fourths natural size]

A. *Procyon* [*Procyon*] *lotor incautus* Nelson; type; male adult; Torch Key, Fla. (No. 255060, U. S. Natl. Mus., Biological Surveys collection.)

B. *Procyon* [*Procyon*] *maynardi* Bangs; male adult; New Providence Island, Bahamas. (No. 121905, U. S. Natl. Mus.)



Skulls of *Procyon*, subgenus *Procyon*.

PLATE 6

[About four-fifths natural size]

A. *Procyon* [*Procyon*] *lotor excelsus* Nelson and Goldman; type; male adult; Owyhee River, Oreg., 10 miles west of Fairylawn, Idaho. (No. 236214, U. S. Natl. Mus., Biological Surveys collection.) Distinguished by very large size.

B. *Procyon* [*Procyon*] *lotor psora* Gray; male adult; Nicasio, Calif. (No. 187936, U. S. Natl. Mus., Merriam collection.)

Skulls of *Procyon*, subgenus *Procyon*.

PLATE 7

[Three-fourths natural size]

A. *Procyon* [*Procyon*] *lotor hernandezii* Wagler; male adult; Tlalpam, Valley of Mexico, Mexico. (No. 51151, U. S. Natl. Mus., Biological Surveys collection.)

B. *Procyon* [*Procyon*] *lotor pumilus* Miller; male adult; Porto Bello, Panama. (No. 171484, U. S. Natl. Mus., Biological Surveys collection.)

Skulls of *Procyon*, subgenus *Procyon*.

PLATE 8

[Five-sixths natural size]

A. *Procyon* [*Procyon*] *pygmaeus* Merriam; type; male young adult; Cozumel Island, Yucatan, Mexico. (No. 108511, U. S. Natl. Mus., Biological Surveys collection.)

B. *Procyon* [*Procyon*] *insularis insularis* Merriam; male adult; María Madre Island, Nayarit, Mexico. (No. 88978, U. S. Natl. Mus., Biological Surveys collection.) Note heavy zygomatic arch.

Skulls of *Procyon*, subgenus *Procyon*.

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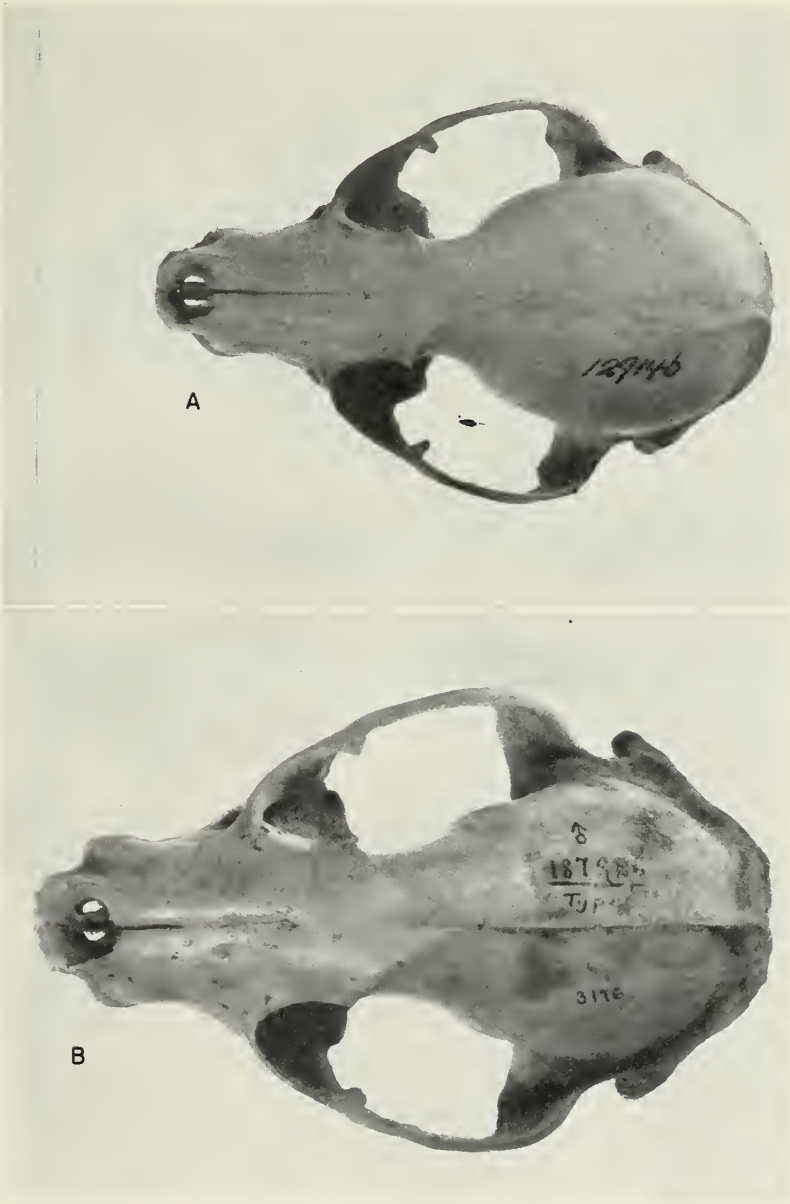
PLATE 9

