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PORTIONS OF THE PRESENT PAPER WERE SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN ZOOLOGY IN THE GRADUATE COLLEGE OF THE UNIVERSITY OF ILLINOIS

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INTRODUCTION

THE GENUS *Spilogale*, one of the three genera comprising the subfamily Mephitinae, was last studied taxonomically by Howell in 1906. Howell considered most of the different kinds of spotted skunks to be species, but later workers have tended to regard many of these allopatric forms as subspecies, and in the last decade some workers have implied that all spotted skunks, upon study, would prove to be a single species, for which the earliest name is *Spilogale putorius*, and have proceeded to use name combinations that indicated this. The present study was undertaken to determine the relationships between the various named forms of *Spilogale* in light of present systematics. Studies of the distribution, variation, and prehistory of spotted skunks, which are included in the present study, and of the life history, which was summarized (Van Gelder, MS), have all been taken into account in my reaching the conclusions here presented.

The results of this study indicate that all living spotted skunks are referable to a monotypic species, *Spilogale pygmaea*, and a polytypic species, *S. putorius*. The former is a small-sized species of small geographic range; the latter is a large-sized species of wide distribution. The differences between the two species and between the subspecies of *Spilogale putorius* are largely those of size and color pattern.

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Specimens in the collections of the following institutions and persons have been examined. The abbreviations are those used in the text to indicate these collections.

A.H.F., Allan Hancock Foundation
A.M.N.H., the American Museum of Natural History
A.P.I., Alabama Polytechnic Institute
B.M., British Museum (Natural History)
B.Y.U., Brigham Young University
Cal.A.S., California Academy of Sciences
C.C.W.R.U., Colorado Cooperative Wildlife Research Unit
Chi.A.S., Chicago Academy of Science
Cleve., Cleveland Museum of Natural History

C.M., Carnegie Museum
C.N.H.M., Chicago Natural History Museum
Colo.M.N.H., Colorado Museum of Natural History
Corn.U., Cornell University
C.R.C.M., Charles R. Connor Museum
D.R.D., Donald R. Dickey Collection
E.H.C., Edmund Hibbard Collection
E.R.W.C., Edward R. Warren Collection
E.U., Emory University
G.C.N.P.M., Grand Canyon National Park Museum
I.S.C., Iowa State College
K.U.M.N.H., Museum of Natural History, University of Kansas
K.U.M.V.P., Museum of Vertebrate Palaeontology, University of Kansas
L.A.C.M., Los Angeles County Museum
L.S.U., Louisiana State University
M.C.Z., Museum of Comparative Zoölogy
M.G.F.C., Mississippi Game and Fish Commission
M.H.C., Milton Hildebrand Collection
M.M.N.H., Minnesota Museum of Natural History
M.N.A., Museum of Northern Arizona
M.V.Z., Museum of Vertebrate Zoology, University of California
N.C.S.C., North Carolina State College
O.A.M., Museum of Zoology, Oklahoma A. and M. College
P.G.P., Paul G. Pearson Collection
R.D.I., Robert DeWitt Ivey Collection
S.D.S.N.H., San Diego Society of Natural History
S.M.U.W., State Museum, University of Washington
T.A.M., Texas Cooperative Research Collection
T.N.H.C., Texas Natural History Collection, University of Texas
U.C.C.A., University of California College of Agriculture
U.Colo., University of Colorado Museum
U.F., University of Florida
U.G., University of Georgia
U.I.M.N.H., Museum of Natural History, University of Illinois
U.M.M.Z., Museum of Zoology, University of Michigan
U.Mo.M.Z., Museum of Zoology, University of Missouri
U.S.C., University of Southern California
U.S.D., University of South Dakota
U.S.N.M., United States Biological Survey Collection
U.S.N.M., United States National Museum
U.U., Museum of Vertebrate Zoology, University of Utah
U.Wyo., University of Wyoming
W.K.C., William K. Clark Collection
W.L.C., William L. Cutter Collection

Materials and Methods

This study is based on the examination of 1974 specimens of *Spilogale*, most of which are conventional study specimens consisting of a stuffed skin and a cleaned skull. A large portion of the material examined, however, consisted of skins without accompanying skulls or of skulls without skins. In addition, postcranial skeletons were examined where available. Some specimens were borrowed for detailed study, but most of the specimens were examined at the museums to which they belong.

The external measurements (total length, length of tail, length of hind foot), the locality and date of capture, and the sex of each specimen were recorded from the label as given by the collector. Each specimen was placed in an age group based on the fusion of the cranial sutures and the amount of wear of the teeth (see p. 242), and the following measurements of the cranium were taken to the nearest 0.1 mm. with dial calipers (names in parentheses indicate the designation of this measurement used in the text and tables):

Basilar Length of Hensel (Basilar): The least distance from the anteriormost border of the foramen magnum to the plane of the posterior margins of the alveoli of the first upper incisors. A to A_1 on figure 1.

Condylobasal Length (Condylobasal): The least distance from the plane of the posteriormost parts of the occipital condyles to the anteriormost portions of the premaxillae. B to B_1 on figure 1.

Occipitonasal Length (Occipitonasal): The least distance from the posteriormost part of the squamous portion of the occipital to the anterior border of the nasal bones. C to C_1 on figure 1.

Zygomatic Breadth (Zygomatic): The greatest distance across the zygomatic arches measured perpendicular to the long axis of the cranium. D to D_1 on figure 1.

Mastoid Breadth (Mastoid): The greatest distance across the mastoid bones perpendicular to the long axis of the cranium. G to G_1 on figure 1.

Interorbital Breadth (Interorbital): The least distance across the frontal bones anterior to the postorbital processes. E to E_1 on figure 1.

Postorbital Breadth (Postorbital): The least distance across the frontal bones posterior

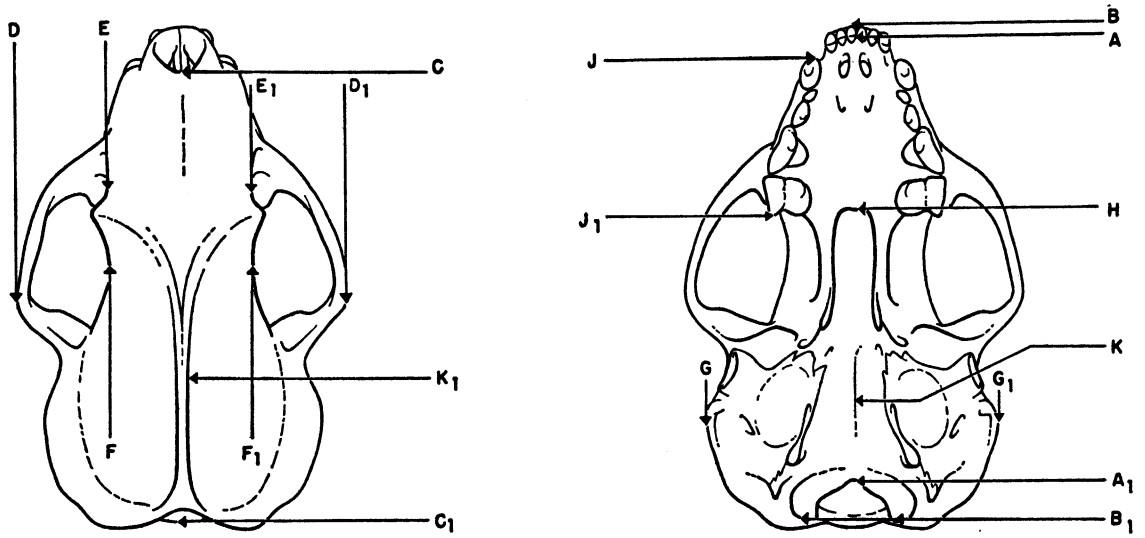

FIG. 1. Dorsal and ventral views of the skull of *Spilogale*, showing the points between which cranial measurements were taken. For details, see page 236.

to the postorbital processes. F to F_1 on figure 1.

PALATILAR LENGTH (PALATILAR): The least distance from the indentation at the posterior of the palatine bones to the plane of the alveoli of the first upper incisors. H to A on figure 1.

POSTPALATAL LENGTH (POSTPALATAL): The least distance from the indentation at the posterior of the palatine bones to the anteriormost border of the foramen magnum. H to A_1 on figure 1.

HEIGHT OF CRANIUM (CRANIUM HEIGHT): The least distance perpendicular to the long axis of the skull between the junction of the basisphenoid and basioccipital bones and the dorsal surface of the parietal bones, exclusive of the sagittal crest. K to K_1 on figure 1.

LENGTH OF MAXILLARY TOOTH ROW (TOOTH ROW): The least distance from the anterior surface of the canine to the posteriormost projection of the molar, in the plane of the tooth row. J to J_1 on figure 1.

For study of color pattern, each skin was photographed in dorsal and lateral aspect. All photographs were taken on black and white film, mostly in 35-mm. size. For the names applied to the black and white areas of the skin, see page 243 and figure 3.

Animals were grouped for study according to sex, age, and locality, comparisons being made only between groups of similar age and sex, except in the study of color pattern. Specimens were studied without regard to previously assigned names, either in the literature or on the specimen labels.

Three of the largest populations from restricted localities were studied in detail to determine the variability in cranial characters, and greatest taxonomic weight generally was given to differences between populations in characters that show the least amount of variation within a population.

After some experimentation, a level of 84 per cent separability between populations (84% of one population is separable from 84% of the other) was chosen as a primary criterion for subspecific distinction. A lower level, 75 per cent of mutual separability, for example, could be found between almost any two groups of animals from different localities, and a higher level, 90 per cent, seemed too stringent and would scarcely separate any of the populations. The 84 per cent level (convenient statistically because this is the point where the mean plus one standard deviation of a small-sized population reaches the level of the mean minus one standard deviation of a large-sized population) was useful in making initial determinations of subspecies, but was not the sole criterion used. In studying spotted skunks from Mexico and Central America it was necessary to rely on more subjective differences in

the determining of the subspecies because of the paucity of specimens. Although almost 2000 specimens were examined, 94 per cent of the material represents half of the named forms, while the remaining 6 per cent was of the eight kinds of spotted skunks the ranges of which do not reach the United States. Very few large samples were available for study. Once the specimens from a single locality were segregated by age and sex, the samples became frustratingly small. Statistical computations were not undertaken on samples of fewer than six specimens. A single population was considered to be the animals from the same locality or from within 8 miles of one another (on the assumption that the range of the spotted skunk is 4 miles), provided no ecological barriers between the two were apparent. Other individuals were compared with populations and with one another to determine whether or not the differences were sufficient to warrant subspecific separability; if few specimens were available and/or the habitat was relatively uniform, individuals and small populations were sometimes computed statistically as a single sample. This was never done without careful prior comparison. The coefficient of variation was frequently used as a check (in comparison with the few large samples) on the validity of the smaller samples. The abbreviations *M.*, *S.E.*, *S.D.*, and *V.* in the tables stand for mean, standard error of mean, standard deviation, and coefficient of variation, respectively. The formulas used in calculation are from Simpson and Roe (1939).

When the specimens had been grouped into distinguishable elements, the earliest name applicable to that group, under the International Rules of Zoological Nomenclature, was applied.

The arrangement of the accounts of the subspecies which follow is first to list the synonymy of each, followed by the distribution and areas of intergradation with other subspecies. Next are listed the average and extreme external measurements in millimeters (total length, length of tail, length of hind foot) of all adult and young adult males and then of females of that subspecies, followed by the averages and extremes of some cranial measurements of these same groups. Animals that are believed to be intermediate between two subspecies are excluded from these averages. Next the weights in grams, average and extreme, of adult and young adult males and females are given, followed by a concise description of the color pattern of that subspecies, with indications of the variation that exists. These form a brief description of the subspecies.

After the description of each subspecies, taxonomic history, comparisons with other subspecies, intergradation, variation, distribution, and possible evolution are discussed where pertinent or known. At the end of each discussion section, the sex ratio of the specimens examined and the frequency of lesions of the skull caused by parasites are mentioned, and probable breeding season, based on aged specimens, is discussed. A list of the localities of collection and the institution where each specimen is located is presented, as well as tables of measurements, either of individuals or of groups. All tables, unless the contrary is specifically indicated, are of adults and young adults combined. In subspecies that seem to behave in clinal or highly variable fashion, measurements of each specimen are presented. Parentheses around the symbol for sex indicate that the sex was determined by me from a specimen for which the sex was not recorded by the collector. For the more static subspecies or those in which several statistically calculable samples were available, only the statistical tables are presented.

Specimens that are intergrades between two subspecies are listed under specimens examined of the subspecies under which they are discussed, and in some cases also appear in tables of measurements under those subspecies.

VARIATION

SPOTTED SKUNKS VARY IN SIZE according to age, sex, and geographic location, and, within any one of these divisions, animals vary individually. In color pattern there is no age or sexual variation, but animals vary geographically and individually. The following accounts deal with age, sex, color pattern, and individual variation; geographic variation is evident from the accounts of the subspecies and is also mentioned under Evolutionary Trends (p. 384).

INDIVIDUAL VARIATION

The most highly variable character of adult spotted skunks is the length of the tail. In general, external features are more variable than cranial characters. This high variability may be, in part, a reflection of variation in technique and accuracy of measurements taken by different collectors, for these data were recorded directly from the specimen labels; but variability in external measurements may also be greater than that in cranial measurements because the external features of spotted skunks are more responsive to environmental differences.

For the study of individual variation, adults of four populations from three localities were chosen: Santa Rosa Island, Santa Barbara County, California; Huachuca Mountains, Cochise County, Arizona; and Micco, Brevard County, Florida (table 1). Only one of the samples is of females, for there were few large samples of adult females from a single locality. However, this one group of females, from Micco, Florida, was checked against the statistics computed for females from several localities (e.g., all of Kansas, or western Oregon) for comparison, but only the data for females from the single locality are presented in table 1.

The five least variable characters in each of these populations are palatilar length, condylobasal length, height of cranium, length of tooth row, and occipitonasal length. The most variable characters are length of tail, length of head and body, length of hind foot, and total length. In general, the least variable cranial measurements are those that are taken along the sagittal plane of the skull, and, with the exception of height of cranium, all are taken anteroposteriorly.

TABLE 1

INDIVIDUAL VARIATION WITHIN A POPULATION: COEFFICIENT OF VARIATION AND STANDARD ERROR OF VARIATION FOR EXTERNAL AND CRANIAL MEASUREMENTS OF SEVERAL POPULATIONS OF *Spilogale putorius*

Measurement	Santa Rosa Island, California (23 Males) *V.* *S.E.*	Huachuca Mountains, Arizona (21 Males) *V.* *S.E.*	Micco, Florida (38 Males) *V.* *S.E.*	Micco, Florida (14 Females) *V.* *S.E.*
Tail	13.37±1.97	9.54±1.55	11.62±1.45	11.42±2.16
Head and body	7.06±1.04	6.68±1.08	5.96±0.76	5.80±1.14
Hind foot	6.83±1.01	7.56±1.23	5.01±0.63	3.45±0.65
Total length	4.72±0.70	5.65±0.92	5.58±0.69	5.06±0.99
Interorbital	5.26±0.83	5.69±0.88	4.19±0.49	3.04±0.58
Postorbital	4.58±0.73	5.01±0.77	4.64±0.55	4.39±0.86
Postpalatal	3.66±0.58	5.16±0.82	4.48±0.51	2.53±0.50
Mastoid	3.34±0.52	5.21±0.80	3.81±0.44	2.40±0.45
Zygomatic	3.33±0.51	3.98±0.63	3.82±0.44	2.27±0.45
Basilar	3.21±0.51	3.98±0.63	3.89±0.45	2.73±0.52
Palatilar	3.83±0.58	3.27±0.51	3.89±0.45	3.55±0.67
Condylobasal	2.68±0.42	3.75±0.59	3.73±0.43	2.61±0.49
Occipitonasal	2.57±0.41	3.96±0.63	3.10±0.36	2.84±0.54
Tooth row	2.64±0.40	3.50±0.54	3.01±0.35	2.07±0.38
Cranium height	3.28±0.51	2.72±0.42	2.95±0.34	3.88±0.73

Measurements of the width of the skull are generally the most variable. Zygomatic and mastoid breadth seem to be less variable than interorbital and postorbital breadth, but these are characters that may vary more with age than do the anteroposterior measurements. The high variability of postorbital breadth is undoubtedly due, in part, to the inflation of the sinuses in this area caused by parasitism, which decreases the accuracy and generally obscures this measurement.

Between males of these populations there are no significant differences in the coefficients of variation of any given measurement. Between most cranial measurements of a single population there are no significant differences except between the extremes. The coefficient of variation of the tail is frequently significantly different from the next largest external measurement and always significantly different from the least variable external measurement. Females, in general, seem less variable than males.

In the process of drawing conclusions concerning the taxonomy of spotted skunks, the greatest consideration has been given to cranial characters, as opposed to external ones, because of the lesser variability of the former, the assumption being that differences between populations in the least variable characters are more likely to be fixed differences than extremes of variation.

Secondary Sexual Variation

Differences not attributable to individual or age variation are evident when spotted skunks of different sexes are compared. In general, the males of *Spilogale* are about 8 per cent larger than females in external measurements and about 7 per cent larger in cranial measurements. The greatest disparities in external measurements are in length of head and body and length of hind foot, which average 10 per cent in the subspecies of *Spilogale putorius*. The least difference is in length of tail (7%).

In cranial measurements the greatest differences between males and females are in zygomatic, mastoid, and postpalatal measurements, being approximately 9 per cent in each; the least differences are in height of cranium and postorbital breadth (5%). Table 2 shows the average and extreme percentages of secondary sexual differences of all subspecies of *S. putorius*, and figure 2 shows the differences between males and females of a single population.

TABLE 2

Average Per Cent of Size of Males Attained by Females of *Spilogale putorius*

(*Spilogale putorius celeris*, *elata*, and *yucatanensis* are excluded from the averages of external measurements.)

Measurement	Average	Range
Total length	91.2	86.1– 94.7
Tail	93.3	78.3–104.0
Hind foot	90.4	85.5– 93.9
Head and body	90.4	85.6– 95.6
Basilar	91.9	89.4– 95.1
Condylobasal	92.3	90.2– 95.2
Occipitonasal	93.4	90.8– 95.8
Zygomatic	90.8	84.9– 94.7
Mastoid	91.2	86.8– 98.8
Interorbital	92.7	83.4– 96.8
Postorbital	94.8	83.0–103.6
Palatilar	92.9	90.8– 97.1
Postpalatal	90.9	88.0– 94.7
Cranium height	95.3	90.9–100.6
Tooth row	94.0	91.2– 97.0

The skulls of male spotted skunks are more robust, have more widely spread zygomatic arches, and show greater development of the sagittal and lambdoidal crests. The canine teeth appear to be thicker and longer, and the postorbital processes are better developed. Although no skulls have been weighed, the skulls of males are probably heavier than those of females of equal size, for generally the males seem to have thicker, rougher bones in the cranium than do females.

There do not seem to be any recognizable differences between the sexes in color pattern.

Approximately 60 per cent of the specimens in collections are males. In subspecies of which more than 20 specimens have been examined, the percentage of males varies from 47 (*latifrons*) to 78 (*amphiala*). Except for *latifrons*, more males of every subspecies are represented than females. Whether or not this disparity in sex ratio as indicated by specimens in collections is genetic is not known. If the ratio at birth is

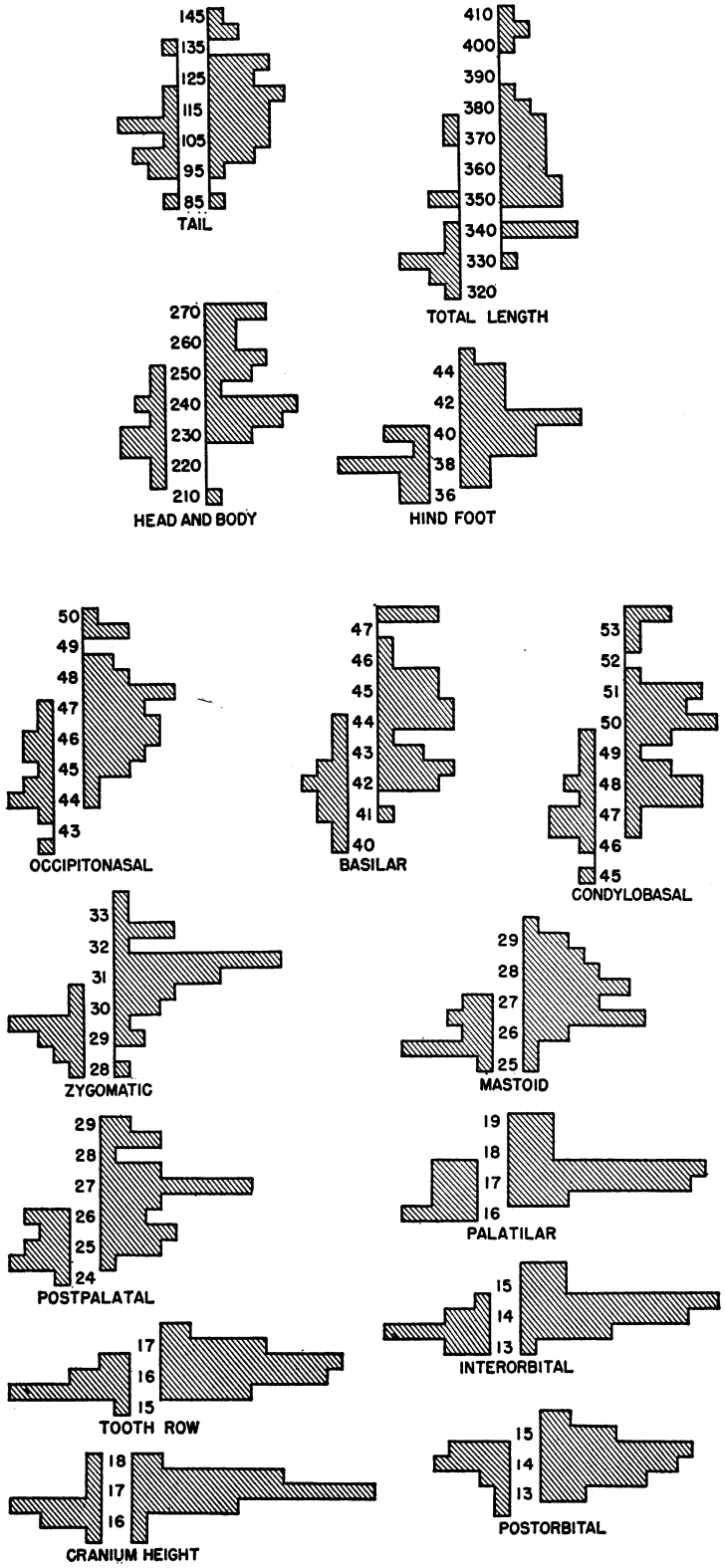

FIG. 2. Measurements of adult males (right) and females of *Spilogale putorius ambarvalis* from Micco, Florida, showing sexual differences in size in external and cranial measurements.

assumed to be 1/1, then the observed ratio of 1.5/1 is highly significant statistically. There are few data on the sex ratios of newborn litters of spotted skunks, the litter studied by Crabb (1944, p. 213) consisting of six animals, three of each sex. The ratios of three other litters (Crabb, 1948, p. 218) was 1.29/1 (actually nine males to seven females), and Crabb believed the sex ratio of *S. p. interrupta* in southeastern Iowa to be approximately 1.68/1. Bennitt and Nagel (1937, p. 122) reported a sex ratio of 1.32/1 for skunks trapped in Missouri.

If it is assumed that skunks are saved for museum collections without regard for sex, and that the sex ratio at birth is 1/1, the disparity in number of males may be accounted for in several ways. The use of scents in attracting animals to traps may well serve as a greater attraction to male spotted skunks than to females, which might be one reason for the greater number of males trapped. Crabb's study (1948, p. 219) shows that during the winter (when most spotted skunks in collections were trapped) the distance traveled by males is approximately 60 per cent greater than that traveled by females. The greater range of male spotted skunks as well as greater attractiveness of scented baits may account for the differences in numbers of males and females in museum collections.

Age Variation

Each specimen examined was placed in an age group established on the degree of fusion of the sutures of the skull. In the adult spotted skunk all of the sutures of the skull are fused and obliterated, and determination of age beyond the fact that the animal is an adult can be made only tentatively on the basis of the amount of wear of the teeth. Four primary age groups were established, but because animals sometimes were intermediate between two age groups, two additional categories were used. The amount of wear on the molars, the development of the sagittal crest, and the degree of fusion of the epiphyseal sutures of the long bones when postcranial elements were present also were used to confirm the age group into which an individual was placed. The age groups and characters used for determinations are:

Adult: All sutures of the skull are fused and not evident; in particular, the obliteration of the internasal and nasomaxillary sutures characterize this group. The teeth are from slightly to very much worn, and the epiphyseal sutures of the long bones are obliterated. The sagittal crest, in subspecies that have one, is well developed.

Young Adult: All sutures of the skull are fused, but the internasal and nasomaxillary sutures are distinguishable. The teeth are slightly worn, and the epiphyseal sutures of the long bones are still evident, although growth has apparently ceased. The sagittal crest is only slightly developed.

Subadult-Young Adult: The internasal and nasomaxillary sutures are not fused, and the suture between the basisphenoid and basioccipital is fused but still evident. The teeth may be slightly worn, but generally are not, and the epiphyseal cartilages of the long bones are evident.

Subadult: The internasal and nasomaxillary sutures are open, and the basisphenoid-basioccipital suture is open. The teeth generally are not worn, and the epiphyseal cartilages of the long bones are large, and the heads of the bones are readily detached from the diaphyses.

Juvenile-Subadult: The internasal, intermaxillary, and basisphenoid-basioccipital sutures are open. The lambdoidal sutures are barely fused, and the frontoparietal suture and sagittal suture are evident. The teeth are not worn.

Juvenile: All sutures are widely open. The teeth are newly or partially erupted and are not worn.

The abbreviations used for these age groups in the tables are as follows:

Ad, adult
Y, young adult
S-Y, subadult-young adult
S, subadult
J-S, juvenile-subadult
J, juvenile

The development of the sagittal crest is correlated with age. Generally in animals younger than subadult there are indications of parietal crests, which approach the sagittal line with age. Some subadults have moderately developed sagittal crests, but the

TABLE 3

PER CENT OF ADULT SIZE ATTAINED IN CRANIAL MEASUREMENTS BY 15 SUBADULT AND 15 SUBADULT-YOUNG ADULT MALES OF *Spilogale putorius interrupta* FROM KANSAS

Measurement	Subadult	Subadult-Young Adult
Basilar	95.8	97.0
Condylobasal	96.4	97.2
Occipitonasal	96.6	97.9
Zygomatic	93.6	96.8
Mastoid	95.9	98.1
Interorbital	94.0	96.7
Postorbital	100.1	99.9
Palatilar	96.8	97.1
Postpalatal	95.7	97.2
Cranium height	99.8	99.1
Tooth row	96.8	98.3

height of the crest increases with age. The size of the crest is, to some extent, a secondary sexual character, and in subspecies that have well-developed crests, the development seems to occur earlier than in those that do not have so high a degree of development. The degree of development of the crest can be used in the determination of the sex of animals in the subadult age group, for generally the males have indications of the crest at this age, while the females may have only the posterior portion of the parietal crests united at the same age.

The postorbital breadth and cranial height seem to reach adult dimensions earliest. By the time spotted skunks are subadult, they may have reached adult size in these characters. The breadth of the zygomatic arches and that of the mastoids seem to be the last measurements to reach adult size. Table 3 shows the per cent of adult size attained by 15 subadult and 15 subadult-young adult males from Kansas.

Between any two successive age groups there are no significant differences in the means of any measurements. There are, however, significant differences in the means of most measurements if one age group is skipped. For example, between subadult and subadult-young adult there are no significant differences, but between subadult and adult there are.

The differences between adult and young adult are slight. The young adults exhibit fusion of all sutures and thus, essentially, have ceased growing. There seems to be a gradual increase in the spread of the zygomatic and mastoid regions with age (the oldest specimens being widest in both these features), and throughout this study, unless stated otherwise, "adult" means adult and/or young adult. In the tables of measurements adults and young adults are considered to be a single group, unless otherwise noted.

Few adequate samples are available for study of age characters in external dimensions. In general spotted skunks of the subadult-young adult age group have reached adult size in total length and length of tail. Probably in the latter adult size is reached first; length of hind foot seems to be the last character to reach adult size.

No specimens of a known age have been examined. Spotted skunks have lived as long as nine years in captivity, but I would guess that five years in the wild is old for a spotted skunk. Probably animals of three and one-half months of age are subadults or subadult-young adults, for data provided by Crabb (1944, p. 219) indicate that by 104 days of age spotted skunks have reached adult size in external measurements.

COLOR PATTERN

Spotted skunks appear to be black animals with a complex pattern of white markings. The variations of these white markings seem infinite, but all appear to be modifications of a basic pattern, which is illustrated in figure 3. Essentially this pattern is composed of a pair of white stripes, the dorsal stripes (DW), which parallel the vertebral column and extend from the back of the head posteriorly to the outer edges of the tail and join each other at the tip of the tail. These stripes may be interrupted in the lumbar region (always in *S. putorius*) and modified in various ways posteriorly. A second pair of white stripes, the shoulder stripes (SW), parallel the preceding and extend over the shoulders, and may continue anteriorly (always in *S. pygmaea*) across the ears and join across the face. In *S. putorius* these stripes end anteriorly in front of the ears (pre-auricular patch, PW), and leave a patch, the nasal patch (N), on

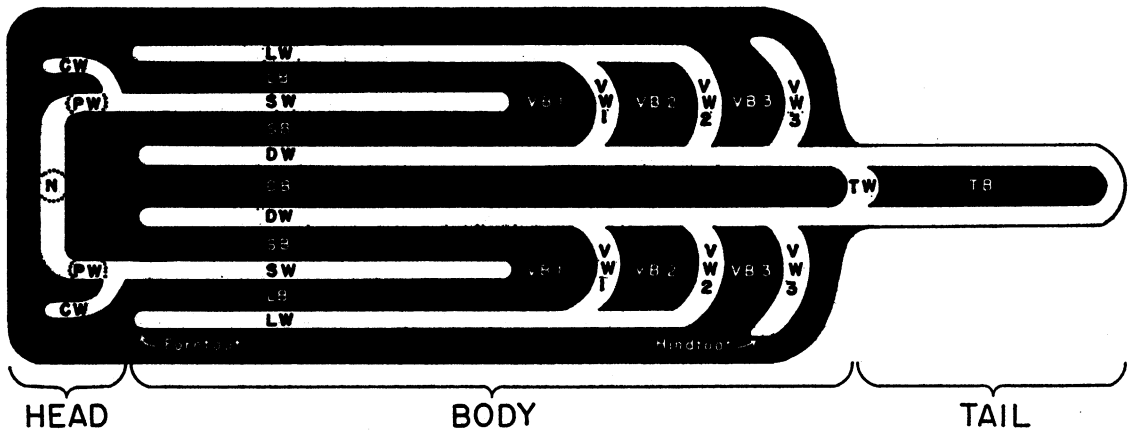

FIG. 3. Diagram of the basic color pattern of *Spilogale*. The names of the lettered stripes are given on page 243.

the nose; frequently thin white stripes extend from the shoulder stripes at the level of the ears and reach the chin, the chin stripes (CW), in some subspecies. There is usually a remnant of this stripe at the anterior tip of the lower jaw. The shoulder stripes always terminate posteriorly approximately at the level of the last ribs. A third pair of white stripes, the lateral stripes (LW), more or less parallel the preceding, and extend from the toes of the forefeet posteriorly past the end of the shoulder stripes and then curve dorsad, forming the first vertical stripes (VW_1), and sometimes join the dorsal stripes or fragments thereof. There is a second dorsad extension of the lateral stripes, the second vertical white stripes (VW_2), which are posterior to and parallel to the first. White stripes extend dorsally from the hind feet, the third vertical white stripes (VW_3), but usually do not join the dorsal stripes and more commonly exist only as patches of white on the rump. A white stripe may ring the base of the tail, the tail-base patch (TW), but often it is interrupted medially and exists as white patches on both sides of the base of the tail. The tail is tipped with white (except in some *S. putorius interrupta*) and has a greater proportion of white ventrally. Ventral variation in white on the tail varies from none to 100 per cent; dorsally the variation is almost as great, but individuals are almost always whiter ventrally.

The closest approach to this basic color pattern is found in the spotted skunks on the west coast of Mexico (*S. pygmaea* and *S. putorius tropicalis*), while the animals from midwestern United States, *S. putorius interrupta*, show the greatest deviation from it in being truly "spotted" skunks.

The differences in color pattern between the various subspecies of *Spilogale putorius* seem to be not so much in the pattern itself as in differences in the width of the white stripes in comparison with the width of the intervening black areas. For purposes of comparison, these intervening black areas are named (fig. 3): medial to the dorsal stripes (DB), dorsal to the shoulder stripes (SB), dorsal to the lateral stripes (LB), anterior to the first vertical stripes (VB_1), anterior to the second vertical stripes (VB_2), anterior to the third vertical stripes (VB_3), and anterior to the tip of the tail (TB).

In live animals the pattern is somewhat different in appearance from study skins. The lateral stripe, instead of being parallel to the shoulder stripe, is diagonal to it, and the appearance of the tail is modified by the spread of the hairs. Of necessity, all descriptions of color pattern in this paper are drawn from the observation of study or flat skins.

For practical purposes the color of spotted skunks may be deemed black and white. There are variations in color, however, and the black portions of the skins frequently appear to have some red or brown in them. I suspect that this aberration may be a result of exposure of the skin to sunlight after preparation, or at least it cannot be demon-

strated that this variation in color is not a result of such exposure. No data on molt were obtained, but spotted skunks do undergo periodic replacement of pelage, and these differences in color may be related to time of molt.

The white portions of the skin are frequently tinged with yellow. I have noted that this staining is frequent around the anterior end of the shoulder stripes, and Dr. Seth B. Benson of the University of California demonstrated to me in 1953 that this staining may be caused by the rubbing of wax from the ears into the fur by the skunks. I also believe that some of the yellow staining may be caused by contact with urine, for spotted skunks that I kept in captivity became "yellowed" when confined to a small cage for several weeks.

Not uncommonly the white stripes contain scattered black hairs which give the stripe the appearance of being gray. This, when it occurs, seems to be most common in the dorsal stripes, and is more frequent in the southern subspecies of *Spilogale putorius* and in *S. pygmaea*.

SYSTEMATICS

GENUS SPILOGALE GRAY

Viverra LINNAEUS, 1758, Systema naturae, ed. 10, vol. 1, p. 43. Type: *Viverra zibetha* Linnaeus.

Mephitis É. GEOFFROY-SAINT-HILAIRE AND CUVIER, 1795, Mag. Encyclopédique, new ser., vol. 2, p. 187. Type: *Viverra mephitis* Schreber.

Spilogale GRAY, 1865, Proc. Zool. Soc. London, pt. 1, p. 150. Type: *Mephitis interrupta* Rafinesque. Placed on the Official List of Generic Names in Zoology, name no. 961, by action of the International Commission on Zoological Nomenclature (Hemming, 1956, p. 76).

From the other members of the subfamily Mephitinae, *Spilogale* differs most from *Conepatus* and least from *Mephitis*. In many characters these three genera form a series, usually with *Spilogale* at one end and *Conepatus* at the other. It is customary to distinguish *Spilogale* and *Mephitis* from *Conepatus* on the number of teeth, the respective dental formulas being:

I 3/3, C 1/1, P 3/3, M 1/2=34 (*Spilogale, Mephitis*)

I 3/3, C 1/1, P 2/3, M 1/2=32 (*Conepatus*)

Although these formulas are generally true for the respective genera, some specimens of *Spilogale* and *Mephitis* occasionally lack the anteriormost upper premolar, and some *Conepatus* retain this same tooth. The anteriormost premolar is always small in *Spilogale* and usually shows little sign of wear.

The three genera of skunks differ in the shape of the skull. In *Conepatus* the cranium forms a curve, with the highest point at the level of the auditory meatus, while in *Mephitis* and *Spilogale* the highest point is above the orbits, generally slightly posterior to the postorbital projections. In *Mephitis* the rostrum is depressed, sloping sharply down from the high point, while in *Spilogale* the rostrum is but little depressed, the skull of some being almost straight dorsally. In *Conepatus* the palate extends clearly beyond the level of the posterior portions of the molars, while in *Spilogale* and *Mephitis* the end of the palate is within a few millimeters either side of the plane of the molars, generally in *Spilogale* anterior to this plane. Postorbital projections seem to be lacking in *Conepatus* and are rarely present in *Mephitis*, but they are common in *Spilogale*. In *Conepatus* the nasals terminate anteriorly posterior to the level of the canines, while in *Mephitis* and *Spilogale* the anterior termination of the nasals is always anterior to the level of the canines. The highest degree of inflation of the auditory bullae is found in *Spilogale*, the least in *Conepatus*, in which the bullae are hardly inflated at all. *Mephitis* seems intermediate in this regard. The mastoid processes are best developed in *Conepatus*, least in *Spilogale*. Only *Spilogale* exhibits great inflation of the mastoid sinuses, so much so in some that the mastoid breadth exceeds that of the zygomatic arches. Dentally, *Spilogale* may be distinguished from the other two genera in having a proportionately longer P^4. In *Conepatus* the greatest anteroposterior length of P^4 is always less than the anteroposterior length of M^1; in *Mephitis* the length of P^4 is approximately the same as M^1; and in *Spilogale* the P^4 is always longer than M^1. The upper molar in *Conepatus* is about as broad as it is long; in *Mephitis* this molar averages somewhat broader than long, varying from roughly quadrate to rectangular; and in *Spilogale* the M^1 is usually longer than broad, sometimes quadrate, but generally giving the appearance of a rectangle.

The mandible of *Spilogale* is flatter ventrally than that of either of the other genera, and the angular process is less elevated above the ventral surface than in *Conepatus* or *Mephitis*. The posterior edge of the ramus is concave in *Conepatus*, with the coronoid process projected posteriorly, while in *Mephitis* and *Spilogale* the coronoid process is not projected posteriorly, and the posterior edge of the ramus is nearly straight. Some specimens of *Mephitis* tend to have a slight concavity of the ramus, but in none is it so marked as in *Conepatus*.

In color pattern *Spilogale* is readily distinguishable from *Conepatus* and *Mephitis* in being the only skunk that has a triangular or broad nose patch (*Conepatus* has no white on the nose, and *Mephitis* has a thin white stripe medially on the nose), and the only skunk that has more than four white stripes on the body (*Conepatus* has either a single broad

white stripe or a pair of dorsal white stripes; *Mephitis mephitis* has two white stripes which are highly variable in length and breadth; and *Mephitis macroura* has either a broad stripe of intermixed black and white hairs, two lateral white stripes, or a combination of both the dorsal and lateral stripes).

The claws of the forefeet of *Conepatus* are long (about 20 mm. or more) and three times as long as those of the hind feet. The claws of the forefeet of *Mephitis* are about 10 mm. long and twice the length of those of the hind feet. The claws of the forefeet of *Spilogale* are about 7 mm. long and a little more than twice the length of those of the hind feet. The claws of all the skunks are slightly curved.

The soles of the hind feet in *Conepatus* are not divided into small pads, having only one division across; in *Mephitis* three pads are present anterior to the cross division; and in *Spilogale* there are four pads. The forefeet of *Spilogale* have many small pads on the soles.

The nose of *Conepatus* distinguishes it at once from the other two genera, being bare, broad, long, and projecting, and to some extent it resembles that of a hog, which gives this genus the common name "hog-nosed skunk." The noses of *Spilogale* and *Mephitis* are very much alike, and they are not so developed for "rooting" in the ground as is the nose of *Conepatus*.

The ears of skunks are small and lack a bursa. The auditory orifice is not concealed by a tragal thickening, and the pinna has no anterior rim. *Spilogale* has, proportionately, the largest ears of the three genera, and *Conepatus* has the smallest; the over-all height of the ear from the notch rarely exceeds 30 mm. in any of the skunks.

The fur of skunks is coarsest in *Conepatus* and finest in *Spilogale*. The hairs are longest on the tail and shortest on the face. *Mephitis* seems to be the longest-haired of the three genera. The grayish color of some *Spilogale* and *Mephitis macroura* is the result of intermixed black and white hairs, not gray hairs.

Spotted skunks may be distinguished from other members of the subfamily Mephitinae in the following ways: size small (total length to 600 mm., tail never more than 240 mm.), never larger externally than *Conepatus* or *Mephitis;* skull small (only *S. p. lucasana* exceeds *Mephitis macroura vitatta* in cranial length); upper carnassial proportionately large (much longer than molar); cranium relatively flat in dorsal profile; auditory bullae and mastoid sinuses greatly inflated; angular process not markedly elevated above plane of ventral surface of mandible; complex pattern of white stripes and spots, white markings never massed; forefeet and hind feet with many pads.

Taxonomic History

Hernandez (1651, p. 332) seems to be the first author to mention a spotted skunk. In his account of "*yzquiepatl*" he mentioned that there are three evil-smelling animals that have black and white markings, and because he was in parts of Mexico where all three genera of skunks occur, it is quite likely that he saw a spotted skunk. Two of the three varieties are called "*yzquiepatl*" by Hernandez, and one of these (the second mentioned) is probably a spotted skunk. The illustration (*op. cit.*, pl. 20) bears no relation to the description and appears to be a composite of a tayra and some ring-tailed animal, possibly a coati-mundi.

Catesby (1743, p. 62) mentioned an animal called the "Pole-Cat," to which he applied the name *Putorius americanus striatus*, the illustration of which could be a spotted skunk. The animal depicted is black, with three parallel white stripes extending the length of the body, and one of these continues one-third of the way down the otherwise black tail. Whether or not there are one, two, or three stripes on the opposite side of the body is not indicated. Catesby's description of the animal does not assist in limiting the "Pole-Cat" to either *Mephitis* or *Spilogale*, but his mention of hollow trees as a hiding place does suggest the latter.

Kalm (1754, p. 378) describes a skunk from Pennsylvania which must be assumed to be a striped, rather than a spotted, skunk, solely by its locality. Although spotted skunks are now known to occur in Pennsylvania, the first authentic record was in the twentieth century, and, inasmuch as Kalm remarks that it is fairly common, it is most likely that the animal of which he writes is *Mephitis*.

In 1758 Le Page du Pratz (vol. 2, p. 97) described a skunk, which might indicate that

he saw a *Spilogale*, but his description and illustration must be regarded as unidentifiable with any skunk. The name that he applies to the animal, "*Bête Puante*," is a common French name for skunk, and is non-Linnean. Le Page du Pratz's description, however, was used as a basis for the name *Mephitis myotis* Fischer (1829, p. 162), which is likewise unidentifiable.

Linnaeus (1758, p. 44) associated the name *Viverra putorius* with the descriptions of Catesby and Kalm, but he clarified their descriptions by saying that this is a black animal with four parallel dorsal white stripes and with a hairy tail as long as the body. This description is applicable to the animals now placed in the genus *Spilogale*, and specifically to *Spilogale putorius* by reason of Linnaeus' reference to Catesby and also on the basis of the long tail. In the thirteenth edition of "Systema naturae" (1789, p. 87), Gmelin "corrected" the description by stating that there are five dorsal white stripes. *Viverra putorius* Gmelin is preoccupied by, if not a synonym of, the same name of Linnaeus (1758, p. 44).

Buffon (1765, pl. 41) provided the first accurate illustration of a spotted skunk, which he called "*Le Zorille*." This illustration (the name itself has no taxonomic status, being a common name) has been the basis for names coined by other authors for spotted, striped, and hog-nosed skunks, as well as for black and white animals from other parts of the world, particularly Africa. I have examined all of the pertinent literature concerning names based upon "*Le Zorille*," and the situation borders on insolubility. One is tempted by the solution offered by Hershkovitz (1953, p. 381) to declare Buffon's "*Le Zorille*" not certainly identifiable, except for the fact that I believe that the animal depicted is most definitely a spotted skunk, and that the fault lies not with Buffon but with subsequent authors. Names based solely on Buffon's "*Le Zorille*" must be considered synomyms of *Viverra putorius* Linnaeus.

Viverra mapurita Müller (1776, p. 32) is based on Buffon's "*Le Zorille*" and is a synonym of *Viverra putorius* Linnaeus. *Viverra zorilla* Schreber (1776–1777; 1776, pl. 123; 1777, p. 445) is also based on Buffon's plate 41 and on Pennant's (1771, p. 233) "Zorilla." The latter is not associated with Buffon's illustration but with a *Conepatus* from South America described by Gumilla (1745). Later uses of *Viverra zorilla* are preoccupied by the usage of Schreber, including Boddaert's (1784, p. 84), which was mistakenly cited by Hershkovitz (1949, p. 14) as "[*Viverra*] *zorille*"; actually the terminal "a" of *zorilla* is inverted and not an "e."

Mustela putida Cuvier (1798, p. 116) is based on *Viverra putorius* of Linnaeus, but the descriptin is taken from the thirteenth edition by Gmelin. *Viverra striata* Shaw (1800, p. 387) is based on the thirteenth edition of "Systema naturae" and also is associated with Buffon's "*Conepate*," which is based on Catesby's illustration.

In 1820 Rafinesque (p. 3) described a spotted skunk under the name *Mephitis interrupta*, which he said inhabited "Louisiana." This name becomes the second valid name for a spotted skunk and is used for the subspecies in middle United States, *Spilogale putorius interrupta*. Gray (1837, p. 581) described a spotted skunk under the name *Mephitis bicolor*. Unfortunately his description fits many of the subspecies of *Spilogale putorius*, and, as he did not specify a locality, *Mephitis bicolor* cannot be associated with any subspecies and becomes a synonym of *Spilogale putorius*.

Desmarest (1882, pp. 186–187) listed under *Mustela americana* three varieties, A, B, and R, that may pertain to spotted skunks. The first is associated with the second-mentioned "*yzquiepatl*" of Hernandez, the second with Catesby's "Pole-Cat," and the third with *Mephitis interrupta* of Rafinesque.

In 1838 Lichtenstein (p. 281) published the first revision of the skunks. In it he recognized two species of spotted skunks, *Mephitis interrupta* and *M. zorrilla*. The former was based on Rafinesque's description, and Lichtenstein ascertained the type locality to be the upper Missouri River. The latter was described as a new species based on a specimen obtained by Deppe from Monterey, California, but the name is preoccupied by Lichtenstein's prior (1827–1834) use of the same name for an African animal. For a detailed discussion of this situation, see page 335.

Baird (1859, pp. 197–199) used the name *Mephitis bicolor* for all North American spotted skunks, having some reservation con-

cerning the use of Rafinesque's name, *interrupta*.

In 1859 Winans (see Coues, 1877, p. 239) described a spotted skunk from Kansas under the name *Mephitis quaterlinearis*, which is a synonym of *Mephitis interrupta* Rafinesque.

In 1865 Gray (p. 103) separated the spotted skunks from the genus *Mephitis* under the generic name *Spilogale*, with the type species being *Mephitis interrupta* Rafinesque. Gray listed *Mephitis bicolor*, which he named in 1837, as a synonym of *interrupta*.

Coues (1877, pp. 238–247), in his excellent account of the spotted skunk, considered *Spilogale* to be only subgenerically different from *Mephitis*, and he listed all the named forms under one species, *Mephitis* (*Spilogale*) *putorius* (Linnaeus).

Merriam described *Spilogale gracilis* from Arizona (1890a, p. 83) and later in the same year published a revision of the genus (1890b, pp. 1–16) in which he described the species *ringens*, *indianola*, *lucasana*, *leucoparia*, *saxatilis*, and *phenax*, and the subspecies *latifrons*. All of these now prove to be elements of a single species, *Spilogale putorius; leucoparia*, *phenax*, and *latifrons* are valid subspecies, *ringens* is a synonym of *putorius*, *indianola* is composed of intergrades between *interrupta* and *putorius*, and *saxatilis* is now considered a synonym of *gracilis*.

Mearns (1891, p. 256) described *Spilogale phenax arizonae* from central Arizona, but at present this race is considered to be identical with *S. putorius leucoparia* Merriam.

In 1897 Mearns (p. 3) described *Spilogale ambigua* from Chihuahua, Mexico; this name is considered to be a synonym of *leucoparia* in the present study.

Bangs (1898, p. 222) named the Florida spotted skunk *Spilogale ambarvalis*, this form now being considered a subspecies of *putorius*.

Thomas (1898, p. 898) described *Spilogale pygmaea* from Sinaloa, Mexico, and this species is still considered to be valid.

Elliot (1899, p. 270) named the spotted skunk from the Olympic Mountains, Washington, as a full species, *Spilogale olympica*, but at present this name is relegated to synonymy under *Spilogale putorius latifrons* Merriam.

Howell (1902, p. 241) described *Spilogale tenuis* from Colorado; this name is now considered to be synonymous with *S. putorius gracilis* Merriam. In the same paper Howell (p. 242) named *Spilogale angustifrons* from the Distrito Federal, Mexico, and *S. a. tropicalis* from Oaxaca, Mexico, both of which are now regarded as subspecies of *S. putorius*.

In 1903 Elliot (p. 170) described as a subspecies of *S. arizonae* a spotted skunk from the Sierra San Pedro Martir, Baja California, Mexico, which he called *martirensis*. This subspecies is now regarded as a subspecies of *S. putorius*.

In 1906 Howell revised the genus *Spilogale* in which he recognized the following species and subspecies: *S. putorius; S. ambarvalis; S. interrupta; S. indianola; S. leucoparia; S. tenuis; S. gracilis*, with subspecies *S. g. saxatilis; S. ambigua; S. angustifrons*, with subspecies *S. a. tropicalis* and *S. a. elata* (described on p. 27); *S. pygmaea; S. arizonae*, with subspecies *S. a. martirensis; S. phenax*, with subspecies *S. p. latifrons* and *S. p. olympica; S. microdon* (described on p. 34); and *S. lucasana*.

In 1926 Hall (p. 53) described *Spilogale phenax microrhina* from southern California; this subspecies seems to be the middle part of a size cline and is now regarded as an intergrade between *phenax* and *martirensis*.

Dickey (1929, p. 158) named the spotted skunk from Santa Rosa Island, California, *Spilogale phenax amphialus;* this subspecies is now regarded as a subspecies of *putorius*.

In 1933 Grinnell (p. 105) arranged *latifrons*, *microrhina*, *amphialus*, *arizonae*, and *phenax* as subspecies of *gracilis*.

Hall (1938, pp. 511, 514) named *Spilogale angustifrons celeris* and *Spilogale pygmaea australis* from San Isidro, Costa Rica, and Acapulco, Guerrero, Mexico, respectively. The former is now regarded as a subspecies of *putorius*, and the latter is a synonym of *S. pygmaea*.

Also in 1938 *Spilogale angustifrons yucatanensis* was described by Burt (p. 2) from Chichen Itza, Yucatan, Mexico. At present *yucatanensis* is regarded as a subspecies of *putorius*.

Dalquest (1948, p. 215) regarded the subspecies *olympica* as identical with, and thus a synonym of, *latifrons*.

In 1952 Hall and Kelson (p. 332) regarded *leucoparia*, *arizonae*, and *ambigua* as identical with *gracilis*, and they placed *tenuis* (p. 333),

microdon (p. 334), *martirensis* (p. 335), and *lucasana* (p. 335) as subspecies of *gracilis*.

Goodwin (1956, p. 13) described *Spilogale pygmaea albipes* from Oaxaca, Mexico; in the present paper this subspecies is regarded as being identical with *S. pygmaea*.

In summary, the early history of the genus *Spilogale* is confused with references to other genera of skunks as well as to Old World black and white carnivores. The Linnean name, *Viverra putorius*, is the first available name for a spotted skunk. From 1800 to 1865 the spotted skunks were considered to be a species of *Mephitis*, but then were separated into the genus *Spilogale* by Gray. The first revision of the spotted skunks was by Lichtenstein (1838), in which two species were recognized. Merriam's (1890b) revision recognized nine species and one subspecies. Howell's (1906) revision listed 14 species and six subspecies. Since Howell's revision, six additional subspecies have been named, bringing the total to 26 named forms. Studies in the interim between Howell's paper and the present one have resulted in a reduction of the named forms to seven species and 15 subspecies. The present revision recognizes two Recent species and 14 subspecies of the genus *Spilogale*.

Distribution

Spotted skunks are found in Central and North America from about latitude 8° N. to latitude 50° N. and from the Atlantic Ocean to the Pacific Ocean (fig. 4). Within this area, some 3500 miles from north to south and 2500 miles from east to west, spotted skunks are found in a variety of climates and habitats but are usually most common in regions of Sonoran or Transition biota.

At the southern extreme of the range of the genus, in Costa Rica, spotted skunks occur high in the mountains, while at the northern limits of the range, in British Columbia, they are found at low elevations, usually near the sea coast.

It is quite likely that the range of this genus, at least at the northern portions, is increasing as skunks move into areas that have become suitable for their habitation as a result of the recession of the Wisconsin glaciers. Most of the records of *Spilogale* at the northern limits of the range are recent ones: spotted skunks in Pennsylvania have been recorded only in the past decade (Latham and Studholme, 1947, p. 409), although they are believed to have been in the region for at least 40 years (Gifford and Whitebread, 1951, p. 40); the first records from northern Minnesota and from central North Dakota have come within the past 40 years (see p. 271), and the same is true of the northernmost records in Wyoming and British Columbia. Of course, these records might be the result of increased trapping or settlement of these regions, but the evidence seems to point more to a northward spread of this genus. The possible reasons for this increase in range are varied.

In part, at least, the northward spread may be considered a post-glacial migration into regions previously unsuitable for habitation because of the cooler climate. It seems likely that at least from 1885 to 1950 there has been an upward trend in global temperature, amounting to about 2° F. in winter and possibly as much as 6° F. (Arctic winters, 1917–1937) in some places (Conover, 1953, p. 229). This slight increase in temperature plus a probable decrease in the amount of precipitation might be one factor that would permit spotted skunks to move northward.

In some parts of the range the northward dispersal of *Spilogale* has doubtlessly been aided by man. As indicated under the account of *S. p. interrupta* (p. 272), man probably assisted in the spread of that subspecies by draining the land and making it more suitable for habitation by spotted skunks; by building houses and outbuildings which provide shelter for the skunks; by bringing in commensal mice and rats which provide a source of food, particularly in winter; by raising crops and storing them, providing additional sources of food in both winter and summer; and possibly by decreasing the number of predaceous animals, mammalian, avian, and reptilian, which may have provided competition for spotted skunks and which also may have preyed on the skunks themselves. Although these factors are particularly pertinent in the case of *S. p. interrupta*, some of them may have aided the spread of spotted skunks of other subspecies. Just how much weight can be placed on the destruction of foxes, hawks, and owls as competitors and predators of spotted skunks is not known, but for an ani-

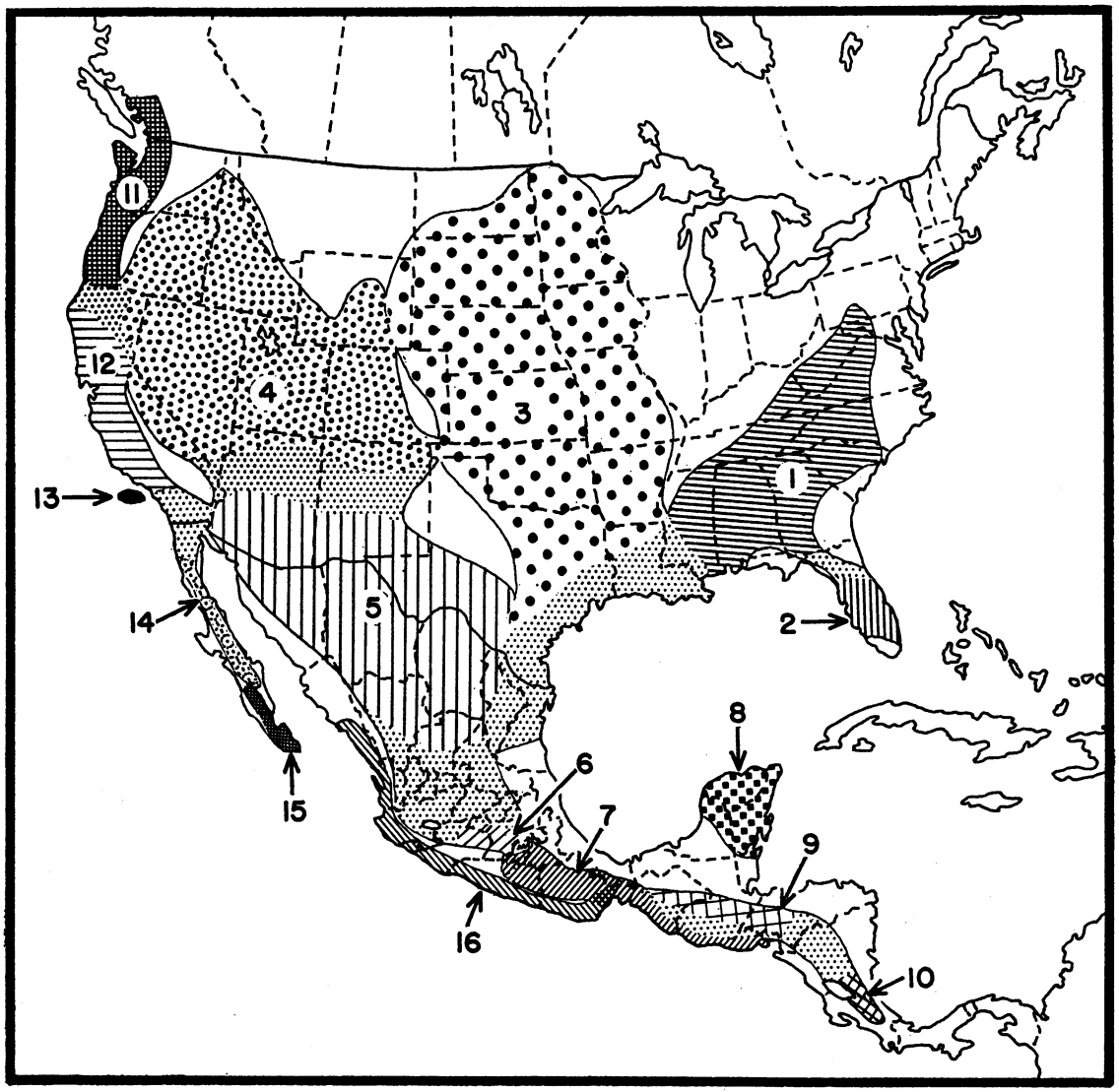

FIG. 4. The distribution of the species and subspecies of *Spilogale*. Lightly dotted areas are zones of intergradation. 1. *Spilogale putorius putorius*. 2. *S. p. ambarvalis*. 3. *S. p. interrupta*. 4. *S. p. gracilis*. 5. *S. p. leucoparia*. 6. *S. p. angustifrons*. 7. *S. p. tropicalis*. 8. *S. p. yucatanensis*. 9. *S. p. elata*. 10. *S. p. celeris*. 11. *S. p. latifrons*. 12. *S. p. phenax*. 13. *S. p. amphiala*. 14. *S. p. martirensis*. 15. *S. p. lucasana*. 16. *S. pygmaea*.

mal at the periphery of its range, the diminution of any of the controlling factors would assist in the persistence and even the spread of the animal.

The prehistory of spotted skunks is not extensive, but in some ways it aids in the study of the present distribution. The earliest record of a *Spilogale* is from the upper Pliocene of Kansas, named *Spilogale rexroadi* by Hibbard (1941, p. 342). This species seems to resemble most closely *Spilogale pygmaea* from southwestern Mexico. Early Pleistocene records of *Spilogale* all seem referable to *S. putorius* or to spotted skunks more like *putorius* than *pygmaea*. At the present time only one fossil species of *Spilogale* from the Pleistocene stands in the literature: *Spilogale marylandensis* Gidley and Gazin (1933, p. 351) from

Cumberland Cave, Maryland. Another early Pleistocene spotted skunk from the Curtis Ranch beds, Arizona, was named *Spilogale pedroensis* by Gazin (1942, p. 502), but comparison of this species with Recent material from nearby locations by Hoffmeister and Goodpaster (1954, p. 30) indicated that the fossil was indistinguishable from the Recent subspecies in that area and was considered to be conspecific with *Spilogale putorius*. The presence of a *pygmaea*-like *Spilogale* in the late Pliocene and *putorius*-like spotted skunks in the early Pleistocene suggests that these two species were derived from some basic stock earlier than the upper Pliocene.

All the localities from which the Pleistocene spotted skunks are known are within the present range of the genus. *Spilogale marylandensis* is found near the northern limits of the genus in eastern United States, but most of the other records are well south of the northernmost extremes of the genus. Quite probably, throughout the alternating cold and warm periods of the Pleistocene, *Spilogale* fluctuated in range, spreading northward during the interglacial periods and being forced southward at times of cold.

The insular subspecies, *Spilogale putorius amphiala*, is believed to have occupied the Channel Islands of California early in the Pleistocene from a stock that either resembled *S. p. latifrons* or later gave rise to that subspecies. Probably at the same time, the subspecies *S. p. lucasana* occupied the tip of Baja California, and during the ensuing interglacial periods was isolated from the adjacent populations. Florida was also probably occupied by spotted skunks rather early in the Pleistocene, but that population has never been greatly isolated from the more northern animals. Thus, early in the Pleistocene spotted skunks probably occurred throughout most of North America south of latitude 35° N. During interglacial periods populations of spotted skunks probably moved northward, but this history is largely speculative.

At the time of the Wisconsin glaciation, spotted skunks probably were concentrated in southern United States and Mexico. Based on the relationships between the subspecies, it seems that there was one population in the southeastern United States as well as one in southwestern United States and Mexico. Whether the southeastern population was in closer contact with *S. p. ambarvalis* of Florida than it is now I do not know, but the differences between the subspecies *ambarvalis* and *putorius* suggest that the present intergradation may be secondary. The southeastern group probably was isolated in the general region of the southern Mississippi River (fig. 5), and, as the glaciers receded, this population spread northward in two general lines, one of which gave rise to the subspecies *putorius* and the other to *interrupta*. The subspecies *indianola* (Merriam, 1890b, p. 10) seems to have been based on the remnants of this general population. Thus, *interrupta* and *putorius* today form the arms of a U-shaped distribution, with specimens from the base of the U being regarded as intergrades between the two subspecies, rather than being recognized by the name *indianola*.

In its northward dispersal, the subspecies *putorius* followed the Appalachian Mountains, which provided the rocky outcrops seemingly desired by these skunks for their general habitation. The somewhat cooler environment thus experienced has probably been one factor that has kept *putorius* from spreading even farther north. Present evidence suggests that spotted skunks, at least in the southern part of the range of *putorius*, may be moving eastward into the coastal plain (p. 258).

