

ARTICLE XIX.—*Notes on the Otter (Lutra canadensis) and Skunks (Genera Spilogale and Mephitis) of Arizona.* By EDGAR A. MEARNS, Assistant Surgeon, U. S. A.

The Otters of North America, north of Mexico, vary considerably in size and in certain minor points in the skull and dentition, but their uniform color pattern admits of only a slight variation in the shade of color. The value of certain differences observed in the shape and size of the nasal pad, and the amount of hairiness of the palms and soles, is yet undetermined, from lack of sufficient material.

Through the kindness of Mr. F. W. True and Dr. J. A. Allen, I have been afforded the opportunity of comparing the skulls of three Otters obtained by me in Arizona with those of this genus (*Lutra*) in the United States National Museum and the American Museum. Besides Mexican and other foreign material, this gave for comparison 34 skulls from North America, of which 3 are from unknown localities, 15 from east of the Mississippi River, and 16 from west of it, the localities represented being as follows: Labrador (2); Lake Superior (2); New York (2); Wisconsin (1); Illinois (1); Indiana (1); Washington, D. C. (2); South Carolina (2); Georgia (2); Fort Kearney, Nebraska (1); Fort Resolution, H. B. T. (1); Indian Territory (1); Alaska (8); Oregon (2); Arizona (3).

With respect to the size of the skull, the widest extremes are represented by an aged specimen (Nat. Mus., No. 2247) from Saranac Lake, New York, and one from Alaska (Nat. Mus., No. 8687). In the former the canines are worn nearly down to the alveoli, and the grinding teeth are much worn, but the sagittal and occipital crests are but slightly developed, the whole skull being light and thin. In the latter the bony ridges, the zygomatic arch, the mandible, in short the whole skull is massive, weighing more than thrice as much as the New York specimen; but the teeth are perfect in this specimen, there being no indication of senility. These two skulls measure, respectively, 102 x 66 and 122 x 84 mm. These wide extremes are quite fully connected by intermediate sizes. Though the size variation is perhaps chiefly geographical, it is also largely individual. The series from single

localities are too small to show the amount of purely individual variation, which, however, is great, as shown by a comparison of the eight Alaskan skulls, in which an apparently aged skull (Nat. Mus., No. 21,480) having the grinding teeth worn, and the lower canines reduced to the level of the incisors, measures only 105 x 73 mm., falling short of the dimensions of the largest Alaskan specimen, above referred to, 17 mm. in length, and 11 mm. in width. This skull is exceeded by several of the largest eastern skulls, which latter, however, fall short of the average of Alaskan and western skulls generally. The measurements of six skulls from Umbagog Lake, Maine, given by Dr. J. A. Allen, in his valuable paper on the geographical variation in North American mammals,* range from 101-114 mm. in basi-cranial length by 69-76 mm. in inter-zygomatic breadth (average 109 x 74 mm.). This may be regarded as an approximate average individual variation. How much of this difference in size is due to difference of sex it is impossible to determine, since few of the above specimens are marked with the sex. In the Arizona skulls the males are larger than the single female, but the difference is slight, the female being older than either of the males. As Dr. Allen has shown, latitude exerts but little influence in the size of the eastern Otter, "skulls from Newfoundland, Maine, Lake Superior, Washington, and Georgia agreeing very closely in dimensions." The western Otter is larger than the eastern, as shown by specimens from Alaska, Oregon, and Arizona. The case is closely parallel to that of the Mink, in which a small nominal species is found in New York and northward, the species increasing in size to the westward, the largest specimens being found in Alaska; but the latitudinal variation in the size of the Mink is greater than in the Otter.

Before a good series of skins as well as skulls of our Otters has been accumulated, attempts to separate geographical races will be premature, though it is not improbable that one or more may be advantageously recognized in the ultimate refinement of mammalogical science; but, as we already have several worthless nominal species of Otters, I will not assume the risk of adding to the confusion by naming any new subspecies.

* Bull. U. S. Geol. and Geog. Surv. Terr., Vol. II, No. 4, 1876, p. 331.