[Five-sevenths natural size]

A. *Procyon* [*Procyon*] *lotor lotor* (Linnaeus); [male] adult; Sing Sing, N. Y. (No. 129146, U. S. Natl. Mus., Biological Surveys collection.)

B. *Procyon* [*Procyon*] *lotor hirtus* Nelson and Goldman; male adult; Elk River, Minn. (No. 187926, U. S. Natl. Mus., Merriam collection.)



Skulls of *Procyon*, subgenus *Procyon*.

PLATE 10

[Three-fourths natural size]

A. *Procyon* [*Procyon*] *lotor litoreus* Nelson and Goldman; type; [male] adult; Saint Simon Island, Ga. (No. 2450, U. S. Natl. Mus.)

B. *Procyon* [*Procyon*] *lotor elucus* Bangs; male adult; Fort Kissimmee, Fla. (No. 64002, U. S. Natl. Mus., Biological Surveys collection.)

Skulls of *Procyon*, subgenus *Procyon*.

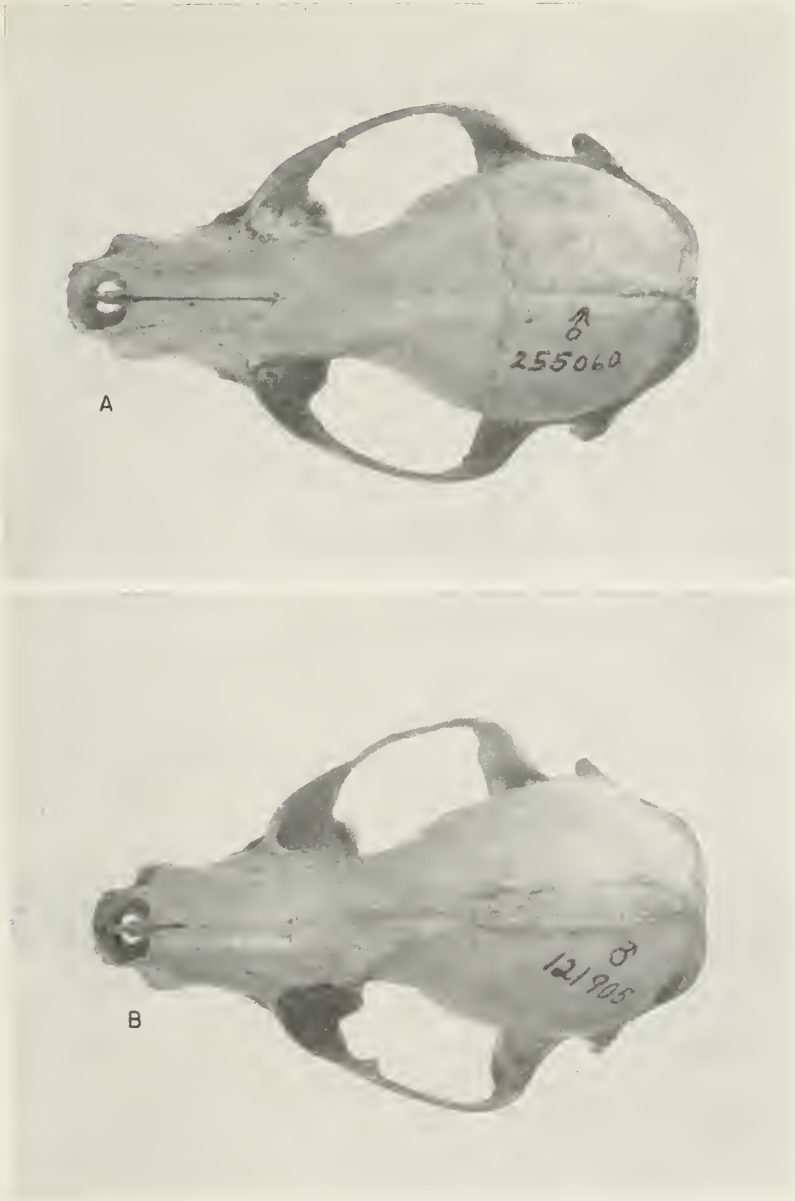
876119°—50——10

PLATE 11

[Three-fourths+ natural size]

A. *Procyon* [*Procyon*] *lotor incautus* Nelson; type; male adult; Torch Key, Fla. (No. 255060, U. S. Natl. Mus., Biological Surveys collection.)

B. *Procyon* [*Procyon*] *maynardi* Bangs; male adult; New Providence Island, Bahamas. (No. 121905, U. S. Natl. Mus.)



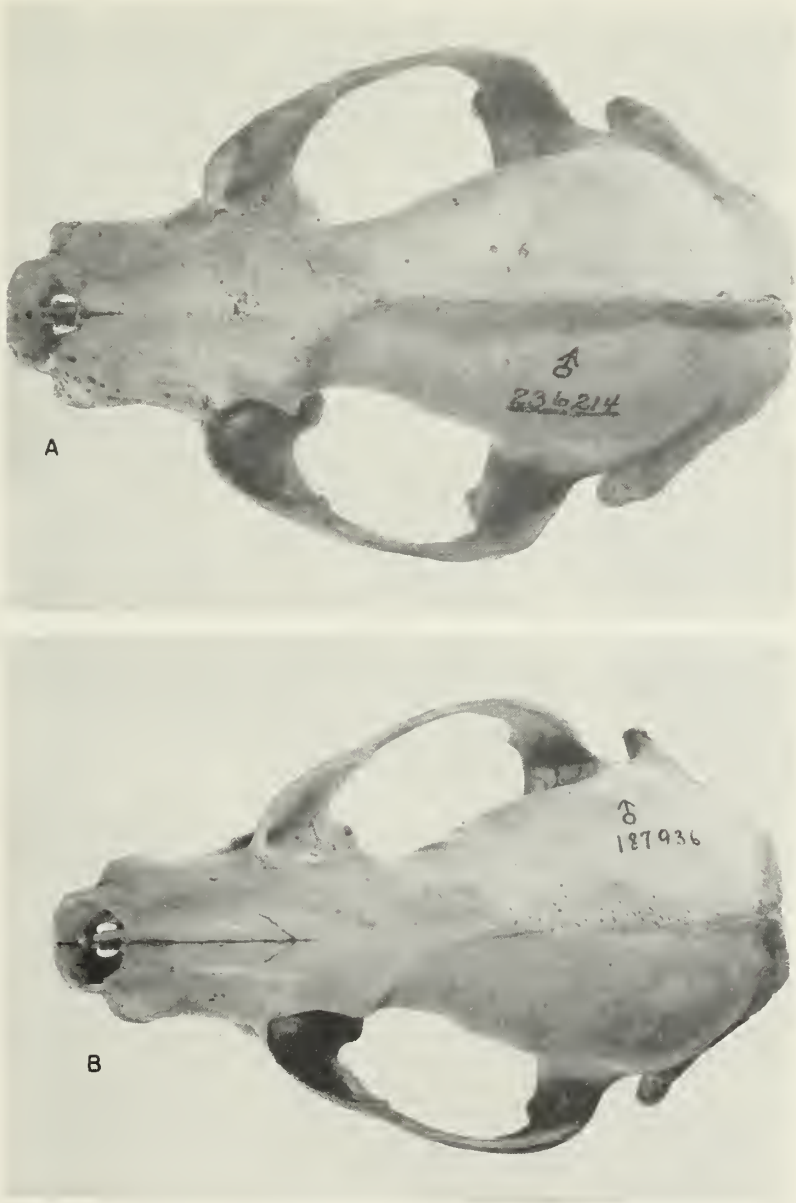
Skulls of *Procyon*, subgenus *Procyon*.