Spilogale putorius interrupta evidently spread northward and westward along the west bank of the Mississippi River. However, I suspect that the extensive flood plains and later deciduous forestation along that river might have accelerated the movement westward, for the moist lowlands would not have provided suitable habitat for *Spilogale*. This situation might also account for the absence of *Spilogale putorius putorius* from the eastern bank of the Mississippi. The general distribution of *interrupta* probably was not in the dense forests, but at the forest edge or in the grasslands. During the warm, dry period that occurred about 5000 years ago, spotted skunks in the central plains seem to have spread into areas from which they were previously excluded by climate and moisture, particularly the high water table. The presence of spotted skunks in archeological sites

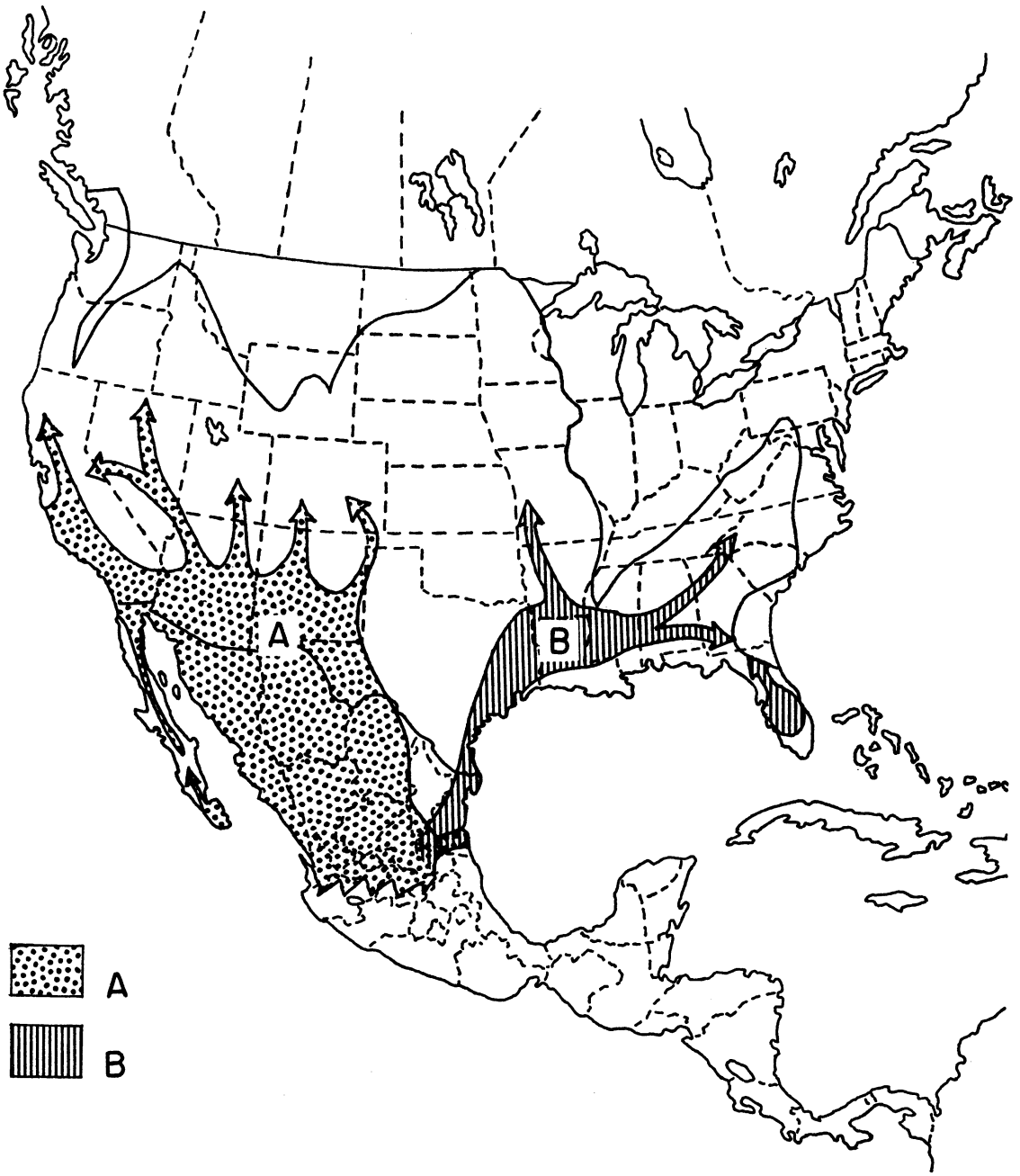

FIG. 5. Map of the hypothetical post-Wisconsin movement of *Spilogale putorius* in western (A) and eastern (B) United States. Solid line indicates the present northern limits of the genus.

in Illinois (p. 272), where *Spilogale* does not occur today, suggests such a spread for these animals and further implies that during the cooler and more moist period that followed, spotted skunks were excluded from these once-occupied regions. In the central plains *interrupta* seems to have increased its range markedly in historic times. As indicated above (p. 250) and below in the account of *interrupta* (p. 272), the activities of man have

probably aided this species in its dispersal.

Another population of spotted skunks probably occurred in the southwestern deserts during the maximum Wisconsin glaciation. Most likely the northern boundaries of this population were in southwestern Texas, and southern New Mexico, Arizona, and California. To the south this population most likely extended down through Mexico in most of the present range of the genus. Following the recession of the glaciers, this population spread northward in the lower elevations, generally inhabiting the lower slopes of the isolated mountain ranges of the southwest. The Colorado River does not seem to have served as a barrier to the distribution of *Spilogale*, and even today spotted skunks are found on both sides of the bottom of the Grand Canyon. The mountain ranges of the southwest are separated from one another by deserts; this has led to semi-isolation of the spotted skunks in this region, which accounts for the great variation in size and color pattern found between populations of *gracilis* as well as in those of *leucoparia*. Invasion of the Front Range of the Rocky Mountains in Colorado probably took place later than the dispersal into Utah and western Colorado. Spotted skunks most likely entered this region first from the west and slightly later from the south, the persistence of glaciers at the mountain tops and consequent cooler climate causing this delay.

On the Pacific coast, which was not so greatly affected by the Wisconsin glaciation, spotted skunks probably existed somewhat farther north than they did elsewhere, but were prevented from eastward movements by the severity of the climate in the Cascade Mountains and Sierra Nevada. Following the recession of the glaciers, these skunks could move northward and also eastward. They rejoined *gracilis* from the eastern side of the Sierra Nevada in central and northern California. Whether or not intergradation between *leucoparia* and the Pacific subspecies takes place across the Colorado River is unknown, but the slight differences between spotted skunks from San Diego County and those from southwestern Arizona suggest that, if intergradation is not now occurring, the cessation of it is of recent occurrence.

The relationship between the eastern and western populations during the Wisconsin glaciation is obscure. At the present time, based on actual specimens, the distribution of the representatives of these two populations (*leucoparia* and *interrupta*) is allopatric. The evidence from Oklahoma (p. 272) and eastern Wyoming (p. 272), which is unsupported by specimens, indicates that these two subspecies do not interbreed at the northern portions of their range. In central and southern Texas, where the two subspecies approach in range, there is no clear-cut sign of intergradation, but also there is no indication of sympatric distribution. I have suggested that intergradation between *leucoparia* and *interrupta* takes place in Tamaulipas and westward, but the evidence for this is based on few specimens, and additional material from this area is sorely needed. The differences between *leucoparia* and *interrupta* are, in any event, scarcely of specific rank.

So few specimens have been collected and so little is known of the range and habits of *Spilogale pygmaea* that it is difficult to discuss its probable distributionary history. It is noteworthy, however, that the present distribution of the species is, for the most part, in a region from which weasels and other skunks are unreported. Hall (1951, p. 221) indicated the presence of several subspecies of *Mustela frenata* in the range of *pygmaea*, but examination of the actual records of occurrence of those subspecies shows that none of these weasels has been recorded from the coastal area known to be inhabited by *pygmaea*. Furthermore, in the southern part of the range of *pygmaea*, in Oaxaca, where it is sympatric with *S. putorius tropicalis*, the differences between *putorius* and *pygmaea* are slight. If competition is the factor that has restricted the tiny *pygmaea* to its present range, the slight differences between it and *S. p. tropicalis* may allow it to compete successfully. In any event, the presence of *pygmaea* in a region from which other small carnivores are absent suggests that competition may be an important factor in the distribution of this species.

Key to the Recent Species of *Spilogale*

Size small, total length less than 300 and tail less than 90; skull small and narrow, basilar length less than 38 and mastoid breadth less than 23.5;

nasal patch connected to shoulder stripes; forefeet and hind feet white dorsally; dorsal stripes not interrupted . . *Spilogale pygmaea* (p. 379)

Size small to large, total length more than 300, or, if less, tail more than 90; skull small to large, but if basilar length less than 38, then mastoid breadth more than 23.5; nasal patch not connected to shoulder stripes; forefeet and hind feet not completely white dorsally; dorsal stripes interrupted posteriorly . . . . . *Spilogale putorius* (p. 255)

Spilogale putorius (Linnaeus)

Viverra Putorius LINNAEUS, 1758, Systema naturae, ed. 10, vol. 1, p. 44. Based on *Putorius americanus striatus* of Catesby (1743, p. 62) and the skunk of Kalm (1754, p. 378). Type locality: South Carolina (Howell, 1906, pp. 15–17).

Viverra Mapurita MÜLLER, 1776, Natursystems, Supplement, p. 32. Based on "*Le Zorille*" of Buffon (1765, pl. 41).

Viverra Zorilla SCHREBER, 1776, Die Saugthiere, pl. 123; description, 1777, p. 445. Based in part on "*Le Zorille*" of Buffon.

Must[ela]. putida CUVIER, 1798, Tableau elementaire de l'histoire naturelle des animaux, p. 116. A substitute name for *Viverra putorius* Linnaeus.

Viverra Striata SHAW, 1800, General zoology, vol. 1, p. 387. Based in part on *Viverra putorius* Linnaeus.

[*mustela americana*] var. B DESMAREST, 1822, Mammalogie, p. 186. Based on *Putorius americanus striatus* of Catesby.

Mephitis bicolor GRAY, 1837, Mag. Nat. Hist., new ser., vol. 1, p. 581. Based on a spotted skunk from North America, but not subspecifically identifiable.

Spilogale ringens MERRIAM, 1890, North Amer. Fauna, no. 4, p. 9. Type locality, Greensboro, Hale County, Alabama. Named under the mistaken impression that the Linnean name *putorius* was applicable to the spotted skunk from Florida.

The characters cited for the genus *Spilogale* are essentially those of *Spilogale putorius*, the differences between it and *pygmaea* being quite slight. In *putorius* the nasal patch is never joined to the pre-auricular patches to form a white band across the face, and the dorsal stripes never continue to the level of the third vertical stripes without interruption.

Cranially *putorius* differs from *pygmaea* in having a longer and broader skull, greater mastoid breadth, and a longer tooth row.

Most of the subspecies of *putorius* are easily distinguishable from *pygmaea* on the basis of their much larger size, longer tails, and more interrupted color pattern. The subspecies *yucatanensis* approaches *pygmaea* in size more closely than any of the others, but can always be distinguished from it by the interrupted white markings, greater mastoid breadth, and proportionately longer tail. The subspecies *S. putorius tropicalis*, which shows the closest approach to *pygmaea* in color pattern, may be distinguished by its discrete nasal patch and interrupted dorsal stripes.

Spilogale putorius putorius (Linnaeus)

Figures 6 and 7

Viverra Putorius LINNAEUS, 1758, Systema naturae, ed. 10, vol. 1, p. 44. Based on *Putorius americanus striatus* of Catesby (1743, p. 62) and the skunk of Kalm (1754, p. 378). Type locality: South Carolina (Howell, 1906, p. 15).

Spilogale ringens MERRIAM, October 8, 1890, North Amer. Fauna, no. 4, p. 9. Type: U.S.N.M. No. 23182/30642; adult female; collected by C. S. Brimley, August 21, 1890; original no. 50; from Greensboro, Hale County, Alabama.

Spilogale indianola MERRIAM, October 8, 1890, North Amer. Fauna, no. 4, p. 10. Type: U.S.N.M. No. 1621; adult, probably female; collected by J. H. Clarke, 1851; from Indianola, Matagorda Bay, Calhoun County, Texas.

DISTRIBUTION: Southeastern United States from Alabama, Mississippi, and northern Florida northward through western and central Georgia and South Carolina, and northward in the Appalachian Mountains to south-central Pennsylvania. Intergrades with *interrupta* in southwestern Mississippi, Louisiana, and southeastern Texas, and with *ambarvalis* in north-central Florida (fig. 4). Upper and Lower Austral Life Zones; Carolinian and Austroriparian Biotic Provinces. Known from sea level to 4000 feet.

EXTERNAL MEASUREMENTS: Males, 506.6 (453–610), 180.9 (152–211), 47.8 (41–51); females, 450.7 (403–470), 171.9 (154–193), 44.0 (39–47).

CRANIAL MEASUREMENTS: Males: basilar length, 50.4 (46.9–54.5), condylobasal length, 57.2 (53.6–61.9), zygomatic breadth, 35.3 (32.5–37.8), interorbital breadth, 15.5 (13.5–16.9), height of cranium, 18.5 (17.3–19.7), length of tooth row, 18.4 (17.0–20.5); females (in same order): 47.6 (45.0–50.0), 54.2 (51.2–56.4), 33.2 (31.8–34.8), 15.0 (13.5–

15.9), 18.0 (16.2–19.1), 17.7 (16.6–18.6).

WEIGHT: Not known; males, probably 600; females, probably 450.

COLOR PATTERN: Nasal patch small to medium. Dorsal stripes narrow, usually narrower than dorsal black stripe, always narrower than black or white shoulder stripes; dorsals frequently constricted or rarely interrupted at level of scapulae, always interrupted at level of posterior shoulder stripes,

FIG. 6. Color pattern of *Spilogale putorius putorius*. Drawn from an adult female, U.I.M.N.H. No. 14438, from 2 miles south of Gerrardstown, Berkeley County, West Virginia. Not to scale.

very rarely (and then weakly) connected to first vertical stripes; dorsals reappearing at level of first verticals as small spots, never connected to second verticals. Shoulder stripes narrow, about as broad as black shoulder stripes; pre-auricular patches small and narrow, usually not reaching top of ear; chin stripes absent. Lateral stripes medium, often broader than shoulder stripes, and never narrower than first vertical stripes; laterals rarely reaching upper foreleg. First vertical stripes medium, never broader than laterals, rarely connected to dorsals around posterior shoulder stripes and never connected to dorsal spots. Second vertical stripes broad, usually the broadest stripe distally; second verticals usually connected (sometimes weakly) with dorsals, but never connected anteriorly with dorsal spots at level of first verticals. Third vertical stripes reduced to small to medium rump spots. No white on forefeet; white sometimes present on hind feet of southern specimens. Tail-base patch variable, from absent to U-shaped, usually remaining as small patches on sides of tail. Tail about one-fifth to one-quarter white middorsally, and about two-fifths white ventrally.

The Linnean name *putorius* was based on the descriptions of Catesby (1743, p. 62) and Kalm (1754, p. 378). The animal described by the latter is undoubtedly a striped skunk (*Mephitis*), and that described and depicted by Catesby seems to be a composite of *Mephitis* and *Spilogale*. The Catesby illustration neatly splits the differences between the two genera, and could be applied to either, depending upon one's point of view. Those who would consider it *Spilogale* could maintain that it cannot be a striped skunk, because no eastern representative of *Mephitis* has more than two stripes. Those who would oppose this point of view could point out that no eastern spotted skunk has a totally black tail, nor does any one have a pattern of stripes resembling more than most remotely the one depicted. The argument, however, should not be based on Catesby's or Kalm's descriptions, but on the description by Linnaeus. The only animal in eastern North America (where Catesby and Kalm traveled) that has four dorsal white lines and a hairy tail as long as the body is *Spilogale*. It should be noted that Linnaeus altered Catesby's description of five parallel lines to four, which is correct. The spotted skunk of Florida, to which Merriam (1890b, p. 7) assumed the Linnean description applied, has a tail that is much shorter than the body, and thus the Linnean name *putorius* must apply to the Appalachian spotted skunks.

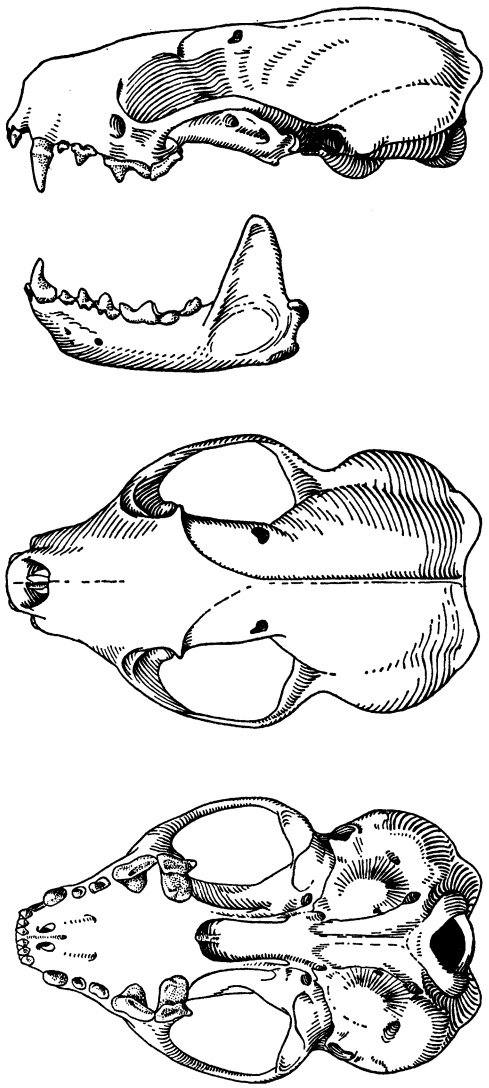

FIG. 7. Lateral, dorsal, and ventral views of the skull of *Spilogale putorius putorius*, adult male, A.M.N.H. No. 4286, from Greensboro, Hale County, Alabama. ×1.

Merriam's misassignment of the name *putorius* to the spotted skunk of Florida led him to name the Appalachian spotted skunk as

new. This name, *ringens*, is a synonym of *putorius*.

The specimens of *S. p. putorius* from Greensboro, Hale County, Alabama, are larger in average than those from most of the other parts of that state and from the southeastern United States in general. In some measurements, specimens of this population are also larger than animals from the more northern part of the range of *putorius*. The external measurements given for most of the specimens of *putorius* are open to question (for the majority of the animals were collected before standardization of these measurements took place) and in some cases include the hairs on the tip of the tail, or the hind foot without claws, but without indication that such is the case. The large size of the Greensboro specimens in cranial measurements is not statistically significant. In external measurements there is a statistical difference of significance, but, as mentioned, the accuracy or conformity of these measurements is questionable. Also, the coefficient of variation of some measurements of this population is unusually low (e.g., 3.30 for length of tail), which suggests that this sample may be drawn from one extreme of the population.

Spilogale p. putorius differs from *S. p. ambarvalis* in being larger in all measurements, in having a relatively longer tail, and in having more reduced white markings. For details of the differences between these subspecies, see the account of *ambarvalis* (p. 261).

From *S. p. interrupta*, *putorius* does not differ markedly in external or cranial measurements. In general, *interrupta* averages slightly larger in external measurements and slightly smaller in most cranial measurements, but none of these differences is sufficient to distinguish these two subspecies at the 84 per cent level. In color pattern, however, *putorius* may always be distinguished by having the terminal quarter of the tail white, by generally having uninterrupted dorsal stripes, and by having the nose patch medium-sized. From southwestern Mississippi westward through Louisiana and southeastern Texas, specimens are intermediate between *interrupta* and *putorius*. These are the animals that Merriam named *indianola* but that now prove to be intergrades between the eastern and midwestern spotted skunks. These intergrades have the tail about as white as in *putorius*, perhaps a little less so, and they have the dorsal stripes interrupted at the level of the scapulae, as in *interrupta*. The nasal patch is smaller than in *putorius*, but larger than in *interrupta*, and the same is true of the pre-auricular patch. In cranial measurements these intergrades are within the ranges of both subspecies, but they are generally slightly smaller than the average in both external and cranial measurements. These intergrades probably were the stock from which both *interrupta* and *putorius* spread northward following the Wisconsin glaciation (p. 258).

North of North Carolina in the range of *S. p. putorius* there are so few specimens available, and the data on these are, for the most part, incomplete, that little may be said concerning any cranial differences at this edge of the range. The two specimens from southern Pennsylvania are without skulls or external measurements, and the three specimens from Virginia have broken skulls. Judging from the measurements of a male and a female from West Virginia, and those measurements that can be taken on the other northern specimens, it is possible that there is a slight increase in size northward in the range of *putorius*, but until additional material is available, this cannot be clearly demonstrated.

In the southeastern portions of the range there is a slight decrease in size towards northern Florida. This may be due to intergradation with *ambarvalis*, which is believed to occur south of this area, or possibly also as a continuation of a north-south cline in size intimated in the previous paragraph. These specimens from southern Georgia and northern Florida also show signs of intergradation with *ambarvalis* in having broader white stripes, particularly the dorsals, and some, in having white on the hind feet.

There are no specimens of *putorius* from the coastal plain of eastern United States, all of the records being from above the fall line. However, Dr. Albert Schwartz informs me that he has seen *Spilogale* dead on the roads within a few miles of Charleston, South Carolina, which would indicate that spotted skunks are present on the coastal plain in some areas.

Sixty-five per cent of the specimens ex-

TABLE 4

MEASUREMENTS OF *Spilogale putorius putorius*

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Greensboro,				
Hale County, Alabama				
Total length[a]				
Males	9	519.44±38.82	58.23	463–596
Females	8	465.00±16.48	23.32	403–470
Tail[a]				
Males	6	201.67± 5.44	6.66	193–211
Females	3	182.00		165–193
Hind foot[a]				
Males	10	47.00± 1.58	2.49	43–51
Females	8	43.88± 1.67	2.51	39–47
Head and body[a]				
Males	10	308.33±34.37	42.10	275–373
Females	3	283.67		277–292
Basilar				
Males	10	51.95± 0.95	1.50	49.6–54.5
Females	7	49.11± 0.68	0.90	47.6–50.0
Condylobasal				
Males	10	58.85± 1.03	1.62	56.3–61.9
Females	7	55.61± 0.38	0.50	55.0–56.4
Occipitonasal				
Males	10	53.35± 0.91	1.44	50.5–55.0
Females	8	51.19± 0.62	0.88	50.3–52.5
Zygomatic				
Males	7	36.25± 0.97	1.29	34.9–37.8
Females	6	34.00± 0.44	0.54	33.1–34.8
Mastoid				
Males	10	31.85± 0.94	1.48	30.1–34.2
Females	7	30.39± 0.66	0.88	28.7–31.4
Interorbital				
Males	10	15.70± 0.54	0.85	14.4–16.9
Females	8	15.31± 0.35	0.50	14.1–15.8
Postorbital				
Males	10	15.10± 0.34	0.53	13.8–15.5
Females	7	14.46± 0.65	0.86	13.3–15.5
Palatilar				
Males	11	21.11± 0.66	1.10	19.6–22.7
Females	8	20.19± 0.44	0.62	19.0–20.8
Postpalatal				
Males	10	31.05± 0.67	1.06	29.4–32.1
Females	7	29.04± 0.43	0.58	28.7–29.7
Cranium height				
Males	10	18.45± 0.46	0.72	17.8–19.6
Females	7	17.89± 0.57	0.76	16.2–18.4
Tooth row				
Males	11	18.84± 0.63	1.04	17.3–20.5
Females	9	17.97± 0.34	0.51	17.3–18.6
North Carolina (all)				
Total length[a]				
Males	11	540.45±25.06	41.60	484–610
Female	1	436		

TABLE 4—(*Continued*)

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Tail[a]				
Males	11	180.45±10.95	18.17	152–208
Female	1	161		
Hind foot[a]				
Males	5	50.80		50–51
Female	—	—		
Head and body[a]				
Males	11	361.00±24.86	41.28	304–448
Female	1			
Basilar				
Males	12	50.46± 1.24	2.15	46.9–53.1
Females	2	46.20		45.1–47.3
Condylobasal				
Males	12	57.13± 1.24	2.15	54.1–60.3
Females	2	52.35		51.2–53.5
Occipitonasal				
Males	12	52.46± 1.26	2.18	48.8–54.7
Females	2	48.75		48.1–49.4
Zygomatic				
Males	13	35.21± 0.39	0.71	33.8–36.3
Females	2	32.55		31.8–33.3
Mastoid				
Males	13	31.25± 0.59	1.07	28.5–32.9
Females	2	28.40		27.7–29.1
Interorbital				
Males	14	15.46± 0.37	0.70	13.5–16.4
Females	2	15.05		14.9–15.2
Postorbital				
Males	6	15.25± 0.90	1.10	13.8–16.2
Female	1	15.5		
Palatilar				
Males	14	20.07± 0.47	0.87	18.6–21.0
Females	2	18.70		18.2–19.2
Postpalatal				
Males	12	31.50± 0.72	1.25	28.4–32.2
Females	2	27.65		27.2–28.1
Cranium height				
Males	11	18.48± 0.49	0.82	17.3–19.5
Females	2	17.60		17.4–17.8
Tooth row				
Males	14	18.68± 0.36	0.68	17.2–19.5
Females	2	17.25		16.6–17.9

[a] External measurements of these specimens are questionable.

amined are males. Lesions or swelling of the frontal sinuses are present in 80 per cent of 49 adults, 46 per cent of 13 young adults, and four of 10 subadult-young adults.

Specimens from every month of the year have been examined. Two subadults were recorded as having been captured in October; subadult-young adults were taken from August through November; and young adults are present from the months of September through February. There is evidence that this subspecies has an extended breeding season or that two litters a year might be produced. Gates (1937, p. 240) reported a second litter born in August in the Nantahala Mountains, North Carolina. A female captured on June 30 at Greensboro, Alabama, is reported as "nursing," and a specimen from Fort Mc-

Pherson, Georgia, captured September 13 is also reported as nursing. Young spotted skunks are weaned by the time they reach 54 days of age, so it would seem unlikely that the September-caught female could have given birth before July 20. By the same reasoning, the female captured in June could not have given birth before May 7. The nine specimens of ages younger than young adult that were studied do not indicate such a wide season of birth, but because more than 40 per cent of the specimens of this subspecies were captured from January through May (at which time young are probably not yet born or liable to capture) these data may be biased.

SPECIMENS EXAMINED: One hundred and twenty-two, from the following localities:

ALABAMA: *Autauga County*: Autaugaville, 3 (U.S.N.M.); Prattville, 1 (U.S.N.M.). *Colbert County:* Leighton, 1 (U.S.N.M.). *Hale County:* "Hale County," 2 (M.C.Z.); Greensboro, 29 (19 U.S.N.M., 6 A.M.N.H., 2 M.C.Z., 1 C.N.H.M., 1 S.D.S.N.H.). *Houston County:* Ashford, 1 (U.S.N.M.). *Lee County:* Auburn, 8 (7 U.M.M.Z., 1 A.P.I.). *Marengo County:* Ten miles west of Demopolis, 1 (U.M.M.Z.). *Mobile County:* Mobile, 2 (U.S.N.M.). FLORIDA: *Leon County:* Two and three-tenths miles east of Tallahassee, 1 (W.K.C.). GEORGIA: "Georgia," 1 (U.S.N.M.). *Clarke County:* Seven miles southeast of Athens, 1 (U.G.). *Fulton County:* Gate 1, Warner Robbins Plant, Atlanta, 2 (E.U.); Fort McPherson, 1 (U.S.N.M.). *Grady County:* Beachton, 4 (U.S.N.M.); 4 miles northeast of Cairo, 1 (U.I.M.N.H.); 8 miles northeast of Cairo, 3 (U.I.M.N.H.). *Talbot County:* Four and one-half miles west of Geneva, 3 (U.S.N.M.); 4 miles north of Junction City, 2 (K.U.M.N.H.). *Thomas County:* "Thomas County," 3 (M.V.Z.); Thomasville, 1 (Cleve.). *Towns County:* Brasstown Bald, 1 (U.S.N.M.). LOUISIANA: *Ascension Parish:* Two miles southeast of Burnside, 1 (L.S.U.); 7 miles southwest of Sorrento, 1 (L.S.U.). *Calcasieu Parish:* "Calcasieu Parish," 1 (U.S.N.M.); Iowa, 3 (U.S.N.M.). *East Baton Rouge Parish:* Three miles south of Baton Rouge, 1 (L.S.U.); near St. Gabriel, 1 (S.D.S.N.H.); University, 2 (L.S.U.). MISSISSIPPI: *Alcorn County:* Corinth, 1 (U.S.N.M.). *Copiah County:* Arista Ranch, 2 (M.G.F.C.). *Forrest County:* Eatonville, 1 (M.G.F.C.). *Hancock County:* Bay St. Louis, 1 (M.C.Z.). *Lamar County:* Lumberton, 2 (M.G.F.C.). *Loundes County:* Hall Lumber Company, 3 (M.G.F.C.). *Stone County:* "Stone County," 2 (M.G.F.C.). NORTH CAROLINA: *Cherokee County:* Valley River, 1 (U.S.N.M.). *Macon County:* Highlands, 1 (U.G.). *Madison County:* Marshall, 2 (Cleve.). *Mitchell County:* Magnetic City, 2 (A.M.N.H.); Roan Mountain, 3500 ft., 9 (U.S.N.M.). *Rutherford County:* Bat Cave, 1 (N.C.S.C.). *Swain County:* Great Smoky Mountain National Park, 1 (U.I.M.N.H.). PENNSYLVANIA: *Bedford County:* Six miles southwest of Chaneysville, 2 (C.M.). SOUTH CAROLINA: *Edgefield County:* Cleora, 1 (U.S.N.M.). TENNESSEE: *Campbell County:* High Cliff, 1 (U.S.N.M.). *Sevier County:* Greenbriar Cave, Great Smokies, 2900 ft., 1 (Chi.A.S.). *Sullivan County:* Head of Firth Dam Creek, Holston Mountains, 1 (U.S.N.M.). VIRGINIA: *Frederick County:* Winchester, 1 (U.S.N.M.). *Lee County:* "Lee County," 2 (M.C.Z.). WEST VIRGINIA: *Berkeley County:* East side of North Mountain, 2 miles south of Gerrardstown, 1 (U.I.M.N.H.). *Hardy County:* Lost River State Park, 1 (C.M.).

Spilogale putorius ambarvalis Bangs

Figures 8 and 9

Spilogale ambarvalis BANGS, March, 1898, Proc. Boston Soc. Nat. Hist., vol. 28, p. 222. Type: M.C.Z. No. 3481; adult male; collected by O. Bangs, January 30, 1895; from Oak Lodge, on east peninsula opposite Micco, Brevard County, Florida.

Spilogale putorius ambarvalis VAN GELDER, May 13, 1953, Jour. Mammal., vol. 34, p. 255.

DISTRIBUTION: Peninsular Florida from northern Dade and northern Immokalee counties north to Marion County; intergrades with *S. p. putorius* in north-central Florida (fig. 4). Lower Austral and Tropical Life Zones; Austroriparian Biotic Province. Known from sea level to 200 feet.

EXTERNAL MEASUREMENTS: Males, 361.2 (311–421), 113.4 (80–147), 39.8 (32–45); females, 341.5 (303–376), 105.4 (85–136), 37.3 (33–40).

CRANIAL MEASUREMENTS: Males: basilar length, 44.2 (40.4–49.3), condylobasal length 49.9 (45.8–54.9), zygomatic breadth, 31.1 (27.4–33.9), interorbital breadth, 14.4 (12.3–15.6), height of cranium, 17.2 (15.4–18.4), length of tooth row, 16.4 (14.8–17.9); females (in same order): 42.0 (39.9–44.9), 47.5 (45.3–50.3), 29.2 (27.9–30.8), 13.7 (12.5–15.0), 16.6 (15.9–18.0), 15.8 (15.1–16.6).

WEIGHT: Males, 396.3 (276–527); females, 305.0 (207–339).

COLOR PATTERN: Nasal patch large, slightly longer than broad. Dorsal stripes medium

to broad, broader than black dorsal stripe, usually broader than black shoulder stripes, usually narrower than white shoulder stripes; dorsals connected by constriction with first vertical stripes in about half of the specimens; dorsals interrupted or joining first verticals at level of posterior shoulder stripes, reappearing at level of first verticals as elongate spots frequently connected by constriction with second vertical stripes. Shoulder stripes medium to broad, never narrower than black shoulder stripes; pre-auricular patches large and broad; chin stripes sometimes present, lateral stripes broad, never narrower than shoulder stripes, usually extending onto upper forelegs. First vertical stripes broad, nev-

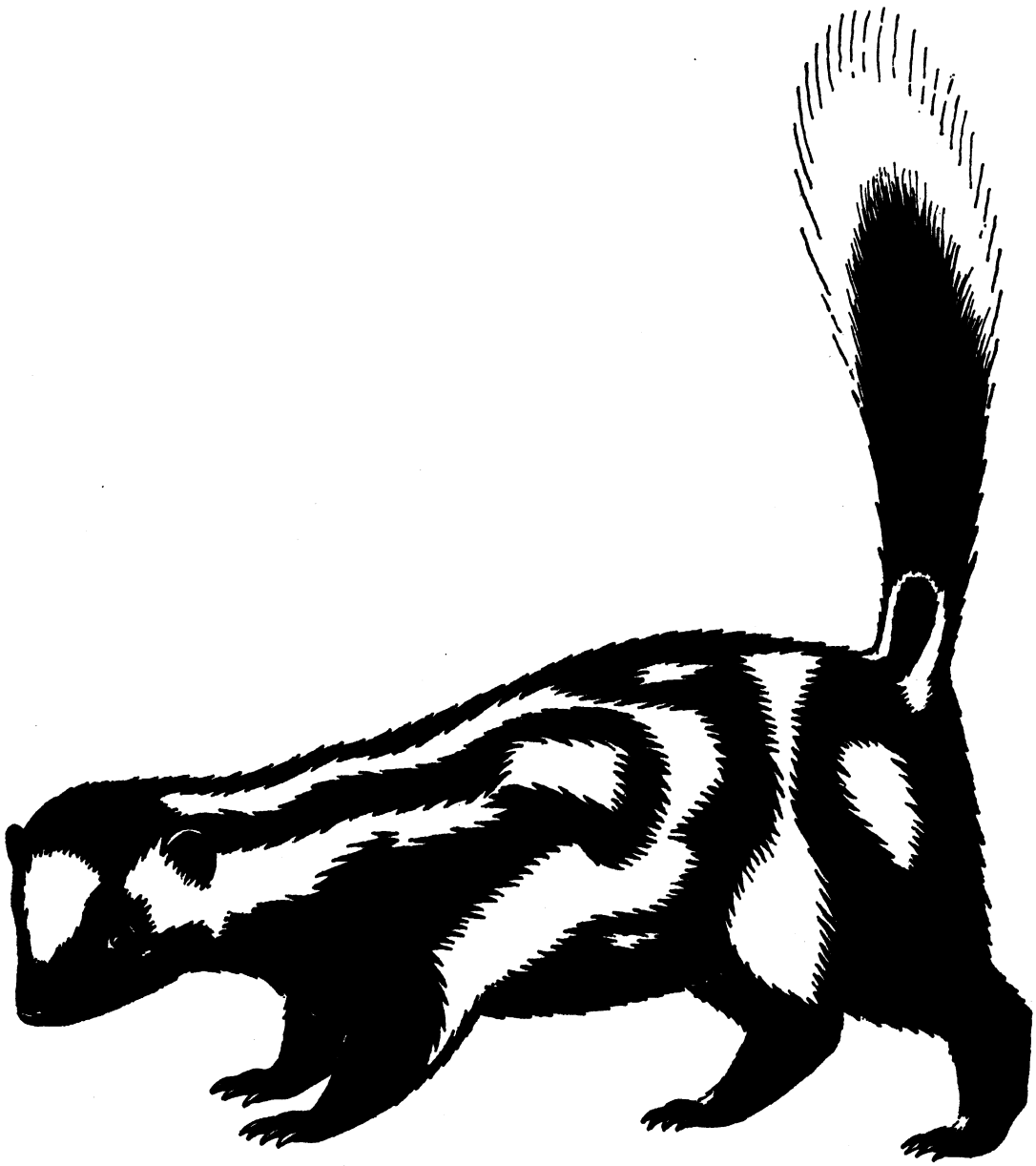

FIG. 8. Color pattern of *Spilogale putorius ambarvalis*. Drawn from an adult male, A.M.N.H. No. 1898/1163, from east peninsula, opposite Micco, Brevard County, Florida. Not to scale.

er broader than laterals, frequently connected to dorsals by constriction around posterior shoulder stripes, never connected to dorsal spots. Second vertical stripes medium to broad, usually about same width as first verticals; second verticals always connected to dorsals, sometimes by constriction, and frequently connected by constriction to dorsal spots at level of first verticals. Third vertical stripes variable, from small rump patches to short stripes reaching onto hind legs, rarely distal to knees. No white on forefeet; hind feet usually with white spots. Tail-base patch variable, usually large and U-shaped, but reduced to small white tufts on sides of tail in some. Tail about one-quarter white middorsally, halfway on sides, and about two-thirds white ventrally.

In his revision of the spotted skunks, Merriam (1890b) used the Linnean name *putorius* for the spotted skunks of Florida. Bangs (1898, pp. 223–224) pointed out that this name did not apply to the Florida animal and described *ambarvalis*. The name *putorius*, however, was used for spotted skunks from Florida for several years.

Spilogale putorius ambarvalis needs comparison only with *S. p. putorius*. From specimens of *putorius* from Hale County, Alabama, *ambarvalis* from Micco, Brevard County, Florida, differs in being smaller in all measurements, from 40 per cent smaller in length of tail to only 4 per cent in postorbital breadth. In external measurements, *ambarvalis* is slightly more than 70 per cent of the total length of *putorius*, less than 60 per cent of its length of tail, 12 per cent smaller in length of hind feet, and 19 per cent smaller in length of head and body. In cranial measurements, *ambarvalis* averages 12 per cent smaller, ranging from 16 per cent in palatilar length to 4 per cent in postorbital breadth. In most measurements there is separability at the 84 per cent level between *putorius* and *ambarvalis*.

Specimens from southwestern Georgia, halfway between Hale County and Brevard County, show a tendency towards *ambarvalis* in their somewhat smaller size; they are only 30 per cent larger in length of tail and 21 per cent larger in total length. In cranial measurements the Georgian specimens average only 9 per cent larger than *ambarvalis* ranging from 12 per cent in postpalatal length and condylobasal length to only 3 per cent in postorbital breadth. In color pattern the specimens from Georgia are whiter than those from Hale County, but darker than *ambarvalis*.

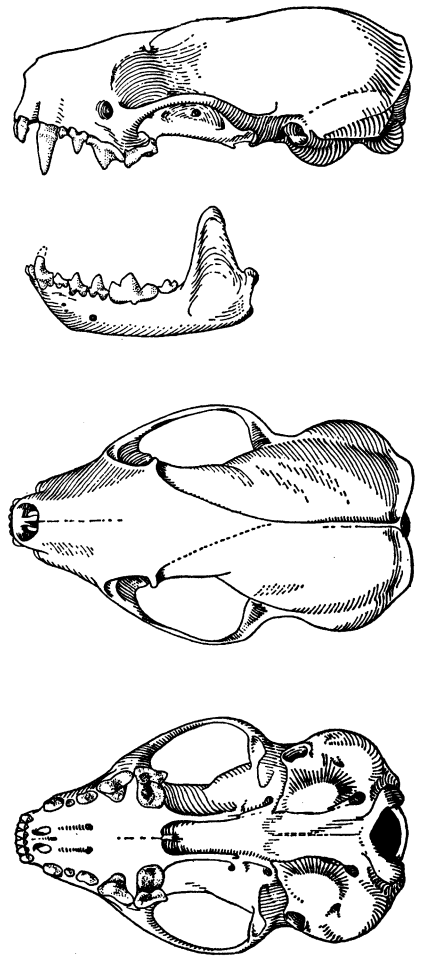

FIG. 9. Lateral, dorsal, and ventral views of the skull of *Spilogale putorius ambarvalis*, adult male, A.M.N.H. No. 1898/1163, from east peninsula, opposite Micco, Brevard County, Florida. ×1.

Within the range of *ambarvalis* there is an increase in size from south to north. Specimens from Micco, for example, average 3.5 per cent larger in cranial measurements than specimens from southeastern (Dade, Broward, Palm Beach counties) Florida. The average distance between the Micco specimens and the southern Florida ones is 117 miles.

TABLE 5

MEASUREMENTS OF *Spilogale putorius ambarvalis* FROM OAK LODGE, OPPOSITE MICCO, BREVARD COUNTY, FLORIDA

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Total length				
Males	33	366.90±7.14	20.47	330–414
Females	13	341.74±9.58	17.30	323–376
Tail				
Males	43	118.75±4.88	13.80	85–147
Females	14	108.93±6.66	12.44	85–136
Hind foot				
Males	32	41.28±0.73	2.07	37–45
Females	14	38.57±0.71	1.33	36–40
Head and body				
Males	31	249.60±5.34	14.88	212–274
Females	13	234.04±7.52	13.58	217–251
Basilar				
Males	38	44.50±0.56	1.73	41.4–47.9
Females	14	42.18±0.61	1.15	40.1–44.0
Condylobasal				
Males	38	50.07±0.61	1.87	46.7–53.8
Females	14	47.54±0.66	1.24	45.3–49.5
Occipitonasal				
Males	38	47.11±0.47	1.46	44.3–50.2
Females	14	45.14±0.68	1.28	42.7–47.4
Zygomatic				
Males	37	31.41±0.39	1.20	28.4–33.9
Females	13	29.48±0.37	0.67	28.0–30.8
Mastoid				
Males	38	27.58±0.34	1.05	25.4–29.8
Females	14	26.22±0.34	0.63	25.4–27.3
Interorbital				
Males	37	14.55±0.20	0.61	13.3–15.6
Females	14	13.82±0.22	0.42	13.2–14.6
Postorbital				
Males	36	14.43±0.22	0.67	13.1–15.9
Females	13	14.13±0.34	0.62	12.8–14.8
Palatilar				
Males	38	17.72±0.22	0.69	16.5–19.1
Females	14	16.89±0.32	0.60	16.0–17.9
Postpalatal				
Males	38	26.99±0.39	1.21	24.9–29.2
Females	13	25.33±0.35	0.64	24.2–26.3
Cranium height				
Males	37	17.28±0.17	0.51	15.8–18.4
Females	14	16.75±0.35	0.65	15.9–18.0
Tooth row				
Males	38	16.59±0.16	0.50	15.6–17.8
Females	15	15.98±0.17	0.33	15.2–16.6

The distance between Micco and the southern Georgia localities is about 300 miles. If this increase in size of 3.5 per cent continues northward uniformly, the specimens from Georgia would be expected to be 9 per cent larger than Micco specimens, as in fact, they are. This pattern holds true for external measurements also, with the estimated in-

crease in size of Georgia specimens being 20.5 per cent, and the actual average increase being 21 per cent.

Except for total length and length of tail, the largest specimens of *ambarvalis* overlap the smallest specimens of *putorius* in all measurements. This is despite a gap of about 150 miles from which no specimens have been obtained, although spotted skunks are reported to occur in this region, which is between Marion and Leon counties, Florida. Animals from this area should be intermediate between *putorius* and *ambarvalis*.

Most of the specimens of *ambarvalis* are from the beaches of the east coast. Spotted skunks in this area seem to be more common on the barrier beach than inland. They are not known from the Everglades nor from the Big Cypress Swamp. Few specimens are available from western or central peninsular Florida, but these generally seem to be larger and darker than those from the eastern part of the state. It is quite likely that intergradation between *ambarvalis* and *putorius* may occur farther south in western Florida than in the central part of the state.

No specimens from the months of August or October have been examined. A single juvenile represents the September-caught specimens. All age groups from subadult and older are represented in November-taken specimens. Subadults also are present in February and March, subadult-young adults are known from January to March, in addition to November, and young adults are known from January, February, March, May, July, and November. From these scanty data it would appear that the spotted skunks in Florida give birth in late July and August and possibly in the winter.

Sixty per cent of 115 specimens are males. Lesions of the frontal sinuses are present in 78 per cent of the adults, 57 per cent of the young adults, none of the three subadult-young adults, and two of three subadults. The one juvenile had signs of parasitic infection in its cranium.

SPECIMENS EXAMINED: One hundred and twenty-six, from the following localities:

FLORIDA: *Brevard County*, Canaveral, 1 (U.S.N.M.); Cape Canaveral, 8 (7 A.M.N.H., 1 U.S.N.M.); Grant, Oak Lodge, 1 (C.N.H.M.); 15 miles south of Indiatlantic, 1 (U.F.); Oak Lodge, east peninsula opposite Micco, 60 (21 M.C.Z., 11 Cleve., 9 U.S.N.M., 8 R.D.I., 4 A.M.N.H., 4 C.N.H.M., 2 U.F., 1 K.U.M.N.H.). *Broward County:* Fort Lauderdale, 6 (4 A.M.N.H., 1 U.S.N.M., 1 K.U.M.N.H.). *Charlotte County*, Chadwick Beach, 1 (C.N.H.M.). *Collier County:* Immokalee, 2 (U.S.N.M.). *Dade County:* Biscayne Gardens, 1 (U.M.M.Z.); Lemon City, 1 (U.S.N.M.); Miami, 3 (2 U.M.M.Z., 1 U.F.). *De Soto County:* Arcadia, 1 (U.S.N.M.). *Hendry County:* La Belle, 1 (U.S.N.M.). *Indian River County:* Sebastian, 3 (M.C.Z.). *Marion County:* Silver Springs, 1 (U.S.N.M.). *Okeechobee County:* Kissimmee Prairie, near Fort Bassinger, 2 (U.S.N.M.); Orange Hammock, 3 miles north of Fort Kissimmee, 3 (U.S.N.M.); Kissimmee Prairie, 1 (U.S.N.M.). *Palm Beach County:* Del Ray Beach, 2 (Cleve.); Jupiter, 1 (U.S.N.M.); Lantana, 3 (Chi. A.S.); Lake Worth, 14 (8 P.G.P., 3 U.S.N.M., 3 C.N.H.M.); Palm Beach, 9 (8 C.N.H.M., 1 A.M.N.H.).

Spilogale putorius interrupta (Rafinesque)

Figures 10 and 11

Mephitis interrupta RAFINESQUE, 1820, Ann. Nat., no. 1, p. 3. Type locality: "Louisiana"; restricted to the upper Missouri River by Lichtenstein (1838, p. 281).

Mustela [sic, lapsus for *Mephitis] americana* var. R DESMAREST, 1822, Mammalogie, p. 18. New name for *Mephitis interrupta* Rafinesque.

Mephitis quaterlinearis WINANS, 1859 (*fide* Coues, 1877, pp. 239–240) in a Kansas (?) newspaper. Type locality: Kansas.

Spilogale indianola MERRIAM, October 8, 1890, North Amer. Fauna, no. 4, p. 10. Type: U.S.N.M. No. 1621; adult, probably female; collected by J. H. Clarke, 1851, from Indianola, Matagorda Bay, Calhoun County, Texas.

Spilogale putorius interrupta MCCARLEY, March 30, 1952, Texas Jour. Sci., vol. 4, p. 108.

DISTRIBUTION: From the Canadian border in Minnesota, central North Dakota, eastern Wyoming, eastern Colorado, western Oklahoma, northwestern Texas, south to central Texas, and east to the Mississippi River and St. Croix County, Wisconsin. Intergrades with *putorius* in south-central and southern Texas; zone of intergradation extends to western Mississippi and to central Tamaulipas where intergradation with *leucoparia* also takes place (fig. 4). Lower Sonoran, Austroriparian, Upper Sonoran, and Transition Life Zones; Saskatchewan, Illinoisian, Kansan, Texan, Austroriparian, and Tamau-

TABLE 6

MEASUREMENTS OF *Spilogale putorius ambarvalis* FROM FLORIDA

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth-Row
Brevard County																
Canaveral	?	Y	—	—	—	—	—	—	29.4	26.4	13.8	14.7	17.0	—	17.6	15.9
Cape Canaveral	♂	Ad	345	91	37	41.7	48.1	45.9	30.8	26.3	14.0	14.3	16.2	25.4	17.2	16.1
	♂	Ad	338	87	36	43.0	49.0	46.0	29.7	26.3	13.3	14.0	17.3	25.8	16.8	16.0
	♂	Ad	360	105	40	—	51.2	48.1	30.6	28.0	13.8	14.5	17.3	—	17.2	16.4
	♀	Ad	321	95	33	40.0	46.0	44.2	28.2	25.5	13.2	13.8	15.8	23.8	16.3	15.6
	♀	Ad	355	90	35	41.2	47.4	45.2	29.1	26.5	13.2	14.5	16.0	24.9	16.2	15.7
	♀	Ad	332	96	36	39.9	45.4	43.6	29.0	25.4	13.4	14.6	16.1	24.0	16.7	15.6
	♀	Ad	343	100	38	41.5	47.5	45.3	28.9	25.5	13.6	14.6	16.1	25.1	16.9	15.9
15 mi. S. Indiatlantic	♂	Y	332	111	37	41.7	47.3	43.8	29.0	26.1	13.2	13.7	16.8	24.9	16.3	15.8
Broward County																
Fort Lauderdale	♂	Y	357	128	39	43.8	49.4	47.4	30.5	28.0	14.6	13.8	17.8	26.5	18.0	16.4
	♀	Ad	345	105	37	41.9	47.5	44.6	29.3	26.7	13.6	13.3	16.6	25.1	16.0	15.3
	♀	Y	325	95	35	41.0	46.7	43.7	27.9	25.5	13.1	13.9	16.7	24.4	15.9	15.3
	♀	Y	338	98	37	41.7	47.3	44.8	28.4	26.1	13.5	12.7	16.4	25.7	16.0	15.7
	♀	S-Y	330	97	36	40.1	45.5	42.2	27.8	25.6	13.4	14.3	15.9	24.2	16.8	14.9
	♀	S-Y	326	91	37	42.7	48.2	44.5	28.0	26.2	12.0	13.9	16.4	26.3	16.3	15.6
Collier County																
Immokalee	♂	Ad	—	—	—	49.3	54.8	49.2	—	30.2	14.1	—	19.1	30.1	18.0	17.2
	♂	Ad	—	—	—	45.8	51.2	47.5	—	—	15.6	—	18.2	28.2	17.5	16.6
Dade County																
Biscayne Gardens	♀	Ad	317	114	37	40.5	46.6	44.6	27.6	25.4	12.5	13.4	16.1	24.6	15.2	15.5
Miami	♀	Ad	366	102	35	40.6	46.3	43.3	28.2	25.3	12.6	11.9	15.7	24.6	16.2	15.1
	♀	Ad	350	100	36	40.9	46.4	43.7	28.2	25.6	13.3	12.5	16.1	24.9	15.9	15.4
De Soto County																
Arcadia	♀	Y	345	109	38	43.3	48.7	44.2	28.8	26.5	—	13.3	—	—	16.4	16.2
Hendry County																
La Belle	♂	Ad	367	115	41	44.7	51.0	47.4	32.0	28.0	14.5	16.2	17.9	27.2	17.0	16.1
Indian River County																
Sebastian	(♂)	Ad	—	—	—	43.0	48.2	45.3	32.9	26.7	13.2	12.7	16.0	26.7	16.0	15.2

TABLE 6—(*Continued*)

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
Okeechobee County																
Kissimmee Prairie	♂	Y	—	—	—	43.9	50.0	46.5	30.6	28.2	14.2	15.8	18.2	25.9	17.3	16.3
	♀	S	330	110	36	42.4	47.5	44.8	27.5	26.0	12.8	13.4	17.0	25.5	16.2	15.4
	♀	S	—	—	—	40.9	46.2	—	—	25.9	—	—	16.5	24.3	—	15.2
Orange Hammock, 3 mi. N. Ft. Kissimmee	♂	Ad	330	108	40	41.7	47.7	44.2	30.1	26.6	13.4	14.3	16.3	25.4	17.6	14.9
	♂	Ad	—	—	—	—	—	—	30.1	—	14.0	13.8	16.7	—	—	16.2
	♀	Ad	338	114	40	42.4	48.5	45.5	30.6	27.6	13.9	14.8	16.5	25.7	17.2	15.2
Palm Beach County																
Del Ray Beach	♂	Ad	356	111	32	42.5	48.4	45.8	30.9	27.0	14.2	15.4	17.2	25.3	17.3	15.6
Jupiter	♂	Y	316	111	32	40.5	45.8	42.0	28.6	25.7	13.2	12.9	15.9	24.6	15.4	15.0
Lantana	♂	Ad	335	92	—	—	—	—	28.7	—	13.8	14.3	16.4	—	—	15.1
	♂	Y	311	91	32	40.7	46.2	44.3	27.4	25.0	12.3	13.5	16.3	24.5	16.4	15.1
	♀	Ad	356	112	—	41.2	46.9	44.2	29.6	26.7	13.4	15.1	16.7	24.3	16.4	15.4
Lake Worth	♂	Ad	372	129	39	46.4	52.4	48.2	33.0	29.4	15.5	14.5	18.7	27.8	17.4	17.0
	♂	Ad	—	—	—	45.9	50.1	47.0	32.1	—	14.9	—	18.6	27.5	16.5	16.5
	♂	Ad	—	—	—	—	—	48.1	—	30.1	14.8	—	19.1	—	—	16.7
	♂	Ad	372	115	38	43.4	49.0	44.6	31.3	27.1	13.3	13.5	16.7	26.5	17.5	15.8
	♂	Ad	340	96	37	40.4	46.0	43.5	29.1	25.8	14.7	14.4	16.3	24.0	17.4	15.0
	♂	Ad	345	115	39	43.4	48.9	46.2	30.1	26.5	13.1	14.2	17.4	25.8	16.8	15.7
	♀	Ad	335	102	37	42.3	47.4	43.7	28.3	25.4	12.8	12.6	17.8	24.9	16.2	16.2
	♀	Ad	325	104	37	41.5	47.3	44.3	29.3	26.9	13.8	13.8	16.3	25.0	16.9	15.8
	♀	Ad	—	—	—	40.8	46.3	43.5	28.6	24.8	13.0	—	16.6	—	16.1	15.1
	♀	J	250	78	32	35.8	40.8	39.5	25.7	22.5	11.5	13.6	15.6	21.1	16.0	14.6
Palm Beach	♀	Ad	—	—	—	—	—	—	—	—	12.9	—	16.6	—	—	15.8
	?	Ad	—	—	—	—	—	—	29.3	—	13.4	13.5	16.7	—	—	15.9
	?	Ad	—	—	—	—	—	—	—	—	13.0	—	16.7	—	—	15.1
	?	Ad	—	—	—	—	—	—	—	—	—	—	17.3	—	—	14.9
	?	Ad	—	—	—	—	—	43.6	29.0	26.9	—	—	17.4	—	—	15.0
	?	Ad	—	—	—	—	—	—	—	—	12.6	16.1	18.6	—	—	16.0
	?	Y	—	—	—	—	—	—	—	25.8	13.2	14.5	17.4	—	—	15.8
	♂	S	—	—	—	—	—	—	—	—	—	—	17.9	—	—	16.8

lipan Biotic Provinces. Known from sea level to 3500 feet.

EXTERNAL MEASUREMENTS: Males, 510.5 (423–585), 200.3 (138–280), 49.0 (38–55); females, 474.8 (410–532), 184.8 (140–210), 45.9 (39–59).

CRANIAL MEASUREMENTS: Males: basilar length, 50.6 (43.3–54.3), condylobasal length,

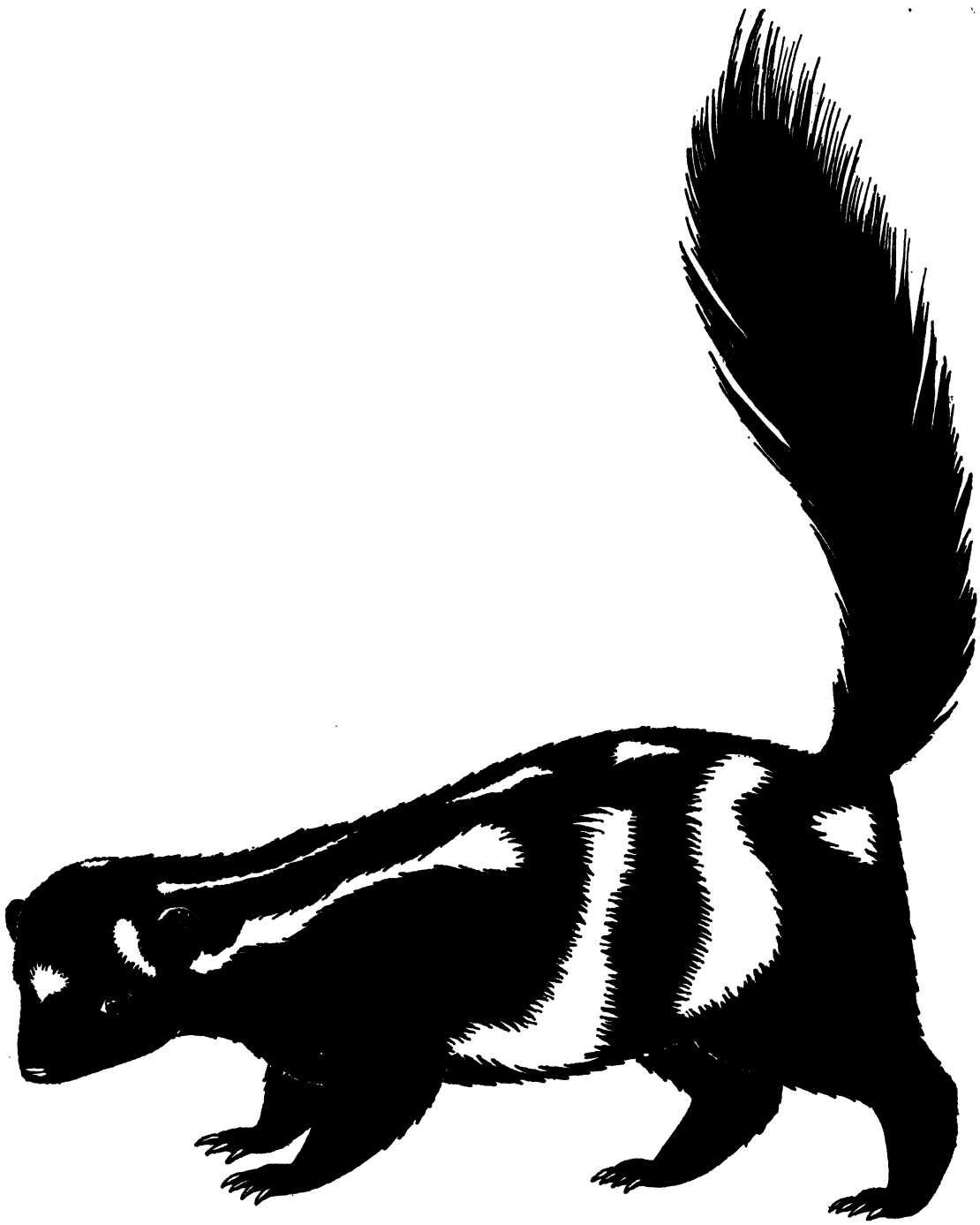

FIG. 10. Color pattern of *Spilogale putorius interrupta*. Drawn from an adult male, A.M.N.H. No. 143824, from Hamilton, Greenwood County, Kansas. Not to scale.

57.0 (49.2–61.2), zygomatic breadth, 34.7 (30.2–37.7), interorbital breadth, 15.1 (13.4–16.9), height of cranium, 17.9 (16.3–20.1), length of tooth row, 18.7 (16.9–20.1); females (in same order): 47.3 (42.7–52.4), 53.2 (48.6–58.8), 32.7 (29.8–35.9), 14.2 (13.0–15.9), 17.4 (16.0–19.6), 17.9 (16.5–19.0).

WEIGHT: Males, 661.1 (501–885); females, (453–475).

COLOR PATTERN: Nasal patch small. Dorsal stripes narrow, usually narrower than dorsal black stripe or black or white shoulder stripes; dorsals highly variable, usually interrupted at level of scapulae, always interrupted at level of posterior shoulder stripes; dorsals often interrupted in several places anterior to posterior end of shoulder stripes, sometimes existing only as postcranial spots and spots at level of posterior shoulder stripes; dorsals never connected to first vertical stripes; dorsals reappearing at level of first verticals as small dots, never continuing posteriorly to level of second verticals. Shoulder stripes narrow to medium, never narrower than dorsals, usually as broad as or broader than black shoulder stripes; pre-auricular patches variable from absent to medium; chin stripes absent. Lateral stripes variable, medium to narrow, rarely reaching upper forelegs, frequently extending less than half of length of shoulder stripes, sometimes interrupted and not connected to first vertical stripes. First vertical stripes broad, usually as broad as or broader than laterals, frequently the broadest stripes; first verticals never joined to dorsals. Second verticals variable, usually narrower than first verticals, sometimes reduced to small spots; second verticals generally connected to dorsals, but never connected anteriorly to dorsal spots at level of first verticals. Third verticals variable, absent to medium-sized rump patches, never forming stripes on forefeet or hind feet. Tail-base patch variable, from absent to (rarely) U-shaped, usually existing as small patches on sides of tail. Tail usually black above and below, with small tuft of white at tip, sometimes as much as one-fifth white middorsally, frequently totally black.

Spilogale putorius interrupta is closely allied to *S. p. putorius* and intergrades with it over a relatively large area in south-central United States. The color pattern of *interrupta* serves to distinguish it from the subspecies to the west and east, for it shows the greatest reduction of white markings of any of the known races of *Spilogale*.

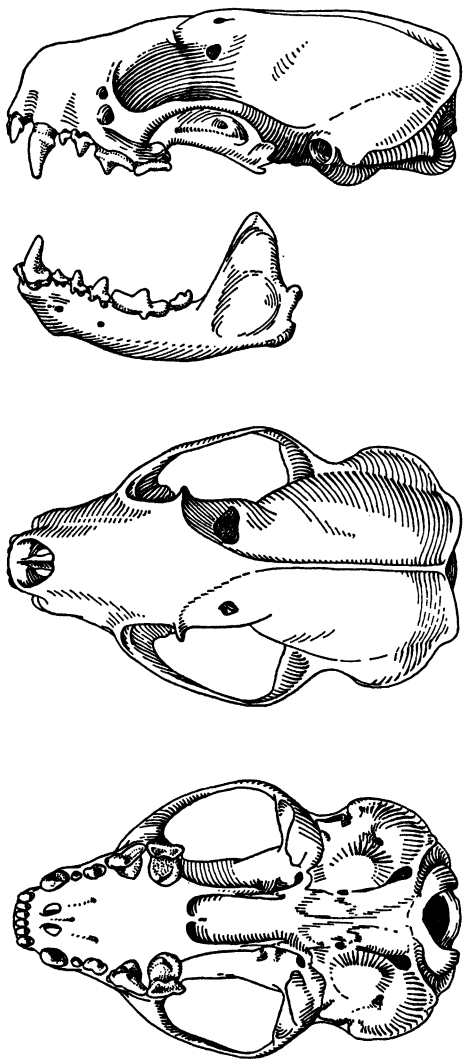

FIG. 11. Lateral, dorsal, and ventral views of the skull of *Spilogale putorius interrupta*, adult male, A.M.N.H. No. 148592, from Bone Creek, Brown County, Nebraska. ×1.

It is somewhat difficult to say whether or not Rafinesque's description of *Mephitis interrupta* fits this subspecies with sufficient accuracy to warrant its citation from that author. However, it is obvious that Rafinesque had a spotted skunk with much reduced markings, and, if it came from the Louisiana Territory, by the process of elimination, it must be the subspecies now called *interrupta*.

Furthermore, Lichtenstein's (1838) description and illustration apply directly to this subspecies, and, should Rafinesque's description be found wanting, the name *interrupta* may be ascribed to Lichtenstein, who also restricted the type locality to the upper Missouri River.