The Arizona Otter bears a close resemblance to the specimen described by Baird as *L. californica*, from the Cascade Mountains, Oregon (of which there is an additional skull in the National Museum series, taken at Fort Klamath, Oregon, by Dr. J. C. Merrill, of the army), than to any others in the present series. The size and proportions of the animals are similar, and the skull (more especially the Fort Klamath specimen) shares several peculiarities with the Arizona skulls. The shape of the nasal pad appears to be the same, though that of even the smallest Arizona specimen (Am. Mus., No. 309) is somewhat larger, measuring 24 mm. in width by 19 mm. in height. From the Alaskan series of skulls (I have seen no skins) they differ in being somewhat smaller, less massive, broader, with more evenly-rounded zygomatic arches, and with the brain-case more convex or bulging in its outlines. Arizona skulls differ from all others in the slender, attenuated postorbital processes, and in the greater height of the under jaw, in its measurements from angle to condyle or to summit of coronoid process. From its geographically near neighbor, *L. felina*, of Central America, it presents many cranial and dental differences; in fact, skulls of the latter are so very distinct from those of any known specimens from North America, north of Mexico, as to be distinguishable from them at a glance. Dr. Coues was disposed to unite with this Mexican Otter the Alaskan specimens of *L. canadensis*. He observes that "the skulls of the Alaskan Otter, unfortunately, are unaccompanied by skins; but they lead me to suspect that they may be those of an animal the same as the Mexican species. This would accord with the ascribed range of the species (from Chili to Kamptschatka); but the point cannot be determined until skins are examined from this region, as the skulls alone do not furnish grounds for separation." With this last statement I cannot agree. The skulls alone proclaim them to be two wholly distinct species. The skull of *Lutra felina*, as compared with North American Otters, differs in being concave inferiorly, with the upper outline much depressed anteriorly, the muzzle much shortened, the nasal orifice much smaller and the opening more oblique, the postorbital processes more broadly triangular, the postorbital constriction much greater, the hinder portion of 'palate' nar-

rower, the brain-case broader, the zygomatic breadth greater, and the mandible and lateral dental series shortened in correspondence with the reduced muzzle. Diagnostic points in the dentition are the absence of the heel in front of the antero-internal cusp of the last upper molar, the shortness of the lateral series of teeth, and the less width across the upper incisors and greater width across the upper canines, resulting in a wider interval between the incisor and canine teeth. The above observations are based on specimens in the United States National Museum, one of which bears the initials of Dr. Coues.

An Otter skull from Raleigh, North Carolina (Am. Mus., No. 890), resembles other skulls of *L. canadensis*, except that it has an additional posterior molar in the upper jaw, which gives it the following dental formula : i. $\frac{3}{3}$ - $\frac{3}{3}$, c. $\frac{1}{1}$ - $\frac{1}{1}$, pm. $\frac{4}{3}$ - $\frac{4}{3}$, m. $\frac{2}{2}$ - $\frac{2}{2}$ - $\frac{2}{18}$ =38. This adventitious molar seems to be analogous to the last under molar. It measures 2.6 mm. across the crown, on the right side, the corresponding tooth on the opposite side having been lost, but, from the size of the alveolar socket, it appears to have been somewhat larger. With the above notable exception, I have found no peculiarities in the dentition of North American specimens which could not be matched by others from opposite geographic regions.

The following description of a specimen of the Arizona Otter was written with the freshly-killed specimen in hand :

Description (No. $\frac{3711^2}{300^2}$ (Am. Mus. Catal.), ♀ ad., Montezuma Well, Beaver Creek, Yavapai County, Arizona, December 26, 1886).—In form this animal resembles both the Seal and the Beaver. The neck and head are very suggestive of those of the Seal, while the limbs and rest of the body are not unlike those of the Beaver. The tail is flattened and cartilaginous as in the Beaver, but is coated densely with hair like other members of the family Mustelidæ. It is wedge-shaped, broad at base, flattened above and below, tapering to the point. There are patches of bristles behind the eyes, angles of mouth, and on either side of both muzzle and chin. The nasal pad is black, and considerably broader than high, being undivided by a hairy septum. The furry coat of the Otter resembles the Beaver's, having a dense coat of short fur and copious outer covering of longer stiff hairs having a fine gloss. There are no distinct markings. Color above dark brown, without reddish tinge; this color changing gradually to a light grayish brown below, being palest—almost whitish—upon the sides of the head below the level of the eyes, and upon the under side of the head and neck as far back as the fore limbs. In point of col-

oration, the extremities, including tail, exhibit no strong contrast with corresponding surfaces of the trunk, but are rather darker. The long hairs of the lighter portions of the body are pointed with yellowish gray; and upon the upper surface of the head and neck the tips of the hairs are yellowish brown, giving a paler cast to that part of the dorsum. There are some hoary areas to the upper surface in which there are some scattered white hairs intermixed with the brown. This is said by trappers to be an indication of advanced age, which its well-worn teeth further attest. The under coat is crimped, silky, and exceedingly dense; at base white, shading to grayish towards the apex. The fur is much worn upon the lower part of the neck and sides of the tail, probably from attrition with grass and driftage when swimming about. The palms and soles are hairy between the pads, much as in the northern Otter. Weight, $19\frac{7}{16}$ pounds, Avoirdupois.