PLATE 12

[About three-fourths natural size]

A. *Procyon* [*Procyon*] *lotor excelsus* Nelson and Goldman; type; male adult; Owyhee River, Oreg., 10 miles west of Fairylawn, Idaho. (No. 236214, U. S. Natl. Mus., Biological Surveys collection.) Distinguished by very large size.

B. *Procyon* [*Procyon*] *lotor psora* Gray; male adult; Nicasio, Calif. (No. 187936, U. S. Natl. Mus., Merriam collection.)



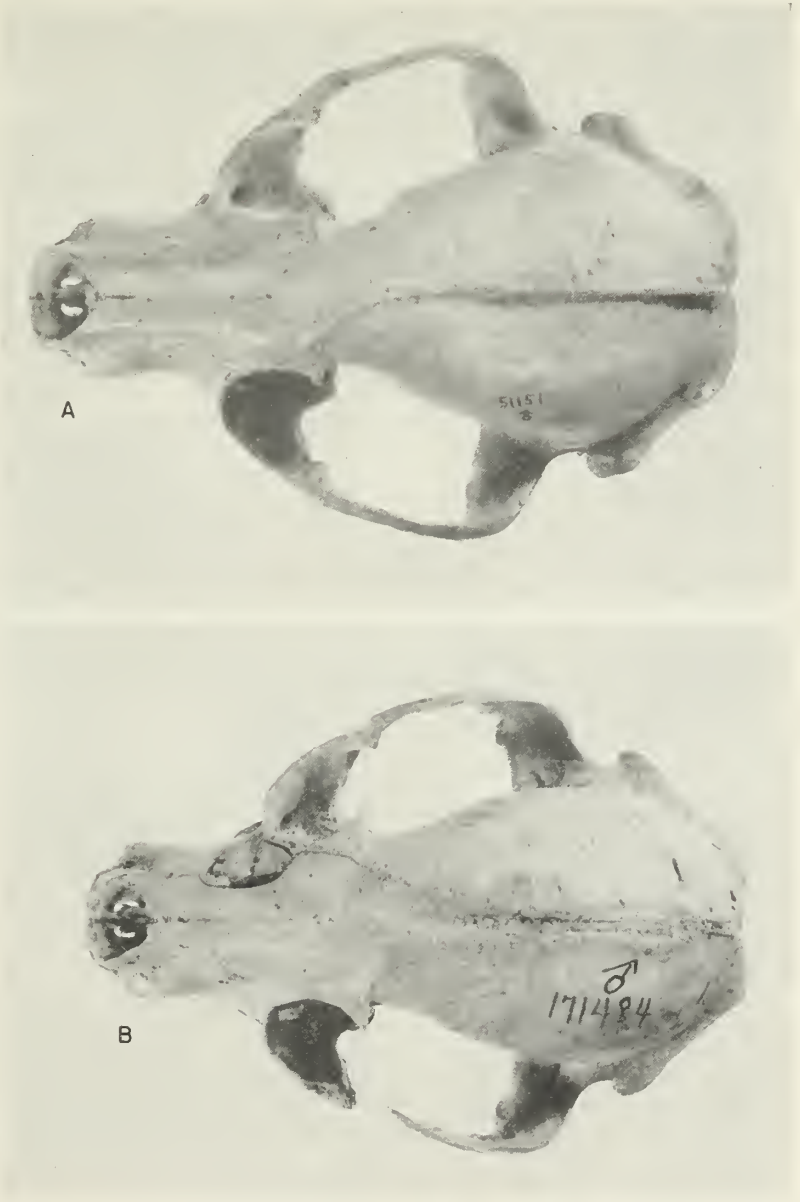
Skulls of *Procyon*, subgenus *Procyon*.

PLATE 13

[About three-fourths natural size]

A. *Procyon* [*Procyon*] *lotor hernandezii* Wagler; male adult; Tlalpam, Valley of Mexico, Mexico. (No. 51151, U. S. Natl. Mus., Biological Surveys collection.)

B. *Procyon* [*Procyon*] *lotor pumilus* Miller; male adult; Porto Bello, Panama. (No. 171484, U. S. Natl. Mus., Biological Surveys collection.)



Skulls of *Procyon*, subgenus *Procyon*.

PLATE 14

[Three-fourths natural size]

A. *Procyon* [*Procyon*] *pygmaeus* Merriam; type; male young adult; Cozumel Island, Yucatan, Mexico. (No. 108511, U. S. Natl. Mus., Biological Surveys collection.)