From *S. p. leucoparia*, *interrupta* differs in being 10 to 30 per cent larger in external measurements and in averaging slightly larger in most cranial measurements except interorbital and mastoid breadth.

From *Spilogale putorius putorius* from Greensboro, Alabama, *interrupta* is only slightly different, and in no measurements of the skull or body are the differences separable at the 84 per cent level. *Spilogale p. interrupta* has a slightly larger hind foot and smaller breadth of zygomatic arches and mastoids, but even in average, the differences are scarcely significant.

The character that is usually used to distinguish *interrupta* from all other subspecies of *Spilogale putorius* is the reduced amount of white on the body, and, in particular, the "totally black tail." Although it is true that the tail of some specimens of *interrupta* is entirely black and at a first glance most specimens seem to have no white on the tail at all, the majority of specimens of *interrupta* have some white hairs on the tail. The reduction of the amount of white on the body and tail of this subspecies seems to be clinal, the darkest specimens being those from the most northern parts of the range. Nevertheless, the extent of variation in any one population of these spotted skunks is great, and one can find specimens with the complete pattern present, but with the stripes quite narrow, and others with only a few white spots to indicate the lost stripes, in a series from the same locality. The amount of white on the tail increases to the south, so that more specimens from Oklahoma, for example, have white-tipped tails more often than do specimens from Kansas; and there is more white on specimens from Arkansas than there is on those from Missouri. Furthermore, it is the habit of fur trappers to pull the white hairs from the tails of specimens of *interrupta* because the blacker animals command a higher price. In 1952, at the fur markets in Saint Louis, Missouri, I saw fur sorters pulling white hairs from the tails of skins of *interrupta*, and they maintained that this was a standard practice in dealing with animals that had only a few white hairs on the tail. These factors would also further increase the likelihood that specimens of this subspecies would be characterized as having totally black tails.

South of the Canadian River, in northern Texas, there is a greater increase in white of the body and of the tail. As far south as Hill and Bosque counties, in Texas, specimens may be considered to be *interrupta*. South of this area *interrupta* grades into contact with *indianola* of Merriam. Merriam distinguished *indianola* only from *ambarvalis* of Florida, and he had no knowledge of the external characters of the animal when he described it. Howell, in his revision in 1906, found a very close resemblance of *indianola* to both *interrupta* and *putorius*. This resemblance is understandable, for, as I see it, *indianola* is based on specimens that show intergradation between both *interrupta* and *putorius*, as well as possibly having some elements of the western *leucoparia*.

In giving the average measurements for *leucoparia*, Howell (1906, p. 20) used three males from Eagle Pass, Samuels, and Laredo, Texas. The fact that the last specimen measures 445 mm. in total length and is thus 17 per cent larger than the other two, and that the tail of this specimen is also 17 per cent larger than that of the other two specimens, seems to have been disregarded by him, although he prudently excluded the measurements of the Laredo specimen from his table of cranial measurements. In size of skull the Laredo specimen is almost identical with two specimens of *interrupta* from Navasota, Grimes County, Texas, and is considerably larger than to be expected in *leucoparia*. In color pattern this specimen is more like *leucoparia* in having extensive white markings, and I regard it as an intergrade between *leucoparia* and the spotted skunks to the east. Intergradation between the eastern and western spotted skunks continues south of the Rio Grande in eastern Tamaulipas. Four specimens from La Pesca and Sierra de Tamaulipas are intermediate between *leucoparia* and "*indianola*" in total length, more like the latter in length of tail, and in cranial measurements resemble "*indianola*," particularly in

the narrowness across the mastoids. In skull proportions, however, these specimens are intermediate between *leucoparia* and "*indianola.*" In color pattern these animals have much white on the tail, and more white on the body than is characteristic of "*indianola.*" Two of the four specimens show an unusual branching of the dorsal stripes. The specimens from near the coast, at La Pesca, are even whiter than those from Sierra de Tamaulipas, but none of the stripes in any of these is so wide as those in *leucoparia.* The extensive whiteness of the tail may be a further continuation of the cline seen in *interrupta*, augmented by genes from the excessively white-tailed *leucoparia.* These specimens from Tamaulipas are also considered to be intergrades between the eastern and western subspecies.

Because the skunks formerly considered under the name of *indianola* are not distinguishable from specimens from many places in the ranges of *interrupta* and *putorius*, they are considered to be intergrades between *interrupta* and *putorius* and also to intergrade with *leucoparia.* The name *indianola* thus became a synonym, in part, of all three subspecies. For additional comments on the relationships between *interrupta* and *putorius*, see page 258.

Spilogale putorius interrupta seems to have extended its range in recent years. It was unknown in Minnesota in 1892 (Herrick), was found in Winona County in the southeastern part of the state in 1914, and by 1934 had been reported from Roseau County, near the Canadian border, as a straggler, and by 1945 was recorded as being taken regularly by trappers in the northwestern corner of the state (Swanson, 1945, p. 68). In 1946 the first spotted skunk from Wisconsin was captured in St. Croix County, although earlier searches for this genus in that state had been made (Scott, 1951, p. 363).

Mr. Edmund Hibbard, formerly with the North Dakota Game and Fish Department, has very kindly made available to me his precise notes on the invasion of spotted skunks in that state. The first record of this genus from North Dakota seems to have been the observation of a road kill near Braddock, Emmons County, in August, 1924. In the early 1930's a few specimens were taken in the southeastern counties, and in the later years of that decade and in the early 1940's they were not rare. By 1955 they had been seen or collected in all of the southern tier of counties east of the Missouri River, and as far north as Barnes and Burleigh counties. West of the Missouri River there is a single record, a specimen from Stark County obtained from a fur buyer who said that he had purchased it from a local trapper. The northernmost record in the state is that from near Wing, Burleigh County. The animal was shot in 1955 by a farm boy and was so unknown to the local people that it was mounted by a taxidermist. In general it seems that spotted skunks have invaded North Dakota in the last 30 years and are continuing to move northward.

The first authentic record of a spotted skunk from Iowa seems to be that of Parker (1870, p. 376) who obtained one at Grinnell, although Spurrell (1917, p. 280) states that they were known to early settlers in Sac County in 1858. In 1892 Nutting recorded the animal as new to the state, being unaware of Parker's publication. By 1900 spotted skunks were fairly common in some parts of the state.

In Kansas spotted skunks were not noted until 1887 (Cockrum, 1952, p. 259), and it is believed that spotted skunks have extended their range westward in that state in the past century.

The first specimen of *interrupta* from Colorado was taken in 1907 at the eastern edge of the state. Historical information concerning the presence of spotted skunks in other states in the range of this subspecies is lacking.

I have little doubt that the present range and abundance of spotted skunks in midwestern United States are not the same as they were prior to the Caucasian settlement of the region. *Spilogale p. interrupta* is a prairie animal; although it may have inhabited the forest edge, I doubt that it was found in dense forests. Certainly nowhere else in its range does the spotted skunk prefer this habitat, and there is no reason to believe or evidence that *interrupta* did. Habitat for *interrupta* in the eastern portions of the range would further have been limited by the high water table. What prairie existed was virtually marshland, and, until this area was drained,

the habitat was unsuitable for spotted skunks. The history of drainage in this area, commencing in 1870 and reaching its peak about 1920, coincides with the spread of spotted skunks. In addition to making the ground drier, the farming of this region also provided additional den sites for spotted skunks in the form of houses, outbuildings, haystacks, and debris, as well as introducing sources of food for the skunks in both winter and summer in the form of the commensal *Rattus norvegicus* and corn. Spotted skunks probably existed as far north as central Iowa before the coming of Caucasians, but most likely they occurred in small, semi-isolated populations wherever conditions were suitable. With farming in this region there came more suitable habitat by the cutting of forest and the drainage of land, as well as more den sites in the form of buildings, and an increased food supply from agricultural products and commensal rats, and the animals increased in numbers and spread.

Parmalee and Hoffmeister (1957, p. 261) present information, based on archeological deposits, to indicate that spotted skunks occurred in Illinois 4500 to 6500 years ago. No specimens of recent occurrence have ever been taken in the state. It is, of course, entirely possible that these animals reported by Parmalee and Hoffmeister were transported to Illinois by the Indians, for the site is on the banks of the Mississippi River, and no postcranial bones were reported. The presence of only skull elements warrants suspicion.

Certainly the prevailing conditions in Illinois prior to the arrival of the Caucasians were not favorable to *S. p. interrupta*. The forested parts of the state would not have favored their presence, and the prairie and lowlands were too moist for them. Nevertheless, the presence of *Spilogale* in Illinois 4500 to 6500 years ago is not in the least surprising, for this period coincides with a presumed warm, somewhat arid climate believed to have occurred at that time (Smith, 1957, p. 211), and the grasslands of Illinois present then would have provided a more suitable habitat. The xerothermic climate waned about 3000 years ago, and the increased moisture and rising water table would have tended to exclude *Spilogale* from the state.

This hypothesis receives support from the distribution of spotted skunks on the western side of the Mississippi River. Evidence from Missouri, for example, suggests that spotted skunks are absent, not numerous, or have only recently occupied the lowlands adjacent to the Mississippi (Bennitt and Nagel, 1937, pp. 121–122), and in Arkansas (Sealander, 1956, p. 284) the distribution of these animals indicates that the same is true. Presumable, also, is that this situation prevailed in Iowa, and thus the opportunities for spotted skunks to cross the Mississippi would have been reduced. Miller (1955, p. 122) suggested that there is now a large population of spotted skunks in eastern Iowa along the edge of the Mississippi River, and that trappers have reported seeing them on islands in the river. Although no specimen is known from Illinois, Howell (1910, p. 32) received reports that they were common in the southern part of the state. I questioned trappers in that area in 1951, and none had information that would support Howell's claim. In fact, most of the trappers were acquainted with *Spilogale*, but they admitted that they knew of it only from west of the Mississippi River. I suspect, however, that spotted skunks may now be present in northwestern Illinois, for the present habitat there seems satisfactory for them, and it would not be unlikely that they have been able to cross the Mississippi River in winter.

In the northwestern parts of its range, *S. p. interrupta* may come in contact with *gracilis*. No specimens are available from any localities, however, where the two might adjoin. I suggest elsewhere (p. 254) that in the Black Mesa region of Oklahoma, the two subspecies may be ecologically separated. No specimens are known from the plains of Colorado west of Wray, Yuma County, although R. G. Beidleman has informed me that he found a spotted skunk dead on a road near Fort Morgan, Morgan County, but did not save the specimen. It is not unlikely that *interrupta* is present in eastern Colorado or may soon occupy that area. E. R. Hall has shown me a picture sent to him by a trapper in eastern Wyoming in which a spotted skunk with the pattern of *interrupta* and one resembling *gracilis* are displayed, the report being that they were taken in the same spot.

If this is so, then *S. p. interrupta* and *S. p. gracilis* do not seem to interbreed in this part of their range. Howell (1906, p. 7) mentioned the presence of spotted skunks in the Black Hills of South Dakota, and he suggested that they may be referable to *tenuis* [=*gracilis*]. It would be most interesting to have specimens from this region, but unfortunately there do not seem to be any in collections. A specimen from Valentine, Cherry County, Nebraska (U.S.N.M. No. 244349), has the terminal third of the tail white above, and the terminal ventral half white, far more white than is usual for *interrupta*. A second specimen from the same area (M.V.Z. No. 76235) is a skull only, with external measurements. If the latter (419, 191, 38) are to be trusted, the animal shows some characters of both *interrupta* and *gracilis*. The specimen in the United States National Museum does not have the external measurements recorded, but the skin appears to be about the same size as in *interrupta*, the tail being slightly shorter, but not so short as in *gracilis*. Cranially both of these specimens fall within the range of *interrupta*, but on an individual basis they show some characters more like those of *gracilis*. The color pattern of the skin is no whiter than in some specimens of *interrupta* from Oklahoma, and the nose patch, while slightly larger than in other Nebraskan specimens, is definitely smaller than is characteristic of *gracilis*. Were it not for the distinctly white-tipped tail of the one, these specimens would not have attracted attention; the possibility that this is an atavistic mutation, of course, exists.

Specimens from every month of the year have been examined. Juveniles are present from July through September; subadults are present from August through December, most being caught in October; subadult-young adults have been collected from October through February; and young adults are present in collections from September to April. Young are probably born from June through August, and an adult female captured on October 11 is recorded as lactating.

Fifty-five per cent of the specimens examined are males. Of 115 adults, 50 per cent had lesions or swellings of the frontal sinuses caused by parasites. Lesions were present in 54 per cent of 98 young adults, 52 per cent of 21 subadult-young adults, and 31 per cent of 48 subadults. No lesions or swellings were noted in specimens younger than subadult.

SPECIMENS EXAMINED: Four hundred and ninety-four, from the following localities:

ARKANSAS: "Arkansas," 1 (U.M.M.Z.). *Boone County:* Four and one-half miles southeast of Bergman, 1 (M.V.Z.); 3 miles north of Olvey, 1 (M.V.Z.); 2 miles north of Zinc, 1 (M.V.Z.). *Montgomery County:* Four miles north of Oden, 1 (U.S.N.M.). *Sebastian County:* Just south of Fort Smith city limits, 2 (M.V.Z.). COLORADO: *Yuma County:* Wray, 15 (14 M.V.Z., 1 E.R.W.C.). IOWA: *Clay County:* Webb, 1 (A.M.N.H.). *Crawford County:* Section 23, Denison Township, 1 (I.S.C.). *Decatur County:* Leon, 1 (U.S.N.M.). *Des Moines County:* Five miles west of Burlington, 5 (U.I.M.N.H.). *Johnson County:* Iowa City, 7 (A.M.N.H.). *Greene County:* Section 27, Jackson Township, 1 (I.S.C.). *Lee County:* Section 17, Pleasant Ridge, 1 (I.S.C.). *Lyon County:* Section 20, Riverside Township, 1 (I.S.C.). *Marshall County:* Marshalltown, 3 (2 U.S.N.M.; 1 I.S.C.). *Monroe County:* Section 9, Franklin Township, 1 (I.S.C.). *Palo Alto County:* "Palo Alto County," 1 (U.M.M.Z.); Ruthven, 3 (U.M.M.Z.). *Poweshiek County:* Grinnell, 1 (M.C.Z.). *Story County:* Ames, 1 (I.S.C.); Colorado, 4 (D.R.D.). *Tama County:* Gladbrook, 1 (U.S.N.M.). *Van Buren County:* Lacey-Keosauqua State Park, 1 (I.S.C.). KANSAS: "Eastern Kansas," 66 (K.U.M.N.H.). *Brown County:* Horton, near Mission Lake, 1 (K.U.M.N.H.). *Coffey County:* Burlington, 1 (U.S.N.M.). *Dickinson County:* Herington, 1 (U.M.M.Z.). *Douglas County:* "Douglas County," 94 (84 K.U.M.N.H., 9 M.V.Z., 1 T.A.M.); Kaw River, 2 (K.U.M.N.H.); Lawrence, 9 (5 K.U.M.N.H., 3 C.N.H.M., 1 T.A.M.); ½ mile west of Lawrence, 1 (K.U.M.N.H.); 3 miles west of K.U. campus, 1 (K.U.M.N.H.); 7 miles south of Lawrence, 1 (K.U.M.N.H.); 7 miles southwest of Lawrence, 1 (K.U.M.N.H.); 7½ miles southwest of Lawrence, 9 (K.U.M.N.H.); 8 miles southwest of Lawrence, 1 (K.U.M.N.H.); 11 miles southwest of Lawrence, 2 (K.U.M.N.H.). *Greenwood County:* "Greenwood County," 8 (K.U.M.N.H.); Hamilton, 15 (10 K.U.M.N.H., 3 C.M., 1 A.M.N.H., 1 M.V.Z.); ½ mile northeast of Hamilton, 1 (K.U.M.N.H.); ¾ mile north of Hamilton, 1 (C.M.); ¾ mile northeast of Hamilton, 1 (C.M.); 8½ miles southwest of Toronto, 2 (M.V.Z., K.U.M.N.H.). *Harper County:* "Harper County," 1 (K.U.M.N.H.); Harper, 1 (K.U.M.N.H.). *Harvey County:* Halstead, 1 (K.U.M.N.H.). *Kiowa County:* Five miles north of Belvidere, 1 (A.M.N.H.). *Leavenworth County:* "Leavenworth County," 1 (K.U.M.N.H.); Fort Leavenworth, 1

TABLE 7

MEASUREMENTS OF *Spilogale putorius interrupta*

Measurement	No.	*M.* ±2 *S.E.*	*S.D.*	Extremes
Wray, Yuma County, Colorado				
Total length				
Male	1	485		
Tail				
Male	1	200		
Hind foot				
Male	1	52		
Head and body				
Male	1	285		
Basilar				
Males	8	50.38± 1.14	1.62	47.4–51.8
Females	4	46.73		44.1–49.0
Condylobasal				
Males	8	56.00± 1.29	1.83	53.3–58.3
Females	4	52.73		49.9–55.3
Occipitonasal				
Males	8	51.13± 1.34	1.90	48.1–53.0
Females	4	48.90		47.1–50.8
Zygomatic				
Males	8	33.25± 1.09	1.54	31.4–35.4
Females	4	31.30		30.6–32.8
Mastoid				
Males	8	29.50± 0.91	1.29	28.0–31.2
Females	4	28.90		28.0–30.0
Interorbital				
Males	8	15.00± 0.56	0.79	13.7–16.0
Females	4	14.70		13.8–15.9
Postorbital				
Males	8	14.81± 0.62	0.88	13.9–16.0
Females	4	15.15		15.0–15.4
Palatilar				
Males	8	20.25± 0.38	0.54	19.6–21.1
Females	4	18.88		18.0–20.0
Postpalatal				
Males	8	29.81± 0.94	1.33	28.0–31.8
Females	4	27.90		26.0–29.5
Cranium height				
Males	8	18.38± 0.37	0.53	16.7–18.4
Females	4	17.20		16.3–18.0
Tooth row				
Males	8	18.08± 0.42	0.60	17.3–18.8
Females	4	17.85		17.2–18.2
Iowa (all)				
Total length				
Males	8	505.63±24.10	34.11	457–555
Females	4	479.50		466–487
Tail				
Males	8	198.75±15.46	21.88	159–220
Females	4	182.00		180–184
Hind foot				
Males	7	52.07± 1.45	1.92	50–55
Females	4	49.00		41–59

TABLE 7—(*Continued*)

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Head and body				
Males	8	306.88±14.57	20.61	279–335
Females	4	297.50		282–305
Basilar				
Males	11	51.39± 0.91	1.51	48.6–53.6
Females	6	47.75± 0.87	1.07	46.3–48.9
Condylobasal				
Males	11	57.75± 1.01	1.67	55.0–60.5
Females	6	53.83± 0.73	0.90	52.1–54.9
Occipitonasal				
Males	11	52.61± 0.67	1.11	50.9–53.8
Females	6	49.33± 1.21	1.48	46.8–50.5
Zygomatic				
Males	9	35.92± 0.93	1.39	32.9–37.7
Females	5	32.68		32.0–33.5
Mastoid				
Males	12	31.13± 0.57	0.99	29.0–32.3
Females	6	29.08± 0.51	0.62	28.6–29.8
Interorbital				
Males	13	15.25± 0.30	0.54	14.1–16.2
Females	6	14.58± 0.34	0.42	14.1–15.2
Postorbital				
Males	12	15.13± 0.38	0.65	13.9–16.2
Females	6	15.08± 0.66	0.81	14.3–16.0
Palatilar				
Males	12	20.63± 0.45	0.78	19.4–22.3
Females	6	19.08± 0.44	0.54	18.2–19.5
Postpalatal				
Males	11	31.30± 0.67	1.12	29.3–33.2
Females	6	28.92± 0.76	0.93	27.5–30.1
Cranium height				
Males	11	17.70± 0.34	0.59	16.5–18.5
Females	6	17.17± 0.43	0.53	16.6–17.6
Tooth row				
Males	12	18.79± 0.29	0.50	17.8–19.4
Females	6	18.00± 0.44	0.54	17.2–18.5
Kansas (all)				
Total length				
Males	33	510.38±11.64	33.40	423–570
Females	25	478.10±13.27	33.17	410–532
Tail				
Males	30	200.50± 6.36	17.42	171–235
Females	25	184.10± 7.52	18.81	140–210
Hind foot				
Males	26	49.56± 1.04	2.64	42–53
Females	22	45.64± 1.17	2.75	40–51
Head and body				
Males	29	310.26± 8.99	24.23	248–343
Females	25	295.30±10.19	26.48	250–340
Basilar				
Males	60	50.65± 0.51	1.97	43.3–53.9
Females	52	47.47± 0.49	1.77	43.4–52.4
Condylobasal				
Males	62	57.03± 0.53	2.10	49.2–61.2

TABLE 7—(*Continued*)

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Females	53	53.50± 0.50	1.81	49.3–58.8
Occipitonasal				
Males	59	51.98± 0.46	1.75	45.7–55.8
Females	52	49.25± 0.42	1.52	45.9–54.0
Zygomatic				
Males	64	34.59± 0.35	1.40	30.2–36.9
Females	46	32.17± 0.40	1.35	29.8–35.9
Mastoid				
Males	58	30.43± 0.37	1.41	26.0–33.3
Females	55	27.49± 0.31	1.14	26.2–31.4
Interorbital				
Males	75	15.06± 0.16	0.71	13.4–16.8
Females	66	14.33± 0.13	0.51	13.0–15.9
Postorbital				
Males	70	14.89± 0.18	0.76	13.6–16.7
Females	60	14.61± 0.17	0.64	13.2–15.9
Palatilar				
Males	78	20.46± 0.18	0.80	18.6–21.8
Females	69	19.34± 0.17	0.71	17.6–21.2
Postpalatal				
Males	59	30.36± 0.34	1.29	26.8–33.6
Females	48	28.15± 0.36	1.26	25.9–31.3
Cranium height				
Males	60	17.94± 0.18	0.71	16.3–19.4
Females	54	17.51± 0.20	0.73	16.0–19.6
Tooth row				
Males	96	18.73± 0.12	0.61	16.9–19.7
Females	75	17.95± 0.13	0.55	16.7–19.0
Nebraska (all)				
Total length				
Male	1	523		
Females	3	487.33		470–508
Tail				
Male	1	223		
Females	3	193.67		175–203
Hind foot				
Male	1	47		
Females	3	44.33		39–48
Head and body				
Male	1	300		
Females	3	293.67		281–305
Basilar				
Males	7	50.18± 1.08	1.43	47.1–51.9
Females	5	47.98		46.6–48.7
Condylobasal				
Males	7	56.75± 1.08	1.43	54.4–58.0
Females	5	53.98		52.3–54.9
Occipitonasal				
Males	7	52.18± 0.86	1.14	50.6–53.2
Females	5	49.44		48.6–50.9
Zygomatic				
Males	7	34.68± 1.15	1.53	32.5–36.8
Females	4	32.95		32.8–33.3

TABLE 7—(*Continued*)

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Mastoid				
Males	7	30.39± 1.23	1.63	27.8–32.3
Females	4	29.30		28.6–30.2
Interorbital				
Males	7	15.25± 0.41	0.54	14.2–15.6
Females	6	14.33± 0.40	0.49	13.7–15.0
Postorbital				
Males	7	15.04± 0.61	0.81	13.8–16.2
Females	6	14.25± 0.59	0.71	13.2–15.1
Palatilar				
Males	7	20.04± 0.62	0.82	18.4–20.8
Females	7	19.54± 0.44	0.58	18.9–20.4
Postpalatal				
Males	7	29.96± 0.61	0.81	28.9–30.8
Females	5	28.14		27.2–28.9
Cranium height				
Males	7	18.25± 0.75	1.00	17.3–20.1
Females	5	17.68		16.7–18.2
Tooth row				
Males	7	18.54± 0.48	0.64	17.3–19.1
Females	7	17.61± 0.54	0.71	16.5–18.3
Oklahoma (all)				
Total length				
Males	16	501.57±14.97	29.94	430–555
Females	10	452.00±19.07	30.13	410–516
Tail				
Males	16	190.00±12.69	25.37	138–227
Females	10	176.50±12.13	19.17	142–204
Hind foot				
Males	16	48.81± 1.37	2.73	43–53
Females	7	44.21± 2.29	3.04	40–48
Head and body				
Males	16	312.82±10.19	20.37	278–350
Females	10	275.00±14.34	22.66	230–316
Basilar				
Males	18	50.39± 1.01	2.14	45.9–54.3
Females	8	47.00± 1.21	1.71	44.5–49.0
Condylobasal				
Males	20	56.70± 0.78	1.75	52.3–59.7
Females	8	53.19± 1.11	1.57	51.4–55.5
Occipitonasal				
Males	20	51.60± 0.83	1.85	47.6–54.5
Females	8	49.19± 0.93	1.31	47.8–50.5
Zygomatic				
Males	21	34.92± 0.50	1.15	32.1–36.8
Females	8	32.38± 0.71	1.01	30.9–33.9
Mastoid				
Males	21	30.23± 0.47	1.07	27.3–32.2
Females	8	28.56± 0.85	1.20	26.2–30.0
Interorbital				
Males	21	15.23± 0.27	0.61	14.1–16.9
Females	9	14.25± 0.39	0.59	13.2–14.8

TABLE 7—(*Continued*)

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Postorbital				
Males	21	15.18± 0.29	0.66	14.0–16.0
Females	8	14.63± 0.38	0.54	13.7–15.2
Palatilar				
Males	20	20.15± 0.34	0.75	18.5–21.2
Females	9	19.08± 0.48	0.72	18.0–20.3
Postpalatal				
Males	19	29.9 ± 0.60	1.30	27.0–31.2
Females	8	27.69± 1.08	1.53	25.4–29.0
Cranium height				
Males	17	17.87± 0.34	0.70	16.7–19.0
Females	8	17.25± 0.33	0.46	16.3–17.9
Tooth row				
Males	22	18.68± 0.34	0.79	17.3–20.1
Females	9	17.75± 0.43	0.64	16.9–18.5

(U.S.N.M.); Botany Bluff, 2 miles east and 6 miles north of Lawrence, 1 (K.U.M.N.H.). *Meade County:* "Meade County," 1 (K.U.M.N.H.); ½ mile north of Fowler, 1 (K.U.M.N.H.); 1½ miles north of Fowler, 1 (K.U.M.N.H.); 2 miles north of Fowler, 1 (K.U.M.N.H.). *Miami County:* Six miles north of Paola, 1 (K.U.M.N.H.). *Montgomery County:* Cherryvale, 1 (U.S.N.M.). *Nemaha County:* Sabetha, 9 (K.U.M.N.H.). *Phillips County:* Long Island, 5 (A.M.N.H.). *Pottawatomie County:* Onaga, 8 (U.S.N.M.). *Pratt County:* Cairo, 2 (U.S.N.M.). *Rawlins County:* Twelve miles south and 4 miles east of Atwood, 2 (M.V.Z.). *Reno County:* Two miles north and 2 miles east of Hutchinson, 1 (K.U.M.N.H.). *Riley County:* Manhattan, 2 (U.S.N.M.). *Thomas County:* "Thomas County," 1 (K.U.M.N.H.). *Trego County:* "Trego County," 8 (U.S.N.M.). *Wallace County:* Three miles southwest of Wallace, 1 (K.U.M.N.H.). *Woodson County:* Neosho Falls, 1 (K.U.M.N.H.); 1½ miles south of Neosho Falls, 2 (D.R.D.). MINNESOTA: *Fillmore County:* Lanesboro, 1 (U.S.N.M.). *Hennepin County:* "Hennepin County," 1 (M.M.N.H.). *Nicollet County:* St. Peter, 6 (M.M.N.H.). *Scott County:* Six miles southwest of Pike Island, 1 (M.M.N.H.). *Watonwan County:* Madelia Game Farm, 1 (M.M.N.H.). MISSOURI: *Andrew County:* One mile east and ½ mile north of Flag Springs, 1 (U.Mo.M.Z.). *Boone County:* Columbia, 1 (U.Mo.M.Z.). *Chariton County:* Along levee at headquarters, 1 (U.Mo.-M.Z.). *Cooper County:* One mile south of Lamine, 1 (K.U.M.N.H.). *Douglas County:* Blanche, 1 (M.V.Z.). *Harrison County:* Hunsicher's Ranch, Washington Township, 2 (M.V.Z.). *Howell County:* Pottersville, 1 (M.V.Z.); 5 miles south of West Plains, 1 (M.V.Z.). *Jackson County:* Courtney, 1 (U.S.N.M.). *Rolla County:* Seven miles south of Perry, 2 (U.Mo.M.Z.). NEBRASKA: *Adams County:* Near Hastings, 1 (Colo.M.N.H.); 5 miles north of Hastings, 1 (Colo.M.N.H.). *Antelope County:* Neligh, 1 (U.S.N.M.). *Brown County:* Bone Creek, 3 (A.M.N.H.); Plum Creek, 1 (A.M.N.H.). *Cherry County:* Niobrara Game Preserve, Valentine, 1 (U.S.N.M.); Section 34, Tier 33, Range 28, 9 miles west of Valentine, 1 (M.V.Z.). *Cuming County:* Beemer, 6 (U.S.N.M.). *Lancaster County:* Lincoln, 1 (A.M.N.H.). *Nemaha County:* London, 1 (U.S.-N.M.). *Saline County:* Four miles north of Tobias, 1 (M.V.Z.). *Sarpy County:* Fort Crook (probably), 6 (A.M.N.H.). *Webster County:* Bladen, 3 (A.M.-N.H.). NORTH DAKOTA: *Cass County:* Near Tower City, 1 (E.H.C.). *Dickey County:* Three miles west of Oakes, 1 (E.H.C.). *Emmons County:* Three miles southwest of Linton, 1 (E.H.C.). *Lamoure County:* One and one-half miles south and 1 mile west of Jud, 1 (E.H.C.). *Stark County:* Dickinson, 1 (E.H.C.). OKLAHOMA: "Oklahoma," 3 (2 O.A.M., 1 C.C.W.R.U.). *Alfalfa County:* Four miles east of Jet, 1 (O.A.M.). *Blaine County:* Two miles west of Longdale, 1 (O.A.M.); 6 miles north and 5 miles west of Watonga, 1 (M.V.Z.). *Cherokee County:* East side of Salt Fork, Arkansas River, 9½ miles east of Cherokee, 1 (U.S.N.M.). *Cleveland County:* O.U. campus, Norman, 1 (K.U.M.N.H.). *Comanche County:* Mt. Scott, 1 (U.S.N.M.); Cache Creek, Mt. Scott, 2 (U.S.N.M.); summit of Mt. Scott, Wichita Mountains, 1 (U.S.N.M.); Fort Sill, 1 (U.S.N.M.); 2 miles southeast of Fort Sill, 1 (U.S.N.M.). *Garfield County:* Four miles west and 3 miles north of Hunter, 1 (O.A.M.). *Jackson County:* One mile south of Blair, 1 (O.A.M.). *Kiowa County:* Three-quarters of a mile south of

Hobart, 1 (K.U.M.N.H.). *La Flore County:* Six miles southeast of Wister, 1 (K.U.M.N.H.). *Payne County:* "Payne County," 1 (O.A.M.); Bonner Lake area, 1 (O.A.M.); Lake Carl, Blackwell area, 1 (O.A.M.); college apiary, Stillwater, 3 (O.A.M.); near airport, 1 mile north of Stillwater, 1 (O.A.M.); 5 miles east of Stillwater, 1 (O.A.M.); near Yost Lake, 1 (O.A.M.). *Pittsburgh County:* Kiowa Agency, 1 (U.S.N.M.). *Pottawatomie County:* Santa Fe cut, Tecumseh, 1 (K.U.M.N.H.); 7 miles southeast of Tecumseh, 1 (K.U.M.N.H.). *Tulsa County:* Mohawk Park, 1 (U.M.M.Z.); Tulsa, 2 (U.M.M.Z.). *Washita County:* Three miles east and ¾ mile north of Lake Valley, 1 (K.U.M.N.H.). *Woods County:* Alva, 9 (5 C.N.H.M., 3 M.C.Z., 1 U.S.N.M.). SOUTH DAKOTA: *Clay County:* One and a half miles north of Vermillion, 1 (U.S.D.); 2 miles north and 1 mile west of Vermillion, 1 (U.S.D.); 3 miles north of Vermillion, 1 (U.S.D.); ½ mile east and 3 miles north of Vermillion, 1 (U.S.D.). *Day County:* Waubay Refuge, Waubay, 1 (U.S.N.M.). *Minnehaha County:* Sioux Falls, 1 (U.S.N.M.). *Roberts County:* Five miles south of Ortley, 1 (U.S.N.M.). TAMAULIPAS: "Tamaulipas," 1 (A.M.N.H.); La Pesca, 1 (K.U.M.N.H.); 3 miles north of La Pesca, 1 (K.U.M.N.H.); Sierra de Tamaulipas, 1200 ft., 10 miles west and 2 miles south of Piedra, 2 (K.U.M.N.H.); Victoria, 1 (U.S.N.M.). TEXAS: "Texas," 1 (A.M.N.H.). *Aransas County:* Rockport, 5 (4 A.M.N.H., 1 C.N.H.M.). *Archer County:* Ten miles west and 6 miles north of Archer City, 1 (M.U.Z.); 12 miles west and 6 miles north of Archer City, 1 (M.V.Z.). *Atacosa County:* "Atacosa County," 1 (K.U.M.N.H.). *Bee County:* Beeville, 1 (U.S.N.M.). *Bexar County:* San Antonio, 6 (A.M.N.H.); Somerset, 1 (K.U.M.N.H.); Tuleta, 1 (A.M.N.H.). *Brazos County:* Two miles northeast of Bryan, 1 (T.A.M.); College Station, 8 (6 T.A.M., 1 M.V.Z., 1 C.N.H.M.). *Calhoun County:* Indianola, 2 (U.S.N.M.). *Colorado County:* Six miles north of Eagle Lake, 1 (T.A.M.). *Cook County:* "Cook County," 1 (U.S.N.M.). *Galveston County:* One mile north of Texas City, 1 (M.V.Z.); Virginia Point, Galveston, 3 (U.S.N.M.). *Grimes County:* Navasota, 2 (U.S.N.M.). *Hansford County:* Berstein, 1 (W.L.C.). *Harris County:* Two and one-half miles north of Hackley, 1 (T.A.M.). *Hemphill County:* Canadian, 1 (U.S.N.M.). *Hill County:* Four miles west of Blum, 1(K.U.M.N.H.). *Jack County:* Seven miles south of Antelope, 1 (T.N.H.C.). *Jackson County:* Edna, 1 (U.S.N.M.). *Matagorda County:* Elliot's, 1 (U.S.N.M.). *Moore County:* Four miles west of Dumas, 1 (U.M.M.Z.). *Nueces County:* Corpus Christi, 6 (4 U.S.N.M., 1 A.M.N.H., 1 M.C.Z.). *Palo Pinto County:* Brazos, 3 (U.S.N.M.). *Travis County:* Eight miles east of Austin, 1 (T.N.H.C.). *Walker County:* Six miles east of Huntsville, 1 (T.A.M.). *Webb County:* Laredo, 1 (U.S.N.M.).

Spilogale putorius gracilis Merriam

Figures 12 and 13

Spilogale gracilis MERRIAM, September 11, 1890, North Amer. Fauna, no. 3, p. 83. Type: U.S.N.M. No. 17986/24897; adult male; collected by C. Hart Merriam, September 12, 1889; original no. 451; from Old Hance Trail, south rim, Grand Canyon of the Colorado River, altitude 3500 feet, north of San Francisco Mountain, Coconino County, Arizona.

Spilogale saxatalis MERRIAM, October 8, 1890, North Amer. Fauna, no. 4, p. 13. Type: U.S.N.M. No. 186454; adult male; collected by Vernon Bailey, November 13, 1888; original no. 384; from Provo, Utah County, Utah.

Spilogale tenuis HOWELL, December 16, 1902, Proc. Biol. Soc. Washington, vol. 15, p. 241. Type: U.S.N.M. No. 99365; adult male; collected by R. S. Weldon, November 13, 1899; original no. 2198X; from Arkins, Larimer County, Colorado.

DISTRIBUTION: Eastern Washington, eastern Oregon, northeastern California, eastward to extreme western Montana, eastern Wyoming, central Colorado, and possibly the Black Hills, South Dakota; south to northern New Mexico, northern Arizona, central Nevada, and east-central California. Intergrades with *phenax* and *latifrons* in northeastern California, with *phenax* in east-central California, and with *leucoparia* in northern and central Arizona and New Mexico; comes in contact with *interrupta* but intergradation is unknown (fig. 4). Lower Sonoran to Transition Life Zones; Montanian, Palusian, Artemisian, Coloradan, and Navahonian Biotic Provinces. Known from 550 to 8600 feet.

EXTERNAL MEASUREMENTS: Males, 416.1 (360–457), 145.4 (115–176), 46.2 (38–53); females, 375.6 (330–431), 136.5 (100–180), 40.0 (34–48).

CRANIAL MEASUREMENTS: Males: basilar length, 48.6 (43.9–52.4), condylobasal length, 55.2 (49.9–59.7); zygomatic breadth, 35.0 (30.9–38.7); interorbital breadth, 14.7 (13.1–16.8); height of cranium, 16.4 (14.8–18.7); length of tooth row, 17.9 (15.1–19.6); females (in same order): 44.0 (40.7–47.4), 49.8 (47.2–53.8), 31.5 (28.8–35.3), 13.4 (12.1–15.3), 15.1 (13.2–17.6), 16.6 (15.5–18.5).

WEIGHT: Male, 535.6; females, 303.3 (269.0–364.5).

COLOR PATTERN: Nasal patch medium to large, generally longer than broad, frequently with small posterior projection. Dorsal stripes broad to narrow, variable in relation to black dorsal or black shoulder stripes, but never broader than white shoulder stripes; dorsals frequently constricted or rarely interrupted at level of scapulae, usually interrupted at level of posterior shoulder stripes, but connected to first vertical stripes in some; dorsals reappearing at level of first verticals as small spots, sometimes connected with second verticals by narrow constriction. Shoulder stripes broad, broader than black shoulder stripes; pre-auricular patches medium, wider than anterior end of shoulder stripes; chin

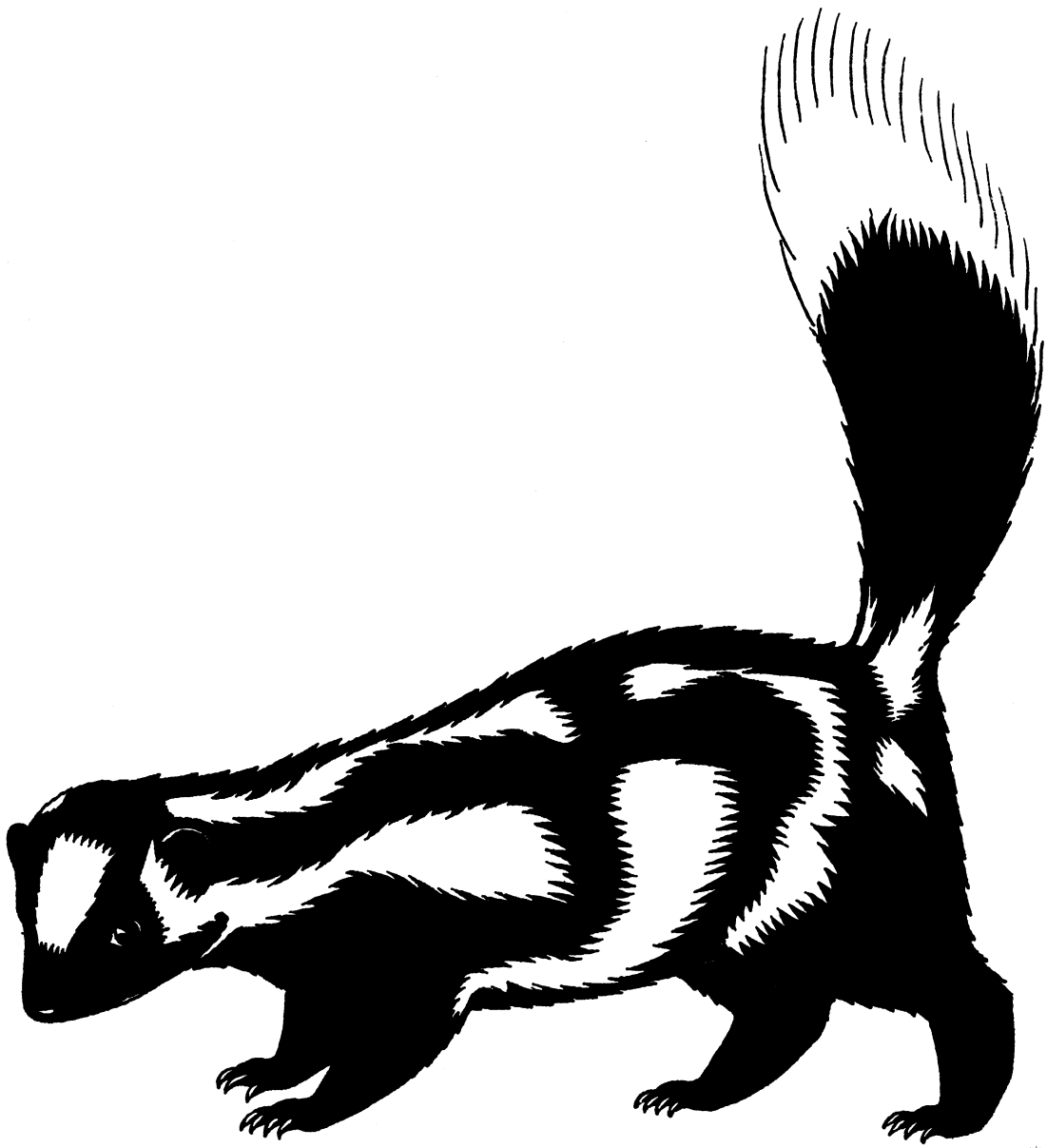

FIG. 12. Color pattern of *Spilogale putorius gracilis*. Drawn from an adult female, A.M.N.H. No. 3353/2632, from Estes Park, Larimer County, Colorado. Not to scale.

stripes rarely present. Lateral stripes variable, but never broader than first vertical stripes, and generally reduced in length or width or absent; laterals reaching upper foreleg rarely, generally extending only one-quarter of length of shoulder stripes. First vertical stripes broad, generally broader than any other stripes, and sometimes connected with dorsals at level of posterior shoulder stripes. Second verticals broad, usually but little narrower than first verticals, and almost always connected to dorsals. Third vertical stripes absent or reduced to medium-sized rump spots. No white on forefeet or hind feet. Tail-base patch variable, from absent to U-shaped, generally remaining only as patches on sides of tail. Tail about one-third white middorsally, less than half white along edges, and about half to two-fifths white ventrally.

Spilogale putorius gracilis and the closely related subspecies to the south, *S. p. leucoparia*, show the greatest amount of cranial variation of all the spotted skunks. At least six names have been applied to populations in the area from the Rocky Mountains to the Cascade Mountains and Sierra Nevada and from Idaho south to northern Mexico. The names involved in this complex are:

1890. *Spilogale gracilis* Merriam (September 11)
1890. *Spilogale leucoparia* Merriam (October 8, p. 11)
1890. *Spilogale saxatilis* Merriam (October 8, p. 13)
1891. *Spilogale phenax arizonae* Mearns
1897. *Spilogale ambigua* Mearns
1902. *Spilogale tenuis* Howell

In his revision in 1906, Howell gave *arizonae* specific rank and suggested that some specimens showed characters of *leucoparia* as well as of *ambigua*. In this same revision, Howell relegated *saxatilis* to subspecific rank under the species *gracilis* and thereby recognized its close resemblance to *gracilis*. In allocating specimens to taxa, Howell recognized *ambigua*, *gracilis*, *arizonae*, and *leucoparia* as occurring in central Arizona but on his distribution map showed these species occurring allopatrically.

Cary (1911, p. 181) mentioned that spotted skunks from Coventry, Montrose County, Colorado, are referable to *saxatilis*, but are not typical. Bailey (1931, p. 342) remarked

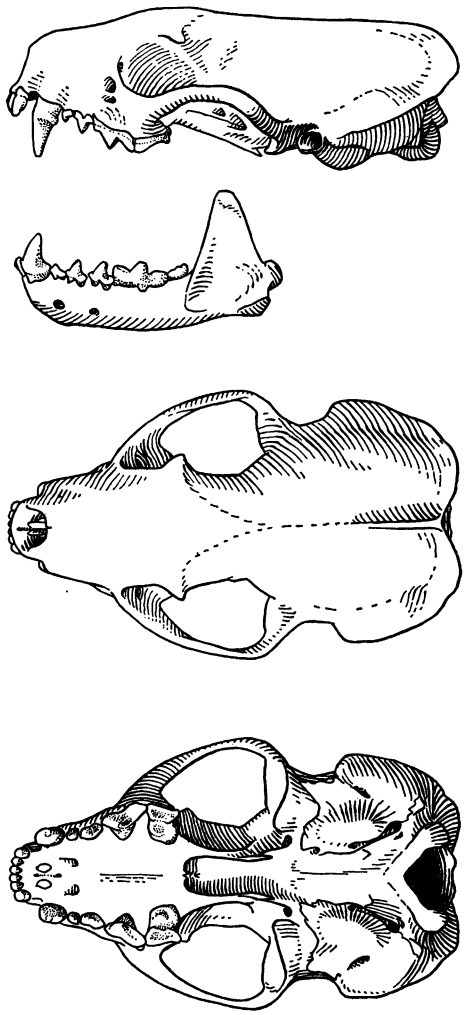

FIG. 13. Lateral, dorsal, and ventral views of the skull of *Spilogale putorius gracilis*, adult male, A.M.N.H. No. 123037, from Dry Fork, 6500 feet, White River, Rio Blanco County, Colorado. ×1.

that these same specimens show a close approach to *tenuis*.

Hall (1946, p. 203) stated that he could not find characters of taxonomic worth to distinguish the crania of *tenuis* from those of *saxatilis*, and for the differences between Nevadan *saxatilis* and *gracilis*, Hall cited Howell. Durrant (1952, p. 432) also gave Howell's characters for distinguishing between *saxatilis* and *gracilis* in Utah.

One major element of the confusion of these subspecies was resolved by Hall and Kelson (1952, pp. 330–334) who put into

synonymy the southern forms, *gracilis*, *leucoparia*, *arizonae*, and *ambigua*, with the oldest name, *gracilis*, prevailing. The basis for this conclusion was that the types and other specimens used by Howell were all encompassed in the range of variation expected in a single population of spotted skunks. Hall and Kelson also pointed out that *saxatilis* differs less from *gracilis* than previously thought, but that there is a difference in extent of white markings between the two kinds of skunks. They also stated that "both *S. g. saxatilis* and *S. g. tenuis* are 'poorly' differentiated from *S. g. gracilis* and from each other." Unfortunately they did not recognize the type of *gracilis* as an intergrade, tending more towards the northern subspecies than to the southern.

The cranial differences between all of these skunks are so inconsistent that in this case it seems that differentiation can best be made on the basis of color pattern, which seems to be more constant than skull characters. Spotted skunks from northern Arizona northward have the lateral white stripe reduced in both length and width. The character by which the northern subspecies (hitherto known as *saxatilis*, *tenuis*, and, in part, *gracilis*) can be distinguished from those to the south is that the lateral stripe is narrower or the same width as the first vertical stripe and may be reduced in length. There are other characters by which some populations of this northern form, for which the name *gracilis* is available and has priority, can be distinguished, but none, other than the narrow lateral stripe, that will distinguish all specimens. With the application of the name *gracilis* to this Great Basin and Rocky Mountain subspecies, the name *leucoparia* becames available for spotted skunks from central Arizona, southern and central New Mexico, western Texas, and northern Mexico. For additional discussion of the differences between *gracilis* and *leucoparia*, see the account of the latter (p. 302).

From *S. p. latifrons*, *gracilis* differs in being slightly smaller, in having a longer tail, in being narrower interorbitally and postorbitally, and in having a lower cranium and shorter tooth row (see fig. 14 and the account of *latifrons*, p. 329).

Compared with *S. p. interrupta*, *gracilis* differs cranially in being shorter in condylobasal, basilar, and occipitonasal length, but broader, actually and proportionately, in zygomatic and mastoid breadth. The extreme postorbital constriction of *gracilis* also serves to distinguish it from *interrupta*. In addition, *gracilis* has a shorter tooth row and lower cranium. In external measurements, *gracilis* is much smaller than *interrupta*, averaging 416, 145, 46 in males and 375, 137, 40 in females as compared with average measurements of 511, 200, 49 and 475, 185, 46 for males and females, respectively, of *interrupta*. In color pattern *gracilis* is readily distinguishable from *interrupta* in having up to one-third of the dorsal surface of the tail white, in having broader dorsal stripes, which are not interrupted anterior to the lumbar region, and in having a broad nasal patch.

Howell (1906, p. 21) did not compare *S. tenuis* with *saxatilis*. In comparing *tenuis* with *leucoparia*, Howell said that the skull of *tenuis* "is much longer and relatively narrower." Compared with six male topotypes of *leucoparia*, male spotted skunks from central Colorado (*tenuis*) are, in average, about 2.5 mm. longer and less than 1 mm. narrower, both of which are well within the range of variation of any population. Table 8 shows the averages of the measurements of six groups of spotted skunks arranged roughly by locality. The measurements of the various populations within these political confines are given in tables 9 and 10. Whatever differences exist between the averages of populations of *gracilis* are obviated by the variation within them. There are no consistent differences between these populations, and likewise there is very little difference between these populations and populations of *leucoparia* to the south.

The type of *gracilis* is an old, adult male. Measurements of its skull do not place it clearly in either the northern or southern subspecies, although, on the basis of its slightly shorter length, it could be considered to belong to the southern subspecies, *leucoparia*. On the other hand, the skin shows the type to have the lateral white stripes narrower than the first vertical extension of the lateral stripes, the only character that seems to distinguish the northern and southern populations with any degree of reliability. The type does not exhibit the extreme

TABLE 8

AVERAGE MEASUREMENTS OF MALE *Spilogale putorius gracilis*

	Idaho	Eastern Oregon	*"saxatilis"* Northern Nevada	Utah	Coventry, Colorado	*"tenuis"* Rocky Mountains, Colorado
Total length	400.5	412.5	409.8	430.8	431.7	420.8
Tail	147.0	142.5	133.0	160.0	144.7	157.8
Hind foot	45.0	46.6	46.3	45.2	46.3	47.3
Head and body	253.5	274.4	276.8	270.8	290.8	266.3
Basilar	48.9	47.3	49.0	48.6	49.9	49.7
Condylobasal	55.4	54.7	55.8	54.8	56.7	56.5
Occipitonasal	50.9	50.3	51.3	49.9	52.3	52.0
Zygomatic	36.0	35.7	34.7	34.5	35.7	36.0
Mastoid	30.9	30.7	30.8	30.3	31.5	31.6
Interorbital	14.5	14.6	14.7	14.6	15.1	15.0
Postorbital	13.5	13.4	14.3	13.8	13.8	14.3
Palatilar	19.9	19.6	20.1	19.7	20.6	20.3
Postpalatal	29.1	28.7	29.0	29.0	29.5	29.7
Cranium height	16.4	16.8	16.5	16.3	16.7	17.0
Tooth row	17.7	17.9	18.3	17.7	18.6	18.2

shortening of the lateral white stripes found in spotted skunks farther north, but it is clearly assignable to the northern subspecies. Other specimens from the Grand Canyon region also indicate that they are intergrades between *gracilis* and *leucoparia*.

The rather large differences in average size between the various populations of *gracilis* have led to much of the confusion in the classification of this subspecies and also of the subspecies to the south, *S. p. leucoparia*. The region occupied by *S. p. gracilis* is one of varied typography and climate. None of the authors who have dealt in detail with the distribution of mammals in this area (e.g., Hall, 1946; Durrant, 1952) has mentioned spotted skunks in relation to a given habitat except in the broadest of terms. Hall (1946, p. 39) showed spotted skunks occurring from the Lower Sonoran Life Zone into the Transition, but he regarded the Lower Sonoran resident as a different subspecies from the one occupying the other life zones. Likewise, Durrant (1952, p. 434) separated *saxatilis* [=*gracilis*] from *gracilis* [=*leucoparia*] along the Colorado River and suggested that intergradation between the two subspecies would be found to be in southeastern Utah. One of the two specimens from Navajo Mountain, San Juan County, Utah, is clearly an intergrade; the other resembles *gracilis* more than it does *leucoparia*.

The differences between populations of *S. p. gracilis* may be explained in several ways. Probably the simplest is that there is semi-isolation between the populations. Spotted skunks prefer broken, generally rocky habitats. In the Great Basin, habitat of this type occurs at the bases of isolated mountain ranges. The intervening low areas between these mountain ranges are not, however, barriers to the dispersal of spotted skunks. These lowlands are more in the nature of impediments to complete genetic interchange between populations. With a decrease in genetic interchange, it is logical that these partly isolated populations should show differences of greater extent than are found between populations that can interbreed more freely. Similarly, climatic differences present in this area are extensive, and the climate may be quite different in places only a few miles apart or a few hundred feet higher or lower in elevation. All these factors have undoubtedly played a part in causing the variations found in *S. p. gracilis*.

One might also explain these variations in light of the Pleistocene history of the Great

Basin, which has consisted of alternating periods of coolness and warmth and moisture and aridity. Durrant's (1952, pp. 491–518) review of the Pleistocene in Utah attempts to account for some of the subspeciation of rodents on the basis of these climatic changes. One could likewise explain the variations between populations of spotted skunks in this area in the same way that Durrant explains the subspeciation of *Thomomys bottae*, except that spotted skunks, being less restricted in movements, were presumably not isolated sufficiently long to form marked subspecies, or those subspecies that were formed were lost by the genetic influx that occurred when the Provo Pluvial ended and the southern spotted skunks could move northward into this area as it became increasingly warmer and drier.

The Colorado River does not seem to have served as a barrier to the dispersal of *Spilogale*. Although most of the specimens from north and west of the river seem to have the reduced lateral stripes characteristic of *gracilis*, the zone of intergradation between *gracilis* and *leucoparia* seems to be south and east of the river and between the river and the edge of the Mogollon Plateau.

Spotted skunks from the Front Range of the Rocky Mountains in Colorado are no more different cranially from other populations of *gracilis* than the spotted skunks from Nevada are, for example, from those from Utah. In external measurements they are most like Utah specimens, as well as much like specimens from Coventry, Colorado. Cranially they resemble specimens from Coventry most closely. In color pattern these eastern specimens of *gracilis* show the reduced lateral stripes that are characteristic of this subspecies, but not so markedly as in other populations to the west. The type and a topotype of *tenuis* each have the lateral stripes extending almost to the upper foreleg, and but slightly narrower than the first vertical stripes. In a specimen from Chugwater, Wyoming, the lateral stripes are more reduced than in the type, but are still more extensive than in most of the specimens of *gracilis* from, for example, Provo, Utah. Two specimens from Raton Range, northwestern Union County, New Mexico, have the lateral stripes very narrow and reduced in length. A specimen from Furnace Canyon, Baca County, Colorado, seems to show intergradation between *gracilis* and *leucoparia*. The lateral stripes in this specimen (M.V.Z. No. 78274) are short but very broad. The first and second vertical stripes are broad and more complete, as is characteristic of *leucoparia*, while the shortness of the lateral stripes implies a relationship to *gracilis*. Cranially two males from this locality are like *gracilis* in size, except for being somewhat wider interorbitally and postorbitally, thereby resembling *leucoparia*. These Baca County specimens are found near the range of *S. p. interrupta*, but in color pattern, at least, there is no indication of intergradation with that subspecies in this area. In 1953 I interviewed residents in the Black Mesa region, Cimarron County, Oklahoma. I asked what "civets" looked like and then specifically asked about the appearance of the tail. Some persons told me that the tail was tipped with white; others said that it was wholly black. When I asked where I could find these animals, those who had described them as having white-tipped tails invariably said that they were "up in the rimrock" of the Black Mesa. Those who spoke of black-tailed animals said that they were down "on the Cimarroon" River. From these descriptions it seems that at this point where *gracilis* and *interrupta* are found close together, they are separated by habitat preference and may not intergrade or interbreed. Specimens from this area would be of considerable interest. Glass (1949) made no mention of spotted skunks in the Black Mesa region.

Intergradation of *S. p. gracilis* with *S. p. phenax* and *S. p. latifrons* takes place in northeastern California. There is not a sufficient number of specimens with accurate data on locality, habitat, or altitude to explain in detail the modifications that occur here, and the only slight cranial differences between *phenax* and *latifrons* also tend to make description of the intergradation difficult.

Two adult males from the Warner Mountains near Alturas, Modoc County, California, resemble *gracilis* in being narrow interorbitally (average, 15.3), are intermediate in postorbital breadth (average, 14.5), and are like *gracilis* in having lower crania (average, 17.1) and shorter tooth rows (average,

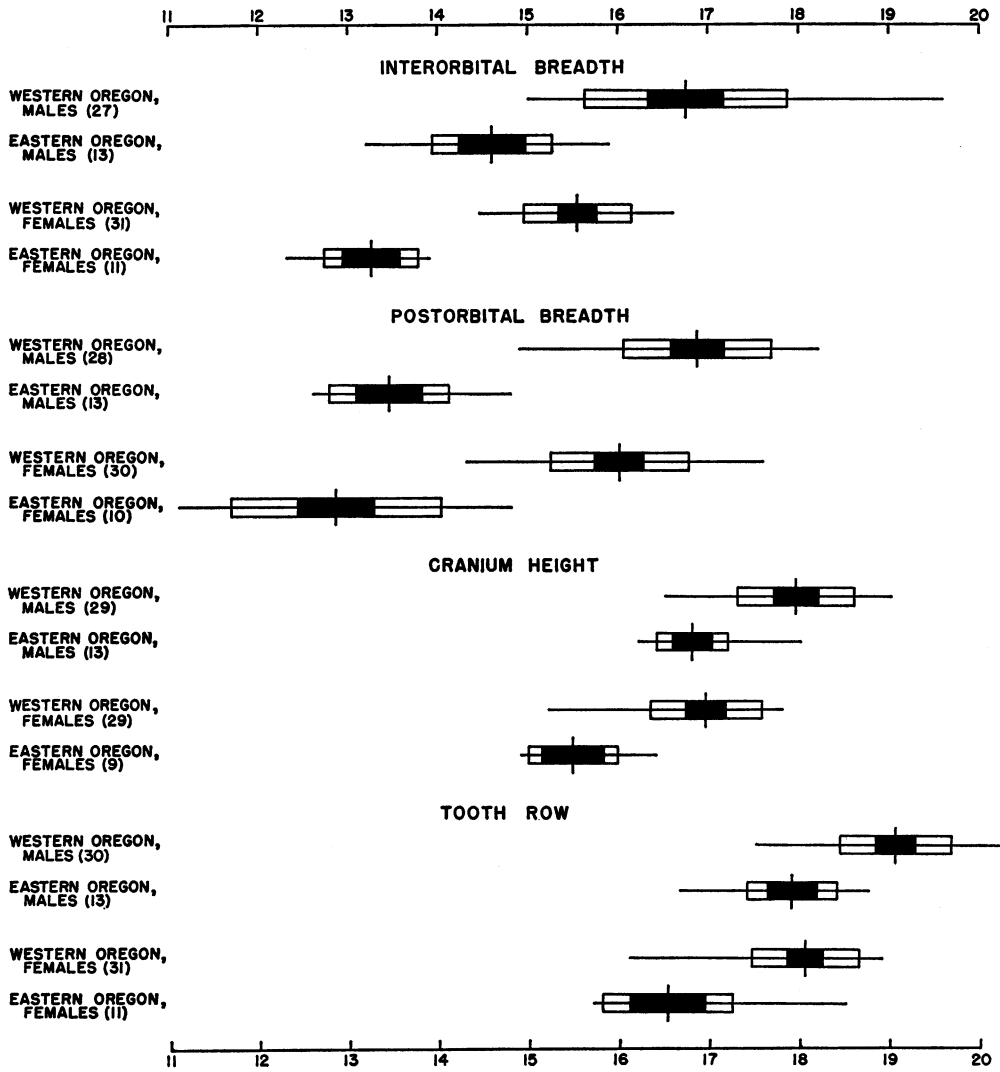

FIG. 14. Comparison of *Spilogale putorius gracilis* from eastern Oregon with *S. p. latifrons* from western Oregon. The vertical lines are the means, the solid bars represent two standard errors of the mean, the open bars are one standard deviation of the mean, and the horizontal lines are the range. The figures in parentheses are the numbers of specimens in each sample.

17.8). Two adult males from Adin, also in Modoc County, are somewhat more like *phenax* and/or *latifrons* in being broader interorbitally (average, 16.1) and postorbitally (average, 14.8) and in having longer tooth rows (average, 19.4). In height of cranium, the one measurable specimen is most like *gracilis* (17.2). A subadult female from 2 miles south of the Pit River Ranger Station in Modoc County, and a subadult-young adult male from Susanville, Lassen County, each seem to be closer to *gracilis* than to either of the other two subspecies. An adult specimen, probably male, from near Red Rock Post Office in Lassen County shows signs of intergradation between *gracilis* and *phenax* and/or *latifrons* in its wider interorbital and postorbital regions (15.6 and 14.2, respectively) and longer tooth row (18.6). In height of cranium it is more like *gracilis*. A young adult female from near Stacy, Lassen County, is clearly *gracilis* in all characters. An adult

male and a female (skin only) from Lake Tahoe and Tahoe City, Placer County, both seem to be *gracilis*. Specimens of *phenax* and/or *latifrons* examined from Siskiyou County show no signs of intergradation with *gracilis*, but material from the eastern portion of the county, where intergradation may occur, is lacking.

Intergradation between *Spilogale putorius gracilis* and *S. p. phenax* takes place along the slopes of the Sierra Nevada of eastern California. Although spotted skunks do not inhabit the highest portions of these mountains, they have been found as high as 8400 feet (Orr, 1943, p. 270), and genetic flow bebetween the two subspecies can be maintained by animals frequenting the lower passes of the Sierra Nevada. Some specimens from the western slopes of the Sierra show evidences of intergradation with *gracilis*. Four males from various localities in Yosemite National Park (altitudes from 3500 to 4000 feet) resemble *gracilis* in averages of interorbital breadth, cranium height, and length of tooth row, but seem closer to *phenax* in postorbital breadth. Six females from the same region are closer to *gracilis* in averages of interorbital breadth and length of tooth row but are intermediate in postorbital breadth and height of cranium. In color pattern the specimens from Yosemite show characters of both *phenax* and *gracilis*. Three specimens from Tuolumne County show intermediacy between *gracilis* and *phenax* in postorbital breadth. A male and a female from Rock Creek, 7500 feet, Mono County, also seem to be intergrades, resembling *phenax* in length of tooth row and being intermediate in other characters. A female from Sierra County is most like *phenax* but shows some resemblance to *gracilis* in the narrow postorbital region.