Dimensions.—Measurements of No. $\frac{3713}{308}$, ♀ ad. (Am. Mus. Catal.): total length, 1300; head and body (measured from tip of nose to anus), 815; tail, measured from anus to end of vertebræ, 472, to end of hairs, 487, width at base, 115, depth at base, 55; ears, height above crown, 15, above notch, 23, width, 24; longest whiskers, 60; girth of head (measured between eyes and ears), 260; girth at middle of neck, 280, at chest, 365, at abdomen, 450, at loin, 383, at base of tail, 178; from tip of nose to front teeth, 20, to angle of mouth, 53, to eye, 44, to centre of pupil, 49, to ear, 95, to external auditory meatus, 100, to tip of ear, 125, to occiput, 155; distance between eyes, 43; fore limb from coracoid process of scapula to end of longest claw, 210, from olecranon, 170; manus, length, 87, width, 44, greatest expanse, 93, claws, 10.3, 10.5, 10, 10.2, 10.5; hind limb from head of femur to end of longest claw, 300, from knee-joint, 250; pes, length, 146, width, 52, greatest expanse, 115, claws, 10, 9.5, 11, 10.5, 13; greatest expanse of fore limbs, outstretched, 500, of hind limbs, 575. Measurements of No. 1932 (Am. Mus. Catal., entire skeleton), ♂ ad., Verde River, Arizona, January 23, 1887: total length (after skinning), 1275; fore limb from coracoid to end of longest claw, 222, from olecranon, 83; manus, 94, claws, 13.6, 14, 13.4, 13, 12.5; hind limb from head of femur to end of longest claw, 310, from knee-joint, 238; pes, 145, claws, 13, 14.5, 14.5, 13.6, 14.2.

Spilogale phenax arizonæ, subsp. nov.

(ARIZONA STRIPED SKUNK.)

Thirteen specimens of the species recently described by Dr. C. Hart Merriam as *Spilogale phenax*,* taken by the author in the vicinity of Fort Verde, Arizona, prove to be subspecifically separable from the typical form, from California, of which I have six skins and skulls before me for comparison. The Arizona Striped Skunk may be known by the following diagnosis:

* North American Fauna, No. 4, October 8, 1890, p. 13.

Type, No. $\frac{2480}{1905}$, ♂ ad., American Museum collection. From near Fort Verde, Central Arizona, March 13, 1886. Collected by Edgar A. Mearns. (Original number, 336.)

General Characters.—Smaller than *Spilogale phenax*, with tail relatively as well as actually considerably longer, with hairs about equaling the length of head and body; feet larger; fur much finer and softer; pattern of marking similar; usually without the white markings on chin, but retaining those at angle of mouth; white stripes averaging a trifle narrower, and snowy instead of creamy white; rump spots smaller, and those on the side of tail at base only confluent above in one specimen, whereas such is the rule in California specimens; black areas faded to brownish or grayish black—much as in *S. gracilis*—instead of glossy black, especially below.

Cranial Characters.—Skull smaller, and relatively broader than in *S. phenax*, with more spreading and higher zygomatic arches; postorbital constriction marked; postorbital processes but slightly developed. The largest skull, a male, measures 38 mm. in zygomatic breadth by 56 mm. in basi-cranial length.

Measurements of Type (from fresh specimen).—Total length, 445; head and body, 305; tail to end of vertebræ, 160, to end of hairs, 260, width outspread, 250; girth of chest, 140; ear above crown, 16, above notch, 28, width, 20; longest whiskers, 50; distance between eyes, 20; diameter of eye, 7; from tip of nose to incisor teeth, 11, to eye, 26, to centre of pupil, 31, to ear, 50, to external auditory meatus, 51, to tip of ear, 72, to occiput, 72, to end of outstretched hind limb, 375; fore limb from head of humerus to end of longest claw, 108, from olecranon, 78; length of manus (measured from behind pisiform bone), 40, width, 19, claws of manus, 8, 12, 10, 9, 8; hind limb from head of femur to end of longest claw, 127, from knee-joint, 87; length of pes, 50, width, 16, claws of pes, 6, 6, 6, 6.5, 6 mm.