B. *Procyon* [*Procyon*] *insularis insularis* Merriam; male adult; María Madre Island, Nayarit, Mexico. (No. 88978, U. S. Natl. Mus., Biological Surveys collection.)

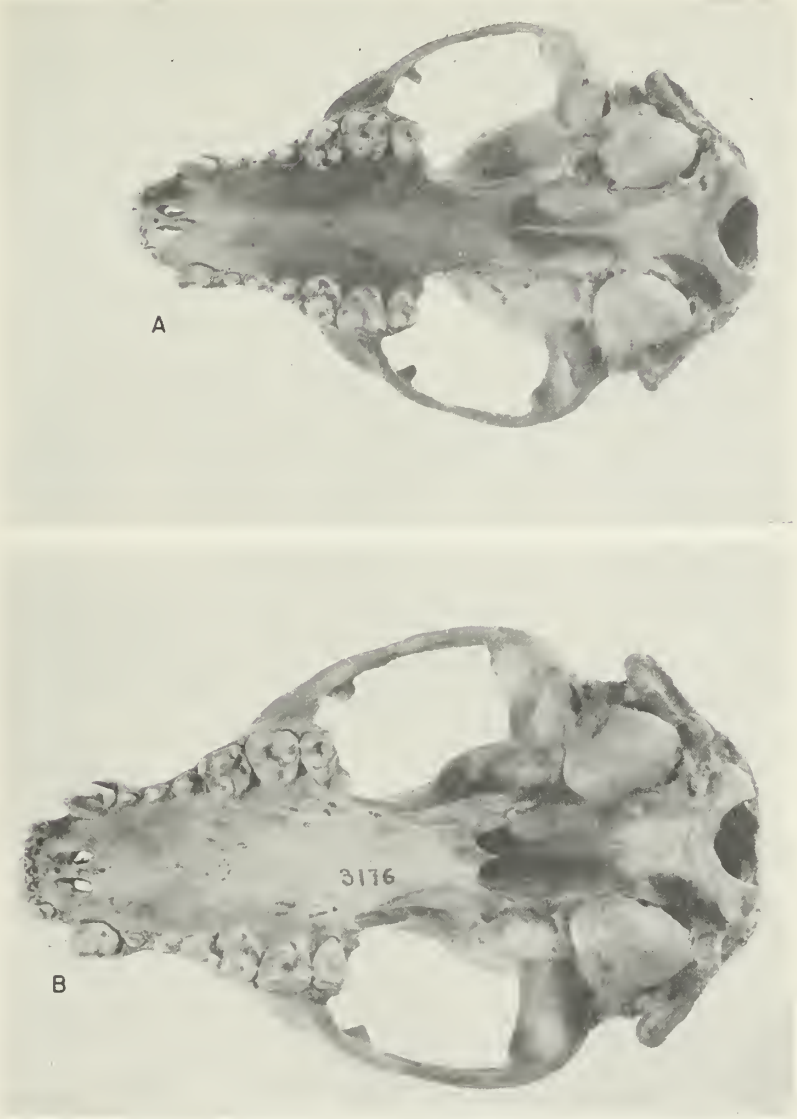
Skulls of *Procyon*, subgenus *Procyon*.

PLATE 15

[Seven-tenths natural size]

A. *Procyon* [*Procyon*] *lotor lotor* (Linnaeus); [male] adult; Sing Sing, N. Y. (No. 129146, U. S. Natl. Mus., Biological Surveys collection.)

B. *Procyon* [*Procyon*] *lotor hirtus* Nelson and Goldman; male adult; Elk River, Minn. (No. 187926, U. S. Natl. Mus., Merriam collection.)



Skulls of *Procyon*, subgenus *Procyon*.

PLATE 16

[About three-fourths natural size]

A. *Procyon* [*Procyon*] *lotor litoreus* Nelson and Goldman; type; [male] adult; Saint Simon Island, Ga. (No. 2450, U. S. Natl. Mus.) Note heavy dentition.

B. *Procyon* [*Procyon*] *lotor elucus* Bangs; male adult; Fort Kissimmee, Fla. (No. 64002, U. S. Natl. Mus., Biological Surveys collection.)

Skulls of *Procyon*, subgenus *Procyon*.