Spotted skunks from Inyo County, California, were identified as *gracilis* by Howell and later authors. Howell (1906, p. 23) mentioned that three specimens from the Panamint Mountains were even smaller in cranial measurements than the type of *gracilis* and that he found the spotted skunks of this group "extremely puzzling." Grinnell, Dixon, and Linsdale (1937, pp. 302–303) found that specimens from the lower end of Owens Valley, Inyo County, showed resemblances in color pattern to both *saxatilis* and *microrhina*, and they regarded a specimen from Carroll Creek as an intergrade between *microrhina* and *gracilis* on the basis of its cranial characters. In 1953 Dr. E. Raymond Hall told me that he intended to recognize as a distinct subspecies the spotted skunks from Inyo County, but at first withheld publication in deference to my studies, and later graciously offered to give me the manuscript of his description for my use. Although Inyo County specimens seem to be distinguishable from most spotted skunks from the surrounding region, it seems impractical at this time to recognize these animals by a subspecific name. Males from Inyo County are represented in collections by two adults and one subadult-young adult from the Panamint Mountains, altitude about 7800 feet; one adult from Wyman Creek, 5800 feet, in the White Mountains; three adults from Beveridge Canyon, Inyo Mountains; and one subadult-young adult from Carroll Creek, 5500 feet, in the Sierra Nevada. When the adults from these separate localities are considered together statistically, as they might be if they were a distinct subspecies or even a discrete population, some points come to light that suggest that these animals should not, at present, be granted taxonomic status. Despite the fact that some of these skunks are at least partially isolated from others in the sample, the coefficient of variation of both the external and cranial measurements is markedly lower than expected even in a homogeneous population. For example, compared with males from the Huachuca Mountains, Arizona, the Inyo County spotted skunks have significantly smaller coefficients of variation in the measurements of hind foot ($p=0.008$); head and body ($p=0.075$); occipitonasal length ($p=0.075$); mastoid breadth ($p=0.000$); interorbital breadth ($p=0.008$); and palatilar length ($p=0.070$). In external measurements the Huachuca Mountain specimens have an average coefficient of variation of 7.36; in the Inyo County material, it is 4.27. For the cranial measurements, the coefficients of variation average 4.11 and 3.13, respectively. One would normally except the coefficient of variation to be greater in a sample drawn from several localities than in one from a single, isolated

mountain range such as the Huachuca Mountains. Because the statistics of the Inyo County material are drawn from a sample of six specimens, and because these specimens are from several localities separated by considerable distance and possible barriers, it would be expected that the variation present would be greater than in a large sample from a single locality (i.e., the Huachuca Mountains), unless the small sample were, by chance, drawn from one of the extremes of the population, which I suspect is the case in this instance. If these six specimens are representative of the smaller animals in this area, it does not seem likely that the spotted skunks from Inyo County can be recognized subspecifically. If the sample is drawn from the larger animals, or if it approximates the true mean size of these skunks, then the Inyo County animals may be recognizable. Until additional material from this area is available for study, it seems inadvisable to provide these animals with a subspecific name.

Furthermore, the one measurement that deviates from the pattern of low variability shown by the Inyo County spotted skunks is that of postorbital breadth. Perhaps more than any other, this character serves to distinguish *gracilis* from the Pacific Coast spotted skunks, and the wide range in breadth (12.1–15.4) and high coefficient of variation (7.10) suggest that Inyo County specimens may be intergrades between *phenax* and *gracilis* and *leucoparia*. The evidence for intergradation is further supported by the relatively long and broad lateral white stripes of the specimens from Inyo County, a characteristic of *leucoparia*. None of the Inyo County animals, however, has these stripes so broad as in *leucoparia* from central Arizona, but neither are the stripes so narrow and reduced as in *gracilis* from northern Nevada, and in this regard the animals are somewhat like *phenax* from southern California.

Spotted skunks from Inyo County, California, should be considered as representatives of the subspecies *gracilis*, but they show some signs of intergrading with *leucoparia* and also with *phenax*.

Spilogale from the Raton Range, Union County, New Mexico, have much reduced lateral stripes and narrow dorsal stripes, and thus they are assignable to *gracilis*. A specimen from Colfax County, New Mexico, has short and only moderately narrow lateral stripes, which may indicate a tendency towards *leucoparia*. The skin of a specimen from Thoreau, McKinley County, New Mexico, has narrow lateral stripes and is referable to *gracilis*.

Most spotted skunks from northern Arizona show signs of intergradation with *leucoparia* in their somewhat more extensive lateral stripes. All specimens from north of the southern edge of the Colorado Plateau have the lateral white stripes narrower than the first vertical stripes, but in some the lateral stripes extend almost to the foreleg, which is farther than usual in specimens of *gracilis* from the more northern parts of the range of this subspecies. South of the escarpment, in central Arizona, spotted skunks have the lateral stripes approximately the same width as the first vertical stripes and thus show a somewhat closer relationship to *leucoparia* than do specimens from the Plateau. These intergrades from central Arizona, being closer to *leucoparia*, are listed in the account of that subspecies (p. 305).

Fifty-nine per cent of the specimens examined are males. Specimens of *S. p. gracilis* from every month of the year have been examined. Of the 156 specimens with data on date of capture, 56 per cent are adults, 26 per cent are young adults, 7 per cent subadult-young adults, 9 per cent subadults, 1 per cent juvenile-subadult, and 1 per cent juvenile. Ninety per cent of the young adults were captured between July and February, one being taken in March and one in April. Eighty-one per cent of the subadult-young adults were captured between July and November, and all of the subadults were taken between June and November. The two juveniles were captured in September, and the two juvenile-subadults were taken in June. The distribution of age groups suggests that young may be born from late March to October.

Lesions of the frontal sinuses in this subspecies are not common. Only 23 per cent of 83 adults and 13 per cent of 31 young adults showed signs of infection. No lesions or

swellings were noted in 31 specimens younger than young adult. The low percentage of infection in this subspecies may be a reflection of the aridity of the habitat, which may reduce the numbers of snails available as intermediate hosts.

SPECIMENS EXAMINED: Two hundred and nineteen, from the following localites:

ARIZONA: *Apache County:* Seven miles above mouth of Cañon de Chelley, 1 (U.S.N.M.). *Coconino County:* Bottom of Grand Canyon, 2 (U.S.N.M.); Hogan's, Grand Canyon National Park, 1 (G.C.N.P.M.); Indian Gardens, Grand Canyon National Park, 1 (G.C.N.P.M.); mouth of Bright Angel Creek, Grand Canyon, 1 (G.C.N.P.M.). *Mohave County:* Democrat Mine, Hualpai Mountains, 1 (S.D.S.N.H.); Cold Spring, 1950 ft., Chemhuevis Mountains, 1 (S.D.S.N.H.); 4 miles north of Wolf Hole, 1 (U.S.N.M.). *Navajo County:* One-quarter of a mile east of Navajo National Monument, Betatakin Pueblo, 6800 ft., 2 (M.N.A.); Keam's Cañon, 2 (M.V.Z., U.S.N.M.); Oraibi, 6000 ft., 1 (M.V.Z.). CALIFORNIA: *Inyo County:* Beveridge Canyon, Inyo Mountains, 6 (C.N.H.M.); Carroll Creek, 5500 ft., Sierra Nevada Mountains, 1 (M.V.Z.); ½ mile southwest of Junction Ranch House, 16 miles south-southeast of Darwin, 5725 ft., 1 (M.V.Z.); Panamint Mountains, about 7800 ft., 3 (U.S.N.M.); Swansea, 1 (M.V.Z.); Wyman Creek, 5800 ft., White Mountains, 1 (D.R.D.). *Lassen County:* Three miles northwest of Red Rock Post Office, 1 (M.V.Z.); 4 miles west-northwest of Stacy, 1 (M.V.Z.); Susanville, 1 (U.S.N.M.). *Mariposa County:* Cascade Falls, 3500 ft., Yosemite region, 1 (M.V.Z.); Cascade, 3500 ft., Yosemite National Park, 2 (M.V.Z.); El Portal, 2000 ft., 1 (M.V.Z.); Indian Cañon, 4000 ft., Yosemite Valley, 1 (M.V.Z.); Mirror Lake, 4000 ft., Yosemite National Park, 1 (M.V.Z.); Wawona, 1 (U.S.N.M.); Yosemite, 2 (U.S.N.M.); Yosemite Valley, 4000 ft., 1 (M.V.Z.). *Modoc County:* Adin, 3 (U.S.N.M.); 10 miles east of Alturas, 2 (M.V.Z.); Payne's Ranch, 12 miles east of Alturas, 1 (M.V.Z.); Warner Mountains, 12 miles east of Alturas, 1 (M.V.Z.); near Boles Spring Ranger Station, 30 miles north of Alturas, 1 (M.V.Z.); 2 miles south of Pit River Ranger Station, 1 (Cal. A.S.). *Mono County:* Rock Creek, 7500 ft., 2 (A.H.F.). *Placer County:* Auburn, 1 (U.S.N.M.); Lake Tahoe, 2 miles south of mouth of Truckee River, 1 (M.V.Z.); near Tahoe City, 1 (M.V.Z.). *Sierra County:* Vicinity of Gold Lake, 1 (M.V.Z.). *Tuolumne County:* Six miles south of Hetch Hetchy Valley, 2 (M.V.Z.); 2¼ miles west of Sonora Pass, 8400 ft., 1 (Cal.A.S.). COLORADO: *Baca County:* Furnace Canyon, 2 (M.V.Z.). *Boulder County:* Boulder, 4 (C.N.H.M.); Halfway House, Flagstaff Mountain, 1 (U.Colo.). *Chaffee County:* Salida, 3 (E.R.W.C.). *Costilla County:* Five miles south-southeast of Fort Garland, 1 (A.M.N.H.). *Denver County:* South Park, 1 (M.V.Z.). *Douglas County:* Goose Creek, 1 (Colo.-M.N.H.). *El Paso County:* Bear Creek Cañon, 7500 ft. Colorado Springs, 1 (E.R.W.C.); gulch tributary to Little Fountain Creek, northeast of Glencairn Ranch, 6000 ft., 1 (E.R.W.C.). *Fremont County:* Eighteen and a half miles south of Lake George, 1 (M.V.Z.); 20 miles south of Lake George, 1 (M.V.Z.). *La Plata County:* Bondad, 1 (U.S.N.M.). *Larimer County:* Arkins, 2 (U.S.N.M.); Estes Park, 1 (A.M.N.H.). *Mesa County:* Grand Junction, 1 (U.S.N.M.); 30 miles south of Grand Junction, 1 (C.M.); 3 miles south of Mack, 1 (C.M.). *Moffat County:* Near mouth of Hell Canyon, 1 (U.Colo.M.). *Montezuma County:* Ashbaugh's Ranch, 5200 ft., 1 (U.S.N.M.). *Montrose County:* Coventry, 6800 ft., 8 (5 E.R.W.C., 3 U.S.N.M.); Maverick Canyon, Coventry, 6800 ft., 1 (E.R.W.C.); West Paradox Valley, 1 (M.V.Z.). *Park County:* Shawnee, 1 (U.S.N.M.). *Rio Blanco County:* Dry Fork, 6500 ft., White River, 1 (A.M.N.H.). IDAHO: *Bannock County:* Justice Park, 6300 ft., 1 (M.V.Z.); Marsh Valley, 1 (U.S.N.M.). *Bingham County:* Taber, 1 (U.S.N.M.). *Blaine County:* Wood River, 1 mile north of Ketcham, 1 (M.V.Z.). *Boise County:* Horseshoe Bend, 1 (U.S.N.M.). *Cassia County:* Howell's Canyon, 8 miles south of Albion, 1 (M.V.Z.). *Gooding County:* Hagerman, 2 (M.V.Z.). *Idaho County:* Four miles southwest of Selway Falls, 5800 ft., 1 (Cal.A.S.). *Owyhee County:* Battle Creek, 20 miles southeast of Silver City, 1 (U.S.N.M.); Miller Gulch, 15 miles south of Hot Springs, 1 (U.S.N.M.). *Power County:* Three and a half miles southwest of American Falls, 4400 ft., 1 (M.V.Z.). MONTANA: *Ravalli County:* Tin Cup District, 1 (M.V.Z.). NEW MEXICO: *Colfax County:* Mouth of Cimarroncito Canyon, 7800 ft., Philmont Ranch, 1 (A.M.N.H.). *McKinley County:* Thoreau, 7500 ft., 1 (A.M.N.H.). *Union County:* Bear Cañon, Raton Range, 1 (U.S.N.M.); Oak Cañon, Raton Range, 2(U.S.N.M.); near base, Sierra Grande, 1 (U.S.N.M.). NEVADA: *Churchill County:* Two miles east-southeast of Fallon, 4000 ft., 1 (M.V.Z.). *Clark County:* One and a half miles northwest of Boulder City, 2500 ft., 1 (M.V.Z.); Charleston Mountains, 6000 ft., 2 (D.R.D.); St. Thomas, 1 (D.R.D.). *Douglas County:* Five miles south of Garnerville, 4700 ft., 1 (K.U.M.N.H.); Carson River, 4900 ft., 5 miles southeast of Minden, 1 (M.V.Z.). *Elko County:* Kleckner Creek, 4 miles east of Lee, Ruby Mountains, 2 (K.U.M.N.H.); 3 miles north of the Elko County line, 1 (K.U.M.N.H.); west side of Ruby

TABLE 9

MEASUREMENTS OF *Spilogale putorius gracilis*

Measurement	No.	*M.* ± 2 *S.E.*	*S.D.*	Extremes
Inyo County, California				
Total length				
Males	6	382.50±10.64	13.04	260–395
Females	3	354.67		330–367
Tail				
Males	6	140.00± 7.24	8.87	130–153
Females	3	129.33		120–136
Hind foot				
Males	6	42.67± 1.20	1.47	40–44
Females	3	39.00		37–40
Head and body				
Males	6	243.34± 7.71	9.45	230–256
Females	3	225.33		210–235
Basilar				
Males	5	45.25± 1.07	1.20	43.9–46.8
Females	3	42.20		41.7–42.5
Condylobasal				
Males	5	51.45± 1.17	1.31	49.9–52.8
Females	3	47.53		47.3–48.0
Occipitonasal				
Males	5	48.15± 0.97	1.09	46.8–49.6
Females	3	44.93		44.7–45.1
Zygomatic				
Males	5	31.55± 0.88	0.99	29.7–30.0
Females	3	29.87		29.7–30.0
Mastoid				
Males	5	28.35± 0.36	0.40	27.7–28.9
Females	3	25.40		25.3–25.5
Interorbital				
Males	6	13.67± 0.29	0.36	13.1–14.2
Females	3	12.53		12.1–12.8
Postorbital				
Males	6	13.67± 0.79	0.97	12.1–15.4
Females	3	13.50		13.0–14.4
Palatilar				
Males	6	18.83± 0.29	0.36	18.3–19.1
Females	3	17.33		16.7–18.2
Postpalatal				
Males	5	26.65± 1.17	1.31	25.4–28.1
Females	3	24.83		24.5–25.5
Cranium height				
Males	6	15.67± 0.48	0.59	15.1–16.8
Females	3	15.17		14.7–15.4
Tooth row				
Males	6	17.17± 0.29	0.36	16.8–17.8
Females	3	15.50		15.5–15.5
Coventry, Montrose County, Colorado				
Total length				
Males	6	431.67±24.20	27.22	400–465
Females	3	369.33		348–380

TABLE 9—(*Continued*)

Measurement	No.	*M.* ± 2 *S.E.*	*S.D.*	Extremes
Tail				
Males	6	141.671±2.07	13.58	127–160
Females	3	125.0		120–130
Hind foot				
Males	6	46.33± 4.20	4.72	40–51
Females	3	36.67		35–40
Head and body				
Males	6	290.84±14.08	15.83	268–305
Females	3	244.33		228–255
Basilar				
Males	6	49.92± 1.68	1.89	47.2–52.4
Females	3	44.20		43.5–44.8
Condylobasal				
Males	6	56.67± 2.22	2.50	53.8–59.7
Females	3	50.40		49.2–51.6
Occipitonasal				
Males	6	52.25± 1.88	2.12	49.8–54.6
Females	3	46.67		45.8–47.5
Zygomatic				
Males	6	35.67± 1.78	2.00	32.9–38.7
Females	3	31.40		30.4–33.1
Mastoid				
Males	6	31.50± 1.54	1.73	29.0–33.3
Females	3	27.37		26.6–28.3
Interorbital				
Males	6	15.08± 0.68	0.76	14.3–16.0
Females	3	13.63		13.3–13.8
Postorbital				
Males	6	13.75± 0.56	0.63	12.9–14.3
Females	3	13.60		13.4–13.9
Palatilar				
Males	6	20.58± 0.74	0.83	19.8–21.8
Females	3	18.03		17.6–18.4
Postpalatal				
Males	6	29.50± 1.25	1.41	27.2–31.4
Females	3	26.20		25.3–27.3
Cranium height				
Males	6	16.68± 0.86	0.97	15.3–17.8
Females	3	15.37		14.3–16.0
Tooth row				
Males	6	18.58± 0.83	0.94	17.4–19.6
Females	3	16.87		16.6–17.1
Eastern Oregon (all)				
Total length				
Males	8	412.50±20.26	28.68	380–455
Females	6	378.33±10.32	12.65	355–385
Tail				
Males	8	142.50± 9.34	13.23	115–155
Females	6	138.50± 9.80	12.00	120–155
Hind foot				
Males	8	46.63± 1.65	2.33	43–50
Females	6	40.67± 1.67	2.04	38–43

TABLE 9—(*Continued*)

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Head and body				
Males	8	274.38±16.36	23.15	240–300
Females	6	241.84± 8.46	10.36	227–253
Basilar				
Males	12	47.29± 1.04	1.80	44.6–50.2
Females	9	43.42± 1.12	1.68	40.7–45.8
Condylobasal				
Males	13	54.67± 1.04	1.87	50.9–57.0
Females	8	49.44± 1.22	1.72	46.2–52.4
Occipitonasal				
Males	13	50.25± 1.07	1.94	47.2–52.5
Females	8	45.25± 1.30	1.84	42.2–48.1
Zygomatic				
Males	12	35.67± 0.80	1.39	33.4–37.9
Females	11	31.93± 0.95	1.57	30.1–35.0
Mastoid				
Males	12	30.67± 0.53	0.91	29.5–32.4
Females	9	27.70± 0.65	0.98	26.2–29.5
Interorbital				
Males	13	14.60± 0.37	0.66	13.4–15.9
Females	11	13.25± 0.32	0.53	12.3–13.9
Postorbital				
Males	13	13.44± 0.37	0.67	12.6–14.8
Females	10	12.85± 0.74	1.17	11.1–14.8
Palatilar				
Males	13	19.64± 0.44	0.80	18.1–20.9
Females	10	18.30± 0.56	0.89	16.8–20.1
Postpalatal				
Males	12	28.71± 0.66	1.15	26.7–30.2
Females	7	25.68± 0.75	0.99	24.0–26.9
Cranium height				
Males	13	16.79± 0.23	0.41	16.2–18.0
Females	9	15.47± 0.34	0.52	14.9–16.4
Tooth row				
Males	13	17.90± 0.28	0.51	16.9–19.0
Females	11	16.53± 0.44	0.72	15.7–18.5
Utah County, Utah				
Total length				
Males	4	425.25		407–450
Females	3	389.00		362–405
Tail				
Males	4	155.50		140–176
Females	3	141.00		120–163
Hind foot				
Males	4	43.25		38–49
Females	3	40.33		38–41
Head and body				
Males	4	269.75		259–279
Females	3	248.00		237–265
Basilar				
Males	8	48.06± 1.36	1.93	44.8–50.6
Females	4	44.00		42.6–45.6

TABLE 9—(*Continued*)

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Condylobasal				
Males	8	54.31± 1.55	2.20	50.2–56.7
Females	4	49.63		48.4–51.2
Occipitonasal				
Males	8	49.38± 1.33	1.88	46.1–51.5
Females	4	45.98		44.0–47.3
Zygomatic				
Males	7	34.63± 1.46	1.93	31.9–36.7
Females	3	31.27		30.8–31.8
Mastoid				
Males	8	30.19± 1.06	1.50	27.8–31.9
Females	3	27.20		26.8–27.7
Interorbital				
Males	8	14.63± 0.54	0.76	13.2–15.6
Females	4	13.18		12.9–13.5
Postorbital				
Males	8	13.94± 0.47	0.66	13.3–15.2
Females	4	13.25		12.9–13.5
Palatilar				
Males	8	19.63± 0.59	0.84	18.4–20.6
Females	4	17.83		17.7–18.0
Postpalatal				
Males	8	28.75± 1.07	1.52	26.5–31.5
Females	4	26.00		24.8–27.5
Cranium height				
Males	8	16.56± 0.63	0.89	14.8–17.6
Females	4	15.18		14.2–16.0
Tooth row				
Males	8	17.56± 0.52	0.74	16.4–18.3
Females	3	16.58		16.2–17.2

Lake, 6 miles north of the Elko County line, 2 (K.U.M.N.H.). *Humboldt County:* Cottonwood Range, 1 (U.S.N.M.). *Lander County:* Peterson Creek, 7300 ft., Shoshone Mountains, 1 (M.V.Z.). *Lyon County:* Wilson Ranch, mouth of Wilson Canyon, 4600 ft., 2 (M.V.Z.); foot bridge, Wilson Canyon, 1 (M.V.Z.). *Nye County:* Potts, 2 (M.V.Z.); Willett Post Office, 1 (M.V.Z.). *Washoe County:* "Washoe County," 1 (U.S.N.M.); Pyramid Lake, 3950 ft., 1 (U.S.N.M.); north side of State Line Peak, 4400 ft., 1 (M.V.Z.). *White Pine County:* One-quarter mile west of Hamilton, 8200 ft., White Pine Mountains, 1 (M.V.Z.); 3 miles west of Hamilton, 8600 ft., White Pine Mountains, 1 (M.V.Z.); West Pole Canyon, Smoke Mountains, 1 (M.V.Z.); ½ mile west of Smith Creek Cave, 6000 ft., Mt. Moriah, 1 (M.V.Z.); 1 mile west of Smith Creek Cave, 6000 ft., Mt. Moriah, 1 (M.V.Z.). Not found: Spaulding Canyon, 1 (U.S.N.M.). OREGON: *Crook County:* Prineville, 1 (U.S.N.M.). *Deschutes County:* Hampton, 1 (U.S.N.M.). *Gilliam County:* Rock Creek, Sageview, 1 (U.S.N.M.); Poker Jim Ridge, Sageview, 1 (U.S.N.M.); Harney, 2 (U.S.N.M.); Narrows, 5 (U.S.N.M.); Middle Creek, 12 miles north of Diamond Steens Mountains, 1 (S.D.S.N.H.); Shirk, 1 (U.S.N.M.). *Jefferson County:* Haycreek, 1 (U.S.N.M.); Warm Spring River, 9 miles northwest of Agency, 1 (U.S.N.M.). *Lake County:* Twenty-one miles southeast of Fort Rock, 1 (S.D.S.N.H.); Fremont, 2 (U.S.N.M.); Plush, 1 (U.S.N.M.); Warner Lake, Plush, 3 (U.S.N.M.); Warner Valley, 1 (U.S.N.M.). *Malheur County:* Barren Valley, Cord, 3950 ft., 1 (U.S.N.M.); Barren Valley, Cord, 1(U.S.N.M.); Cedar Mountains, 2 (U.S.N.M.); 2 miles northwest of Riverside, 1 (U.S.N.M.). *Morrow County:* Ten miles southwest of Hardman, 2 (U.S.N.M.). *Sherman County:* Mouth of Deschutes River, Millers, 1 (U.S.N.M.). UTAH: *Garfield County:* "Bown's Res.," 6000 ft., east side of Boulder Mountain, 1 (U.U.). *Grand County:* Mouth of Florence Canyon, 4306 ft., 35

TABLE 10

MEASUREMENTS OF *Spilogale putorius gracilis*

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
ARIZONA																
Apache County																
Cañon de Chelley	♀	Ad	375	133	43	44.0	49.3	46.0	31.9	27.9	14.2	14.7	18.2	26.0	16.5	16.9
Coconino County																
Grand Canyon region	♂	Ad	—	143	38	45.7	51.7	48.4	32.2	30.6	13.9	13.4	18.9	27.0	16.8	16.9
	♂	Ad	400+	142+	46	47.0	53.7	50.1	34.0	29.7	14.8	12.0	19.3	27.8	15.6	18.0
	♀	Y	—	—	—	41.8	47.5	45.2	30.1	26.4	13.0	13.3	17.5	24.2	14.9	15.9
	♂	Sad	390	160	46	46.9	52.7	48.4	31.8	29.0	13.9	14.7	18.9	28.2	17.5	16.8
Mohave County																
Gold Spring, Chemhuevis Mts.	♂	Ad	405	143	44	49.8	56.1	52.0	34.4	30.5	14.8	14.5	20.1	29.5	16.1	18.4
Hualpai Mts.	♀	Ad	362	126	38	42.8	48.0	45.4	31.6	28.2	13.2	13.2	18.2	24.8	15.5	16.4
4 mi. N. Wolf Hole	♂	S	395	120	51	47.8	54.1	50.9	32.3	29.7	13.9	14.5	20.1	27.6	18.4	17.9
Navajo County																
Betatakin Pueblo	♂	Ad	380	142	47	—	54.5	—	34.4	—	15.1	14.1	20.3	—	—	17.2
	♀	Ad	345	142	47	41.1	46.5	43.9	28.8	24.6	12.5	12.8	17.0	24.1	15.1	15.2
Keam's Canyon	♂	S	426	142	47	49.4	56.0	49.6	34.0	31.6	15.0	15.1	20.0	29.5	17.0	18.1
	♀	S	—	—	—	40.4	46.0	45.6	31.0	27.3	13.2	13.9	17.1	23.5	15.7	15.9
Oraibi	♂	S	392	128	43	46.9	52.7	48.0	32.5	29.5	13.9	14.8	19.7	27.2	16.6	16.9
CALIFORNIA																
Lassen County																
3 mi. NW. Red Rock Post Office	♂	Ad	—	—	—	50.1	56.8	53.0	36.3	32.4	15.6	14.2	21.5	28.8	16.7	18.6
4 mi. WNW. Stacy	♀	Y	—	—	—	42.0	47.2	44.5	29.8	25.9	13.3	13.1	17.1	24.9	15.2	16.0
Susanville	♂	S-Y	—	160	39	—	—	—	31.7	26.5	13.7	13.1	19.1	—	15.7	17.3
Mariposa County																
Yosemite region	♂	Y	—	—	—	50.2	57.1	52.7	—	30.3	15.1	15.8	19.7	30.5	16.9	16.9
	♂	Y	—	—	—	45.8	51.7	48.0	31.1	27.3	13.5	14.9	19.5	26.2	15.1	15.1
	♂	Y	430	150	50	50.1	56.8	51.8	34.8	31.2	14.7	15.5	20.4	29.7	16.8	16.8
	♂	Ad	—	—	—	49.5	56.8	52.2	35.3	31.3	15.5	15.7	19.5	30.1	16.7	16.7
	♀	Y	—	—	—	—	—	—	31.4	28.4	12.7	13.9	18.9	—	15.9	17.1

TABLE 10—(*Continued*)

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
	♀	Y	395	155	44	46.2	52.0	47.0	34.4	28.8	14.2	14.9	19.2	27.2	17.6	17.9
	♀	Ad	390	135	40	46.5	52.0	49.4	31.3	28.0	13.4	14.5	19.2	26.6	15.5	16.7
	♀	Ad	382	150	42	44.1	50.2	48.0	32.4	28.9	14.3	15.2	18.7	25.4	15.6	16.8
El Portal	♀	Y	404	154	41	44.1	50.4	46.9	32.0	27.5	13.2	14.3	17.7	26.2	16.4	16.3
Wawona	♀	Y	—	—	—	44.9	50.7	45.8	31.5	28.5	13.2	—	18.3	26.7	16.3	16.9
Modoc County																
Adin	♂	Ad	413	133	47	—	—	—	—	—	15.4	14.6	20.6	—	—	19.5
	♂	Ad	430	133	53	51.7	57.9	52.8	37.2	31.7	16.8	14.9	21.3	30.1	17.2	19.3
	♀	S-Y	355	108	37	42.5	48.1	44.7	30.2	—	13.1	14.3	17.6	24.6	16.8	16.5
Near Alturas	♂	Y	—	—	—	48.8	55.2	50.9	35.4	30.1	15.1	15.0	20.0	28.4	17.0	17.8
	♂	Y	—	—	—	49.5	56.2	50.2	36.3	31.1	15.4	13.9	19.7	29.1	17.2	17.8
	♂	J-S	360	120	41	45.5	51.9	49.2	33.2	29.2	15.1	16.2	19.0	26.5	17.5	17.5
2 mi. S. Pit River Ranger Station	♀	S	340	132	40	42.1	47.7	44.8	—	27.1	12.2	13.6	18.0	24.2	16.3	15.6
Mono County																
Rock Creek	♂	Ad	—	—	—	50.1	57.4	51.3	38.3	34.3	14.9	16.1	20.9	29.5	16.8	19.1
	♀	Ad	—	—	—	45.5	52.0	47.6	33.4	28.6	—	13.6	18.9	26.9	16.2	17.8
Placer County																
Auburn	♀	S	385	146	44	44.9	50.4	46.1	30.4	27.0	13.1	13.9	18.4	26.4	16.6	16.7
Lake Tahoe	♂	Ad	390	141	42	44.7	51.0	47.5	33.8	28.4	13.3	13.5	18.6	26.2	15.5	16.6
Sierra County																
Vicinity of Gold Lake	♀	Ad	—	—	—	47.4	53.8	49.0	35.3	29.9	14.6	13.8	19.7	27.7	17.0	17.7
Tuolumne County																
6 mi. S. Hetch Hetchy Valley	♂	Y	—	—	—	45.6	51.8	47.2	32.1	28.8	13.7	14.3	19.6	25.9	15.1	17.0
	♀	Ad	—	—	—	45.2	51.0	47.7	31.5	27.7	13.3	14.7	18.9	26.7	15.3	17.3
2½ mi. W. Sonora Pass	♀	Y	367	120	40	43.2	49.5	44.9	32.2	26.8	13.3	14.8	18.1	25.1	16.4	16.4
COLORADO																
Baca County																
Furnace Canyon	♂	Ad	453	129	53	50.0	57.0	51.9	36.8	32.0	15.6	14.5	20.5	29.6	16.1	18.3
	♂	Ad	435	142	40	51.4	57.4	52.5	37.6	32.7	15.9	15.5	20.6	30.9	17.4	17.7
Boulder County																
Boulder	♂	Ad	—	—	—	51.2	58.1	52.6	35.5	31.1	14.2	13.9	21.0	30.7	16.9	18.4

TABLE 10—(*Continued*)

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
	♂	Ad	—	—	—	49.7	56.4	53.5	—	31.9	15.2	13.4	19.7	29.9	18.2	18.3
	♂	Ad	431	164	45	47.7	55.0	50.5	35.7	30.6	14.5	13.8	18.0	29.8	16.4	18.0
	♀	Ad	—	—	—	44.9	50.8	47.8	31.4	26.9	13.2	13.9	18.3	26.4	15.0	16.6
Chaffee County																
Salida	♂	Y	390	135	45	50.0	56.7	52.1	—	31.2	15.1	15.4	20.9	29.3	16.3	18.5
	♂	Y	408	—	—	49.9	56.3	52.2	37.8	32.0	15.8	14.2	20.8	29.3	16.1	18.6
	♀	Y	370	135	38	44.2	49.8	46.3	31.5	28.3	13.1	12.5	18.8	25.6	15.1	16.9
Costillo County																
5 mi. SSE. Ft. Garland	♂	S	412	155	51	47.5	55.0	51.4	35.8	31.8	14.4	14.6	20.8	28.1	18.4	17.7
Denver County																
South Park	♂	Y	457	173	48	51.8	57.9	53.5	—	32.9	15.2	15.0	20.7	31.1	17.2	18.2
El Paso County																
Colorado Springs	♂	Ad	418	159	51	48.8	55.8	51.5	36.1	31.5	15.2	14.6	20.4	28.7	17.2	18.0
Glencairn Ranch	♀	Y	420	180	41	44.3	50.3	47.0	31.6	27.5	13.3	14.4	19.0	25.2	16.2	16.9
Fremont County																
18½ mi. S. Lake George	♀	Ad	—	—	—	46.0	52.3	49.1	34.1	28.5	15.3	14.7	19.5	26.6	16.4	17.2
20 mi. S. Lake George	♂	Y	—	—	—	48.8	55.5	49.9	34.9	31.4	14.6	14.2	20.5	28.4	17.7	17.6
Larimer County																
Arkins	♂	Ad	450	165	51	52.1	58.5	53.1	34.7	32.3	14.2	13.6	21.8	30.2	15.9	18.3
	♀	Ad	381	150	—	44.9	51.1	47.3	32.8	28.7	14.7	16.0	18.8	26.5	17.1	17.8
Mesa County																
3 mi. S. Mack	♀	Ad	—	149	38	43.9	49.6	46.6	32.4	27.8	13.0	12.3	17.6	26.0	15.4	16.5
Grand Junction	♂	S-Y	425	177	47	48.4	54.9	50.6	—	31.5	14.7	15.2	20.4	28.1	17.3	18.1
30 mi. S. Grand Junction	♂	Ad	399	149	—	48.9	54.6	49.6	33.9	30.5	13.7	13.3	18.9	30.0	16.8	16.7
Moffat County																
Mouth of Hell Canyon	♂	S-Y	—	—	—	50.7	57.7	53.9	36.5	33.4	15.5	16.7	22.3	29.3	17.9	18.8
Montezuma County																
Ashbaugh's Ranch	♀	Ad	330	130	38	—	—	—	30.9	—	13.2	14.4	17.4	—	—	16.2
Montrose County																
West Paradox Valley	♀	Ad	384	113	35	45.5	51.4	48.3	32.3	28.6	14.3	14.1	18.0	27.3	16.1	17.3
Park County																
Shawnee	♂	Ad	—	—	—	49.7	56.5	52.4	37.0	31.7	15.7	14.7	21.4	28.9	17.3	18.6
Rio Blanco County																
White River	♂	Ad	400	140	49	50.6	57.5	52.3	35.2	31.6	15.6	12.8	21.3	29.3	16.4	18.3

TABLE 10—(*Continued*)

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
IDAHO																
Bingham County																
Taber	♂	Ad	—	—	—	48.6	54.9	50.1	36.3	32.0	14.8	13.1	19.5	29.4	15.5	17.5
Blaine County																
1 mi. N. Ketchum	♀	Ad	—	—	—	44.9	50.6	46.7	31.4	27.0	13.2	12.3	18.9	26.0	15.4	16.7
Cassia County																
8 mi. S. Albion	♂	Y	381	144	45	51.3	57.6	53.2	35.6	31.7	15.3	13.7	20.9	30.5	17.0	18.2
Gooding County																
Hagerman	♀	Ad	—	—	—	46.2	52.5	48.2	34.0	30.3	14.8	14.6	18.1	28.3	17.0	16.9
	♀	Ad	—	—	—	45.9	52.2	47.6	32.1	29.0	13.6	11.8	18.4	27.1	14.9	17.4
Idaho County																
4 mi. SW. Selway Falls	♂	S-Y	402	142	46	47.7	53.8	48.9	33.6	29.9	13.9	13.8	20.0	27.8	17.0	17.6
Owyhee County																
20 mi. SE. Silver City	♂	Y	—	—	—	47.2	54.2	49.1	—	29.4	13.5	14.1	19.4	28.4	16.3	17.5
15 mi. S. Hot Springs	♂	S	—	—	—	42.9	49.0	47.1	29.7	27.8	12.4	13.7	18.2	24.6	15.2	16.1
Power County																
3½ mi. SW. American Falls	♂	Ad	420	150	45	48.5	54.8	51.1	36.1	30.5	14.3	12.9	19.9	28.2	16.6	17.7
MONTANA																
Ravalli County																
Tin Cup District	♂	Y	413	137	52	46.3	52.4	47.5	31.8	28.4	13.8	13.3	18.7	27.6	15.9	17.5
NEVADA																
Clark County																
Charleston Mts.	♂	S-Y	369	132	39	44.0	49.6	45.3	32.2	28.2	13.1	13.6	19.0	24.7	17.0	16.1
	♀	Ad	337	111	34	42.0	47.8	45.5	29.0	25.8	12.6	12.1	17.3	24.8	15.1	16.2
St. Thomas	♀	Y	—	—	—	42.8	47.9	44.9	30.7	27.9	13.4	14.2	17.7	25.2	16.4	16.1
Douglas County																
5 mi. SE. Minden	♂	Ad	420	145	46	48.2	54.7	51.1	34.5	30.1	15.1	14.3	19.6	28.8	16.0	18.2
Elko County																
W. side Ruby Lake	♂	Ad	—	—	—	50.5	57.0	52.1	35.4	31.2	14.1	13.2	20.1	29.8	15.8	18.5
	♀	Ad	383	138	40	43.7	49.3	45.8	29.3	26.0	12.5	12.0	18.5	25.3	14.4	16.1
	♀	Y	364	125	40	43.2	49.5	45.8	30.2	27.4	12.9	12.1	17.7	25.6	14.7	15.9
Ruby Mts.	♂	Ad	—	—	—	48.8	55.5	50.6	35.2	31.3	14.1	13.9	19.2	29.6	16.7	18.0
	♂	Y	—	—	—	50.3	57.3	50.7	35.6	31.7	15.7	15.8	21.8	28.9	16.5	18.5

TABLE 10—(*Continued*)

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
Humboldt County																
Cottonwood Range	♀	Y	—	—	41	43.1	48.6	45.6	30.1	26.1	12.4	12.5	17.8	25.2	15.9	15.9
Lander County																
Shoshone Mts.	♀	Ad	351	120	38	42.6	47.8	45.0	28.8	26.6	12.3	12.0	17.1	25.4	13.2	16.3
Lyon County																
Wilson Canyon	♂	Y	401	118	47	48.4	54.6	49.6	33.9	30.0	14.7	14.5	19.9	28.5	16.5	17.9
	♀	Ad	355	130	38	43.9	50.2	47.5	31.2	28.7	13.5	13.4	17.8	25.9	15.2	16.6
	♀	Y	—	—	—	42.2	48.0	44.9	29.9	26.1	13.5	14.3	17.9	24.2	15.5	15.9
Nye County																
Potts	♂	Y	395	125	45	47.3	54.2	51.0	33.7	29.9	14.4	14.1	19.6	28.0	16.2	18.4
	♂	Y	423	144	47	49.8	56.8	52.8	34.4	30.7	14.0	14.0	21.3	28.8	17.1	18.2
Willett	♀	Ad	—	—	—	43.6	49.8	46.3	30.8	27.1	13.4	12.3	17.6	25.9	14.7	16.4
Washoe County																
Pyramid Lake	♂	S	—	—	—	46.1	52.2	48.6	31.2	28.7	14.0	14.7	19.0	27.1	16.1	17.4
White Pine County																
½ mi. W. Smith Creek Cave	♂	J-S	—	—	—	41.5	47.5	45.6	28.7	25.1	12.3	14.0	17.4	24.3	17.0	16.0
Smith Creek Cave	♀	J-S	305	120	40	40.1	46.2	44.0	28.5	25.3	12.8	14.0	16.7	23.5	16.0	15.6
Smoke Mts.	♀	Ad	—	—	—	42.7	49.8	46.0	30.9	25.8	13.9	13.6	17.5	25.2	15.3	15.9
White Pine Mts.	♂	S-Y	383	120	45	48.0	54.9	51.9	32.8	30.4	14.2	14.6	19.5	28.7	17.6	17.0
	♀	S	368	110	42	42.6	48.3	45.8	30.0	27.7	13.0	13.7	18.2	24.3	15.5	16.5
NEW MEXICO																
Colfax County																
Cimarroncito Canyon	♂	Ad	413	141	48	49.3	55.3	51.4	34.4	31.1	15.2	15.6	20.8	28.1	18.7	18.8
McKinley County																
Thoreau	♀	Y	362	100	40	44.2	49.2	46.1	29.9	27.7	13.4	14.7	18.1	26.2	16.7	15.8
Union County																
Raton Range	♂	Ad	450	170	50	50.8	57.8	52.5	37.0	31.5	15.4	14.8	20.8	30.1	17.6	19.1
	♂	S	—	—	—	—	—	—	33.7	31.7	14.5	14.3	20.1	—	17.3	17.7
	♀	S	400	160	47	46.1	51.9	49.3	32.9	29.0	14.3	15.0	19.6	26.7	17.0	17.0
Sierra Grande	♀	Ad	—	—	—	42.2	48.9	46.0	—	—	13.2	14.1	17.5	24.9	15.1	16.4
UTAH																
Juab County																
Deep Creek Mts.	♂	Ad	440	160	47	49.2	54.9	50.6	35.1	30.4	15.2	13.8	19.9	29.4	16.9	17.1

TABLE 10—(*Continued*)

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
	♂	Ad	—	—	—	50.9	56.9	51.5	34.3	31.4	14.3	12.7	20.4	30.3	15.7	18.2
	♂	Ad	—	—	—	48.8	55.0	50.7	34.0	30.1	14.2	13.4	19.5	28.9	15.3	17.7
E. Mt. Nebo	♀	Ad	431	156	46	43.7	50.1	46.0	31.8	28.3	13.1	14.2	18.8	25.0	16.0	17.0
Millard County																
16 mi. N. Deseret	♀	Ad	—	—	—	42.8	49.1	46.5	31.4	28.3	13.0	12.8	18.4	24.6	15.6	15.8
Piute County																
Kingston	♂	Ad	—	—	—	48.1	54.0	48.9	33.6	29.1	14.2	13.4	19.6	28.6	15.4	17.6
Salt Lake County																
Salt Lake City	♂	S-Y	400	131	45	46.4	53.0	49.2	32.4	29.1	13.5	14.4	18.8	27.9	16.0	17.6
	♀	Y	412	175	46	43.9	49.1	45.4	31.1	27.4	13.1	13.3	17.5	26.1	15.7	16.6
San Juan County																
13 mi. SE. Moab	♂	S	435	173	48	48.1	54.5	52.5	33.3	31.6	14.5	15.3	19.8	28.8	17.3	18.6
Tooele County																
W. of Grantsville	♀	Y	—	—	—	44.5	50.1	47.3	31.0	28.4	13.4	13.2	18.4	25.8	15.7	16.9
Washington County																
St. George	♂	Ad	436	171	49	50.2	56.8	51.9	34.5	31.3	14.5	14.4	20.5	30.0	16.1	18.5
WASHINGTON																
Whitman County																
Almota	♂	Ad	—	—	—	47.6	54.0	49.5	34.3	30.1	14.7	14.2	19.1	28.6	16.0	17.6
	♀	Ad	368	133	48	42.9	48.9	45.2	30.5	—	—	—	18.2	25.3	14.3	16.8
	♀	Ad	—	—	—	46.9	52.3	47.8	32.0	28.7	13.7	14.4	18.8	28.1	16.3	17.2
WYOMING																
Carbon County																
Fort Steele	♀	Y	—	—	—	45.8	51.3	46.1	30.6	28.6	14.5	13.9	19.1	26.8	16.7	16.7
Fremont County																
3 mi. S. Hudson	♀	Y	351	138	40	45.7	51.8	47.9	31.4	26.6	12.8	13.1	18.7	27.0	16.0	17.0
Split Rock	♂	Ad	—	—	—	48.1	54.9	49.5	35.5	30.5	14.6	13.8	20.2	27.9	15.6	17.8
	♂	S	—	—	—	44.3	50.6	46.1	—	—	14.6	15.3	18.6	25.8	16.9	16.9
Platte County																
Chugwater	♂	Ad	405	156	46	49.2	56.2	51.1	34.2	30.1	13.8	12.0	20.4	28.8	15.2	17.9

miles north of Green River, 1 (C.M.). *Juab County:* Above where Birch and Trout creeks merge, Bobcat Camp, 5600 ft., Deep Creek Mountains, 1 (U.U.); Bobcat Camp, 5600 ft., Trout Creek, 2 (U.U.); Bear Canyon Campground, 7000 ft., East Mt. Nebo, 1 (U.U.). *Millard County:* Sixteen miles north of Deseret, 1 (M.V.Z.). *Piute County:* Kingston, 1 (B.Y.U.). *Salt Lake County:* Mouth of Dry Canyon, 4300 ft., 1 (U.U.); 10,600 South 2000 East, Salt Lake City, 4590 ft., 1 (U.U.). *San Juan County:* Thirteen miles southeast of Moab, 1 (C.M.); 2 miles north of Navajo Mountain, 1 (M.V.Z.); 4 miles north of Navajo Mountain, 1 (M.V.Z.). *Sanpete County:* Fairview Canyon, 2 miles east of Fairview, 1 (B.Y.U.). *Tooele County:* Muskrat Spring, 1 (U.S.N.M.). *Uinta County:* Two miles east of Dragon, 1 (C.M.); Dry Fork Canyon, 10 miles northwest of Vernal, 1 (C.M.). *Utah County:* Cedar Valley, 1 (B.Y.U.); Maple Canyon, 1 (B.Y.U.); Nunn's Station, Provo Canyon, 2 (M.V.Z.); Provo, 4 (U.S.N.M.); 8 miles northeast of Provo, 1 (M.V.Z.); Provo Canyon, near Provo, 2 (M.V.Z.); Rock Canyon, Provo, 1 (B.Y.U.). *Washington County:* St. George, 1 (U.S.N.M.). WASHINGTON: *Whitman County:* Almota, 3 (U.S.N.M.); Almota, 550 ft., 1 (U.S.N.M.); Snake River Canyon, Almota, 1 (U.S.N.M.); Pullman, 1 (U.S.N.M.). WYOMING: *Carbon County:* Fort Steele, 1 (U.S.N.M.). *Fremont County:* Three miles south of Hudson, 1 (U. W.); Split Rock, 2 (U.S.N.M.). *Platte County:* Chugwater, 1 (U.S.N.M.).

Spilogale putorius leucoparia Merriam

Figures 15 and 16

Spilogale leucoparia MERRIAM, October 8, 1890, North Amer. Fauna, no. 4, p. 11. Type: U.S.N.M. No. 186452; young adult male; collected by Ira B. Henry, December 2, 1885; original no. 16, Merriam Collection No. 1701/2270; from Mason, Mason County, Texas.

S[pilogale]. texensis MERRIAM, October 8, 1890, North Amer. Fauna, no. 4, table following p. 15. The heading of the column under which Merriam gives measurements of *S. leucoparia* from Mason, Texas, is given this name, which is a *lapsus* and a synonym of *leucoparia.*

Spilogale phenax arizonae MEARNS, June 5, 1891, Bull. Amer. Mus. Nat. Hist., vol. 3, art. 19, p. 256. Type: A.M.N.H. No. 2480/1901; adult male; collected by E. A. Mearns, March 13, 1886; original no. 336; from Fort Verde, Yavapai County, Arizona.

Spilogale ambigua MEARNS, January 12, 1897, Preliminary diagnoses of new mammals of the genera *Lynx, Urocyon, Spilogale,* and *Mephitis,* from the Mexican boundary line, p. 3 (preprint of Proc. U. S. Natl. Mus., vol. 20, no. 1126, p. 460, December 24, 1897). Type: U.S.N.M. No. 35606/20302; adult male; collected by E. A. Mearns and F. X. Holzner, March 23, 1892; original no. 1547; from Eagle Cliff Mountain, latitude 31° 47′ N., 2 miles south of Monument No. 5 of Emory's Survey, about 4 miles south of Monument No. 15, Mexican Boundary Line, Chihuahua, Mexico.

DISTRIBUTION: From central Arizona, central New Mexico, and west-central Texas, south on the tableland of Mexico to southern Coahuila and central Durango. Intergrades with *interrupta*×*putorius* in Tamaulipas, with *gracilis* north of the edge of the Colorado Plateau, and with *angustifrons* at the northern edge of the Transverse Volcanic Biotic Province. Possibly intergrades with *interrupta* in western Texas, and with *phenax* ×*martirensis* in northwestern Sonora and southwestern Arizona (fig. 4). Lower Sonoran, Upper Sonoran, and Transition Life Zones; Sonoran, Apachian, Chihuahuan, Comanchean, Tamaulipan, and Potosian Biotic Provinces. Known from sea level to 8000 feet.

EXTERNAL MEASUREMENTS: Males, 404.0 (340–450), 143.2 (110–172), 45.2 (37–52); females, 361.1 (330–394), 131.2 (100–158), 40.3 (36–47).

CRANIAL MEASUREMENTS: Males: basilar length, 47.8 (42.3–53.3); condylobasal length, 53.9 (47.5–60.1); zygomatic breadth, 34.9 (29.5–38.3); interorbital breadth, 15.1 (13.1–17.9); height of cranium, 17.0 (15.1–18.9); length of tooth row, 17.5 (15.1–19.0); females (in same order): 43.4 (40.1–49.7), 49.2 (45.2–56.6), 31.0 (28.5–35.9), 13.9 (12.7–15.2), 16.2 (14.9–19.2), 16.5 (15.2–18.3).

WEIGHT: Males, 478.1 (255–600); females, 368.5 (325–412).

COLOR PATTERN: Nasal patch large, length about equal to breadth or longer than broad, frequently truncate distally. Dorsal stripes broad, generally as broad as or broader than dorsal black stripe, always narrower than shoulder stripes; dorsal stripes usually constricted at level of scapulae, rarely interrupted at scapulae; dorsals usually expanded anteriorly and at level of posterior shoulder stripes; dorsal stripes frequently joined to first vertical stripes or, if not, interrupted anterior to, at level of, or posterior to posterior end of shoulder stripes; never continuing to

level of first verticals without interruption; dorsals reappearing at level of first verticals as medium-sized spots, frequently continuing as narrow line to level of second verticals. Shoulder stripes very broad, broader than dorsal white or black shoulder stripes; preauricular patches large, generally extending dorsad as high as top of ears; chin stripes present in some. Lateral stripes broad, always as broad as, and generally broader than, first vertical stripes; lateral stripes reaching to elbow in some. First vertical stripes broad, but never broader than laterals; first verticals joining dorsals around posterior of shoulder stripes in some; in others first verticals reaching level of shoulder stripes proximally, but not joining dorsal spots at level of first verticals. Second vertical stripes broad, especially distally where as broad as lateral stripes; second verticals joining dorsals, sometimes connecting with spots at level of first verticals. Third vertical stripes large, always present as rump patch, frequently extending as stripe distally as far as knee. Small amounts of white present on forefeet occasionally, frequently on hind feet. Tail-base patch varies from absent to U-shaped. Tail about one-third white middorsally, white extending halfway down edges, and about two-thirds white ventrally.

Howell (1906) assigned specimens from Arizona to four species: *ambigua*, *gracilis*, *leucoparia*, and *arizonae*. Under remarks on color pattern, he says, concerning *gracilis:* "similar . . . to *S. leucoparia*"; concerning *ambigua:* "essentially as in *gracilis*"; and concerning *arizonae:* "as in *leucoparia* and *gracilis*." In essence, then, he found little difference in color pattern between these four "species." On his distribution map Howell shows these four species occurring allopatrically, but under the lists of specimens examined, he has, for example, specimens from the vicinity of Fort Verde (the type locality of *arizonae*) assigned to the species *arizonae*, *ambigua*, *gracilis*, and *leucoparia*. Howell assigned specimens from the Huachuca Mountains to both *ambigua* and *arizonae*. In our current understanding of systematics, distributions like these could occur only if these four species do not interbreed, i.e., are truly species in the biological sense, but Howell (1906, p. 23) states, "These four forms either intergrade or hybridize in this region of central Arizona, with the result that many individuals cannot satisfactorily be referred to one or the other. There are no appreciable color differences, and in identifying specimens dependence must be placed alone upon skull characters."

The skull characters on which Howell separated these four species are those of height of cranium and inflation and spread of the mastoids, with *ambigua* considered as typical of the high-crowned and narrow forms, and *arizonae* typical of the low-crowned and wide forms. He found a specimen from Whipple Barracks, Arizona, intermediate (a hybrid rather than intergrade) between *arizonae* and *ambigua;* a specimen from Pinal County, Arizona, intermediate between *leucoparia* and *arizonae;* and a specimen from near Fort Verde, Arizona, intermediate between *gracilis* and *ambigua*.

Hall and Kelson (1952, pp. 330–334) pointed out that most of the differences between these four species are ones that are encompassed by individual and age variation, and put all four species into synonymy, using the oldest name, *gracilis*, for all four. Under the account of *gracilis*, I indicate that the type of *gracilis* is an intergrade between the northern Great Basin subspecies (hitherto known as *saxatilis*) and the southern form (called *gracilis* by Hall and Kelson), that on the basis of color pattern the type of *gracilis* belongs to the northern subspecies, and that that name has priority over *saxatilis*. The next available name for the southern subspecies is *leucoparia* (Merriam, 1890b, p. 11).

Hoffmeister and Goodpaster (1954, pp. 74–75), in comparing specimens from the Huachuca Mountains, Arizona, found both "*arizonae*" and "*ambigua*" present, and in analyzing the differences found that "In the slant-sided ('*arizonae*') skulls, the skulls are consistently broader across the zygomatic arches and the mastoidal bullae are more greatly inflated. This is particularly noticeable when the skull is viewed from above; the sagittal crest is higher and more prominent, and the skull is broader through the interorbital region." These authors suggest that these differences are ones of age and correlate them with tooth wear, indicating that with increased age the mastoids and

zygomata expand, and the sagittal crest increases in height. Oddly, they suggest that the interorbital region decreases in breadth with age (possibly because this is so in *Mustela*), despite the fact that they have indicated that the "older" animals are wider interorbitally. Actually, the greatest increases in cranial size that take place in young adults are in those characters typical of "slant-sided" skulls: zygomatic, mastoid,

FIG. 15. Color pattern of *Spilogale putorius leucoparia*. Drawn from an adult male, A.M.N.H. No. 136421, from 3 miles south of Government Spring, 4500 feet, Brewster County, Texas. Not to scale.

and interorbital breadth, as well as increasing development of the sagittal crest. The least increase in size in this age group is in height of cranium and postorbital breadth. Thus a young adult animal might have the cranium as high as an adult, but it would be narrower across the zygomatic arches, the mastoids, and interorbital region, and would have a lower sagittal crest.

Comparison of populations of spotted skunks from the vicinity of Mason, Mason County, Texas (type locality of *leucoparia*), the Animas Mountains, Hidalgo County, New Mexico (in the range of *ambigua* according to Howell's map), from the Huachuca Mountains, Cochise County, Arizona (in the range of *arizonae* according to Howell's map, and from which he assigned specimens to both *arizonae* and *ambigua*), and from Yavapai County, Arizona (near the type locality of *arizonae*), reveals that none of these populations is separable from another at the 84 per cent level, and, further, that there are no significant differences in the means of either external measurements or cranial measurements between any of these populations. In the absence of differences in color pattern or in external or cranial measurements, I regard the animals that have been named *arizonae*, *ambigua*, and *leucoparia* as representatives of a single subspecies, for which the name *leucoparia* has priority.

From *S. p. gracilis*, which is found to the north, *leucoparia* can be distinguished with certainty only by the longer and broader lateral stripes. Topotypes of *gracilis* compared with topotypes of *leucoparia* are not distinguishable at the 84 per cent level in either external or cranial measurements, and, further, there is no significant difference in the mean of any measurement. As indicated in the account of *gracilis*, there is considerable difference between populations from various parts of the range of that subspecies, and the differences between any population of *leucoparia* and any of *gracilis* are of no greater magnitude than the difference that is found within either subspecies. In general, however, *gracilis* averages 2 to 3 per cent longer in external measurements, and about 2 per cent larger in cranial measurements excepting mastoid, interorbital, and postorbital breadth and height of cranium, in which *leucoparia* averages 3 per cent larger.

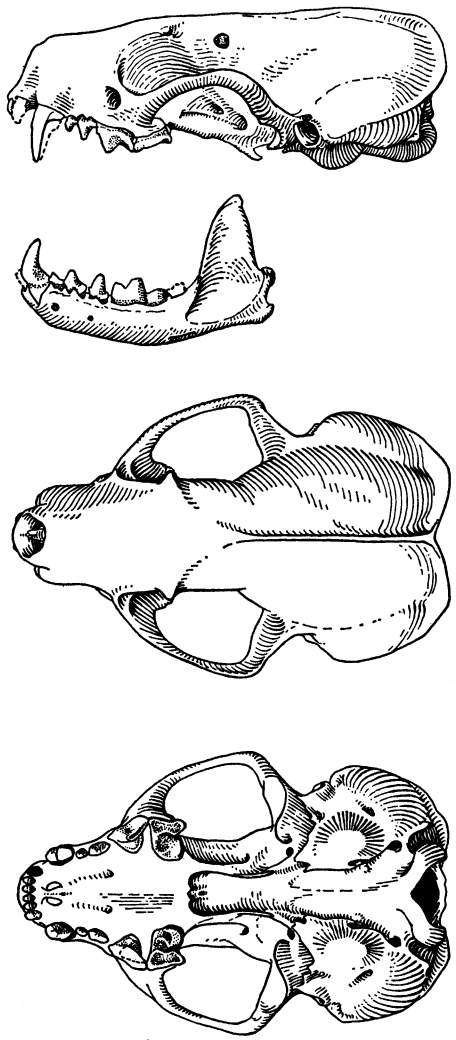

FIG. 16. Lateral, dorsal, and ventral views of the skull of *Spilogale putorius leucoparia*, adult male, A.M.N.H. No. 2480/1901, from Fort Verde, Yavapai County, Arizona. ×1.

As is also true of *gracilis*, the populations of *leucoparia* are partially isolated. Most of the specimens have been collected in the mountain ranges of southwestern United States and northern Mexico, where the populations seem to be densest and where they are probably partially isolated from neighboring populations. Spotted skunks do occur sporadically in the deserts surrounding the mountains, but generally they are not omnipresent.

From *S. p. phenax* to the west, *leucoparia* differs in being smaller in all measurements. As pointed out in the account of that subspecies, *phenax* increases in size from south to north, and *leucoparia* is clearly distinguishable from the larger specimens (e.g., from Alameda County, California) in most measurements by its smaller size and by its broader stripes. However, from the smaller animals in this cline (e.g., *phenax*×*martirensis* intergrades from Julian, San Diego County, California) there are no significant differences in the means of any external measurements, and only in postorbital breadth is there a significant difference in cranial measurements, and, even then, the two populations are not separable at the 84 per cent level. In color pattern only can these *phenax*×*martirensis* intergrades clearly be distinguished from *leucoparia*. In the intergrades the dorsal, shoulder, and lateral stripes are narrower, the rump patches are smaller, and there is seldom white on the hind feet. In *leucoparia* the shoulder stripes are always wider than the dorsal stripes, and the lateral stripes are always broader than the first vertical stripes. The rump patches in *leucoparia* are large, and there is frequently white on the hind feet.

Intergradation between spotted skunks in southern California and those in Arizona is not clearly evident from the few specimens available from near the Colorado River. A single specimen from Pilot Knob, Imperial Country, California, was assigned to "*arizonae*" by Howell, but, other than having slightly smaller teeth, Grinnell, Dixon, and Linsdale (1937, p. 304) "observed no other important difference." The rather long tail (170) of this specimen and its reduced lateral stripes would tend to place it with the California spotted skunks, rather than with *leucoparia*. A specimen from Presidio, Sonora, a locality that I cannot find on any map, resembles the Pilot Knob specimen in external measurements, and cranially could fit into either the California or Arizona populations, but resembles the latter somewhat more in its short maxillary tooth row. It is quite possible that intergradation between *phenax*×*martirensis* and *leucoparia* takes place in northwestern Sonora.

From *S. p. interrupta*, *leucoparia* differs in being smaller in external measurements and in all cranial measurements except interorbital and mastoid breadth. In color pattern *leucoparia* is distinguished from *interrupta* in having much more extensive white markings. *Spilogale p. leucoparia* differs from *putorius* in the same ways that it differs from *interrupta*. For additional remarks on the differences between these subspecies, see the account of *interrupta*.

There are no specimens of *Spilogale* from west-central Texas where *interrupta* and *leucoparia* might come in contact. I know of no reason why spotted skunks should not be present in this region, and it is possible that intergradation may occur there.

Intergradation of *leucoparia* with the eastern *putorius* and northern *interrupta* takes place in Tamaulipas. As pointed out in the account of *interrupta*, spotted skunks from southeastern Texas are regarded as intergrades between *putorius* and *interrupta* and possibly have some elements of *leucoparia*. The specimens from Tamaulipas consist of three males, skins and skulls, of which one may not be included in average measurements because the skull is malformed, and two females, one of which is a skull only, and the other consists of a very poorly made skin without measurements and a skull so broken that only one measurement could be taken. This last specimen is labeled as being from "Tamaulipas," with no further definition of locality, and appears to be identical in color pattern with spotted skunks from the Gulf coast of Texas. An adult and a young adult male from the vicinity of La Pesca, Tamaulipas, are intermediate in external measurements between *leucoparia* from Mason, Texas, and *interrupta*×*putorius* from the Gulf coast of Texas. Average external measurements for the males from Mason (five), La Pesca (two), and southeastern Texas (six) are, respectively: total length, 410, 437, 458; tail, 133, 167, 183; hind foot, 44, 47, 48. In mastoid breadth and cranial height, the main characters by which *leucoparia* differs from *interrupta*×*putorius*, the averages for the three groups are 31.8, 29.0, 29.2, and 16.7, 17.4, 17.6.

In color pattern the specimens from La Pesca and from the Sierra de Tamaulipas seem also to be intermediate between *leuco-*

paria and the eastern subspecies. The nasal patch, which is small in *interrupta*×*putorius* and large in the western *leucoparia*, is intermediate in size in the Tamaulipas specimens. The dorsal white stripes, which are broad in *leucoparia* and narrow or broken in the eastern forms, are slightly narrower than characteristic of *leucoparia*, but much broader than in *putorius* or *interrupta*. The shoulder stripes, however, which are broader than the dorsal stripes in *leucoparia* and in *interrupta*×*putorius*, are about the same width as the dorsal stripes in the Tamaulipas specimens. The lateral stripes in *leucoparia* are characteristically broader than the first vertical stripes; in *interrupta*×*putorius* the lateral stripes are generally narrower and may be broken. In the four Tamaulipas specimens, one has the lateral stripes slightly broader than the first verticals, one has these stripes smaller than the verticals, and in two the lateral stripes are narrower than the first verticals, and one of these has the lateral stripe reduced in length. The Tamaulipas specimens have the second vertical stripes more reduced than in *leucoparia*, and the rump patches are smaller, but each of these stripes is larger than in *interrupta*×*putorius*. The tail-base patch is as white and complete as in *leucoparia*, and the tail of one is as white as in *leucoparia*, and in the other three it is even more white. In general, then, the Tamaulipas specimens are intermediate between *leucoparia* and *putorius-interrupta* intergrades in external measurements, closer to the latter in cranial measurements, and closer to *leucoparia* in color pattern.

Two males, an adult and a subadult-young adult, from Monterrey, Nuevo Leon, are clearly *leucoparia*, but in length of tail average somewhat larger than topotypes. Specimens from Coahuila, also clearly *leucoparia*, have the dorsal stripes somewhat narrower than usual and smaller rump patches. The second vertical stripes are narrower, also, which might indicate some tendency towards *interrupta*×*putorius* or towards *angustifrons*. In external and cranial measurements, however, these specimens, from Sierra Encarnacion and Saltillo, show no signs of intergradation.

From *S. p. angustifrons*, *leucoparia* differs in being larger in all measurements, particularly the external ones. In length of tail, for example, *leucoparia* is about 30 per cent larger than *angustifrons*, and in total length the difference between the two subspecies is about 15 per cent. In cranial measurements *angustifrons* is about 6 per cent smaller than *leucoparia*, the greatest differences being in zygomatic and mastoid breadth and palatilar length, each averaging about 10 per cent smaller in *angustifrons*. In color pattern *angustifrons* differs in having much narrower white stripes.