General Remarks.—The sexual difference in size is great in this species, as indicated by the skulls, as well as by the measurements of eight fresh specimens. Four of eleven skulls are those of females, two of them being rather young adults, the remaining two quite young though with sutures closed; but the largest of them is considerably smaller than the two youngest and smallest of the seven males, in which the sutures remain open. The skull of No. 1905, of the American Museum collection, taken at Fort Verde, Arizona, October 26, 1885, a young but apparently nearly grown male, is the only one of the twenty-seven skulls of this genus examined in this connection in which the first pre-molar is wholly lacking on both sides of the upper jaw, leaving but three teeth behind the canine. The remaining teeth, including those of the mandible, are normal. In several other speci-

mens of the present subspecies, as well as in a specimen of *S. lucasana*, this tooth has disappeared on one side of the jaw, but always in oldish individuals, leaving a distinct diastema marking its former position. The tail varies considerably in length. That of the type specimen is unusually short. In two of the seven specimens measured in the flesh it exceeds the length of the head and body, equaling or falling more or less short of that in the remaining five. The tail averages 94.2 per cent. of the length of the head and body, the vertebræ alone 54.5 per cent.

All of the Skunks of this genus in the vicinity of Fort Verde are the present subspecies; while all of those taken by Mr. W. E. D. Scott, in Pinal County, Arizona, at a higher altitude, in the oak-timbered zone, were *S. gracilis*.

A skull in the American Museum collection (No. 1900), unaccompanied by the skin, taken at Flagstaff, Arizona (in the *Pinus ponderosa* belt), indicates a species perhaps different from the present or *S. gracilis*. If either of these, it must be the latter, with which it agrees in the long pterygoid fossa, narrower skull with less spreading zygomatic arches, and less measurement across upper molars and of lateral tooth-row than in *S. phenax*. It has the pterygoid fossa much longer than the combined length of crowns of upper molar and sectorial tooth, insomuch that it agrees with *S. saxatilis*; while, in the enormous and evenly rounded mastoid bullæ, with but slight trace of lateral ridges, it resembles *S. leucoparia*.

A STUDY OF THE ARIZONA SKUNKS OF THE GENUS *Mephitis*.

Dr. C. Hart Merriam has recently ventured to name a new species of this difficult genus, on the strength of one adult and two young individuals, taken by himself, at the base of San Francisco Mountain, Arizona.* He has pointed out characters serving to distinguish it very readily from *Mephitis mephitis* or *M. occidentalis*, but makes no comparison with the Texan and Mexican species, with which a much closer relationship exists, dismissing the subject by remarking that "*M. estor* may be distinguished at a glance from *M. macroura* by the shortness of its tail." That the type of *M. estor*, an old male, had an abnormally

* North American Fauna, No. 3, p. 81, September 11, 1890.

short tail, is evident from the fact that the tail measurement of the two young and much smaller female specimens obtained by Dr. Merriam equals or considerably exceeds that of the adult male. The skull of the type specimen also presents certain peculiarities that are unusual, as the narrowness across the mastoids, and great distance from the foramen magnum to the postpalatal notch, which are only paralleled by one other skull from Arizona (No. 600, Am. Mus. Coll.). This difference aside, the skull of *M. estor* presents no noticeable departure from average skulls of this genus from other portions of Arizona, except that it is slightly larger than the average. On the whole, the thirty Arizona skulls of *Mephitis* before me show little even of individual differences, the sexes, apparently, being more nearly of a size than in the northern species. The figured skull of Dr. Merriam's type of *Mephitis estor* shows the dentition of that species to be in strict agreement with that of the series of sixteen specimens from Fort Verde, Arizona, collected by the writer, and thirteen from Pinal County, Arizona, collected by Mr. W. E. D. Scott, except that the lateral rows of teeth are less divergent posteriorly, owing to the narrowness of the skull of the type specimen; but No. 600, Am. Mus. Coll., from Pinal County, has the same conformation, and, as a coincidence, as short a tail as that of the type of *M. estor*.* The average basi-cranial length of twelve of the oldest specimens from Arizona (six males and six females) is 64.6 mm. (extremes 60 and 68 mm.), this being about 4 mm. less than the type of *M. estor*.

As to the length of tail, the series of measurements taken by me from fresh specimens, at Fort Verde, Arizona, shows this to be an extremely variable member, the vertebræ alone, in adult specimens, ranging from 272 to 335 mm., the shortest tail (No. $\frac{2471}{1887}$, Am. Mus. Coll.) falling considerably below the maximum of *M. estor*, while the longest (No. $\frac{2473}{1913}$, Am. Mus. Coll.) exceeds Lichtenstein's measurement of his *M. macroura*. In the longest-tailed