PLATE 17

[About three-fourths natural size]

A. *Procyon* [*Procyon*] *lotor incautus* Nelson; type; male adult; Torch Key, Fla. (No. 255060, U. S. Natl. Mus., Biological Surveys collection.)

B. *Procyon* [*Procyon*] *maynardi* Bangs; male adult; New Providence Island, Bahamas. (No. 121905, U. S. Natl. Mus.)

Skulls of *Procyon*, subgenus *Procyon*.

PLATE 18

[About three-fourths natural size]

A. *Procyon* [*Procyon*] *lotor excelsus* Nelson and Goldman; type; male adult; Owyhee River, Oreg., 10 miles west of Fairylawn, Idaho. (No. 236214, U. S. Natl. Mus., Biological Surveys collection.) Distinguished by very large size.

B. *Procyon* [*Procyon*] *lotor psora* Gray; male adult; Nicasio, Calif. (No. 187936, U. S. Natl. Mus., Merriam collection.)

Skulls of *Procyon*, subgenus *Procyon*.

876119°—50——11

PLATE 19

[Five-sixths natural size]

A. *Procyon* [*Procyon*] *lotor hernandezii* Wagler; male adult; Tlalpam, Valley of Mexico, Mexico. (No. 51151, U. S. Natl. Mus., Biological Surveys collection.)

B. *Procyon* [*Procyon*] *lotor pumilus* Miller; male adult; Porto Bello, Panama. (No. 171484, U. S. Natl. Mus., Biological Surveys collection.)

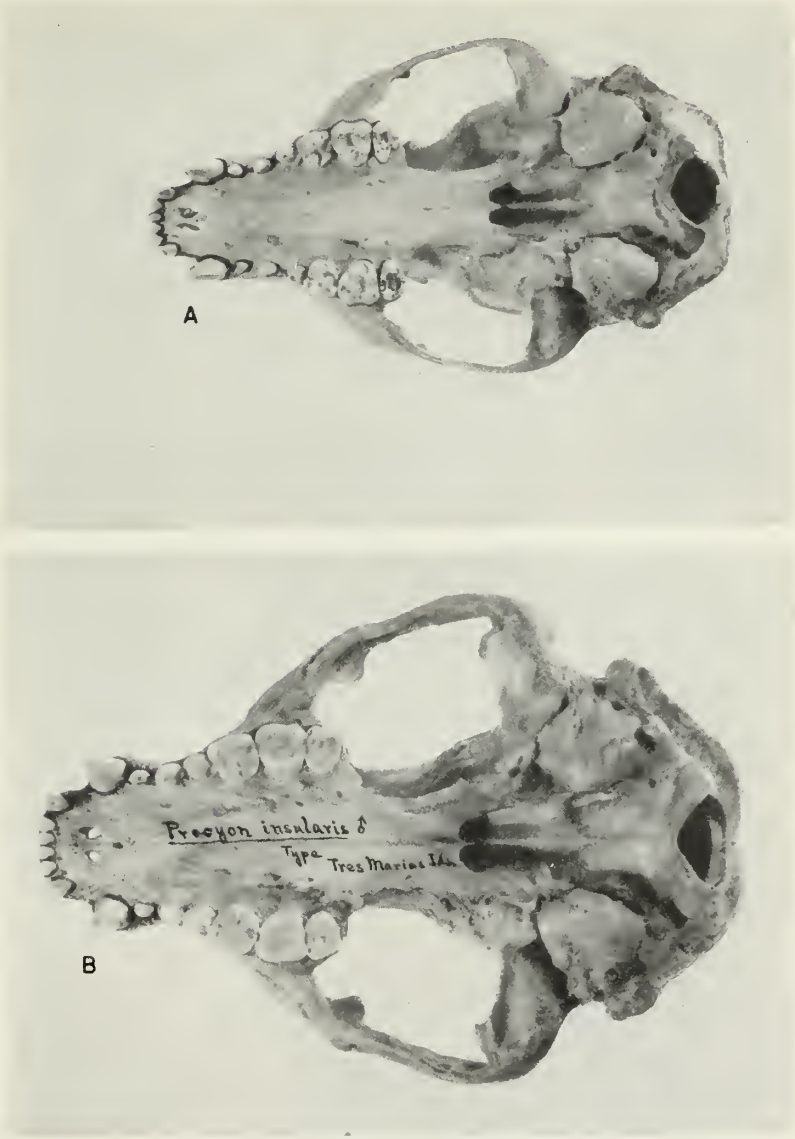
Skulls of *Procyon*, subgenus *Procyon*.