Signs of intergradation between *leucoparia* and *angustifrons* are seen in specimens from northern Jalisco, Guanajuato, and Hidalgo. Specimens from Jalisco (Barranca Ibarra, Garabatos, Estancia, Arroyo de Platanar, San Sebastian, and Lagos) are separable from *leucoparia* from the Huachuca Mountains, Arizona, at the 84 per cent level only in total length, but are significantly smaller in the means of most external and cranial measurements. Generally, the average measurements of Jalisco specimens seem to fall between *angustifrons* (as exemplified by specimens from Distrito Federal and Michoacan) and those from the Huachuca Mountains and northern Mexico. Table 11 shows the intermediate position of these specimens in some measurements. A male and a female from Santa Rosa, Guanajuato, for which no external measurements are recorded, seem also to be intermediate in cranial characters, and a male from Tulancingo, Hidalgo, which has a short tail (117) but relatively great total length (393) and which is smaller in some cranial measurements than *leucoparia*, must also be so regarded. Except on the coasts, specimens from between latitude 20° and latitude 22° N. are considered to be intergrades between *leucoparia* and *angustifrons*.

Specimens from every month of the year have been examined. Juveniles and juvenile-subadults have been collected in August and September, and subadults from July through November. Subadult-young adults are present in collections from the months of September through March, and young adults have been collected in all months except January, June, September, and October. It would seem that the season of birth in this subspecies is from June through August.

TABLE 11

AVERAGES OF SOME MEASUREMENTS OF MALE *Spilogale putorius leucoparia* AND *Spilogale putorius angustifrons* AND SOME INTERGRADES FROM JALISCO

	leucoparia			
	Huachuca Mountains, Arizona	Northern Mexico	Intergrades Jalisco	*angustifrons* Michoacan
Total length	404	402	379	338
Tail	147	144	138	101
Head and body	259	258	244	237
Condylobasal	54.1	53.9	52.6	51.1
Mastoid	30.9	31.2	29.4	28.9
Postpalatal	28.5	28.2	27.3	27.4

Seventy per cent of the specimens examined are males. Of 116 adults, 85 are males; 13 of 22 young adults are males; seven of 13 subadult-young adults are males; 10 of 12 subadults are males; and two of five juvenile-subadults are males.

Lesions or swellings of the frontal sinuses are present in a high proportion of the specimens of this subspecies. Ninety-three per cent of the adults and 69 per cent of the young adults exhibit damage to the cranium caused by parasites. Five of 12 subadult-young adults and one of 11 subadults show signs of infection. None of the five specimens younger than subadult shows signs of infection.

SPECIMENS EXAMINED: Two hundred and five, from the following localities:

ARIZONA: *Apache County:* Springerville, 7000 ft., 3 (U.S.N.M.). *Cochise County:* Fort Lowell, 1 (U.S.N.M.); Huachuca Mountains and Fort Huachuca, 34 (13 U.I.M.N.H., 7 U.S.N.M., 5 C.N.H.M., 3 C.M., 2 M.C.Z., 1 K.U.M.N.H., 1 M.V.Z., 1 U.M.M.Z., 1 A.M.N.H.); F. Hand's Ranch, Pinery Canyon, Chiricahua Mountains, 1 (M.V.Z.); 2 miles southeast of Portal, 2 (U.M.M.Z.). *Gila County:* Three-Bar Cabin, 7 miles west and 3½ miles north of Roosevelt, 1 (U.I.M.N.H.). *Graham County:* Ash Creek, 3200 ft., Graham Mountains, 1 (U.S.N.M.); Safford, 2900 ft., 1 (U.S.N.M.). *Greenlee County:* Cosper Ranch, 5000 ft., Blue River, 2 (U.S.N.M.). *Maricopa County:* Twenty miles south of Phoenix, 1 (K.U.M.N.H.); 20 miles southwest of Phoenix, 3 (K.U.M.N.H.). *Pima County:* Bates Well, 1 (S.D.S.N.H.); Tucson, 1 (U.M.M.Z.); Tumomoc Hill, Tucson, 1 (M.U.M.Z.); Santa Catalina, 1 (M.C.Z.); Soldier Camp, Santa Catalina Mountains, 2 (C.M.); mouth of Soldier Canyon, Santa Catalina Mountains, 3 (C.M.); near Stratton Mine, Santa Catalina Mountains, 1 (C.M.); Sabine Canyon, Santa Catalina Mountains, Tucson, 1 (A.M.N.H.); 12 miles northwest of Tucson, 3 (A.M.N.H.); 16 miles east of Tucson, 1 (M.C.Z.); Molino Canyon, 18 miles east-northeast of Tucson, 2 (A.M.N.H.); Santa Rita Mountains, 2 (C.M., U.S.N.M.); Madera Canyon, 5200 ft., Santa Rita Mountains, 1 (Cal.A.S.); 30 miles south of Tucson, 4100 ft., near Santa Rita Mountains, 8 (K.U.M.N.H.). *Pinal County:* "Pinal County," 6 (5 A.M.N.H., 1 C.N.H.M.); 9 miles east of Casa Grande, 1 (Corn.U.). *Yavapai County:* Bradshaw City, 2 (A.M.N.H.); Congress Junction, 3000 ft., 1 (U.S.N.M.); Fort Verde, 4 (A.M.N.H.); Canyon of Verde River, 3 (A.M.N.H.); Box Canyon, 20 miles south of Fort Verde, 1 (A.M.N.H.); Fossil Creek, 2 (A.M.N.H.); Prescott, 1 (A.M.N.H.); Whipple Barracks, 1 (A.M.N.H.). *Yuma County:* Castle Dome Mountains, 1 (T.A.M.); 4 miles south of Gadsden, 120 ft., 1 (M.V.Z.); 10 miles east of Quartzite, in Plumosa Mountains, 1 (M.V.Z.); Tinajas Altas, Gila Mountains, 1 (K.U.M.N.H.); Vicksburg, 1600 ft., 1 (U.S.N.M.). CHIHUAHUA: Chihuahua, 1 (U.S.N.M.); Colonia Garcia, 6700 ft., 1 (U.S.N.M.); Eagle Cliff Mountain, about 4 miles south of Monument No. 15, Mexican Boundary Line, 1 (U.S.N.M.); Little Box, Rio Grande, about 45 miles southeast of Fort Hancock, Texas, 1 (U.S.N.M.). COAHUILA: Two miles south and 2 miles east of Boquillas, 1800 ft., 1 (K.U.M.N.H.); west foot of Pico de Jimulco, 4700 ft., 1 (K.U.M.N.H.); Saltillo, 1 (U.S.N.M.); Sierra Encarnacion, 3 (U.S.N.M.). GUANAJUATO: Santa Rosa, 2 (U.S.N.M.). HIDALGO: Tulancingo, 1 (U.S.N.M.). JALISCO: Arroyo de Platanar, 1 (A.M.N.H.); Barranca Ibarra, 1 (U.S.N.M.); Estancia, 5 (A.M.N.H.); Garabatos, 4 (A.M.-N.H.); 21 miles southeast of Guadalajara, 5100 ft., 1 (K.U.M.N.H.); Lagos, 6150 ft., 1

TABLE 12

MEASUREMENTS OF *Spilogale putorius leucoparia*

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Huachuca Mts., Cochise County, Arizona				
Total length				
Males	19	404.08±10.46	22.80	340–440
Females	6	353.34±13.02	15.95	338–380
Tail				
Males	19	146.71± 6.42	13.99	110–163
Females	6	129.17±11.17	13.68	110–148
Hind foot				
Males	19	45.66± 1.58	3.45	37–52
Females	5	40.50		37–42
Head and body				
Males	19	258.82± 7.93	17.29	212–280
Females	6	225.84± 8.11	9.94	210–235
Basilar				
Males	20	47.98± 0.85	1.91	44.5–52.0
Females	6	42.25± 0.90	1.10	40.1–43.3
Condylobasal				
Males	20	54.13± 0.91	2.03	50.4–58.4
Females	6	48.08± 1.28	1.57	45.2–49.7
Occipitonasal				
Males	20	50.48± 0.89	2.00	47.4–54.7
Females	6	45.42± 1.11	1.36	32.2–46.9
Zygomatic				
Males	20	34.80± 0.62	1.39	32.3–37.1
Females	6	30.41± 0.47	0.57	29.5–31.4
Mastoid				
Males	21	30.92± 0.70	1.61	28.4–35.2
Females	6	27.75± 0.63	0.77	26.5–28.8
Interorbital				
Males	21	14.77± 0.37	0.84	13.1–16.5
Females	6	13.50± 0.51	0.62	12.7–14.1
Postorbital				
Males	21	13.96± 0.31	0.70	12.8–16.5
Females	5	13.00		12.4–13.6
Palatilar				
Males	21	19.58± 0.24	0.64	18.4–20.8
Females	6	17.33± 0.67	0.82	16.3–18.5
Postpalatal				
Males	20	28.50± 0.66	1.47	25.8–31.4
Females	6	25.00± 0.44	0.54	24.0–25.6
Cranium height				
Males	21	16.92± 0.20	0.46	16.0–17.8
Females	6	15.92± 0.42	0.52	15.1–16.7
Tooth row				
Males	21	17.70± 0.27	0.62	16.8–18.8
Females	6	16.18± 0.70	0.86	15.2–17.6
30 mi. S. Tucson, Pima County, Arizona				
Total length				
Males	10	405.50±11.40	18.01	360–428
Females	3	373.33		346–394

TABLE 12—(*Continued*)

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Tail				
Males	10	137.50± 9.55	15.09	122–160
Females	3	135.00		120–150
Hind foot				
Males	10	45.60± 1.78	2.82	41–50
Females	3	38.33		36–41
Head and body				
Males	10	265.00±14.75	23.30	236–288
Females	3	238.33		226–245
Basilar				
Males	10	47.45± 1.45	2.29	42.3–50.0
Females	2	43.25		41.9–44.6
Condylobasal				
Males	10	53.70± 1.62	2.56	47.5–56.9
Females	2	48.65		47.2–50.1
Occipitonasal				
Males	10	50.10± 1.65	2.61	44.7–54.3
Females	2	45.80		44.9–46.7
Zygomatic				
Males	10	35.30± 0.86	1.36	32.5–37.6
Females	2	30.45		30.3–30.6
Mastoid				
Males	10	31.05± 0.71	1.12	28.1–32.3
Females	2	27.90		27.4–28.4
Interorbital				
Males	9	15.42± 0.83	1.25	13.4–17.9
Females	3	14.13		13.8–14.8
Postorbital				
Males	9	14.25± 0.57	0.85	13.4–15.5
Females	3	13.43		13.1–13.8
Palatilar				
Males	9	19.47± 0.79	1.18	17.8–21.2
Females	3	18.33		17.5–19.7
Postpalatal				
Males	9	28.19± 0.97	1.45	24.6–29.9
Females	2	25.80		24.7–26.9
Cranium height				
Males	9	17.14± 0.35	0.52	16.5–17.6
Females	3	16.07		15.4–17.2
Tooth row				
Males	9	17.53± 0.56	0.84	15.5–18.7
Females	3	16.90		16.3–17.6
Animas Mts., Hidalgo County, New Mexico				
Total length				
Males	7	420.36±18.42	24.37	398–450
Tail				
Males	7	156.07± 7.78	10.31	138–168
Hind foot				
Males	7	46.79± 1.15	1.53	44–48
Head and body				
Males	7	264.65±13.94	18.47	240–290
Basilar				
Males	7	48.54± 0.82	1.08	47.3–50.4
Condylobasal				
Males	7	54.61± 0.92	1.22	53.0–56.5

TABLE 12—(*Continued*)

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Occipitonasal				
Males	7	50.25± 1.19	1.58	47.2–51.5
Zygomatic				
Males	7	36.39± 0.99	1.31	34.4–38.3
Mastoid				
Males	7	31.54± 0.93	1.23	29.1–33.0
Interorbital				
Males	7	15.11± 0.31	0.41	14.5–15.5
Postorbital				
Males	7	14.55± 0.53	0.70	13.0–15.3
Palatilar				
Males	7	19.48± 0.62	0.82	19.3–21.5
Postpalatal				
Males	7	28.68± 0.53	0.70	27.5–29.5
Cranium height				
Males	7	17.61± 0.48	0.63	16.8–18.9
Tooth row				
Males	7	17.68± 0.48	0.63	16.6–18.6
Near Mason, Mason County, Texas				
Total length				
Males	5	410.20		393–427
Females	4	360.25		330–388
Tail				
Males	5	133.20		115–149
Females	4	131.75		119–148
Hind foot				
Males	5	43.80		39–45
Females	4	40.25		38–43
Head and body				
Males	5	277.00		265–286
Females	4	231.00		211–240
Basilar				
Males	6	47.33± 1.56	1.91	44.4–49.3
Females	4	42.25		41.2–43.7
Condylobasal				
Males	7	53.46± 1.41	1.87	50.7–55.0
Females	4	48.55		47.2–50.0
Occipitonasal				
Males	6	49.75± 1.49	1.83	47.2–51.5
Females	4	46.20		44.8–47.5
Zygomatic				
Males	7	34.32± 1.17	1.55	31.8–35.7
Females	4	31.45		31.1–31.8
Mastoid				
Males	7	31.75± 1.10	1.46	29.5–33.8
Females	4	29.05		27.4–30.8
Interorbital				
Males	7	15.39± 0.48	0.63	14.6–16.1
Females	4	14.23		13.3–15.0
Postorbital				
Males	7	14.82± 0.69	0.92	13.8–15.9
Females	4	14.88		13.8–16.6

TABLE 12—(*Continued*)

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Palatilar				
Males	8	19.50± 0.42	0.60	18.7–20.3
Females	4	17.65		16.6–18.7
Postpalatal				
Males	6	27.75± 1.20	1.47	25.6–28.9
Females	4	24.58		24.0–25.0
Cranium height				
Males	7	16.68± 0.26	0.35	16.2–17.2
Females	4	16.53		15.6–17.6
Tooth row				
Males	8	17.13± 0.63	0.89	15.1–17.9
Females	4	16.83		15.8–17.3

(U.S.N.M.); Ocotlan, 1 (U.S.N.M.); Rio Ameca, 1 (A.M.N.H.); San Sebastian, 1 (U.S.N.M.); 3 miles east-northeast of Santa Cruz de las Flores, 1 (K.U.M.N.H.). NEW MEXICO: *Eddy County:* Hope, 8 (M.V.Z.). *Grant County:* Burro Mountains, 1 (U.S.N.M.); Hachita, 1 (U.S.N.M.); head of Mimbres, 1 (U.S.N.M.); Redrock, 4000 ft., 1 (U.S.N.M.). *Hidalgo County:* North slope of Animas Peak, 5800 and 6000 ft., Animas Mountains, 6 (U.S.N.M.); summit of Animas Peak, 8000 ft., Animas Mountains, 1 (U.S.N.M.). *Luna County:* Ten miles east of Deming, 1 (U.S.N.M.). *Otero County:* Malpais Spring, 4235 ft., 15 miles west of Three Rivers, 1 (M.V.Z.); 5 miles east of Tularosa, 1 (U.S.N.M.). SONORA: Presidio, 1 (M.C.Z.); Punta Penascosa, 1 (S.D.S.N.H.); San Jose Mountain, 6050 ft., 1 (U.S.N.M.); Sierra Seri, 9 miles west of San Javier, 70 miles west of Hermosillo, 1 (M.V.Z.). TEXAS: *Bexar County:* Camp Bullis, 1 (U.S.N.M.). *Brewster County:* One mile southwest of Boquillas, 1850 ft., Rio Grande, 1 (M.V.Z.); 3 miles south of Government Spring, 4500 ft., 1 (A.M.N.H.). *Jeff Davis County:* Upper Limpia Canyon, 5500 ft., 5 miles east of Mount Livermore, 2 (U.M.M.Z.). *Kendall County:* Waring, 1 (U.S.N.M.). *Kerr County:* "Kerr County," 3 (M.C.Z.); near Kerrville, 1650 ft., 3 (M.V.Z.); Hall Brothers' Ranch, 12 miles west of Mt. Home, 1 (T.A.M.); Turtle Creek, 2 (A.M.N.H.). *Maverick County:* Eagle Pass, 2 (U.S.N.M.). *Mason County:* Mason, 4 (3 U.S.N.M., 1 T.A.M.); 10 miles north of Mason, 1 (T.A.M.); 12 miles south of Mason, 2 (T.A.M.); 20 miles south of Mason, 6 (3 T.A.M., 3 K.U.M.N.H.). *Menard County:* Five miles north of Fort McKavett, 1 (A.M.N.H.). *Presidio County:* Ten miles west-southwest of Valentine, 1 (T.N.H.C.); 11 miles west of Valentine, 3 (T.N.H.C.). *Terrell County:* Fifteen miles south of Sheffield, 1 (T.N.H.C.); Comstock, 1 (U.S.N.M.); Rio Grande, near Comstock, 1 (U.S.N.M.); Langtry, 1 (U.S.N.M.); Samuels, 19 miles west of Langtry, 1 (U.S.N.M.). *Webb County:* Laredo, 1 (U.S.N.M.).

Spilogale putorius angustifrons Howell

Figures 17 and 18

Spilogale angustifrons HOWELL, December 16, 1902, Proc. Biol. Soc. Washington, vol. 15, p. 242. Type: U.S.N.M. No. 50825; subadult-young adult male; collected by E. W. Nelson and E. A. Goldman, December 15, 1892; original no. 4035; from Tlalpan, Distrito Federal, Mexico.

DISTRIBUTION: Known only from Distrito Federal and central Michoacan; probably occurs throughout the southern part of the Transverse Volcanic Biotic Province. Intergrades with *leucoparia* in Jalisco, Guanajuato, and Hidalgo; probably intergrades with *tropicalis* in southern Michoacan and northern Guerrero (fig. 4). Upper Sonoran Life Zone; Transverse Volcanic Biotic Province. Known from 6700 to 7400 feet.

EXTERNAL MEASUREMENTS: Male, 338, 101, 39; female, 325, 105, 36.

CRANIAL MEASUREMENTS: Males: basilar length, 45.1 (44.3–45.9); condylobasal length, 51.1 (50.0–52.2); zygomatic breadth, 32.2 (32.0–32.2); interorbital breadth, 14.1 (13.7–14.4); height of cranium, 16.1 (15.9–16.3); length of tooth row, 16.7 (16.2–17.1); female (in same order): 40.7, 46.5, 29.3, 13.2, 16.2, 15.4.

WEIGHT: Male, 308; female, unknown.

COLOR PATTERN: Nasal patch medium. Dorsal stripes medium, generally as broad as or broader than black dorsal stripe or black shoulder stripes; dorsals constricted, but not

interrupted at level of scapulae; dorsals always narrower than white shoulder stripes; dorsals usually interrupted at level of posterior shoulder stripes, rarely (and then weakly) connected to first vertical stripes; dorsals reappearing at level of first verticals as small spots usually connected to second verticals by constriction. Shoulder stripes medium, broader than dorsals and as broad as or broader than black shoulder stripes; pre-auricular patches large, almost touching eye anteriorly; chin stripes rarely present. Lateral stripes variable, narrow to broad, usually not narrower than first vertical stripes; laterals usually reaching upper forelegs, never extended on leg. First vertical stripes narrow, rarely connected to dorsals at level of posterior shoulder stripes, usually not connected to dorsal spots. Second vertical stripes broad distally, usually narrow proximally, always connected to dorsals, sometimes connected to dorsal spots at level of

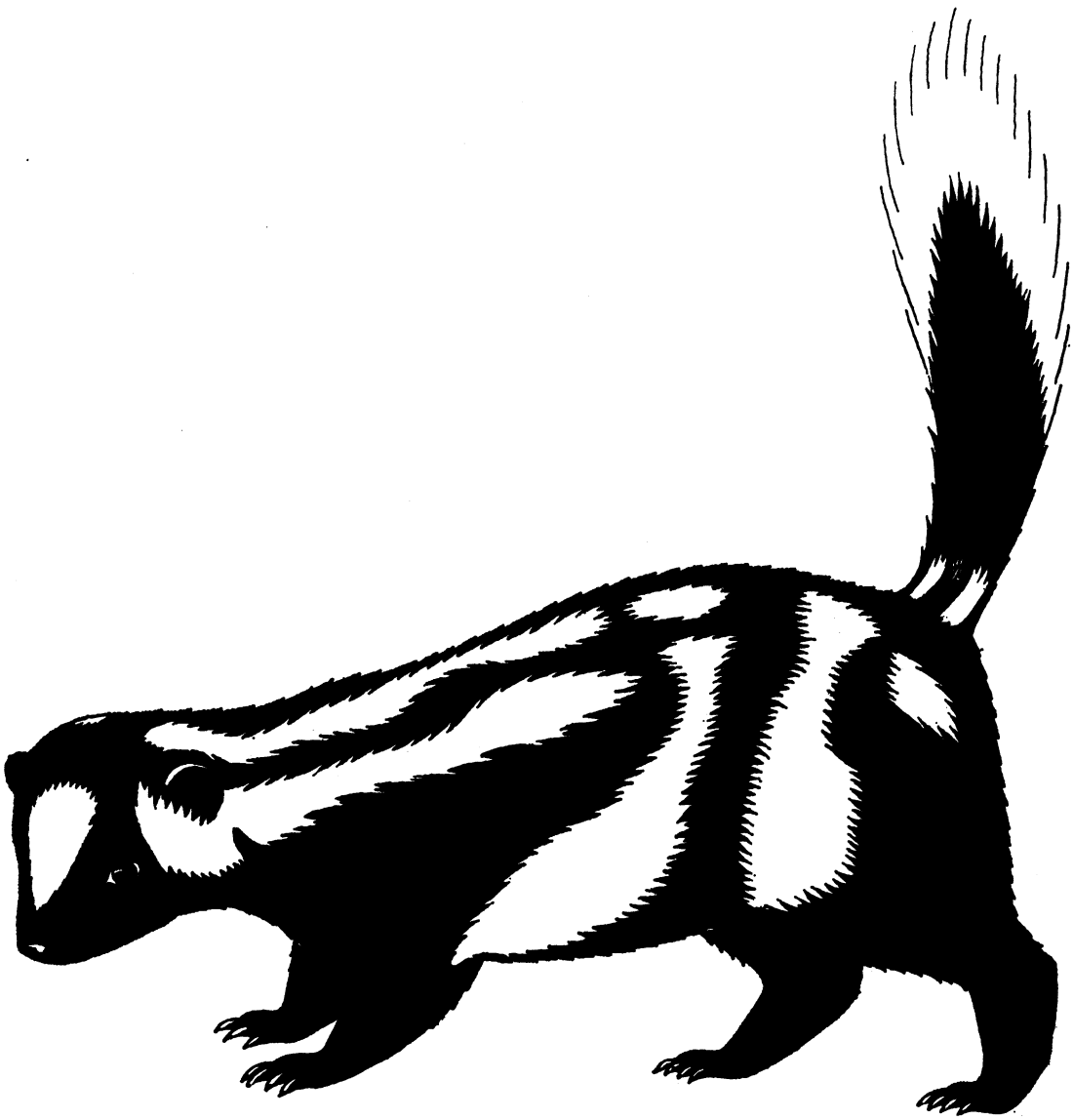

FIG. 17. Color pattern of *Spilogale putorius angustifrons*. Drawn from a subadult female, U.S.N.M. No. 50823, from Tlalpan, Distrito Federal, Mexico. Not to scale.

first verticals by constriction. Third vertical stripes absent or small rump patches, never extending onto hind legs. No white on forefeet or hind feet. Tail-base patch variable, indistinctly U-shaped to small tufts on sides of tail. Tail about one-fifth to one-quarter white middorsally, extending about halfway on sides; tail about two-thirds white ventrally.

The lack of adult specimens and adequate series of specimens with accurate data on locality from southern Mexico and Central America prohibits detailed analysis of the subspecific characters of the forms named from this region comparable to that done for the subspecies in the United States. Until sufficient material is available from this region, it seems best to assign specimens to the named subspecies and to hold in abeyance detailed discussion.

Howell based his description of *angustifrons* on a series of specimens from Tlalpan, Distrito Federal. As Hall and Kelson have pointed out (1953, p. 330), the typical series consists of animals that have not yet reached adult size. Of the five specimens from the type locality, three of them are subadult, the type is a subadult-young adult, and one, the only female, is an adult. Thus many of the characters by which Howell distinguished *angustifrons* from *ambigua* [=*leucoparia*] are those by which subadults are distinguished from adults. Howell (1906, p. 26) diagnosed *angustifrons* as having a small and narrow skull, a highly arched cranium, narrow rostrum, and obsolescent sagittal crest—all of which are subadult characters. Howell assigned three other specimens, from Morelos and Guanajuato, to this subspecies; the latter prove to be animals which show some tendency towards intergradation with *leucoparia*, and the single specimen from Morelos (which Howell found to differ in color pattern from the topotypical series) now proves to be more closely related to the subspecies to the south, *tropicalis*.

The cranial characters on which Howell based *angustifrons*, being those of immature animals, do not serve to distinguish it from *tropicalis*. Even when the measurements of the four subadult males from the type locality are projected to their theoretical adult size, they are not distinguishable from *tropicalis*. Only a tentative separation of these two subspecies can be made by using Howell's description, and that is on the basis of color pattern. The topotypes of *angustifrons* are characterized by having less extensive white markings than *tropicalis*. This is particularly true on the posterior part of the body where the rump patches are small and do not extend down the hind legs, the tail-base patch is small and is not strongly U-shaped but is broken or indistinct medially, and the second vertical stripes are narrow. In addition, in comparison with *tropicalis*, the nasal patch of *angustifrons* is smaller,

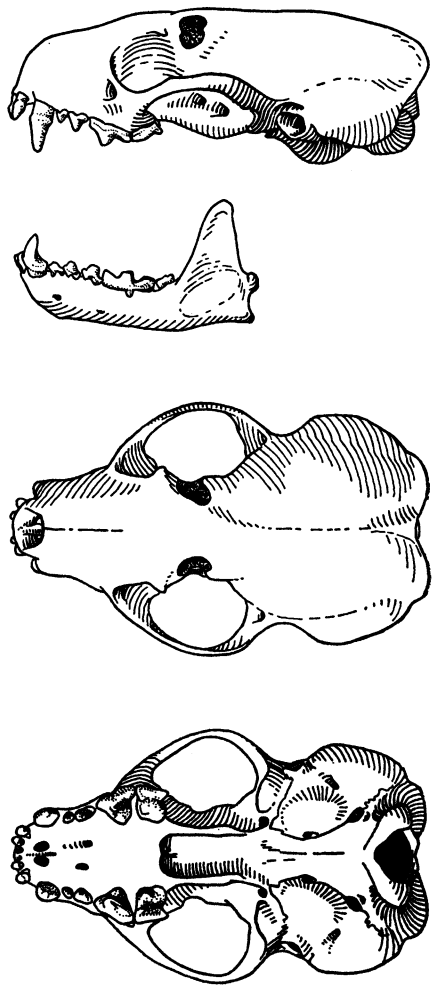

FIG. 18. Lateral, dorsal, and ventral views of the skull of *Spilogale putorius angustifrons*, adult male, U.S.N.M. No. 47177, from Patzcuaro, Michoacan, Mexico. ×1.

TABLE 13

MEASUREMENTS OF *Spilogale putorius angustifrons* FROM MEXICO

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
DISTRITO FEDERAL																
Tlalpan	♂	S-Y	345	130	40	42.8	48.9	46.6	31.3	26.9	13.0	13.6	17.3	25.4	16.5	16.5
	♂	S	—	—	—	40.3	46.3	45.8	28.5	25.9	13.1	14.1	17.6	23.2	16.4	15.9
	♂	S	—	—	—	41.9	47.4	45.0	29.9	26.0	13.1	13.8	18.0	24.0	16.5	16.0
	♂	S	—	—	—	42.7	48.5	46.1	29.3	26.3	13.0	13.1	16.9	25.7	16.2	16.1
	♀	Ad	325	105	36	40.7	46.5	44.7	29.3	25.1	13.2	13.4	16.5	24.2	16.2	15.4
MICHOACAN																
Vicinity of Patzcuaro	♂	Ad	338	101	39	44.3	50.0	46.9	32.3	28.3	14.4	14.9	17.5	26.8	16.3	16.2
	♂	Ad	—	—	—	45.9	52.2	48.9	32.0	29.4	13.7	12.7	17.6	28.1	15.9	17.1

and the lateral and dorsal stripes are narrower. The lateral stripes also do not extend onto the forelegs.

Comparison of *leucoparia* with *angustifrons* is made in the account of the former. In general, however, in addition to being smaller cranially, *angustifrons* differs from *leucoparia* in color pattern, also in having less extensive white markings, particularly in having narrower dorsal and lateral stripes.

Six of the seven specimens examined are males. The three adults were taken in the months of March, July, and December; the three subadults and the one subadult-young adult were captured in December. Lesions or swellings of the frontal bones are present in two of the three adults and in two of the subadults.

SPECIMENS EXAMINED: Seven, from the following localities:

MEXICO: *Distrito Federal:* Tlalpan, 5 (U.S.N.M.). *Michoacan:* Patzcuaro, 1 (U.S.N.M.); 3 miles northwest of Patzcuaro, 6700 ft., 1 (M.V.Z.).

Spilogale putorius tropicalis Howell

Figures 19 and 20

Spilogale angustifrons tropicalis HOWELL, December 16, 1902, Proc. Biol. Soc. Washington, vol. 15, p. 242. Type: U.S.N.M. No. 73523; adult male; collected by E. W. Nelson and E. A. Goldman, May 16, 1895; original no. 7958; from San Mateo del Mar, Oaxaca, Mexico.

DISTRIBUTION: From eastern Puebla, central Morelos, and central Guerrero, southeastward to southern Oaxaca and eastward along the Pacific coast to eastern El Salvador. Probably intergrades with *angustifrons* in northern Guerrero and northern Morelos. Probably intergrades with *elata* in southeastern Oaxaca and possibly eastward on the lower slopes of the coastal mountains (fig. 4). Lower Tropical (Arid Lower Tropical Subzone), Upper Tropical (Arid Upper Tropical Subzone), and Lower Sonoran Life Zones; southern Transverse Volcanic, Sierra Madre del Sur, and Tehuantepec Biotic Provinces. Known from 25 to 4600 feet.

EXTERNAL MEASUREMENTS: Males, 359.3 (310–398), 123.3 (101–145), 41.3 (35–47); females, 328.3 (300–343), 118.5 (105–130), 36.5 (34–39).

CRANIAL MEASUREMENTS: Males: basilar length, 43.5 (39.2–47.0); condylobasal length, 49.6 (44.8–54.2); zygomatic breadth, 31.0 (27.9–34.3); interorbital breadth, 13.9 (12.3–15.6); cranium height, 16.5 (15.1–17.6); length of tooth row, 16.1 (14.9–17.9); females (in same order): 40.1 (38.5–42.5), 45.9 (44.0–49.1); 28.0 (26.1–30.6), 12.8 (12.1–14.0), 15.6 (15.0–16.4), 15.3 (14.5–15.9).

WEIGHT: Unknown.

COLOR PATTERN: Nasal patch very large, almost as broad as long. Dorsal stripes broad, broader than dorsal black stripes, usually slightly narrower than shoulder stripes;

dorsals usually interrupted at level of posterior shoulder stripes, sometimes weakly connected to first vertical stripes. Dorsals reappear at level of first verticals as elongate spots usually connected by constriction with second vertical stripes. Shoulder stripes medium to broad, usually not narrower than dorsal stripes; pre-auricular patches very large, closely approaching nasal patch; chin stripes usually present. Lateral stripes broad and long, never narrower than first verticals; laterals usually extending onto foreleg, sometimes reaching toes. First vertical stripes broad, never broader than laterals; first verticals sometimes connected with dorsals around posterior shoulder stripes, never connected to dorsal spots. Second vertical stripes broad, usually broader than first verticals, always connected to dorsals, usually connected anteriorly to dorsal spots at level of first verticals. Third vertical stripes very long, usually extending onto hind leg, reaching toes in some. White usually present on forefeet and hind feet. Tail-base path U-shaped,

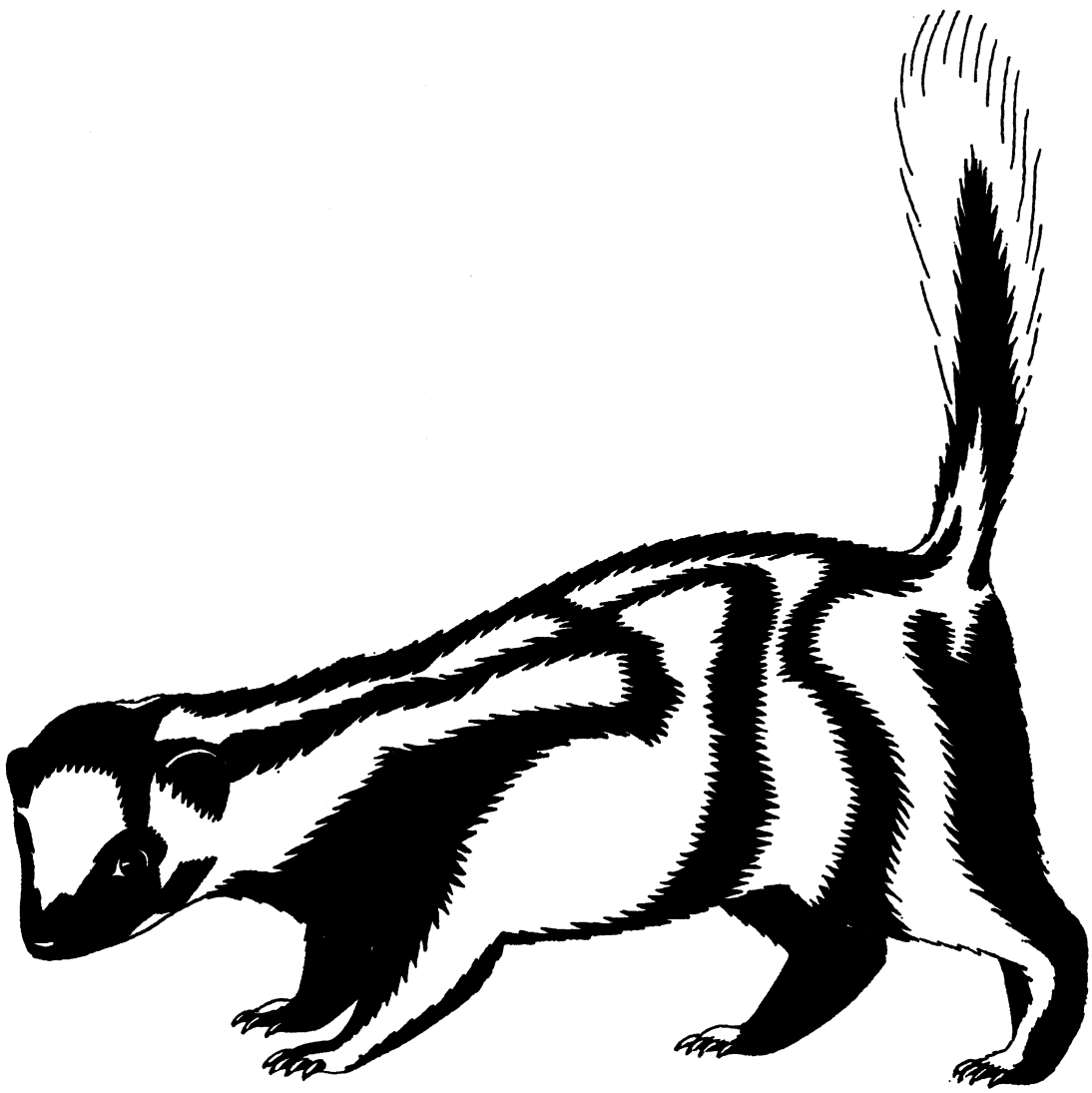

FIG. 19. Color pattern of *Spilogale putorius tropicalis*. Drawn from a subadult, sex unknown, A.M.N.H. No. 145627, from La Presa, Distrito Tehuantepec, Oaxaca, Mexico. Not to scale.

white often extended distally. Tail about one-fifth to one-quarter white middorsally, white extending about two-thirds down sides; tail about four-fifths white ventrally.

Howell selected as the type of *tropicalis* the largest specimen available to him. His comparisons with the other subspecies were made with the type used as the basis for the subspecies, and thus, although he says that the skull of *tropicalis* is larger than that of *angustifrons*, two of the five male topotypes of *tropicalis* that he examined were smaller. Likewise, in comparison with *elata*, Howell states that the skull of *elata* is about the same size as that of *tropicalis*, although narrower across the mastoids, but in his table of measurements the three largest specimens of *tropicalis* average only 0.3 mm. larger, and the two smaller specimens average 2 mm. smaller than *elata*. Howell (1906, p. 27) mentions that *tropicalis* "is remarkable for the great amount of variation in the size of the skull. In the type series of eight specimens this amounts in the basilar length to 17 per cent of the average." Inasmuch as Howell was considering the measurements of both males and females together, this amount of variation is not unusual. The males alone show variation of 14 per cent of the mean in basilar length, but this, though high, is not unusual and is surpassed by populations from Santa Rosa Island, California, the Huachuca Mountains, Arizona, and a few others. However, the extent of variation of the skull of topotypes of *tropicalis* is sufficient to encompass in its range the cranial measurements of the adjacent subspecies, *angustifrons* and *elata*. From the largest specimens of *tropicalis*, *angustifrons* and *elata* differ in being smaller; compared with the smallest specimens, the two other subspecies differ from *tropicalis* in being larger. As pointed out in the account of *angustifrons*, the material available from southern Mexico and Central America is not sufficient to permit detailed analysis of the subspecies in this region, and assignment of specimens to the subspecies is made only tentatively.

Using as a basis for the distinction of *tropicalis* the character of extensive white markings, there seem to be five areas from which this subspecies is known: from the vicinity of Izucar de Matamoros, Puebla; from Yautepec, Morelos; from Chilpancingo, Guerrero; from southern Oaxaca in the region of the Isthmus of Tehuantepec; and from the coastal portion of El Salvador.

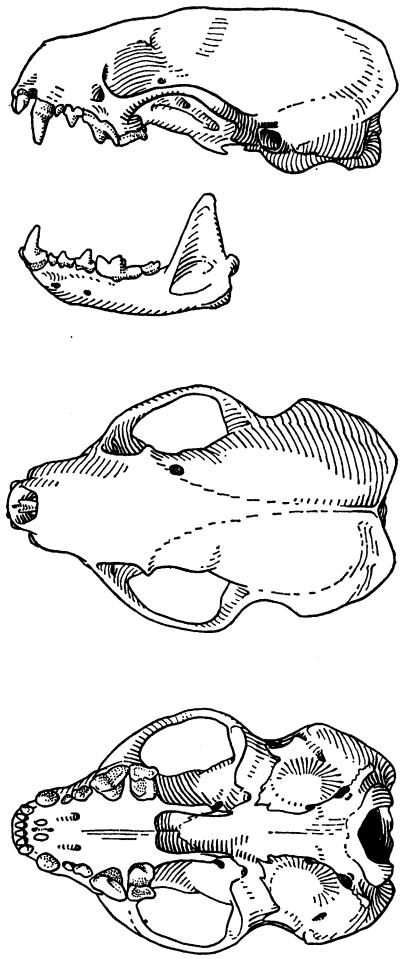

FIG. 20. Lateral, dorsal, and ventral views of the skull of *Spilogale putorius tropicalis*, adult male, U.I.M.N.H. No. 15461, from 16 kilometers south-southwest of Izucar de Matamoros, Puebla, Mexico. ×1.

Spilogale putorius tropicalis differs from *angustifrons* in having more extensive white markings. The dorsal stripes and shoulder stripes are broader, and the lateral stripes are broader and extend onto the forelegs and may continue distally to the toes. The vertical stripes are broad, particularly the second verticals, and the third vertical stripes are broad and extend onto the hind legs, continuing in some specimens onto the feet. The

patch at the base of the tail is large and generally U-shaped.

Cranially *tropicalis* differs from *angustifrons* is averaging smaller in most measurements. With only two adult males of *angustifrons* for comparison, however, the validity of even these slight differences is questionable. The two specimens of *angustifrons* are smaller than the largest specimens of *tropicalis*, and in all measurements of both skin and skull the variation of *tropicalis* encompasses the measurements of *angustifrons*. Howell (1906, p. 27) gave as one character of *tropicalis* that the upper molars have a narrow projecting lobe at the postero-internal corner, but this proves to be an inconsistent feature. The length of the palate is great, averaging about the same as in *angustifrons*, but Howell's remark that the palate usually reaches beyond the posterior border of the molars is not true, for in seven specimens from the type locality, the palate extends posterior to the plane of the molars in two specimens, is even with the molars in two, and falls short of the plane of the molars in three specimens. In none of the other specimens from Oaxaca does the palate extend farther back than the plane of the posterior portion of the molars.

From *S. p. elata*, *tropicalis* differs in the same ways that it differs from *angustifrons*. In color pattern *elata* lacks the white on the feet, the great extension of the rump patches onto the hind legs, the broad lateral stripes, the extension of the lateral stripes onto the forefeet, and the strong tail-base patch, and it has the white on the ventral side of the tail more reduced. Cranially, *elata* differs from *tropicalis* in being larger in all measurements. Except for being about 1.5 mm. longer in average length of tooth row, the average measurements of the skulls of specimens of *elata* are almost identical with those of *angustifrons*, and thus, cranially, *elata* also differs from *tropicalis* in the same way that *angustifrons* does.

It may well be that specimens from the region of the Isthmus of Tehuantepec are intergrades between the rather dark-colored, large-skulled *elata*, and a whiter, small-skulled race that is found south of the Transverse Volcanic Biota Province, to which I am applying the name *tropicalis*. For example, specimens from Puebla, Guerrero, and Morelos all have the characters of being rather small in cranial measurements and in having very extensive white markings. The specimens from the Isthmus of Tehuantepec are very white, but some specimens are as large cranially as specimens of the large-skulled *elata*. Table 14 shows the average and extreme cranial measurements of these three groups of spotted skunks. In each measurement the animals from the Isthmus of Tehuantepec are intermediate between those

TABLE 14

AVERAGE AND EXTREME CRANIAL MEASUREMENTS OF MALE *Spilogale putorius elata* AND *S. p. tropicalis*, SHOWING POSSIBLE INTERGRADATION IN SPECIMENS FROM THE ISTHMUS OF TEHUANTEPEC, OAXACA

	S. p. tropicalis		*S. p. elata*
	Puebla, Morelos, and Guerrero (6)	Isthmus of Tehuantepec (7)	Highlands of Chiapas, El Salvador, and Guatemala (6)
Basilar	42.2 (39.2–44.5)	43.4 (40.3–46.5)	44.8 (43.3–45.8)
Condylobasal	47.9 (44.8–49.6)	48.9 (45.4–52.8)	51.7 (49.4–53.0)
Occipitonasal	45.1 (43.3–48.2)	46.4 (43.5–48.9)	48.2 (45.6–49.8)
Zygomatic	29.7 (27.9–31.5)	30.9 (28.1–32.9)	32.1 (30.9–33.6)
Mastoid	26.8 (25.4–28.8)	27.2 (24.8–29.8)	27.4 (26.0–28.5)
Interorbital	13.2 (12.3–13.9)	13.9 (12.5–15.6)	14.0 (13.7–14.7)
Postorbital	13.8 (13.4–14.3)	14.2 (13.4–14.8)	14.4 (13.8–15.8)
Palatilar	16.9 (15.9–18.0)	17.5 (16.0–18.4)	18.0 (17.1–18.8)
Postpalatal	25.3 (23.2–26.6)	25.9 (24.0–28.8)	26.8 (25.6–28.2)
Cranium height	16.4 (15.1–17.4)	16.2 (15.9–17.0)	17.5 (16.5–17.8)
Tooth row	15.7 (14.9–16.5)	16.0 (15.4–16.6)	16.6 (15.7–17.3)

from the northwest and those from the southeast of the Isthmus. The range of measurements of the animals from the Isthmus is so great that the smallest specimens are almost as small as the smallest of the animals to the northwest, and the largest are almost as large as the largest of those to the southeast.

In color pattern these specimens from the Isthmus are but slightly less white than those from Puebla, for example. The dorsal, shoulder, and lateral stripes, in average, are narrower, and the nasal patch is slightly smaller, all of which might be considered a tendency towards *elata*. The Oaxaca animals, in general, have the lateral stripes extended farther down on the forelegs than do those from Puebla, and the third vertical stripes likewise extend farther down the hind legs. But some of the specimens from Oaxaca, on the other hand, have the third vertical stripes much reduced, in which they resemble *elata*. The specimen from Yautepec, Morelos, is not so white as specimens from Puebla, and in the reduction of white posteriorly, particularly in the somewhat smaller third vertical stripes and narrower second verticals, may indicate signs of intergradation with *angustifrons*.

The possibility that the specimens from Oaxaca are intergrades does not seem so plausible if spotted skunks from the coastal region of El Salvador are considered to be *tropicalis*. These animals have comparatively large skulls, about the size of those of animals from the highlands of Nicaragua and Honduras, and are large in external measurements. Compared with specimens from the highlands (7000–8000 feet) of El Salvador (*elata*), the lowland (sea level–200 feet) specimens average larger in all measurements except height of cranium, in which they average 0.3 mm. smaller. Compared with the Oaxaca specimens, the El Salvador lowland skunks are larger and slightly darker. If the animals from El Salvador are *tropicalis*, then this subspecies exhibits a cline of increasing size and decreasing white markings from central Mexico southeastward. It is also possible that intergradation between *elata* and *tropicalis* occurs on the lower slopes of the coastal mountains of El Salvador, which might account for the larger size of these specimens, or the sample from the lowlands might consist only of the larger specimens of the highly variable *tropicalis*, for, compared with the larger specimens from Oaxaca, those from El Salvador average about the same in cranial measurements.

One other possibility concerning the Oaxaca specimens deserves consideration: near the city of Tehuantepec, *Spilogale putorius tropicalis* comes in contact with the other species of spotted skunk, *Spilogale pygmaea*. There are specimens of both species from Tehuantepec City. The smaller adult males of *tropicalis* are less than 4 mm. larger than *pygmaea* in any cranial measurement, although none shows the distinctive color pattern of the latter, nor are the external measurements of any so small as those of *pygmaea*. However, specimens of *tropicalis* show the closest approach to the color pattern of *pygmaea* of any of the subspecies of *putorius*. Some Oaxaca *tropicalis* have much white on the forefeet and hind feet, a characteristic of *pygmaea*, and the possibility of hybridization between the two species, however slight, cannot yet conclusively be eliminated.

Until more specimens are available, the true relationships of *tropicalis* are conjectural. I believe, however, that intergradation between *tropicalis* and *elata* occurs north and east of the lowlands at the Gulf of Tehuantepec, and probably intergradation between the highland and lowland forms occurs at the lower elevations of the mountains of southern Guatemala and El Salvador.

No specimens taken from June through September have been examined. One juvenile-subadult is recorded from October, and two subadults were taken in December and January. Subadult-young adults have been collected from November through March, and young adults from November through May. A female from Lake Olomega, El Salvador, captured February 8, is recorded as having two embryos 12 mm. long, which suggests that breeding may take place throughout the year. Lesions or swellings of the frontal sinuses are present in all 22 adults examined, in 10 of the 11 young adults, and in five of nine subadult-young adults. Some of the lesions in specimens of this subspecies are very large, measuring 10.1 by 6.4 mm. in one specimen from the type locality. Sixty per cent of the specimens examined are males.

TABLE 15

MEASUREMENTS OF *Spilogale putorius tropicalis*

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
GUERRERO																
Chilpancingo	♂	Ad	360	125	40	—	—	—	—	—	13.1	14.2	18.0	—	—	15.9
	♂	Ad	310	110	35	39.2	44.8	43.4	27.9	25.4	12.9	13.8	16.2	23.2	15.1	14.9
	♂	Y	335	120	38	41.7	47.5	44.0	28.1	25.9	12.6	13.3	16.6	25.3	16.8	15.5
	♀	Ad	310	105	35	—	—	—	27.3	—	13.1	13.8	15.0	—	16.1	15.0
MORELOS																
Yautepec	♂	Ad	—	—	—	42.9	48.7	45.2	30.7	26.1	13.6	13.7	17.2	25.4	16.8	15.5
OAXACA																
"District Astata"	♀	S-Y	276	87	33	36.5	41.9	40.3	26.2	22.5	11.4	—	14.8	21.6	14.9	14.6
	?	S-Y	—	—	—	44.0	49.1	45.3	30.4	26.6	12.8	—	18.3	25.6	15.6	16.8
Bisilana	♀	Y	339	116	37	40.7	46.5	44.3	27.9	24.3	12.4	13.0	17.1	23.5	15.3	15.3
	♀	S-Y	335	107	38	41.5	47.8	45.6	27.8	24.1	12.4	13.4	16.9	24.5	15.6	16.5
Cerro San Pedro	♀	S-Y	370	120	40	40.4	46.5	43.1	28.1	25.3	13.1	13.6	16.1	24.6	15.9	15.1
Cerro Tablon	♀	Y	300	110	35	38.7	44.0	42.7	27.4	24.0	13.3	14.2	16.3	22.4	15.0	15.5
Escurano	♂	S-Y	352	105	35	41.4	47.3	44.6	29.7	25.7	13.2	13.2	17.1	24.4	16.9	15.3
	♂	J-S	295	105	37	38.3	43.8	42.3	27.8	24.8	12.7	13.3	15.9	22.3	15.8	14.6
La Presa	♀	Y	320	114	37	40.3	46.0	43.1	28.1	23.7	12.5	—	16.2	24.0	15.5	15.4
	?	S-Y	—	—	—	42.5	28.6	27.0	31.0	26.1	13.7	13.6	17.1	25.2	17.0	15.9
La Ventosa	♀	Y	330	125	35	—	—	—	26.1	23.9	12.4	12.8	15.9	—	15.1	15.2
Salazar	♀	Ad	316	115	34	39.6	45.7	44.2	27.7	—	12.1	12.6	16.2	22.9	15.5	15.5
San Antonio	♀	S	419	148	42	44.0	—	—	—	—	—	—	18.5	—	—	16.7
San Mateo del Mar	♂	Ad	387	145	46	46.5	52.8	48.9	32.9	29.8	14.8	14.4	18.2	28.8	16.2	16.5
	♂	Ad	—	—	—	40.3	46.7	43.5	29.6	26.1	13.6	—	16.2	24.0	16.6	15.4
	♂	Ad	—	—	—	41.5	47.0	44.2	29.0	26.6	13.8	14.8	17.1	24.2	15.9	15.4
	♂	Ad	—	—	—	—	—	—	—	—	14.4	—	18.4	—	—	—

TABLE 15—(*Continued*)

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
	♂	Y	—	—	—	44.7	50.3	46.2	31.2	27.9	13.5	13.6	18.0	26.7	16.0	15.8
	♀	Ad	—	—	—	42.5	49.1	46.0	30.6	27.8	14.0	14.8	17.4	25.1	16.4	15.7
	♀	Ad	—	—	—	—	—	—	—	—	12.9	—	15.6	—	—	14.8
	♀	Y	—	—	—	—	—	—	—	—	12.3	13.5	—	22.8	15.3	14.5
Santa Maria del Mar	♀	Ad	336	120	36	38.5	45.4	43.2	27.6	24.8	12.9	—	16.4	22.1	15.3	15.4
	♀	Ad	343	130	35	—	—	43.3	—	25.4	—	—	15.0	—	16.0	15.3
Tehuantepec and near Tehuantepec	♂	Ad	344	115	35	40.8	45.4	—	28.1	24.8	12.5	14.0	16.0	23.5	15.4	15.4
	♂	Ad	—	—	—	45.6	50.1	48.3	33.9	28.8	15.6	14.7	17.7	27.7	17.0	16.2
	♂	Y	—	—	—	44.6	50.2	47.0	31.6	26.4	13.3	13.4	18.2	26.4	16.3	16.3
	♂	S-Y	334	115	35	40.1	45.7	43.3	28.6	23.8	13.3	14.3	16.2	23.6	15.9	15.0
	♀	Ad	—	—	—	39.4	44.8	42.5	27.7	24.1	12.2	12.9	16.3	23.2	15.2	15.9
Tres Cruces	♂	S	300	100	36	—	46.6	45.6	28.3	25.8	12.5	13.4	17.1	—	16.4	15.6
	♀	Y	320	120	37	39.5	44.7	43.5	—	25.4	12.9	13.0	16.4	22.3	16.3	14.7
PUEBLA																
Near Izucar de Matamoros	♂	Ad	352	111	40	44.2	50.1	48.2	31.2	28.8	13.8	13.7	17.7	26.2	15.9	16.5
	♂	Ad	346	101	39	44.5	49.6	46.2	31.5	28.2	13.9	14.3	16.6	26.6	17.4	16.0
	♂	Y	325	109	35	40.7	46.5	43.3	29.0	26.2	12.3	13.3	15.9	24.8	16.4	15.7
	♀	S-Y	292	99	36	29.0	44.6	42.9	27.5	25.7	12.8	13.7	15.4	23.3	17.2	15.2
EL SALVADOR																
Lake Olomega	♂	Ad	385	122	41	43.1	48.8	46.3	31.4	27.5	14.7	14.5	17.2	25.9	16.9	16.4
	♂	Y	398	137	47	—	53.3	49.3	31.9	26.9	—	—	19.3	—	—	16.4
	♂	S-Y	374	108	46	46.2	52.5	29.9	32.9	28.8	13.9	14.1	18.4	27.8	17.7	16.5
	♀	Ad	337	111	39	41.3	47.0	44.6	29.4	26.2	13.9	13.9	17.0	24.2	15.2	15.9
Puerto de Triunfo	♂	Ad	381	122	46	47.0	54.2	51.0	34.3	29.4	14.9	13.8	19.3	28.3	17.6	17.9
	♂	Ad	383	122	44	46.3	52.5	49.3	32.5	28.7	15.4	15.1	18.5	27.9	17.0	16.5

SPECIMENS EXAMINED: Forty-seven, from the following localities:

MEXICO: *Guerrero:* Chilpancingo, 4 (3 C.N.H.M., 1 U.M.M.Z.). *Morelos:* Yautepec, 1 (U.S.N.M.). *Oaxaca:* Dist. Astata, 2 (A.M.N.H.); Bisilana (on plains between Las Tejas and San Antonio), 2 (A.M.N.H.); Cerro San Pedro, Dist. Tehuantepec, 1 (A.M.N.H.); Cerro Tablon, 1 (A.M.N.H.); Escurano, Dist. Tehuantepec, 2 (A.M.N.H.); La Presa, Dist. Tehuantepec, 2 (A.M.N.H.); La Ventosa, Salina Cruz, Dist. Tehuantepec, 1 (A.M.N.H.); Salazar, Dist. Tehuantepec, 1 (A.M.N.H.); San Antonio, 1 (A.M.N.H.); San Geronimo, 1 (U.S.N.M.); San Mateo del Mar, 8 (U.S.N.M.); Santa Maria del Mar, Dist. Juchitan, 2 (A.M.N.H.); Tehuantepec, Dist. Tehuantepec, 4 (2 A.M.N.H., 2 U.S.N.M.); near Tehuantepec, 1 (U.S.N.M.); Tres Cruces, Dist. Tehuantepec, 2 (A.M.N.H.). *Puebla:* Four and one-half miles southeast of Izucar de Matamoros, 1 (U.I.M.N.H.); 8 kilometers west of Izucar de Matamoros, 1 (U.I.M.N.H.); 5 miles east of Izucar de Matamoros, 1 (U.I.M.N.H.); 16 kilometers south-southwest of Izucar de Matamoros, 2 (U.I.M.N.H.). EL SALVADOR: *San Miguel:* southwest edge of Lake Olomega, 200 ft., 4 (M.V.Z.). *Usulutan:* Puerto de Triunfo, sea level, 2 (M.V.Z.).

Spilogale putorius yucatanensis Burt

Figures 21 and 22

Spilogale angustifrons yucatanensis BURT, September 6, 1938, Occas. Papers Mus. Zool., Univ. Michigan, no. 384, p. 2. Type: U.M.M.Z. No. 75780; adult female; collected by Milton B. Trautman, March 2, 1936; from Chichen Itza, Yucatan, Mexico.

DISTRIBUTION: Known only from the type locality, but probably occurs throughout most of the Yucatan Peninsula. Integradation with other subspecies not known. Lower Tropical (Arid Lower Tropical Subzone) Life Zone: Yucatan Peninsula Biotic Province. Known from 200 to 300 feet.

EXTERNAL MEASUREMENTS: Males, unknown; probably about 300, 115, 35; female, 270, 104, 32.

CRANIAL MEASUREMENTS: Males: zygomatic breadth, 28.2; length of tooth row, 14.8 (14.4–15.2); female: basilar length, 37.9; condylobasal length, 43.2; zygomatic breadth, 26.4; interorbital breadth, 12.3; height of cranium, 14.0; length of tooth row, 13.5.

WEIGHT: Males, unknown; female, 133.7.

COLOR PATTERN: Nasal patch medium, truncate distally. Dorsal stripes medium, as wide as black dorsal stripe, narrower than black shoulder stripes; dorsals connected weakly to first vertical stripes around posterior shoulder stripes, reappearing at level of first verticals as elongate spots, connected by constriction to second vertical stripes. Shoulder stripes medium, about as broad as black shoulder stripes; pre-auricular patches medium; chin stripes absent. Lateral stripes medium, broader than first vertical stripes, laterals reaching, but not extending onto, foreleg. First vertical stripes medium, slightly narrower than laterals, connected by constriction to dorsals around posterior shoulder stripes, not connected to dorsal spots at level of first verticals. Second vertical stripes broad, distally the broadest stripes; second verticals connected to dorsals proximally and connected anteriorly with dorsal spots at level of first verticals. Third vertical stripes reduced to small rump patches. No white on forefeet or hind feet. Tail-base patch U-shaped. Tail about one-quarter white mid-dorsally, remainder of tail, dorsally and ventrally, composed of mixed black and white hairs.

This subspecies is known only by three specimens: the type, a female, and the broken skulls of two males. *Spilogale putorius yucatanensis* is the smallest subspecies of *Spilogale putorius* and approaches in size the diminutive *S. pygmaea*. In total length *yucatanensis* is but slightly larger than *pygmaea* but differs from it in having a longer (both actually and proportionately) tail. In *pygmaea* the tail, which averages 75 mm. in males, is about one-fourth of the total length; in *yucatanensis* it is almost two-fifths, being 104 mm. long. Cranially, *yucatanensis* also resembles *pygmaea* in its small size but is 3 or 4 per cent larger in most measurements, except for mastoid breadth in which it is 13 per cent larger and height of cranium in which it is 8 per cent smaller. In addition to the longer tail and wide mastoids, *yucatanensis* differs from *pygmaea* most markedly in color pattern. There is no white on the feet, the lateral stripes do not extend well down on the forelegs, the third vertical stripes do not extend down onto the hind legs, the nasal patch is

not connected to the shoulder stripes, and the dorsal stripes are not connected to the laterals. In many ways *yucatanensis* resembles *elata* in color pattern but differs from it in having a much whiter tail, in addition to being smaller in all measurements.

Gaumer (1917, p. 231) recorded spotted skunks (under the name *Spilogale putorius*) from 15 localities in Yucatan, three in Quintana Roo, and one in British Honduras, all of which I tentatively assign to this subspecies. The external measurements that he gives (p. 232) for one specimen are too large for *yucatanensis*, but could be those of *tropicalis* or *elata*, and inasmuch as Gaumer lists specimens from as far north as Iowa, from Guanajuato, Mexico, and from Guatemala all under the same heading, it may well be that his measurements were of a specimen from some other place than the Yucatan Peninsula.

Intergradation with other subspecies is un-

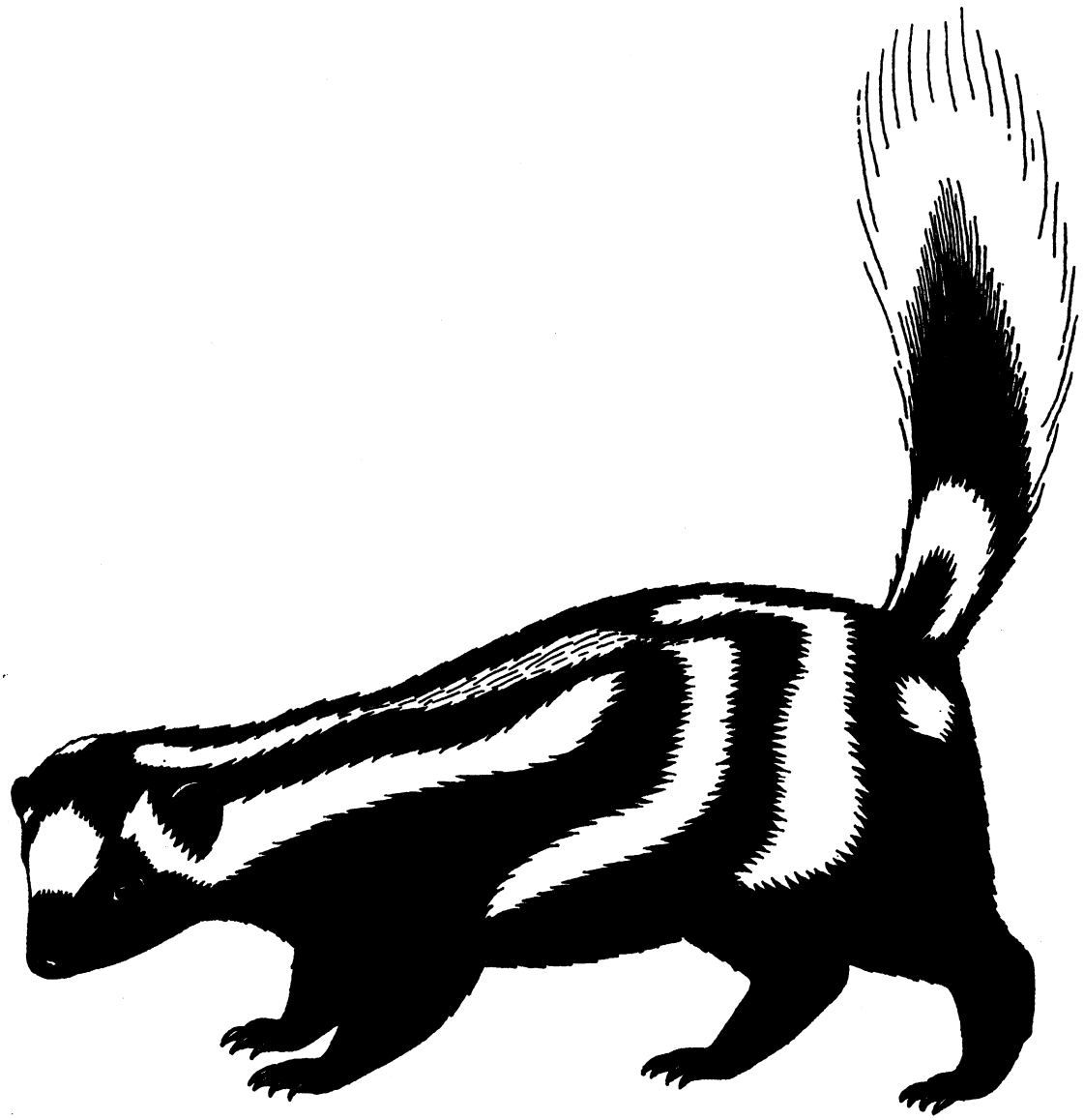

FIG. 21. Color pattern of *Spilogale putorius yucatanensis*. Drawn from an adult female, U.M.M.Z. No. 75780, from Chichen Itza, Yucatan, Mexico. Not to scale.