*The ratio of the two measurements, from foramen magnum to hinder margin of palate, and breadth across mastoids, is by no means diagnostic of *M. estor*, as skulls from Essex County, New York (Nat. Mus. No. 3816), Santa Clara, California (Nat. Mus. No. 2031), Fort Randall, South Dakota (Nat. Mus. No. 12,011), and Kansas (Nat. Mus. No. 6557), all have the former measurement the greater, while No. 1394 (Nat. Mus. Coll.), from Matamoros, Mexico, has the two measurements equal. Therefore, the greater distance from the foramen magnum to the postpalatal notch than that across the mastoids in the type of *M. estor*, cannot be taken as a specific character.

specimen from Fort Verde, the vertebræ of the tail, measured from *os sacrum*, equal the length of the head and body. The ratio of the length of the caudal vertebræ to that of head and body, in several forms of *Mephitis*, is as follows: in nine specimens from Fort Verde, Arizona, 87.9 per cent.; in Dr. Merriam's three specimens of *M. estor*, approximately,* 84.9 per cent.; in Lichtenstein's *M. macroura*, 92.7 per cent.; in Baird's Texan specimens, referred by him to *M. varians*, 98.5 per cent. It thus appears that the *Mephitis* of Arizona has a tail *averaging* less than that of the Skunks of Texas and the adjacent portions of Mexico, which, taken with its smaller size, slightly weaker dentition, and lighter ossification may serve to separate it from them, though it may be difficult to dispose of individual specimens, from intermediate localities.

For the present I would refer all Arizona specimens to *M. estor*, a form distinguishable from *M. macroura* or *M. varians* by its somewhat smaller size, shorter tail, and weaker dentition, especially as to the upper true molar. In view of the extreme variation in color exhibited by Arizona specimens, the pattern of the white markings cannot be allowed much prominence in the definition of the species. That described by Dr. Merriam is as common as any. In all there is a white frontal stripe, though in No. 1346, of the American Museum collection, this is reduced to a mere trace; and the terminal pencil of differentiated white hairs also appears to be constant, even in specimens with black tails. As to the white dorsal markings, the various forms of pattern described by most authors are all more or less applicable here, from those in which the whole back and upper surface of tail are white, as in *Conepatus*, to the example above mentioned (Am. Mus. No. 1346), in which, in addition to the trace of a frontal stripe, there is only a very narrow white stripe from shoulder to thigh, low down on the sides. In this specimen the tail is black, with the hairs white at base, and the usual terminal tuft of peculiar white hairs. The most marked peculiarity that I have noted in this species is the enormous development of its ears, which at first led to the suspicion that the Fort Verde specimens might prove to be a distinct form, peculiar to the Sonoran faunal

* Assuming that the head and body equal the total length minus the tail.

region. These specimens are distinguished from those of higher regions in Arizona by the scantiness of the coat, the less hairy soles, and longer claws, all of which are readily accounted for by the difference in climate and soil, those living in rocky places, in the mountains, usually having shorter claws than those from the soft soil of the valleys. The greater length of the claws gives an increase in the measurements of the manus and pes over those collected by Mr. Scott and Dr. Merriam, from more elevated localities. Dr. Merriam describes *M. estor* as having "small" ears, measuring but 8 mm. in height above the crown, in skins, whereas the measurements of adults taken by myself at Fort Verde, from fresh specimens, average just twice that. Mr. Scott's specimens measure about 11 mm., in dry skins, thus appearing to be intermediate in this respect. The large Skunk of the Upper Mississippi region has ears that measure about 12 mm., in fresh specimens.

The Texan and Mexican skulls, of which there are six adults,* present two quite different sets of sizes (extremes 65 and 74 mm. in basi-cranial length), three of each. This difference of size is probably sexual, both coming from one locality, as those from Matamoras, Mexico. The six skulls agree among themselves, and differ from Arizona skulls, in having the posterior upper molar very large, as shown in Baird's figure of *M. varians* (Pl. lx, fig. 2), the dentition as a whole being rather stronger than in the Arizona Skunk. After taking a careful series of measurements of these six skulls from Texas and Mexico, and of twice that number (sexes equally represented), selected from the Arizona series of thirty, and reducing the average of the various dimensions to percentages of the basilar length of Hensel, we are prepared to make a somewhat satisfactory comparison of the two forms. In *M. estor*, the zygomatic arches are more expanded, while the breadth across the mastoids is decreased. The breadth across the postorbital processes is greater, the interorbital region being relatively more constricted. The cranium is higher posteriorly, the pterygoid fossa longer, and the mandible considerably higher at the coronoid and condyloid processes. The length of

* Kindly loaned me, with many others of the genus *Mephitis*, by the authorities of the U. S. National Museum, at Washington, to whom I take pleasure in acknowledging this further obligation.

the lower molar series is less, the measurement from last molar to extremity of condyle being proportionately greater. The ratios of the other measurements taken are almost identical with those of Mexican or Texas skulls.