PLATE 20

[About two-thirds natural size]

A. *Procyon* [*Procyon*] *pygmaeus* Merriam; type; male young adult; Cozumel Island, Yucatan, Mexico. (No. 108511, U. S. Natl. Mus., Biological Surveys collection.)

B. *Procyon* [*Procyon*] *insularis insularis* Merriam; male adult; María Madre Island, Nayarit, Mexico. (No. 88978, U. S. Natl. Mus., Biological Surveys collection.)



Skulls of *Procyon*, subgenus *Procyon*.

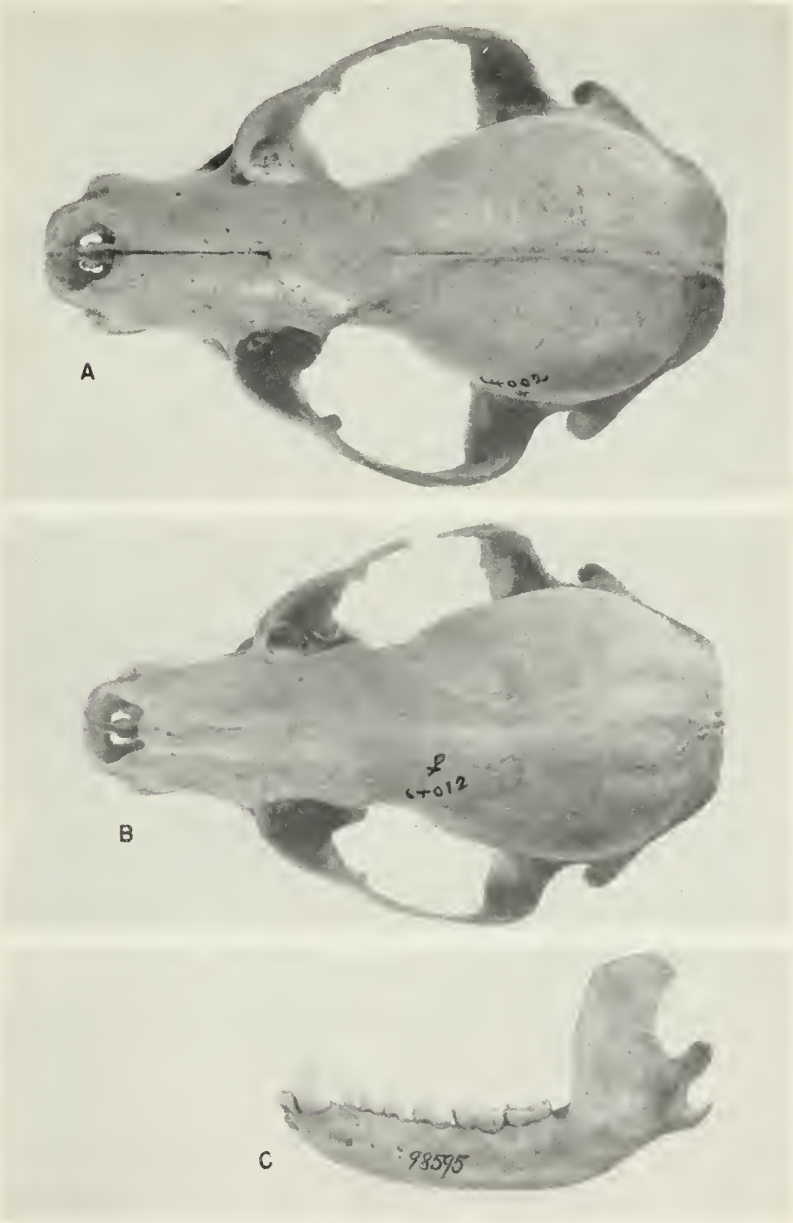
PLATE 21

[Six-sevenths natural size]

A. *Procyon* [*Procyon*] *lotor elucus* Bangs; male adult; Fort Kissimmee, Fla. (No. 64002, U. S. Natl. Mus., Biological Surveys collection.) Note larger size and greater angularity of male.