TABLE 16

MEASUREMENTS OF *Spilogale putorius yucatanensis* FROM CHICHEN ITZA, YUCATAN

Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
♂	Ad	—	—	—	—	—	—	—	—	—	—	16.9	—	—	15.2
♂	Y	—	—	—	—	—	—	28.2	25.4	—	—	16.1	—	—	14.4
♀	Ad	270	104	32	37.9	43.2	41.0	26.4	25.1	12.3	12.8	15.1	23.0	14.0	13.5

known. It is quite likely that when additional specimens are collected, *yucatanensis* will be shown to intergrade with *elata* in northern Guatemala and possibly in northeastern Chiapas.

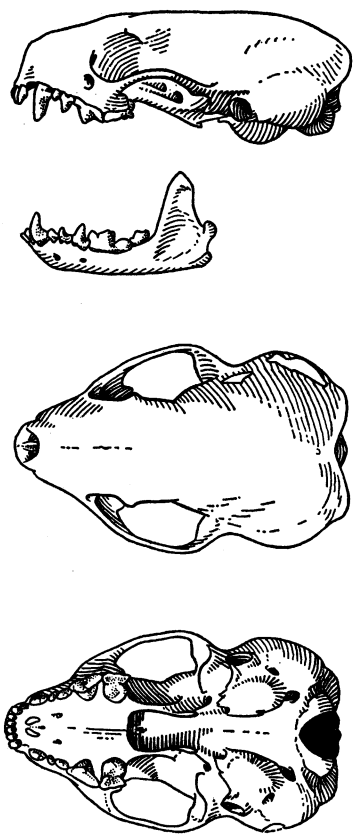

FIG. 22. Lateral, dorsal, and ventral views of the skull of *Spilogale putorius yucatanensis*, adult female, U.M.M.Z. No. 75780, from Chichen Itza, Yucatan, Mexico. ×1.

The one complete skull shows no signs of lesions or swellings of the frontal bones. The female was captured in March, and the two males in July and November. The specimen taken in the last month is probably a young adult. Gaumer (1917, p. 233) says that the young number four to six and are born in February and that by May they accompany the mother on her hunting trips.

SPECIMENS EXAMINED: Three, from the following locality:

MEXICO: *Yucatan:* Chichen Itza, 3 (U.M.M.Z.).

Spilogale putorius elata Howell

Figures 23 and 24

Spilogale angustifrons elata HOWELL, November 24, 1906, North Amer. Fauna, no. 26, p. 27. Type: U.S.N.M. No. 133186; adult male; collected by E. A. Goldman, March 19, 1904; original no. 16618; from San Bartolome, Chiapas, Mexico.

DISTRIBUTION: Highlands of Chiapas, Guatemala, El Salvador, and Honduras. Intergrades with *celeris* in northern Nicaragua, and with *tropicalis* in southeastern Oaxaca and possibly at lower elevations in El Salvador (fig. 4). Upper Tropical (Arid Tropical Subzone) Life Zone. Known from 1000 to 8000 feet.

EXTERNAL MEASUREMENTS: Males, 358.5 (335–385), 113.2 (105–130), 39.5 (34–45); females, 375.0 (335–415), 120 (100–140), 35 (30–40).

CRANIAL MEASUREMENTS: Males: basilar length, 44.8 (43.3–45.7); condylobasal length, 51.3 (49.4–53.0); zygomatic breadth, 32.2 (30.9–33.6); interorbital breadth, 14.1 (13.4–14.7); height of cranium, 17.4 (16.5–17.9);

length of tooth row, 16.7 (15.7–17.3); females (in same order): 42.6 (41.0–44.1), 48.5 (46.6–50.4), 30.4 (28.6–32.1), 13.5 (12.4–14.6), 16.8 (16.5–17.0), 16.1 (15.7–16.5).

WEIGHT: Unknown.

COLOR PATTERN: Nasal patch large, slightly longer than broad. Dorsal stripes medium, about as broad as black dorsal stripe and white shoulder stripes; dorsals constricted at level of scapulae, wider posterior to constriction than anteriorly; dorsals interrupted at level of posterior shoulder stripes, never connected to first vertical stripes; dorsals appearing again at level of first verticals as small spots, sometimes connected posteriorly to second vertical stripes. Shoulder stripes narrow, about as broad as dorsals, frequently narrower than black shoulder stripes; preauricular patches medium to large; chin stripes absent. Lateral stripes medium, sometimes narrower than and sometimes not joined to first vertical extensions; laterals extending onto forelegs, but never distal to elbow. First vertical stripes variable, broad to

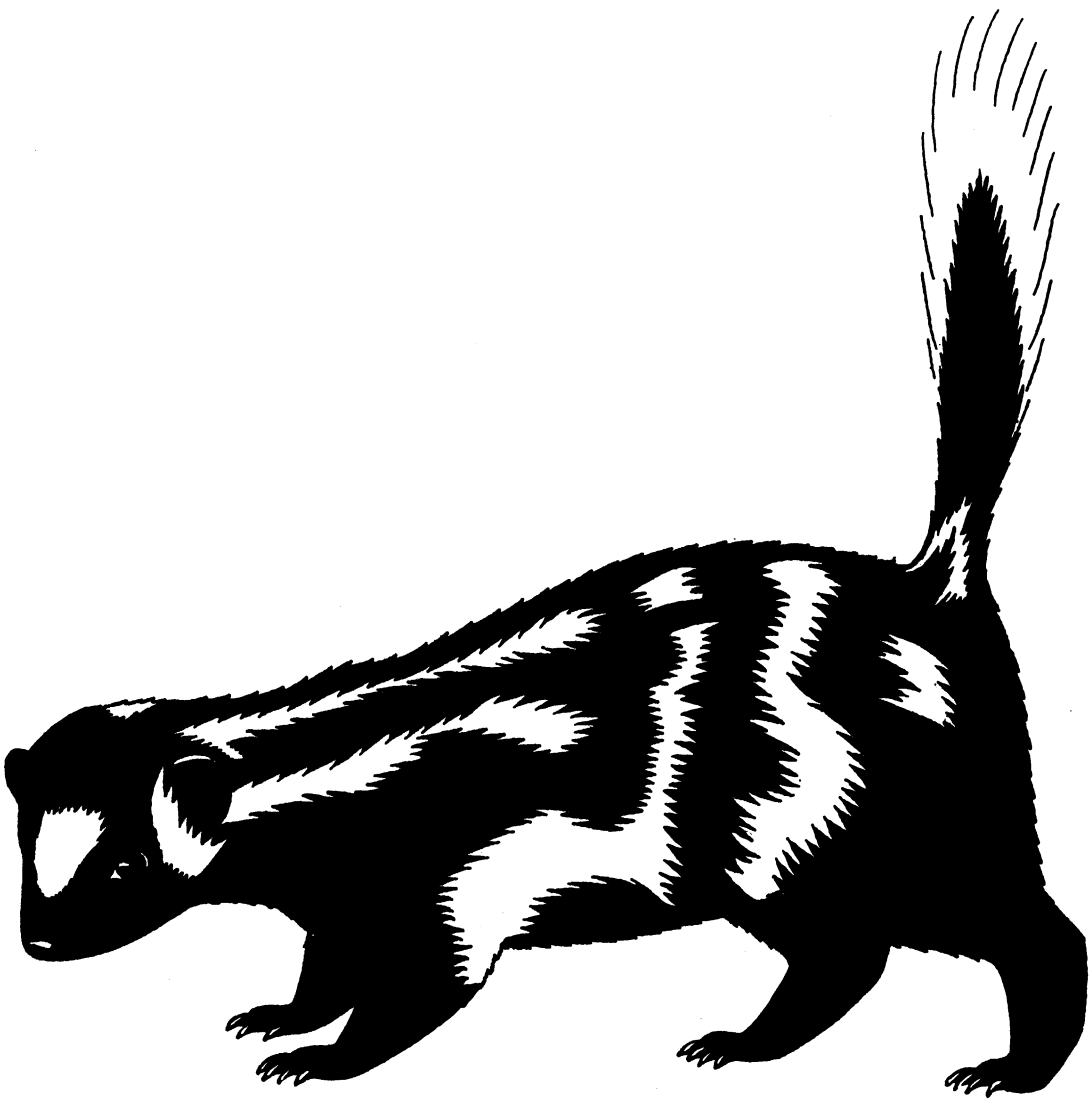

FIG. 23. Color pattern of *Spilogale putorius elata*. Drawn from an adult male, A.M.N.H. No. 126187, from La Flor, Archaga, Honduras. Not to scale.

narrow; first verticals never connected to dorsals. Second verticals variable, usually much reduced proximally, expanded distally, always joined to dorsals and sometimes connected anteriorly to dorsal spots at level of first verticals. Third vertical stripes absent or present as small rump patches, never extending far down hind legs. No white on forefeet; white often present on hind feet. Tail-base patch variable, from absent to U-shaped, often indistinct medially. Tail about one-fourth white middorsally, white extending about halfway down sides; tail two-thirds to three-quarters white ventrally.

Spilogale putorius elata differs from *S. p. tropicalis* in being slightly larger cranially, in having a shorter tail, and in having less extensive white markings. In particular, the third vertical stripes are reduced to small rump patches and do not descend onto the hind legs, and the lateral stripes are narrower and do not reach the forefeet. Some individuals of *elata* resemble specimens of *angustifrons* in having the second vertical stripes reduced and in having a less distinct tail-base patch. For additional discussion of the differences between *elata* and *tropicalis*, see the account of the latter.

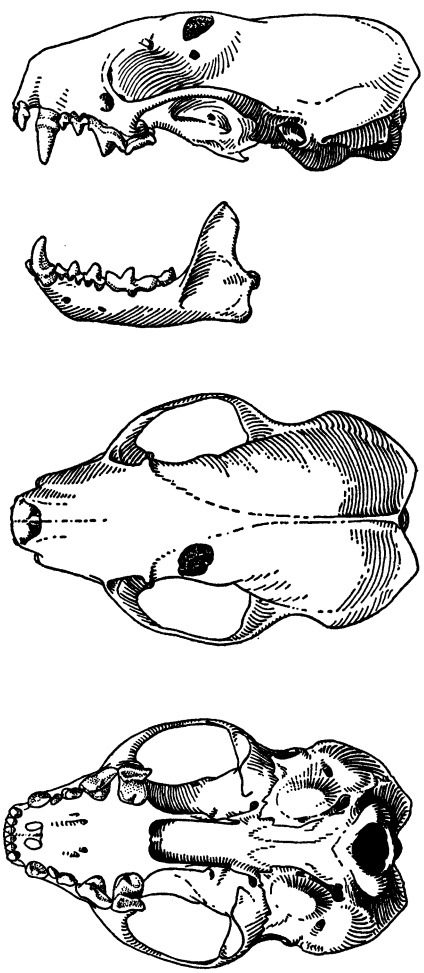

FIG. 24. Lateral, dorsal, and ventral views of the skull of *Spilogale putorius elata*, adult male, A.M.N.H. No. 126187, from La Flor, Archaga, Honduras. ×1.

From *S. p. yucatanensis*, with which *elata* may intergrade in northern Guatemala, *elata* differs in being larger in all cranial measurements and in having a much greater length of head and body.

The differences between *elata* and *celeris* are slight. In general, *celeris* is larger and darker. Probably there is a cline of increasing size and decreasing amounts of white from the range of *elata* to that of *celeris*.

It is quite likely that animals from the higher elevations of the range of *elata* (and this is probably true of *celeris*, as well) are darker and shorter-tailed than those from the lower elevations. Specimens from 7000 to 8000 feet in El Salvador seem to indicate this when they are compared with those from lower elevations in Chiapas and El Salvador. Although this may be an environmental response, it may also indicate that intergradation between *elata* and *tropicalis* occurs at lower elevations.

The external measurements of one of the two females exceed those of any of the males; in cranial measurements this specimen could fit into the series of males, for they closely approximate the averages. It may be that this specimen was incorrectly sexed, but, with only one other female for comparison, it seems advisable to consider this specimen as a female until the range of variation of specimens of that sex is established for this subspecies.

Lesions of the frontal sinuses are present in all the adult specimens examined. Only two of the 12 specimens are females. Young adults have been captured in September, January, and February, and adults in February and March; a subadult-young adult was taken in December.

TABLE 17

MEASUREMENTS OF *Spilogale putorius elata*

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
GUATEMALA																
Capetillo	♂	Y	—	—	—	—	—	—	31.3	26.0	13.4	—	17.9	—	17.7	15.7
HONDURAS																
Cantoral	♂	Ad	360	130	34	44.7	49.5	47.1	32.4	27.1	13.9	13.9	18.3	25.9	17.6	16.6
La Flor Archaga	♂	Ad	359	105	36	45.0	50.9	48.5	32.6	28.1	14.4	14.7	18.0	27.9	17.0	16.0
Laguna Archaga	♂	S-Y	290	80	36	44.1	49.7	47.3	—	26.5	13.1	14.1	17.9	26.0	17.1	16.0
MEXICO: CHIAPAS																
Cinco Cerros	♀?	Ad	415	140	40	44.1	50.4	47.4	32.1	27.4	14.6	—	17.8	26.2	17.0	16.5
Pinabete	♂	Y	—	—	—	43.9	51.1	47.8	32.2	27.4	14.2	15.8	18.8	25.6	17.9	16.6
San Bartolome	♂	Ad	385	123	45	45.7	52.2	49.2	33.6	28.5	14.4	13.8	18.1	27.6	16.5	16.6
EL SALVADOR																
Los Esesmiles	♀	Y	335	100	30	41.0	46.6	44.5	28.6	24.6	12.4	13.0	16.6	24.4	16.5	15.7
	♂	Ad	360	106	42	45.4	52.5	49.8	31.6	27.5	14.1	13.8	18.6	26.8	17.8	17.1
San Salvador	♂	Ad	352	110	40	45.8	51.7	47.8	32.5	27.2	13.8	14.2	17.4	28.2	17.7	16.6
	♂	Y	335	105	40	43.3	49.4	45.6	30.9	27.1	13.7	14.4	17.1	26.0	17.2	16.2
	♂	Y	—	—	—	—	53.0	48.9	32.9	28.5	14.7	14.8	18.9	—	17.0	17.3

SPECIMENS EXAMINED: Twelve, from the following localities:

GUATEMALA: Capetillo, 1 (U.S.N.M.). HONDURAS: *Tegucigalpa:* Cantoral, 1 (A.M.N.H.); La Flor Archaga, 1 (A.M.N.H.); Laguna Archaga, 2000 ft., 1 (A.M.N.H.). MEXICO: *Chiapas:* Cinco Cerros, Cintalapa, 1 (A.M.N.H.); Pinabete, 1 (U.S.N.M.); San Bartolome, 1 (U.S.N.M.). EL SALVADOR: *Cucutlan:* Colima, 1000 ft., 1 (M.V.Z.). *Chalatenango:* Los Esesmiles, 7000–8000 ft., 3 (M.V.Z.). *San Salvador:* San Salvador, 1 (M.H.C.)

Spilogale putorius celeris Hall

Figures 25 and 26

Spilogale angustifrons celeris HALL, May, 1938, Ann. Mag. Nat. Hist., ser. 11, vol. 1, p. 510. Type: B.M. No. 3.2.1.8; adult male; collected by C. F. Underwood, February 4, 1901; from San Isidro, Alajuela, Costa Rica.

DISTRIBUTION: Highlands of Nicaragua southward to central Costa Rica; southern limits of range unknown. Intergrades with *elata* in northern Nicaragua (fig. 4). Upper Tropical (Arid Tropical Subzone) Life Zone. Known from about 3000 to 4500 feet.

EXTERNAL MEASUREMENTS: Males [type, measured from the stuffed skin by Hall (1938, p. 511)] and a specimen from Nicaragua with questionable measurements, 360, 480; 90, 150; —, 40; females, unknown.

CRANIAL MEASUREMENTS: Males: basilar length, 46.2 (45.5–46.9); condylobasal length, 52.6 (51.2–53.9), zygomatic breadth, 34.9; interorbital breadth, 15.0 (14.6–15.4); height of cranium, 17.6 (17.5–17.7); length of tooth row, 16.5 (16.5–16.5); female (in same order): 41.6, 47.7, 29.4, 13.5, 16.2, 15.2.

WEIGHT: Unknown.

COLOR PATTERN: Nasal patch medium, truncate distally. Dorsal stripes narrow, about as wide as dorsal black stripe, narrower than black or white shoulder stripes; dorsals not connected to first vertical stripes, interrupted at level of posterior shoulder stripes; dorsals reappearing at level of first verticals as elongate spots sometimes connected by constriction to second vertical stripes. Shoulder stripes medium, broader than dorsals and slightly broader than black shoulder stripes; pre-auricular patches medium; chin stripes absent. Lateral stripes medium, broader than first vertical stripes and extending onto forelegs, but never below elbow. First vertical stripes medium to narrow, always narrower than laterals; first verticals never connected to dorsals anteriorly around end of posterior shoulder stripes or to dorsal spots. Second verticals broad, distally the broadest stripes, connected by constriction to dorsals, and connected anteriorly by constriction to dorsal spots at level of first verticals in some. Third vertical stripes absent or reduced to small rump patches, never extending as stripes onto hind legs. No white on forefeet; small patches of white sometimes on hind feet. Tail-base patch U-shaped, indistinct medially in some. Tail about one-third white middorsally, extending more than

TABLE 18

MEASUREMENTS OF *Spilogale putorius celeris*

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
COSTA RICA																
"Costa Rica"	(♂)	Y	—	—	—	45.5	51.2	47.2	—	27.4	14.6	—	17.8	27.6	17.7	16.5
San Isidro (after Hall, 1938, pp. 511–512)	♂	Ad	360	90	—	46.1	—	50.6	34.1	28.9	14.5	—	17.6	28.6	16.3	—
	♂	S	379	120	—	45.1	—	48.5	32.1	28.6	14.5	—	18.0	26.8	16.3	—
NICARAGUA																
Matagalpa	♂	Ad	480	150	40	46.9	53.9	51.1	34.9	28.2	15.4	15.3	18.7	28.1	17.5	16.5
Jalapa	♀	Ad	—	—	—	41.6	47.7	45.5	29.4	25.9	13.5	12.7	16.6	25.5	16.2	15.2
	♀	S	—	—	—	—	—	—	—	—	14.0	14.3	17.9	—	—	16.2

halfway down sides; tail about four-fifths white ventrally.

Hall (1938, p. 511) distinguished *celeris* from *elata* as having "narrower white stripes, absence of white spots on the thighs, seemingly shorter tail, less inflated tympanic bullae, and truncated, rather than anteriorly convex glenoid processes." This last character, which Hall believed to occur in clinal fashion, with the ventral lip of the glenoid fossa becoming increasingly shorter and more truncate in southern forms, proves to be one of individual variation, for specimens from all parts of the range of *Spilogale* may exhibit truncate lower lips of the glenoid fossa.

Another feature of *celeris* cited by Hall (p. 513) is that of a fenestration of the lateral wall of the interpterygoid space at the junction of the palatine and interpterygoid bones. This, too, proves to be an individual variant which I have found in spotted skunks from Nebraska, Texas, and California. It does seem to be more prevalent in the southern races, however, and possibly may be a characteristic of older animals. It is not suitable as a diagnostic character of *celeris*.

Spilogale putorius celeris seems to be the end of a cline in size and color pattern that

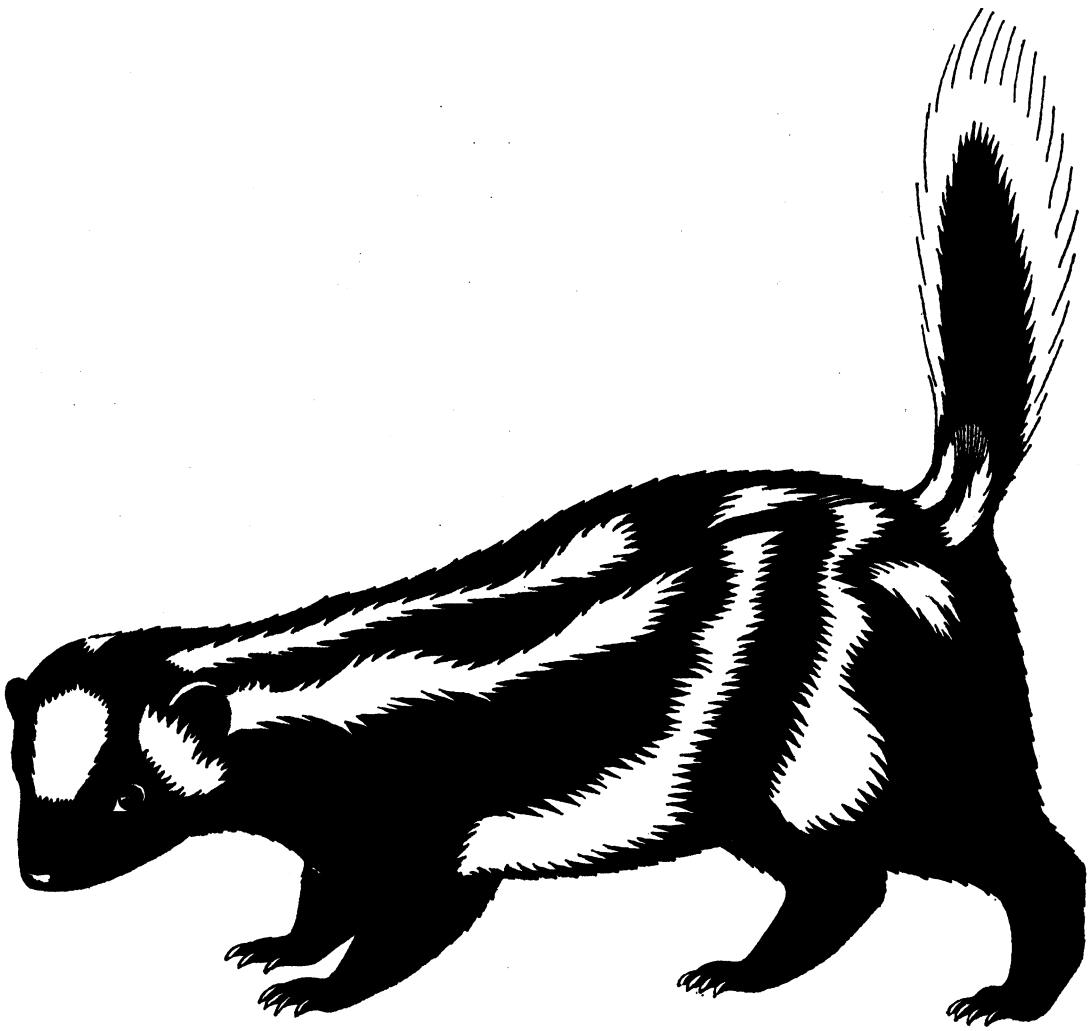

FIG. 25. Color pattern of *Spilogale putorius celeris*. Drawn from an adult male, A.M.N.H. No. 28408, from Matagalpa, Nicaragua. Not to scale.

starts in Chiapas. Southeastward from Chiapas specimens become larger and darker, but the differences between specimens at the two ends of the cline appear to be slight. It is possible that when additional specimens are collected from intervening areas, *celeris* and *elata* will prove to be variants of a single subspecies, for which the latter name will prevail. Because I have not examined the type of *celeris* and in view of the slight differences in color pattern and size that exist between it and *elata*, I have not synonymized this subspecies.

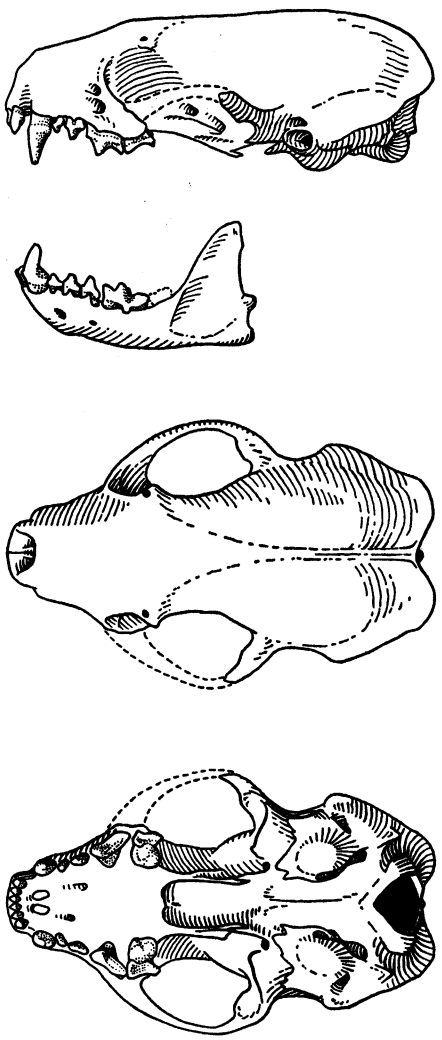

FIG. 26. Lateral, dorsal, and ventral views of the skull of *Spilogale putorius celeris*, adult male, A.M.N.H. No. 28408, from Matagalpa, Nicaragua. ×1.

Three specimens from Nicaragua (an adult male and female and a subadult female) are provisionally assigned to *celeris* on the basis of their somewhat larger cranial measurements. The external measurements given for the male, 48[0], 15[0], 4[0], are considerably larger than those recorded by Hall from the skins of the type and a young [=subadult] male topotype. The measurements of the subadult female seem to be closer to those recorded by Hall. This Nicaragua specimen, and the others from that country, all have small patches (of the third vertical stripes) on the rump and thereby differ from the type which is recorded as lacking white spots on the thighs. These Nicaragua spotted skunks may be considered as showing some signs of intergradation with *elata*.

Two of the three adult specimens have lesions of the frontal sinuses. The subadult was captured in January, and the two adults in September and January.

SPECIMENS EXAMINED: Four, from the following localities:

COSTA RICA: "Costa Rica," probably from near Alajuela, 3000 ft., 1 (U.S.N.M.). NICARAGUA: Jalapa, 2 (A.M.N.H.); Matagalpa, 1 (A.M.N.H.).

Spilogale putorius latifrons Merriam

Figures 27 and 28

Spilogale phenax latifrons MERRIAM, October 8, 1890, North Amer. Fauna, no. 4, p. 15. Type: U.S.N.M. No. 17271/24200; adult female; collected by T. S. Palmer, July 13, 1889; original no. 216; from Roseburg, Douglas County, Oregon.

Spilogale olympica ELLIOT, May 17, 1899, Field Columbian Mus. Publ., no. 32, zool. ser., vol. 1, no. 13 (March), p. 270. Type: C.N.H.M. No. 6336; adult male; collected by D. G. Elliot, October 18, 1898; from Lake Sutherland, Clallam County, Washington.

DISTRIBUTION: Southwestern British Columbia south and west from Alta Lake and Hope, Washington and Oregon west of the crest of the Cascade Mountains, intergrading with *phenax* in northwestern California and with *phenax* and *gracilis* in northeastern California (fig. 4). Upper Sonoran, Transition, and (in a few places) Canadian Life Zones; Oregonian Biotic Province. Known from sea level to 4000 feet.

EXTERNAL MEASUREMENTS: Males, 411.6 (353–460), 126.5 (101–158), 48.3 (41–54); fe-

males, 384.3 (323–439), 120.5 (85–140), 44.3 (40–48).

CRANIAL MEASUREMENTS: Males: basilar length, 50.8 (46.0–55.9); condylobasal length, 57.6 (52.4–62.9); zygomatic breadth, 37.2 (33.4–40.9); interorbital breadth, 16.6 (15.0–19.6); height of cranium, 18.0 (16.5–19.1); length of tooth row, 19.3 (17.5–21.2); females (in same order): 46.8 (43.6–50.7), 52.3 (50.0–56.8), 33.5 (30.9–36.8), 15.4 (13.7–16.6), 16.9 (15.2–18.3), 18.3 (16.1–19.1).

WEIGHT: Males, 815.6 (784–847); females, 411.5 (370–453).

COLOR PATTERN: Nasal patch large, longer than broad, with small posterior projection in some. Dorsal stripes narrow, narrower than intervening dorsal black stripe; dorsals interrupted at level of scapulae in some, and continuing posteriorly to level of posterior end of shoulder stripes or slightly beyond;

FIG. 27. Color pattern of *Spilogale putorius latifrons*. Drawn from an adult male, A.M.N.H. No. 15722, from Port Angeles, Clallam County, Washington. Not to scale.

dorsals rarely connected to first vertical stripes; dorsal stripes reappearing at level of first verticals as small spots, rarely connected by constriction to second verticals. Shoulder stripes narrow, broader than dorsal stripes, but usually narrower than black shoulder stripes; pre-auricular patches medium, generally more than twice width of anterior end of shoulder stripes, and without branching chin stripes. Lateral stripes generally narrow and reduced in length, but longer and broader in southern specimens; laterals generally broader than first verticals in southern specimens, narrower or equal in width in northern ones; laterals reaching upper foreleg in some, almost absent in others. First vertical stripes generally narrow, usually not connected with dorsals. Second vertical stripes medium, generally broader than first verticals; frequently connected with dorsal stripes. Third vertical stripes reduced to small rump patches or absent. Tail-base patch usually broken medially and small. Tail about one-third white middorsally, extending about halfway on sides, and about two-thirds white ventrally.

Spilogale putorius latifrons is not markedly different from *S. p. phenax*. Although there are significant differences in the means of most measurements, these are of not greater magnitude than might ordinarily be expected between two adjacent populations. It is only in the short tail, and consequent shorter total length, that *latifrons* differs from *phenax* at the 84 per cent level of separability. In general, *latifrons* is smaller in all external and cranial measurements, except interorbital and postorbital breadth, height of cranium, and length of tooth row. In these last two measurements *latifrons* averages approximately the same size as the largest specimens of *phenax* from Marin and Alameda counties, California. In postorbital breadth, *latifrons* is both actually and relatively wider than *phenax*. *Spilogale putorius latifrons* can be distinguished from *phenax* in the following characters: tail short, usually less than 145 mm., and generally less than half of the length of the head and body; postorbital breadth great, usually wider than interorbital breadth and more than 44 per cent of the zygomatic breadth in males (more than 46 per cent in females).

Intergradation between *latifrons* and *phenax* takes place in northwestern California. Spotted skunks examined from southwestern Oregon all are clearly *latifrons*, while specimens from Del Norte, Humboldt, and western Siskiyou, Shasta, and Mendocino counties, California, show some signs of intergradation between *latifrons* and *phenax*, although most seem less like the former and more like *phenax*. There is need of more specimens from southern Coos and Josephine counties in Oregon to delimit more clearly the zone of intergradation. Specimens from the higher elevations in the zone of intergradation seem to resemble the northern race, *latifrons*, more closely than do those from the lower altitudes.

Spilogale putorius latifrons differs from *S. p. gracilis* of eastern Oregon in being slightly larger in all measurements, except length of tail. *Spilogale p. latifrons* is separable from *gracilis* at the 84 per cent level in interorbital and postorbital breadth, height of cranium, and length of tooth row (fig. 14).

Spilogale p. gracilis is slightly shorter in length of head and body, and the relatively long tail comprises about 50 per cent of this length. In color pattern *latifrons* differs from *gracilis* in having narrower dorsal stripes and generally narrower vertical stripes. The lateral stripes of *latifrons* may be as much reduced as in *gracilis*. Intergradation between *latifrons* and *gracilis* takes place in northeastern California, where intergradation with *phenax* also occurs. For details of intergradation between these subspecies, see the account of *phenax*.

Dalquest (1948, p. 215) showed that there were no differences between *latifrons* and *olympica* sufficient to warrant the recognition of the latter, even at the subspecific level. He mentioned that there is considerable variation but that the overlap is so great as to make the supposedly distinctive characters of *olympica* untenable. Specimens from southwestern Oregon, where the type of *latifrons* is from, are smaller than those from most other places within the range of this subspecies. Specimens from the northern part of the range, in British Columbia, are also small, being about the same size as those from southwestern Oregon in many measurements. The largest specimens of *latifrons* are from northwestern Oregon and southwestern

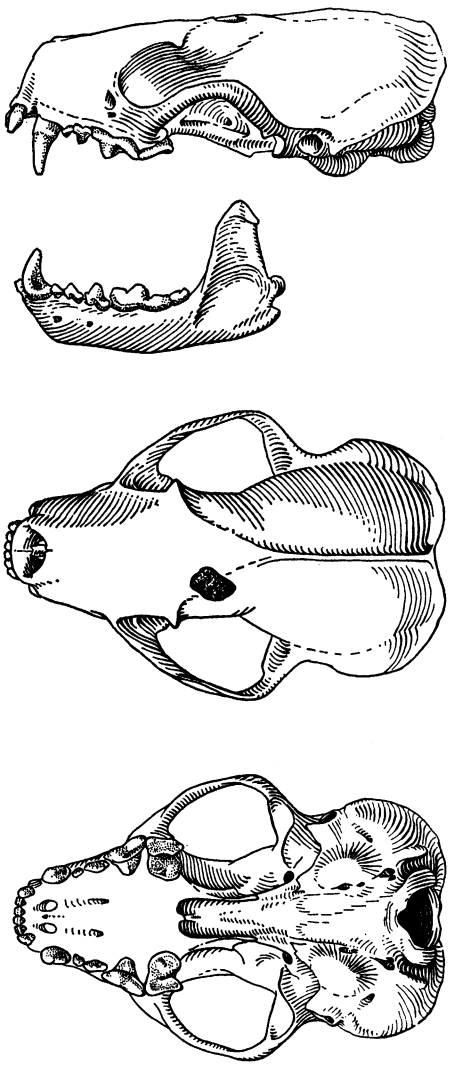

FIG. 28. Lateral, dorsal, and ventral views of the skull of *Spilogale putorius latifrons*, adult male, A.M.N.H. No. 15722, from Port Angeles, Clallam County, Washington. ×1.

Washington. From northern Oregon to British Columbia there seems to be a gradual decrease in size, particularly in length of tail and total length. Comparison of all specimens from western Oregon with all from western Washington reveals no differences of taxonomic significance and a very close over-all resemblance.

Specimens from the Olympic Peninsula differ only slightly from those on the opposite side of Puget Sound. Males from the Peninsula are larger in total length and in length of head and body, while females are shorter in these measurements, when compared with specimens from the eastern side of the Sound. In length of tail both males and females from the two areas are approximately the same. In most cranial measurements both populations are essentially the same size.

Spotted skunks from British Columbia are noticeably smaller than those from the other parts of the range of *latifrons*. In particular, the zygomatic width is much less, and British Columbia spotted skunks are separable from those from western Washington at the 84 per cent level in this measurement. Zygomatic breadth, however, is the only character that will so clearly distinguish this population, and I do not feel that this difference is sufficient to warrant the subspecific recognition of the British Columbia populations. Furthermore, almost all of these specimens are skulls without skins and probably were obtained from fur buyers; the determination of sex of many of these specimens is open to question.

Males of *latifrons* average about 7 per cent larger than females in both external and cranial measurements, the range being from 11 per cent (in zygomatic breadth) to 2 per cent (in length of tail).

Adult specimens caught in every month of the year have been examined. Young adults appear in this subspecies from July through January, and they comprise about one-third of all the skunks captured in December and January. Subadults are found from August through November, and juveniles have been taken only in August. If juveniles are about 45 days old, these August-caught specimens must have been born in mid-June or early July. If young adults are approximately 100 days old, the July and August-caught specimens must have been born in April and May, and the December- and January-captured animals presumably were born in September and October. It would seem, then, that *S. p. latifrons* has an extended breeding season, from April to October, or possibly two litters per year may be experienced by some females. Little collecting of spotted skunks of this subspecies seems to have been done in spring (March–June), for only 7 per cent of the specimens were taken in those months (see table 19).

TABLE 19

PER CENT OF SPECIMENS IN AGE GROUPS OF *Spilogale putorius latifrons* COLLECTED EACH MONTH THROUGHOUT THE YEAR

[Figures in parentheses are numbers of males (left) and females in each group.]

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total of Age Group in Entire Population
Adult	59 (4-6)	100 (3-2)	100 (1-1)	100 (0-1)	100 (3-1)	100 (1-1)	50 (0-2)	42 (4-4)	25 (3-0)	65 (12-3)	61 (6-5)	50 (4-5)	58 (41-31)
Young adult	29 (2-3)	—	—	—	—	—	25 (0-1)	11 (1-1)	17 (1-1)	13 (1-2)	17 (1-2)	33 (4-2)	18 (9-13)
Subadult-young adult	12 (2-0)	—	—	—	—	—	25 (0-1)	11 (0-2)	42 (3-2)	—	6 (1-0)	17 (2-1)	11 (8-6)
Subadult		—	—	—	—	—		11 (1-1)	8 (1-0)	22 (2-3)	17 (1-2)	—	9 (5-6)
Juvenile-subadult		—	—	—	—	—		11 (2-0)	8 (1-0)	—	—	—	2 (3-0)
Juvenile		—	—	—	—	—		16 (2-1)	—	—	—	—	2 (2-1)
Number of males and females by months	(8-9)	(3-2)	(1-1)	(0-1)	(3-1)	(1-1)	(0-4)	(10-9)	(9-3)	(15-8)	(9-9)	(10-8)	

Forty-seven per cent of the specimens examined are males. *Spilogale putorius latifrons* is the only subspecies of which more females than males are present in collections. As indicated above, it is believed that a large proportion of the specimens represented only by skulls is sexed incorrectly. This contention is further supported by the fact that among specimens consisting of both skin and skull, with adequate data on locality and date of capture, the percentage of males is 55.

Lesions or swellings of the frontal sinuses are common in this subspecies. Ninety-five per cent of 113 adults showed the effects of the parasites; 91 per cent of 49 young adults had lesions, and 84 per cent of 22 subadult-young adults were infected. One-third of 15 subadults showed signs of infection, but the two juvenile-subadults did not appear to have been infected.

SPECIMENS EXAMINED: Two hundred and twenty-nine, from the following localities:

OREGON: *Clackamas County:* Estacada, 2 (U.S.N.M.); Roaring River, Estacada, 2 (U.S.N.M.); Hillock Burn, Estacada Post Office, 1 (U.S.N.M.); Marmot, 2 (U.S.N.M.); Oak Grove Butte, 1 (U.S.N.M.). *Clatsop County:* Old Fort Clatsop, 100 ft., 2 (M.V.Z.); Gearhart, 2 (M.V.Z.); 1 mile north of Gearhart, 1 (M.V.Z.). *Columbia County:* Seven miles southeast of Ranier, 100 ft., 1 (M.V.Z.). *Coos County:* Empire, 1 (U.S.N.M.); Charleston, 3 (A.H.F.); Coos Head Municipal Park, Charleston, 1 (A.H.F.); Marshfield, 4 (3 C.N.H.M., 1 M.C.Z.). *Curry County:* Port Orford, 4 (U.S.N.M.); southeast of Hubbard Creek, near Port Orford, 1 (U.S.N.M.); Goldbeach, 2 (C.N.H.M.). *Douglas County:* Gardiner, 2 (U.S.N.M.); Roseburg, 1 (U.S.N.M.); 43 miles northeast of Grants Pass, 2 (U.S.N.M.). *Hood River County:* Mouth of Laurel Creek, north base of Mt. Hood, 1 (U.S.N.M.). *Josephine County:* Evans Creek, 1 (S.D.S.N.H.). *Lane County:* Reed, 3 (U.S.N.M.); Eugene, 2 (U.S.N.M.); Hall Creek, Oakridge, 1 (U.S.N.M.). *Lincoln County:* Yaquina, 2 (U.S.N.M.); Delake, 1 (S.D.S.N.H.). *Multnomah County:* Fairview, 1 (S.D.S.N.H.). *Tillamook County:* Netarts, 6 (4 S.D.S.N.H., 2 U.S.N.M.); Blaine, 6 (4 D.R.D., 1 K.U.M.N.H., 1 U.M.M.Z.); Tillamook, 7 (3 K.U.M.N.H., 2 L.A.C.M., 1 M.V.Z., 1 M.C.Z.); Pleasant Valley, 8 miles south of Tillamook, 1 (D.R.D.); Beaver, 1 (K.U.M.N.H.). *Washington County:* Hermann, 10 (U.S.N.M.); Beaverton, 3 (C.N.H.M.). WASHINGTON: *Clallam County:* Lake Sutherland,

TABLE 20

MEASUREMENTS OF *Spilogale putorius latifrons*

Measurement	No.	*M.* ± 2 *S.E.*	*S.D.*	Extremes
Western Oregon (all)				
Total length				
Males	18	418.90 ± 14.10	29.90	356–460
Females	22	391.36 ± 7.84	18.38	355–439
Tail				
Males	18	128.35 ± 7.08	15.00	102–158
Females	22	125.23 ± 1.78	8.34	110–140
Hind foot				
Males	16	48.38 ± 1.51	3.03	43–54
Females	22	44.46 ± 0.75	1.77	40–47
Head and body				
Males	18	290.00 ± 10.42	22.10	250–330
Females	23	268.48 ± 7.30	17.50	240–329
Basilar				
Males	29	51.05 ± 0.80	2.14	46.0–55.9
Females	29	47.13 ± 0.53	1.45	44.0–50.7
Condylobasal				
Males	29	57.87 ± 0.85	2.30	52.4–62.6
Females	31	53.52 ± 0.47	1.32	50.2–56.8
Occipitonasal				
Males	29	52.44 ± 0.77	2.06	47.0–57.0
Females	31	49.11 ± 0.36	0.99	46.3–51.7
Zygomatic				
Males	27	37.21 ± 0.68	1.76	33.8–40.9
Females	31	33.82 ± 0.38	1.06	31.1–35.9
Mastoid				
Males	28	31.95 ± 0.59	1.55	28.3–34.1
Females	30	28.93 ± 0.28	0.77	28.3–31.6
Interorbital				
Males	27	16.75 ± 0.43	1.13	15.0–19.6
Females	31	15.54 ± 0.22	0.60	14.4–16.6
Postorbital				
Males	28	16.88 ± 0.31	0.83	14.9–18.2
Females	30	16.00 ± 0.28	0.78	14.3–17.6
Palatilar				
Males	30	21.15 ± 0.32	0.87	19.1–22.7
Females	30	19.63 ± 0.22	0.60	18.5–20.8
Postpalatal				
Males	30	30.05 ± 0.54	1.48	26.7–33.0
Females	29	27.66 ± 0.37	1.01	25.6–30.2
Cranium height				
Males	29	17.94 ± 0.24	0.65	16.5–19.0
Females	29	16.96 ± 0.23	0.62	15.2–17.8
Tooth row				
Males	30	19.05 ± 0.23	0.63	17.5–20.7
Females	31	18.04 ± 0.21	0.59	16.1–18.9
Western Washington (all)				
Total length				
Males	13	406.54 ± 7.81	14.06	370–434
Females	13	371.15 ± 14.12	25.40	323–424
Tail				
Males	13	129.04 ± 6.67	12.00	104–145
Females	13	119.23 ± 6.88	12.35	87–135

TABLE 20—(*Continued*)

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Hind foot				
Males	13	48.27± 1.76	3.17	41–53
Females	13	44.27± 1.29	2.32	41–48
Head and body				
Males	16	288.13±12.67	25.34	255–356
Females	14	252.14±13.40	25.05	203–309
Basilar				
Males	29	51.06± 0.68	1.82	46.4–54.2
Females	33	46.93± 0.43	1.24	43.6–49.1
Condylobasal				
Males	29	57.82± 0.65	1.74	54.1–61.8
Females	34	53.53± 0.42	1.22	50.4–55.7
Occipitonasal				
Males	29	53.28± 0.59	1.59	49.5–56.2
Zygomatic				
Males	30	37.85± 0.30	0.84	36.4–39.4
Females	31	33.51± 0.30	0.84	31.9–35.3
Mastoid				
Males	30	32.70± 0.31	0.86	31.3–34.5
Females	33	29.67± 0.33	0.95	27.7–31.6
Interorbital				
Males	32	16.64± 0.22	0.62	15.8–18.3
Females	33	15.14± 0.17	0.50	13.7–16.2
Postorbital				
Males	31	17.04± 0.25	0.71	16.1–18.7
Females	29	15.96± 0.21	0.57	14.7–17.1
Palatilar				
Males	29	21.13± 0.24	0.64	20.2–22.2
Females	35	19.48± 0.17	0.49	18.3–20.1
Postpalatal				
Males	26	30.02± 0.55	1.40	26.3–32.1
Females	34	27.63± 0.35	1.01	25.8–30.5
Cranium height				
Males	28	18.16± 0.26	0.68	16.9–19.1
Females	35	16.91± 0.18	0.54	15.8–18.3
Tooth row				
Males	29	19.58± 0.32	0.86	18.0–21.2
Females	35	18.45± 0.18	0.54	17.3–19.1
Southwestern British Columbia (all)				
Total length				
Males	4	393.25		372–418
Females	5	384.00		360–430
Tail				
Males	4	108.75		101–119
Females	5	100.60		85–112
Hind foot				
Males	4	48.00		47–49
Females	5	43.80		40–46
Head and body				
Males	4	284.50		262–313
Females	5	283.40		275–330
Basilar				
Males	16	49.84± 0.94	1.87	46.5–53.0

TABLE 20—(*Continued*)

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Females	19	45.86± 0.51	1.11	43.8–48.1
Condylobasal				
Males	16	57.00± 0.99	1.98	53.5–60.3
Females	19	52.62± 0.53	1.16	50.0–54.9
Occipitonasal				
Males	16	51.44± 1.01	2.01	48.2–54.5
Females	19	48.22± 0.54	1.18	46.0–50.7
Zygomatic				
Males	13	35.60± 0.74	1.34	33.4–37.4
Females	18	32.83± 0.62	1.31	30.9–36.8
Mastoid				
Males	16	31.19± 0.63	1.26	29.4–34.0
Females	19	28.59± 0.50	1.10	26.0–30.2
Interorbital				
Males	16	16.28± 0.20	0.39	15.5–16.9
Females	19	15.28± 0.18	0.39	14.5–15.9
Postorbital				
Males	16	16.53± 0.43	0.86	14.9–17.9
Females	19	15.96± 0.22	0.48	14.9–16.9
Palatilar				
Males	16	20.56± 0.41	0.81	19.3–22.1
Females	19	18.93± 0.26	0.57	18.0–20.1
Postpalatal				
Males	16	29.44± 0.66	1.32	27.0–31.8
Females	19	26.70± 0.35	0.76	25.3–28.1
Cranium height				
Males	16	17.81± 0.27	0.53	16.5–18.7
Females	19	16.78± 0.18	0.39	16.1–17.2
Tooth row				
Males	16	19.31± 0.29	0.57	18.2–20.2
Females	19	18.22± 0.27	0.59	17.3–19.0

Olympic Mountains, 1 (C.N.H.M.); Port Angeles, 5 (4 C.N.H.M., 1 A.M.N.H.); Elwha River, 12 miles from Port Angeles, 1 (C.R.C.M.); 4 miles southwest of Frazier Creek, 800 ft., Port Angeles, 1 (U.S.N.M.); Elwha River, 21 miles southeast of Elwha Post Office, 1 (U.S.N.M.); Clallam Bay, 2 (D.R.D.); Sequim, 5 (U.S.N.M.); mouth of Sekiu River, 4 (C.R.C.M.). *Grays Harbor County:* Oakville, 1 (U.S.N.M.); Quinault Lake, 1 (U.S.N.M.); east of Humptulips, 1 (A.M.N.H.); Clemons Tree Farm, 1 (C.R.C.M.); near Elma, 1 (C.R.C.M.). *Jefferson County:* Duckabush, Hood's Canal, 1 (U.S.N.M.). *Jefferson or Clallam County:* Olympic Mountains, 1 (U.S.N.M.). *King County:* Bothell, 6 (S.M.U.W.); Kirkland, 1 (D.R.D.); Renton, 1 (M.V.Z.); Lake Summamish, 4½ miles east of Bellvue, 70 ft., 1 (M.V.Z.). *Kitsap County:* Two miles west of Bremerton, 2 (C.R.C.M.). *Kittatas County:* Keechelus Lake, 1 (U.S.N.M.). *Mason County:* Skokomish River, Olympic Mountains, 2 (U.S.N.M.); Lake Cushman, 11 (U.S.N.M.). *Pacific County:* Near Wallicut River, 1 mile northeast of Ilwaco, 2 (M.V.Z.); Lower Bear River, 5 miles northeast of Ilwaco, 1 (M.V.Z.); 2½ miles southeast of Chinook, 10 ft., 1 (M.V.Z.); 4 miles west-northwest of Chinook, 2 (M.V.Z.). *Pierce County:* Kirstenhorf Manor, McKenna, 1 (U.M.M.Z.); Steilacoom, 2 (U.S.N.M.). *Skagit County:* Shafit Valley, Hamilton, 3 (U.S.N.M.); Mount Vernon, 22 (U.S.N.M.). *Skamania County:* Two miles north of Carson Shepherd Spring, 1 (U.S.N.M.). *Snohomish County:* Index, 1 (U.S.N.M.); 5 miles north of Monroe, 1 (D.R.D.); 4 miles south of Everett, 1 (U.S.N.M.). *Thurston County:* Henderson Inlet, 1 (S.M.U.W.); Tenino, 8 (U.S.N.M.). BRITISH COLUMBIA: Sumas, 8 (5 M.C.Z., 3 U.S.N.M.); Port Moody, 32 (U.S.N.M.); 12 miles west of Port Moody, 1 (U.S.N.M.); north shore of south arm of Burrard Inlet, Port Moody, 5 (U.S.N.M.); Hastings, 3 (U.S.N.M.).

Spilogale putorius phenax Merriam

Figures 29 and 30

Mephitis Zorrilla LICHTENSTEIN, 1838, Abhandl. Akad. Wiss. Berlin, 1836, p. 281. Berlin Museum specimen, collected by Deppe; from Monterey, California. Preoccupied by *M. zorilla* Lichtenstein, 1827–1834, p. 105, pl. 48.

Spilogale phenax MERRIAM, October 8, 1890, North Amer. Fauna, no. 4, p. 13. Type: U.S.N.M. No. 186453; adult male; collected by C. A. Allen, October 31, 1885; original no. (Merriam Collection) 1500/2100; from Nicasio, Marin County, California.

Spilogale phenax microrhina HALL, February 12, 1926, Jour. Mammal., vol. 7, p. 53. Type: M.V.Z. No. 3215; adult male; collected by Frank Stephens, July 29, 1908; original no. 1308; from Julian, San Diego County, California.

DISTRIBUTION: California west of the crest of the Sierra Nevada, from southern Humboldt and Trinity counties, east to western Modoc County, south to Los Angeles County. Intergrades with *latifrons* in Humboldt, Del Norte, and Siskiyou counties, and with *gracilis* along the slopes of the Sierra Nevada; intergradation with *martirensis* occurs south of Los Angeles County and into northern Baja California; possibly intergrades with *leucoparia* in southeastern California or northwestern Sonora or southwestern Arizona (fig. 4). Lower Sonoran to Canadian Life Zones; Oregonian and Californian Biotic Provinces. Known from sea level to 8400 feet.

EXTERNAL MEASUREMENTS: Males, 445.5 (356–581), 156.5 (107–195), 48.3 (32–57); females, 401.9 (340–470), 146.2 (112–203), 43.3 (30–55).

CRANIAL MEASUREMENTS: Males: basilar length, 51.7 (44.9–56.2); condylobasal length, 58.3 (51.2–63.2); zygomatic breadth, 37.5 (33.0–41.4); interorbital breadth, 15.9 (14.0–18.0); height of cranium, 17.6 (15.7–19.3); length of tooth row, 19.1 (16.7–20.8); females (in same order): 46.2 (43.3–50.3), 53.0 (48.8–56.5), 33.1 (30.1–36.0), 14.5 (12.3–16.2), 16.0 (14.8–18.3), 17.7 (16.0–19.4).

WEIGHT: Males, 692.6 (508–923); females, 430.6 (348–566).

COLOR PATTERN: Nasal patch medium, varying from as broad as long to longer than broad and often with small posterior projection. Dorsal stripes narrower than dorsal black stripe, and narrower than shoulder stripes; dorsals rarely connected with first vertical stripes; dorsal stripes interrupted at level of posterior shoulder stripes, reappearing at level of first vertical stripes as a spot (rarely continuing to join second verticals). Shoulder stripes not broad, generally same size or narrower than black shoulder stripes; pre-auricular patches large, broader than anterior end of shoulder stripes, and without branching chin stripes. Lateral stripes varying in length and width, generally shorter and narrower in northern specimens and broader and longer in southern ones, but usually not broader than first vertical stripes; lateral stripes reaching upper forelegs in some. Second vertical stripes narrow, rarely as broad as first verticals; second verticals reaching dorsal stripes proximally, or dorsal stripes represented as spots at level of second verticals. Third vertical stripes varying from large rump patch to absent. No white on forefeet or hind feet. Tail-base patch absent to U-shaped. Tail about one-third white middorsally, generally less than half white along edges, and a little more than half white ventrally.

In 1838 Lichtenstein described as new a species of spotted skunk from California, giving it the name *Mephitis zorrilla*. The choice of the specific name is an unfortunate one, for it has been used for several animals in various parts of the world, and its allocation to any one species is a disputed matter. Lichtenstein stated that he used this name because he associated the species with the animal described and depicted by Buffon (1865, pp. 302–303, pl. 41) as "*Le Zorille.*" In this I concur; Buffon's illustration of "*Le Zorille*" is without doubt a spotted skunk. The argument of Hershkovitz (1949, p. 13) that the white-tipped ears make this illustration that of an African polecat is a poor one, for in detail of color pattern, color of tail, and all features in general, the animal depicted by Buffon fits readily into the genus *Spilogale*. The white-tipped ears are not emphasized, and I would consider them artistic license, necessary to show that ears are present. In any event, I can see no reason for calling this animal either an African polecat or unidentifia-

ble—two of the choices that Hershkovitz (1955, p. 187) allows. Unfortunately, Lichtenstein's use of the name may be preoccupied by his own use of *Mephitis zorilla* (1827–1834, p. 105, pl. 48) for an African animal, for the Rules of International Zoological Nomenclature do not consider a doubled consonant as opposed to a single one as constituting a sufficient difference to distinguish otherwise homonymic names. In the 1838 publication Lichtenstein described *Mephitis africana* as new, and he listed as a synonym of it *Mephitis zorilla* as used by him in the 1827–1834 publication. In this last publication the illustration is that of an African animal, and Lichtenstein stated that the animal is from

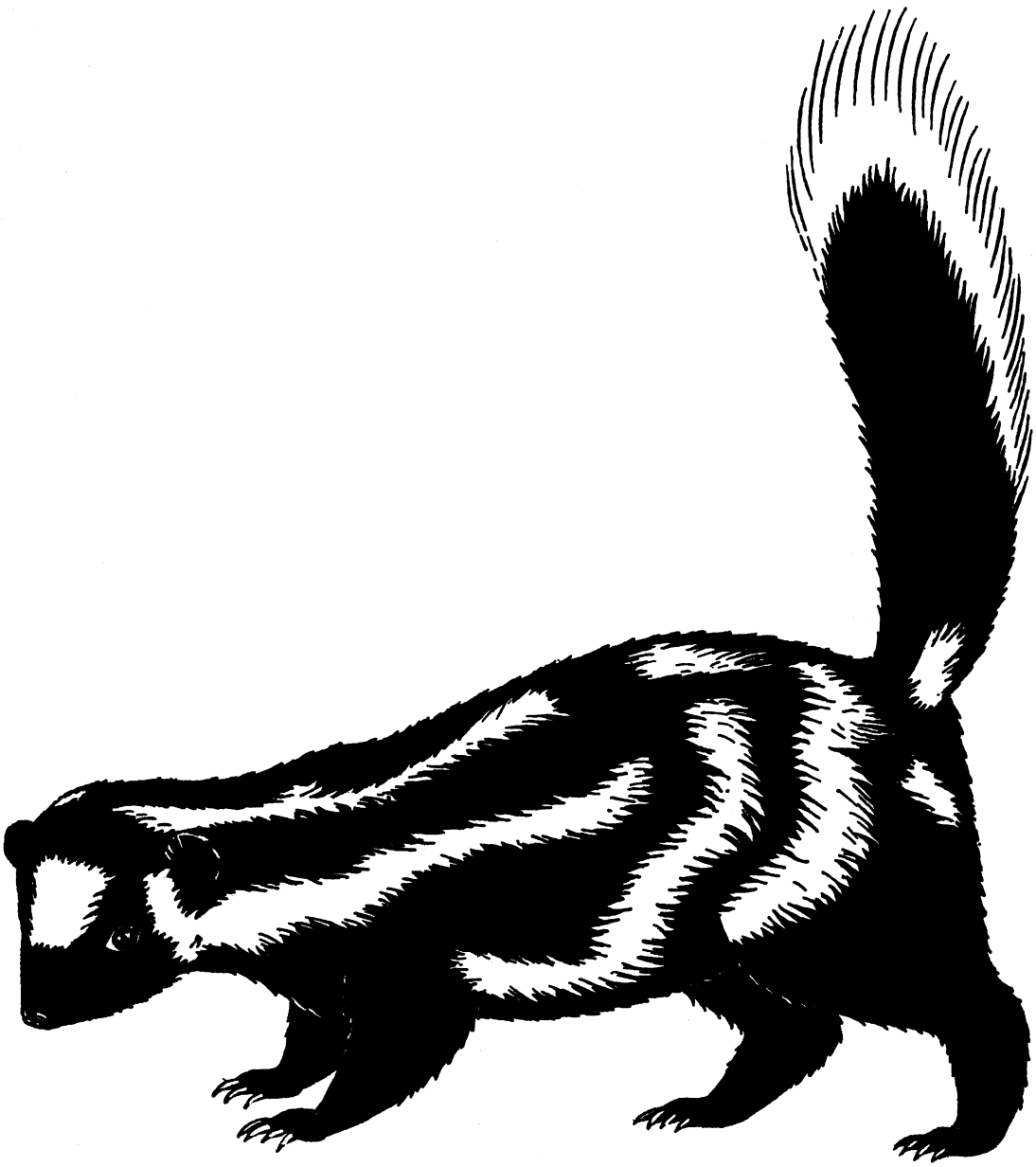

FIG. 29. Color pattern of *Spilogale putorius phenax*. Drawn from an adult male, A.M.N.H. No. 144923, from Half Moon Bay, San Mateo County, California. Not to scale.

Africa, and he gave the name as *Mephitis zorilla* Illiger. Illiger (1815, pp. 86–87), however, stated that the name is *Mustela zorilla* for the African animal, and he even remarked that this African polecat is readily confused with *Mephitis*. Also, Illiger (1815, table 2) indicated that *Mephitis* is found only in the New World. Thus the problem arises as follows: Is *Mephitis zorrilla*, new species, of Lichtenstein in 1838 a homonym of *Mephitis zorilla*, new combination, of Lichtenstein (1827–1834), even though the names apply to animals now considered to be in two different genera?

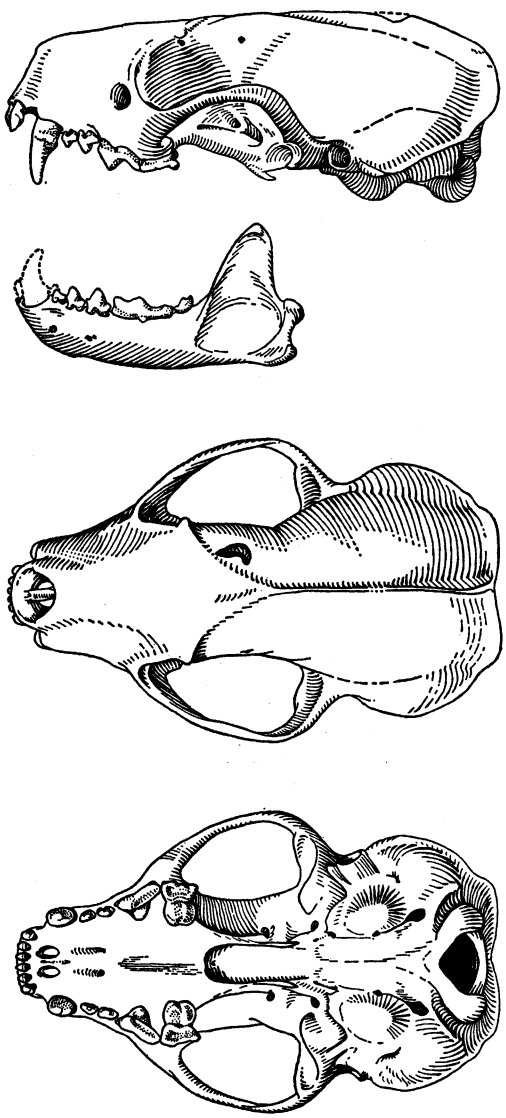

FIG. 30. Lateral, dorsal, and ventral views of the skull of *Spilogale putorius phenax*, adult male, A.M.N.H. No. 538/1275, from Nicasio, Marin County, California. ×1.

Lichtenstein's description (1838, pp. 281–282) fits the spotted skunk of California, and Howell (1906, p. 12) recognized this. Howell's reasons for rejecting the name are remarkable: "Lichtenstein was the first author to use the name in a restricted sense, and his application of it to the California species might be accepted were it not for the fact that at the time of Buffon's description California was not inhabited by civilized peoples; and the possibility that his specimen was received from there is therefore very remote." The fact that Lichtenstein's description was based on a known specimen, and that he merely associated it with "*Le Zorille*" of Buffon, seems to have escaped Howell. Furthermore, were the criterion of habitation by civilized peoples used for taxa, how many other names would have to be rejected?

The present policies of the International Commission for Zoological Nomenclature (Hemming, 1953, pp. 119–122) seem to be in the direction of conserving names that have been in use for approximately 50 years, and the rejection of names, however valid, that have not been used in that period. Although it seems to me that the Law of Priority should be followed and that the conservation of names should be only *in extremis*, I have little choice in the present case but to put aside the name *Mephitis zorrilla* Lichtenstein, 1838, because there is some doubt as to whether or not the use of the same name by the same author prior to this date, but for a different genus of animals, constitutes a homonym. And further, the rejection of the name *zorrilla* for the spotted skunk of California could undoubtedly be accomplished shortly after its presentation by those who feel that the names in use for 50 or more years must be conserved.

The subspecies *microrhina* was named from southern California by Hall in 1926. In his description, Hall points out that there is a gradual change in size from north to south in spotted skunks from the Pacific coast, and he remarks that "Several of the characters in which *microrhina* differs from *phenax* are ones in which *microrhina* approaches *Spilogale*

microdon." He also states that "*microrhina* approaches nearer to *martirensis* than does *S. p. phenax*." These statements become more understandable in light of the findings of this study whereby *martirensis* and *microdon* are considered synonymous. Grinnell, Dixon, and Linsdale (1937) also found the characters of *microrhina* indistinct and remark that other than the generally smaller size and relatively longer tail, "other relative differences in certain dimensions . . . are too small to be of real significance."

Examination of specimens from the coastal area of the ranges of *phenax* and *microrhina* reveals that the characters that differentiated these two subspecies are clinal. From the San Francisco area southward, there is a gradual decrease in the size of all measurements, including the length of the tail, which Hall says is actually as well as relatively longer in *microrhina*. Hall compared only topotypes of the two subspecies, and the topotypes of *phenax* have somewhat shorter tails than do specimens from adjacent areas, e.g., Berkeley, Alameda County. This is probably because of some genetic influx from the short-tailed *latifrons* of northwestern California. Specimens from Berkeley have longer tails than do those from Julian, but specimens from Julian have longer tails than do other specimens from San Diego County. The difference in length of tail between the two subspecies is not great, and when Hall compared a somewhat short-tailed topotypical series of *phenax* with a long-tailed series of *microrhina*, he concluded that the tail of *microrhina* was actually longer than that of *phenax*. (Julian specimens average 153 in length of tail, while specimens from other localities in San Diego County average 143; specimens from Nicasio average 150 in length of tail, while specimens from Berkeley average 161 in this measurement.) The subspecies *microrhina* is, then, smaller than *phenax* in all measurements. The discrepancies in size are greater in some characters than in others, but in each case the change in size is a gradual and more or less uniform one of decreasing size from north to south. This decrease in size seems to continue southward to the vicinity of San Ignacio, Baja California, where the smallest specimens of spotted skunks in this cline are found. South of San Ignacio the skunks again become larger (see the accounts of *martirensis* and *lucasana*). In color pattern the cline is one of decreasing amount of white from Cape San Lucas northward, with *lucasana* whiter than *martirensis*, *martirensis* whiter than *phenax*, and *phenax* whiter than *latifrons*. The cline seems most marked in the reduction of the width of the dorsal and lateral white stripes and in the decreasing size of the rump patches.

Along this cline it is impossible to separate any two adjacent populations at the 84 per cent level. From localities more than 100 miles apart, it is sometimes possible to separate populations; for example, the San Diego County spotted skunks are separable from both the San Ignacio and San Francisco populations, but the population from San Diego County is not clearly separable from that of Los Angeles County, nor is the latter population separable from specimens from Monterey County. This is readily seen by comparing figures 31 and 32 with figure 33, the first two illustrating the comparisons of populations from rather distant localities, and the last showing the gradual change that is seen when specimens from the intervening areas are included. Between San Diego County and San Ignacio there are few specimens available for study, but each of these seems to be intermediate between the two populations, and it is believed that this cline in size continues in Baja California.

When topotypes of *microrhina* are compared with specimens of *martirensis* from San Ignacio, the two populations are separable at the 84 per cent level; when all specimens of *microrhina* from San Diego County are compared with all the specimens of *martirensis* (including the population from Comondu, formerly considered a different subspecies, *microdon*), the two populations cannot be distinguished cranially. Similarly, *phenax* from Berkeley, which cannot be distinguished at the 84 per cent level from the population from Los Angeles County, can be separated from *microrhina* from San Diego County at the 84 per cent level.

Although it would be possible to treat this case of uninterrupted clinal change in characters in a variety of ways, the manner that seems best to express the biological situation found here, and also to conform with the cri-

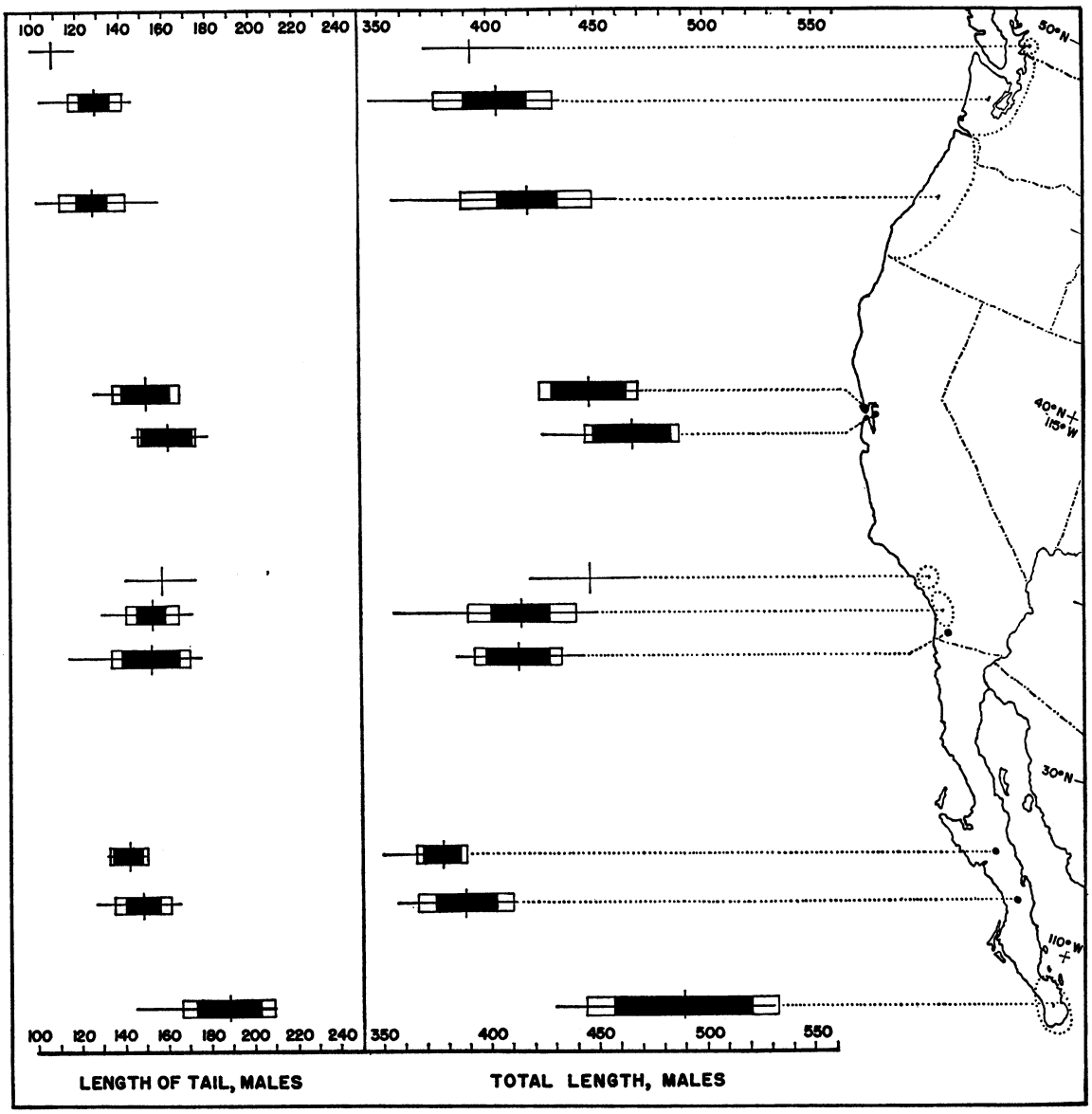

FIG. 31. Comparison of male *Spilogale putorius* from various localities on the Pacific coast of North America. For explanation of symbols, see figure 14.

teria for subspecies used in this study, is to leave the two extremes of the cline with names, and to consider those animals between the extremes that fall outside the 84 per cent level of overlap of either extreme population as intergrades. In this manner spotted skunks from south of Los Angeles County and north of latitude 31° 30′ N. in Baja California are considered to be intergrades between *phenax* and *martirensis*, and the name *microrhina* falls into the synonymy of both subspecies.

Spilogale putorius phenax differs from the insular subspecies, *S. p. amphiala*, in having a longer tail and consequent greater total length and in being wider interorbitally. For detailed comparison of these two subspecies, see the account of *amphiala*.

From *S. p. latifrons*, *phenax* differs in having a longer tail and in being larger in most measurements except interorbital and post-

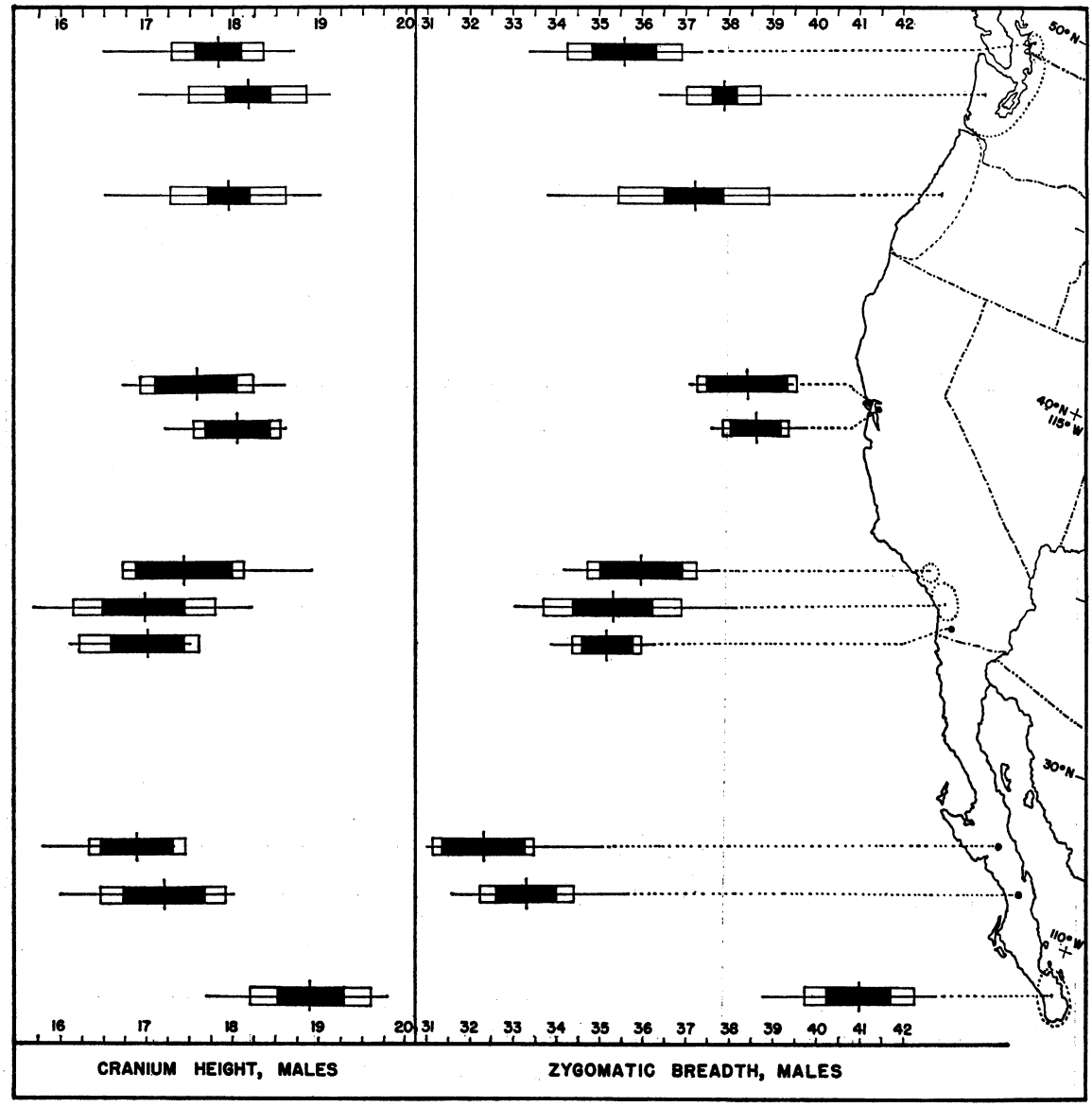

FIG. 32. Comparison of male *Spilogale putorius* from various localities on the Pacific coast of North America. For explanation of symbols, see figure 14.

orbital breadth, height of cranium, and length of tooth row. In color pattern *phenax* usually has broader white stripes.

Spilogale putorius phenax differs from *gracilis* and *leucoparia* in being broader interorbitally and postorbitally and in having a higher cranium and longer tooth row. In color pattern *leucoparia* differs from *phenax* in having broader dorsal, shoulder, and lateral white stripes and in having longer and broader vertical extensions. Color-pattern differences between *gracilis* and *phenax* are slight, the variation within each subspecies being sufficient to obscure the differences.

Although there is a gradual reduction in width of white stripes from south to north in the range of *phenax*, the variation within a single population may encompass the extremes, with some individuals being almost as dark as *latifrons* and others almost as

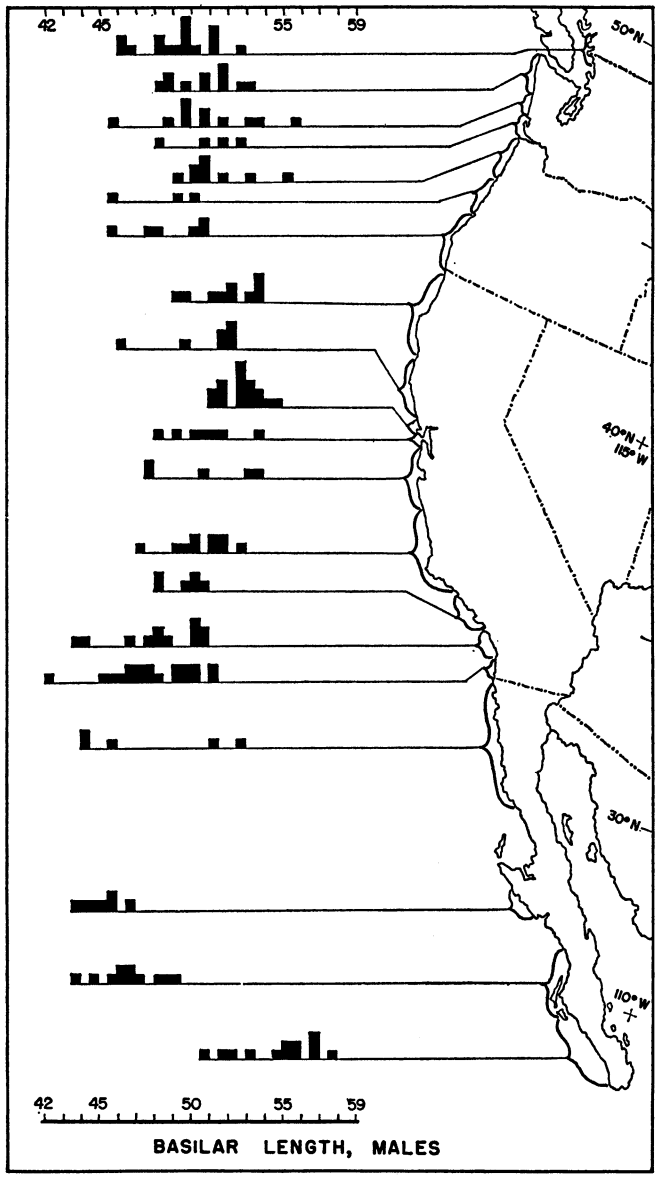

FIG. 33. Histograms of basilar length of male *Spilogale putorius* from various localities on the Pacific coast of North America.

white as *martirensis*. Animals from higher elevations are generally darker than those from the lower altitudes.

The mountain ranges of California lie primarily in a northwest-southeast direction. The Coast Range is relatively low, and the series of mountains that compose it are in echelon. The position of these mountains thus provides suitable habitats and minimal barriers for spotted skunks in this region. Although spotted skunks prefer the lower slopes of the hills, the valleys between the mountain ranges probably are of little or no impediment to interbreeding. The distribution map in Grinnell, Dixon, and Linsdale (1937, p. 297) clearly shows that the preponderance of spotted skunks in collections is from the more mountainous sections of California, but that

TABLE 21

PER CENT OF SPECIMENS IN EACH AGE GROUP OF *Spilogale putorius phenax* COLLECTED IN EACH MONTH

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Adults	49	86	67	100	54	64	54	35	45	56	57	47
Young adults	43	14	33	0	8	9	9	6	16	13	20	38
Subadult-young adults	6	0	0	0	0	0	0	18	24	15	17	16
Subadults	3	0	0	0	0	0	12	35	12	15	7	0
Juvenile-subadults	0	0	0	0	8	18	14	9	2	0	0	0
Juveniles	0	0	0	0	31	9	12	3	2	0	0	0

some animals have been taken in the valleys. Whether or not spotted skunks occurred in the San Joaquin and Sacramento valleys before man's agricultural works altered the environment is not known, but some animals may have occurred there. I suspect that the farming that now is done in this region has made the habitat more suitable for spotted skunks. Even if there is little or no breeding in an east-west direction between the animals on the western slopes of the Sierra Nevada and those on the eastern slopes of the Coast Range, these two mountain chains are contiguous at their northern and southern ends around the Great Valley of California, and interbreeding certainly can continue in this way. There are no differences of note between skunks from the Sierra Nevada and those from the Coast Range, which further indicates uninterrupted gene flow.

The cline of increasing size from south to north reaches its culmination in the vicinity of San Francisco Bay. Specimens from the east side of the Bay are the largest in this cline. Animals from Marin County, on the north side of the Bay, show some influence of *latifrons* from the north in their somewhat shorter tails. Genes for short tail in the *latifrons* populations in southern Oregon and northern California can be transmitted southward in the zone of intergradation and then passed into the longer-tailed specimens to the south. Genes for short tail coming into Marin County cannot be dispersed, for the peninsula forms a cul-de-sac in which these genes can only accumulate. Dilution of the short tail can take place in this area only from the northeast, where specimens are also receiving some genes for short tail from the north. In most cranial measurements of Marin County specimens the slightly smaller size is not so evident because the cranial differences between *phenax* and *latifrons* are slight.

With much of the flow of genes that might come from *latifrons* being trapped in Marin County, specimens from Alameda, Contra Costa, and San Mateo counties are of large size, and this area may be considered the peak of the cline along the coast of California. South of this region through the Coast Range there is a gradual diminution of the cranial and external measurements which culminate in the population from San Ignacio, Baja California.

North of the San Francisco Bay area, signs of intergradation with *latifrons* appear. Specimens from Del Norte, Humboldt, Mendocino, Siskiyou, and Shasta counties show some signs of intergradation between *phenax* and *latifrons*. Several specimens from these localities have tails as short as animals from southwestern Oregon, but generally the average length of tail of specimens in this area is intermediate between the two subspecies. The wider postorbital region in specimens from these counties also indicates their relationship to *latifrons*.

Seventy-one per cent of the specimens of *S. putorius phenax* had lesions or swellings of the frontal sinuses caused by parasites. Eighty-eight per cent of the adults, 64 per cent of the young adults, 58 per cent of the subadult-young adults, and 41 per cent of the subadults showed signs of infection. None of 28 juveniles and juvenile-subadults had lesions or swellings.

Specimens from every month of the year

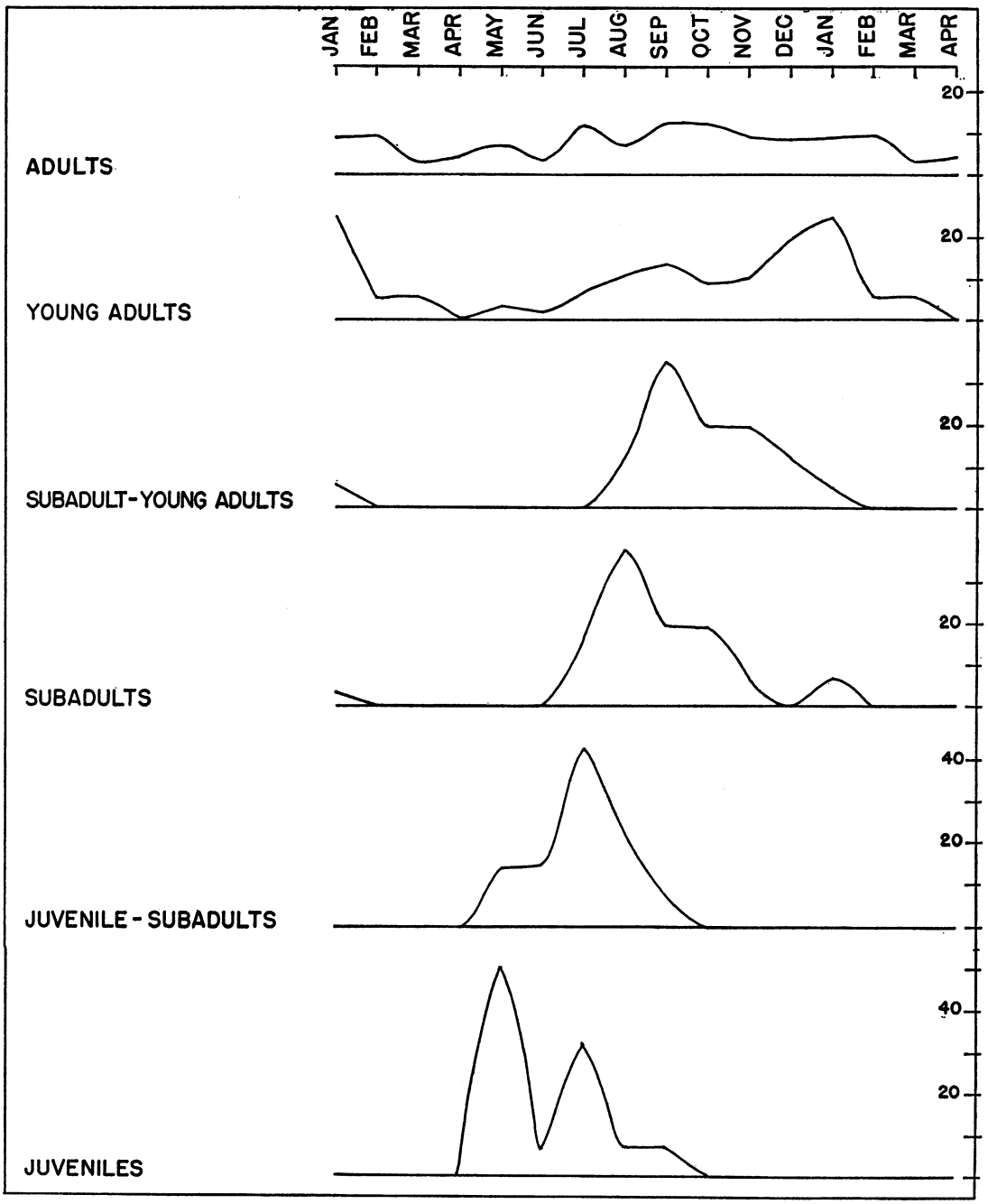

FIG. 34. Per cent of specimens of each age group of *Spilogale putorius phenax* collected in each month of the year.

have been examined. Juveniles and juvenile-subadults from May through August are present in collections. Half of the juveniles were collected in May, and almost half of the juvenile-subadults were collected in July. Subadults from the months of July through January, excepting December, are in collections, most being taken in August. Young adults have been taken in every month but April, the most specimens being collected from September through January (fig. 34). From these data it would seem that the young

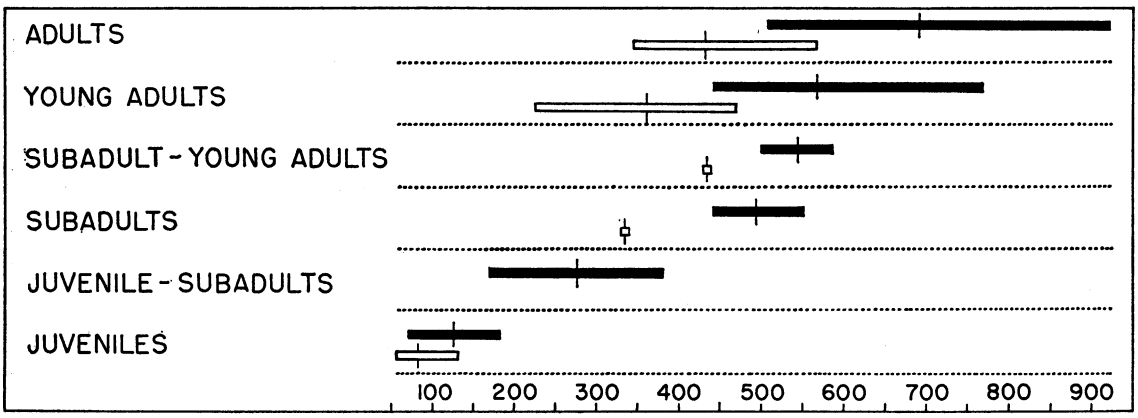

FIG. 35. Comparison of the weights in grams of males (solid bars) and females (open bars) of *Spilogale putorius phenax* of various age groups. Vertical lines are the means; the horizontal bars indicate the ranges.

are born from late March through June. A specimen taken at Valley Center, San Diego County, on April 20, is recorded as having six fetuses, and one taken at Rose Station, Kern County, on March 29 is also recorded as having six fetuses. A specimen from 8 miles northwest of Davis, Yolo County, is recorded as having five nursing young on May 26, and two specimens taken on July 20 in Humboldt County are recorded as lactating.

Fifty-eight per cent of the specimens of *S. p. phenax* are males. Although females are about 90 per cent of the size of males in most measurements, they weigh only 60 per cent as much. Five young adult males, averaging 568.8 grams in weight, are 82 per cent of the weight of 19 adults; 12 young adult females, averaging 434.1 grams, are 84 per cent of the weight of 14 adults (fig. 35).

SPECIMENS EXAMINED: Three hundred and ninety-nine, from the following localities:

CALIFORNIA: *Alameda County:* Berkeley, 6 (3 M.V.Z., 1 S.D.S.N.H., 1 A.M.N.H., 1 U.S.N.M.); Dwight Way Canyon, Berkeley, 3 (K.U.M.N.H.); 300 Panoramic Way, 650 ft., Berkeley, 3 (2 K.U.M.N.H., 1 U.C.C.A.); Physiology Building, University of California campus, Berkeley, 2 (M.V.Z.); 745 South Santa Barbara Road, Berkeley, 2 (C.M., M.V.Z.); Strawberry Creek, Berkeley, 2 (M.V.Z.); ¾ mile east of stadium, Berkeley, 4 (K.U.M.N.H.); Calaveras Dam, 1 (L.A.C.M.); San Leandro Creek Dam, 4 miles north of Hayward, 1 (M.V.Z.); Municipal Golf Links, Oakland, 1 (A.M.N.H.); Rattlesnake Canyon in Berkeley Hills, near Orinda, 1 (M.V.Z.); Piedmont, 2 (M.V.Z.); Piedmont Pines, 1 (U.U.) *Amador County:* Carbondale, 1 (U.S.N.M.). *Calaveras County:* Valley Springs, 1 (M.C.Z.). *Colusa County:* Eight miles north of Colusa, 1 (M.V.Z.); Snow Mountains, 1 (C.N.H.M.). *Contra Costa County:* Two miles west of Lafayette, 1 (M.V.Z.); Moraga Valley, 1 (M.V.Z.); 1 mile southeast of Moraga, 1 (K.U.M.N.H.); 2 miles north of Moraga, 1 (K.U.M.N.H.); summit of Pacheco Pass, 2 (U.S.N.M.); 2 miles southwest of Walnut Creek, 1 (M.V.Z.). *Del Norte County:* East Fork of Illinois River, between East Fork and Dunn Creek, 1 (M.V.Z.). *Fresno County:* Biola, 1 (A.M.N.H.); Kings River, 5000 ft., 1 (M.V.Z.); Kings River Canyon, 5000 ft., 1 (M.V.Z.); 75 yards northwest of lower no. 3 dam, Kings River, Trimmer, 1 (M.V.Z.). *Humboldt County:* Big Lagoon, 2 (M.V.Z.); Carlotta, 5 (4 M.V.Z., 1 D.R.D.); Cuddleback, 3 (M.V.Z.); Fortuna, 1 (D.R.D.); Horse Mountain, 4700 ft., 1 (M.V.Z.); Horse Ridge, 4500 ft., 1 (M.V.Z.); Rio Dell, 2500 ft., 5 (U.S.N.M.); Trinidad, 2 (U.S.N.M., S.D.S.N.H.). *Imperial County:* Pilot Knob, Colorado River, 1 (M.V.Z.). *Kern County:* Twelve and a half miles northeast of Bakersfield, on Kern River, 1 (L.A.C.M.); mouth of canyon 15 miles northeast of Bakersfield, Kern River, 1 (U.S.N.M.); Kern River at Bodfish, 2400 ft., 1 (M.V.Z.); 3 miles north of Buena Vista Lake, 1 (D.R.D.); Delano, 3 (2 D.R.D., 1 U.S.N.M.); Fort Tejon, 1 (C.N.H.M.); 2 miles north of Sorrell Ranch, 4500 ft., Kelso Valley, 2 (M.V.Z.); Kern Lakes, 2 (U.S.N.M.); 8 miles west and 3 miles north of McKittrick, 2100 ft., 6 (M.V.Z.); Rose Station, 1300 ft., 1 (M.V.Z.); San Emigdio, 5 (U.S.N.M.). *Kings County:* Lemoore, 2 (U.M.M.Z.). *Lake County:* Hildebrand Ranch, Morgan Valley, 2 (M.V.Z.). *Los Angeles County:*

Alhambra, 2 (U.S.N.M.); Eaton Canyon, Altadena, 1300–1375 ft., 6 (D.R.D.); San Gabriel Wash, Azusa, 1 (M.V.Z.); San Gabriel Wash, 900 ft., 2 miles west of Azusa, 1 (A.H.F.); Baldwin Hills, 2 (L.A.C.M.); Culver City, 1 (U.S.C.); El Mante, 400 ft., 1 (U.S.C.); Highland Park, 1 (D.R.D.); Hollywood Dam, Santa Monica Mountains, 2 (L.A.C.M.); U.C.L.A. campus, west Los Angeles, 1 (L.A.C.M.); Ferndale, Griffith Park, Los Angeles, (U.S.C.); ¼ mile west of Ferndale, Griffith Park, 800 ft., Los Angeles, 1 (A.H.F.); Griffith Park, Los Angeles, 1 (L.A.C.M.); near Lovejoy Buttes, 2 (M.V.Z.); Newhall Ranch, 1 (L.A.C.M.); Pasadena, 6 (5 D.R.D., 1 M.V.Z.); Devils Gate Dam, 7 (D.R.D.); Arroyo Seco Canyon, near Pasadena, 6 (4 M.V.Z., 2 E.R.W.C.); Bear Flat, San Antonio Canyon, 1 (D.R.D.); Santa Anita, 1 (A.M.N.H.); Sierra Madre, 2500 ft., 2 (M.V.Z.). *Madera County:* Near Firebaugh, 1 (M.V.Z.); Raymond, 940 ft., 1 (M.V.Z.). *Marin County:* Five miles west of Inverness, 300 ft., 2 (M.V.Z.); Lagunita, 1300 ft., 1 (U.S.N.M.); Mailliard, 1 (M.V.Z.); Nicasio, 13 (6 M.C.Z., 3 A.M.N.H., 1 U.S.N.M., 1 M.V.Z., 1 C.N.H.M., 1 Cal.A.S.); 2 miles south of Novato, 2 (Cal.A.S.); Point Reyes, 6 (U.S.N.M.); Point Reyes, 5 miles west of Inverness, 1 (M.V.Z.); Sausalito, 1 (U.S.N.M.); Mt. Tamalpais, 2 (M.V.Z.). *Mendocino County:* Gualala, 1 (M.V.Z.); Laytonville, 2 (M.V.Z.). *Merced County:* Los Baños, 1 (D.R.D.); near Los Baños, 1 (Cal.A.S.); Los Baños Game Refuge, 1 (M.V.Z.); Snelling, 200 ft., 2 (M.V.Z.); Volta, 1 (U.S.N.M.). *Monterey County:* Bolton Ranch, 2 (U.S.N.M.); Butlerford Ranch, 1 (U.S.N.M.); John Glan Ranch, Lockwood, 1 (U.S.N.M.); Sargent Ranch, Pesante Canyon, 500 ft., 1 (M.V.Z.); Stonewall Creek, 1300 ft., 6.3 miles northeast of Soledad, 1 (M.V.Z.). *Napa County:* Huichica Creek, 250 ft., 2 (M.V.Z.); Mt. St. Helena, 1 (U.S.N.M.). *Orange County:* One mile southeast of Laguna Beach, 500 ft., 1 (M.V.Z.); Trabuco Canyon, 1700 ft., Trabuco Mountains, 3 (M.V.Z.). *Plumas County:* Rich Gulch, 3850 ft., 11 miles north and 8 miles west of Quincy, 1 (M.V.Z.). *Riverside County:* One and one-half miles south and 1 mile west of Banning, 2300 ft., 1 (M.V.Z.); Box Spring, 1300 ft., 3 (2 U.S.N.M., 1 S.D.S.N.H.); Cabazon, 1 (M.V.Z.); base of San Jacinto Mountains, 1700 ft., near Cabazon, 1 (M.V.Z.); Santa Ana River, 800 ft., 2 miles southwest of Prado, 1 (L.A.C.M.); Riverside Mountains, 4 (L.A.C.M.); Santa Ana River, below West Riverside, 1 (D.R.D.); Jurupa Mountains, 1200 ft., 7 miles northwest of Riverside, 1 (M.V.Z.); San Jacinto Mountains, 2 (M.V.Z., U.S.N.M.); Carrizo Creek, San Jacinto Mountains, 2 (L.A.C.M.); Carrizo Creek, 3000 ft., Santa Rosa Mountains, 1 (M.V.Z.). *San Benito County:* Post Office, Bear Valley, 1 (M.V.Z.); Hernandez, 1 (M.V.Z.). *San Bernardino County:* Mouth of the Reche Canyon, 1000 ft., near Colton, 2 (M.V.Z.); Reche Canyon, 1 (U.S.N.M.); Pine City, 1 (U.S.N.M.); San Bernardino, 3 (U.S.N.M.); Waterman Canyon, 4000 ft., 6 miles north of San Bernardino, 2 (M.V.Z.); San Bernardino Peak, 3800 ft., 1 (U.S.N.M.); Converse Flats, San Bernardino Mountains, 2 (U.S.N.M.); Converse Experiment Station, San Bernardino Mountains, Los Angeles National Forest, 1 (U.S.N.M.); Thousand Pines, 5000 ft., San Bernardino Mountains, 1 (L.A.C.M.); Camp Baldy, 4250 ft., 1 (D.R.D.); Devil Canyon, 2500 ft., 2 (D.R.D.); Warren's Well, 2500 ft., 22 miles northeast of Whitewater Station, 1 (M.V.Z.); 5 miles northeast of Granite Well, 5400 ft., Providence Mountain, 1 (U.S.N.M.). *San Diego County:* Bonita, 1 (S.D.S.N.H.); Borrego Desert State Park, 1 (Cal.A.S.); Cuyamaca Mountains, 3 (M.V.Z.); Dulzura, 6 (U.S.N.M.); Encanto, 1 (S.D.S.N.H.); Escondido, 5 (K.U.M.N.H.); Jamul, 1 (S.D.S.N.H.); Julian, 15 (M.V.Z.); La Jolla, 3 (2 U.M.M.Z., 1 S.D.S.N.H.); La Puerta, 2100 ft., 1 (U.S.N.M.); La Puerta Valley, 1 (M.V.Z.); Ramona, 1 (S.D.S.N.H.); San Diego, 3 (A.M.N.H., U.S.N.M., S.D.S.N.H.); San Marcos, 4 (2 U.S.N.M., 2 S.D.S.N.H.); Santa Ysabel, 4 (2 A.M.N.H., 1 U.S.N.M., 1 S.D.S.N.H.); Twin Oaks, 1 (U.S.N.M.); Valley Center, 1 (U.S.N.M.); Witch Creek, 2700–2750 ft., 4 (2 S.D.S.N.H., 1 A.M.N.H., 1 U.S.N.M.). *San Joaquin County:* Corral Hollow, 350 ft., 5 miles south and 3½ miles west of Tracy, 1 (M.V.Z.); 7 miles southwest of Tracy, 1 (M.V.Z.); Corral Hollow, 8 miles southwest of Tracy, 1 (M.V.Z.); Castle Rock, 9 miles southwest of Tracy, 1 (U.S.N.M.). *San Luis Obispo County:* Morro, 1 (U.S.N.M.); 1 mile northeast of Morro, 1 (M.V.Z.); San Carpajo Creek, 7 miles north of Piedras Blancas, 1 (M.V.Z.); Pozo, 1 (U.S.N.M.); San Luis Obispo, 10–250 ft., 5 (U.S.N.M.). *San Mateo County:* Half Moon Bay, 2 (A.M.N.H.); Lake Pilarcitos, 1 (M.C.Z.); Menlo Park, 1 (S.D.S.N.H.); Palo Alto, 1 (A.M.N.H.); Pescadero, 1 (A.M.N.H.); Portola, 1 (M.V.Z.). *Santa Barbara County:* Santa Anita Ranch, 7 miles west of Gaviota, 1 (M.V.Z.); Las Positas Ranch, 5 miles northwest of Santa Barbara, 1 (D.R.D.); Mission Santa Inez, 2 (U.S.N.M.). *Santa Cruz County:* Five miles south of Aptos, 1 (U.S.N.M.); ½ mile east of Sky Meadow, Big Basin, 1 (Cal. A.S.); Boulder Creek, 1 (U.S.N.M.); Bear Creek, 650 ft., 2 miles northeast of Boulder Creek, 1 (M.V.Z.); Felton, 1 (Cal.A.S.); 3 miles east of Santa Cruz, 1 (M.V.Z.); Blackburn Gulch, 500 ft., 7 miles north-northeast of Santa Cruz, 1 (M.V.Z.). *Shasta County:* Baird, 1 (U.S.N.M.); Montgomery Creek, 2 (U.S.N.M.);

TABLE 22

MEASUREMENTS OF *Spilogale putorius phenax* FROM CALIFORNIA

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Berkeley, Alameda County				
Total length				
Males	6	466.67±17.96	22.00	425–485
Females	8	412.50±16.20	22.92	378–451
Tail				
Males	6	161.67±11.28	13.82	146–180
Females	8	150.00±10.77	15.24	125–170
Hind foot				
Males	6	48.83± 1.02	1.25	47–50
Females	7	43.79± 1.68	2.22	40–47
Head and body				
Males	6	308.34±17.36	21.27	272–325
Females	6	265.00± 8.45	11.95	250–281
Basilar				
Males	7	51.25± 1.34	1.78	48.7–54.1
Females	8	47.25± 0.80	1.13	45.4–48.6
Condylobasal				
Males	7	58.39± 1.28	1.70	55.9–61.3
Females	8	53.50± 0.87	1.23	51.4–55.1
Occipitonasal				
Males	7	52.75± 1.35	1.79	49.7–55.4
Females	8	48.63± 0.77	1.09	46.8–50.2
Zygomatic				
Males	7	38.61± 0.57	0.76	37.6–39.8
Females	8	34.00± 0.78	1.11	32.7–36.0
Mastoid				
Males	7	32.96± 0.30	0.40	32.4–33.4
Females	8	29.19± 0.44	0.62	28.0–30.4
Interorbital				
Males	7	16.12± 0.60	0.80	15.0–17.1
Females	8	14.50± 0.42	0.60	13.5–15.1
Postorbital				
Males	7	16.04± 0.72	0.96	14.8–17.2
Females	8	15.19± 0.40	0.56	14.5–16.1
Palatilar				
Males	7	21.68± 0.61	0.81	20.6–22.5
Females	8	20.13± 0.59	0.84	18.5–21.8
Postpalatal				
Males	7	29.89± 0.87	1.15	28.2–31.6
Females	8	27.06± 0.76	1.07	25.8–29.1
Cranium height				
Males	7	18.04± 0.38	0.50	17.2–18.6
Females	8	17.19± 0.30	0.42	16.6–17.9
Tooth row				
Males	7	18.68± 0.26	0.35	18.2–19.2
Females	8	17.50± 0.50	0.71	16.5–18.3
Los Angeles County				
Total length				
Males	5	445.80		419–470
Females	10	390.00±15.87	25.07	355–425
Tail				
Males	5	158.80		142–175
Females	10	140.25± 7.27	10.90	130–160
Hind foot				
Males	6	46.50± 3.43	4.20	38–50
Females	9	40.69± 2.15	3.23	35–45

TABLE 22—(*Continued*)

Measurement	No.	*M.* ± 2 *S.E.*	*S.D.*	Extremes
Head and body				
Males	6	286.94±11.17	13.68	267–304
Females	7	249.29±16.85	22.32	223–280
Basilar				
Males	6	50.08± 0.93	1.14	48.7–51.3
Females	7	44.96± 1.27	1.68	42.0–47.0
Condylobasal				
Males	7	56.04± 0.93	1.23	54.9–57.7
Females	7	50.75± 1.31	1.74	47.1–53.4
Occipitonasal				
Males	7	51.96± 0.87	1.15	50.8–53.8
Females	7	47.32± 1.39	1.84	44.9–49.9
Zygomatic				
Males	7	36.03± 0.95	1.26	34.2–37.8
Females	7	31.68± 1.16	1.54	28.6–33.7
Mastoid				
Males	7	32.89± 0.97	1.28	31.1–34.6
Females	8	28.75± 1.25	1.77	25.8–31.1
Interorbital				
Males	7	15.68± 0.34	0.45	15.2–16.2
Females	8	13.69± 0.48	0.68	12.3–14.3
Postorbital				
Males	7	16.11± 0.48	0.63	15.3–16.7
Females	8	14.69± 0.71	1.01	13.0–16.3
Palatilar				
Males	7	21.32± 0.34	0.45	20.5–21.8
Females	8	18.88± 0.26	0.37	18.0–19.3
Postpalatal				
Males	6	29.17± 0.94	1.15	27.7–30.5
Females	7	26.25± 0.97	1.29	23.7–27.7
Cranium height				
Males	6	17.42± 0.56	0.69	16.9–18.9
Females	7	16.69± 0.54	0.72	15.7–17.5
Tooth row				
Males	7	18.61± 0.29	0.38	18.1–19.1
Females	8	17.06± 0.47	0.66	16.3–18.3
Nicasio, Marin County				
Total length				
Males	7	445.00±17.70	23.45	432–469
Females	4	435.00		394–470
Tail				
Males	7	149.65±10.52	13.94	127–157
Females	4	179.25		134–203
Hind foot				
Males	6	49.17± 5.35	6.56	36–52
Female	1	30		
Head and body				
Males	7	296.79± 8.89	11.78	279–318
Females	4	255.75		241–267
Basilar				
Males	8	54.00± 0.28	0.39	53.5–54.5
Females	4	48.10		44.8–50.2
Condylobasal				
Males	8	60.13± 0.96	1.36	57.0–61.5
Females	4	53.60		50.2–55.2
Occipitonasal				
Males	8	55.25± 0.86	1.22	53.0–57.2
Females	4	49.93		48.5–50.7

TABLE 22—(*Continued*)

Measurement	No.	*M.* ± 2 *S.E.*	*S.D.*	Extremes
Zygomatic				
Males	6	38.42± 0.92	1.13	37.1–39.5
Females	4	33.23		32.4–34.2
Mastoid				
Males	7	33.32± 0.88	1.16	31.3–34.6
Females	4	28.53		27.7–30.3
Interorbital				
Males	8	16.13± 0.56	0.79	15.1–17.2
Females	4	14.03		13.7–14.5
Postorbital				
Males	8	16.06± 0.42	0.60	15.1–16.9
Females	4	15.15		14.6–15.9
Palatilar				
Males	8	22.70± 0.40	0.56	22.2–23.5
Females	4	20.18		19.6–20.9
Postpalatal				
Males	8	31.50± 0.28	0.39	30.9–31.9
Females	4	28.00		25.5–29.5
Cranium height				
Males	8	17.56± 0.47	0.23	16.7–18.6
Females	4	17.53		17.2–18.3
Tooth row				
Males	8	19.81± 0.30	0.42	19.2–20.3
Females	4	17.68		16.2–18.4
Julian, San Diego County				
Total length				
Males	8	413.75±14.36	20.32	385–444
Females	2	363.5		345–382
Tail				
Males	8	153.75±12.78	18.08	116–177
Females	2	146.0		139–153
Hind foot				
Males	8	46.50± 0.76	1.08	44–47
Females	2	40.0		39–41
Head and body				
Males	8	258.13± 5.80	8.21	248–269
Females	2	217.5		206–229
Basilar				
Males	8	48.69± 1.33	1.88	45.8–50.9
Females	2	45.65		44.8–46.5
Condylobasal				
Males	8	55.13± 1.22	1.72	52.1–57.1
Females	2	51.55		50.7–52.4
Occipitonasal				
Males	8	50.81± 0.95	1.35	48.5–52.8
Females	2	47.75		47.0–48.5
Zygomatic				
Males	8	35.19± 0.58	0.82	33.9–36.3
Females	2	32.55		31.5–33.6
Mastoid				
Males	8	32.06± 0.66	0.94	30.2–32.8
Females	2	28.80		28.1–29.5
Interorbital				
Males	8	15.00± 0.42	0.60	14.0–15.6
Females	2	14.30		14.0–14.6
Postorbital				
Males	8	15.31± 0.52	0.73	14.0–16.5
Females	2	14.65		14.1–15.2

TABLE 22—(*Continued*)

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Palatilar				
Males	8	19.89± 0.56	0.79	18.9–20.9
Females	2	18.80		18.7–18.9
Postpalatal				
Males	8	28.81± 0.78	1.11	26.9–30.4
Females	2	26.90		26.0–27.8
Cranium height				
Males	8	17.00± 0.42	0.60	16.1–17.5
Females	2	15.60		
Tooth row				
Males	8	18.50± 0.66	0.93	17.4–20.0
Females	2	17.50		17.1–17.9
Petaluma, Sonoma County				
Total length				
Males	6	418.34±21.51	26.35	393–452
Female	1	390.		
Tail				
Males	6	145.84± 7.25	8.88	130–155
Female	1	140		
Hind foot				
Males	6	49.17± 2.63	3.22	43–52
Female	1	45		
Head and body				
Males	6	275.84±16.64	20.39	253–300
Female	1	250		
Basilar				
Males	5	51.02		46.9–52.9
Female	1	50.3		
Condylobasal				
Males	6	57.67± 2.00	2.45	53.4–59.6
Female	1	56.5		
Occipitonasal				
Males	5	52.26		49.3–54.4
Female	1	51.9		
Zygomatic				
Males	5	36.98		34.6–38.8
Female	1	34.6		
Mastoid				
Males	6	31.75± 1.14	1.40	29.9–32.8
Female	1	20.3		
Interorbital				
Males	6	15.83± 0.50	0.61	14.8–16.4
Female	1	15.4		
Postorbital				
Males	6	16.08± 0.50	0.61	15.7–17.0
Female	1	15.5		
Palatilar				
Males	6	21.58± 0.93	1.14	19.5–22.7
Female	1	21.0		
Postpalatal				
Males	5	29.78		27.5–31.6
Female	1	29.3		
Cranium height				
Males	6	17.42± 0.50	0.61	16.6–18.3
Female	1	17.9		
Tooth row				
Males	6	19.33± 0.38	0.46	18.5–19.9
Female	1	18.4		

TABLE 23

MEASUREMENTS OF *Spilogale putorius phenax* FROM CALIFORNIA

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
Alameda County																
Calaveras Dam	♂	Y	410	176	49	52.0	58.0	51.6	38.7	32.8	15.9	17.0	22.1	30.0	18.5	18.4
San Leandro Creek Dam, 4 mi. N. Hayward	♂	Ad	—	—	—	50.0	58.0	53.1	39.1	32.7	16.0	15.4	21.3	29.1	18.0	19.1
Piedmont and Piedmont Pines	♂	S-Y	430	170	49	54.2	60.9	57.2	40.5	34.0	17.1	17.3	22.9	31.5	19.3	18.4
	♀	Ad	412	143	40	47.7	53.7	49.1	33.8	29.0	15.0	15.4	18.5	29.1	16.6	17.7
	♀	Ad	410	160	—	47.2	53.2	47.5	34.5	29.3	14.6	14.4	20.4	27.1	16.7	18.0
Amador County																
Carbondale	(♀)	Ad	376	133	45	47.6	53.8	48.8	34.6	29.4	15.4	15.8	19.9	27.8	16.3	18.3
Calaveras County																
Valley Springs	♀	Ad	445	130	40	47.2	52.7	49.0	31.6	28.2	14.1	14.9	19.7	27.8	16.2	18.0
Colusa County																
8 mi. N. Colusa	♀	Y	405	137	45	48.5	55.1	50.7	33.4	29.8	15.0	15.5	20.8	28.8	17.3	18.0
Snow Mts.	♂	Ad	434	120	51	53.2	59.9	54.7	38.4	32.9	16.3	16.3	22.8	30.4	18.8	20.4
Contra Costa County																
Vicinity of Moraga	♂	Ad	—	172	43	50.9	58.9	53.5	40.1	35.4	15.9	15.4	21.0	29.9	17.6	19.1
	♂	Ad	460	175	50	53.6	60.1	53.6	40.6	34.8	16.3	16.0	21.5	32.0	18.5	18.5
	♀	Ad	410	140	45	47.9	54.2	50.0	34.4	30.0	15.0	16.0	19.8	27.9	17.8	17.0
Summit of Pacheco Pass	♂	Ad	440	142	50	51.5	58.9	54.5	38.9	33.2	16.3	16.9	21.2	30.1	18.2	19.6
	♂	Ad	475	180	51	52.6	58.3	52.9	39.3	34.6	16.1	16.6	22.2	30.5	17.8	19.3
Del Norte County																
E. Fork Illinois River	(♀)	Y	—	—	—	46.1	52.6	50.1	33.8	30.0	14.8	15.8	19.5	26.8	17.1	18.3
Fresno County																
Vicinity of Kings River	♂	Ad	—	—	—	—	—	50.8	33.0	30.2	14.5	15.7	20.2	—	15.7	18.6
	♂	S	—	—	—	46.8	53.3	49.2	32.5	29.3	13.0	14.3	20.2	27.0	16.8	17.5
	♀	Y	381	140	41	45.0	51.5	48.2	30.5	28.1	12.8	13.4	19.0	26.1	16.4	16.9
Humboldt County																
Big Lagoon	♀	Ad	410	137	46	47.9	54.1	50.6	34.3	31.0	16.2	15.0	20.3	27.8	17.4	18.5
	♀	Ad	408	132	42	48.7	54.3	48.7	35.3	30.3	15.2	15.2	20.2	28.4	17.4	18.7
Cuddeback	(♀)	Ad	366	125	41	45.5	51.5	46.8	33.6	28.2	15.5	16.7	19.5	26.2	16.5	17.8
	♂	Ad	398	124	48	50.2	57.5	52.3	38.3	32.1	16.4	15.5	19.4	29.7	18.2	18.6
Fortuna	♀	Ad	422	157	44	47.5	53.3	48.5	33.9	29.6	15.1	14.5	19.6	27.9	17.0	18.9
Carlotta	♂	Ad	445	150	50	52.9	59.3	53.4	39.6	34.0	16.8	16.6	21.9	31.1	17.8	20.5

TABLE 23—(*Continued*)

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
	(♂)	Ad	523	160	60	51.5	58.8	53.5	36.9	32.5	17.8	17.1	21.8	29.9	18.1	19.6
	♂	Y	433	120	46	49.8	56.3	51.8	37.3	31.5	15.6	15.6	21.1	28.6	18.0	18.3
	♂	Y	380	164	52	54.4	60.9	54.8	38.2	34.8	16.5	16.2	22.5	31.7	18.2	20.2
	♀	Y	406	152	50	48.8	55.5	50.7	34.8	29.8	15.2	15.9	20.1	28.6	17.5	18.3
Horse Mountain and Horse Ridge	♂	Ad	435	145	52	53.6	59.7	55.1	40.5	32.4	17.7	18.8	22.0	31.7	18.1	19.9
	♀	Ad	385	140	43	45.6	51.8	—	33.0	28.8	15.0	15.7	19.3	26.0	16.7	17.8
Miranda	♂	S	405	150	48	51.5	57.6	53.9	35.4	31.0	15.8	17.3	21.5	29.9	18.0	19.6
Rio Dell	♂	Ad	433	132	52	54.2	61.1	54.5	39.5	33.8	17.3	17.5	22.0	32.2	18.0	20.6
	♂	Ad	430	155	50	52.6	58.7	54.0	38.7	31.9	16.3	18.1	21.7	30.6	17.6	19.8
	♂	Ad	462	152	50	54.0	61.3	55.5	39.7	33.6	16.7	17.1	22.1	32.0	17.9	20.4
	♂	Y	442	145	48	52.4	58.6	53.3	36.5	—	15.9	16.5	22.2	30.2	18.5	19.4
	♀	S	390	137	41	48.7	54.5	49.9	32.1	30.3	14.5	15.1	20.8	27.8	16.9	18.5
Trinidad	♀	Ad	410	130	40	47.5	53.7	49.1	34.6	30.8	14.8	14.6	19.4	28.2	17.2	18.1
5 mi. S. Dyerville	♀	S-Y	380	135	48	45.2	52.1	47.8	32.3	28.2	14.5	16.0	19.4	26.1	17.0	17.3
Imperial County																
Pilot Knob	♂	Ad	440	170	46	49.7	56.0	51.6	36.2	30.9	15.2	14.2	20.1	29.6	17.2	17.7
Kern County																
NE. Bakersfield	♂	Ad	462	176	50	53.1	59.9	55.8	37.9	34.4	15.8	15.1	21.9	31.3	17.6	19.1
	♂	J	390	164	49	47.0	53.8	51.6	34.2	31.7	14.6	15.4	19.4	27.5	17.2	17.6
	♀	J-S	360	135	45	45.1	51.2	46.9	31.9	27.8	13.3	15.1	18.9	26.3	16.4	17.2
3 mi. N. Buena Vista Lake	♂	Ad	445	170	45	50.8	57.8	51.4	37.1	31.7	15.4	14.9	21.7	29.3	17.3	19.7
Delano	♂	Y	443	182	50	51.8	58.6	53.5	36.5	33.3	15.0	15.7	21.2	30.1	17.5	18.9
	♀	Ad	400	140	45	44.7	50.7	47.5	32.7	28.1	14.0	14.8	19.3	25.4	15.4	17.2
2 mi. N. Sorrell Ranch, 4500 ft., Kelso Valley	♂	Ad	420	150	49	50.3	56.9	53.3	35.1	30.3	14.1	13.7	21.0	29.3	16.3	19.0
	♂	Ad	440	135	50	52.0	58.3	54.8	38.9	33.7	16.4	15.7	20.6	30.1	17.2	19.3
Fort Tejon	♂	Ad	472	175	42	51.1	57.3	51.5	34.9	30.5	14.7	15.4	21.4	29.6	17.3	18.9
8 mi. W., 3 mi., N. McKittrick, 2100 ft.	♂	Ad	581	180	50	55.1	62.1	56.1	39.7	35.5	16.4	15.3	23.4	31.9	17.6	19.9
	♀	Ad	424	159	43	47.4	53.7	49.1	33.8	29.9	14.8	15.8	20.1	27.5	15.5	18.5
	♀	Ad	423	149	44	48.3	54.7	50.8	34.6	30.4	14.9	14.5	20.7	27.6	16.0	18.9
	♂	S-Y	438	145	46	52.5	59.7	53.8	35.4	32.0	14.6	14.6	22.3	30.1	17.7	18.7
	♂	S-Y	439	182	49	52.1	58.8	54.5	34.6	32.1	14.8	15.0	21.6	30.3	17.9	19.2
	♂	S-Y	426	164	50	51.0	58.3	53.4	35.5	31.8	14.5	15.2	21.5	29.7	18.2	19.1
Rose Station, 1300 ft.	♀	Ad	389	138	41	46.9	49.3	48.5	32.2	28.6	14.5	13.9	19.5	27.2	15.9	17.8

TABLE 23—(*Continued*)

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
San Emigdio	♂	Ad	500	195	55	56.2	63.2	56.7	39.7	35.2	17.2	14.7	22.8	33.4	18.0	19.5
	♂	Ad	460	158	52	53.9	61.0	55.8	39.5	33.5	16.0	16.4	22.3	31.6	17.5	19.6
	♀	Ad	445	161	47	47.6	55.7	51.9	34.5	30.5	15.8	16.1	19.9	27.8	17.2	19.4
	♀	Y	420	170	48	48.7	55.5	51.6	34.9	30.2	15.3	16.9	20.0	28.3	17.5	18.1
	♀	Y	420	153	46	49.0	55.2	49.9	32.0	29.7	13.9	14.9	21.4	27.5	16.9	17.7
Kings County																
Lemoore	♂	S-Y	453	158	52	53.5	59.5	55.0	38.7	34.1	16.5	16.1	21.8	31.5	18.8	19.2
	♂	S-Y	440	140	48	51.8	58.6	52.9	38.0	32.6	16.0	15.9	22.3	29.5	18.0	18.0
Lake County																
Hildebrand Ranch, Morgan Valley	♂	Y	—	—	—	52.4	59.0	53.0	—	32.6	15.9	15.4	21.7	30.8	16.5	19.3
	♀	Ad	—	—	—	48.5	55.9	53.3	35.3	31.5	16.1	15.2	21.1	27.5	16.2	19.4
Madera County																
Raymond, 940 ft.	♂	Ad	450	155	45	51.4	57.5	51.8	37.7	33.2	16.0	15.6	20.6	30.8	17.8	18.5
Marin County																
5 mi. W. Inverness, 300 ft.	♂	Ad	457	145	32	55.3	62.4	56.6	39.5	34.7	16.6	16.1	22.2	32.9	18.3	20.0
	♂	Ad	483	168	50	54.2	62.4	57.2	41.4	34.3	17.4	—	23.5	30.8	18.4	20.5
Lagunita	♀	S-Y	360	140	41	45.0	51.7	47.7	31.9	27.4	13.6	15.2	19.4	26.1	16.9	17.4
Mailliard	♂	Ad	442	165	45	49.2	55.4	51.5	36.4	32.7	16.4	16.5	19.9	29.3	17.4	19.3
2 mi. S. Novato	♂	Ad	404	107	43	52.1	59.2	54.6	41.0	33.3	16.2	16.0	21.1	31.4	17.6	18.8
	♂	Y	430	149	46	54.5	61.7	56.6	39.0	33.9	16.8	16.8	22.8	31.6	17.5	19.5
Point Reyes	♂	Ad	448	135	50	51.5	57.8	52.6	36.1	32.1	15.5	15.2	21.4	30.0	17.5	18.7
	♂	Ad	485	150	53	55.5	62.3	55.4	40.1	35.2	17.9	15.6	22.7	33.2	17.7	19.9
	♂	Ad	430	130	50	51.6	59.0	52.6	38.4	31.6	18.0	17.9	20.9	30.5	17.6	19.3
	(♂)	Y	—	—	—	52.3	59.6	52.5	37.7	33.1	15.9	15.8	22.2	30.0	18.3	19.1
	♀	Ad	—	—	—	49.7	55.6	50.2	—	31.9	15.7	15.0	21.5	28.3	16.6	18.9
	♀	Ad	386	142	43	46.0	51.9	46.8	33.5	28.4	14.4	15.8	19.5	26.5	17.1	18.1
	♀	S	344	90	42	44.6	50.2	46.4	30.0	26.5	15.5	16.4	18.5	26.0	17.1	18.1
Mt. Tamalpais	♂	Ad	452	135	47	52.4	58.7	53.3	37.4	31.8	15.1	16.1	20.7	31.6	17.3	18.8
	♀	Ad	388	126	55	47.2	52.8	48.6	33.3	29.0	14.2	14.4	19.1	28.3	16.5	17.8
Mendocino County																
Gualala	♀	Ad	366	110	44	47.1	52.5	47.5	31.9	28.6	14.8	16.7	19.7	27.2	16.3	18.2
Laytonville	♂	Y	—	—	—	52.0	59.2	54.7	—	32.6	16.3	17.7	21.0	30.8	16.8	18.6
	♀	Ad	385	120	43	46.6	53.0	47.9	32.7	27.8	15.0	16.6	19.3	27.1	16.4	18.5
Merced County																
Los Baños	♀	Ad	—	—	—	45.3	52.0	47.5	34.2	28.6	14.0	14.0	19.2	26.2	16.6	17.6

TABLE 23—(*Continued*)

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth-Row
	♀	Ad	—	—	—	46.9	53.5	49.5	33.9	30.4	14.6	15.2	18.9	27.9	16.0	18.2
	(♀)	Y	—	—	—	47.7	54.7	49.8	33.3	30.8	15.2	16.0	19.1	28.8	16.6	17.6
Snelling, 200 ft.	♂	Ad	415	150	48	46.7	53.2	48.7	35.4	31.5	14.9	16.1	19.8	26.9	17.1	17.4
	♀	Y	408	160	43	45.0	51.2	45.3	32.8	29.7	14.5	15.9	18.9	26.1	17.6	16.8
Monterey County																
Bolton Ranch	♂	S-Y	—	—	—	52.8	59.0	55.0	39.0	32.5	16.1	16.4	22.1	30.8	19.8	18.9
	♀	S-Y	—	—	—	54.2	61.3	55.2	39.0	32.9	16.9	15.6	22.1	32.0	18.1	20.1
Butlerford Ranch	♂	Y	—	—	—	53.6	58.9	56.9	38.4	32.8	16.4	14.8	23.2	33.7	18.2	20.8
John Glan Ranch, Lockwood	♂	J-S	—	—	—	47.9	54.5	49.4	34.6	30.2	14.6	15.0	20.0	28.0	17.5	17.6
Sargent Ranch, Pesante Canyon, 500 ft.	♀	S	—	—	—	49.4	56.7	51.6	36.7	31.8	15.4	16.1	20.9	28.6	18.2	17.7
6.3 mi. NE. Soledad, 1300 ft.	♂	Ad	—	—	—	51.0	57.6	32.1	37.1	30.9	15.9	15.5	21.0	29.9	18.3	18.3
Napa County																
Huichica Creek, 250 ft.	♂	Ad	445	172	44	54.5	61.2	56.0	38.3	33.3	17.0	16.4	23.3	31.4	18.2	19.9
	♂	Ad	—	—	—	52.8	59.3	54.5	38.0	33.0	15.2	15.5	22.2	30.8	17.3	19.0
Mt. St. Helena	♂	S	460	158	52	52.4	59.4	54.5	38.1	33.0	17.0	16.9	22.1	30.7	18.5	19.4
Orange County																
1 mi. SE. Laguna Beach, 500 ft.	(♀)	S	—	—	—	—	—	—	—	28.7	13.4	14.7	19.7	—	16.6	16.7
Trabuco Canyon, 1700 ft., Trabuco Mts.	♂	Ad	400	130	50	51.3	57.8	52.2	37.0	33.1	15.6	15.5	21.4	29.8	17.3	18.8
	♂	Ad	450	150	50	50.6	57.2	52.4	38.2	34.1	16.3	16.6	21.7	28.7	17.6	19.2
	♂	S-Y	378	140	42	45.3	51.7	47.3	32.5	29.2	14.4	16.7	18.9	26.6	16.9	17.1
Plumas County																
Rich Gulch, 3850 ft., 11 mi. N., 8 mi. W. Quincy	♂	Ad	422	148	46	51.1	58.7	54.4	37.1	31.6	15.8	16.0	20.0	31.1	16.7	19.0
Riverside County																
1½ mi. S., 1 mi. W. Banning, 2300 ft.	♂	S-Y	—	—	43	44.7	50.9	46.9	30.1	27.6	13.8	13.4	19.6	25.3	15.2	17.2
Box Spring, 1300 ft.	♂	S-Y	427	166	48	51.3	58.0	54.0	35.9	33.1	14.7	15.7	21.7	21.7	17.7	18.5
	♀	Ad	385	141	40	45.8	51.6	47.7	33.1	29.0	14.8	15.3	19.3	26.4	16.2	17.5
	♀	Ad	380	140	40	45.5	51.2	46.5	33.7	29.6	14.6	14.9	18.7	26.2	15.9	17.0
Cabazon	♂	Y	—	—	—	48.7	55.8	51.0	35.2	32.1	14.8	15.0	19.9	29.1	17.3	18.0
San Jacinto Mts.	♂	Ad	441	172	—	50.5	57.3	53.0	36.1	32.1	14.7	15.4	21.5	29.0	16.8	19.0
	♂	Ad	406	146	46	48.3	54.5	51.0	35.8	31.7	15.2	15.8	20.2	28.2	16.2	18.3
	♀	Ad	360	145	39	44.6	51.1	47.2	31.0	27.0	13.5	15.0	18.3	26.3	15.3	17.5