B. *Procyon* [*Procyon*] *lotor elucus* Bangs; female adult; Fort Kissimmee, Fla. (No. 64012, U. S. Natl. Mus., Biological Surveys collection.) Note smaller size and lesser angularity of female.

C. *Procyon* [*Procyon*] *lotor lotor* (Linnaeus); female adult; Schroon Lake, N. Y. (No. 98595, U. S. Natl. Mus., Biological Surveys collection.) Lateral view of typical mandibular ramus.



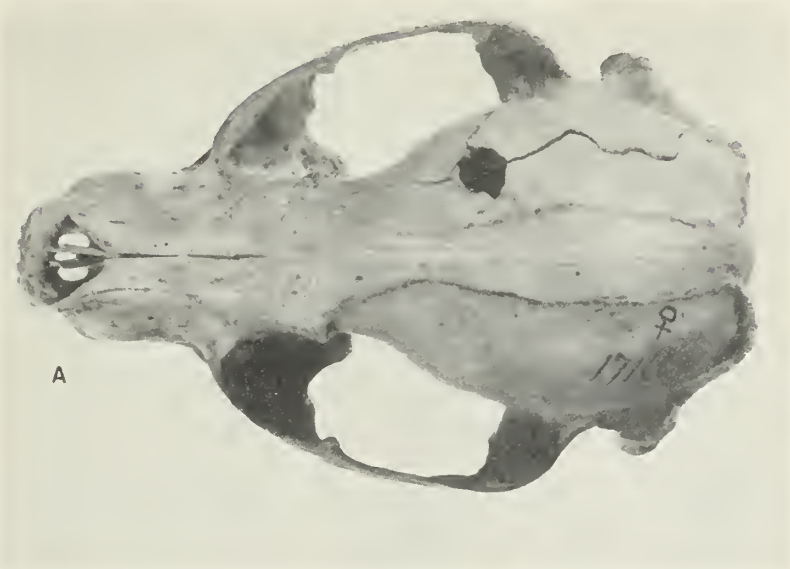
Skulls, including a mandibular ramus, of *Procyon*, subgenus *Procyon*.

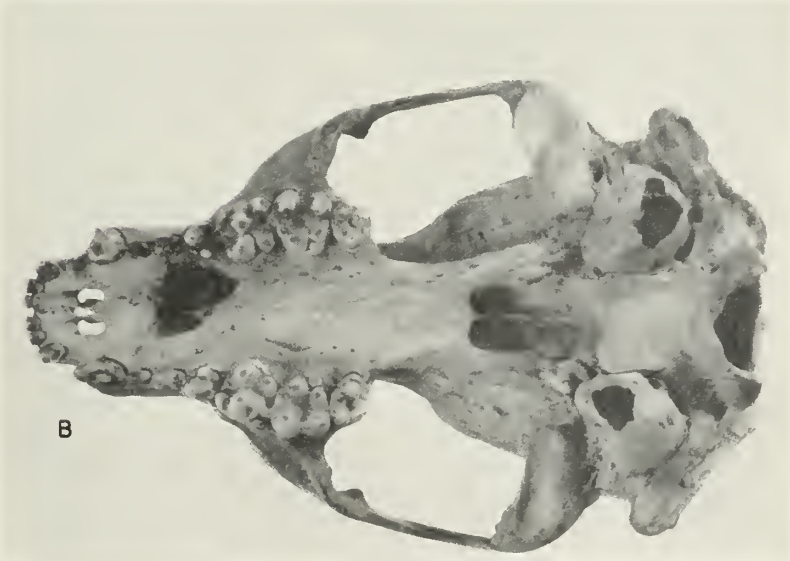
PLATE 22

[About five-sixths natural size]

A. *Procyon* [*Euprocyon*] *cancrivorus panamensis* Goldman; type; female adult; Gatun, Canal Zone, Panama. (No. 171669, U. S. Natl. Mus., Biological Surveys collection.) Upper surface of cranium.

B. *Procyon* [*Euprocyon*] *cancrivorus panamensis* Goldman; type; female adult; Gatun, Canal Zone, Panama. (No. 171669, U. S. Natl. Mus., Biological Surveys collection.) Under surface of cranium. Note molar crowns with rounded cusps adapted for crushing food; and compare with more trenchant cusps in subgenus *Procyon*.





Skulls of *Procyon*, subgenus *Euprocyon*.

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[Page numbers in **boldface** refer to principal entries; those in *italic* to synonyms.]