TABLE 23—(*Continued*)

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
Jurupa Mts., 7 mi. NW. Riverside	♀	S-Y	—	102	22	43.8	49.3	46.1	30.9	27.5	13.6	16.4	18.2	25.1	16.1	16.8
Riverside Mts.	♂	Ad	—	—	—	47.4	53.7	48.6	34.5	30.1	14.5	15.2	19.7	27.8	16.9	17.2
	♂	Y	382	158	39	44.0	49.7	44.8	33.1	28.6	13.5	14.4	18.3	26.1	15.7	17.0
	♀	Y	352	142	38	43.6	49.5	45.4	29.0	26.0	12.8	13.2	18.8	25.0	15.0	16.6
	♀	Y	350	135	37	39.8	44.9	42.4	28.2	24.7	11.3	12.0	17.1	23.0	14.2	15.4
Carizo Creek, Santa Rose Mts.	♂	Y	410	152	46	50.9	57.0	53.0	33.7	31.3	13.9	13.6	20.2	30.2	16.1	18.5
San Benito County																
Bear Valley Post Office	♂	J	315	102	41	43.0	49.3	45.4	30.4	29.0	13.8	15.1	18.8	24.2	15.5	17.7
Hernandez	♂	Ad	440	158	48	52.1	59.7	54.6	38.9	34.2	16.1	15.6	21.4	30.8	19.3	18.9
San Bernardino County																
Reche Canyon	♂	Ad	408	149	48	51.0	57.0	52.8	36.7	32.0	16.0	17.3	21.0	29.8	18.0	19.2
	♂	Ad	407	150	45	49.2	55.2	49.6	35.2	31.4	14.0	16.4	21.4	27.6	18.2	18.8
	♂	Ad	356	132	37	44.9	51.2	48.3	33.4	29.1	15.9	15.6	17.6	27.1	16.3	16.6
Pine City	♂	Ad	—	—	—	50.6	56.9	51.5	34.8	31.1	15.6	15.9	21.4	29.3	17.1	18.7
Waterman Canyon, 4000 ft., 6 mi. N. San Bernardino	♂	S-Y	414	165	53	49.4	56.4	52.0	33.8	31.9	14.7	15.4	20.9	28.5	17.3	18.9
	♀	S-Y	343	127	41	43.5	49.6	46.9	29.8	29.2	13.5	14.1	18.3	25.6	15.7	15.9
San Bernardino Peak, 3800 ft.	♀	Y	411	151	43	44.1	50.1	47.1	31.9	28.0	13.2	14.3	18.2	25.6	16.9	16.5
San Bernardino Mts.	♂	S-Y	375	176	33	49.2	56.0	51.9	34.1	30.5	14.0	14.6	20.6	28.9	17.5	18.3
	♀	Y	362	116	39	45.2	51.3	47.8	31.5	28.4	13.9	15.0	18.5	26.6	16.2	17.4
	♀	Y	355	118	39	43.1	48.8	44.1	30.1	27.1	13.6	13.5	17.0	28.8	15.2	16.0
Camp Baldy	♂	Y	420	160	45	48.7	54.5	51.3	34.3	29.5	14.3	14.4	19.5	29.0	16.8	16.7
Devil Canyon, 2500 ft.	♂	S-Y	410	145	45	46.4	52.8	48.8	—	30.2	14.0	16.0	19.6	26.7	17.3	17.4
22 mi. NE. Whitewater Station	♂	S-Y	—	—	—	45.8	55.8	51.0	35.2	32.1	14.8	15.9	19.9	29.1	17.3	18.0
Providence Mts.	♀	S-Y	354	129	38	41.1	56.2	43.0	28.4	25.3	11.6	12.0	16.6	24.0	14.1	15.7
San Diego County																
Bonita	♀	Ad	385	122	41	47.0	53.3	49.9	31.4	30.2	13.8	14.4	19.6	27.7	15.8	17.9
Borrego Desert State Park	♂	S	—	—	—	47.9	54.1	50.2	34.1	30.4	14.2	14.8	20.5	27.7	17.3	18.4
Cuyamaca Mts.	♂	Ad	440	176	50	51.8	58.7	54.5	37.6	33.8	15.9	15.6	21.5	30.4	17.2	18.6
	♂	S	418	178	48	48.9	55.1	50.3	35.2	32.1	14.9	15.4	19.6	28.6	18.4	17.6
	♂	J-S	447	182	50	52.6	59.8	55.1	35.1	32.9	14.8	14.8	21.0	31.4	17.9	19.4
Dulzura	♂	Ad	480	140	—	51.5	58.0	52.8	35.5	33.2	15.4	15.5	21.2	30.5	16.8	19.4
	(♂)	Ad	—	—	—	49.6	56.7	51.7	36.5	31.6	16.0	15.9	19.8	30.0	17.3	18.9

TABLE 23—(*Continued*)

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
	♂	S-Y	425	152	48	48.8	55.3	51.0	43.6	30.1	15.0	15.7	20.5	28.2	17.0	17.8
	♂	S	405	150	45	—	55.5	50.0	—	31.0	14.1	15.1	20.5	—	17.0	18.7
	(♂)	S	—	—	—	—	53.1	50.4	32.5	30.1	14.7	15.2	19.1	—	16.6	17.6
	(♀)	S-Y	—	—	—	45.8	50.9	48.6	31.8	27.5	13.4	15.0	18.2	27.3	17.2	18.1
Encanto	♂	Y	350	110	40	42.9	48.7	44.9	30.2	27.9	13.2	15.3	17.3	25.4	16.9	16.3
Escondido	♂	Ad	356	90	46	46.8	53.6	50.3	34.9	30.8	15.0	16.2	19.8	27.2	16.4	17.7
	♂	Ad	410	153	50	49.8	56.5	52.3	35.4	32.5	15.0	15.9	20.7	29.1	16.6	18.1
	♂	S	377	133	44	47.5	53.7	50.4	42.8	30.1	14.9	15.9	20.0	27.4	16.8	18.2
	♂	S	411	145	50	51.4	57.2	52.2	33.6	31.2	13.8	14.1	21.9	28.8	16.0	18.8
	♂	S	415	156	47	48.5	54.6	49.9	33.4	31.5	15.1	16.1	20.5	28.1	17.4	18.7
Jamul	♀	Ad	384	140	39	44.3	50.5	46.2	33.5	28.4	14.2	15.3	18.5	25.9	16.2	16.7
La Jolla	♂	Ad	372	134	42	47.4	53.6	49.3	33.8	29.0	14.2	16.4	19.6	28.0	16.7	18.3
	♂	Ad	—	—	—	47.6	52.9	48.8	36.9	30.8	16.7	16.6	19.2	28.3	17.2	16.8
	♀	Ad	335	116	39	43.5	49.0	46.0	29.2	27.0	13.0	14.5	17.6	25.7	15.1	16.7
La Puerta	♂	Ad	400	153	45	48.4	55.2	51.8	33.9	31.1	15.6	15.9	19.8	28.3	15.5	17.6
	♀	J	274	103	35	—	—	—	—	—	12.2	13.7	15.6	—	—	15.7
Ramona	♂	S	351	140	51	52.6	58.6	52.7	35.6	34.1	16.3	15.7	22.3	30.0	17.4	19.4
San Diego	♂	S	370	130	44	47.4	53.9	49.9	34.2	30.4	14.5	16.1	19.8	27.8	18.0	17.4
San Marcos	♂	Y	—	—	—	47.7	54.3	50.4	33.4	30.7	14.1	15.1	20.0	28.3	17.1	17.8
	♂	Y	425	157	45	50.4	56.3	52.3	35.6	33.0	14.3	16.2	21.0	29.3	18.4	18.4
	(♂)	Ad	—	—	—	46.1	51.9	47.8	32.3	28.6	13.9	15.0	19.1	27.0	16.6	17.3
	♀	Y	390	160	43	46.8	52.4	49.6	32.8	30.0	14.5	15.9	20.1	26.9	16.2	17.7
Santa Ysabel	♀	Ad	370	138	40	43.8	49.4	46.3	32.0	28.5	13.5	15.4	18.0	25.8	17.0	15.7
Twin Oaks	♀	Y	331	125	39	45.1	51.3	46.8	—	27.7	13.0	14.8	18.8	26.7	15.5	17.5
Valley Center	♀	Ad	370	143	41	44.4	50.2	46.5	32.5	29.1	13.9	15.8	18.0	26.3	16.2	17.8
Witch Creek	♂	Ad	380	154	46	50.2	56.4	51.9	35.4	32.9	15.9	16.4	20.7	29.1	15.7	19.3
	♀	Ad	354	150	40	44.5	50.3	45.0	—	27.2	13.3	14.8	18.7	25.9	15.4	17.0
	♂	S	413	171	46	46.7	53.0	48.5	34.3	30.7	14.4	15.9	19.6	26.9	16.8	17.8
	♀	S	354	150	40	48.0	54.5	50.8	—	29.5	13.6	14.5	19.2	29.2	17.4	17.2
San Joaquin County																
SW. Tracy	♂	Y	399	139	41	45.6	52.4	48.7	33.0	28.5	14.5	16.1	19.1	26.6	17.7	17.2
	♀	Ad	409	154	43	47.8	53.8	49.0	32.9	29.0	13.9	15.1	20.2	26.7	16.8	17.9
	♀	Ad	—	—	—	47.1	53.7	48.7	33.0	29.3	—	15.1	20.0	27.0	16.9	17.4
	♀	Y	374	140	42	—	—	—	32.5	—	13.5	13.9	18.9	—	17.0	17.7

TABLE 23—(*Continued*)

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
San Luis Obispo County																
Morro	♂	Y	470	176	51	51.9	58.6	53.7	36.3	32.8	15.1	15.5	21.0	31.0	17.2	18.4
	(♀)	Y	—	—	—	45.1	50.9	47.0	31.4	27.4	14.0	15.0	18.5	26.6	17.0	16.8
7 mi. N. Piedras Blancas	♂	S-Y	430	148	48	49.9	56.9	51.3	36.6	32.3	16.1	16.3	21.8	28.2	17.7	18.4
Pozo	♂	Ad	480	195	50	52.0	58.9	53.4	37.7	33.5	16.4	16.6	21.7	30.5	17.5	19.6
San Luis Obispo	♂	Ad	470	182	53	50.7	57.6	50.6	37.4	32.3	15.1	14.8	20.4	30.0	16.8	18.3
	♂	Ad	424	142	49	49.5	57.1	51.1	37.0	31.7	15.2	15.5	20.3	29.6	17.3	18.2
	♂	Ad	—	—	—	53.1	59.6	53.9	38.9	33.6	15.8	15.8	22.0	31.5	18.5	18.9
	♀	Ad	408	164	45	47.0	53.3	49.3	31.6	28.0	14.3	15.0	20.2	26.5	15.9	17.7
	♀	Ad	420	155	46	47.2	53.8	48.3	34.0	29.4	14.0	15.1	20.0	27.2	15.0	17.6
San Mateo County																
Half Moon Bay	♂	Ad	432	143	—	51.0	57.8	50.8	37.3	31.5	15.9	15.2	21.4	29.1	18.2	18.9
	♂	Ad	464	152	—	52.3	59.2	52.7	38.2	31.8	16.4	15.5	22.1	29.9	18.4	19.5
	♂	Ad	490	160	46	51.4	57.2	50.8	36.9	30.8	15.1	14.2	21.4	20.1	17.8	17.8
Palo Alto	(♂)	Ad	—	—	—	48.0	54.6	48.6	34.3	28.3	14.2	15.2	20.3	27.5	17.2	17.4
Portola	♀	Y	—	—	—	47.2	53.1	47.1	34.0	29.4	14.2	14.8	19.5	27.6	17.2	17.1
Santa Barbara County																
7 mi. W. Gaviota	♀	Ad	382	121	38	45.6	52.0	47.4	32.8	29.0	14.2	15.2	19.5	26.1	16.2	17.3
5 mi. NW. Santa Barbara	♂	Ad	444	145	57	50.6	57.9	54.2	37.3	31.7	15.9	15.6	20.9	29.6	16.9	19.7
Mission Santa Ynez	♂	Ad	464	175	51	52.3	60.4	54.6	41.0	33.4	16.9	15.5	21.6	30.6	17.5	19.6
	♀	Ad	420	162	46	47.7	54.9	50.5	33.6	29.8	14.3	14.9	19.7	28.4	16.0	18.4
Santa Cruz County																
5 mi. S. Aptos	♀	Ad	—	—	—	45.3	51.3	48.6	33.6	29.1	14.0	15.9	18.8	26.6	17.4	17.7
Boulder Creek	♂	Ad	459	188	55	54.2	60.6	55.6	38.8	33.8	16.6	16.2	22.8	31.9	18.6	19.3
Felton	♀	S	353	149	40	—	—	—	—	—	14.6	—	19.3	—	—	17.8
3 mi. E. Santa Cruz	♂	Y	423	156	43	48.2	54.7	48.7	34.7	29.2	14.1	14.9	19.8	28.4	16.8	18.8
7 mi. NNE. Santa Cruz	♀	Ad	395	160	43	46.2	52.0	47.4	34.8	29.6	14.7	14.6	19.7	26.5	16.6	18.3
Shasta County																
Baird	♀	Ad	350	117	41	43.9	49.6	46.2	31.0	27.1	13.2	16.0	18.7	25.1	15.4	17.4
Montgomery Creek	♂	Ad	431	127	50	52.0	59.6	53.6	37.7	34.1	16.1	16.9	20.8	31.3	17.4	18.8
	♀	S-Y	368	115	41	45.3	51.6	48.7	30.7	27.3	14.0	15.2	19.4	26.1	16.1	17.7
Stillwater	♂	Ad	440	150	55	53.5	60.0	54.1	37.9	33.2	17.0	15.5	21.8	31.9	17.4	20.0

TABLE 23—(*Continued*)

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
Siskiyou County																
Gottville	♀	Ad	—	—	—	47.2	53.9	48.5	32.0	29.5	14.5	15.5	20.0	27.4	15.8	18.1
Hornbrook, 2154 ft.	♂	Ad	465	157	49	52.5	59.4	53.9	38.6	33.2	17.4	16.6	21.9	31.5	17.6	19.2
	♀	Ad	392	148	43	45.8	52.4	48.8	33.2	29.1	15.4	15.8	19.3	26.5	16.2	18.6
	♀	S	393	152	43	44.3	50.4	46.3	33.2	29.0	14.6	16.0	18.5	25.7	16.7	17.7
Creek Station, Siskiyou Mts.	♂	S	391	149	46	47.7	54.2	50.6	33.5	29.7	13.9	14.5	19.0	28.9	17.0	18.3
5 mi. W. Tule Lake, 4500 ft.	(♂)	Y	—	—	—	53.8	61.0	54.2	—	34.2	17.4	16.6	21.9	31.5	17.6	19.2
Solano County																
Fairfield	♂	Ad	475	157	54	54.1	60.4	55.0	39.7	33.4	16.1	16.3	22.2	32.0	18.2	20.6
3 mi. W. Vacaville	♂	Ad	473	158	50	53.2	59.4	55.6	39.5	34.4	17.2	17.2	22.6	30.2	17.8	18.8
9 mi. E. Vacaville	♂	Ad	449	162	49	49.9	56.7	52.3	37.3	32.5	16.9	16.3	21.4	28.6	17.5	19.8
Sonoma County																
Glen Ellen	♂	Y	460	153	51	52.3	58.7	53.0	36.4	32.3	16.0	16.2	20.8	30.4	17.6	19.8
	♀	Ad	395	135	46	45.0	51.5	47.2	34.0	28.8	14.0	15.0	19.2	25.6	16.2	18.0
Stanislaus County																
La Grange	♂	Ad	445	145	50	50.9	58.5	53.6	38.7	32.9	15.7	16.4	21.8	29.9	17.0	19.2
	♂	Y	430	150	47	50.7	56.6	52.1	35.2	31.5	14.3	14.7	20.1	29.5	16.7	18.5
	♀	Y	390	145	44	45.0	50.7	45.9	30.9	27.1	13.5	14.0	18.5	26.2	16.1	17.5
13 mi. SE. Tracy	♂	S	479	155	46	52.0	58.6	53.0	35.6	33.3	15.5	16.8	21.2	30.8	18.0	19.9
Tehama County																
Vicinity of Mt. Tomhead	♂	Ad	447	145	49	51.5	58.9	53.5	36.0	31.5	15.4	15.1	21.8	29.8	16.5	18.9
	♂	Ad	426	145	50	52.0	58.7	53.3	37.7	33.4	15.1	15.6	20.8	31.3	17.1	19.4
	♂	Ad	433	147	50	53.1	60.5	54.9	39.7	32.4	17.1	16.5	22.2	30.9	18.2	20.0
	♂	S-Y	422	140	45	50.4	57.2	52.9	45.1	30.9	15.0	15.3	21.1	29.2	17.2	18.7
	♂	S-Y	385	130	45	48.4	55.5	50.7	34.7	29.9	15.3	16.6	20.0	28.5	17.0	18.7
	♀	Ad	417	155	44	50.0	56.2	50.3	33.5	29.5	16.1	15.8	21.0	28.8	16.2	18.7
	♀	Ad	415	140	47	48.6	55.2	51.6	34.0	29.7	15.0	15.7	19.0	29.8	16.8	17.4
	♀	Ad	388	135	43	45.1	51.7	49.5	33.1	29.2	14.8	16.1	18.3	27.0	16.8	16.9
	♀	Y	400	140	44	49.4	55.9	51.5	33.2	29.7	13.8	14.5	19.5	29.7	16.2	18.1
Paine Creek, 600 ft.	♂	Y	448	151	51	50.5	58.3	53.5	36.1	32.0	15.6	16.3	20.7	30.0	18.1	18.2
	♂	Y	422	160	48	50.4	56.9	51.4	34.6	30.7	15.1	14.7	21.3	29.5	17.1	18.9
Trinity County																
South Fork Mt., 3000 ft.	♀	Ad	390	130	42	48.1	54.4	49.6	33.5	30.5	15.8	16.5	21.0	27.0	17.0	17.9

TABLE 23—(*Continued*)

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
Tulare County																
Alila	♂	Ad	427	166	51	49.1	55.7	51.1	38.5	31.0	15.3	15.7	20.3	28.9	17.5	18.8
	♂	Y	421	153	48	49.7	55.3	50.7	35.3	30.5	15.3	15.5	20.4	29.4	16.8	18.3
	♀	Ad	376	149	42	44.6	50.9	46.1	31.4	29.6	13.3	14.0	18.0	26.2	15.7	17.5
	♀	Y	—	—	—	45.7	51.5	47.4	30.1	28.4	13.5	14.2	19.4	26.0	15.4	17.4
Milo	♀	Ad	371	128	41	43.7	50.5	46.5	32.3	28.2	13.6	—	18.8	25.3	14.8	17.1
	♀	J	230	78	30	32.3	36.3	35.7	23.1	21.7	11.6	12.5	13.9	18.4	14.0	14.0
	♀	J	246	87	34	35.0	40.1	38.7	25.3	24.3	12.0	14.5	16.1	18.9	15.3	14.8
Orosi	♂	S	460	170	50	—	—	—	—	—	14.2	14.8	21.2	—	—	18.9
Portersville	♂	Ad	462	158	35	50.3	57.0	51.3	37.3	33.0	16.0	15.6	20.9	29.2	18.6	18.3
	(♀)	S-Y	—	—	—	47.0	52.7	48.1	42.9	29.0	13.5	14.1	20.5	26.6	15.4	17.4
Three Rivers	♂	Ad	435	160	46	50.2	56.8	51.9	35.4	30.8	15.2	15.7	20.5	30.0	16.2	19.3
	♂	Ad	472	170	49	53.9	61.3	55.8	39.0	33.8	16.1	15.3	21.2	32.7	17.9	19.8
	♂	S-Y	440	155	48	51.7	58.1	51.5	34.7	31.4	14.9	15.2	21.2	30.6	17.8	18.5
	♀	Ad	340	112	41	44.4	50.5	46.2	30.6	26.5	12.3	13.2	18.4	25.9	15.2	17.4
	♀	Ad	365	124	41	43.3	49.4	45.9	31.2	28.5	14.0	14.8	17.9	25.5	14.9	16.6
	♀	J-S	330	132	37	41.3	47.0	42.0	29.5	26.5	13.3	14.8	16.7	24.7	15.3	16.2
Ventura County																
Matilija	♀	Ad	—	—	—	47.0	53.3	49.0	31.7	29.8	14.3	14.4	19.5	27.6	15.5	18.0
Santa Paula	♂	Y	445	162	48	50.1	56.8	52.4	35.1	32.2	14.6	15.6	21.1	29.1	17.0	17.7
	♀	S-Y	385	152	43	46.4	52.1	48.6	31.4	28.0	13.8	14.7	19.6	26.8	15.6	17.2
Ventura	♂	Ad	—	—	—	47.6	52.9	49.3	37.0	31.0	15.4	16.4	20.2	27.6	17.0	18.0
	♂	Ad	—	—	—	51.9	58.6	52.7	36.0	31.7	15.7	15.7	21.2	30.9	17.2	18.6
	♀	Ad	—	—	—	46.6	51.6	48.3	32.3	29.1	14.4	15.0	18.5	27.7	16.2	17.6
Ventura River, 500 ft.	♂	Ad	425	160	47	48.2	55.3	49.8	36.8	31.7	15.6	15.8	20.3	27.9	17.1	19.7
	♂	Ad	465	193	51	53.6	60.1	55.6	38.0	31.8	15.3	15.9	22.2	31.0	16.7	19.2
Yolo County																
Vicinity of Davis	(♂)	Ad	—	—	—	—	—	—	36.4	—	16.4	—	20.6	—	18.3	19.5
	♂	J	175	48	26	29.8	34.8	33.9	23.0	22.7	12.2	—	13.3	16.4	14.6	—
	♀	Ad	373	125	46	—	53.7	49.6	33.1	30.2	15.3	15.2	20.8	—	16.5	18.5
	♀	Ad	—	—	—	43.6	50.3	46.9	33.4	28.9	15.8	16.8	20.6	23.2	17.0	18.3
	♀	J	186	52	25	30.1	34.4	32.9	22.2	20.5	11.6	—	14.9	16.2	13.8	—
	♀	J	184	50	24	29.3	34.3	32.6	21.9	20.7	12.1	—	13.4	16.0	14.1	—
Yuba County																
S. Marysville	♀	J	266	85	33	36.6	41.9	40.3	27.0	25.4	12.6	14.4	16.0	20.6	15.0	15.6

Stillwater, 1 (U.S.N.M.). *Siskiyou County:* Cottville, 1 (U.S.N.M.); Hornbrook, 2154 ft., 3 (U.S.N.M.); Creek Station, Shelley Creek, Siskiyou Mountains, 1 (U.S.N.M.); Sheepy Peak, 4500 ft., 5 miles west of Tule Lake, 1 (M.V.Z.). *Solano County:* Fairfield, 1 (U.S.N.M.); 3 miles west of Vacaville, 1 (M.V.Z.); 9 miles east of Vacaville, 1 (M.V.Z.). *Sonoma County:* Glen Ellen, 2 (U.S.N.M.); Petaluma, 8 (5 C.N.H.M., 3 M.V.Z.); 1½ miles west of Petaluma, 1 (M.V.Z.). *Stanislaus County:* La Grange, 1 (M.V.Z.); 3 miles south of La Grange, 2 (M.V.Z.); 13 miles southeast of Tracy, 1 (Cal.A.S.). *Tehama County:* Tomhead Mine on north slope of Mt. Tomhead, 3800 ft., Trinity National Forest, 1 (M.V.Z.); Cedar Creek near Tomhead Mine, 3500 ft., north slope of Mt. Tomhead, Trinity National Forest, 3 (M.V.Z.); Cedar Creek, 3000 ft., 2 miles north of Mt. Tomhead, Trinity National Forest, 1 (M.V.Z.); Saddle Camp Ranger Station, 3600 ft., on north slope of Mt. Tomhead, Trinity National Forest, 2 (M.V.Z.); Brush Ridge, 3000 ft., 4 miles north of Mt. Tomhead, Trinity National Forest, 1 (M.V.Z.); Handy Camp, 3500 ft., 10 miles north of Mt. Tomhead, Trinity National Forest, 2 (M.V.Z.); Paine Creek, 600 ft., 2 (M.V.Z.). *Trinity County:* Helena, 1405 ft., 1 (M.V.Z.); South Fork Mountain, 3000 ft., 4 miles north of Mad Rock River, 1 (M.V.Z.). *Tulare County:* Alila, 5 (U.S.N.M.); Kaweah, 1 (U.S.N.M.); Milo, 1800 ft., 3 (U.S.N.M.); 2 miles west of Camp Nelson, 1 (A.M.N.H.); Orosi, 1 (U.S.N.M.); Portersville, 2 (A.M.N.H., U.S.N.M.); Three Rivers, 6 (U.S.N.M.). *Ventura County:* Matilija, 1 (U.S.N.M.); Santa Paula, 800 ft., 2 (U.S.N.M.); Ventura, 3 (M.V.Z.); vicinity of Ventura, 1 (D.R.D.); Ventura River, 500 ft., 2 (U.S.N.M.). *Yolo County:* Davis, 1 (U.C.C.A.); 1¾ miles southeast of Davis, 1 (U.C.C.A.); 8 miles northwest of Davis, 4 (2 U.C.C.A., 2 M.H.C.). *Yuba County:* South of Marysville, 1 (M.V.Z.).

Spilogale putorius amphiala Dickey

Figures 36 and 37

Spilogale phenax amphialus DICKEY, April 4, 1929, Proc. Biol. Soc. Washington, vol. 42, p. 158. Type: D.R.D. No. 13400; adult male; collected by H. H. Sheldon, November 6, 1927; original no. 14; from 2½ miles north of ranch house near coast, Santa Rosa Island, Santa Barbara County, California.

DISTRIBUTION: Known only from Santa Rosa and Santa Cruz Islands, Santa Barbara County, California (fig. 4). Upper Sonoran Life Zone.

EXTERNAL MEASUREMENTS: Males, 422.9 (375–466), 137.8 (100–175), 46.4 (37–53); females, 380.4 (355–410), 121.1 (95–144), 42.9 (40–46).

CRANIAL MEASUREMENTS: Males: basilar length, 50.6 (46.6–53.9); condylobasal length, 57.4 (53.8–60.0); zygomatic breadth, 37.8 (35.2–40.1); interorbital breadth, 16.5 (15.2–18.6); height of cranium, 18.1 (17.2–19.5); length of tooth row, 18.6 (17.7–19.7); females (in same order): 45.9 (44.5–48.2), 52.3 (50.2–54.4), 33.2 (32.0–34.4), 15.2 (14.2–15.8), 17.2 (16.8–17.7), 17.5 (16.7–18.2).

WEIGHT: Males, 641.7 (566–793); female, 453.

COLOR PATTERN: Nasal patch medium, longer than broad, with small posterior projection in some. Dorsal stripes narrow, about as wide as or slightly wider than black dorsal stripe and narrower than shoulder stripes; dorsals narrowest at level of scapulae, frequently interrupted at this point for about 15 mm., then continuing posteriorly and always interrupted again posterior to end of shoulder stripes, but anterior to level of first vertical stripes; dorsal stripes reappearing at level of first verticals as small spots, never joined to first verticals and rarely joined to second verticals. Shoulder stripes medium to narrow, slightly broader than black shoulder stripes; shoulder stripes rarely interrupted in middle; pre-auricular patches medium, about twice width of anterior end of shoulder stripes, and without branching chin stripes. Lateral stripes variable, generally about same width as first verticals or broader; laterals reaching upper foreleg. First vertical stripes broad, never joined to dorsals; first verticals terminating proximally at level of shoulder stripes. Second vertical stripes as broad as first verticals, or narrower; joined to dorsals proximally. Third vertical stripes reduced to medium-sized rump patches, never extending onto hind legs. No white on forefeet or hind feet. Tail-base patch absent to U-shaped. Tail averages about two-fifths white dorsally and laterally, and slightly less than half white ventrally.

Spilogale putorius amphiala is unique in being the only spotted skunk that has an insular distribution. One would expect spotted skunks to occur on islands near other portions of the range, particularly off the coast of Baja California, but water generally seems to be an effective barrier to insular dispersal in this

genus. Because *amphiala* is the only subspecies of *Spilogale* that is completely isolated from all other subspecies, considerable attention has been paid to it in order to obtain some indication of possible rate of evolution of these animals.

Spilogale putorius amphiala is found on two of the four islands generally known as the Santa Barbara Channel Islands, which extend from about 30 miles to 95 miles west of Point Dume, Los Angeles County, California, and which lie about 25 miles south of the southern edge of Santa Barbara County. Spotted skunks are found on the two largest of the islands, Santa Rosa and Santa Cruz.

Spotted skunks from Santa Rosa and Santa Cruz Islands cannot be separated from each other at the 84 per cent level of distinction. The greatest difference between males of the two populations is in the height of the

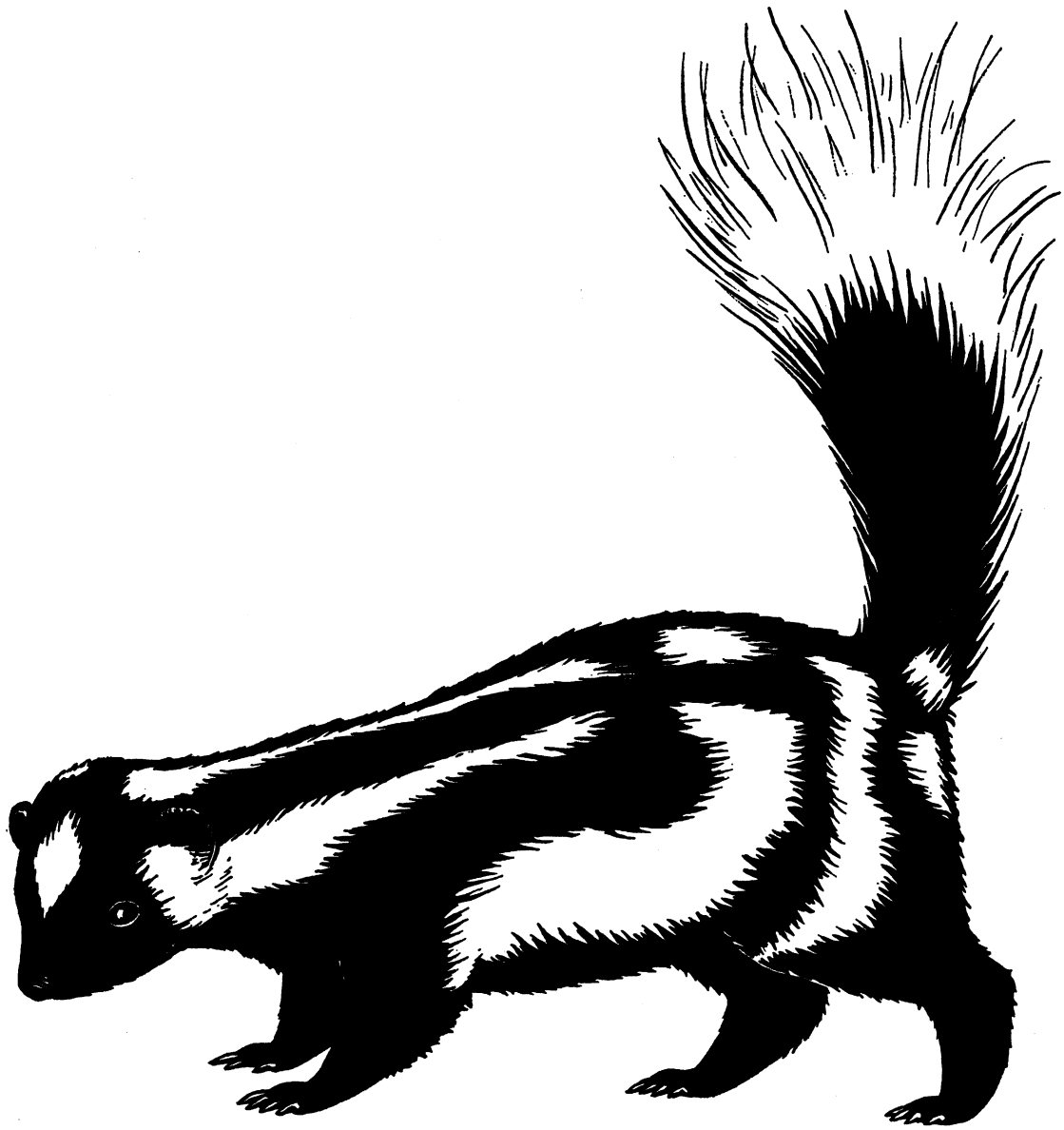

FIG. 36. Color pattern of *Spilogale putorius amphiala*. Drawn from an adult male, L.A.C.M. No. 7875, from Santa Rosa Island, Santa Barbara County, California. Not to scale.

cranium, in which the spotted skunks from Santa Rosa are significantly larger ($p = 0.002$), but in which more than 25 per cent of each population overlaps the other. Significant differences in the means of total length and postorbital breadth also exist between the males of each of these populations, but the extent of overlap in measurements is too great to permit subspecific distinction. Females from Santa Rosa and Santa Cruz Islands differ significantly in total length and in length of head and body, but again the amount of overlap is much more than the level of subspecific separability. Males from Santa Rosa Island are larger than males from Santa Cruz in most measurements; females from Santa Rosa are larger than those from Santa Cruz in about half of the measurements taken (table 24).

Because the populations of *S. p. phenax* from the mainland form clines in most measurements, *amphiala* cannot be compared with *phenax per se*, but must be compared with specimens from various localities. The logical specimens for comparison would be those from the Santa Monica Mountains in Los Angeles County, because the Santa Barbara Channel Islands are thought to be a structural part of these mountains (Bremner, 1933, p. 7). Unfortunately, the only specimens from the Santa Monica Mountains are juveniles and cannot be used for comparison. A sufficient number of specimens is available from Los Angeles County, however, and because these specimens probably do not differ materially from the spotted skunks in the Santa Monica Mountains, they were used for comparison with *amphiala*. The specimens from Los Angeles County are at the edge of the zone of intergradation between *phenax* and *martirensis*. Because the specimens from Los Angeles County are small representatives of *phenax*, being from the small end of the cline, and *amphiala* is larger, the Channel Island *Spilogale* have been compared also with a population of *phenax* from the portion of the cline that has animals of larger size; a sample from Berkeley, Alameda County, has been used for this purpose.

Males from Santa Cruz Island are significantly shorter than males from Los Angeles County in the means of total length and length of tail and are significantly larger in zygomatic and interorbital breadth. Females from Santa Cruz Island are significantly smaller than Los Angeles County females in length of tail and are significantly larger in length of head and body, condylobasal and palatilar lengths, and in zygomatic and interorbital breadths (table 25).

Males from Santa Cruz Island probably are separable from males from Los Angeles County at the 84 per cent level only in total

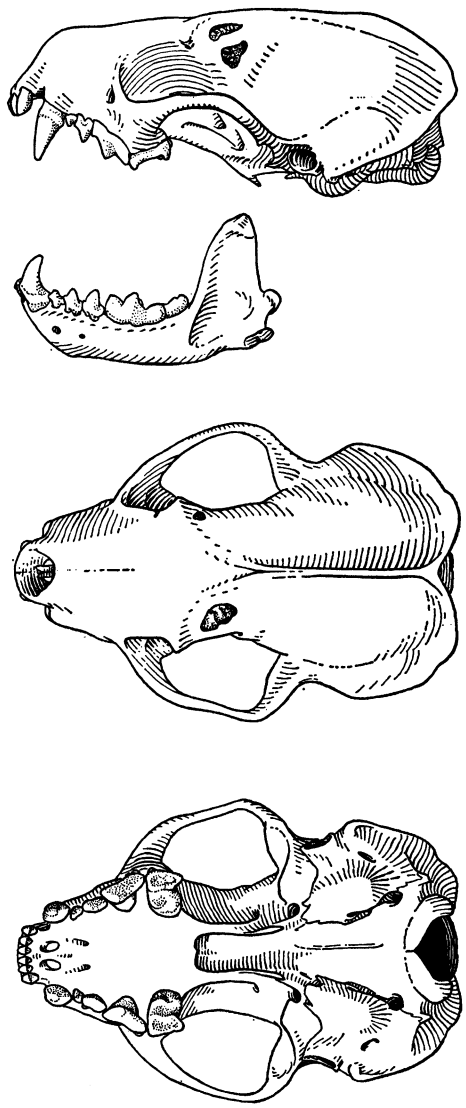

FIG. 37. Lateral, dorsal, and ventral views of *Spilogale putorius amphiala*, adult male, L.A.C.M. No. 7875, from Santa Rosa Island, Santa Barbara County, California. ×1.

TABLE 24

SANTA ROSA ISLAND SPOTTED SKUNKS COMPARED WITH SANTA CRUZ ISLAND SPOTTED SKUNKS

	T Values	
	Males	Females
Total length	1.979[a]	2.031[a]
Tail	1.406	0.585
Hind foot	0.197	0.045
Head and body	0.118	1.758[b]
Basilar	0.858	0.189
Condylobasal	0.689	1.588
Occipitonasal	0.394	0.780
Zygomatic	0.945	0.776
Mastoid	0.936	0.261
Interorbital	0.595	0.067
Postorbital	1.722[b]	1.652
Palatilar	1.534	0.429
Postpalatal	0.189	0.509
Cranium height	3.151[c]	0.459
Tooth row	0.481	1.538

[a] Significant at the 5 per cent level (p=less than 0.057).

[b] Significant at the 10 per cent level (p=less than 0.089).

[c] Significant at the 1 per cent level (p=less than 0.012).

length and length of tail (only five specimens from Los Angeles County were available for these measurements), which are shorter in the insular subspecies. Females from Santa Cruz Island are separable at an 88 per cent level in interorbital breadth. Males from Santa Rosa Island are not separable from Los Angeles County males at the 84 per cent level in any measurement, although females can be distinguished (at a 90% level) by their greater interorbital breadth (table 25).

From *S. p. phenax* from Berkeley, males of *amphiala* from Santa Cruz Island are significantly smaller in total length, length of tail, length of head and body, zygomatic breadth, and height of cranium, but only in the first two external measurements are more than 84 per cent of each population mutually distinct. Females from Santa Cruz Island are separable at this level also in total length and length of tail, although they average significantly larger in interorbital breadth and significantly smaller in postpalatal length (table 25).

Specimens of *amphiala* from Santa Rosa Island are barely separable at the 84 per cent level from specimens of *phenax* from Berkeley in the shorter total length of both males and females. Males from Santa Rosa are significantly smaller in all external measurements and in zygomatic breadth. Females from Santa Rosa are significantly smaller in total length, length of tail, basilar length, condylobasal length, occipitonasal length, zygomatic breadth, and postpalatal length. In the means of interorbital and postorbital breadth, Santa Rosa females are significantly larger than Berkeley females (table 25).

From the preceding discussion it is obvious that *Spilogale putorius amphiala* is, at best, a "weak" subspecies. Except for the short tail and consequent shorter total length, *amphiala* cannot be separated clearly from mainland spotted skunks in any given measurement, although the combination of short tail (half or less of the total length) and wide interorbital region generally will distinguish the insular subspecies.

As with cranial characters, the color pattern of *amphiala* does not serve clearly to distinguish the insular subspecies from the mainland race. There are no discernible differences in color pattern between the skunks from the two islands, and the main difference between *amphiala* and *phenax* is in the amount of white on the ventral side of the tail. In *amphiala* the ventral side of the tail is usually less than half white (average about 45%), and in *phenax* the tail is generally more than half white below (average 55%). The constriction and frequent interruption of the dorsal stripes at the level of the scapulae are also more characteristic of *amphiala* than of the mainland spotted skunks. In general, *amphiala* is whiter than the northern population of *phenax* and darker than the southern populations.

It must be assumed that *Spilogale putorius amphiala* occupied the Channel Islands at a time when these islands were connected with the mainland. The absence of spotted skunks from other islands close to portions of the range seems to suggest that they cannot cross a water barrier of several miles in extent. The absence of spotted skunks from San Miguel Island, the westernmost of the Santa Barbara Channel Islands, also suggests this, as is discussed below. During up-

TABLE 25

COMPARISON OF *Spilogale putorius amphiala* WITH MAINLAND POPULATIONS

	T Values							
	Los Angeles Co. Compared with Santa Cruz Is.		Los Angeles Co. Compared with Santa Rosa Is.		Berkeley Compared with Santa Cruz Is.		Berkeley Compared with Santa Rosa Is.	
	Males	Females	Males	Females	Males	Females	Males	Females
Total length	—	0.000	—	1.617	5.230[a]	2.389[b]	4.141[a]	3.729[a]
Tail	—	3.513[a]	—	2.317[b]	3.529[a]	4.281[a]	3.110[a]	3.202[a]
Hind foot	0.203	1.509	0.022	1.759[c]	1.539	0.770	2.736[a]	0.871
Head and body	0.261	2.082[b]	0.387	0.392	2.341[b]	0.795	2.501[a]	1.289
Basilar	0.125	1.446	1.117	1.176	1.239	2.390	0.662	2.201[b]
Condylobasal	0.185	2.112[b]	2.467[b]	1.297	1.504	1.139	1.147	2.542[a]
Occipitonasal	0.154	0.956	0.304	0.467	0.717	1.005	1.288	1.859[c]
Zygomatic	7.316[a]	2.623[a]	3.345[a]	2.180[b]	2.464[b]	1.457	1.864[c]	2.060[b]
Mastoid	0.985	1.029	0.093	0.980	1.560	0.713	0.070	0.957
Interorbital	2.031[b]	4.340[a]	3.307[a]	5.034[a]	0.516	2.087[b]	1.142	2.500[a]
Postorbital	0.088	1.485	1.672	2.797[a]	0.911	0.450	1.400	2.258[b]
Palatilar	0.632	2.883[a]	1.388	3.647[a]	1.367	1.204	0.057	0.867
Postpalatal	0.000	0.157	0.152	0.222	1.288	1.785[c]	1.238	1.718[c]
Cranium height	0.485	1.534	2.733[a]	1.006	1.776[c]	0.093	1.000	0.051
Tooth row	0.333	0.640	0.114	1.993[c]	0.000	0.804	0.539	0.430

[a] Significant at the 1 per cent level (p=less than 0.012).
[b] Significant at the 5 per cent level (p=less than 0.057).
[c] Significant at the 10 per cent level (p=less than 0.089).

lift of the land that occurred in the early Pleistocene, the Santa Barbara Channel Islands were connected with the mainland (Reed, 1933, p. 8), and this probably was the last time that spotted skunks could have reached the islands or that there was uninterrupted gene flow. After separation from the mainland, the islands may have been connected to one another or separated, depending upon uplift and fluctuations of the water level surrounding them. If the water level were lowered 300 feet, the islands would form a single unit, but would be separated from the mainland by more than 10 miles of water; the depth of the Santa Barbara Channel between Santa Rosa Island and the mainland is about 1500 feet (Shepard and Emery, 1941, chart 1). Moderate estimates of the extent to which the sea level was lowered during the last (Wisconsin) period of glaciation are about 300 feet, and thus it is presumed that the last possible time at which spotted skunks from Santa Rosa and those from Santa Cruz Islands could have contact with each other was during the Wisconsin glacial period.

During the glacial periods of the Pleistocene, the climate on the Channel Islands probably was cool and moist, and the Life Zone resembled the Transition, for evidence of Douglas fir forests has been found on Santa Cruz Island (Bremner, 1932, p. 33). After the last glaciation, the climate changed from humid to the present arid state. It is of interest, then, to note that in its most distinctive characters (short tail, wide interorbital breadth, and high cranium), *S. p. amphiala* resembles *S. p. latifrons* of Oregon and Washington. This close resemblance might have occurred by chance, but two other possibilities seem more likely. One is that the Channel Islands were populated by animals with the characters of *latifrons* during a cool, moist period when a *latifrons*-like subspecies occurred (or had been forced down the coast by severe climate) in the Santa Monica Mountains. When the climate became warmer, the *latifrons*-like subspecies on the mainland followed the Transition Life Zone northward to its present location, while the Channel Island animals, being isolated and having only a limited amount of genetic plasticity, retained the *latifrons* characters, or are still in the process of changing in response to the

arid climate. The second possibility is that the *latifrons* characters were evolved in response to the cool climate after the islands were separated from the mainland and that these characters have either been retained or are still in the process of modification in response to the present arid climate.

The suggestion that *S. p. amphiala* is in the process of modification, at least in length of tail, is enhanced by comparison of the coefficients of variation of the two insular populations with specimens from western Washington and western Oregon. Although the differences between the coefficients of variation are not significant statistically, the presumably inbred populations from Santa Rosa and Santa Cruz Islands have coefficients of variation of 14.46 and 13.37, respectively, in length of tail, while all the males from western Washington have a coefficient of variation of 9.40 and all males from western Oregon, 11.67. Coefficients of variation for length of tail of females from these four localities are: Santa Rosa Island, 10.50; Santa Cruz Island, 14.78; western Washington, 10.39; western Oregon, 6.66.

Spotted skunks are not known from either the westernmost of the Santa Barbara Channel Islands, San Miguel, or the easternmost, Anacapa. The small size of these two islands seems to be the most likely reason for the absence of spotted skunks. Anacapa is actually several small islands extending for about 5 miles, being less than ½ mile wide, and having a maximum elevation of 980 feet. The only mammal known from Anacapa is the ubiquitous *Peromyscus maniculatus*. San Miguel Island is about 8 miles long, averages 2 miles in width, and has a maximum elevation of 861 feet. It comprises only 14,000 acres and has two species of mammals present, *Urocyon littoralis* and *Peromyscus maniculatus*. It is noteworthy that the number of species of mammals and other terrestrial

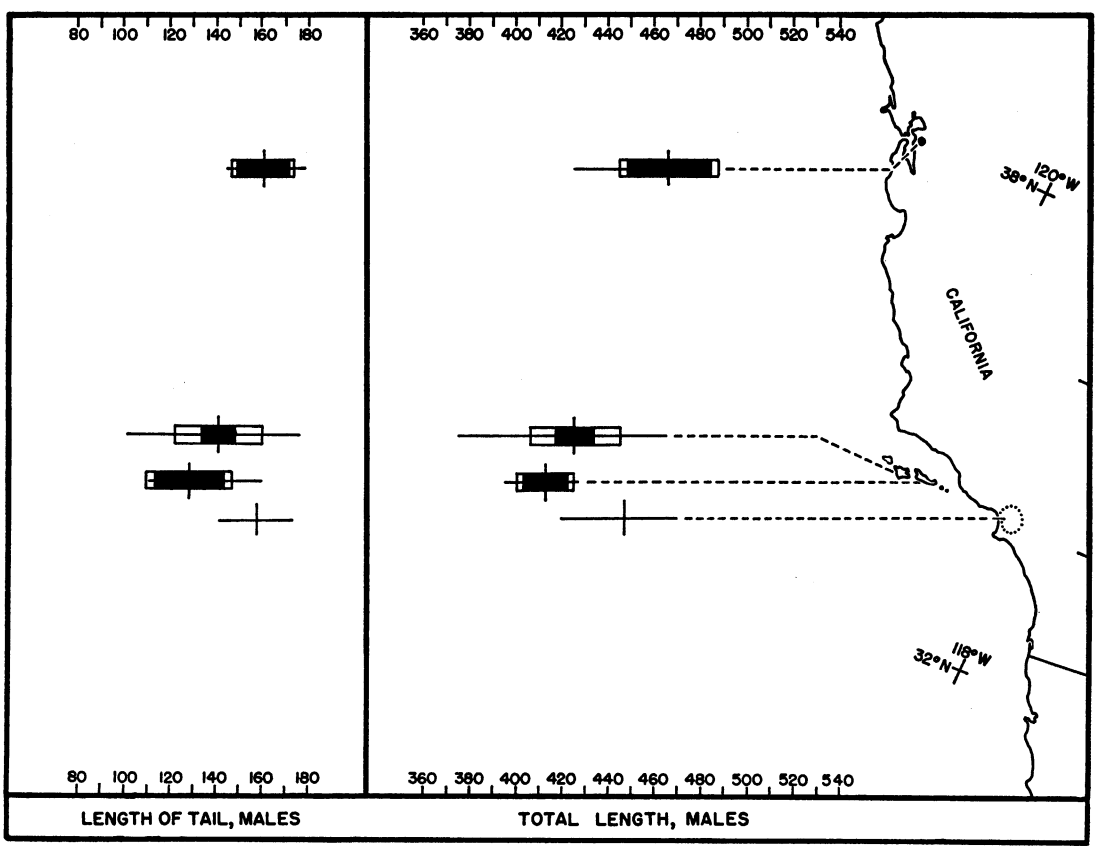

FIG. 38. Comparison of *Spilogale putorius amphiala* with *S. p. phenax*. For explanation of symbols, see figure 14.

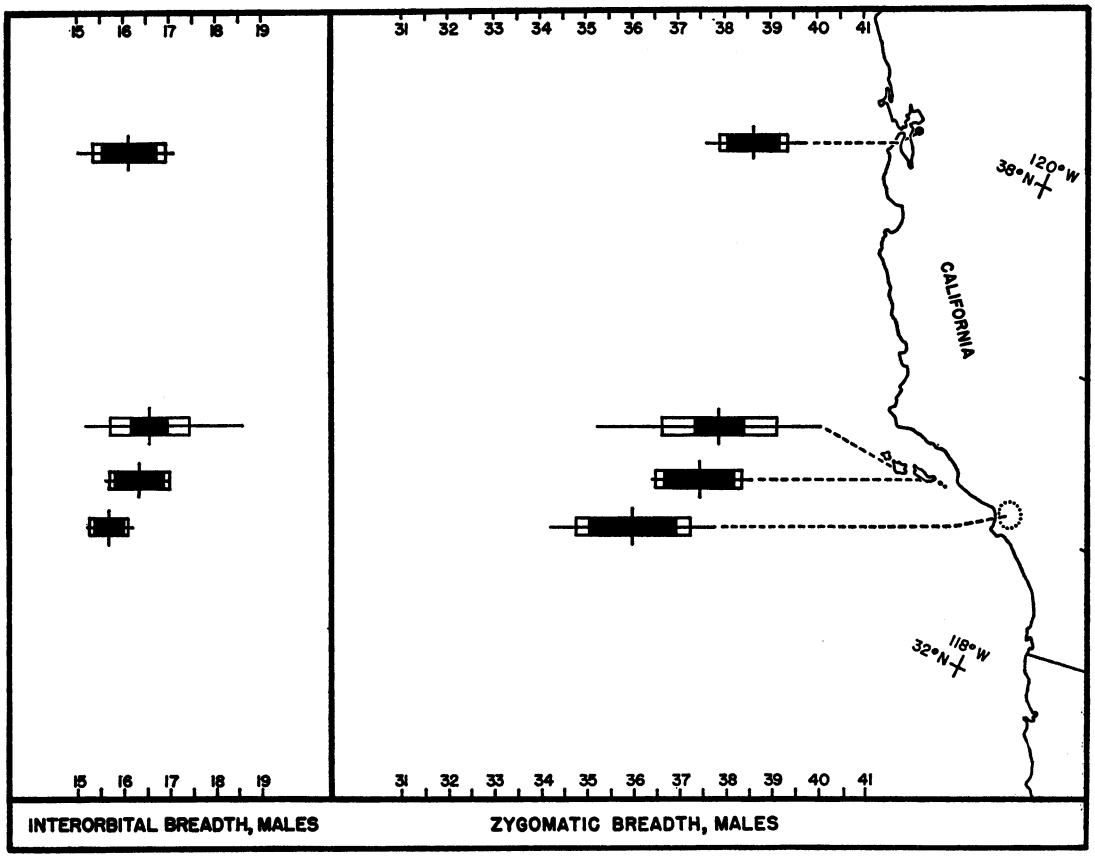

FIG. 39. Comparison of *Spilogale putorius amphiala* with *S. p. phenax*. For explanation of symbols, see figure 14.

vertebrates on each island is in the same order as the sizes of the islands: Santa Cruz Island, seven mammals (48 terrestrial vertebrates); Santa Rosa Island, three mammals (34 terrestrial vertebrates); San Miguel Island, two mammals (16 terrestrial vertebrates); and Anacapa Island, one mammal (15 terrestrial vertebrates).

The absence of spotted skunks from these two islands may be accounted for in several ways. The topography of San Miguel and Anacapa Islands is such that a raising of the water level (or a lowering of the island) about 300 feet would halve the area of San Miguel and materially reduce the size of Anacapa, while Santa Rosa and Santa Cruz Islands would be little changed. The extensive Pleistocene terraces on San Miguel seem to indicate that previously the island had a smaller area above the water than it does today. Spotted skunks could have inhabited San Miguel at the time the islands were connected with the mainland and probably also during the Wisconsin, if the islands were connected with one another at that time. Possibly the subsequent reduction in size of the island in the Pleistocene left an area too small to support a population of spotted skunks. At present San Miguel is separated from Santa Rosa by about $3\frac{1}{2}$ miles of water. Spotted skunks either have been unsuccessful in crossing this barrier or, if they have crossed, have not succeeded in establishing a colony, possibly because of the presence of foxes on the island.

Except for one adult male taken in April, all the spotted skunks examined from Santa Rosa Island were captured in November. Of these 37 specimens, 78 per cent were males. Three of the males are juveniles and three are subadults; only one male was recorded as

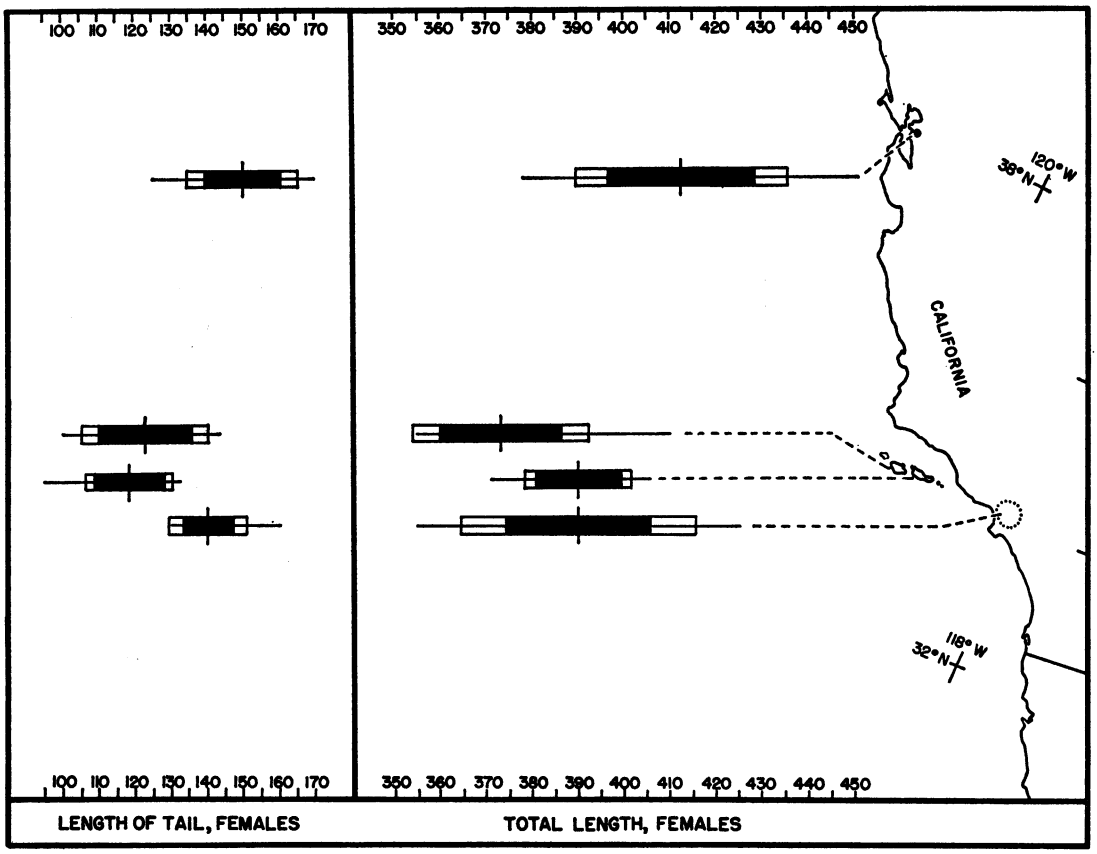

FIG. 40. Comparison of *Spilogale putorius amphiala* with *S. p. phenax*. For explanation of symbols, see figure 14.

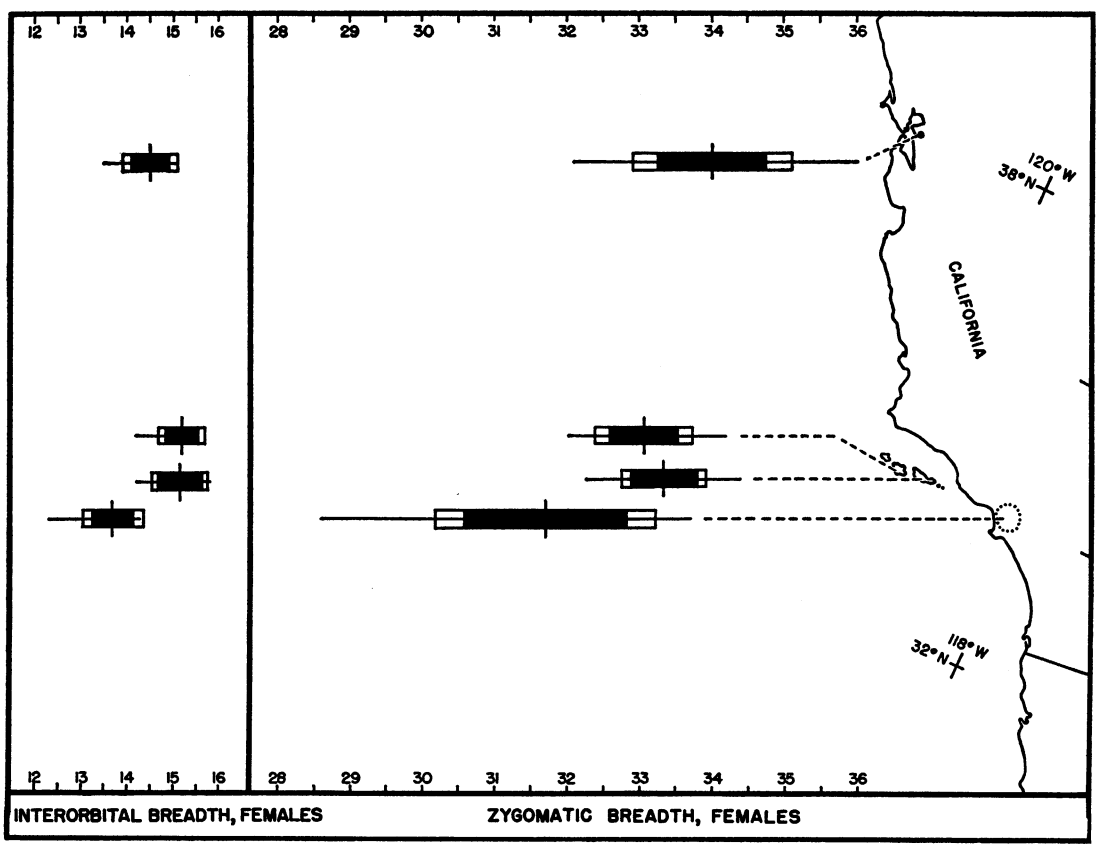

FIG. 41. Comparison of *Spilogale putorius amphiala* with *S. p. phenax*. For explanation of symbols, see figure 14.

TABLE 26

MEASUREMENTS OF *Spilogale putorius amphiala* FROM SANTA BARBARA COUNTY, CALIFORNIA

Measurement	No.	*M.* ± 2 *S.E.*	*S.D.*	Extremes
Santa Cruz Island				
Total length				
Males	6	412.50 ± 10.33	12.65	395–427
Females	6	390.00 ± 9.62	11.78	371–406
Tail				
Males	6	128.34 ± 15.15	18.56	110–160
Females	6	118.34 ± 10.14	12.42	95–133
Hind foot				
Males	6	46.00 ± 3.53	4.33	37–48
Females	6	42.83 ± 1.84	2.26	40–46
Head and body				
Males	6	285.00 ± 9.81	12.02	260–293
Females	6	270.84 ± 12.03	14.74	252–292
Basilar				
Males	6	50.17 ± 1.11	1.36	47.9–51.7
Females	6	46.00 ± 0.68	0.83	44.7–46.7
Condylobasal				
Males	6	57.00 ± 1.33	1.63	54.4–58.5
Females	6	52.83 ± 0.79	0.97	51.2–54.4
Occipitonasal				
Males	6	52.08 ± 1.29	1.58	49.2–53.3
Females	6	48.08 ± 0.78	0.95	46.7–49.1
Zygomatic				
Males	6	37.42 ± 0.78	0.95	36.4–38.6
Females	6	33.33 ± 0.48	0.59	32.5–34.4
Mastoid				
Males	6	32.25 ± 0.86	1.05	30.8–33.2
Females	6	29.50 ± 0.75	0.92	27.8–30.0
Interorbital				
Males	6	16.33 ± 0.55	0.67	15.6–17.0
Females	6	15.17 ± 0.48	0.59	14.2–15.8
Postorbital				
Males	6	16.08 ± 0.50	0.61	15.2–16.9
Females	6	15.33 ± 0.48	0.59	14.2–15.8
Palatilar				
Males	6	21.08 ± 0.67	0.82	19.8–21.9
Females	6	19.67 ± 0.48	0.59	18.7–20.3
Postpalatal				
Males	6	29.17 ± 0.70	0.86	28.2–30.8
Females	6	26.33 ± 0.31	0.38	25.7–26.7
Cranium height				
Males	6	17.58 ± 0.35	0.43	17.2–18.0
Females	6	17.17 ± 0.31	0.38	16.8–17.5
Tooth row				
Males	6	18.68 ± 0.31	0.38	18.3–19.0
Females	6	17.25 ± 0.37	0.45	16.7–17.5
Santa Rosa Island				
Total length				
Males	23	425.65 ± 8.36	20.07	375–466
Females	8	373.13 ± 13.55	19.17	355–410

TABLE 26—(*Continued*)

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Tail				
Males	23	140.33± 7.82	18.76	100–175
Females	8	123.13±12.87	18.21	100–144
Hind foot				
Males	23	46.54± 1.33	3.18	40–53
Females	8	42.88± 1.25	1.77	40–45
Head and body				
Males	23	284.24± 8.36	20.06	232–317
Females	8	253.75±15.28	21.62	222–290
Basilar				
Males	20	50.74± 0.73	1.63	46.6–53.9
Females	7	45.89± 0.94	1.25	44.5–48.2
Condylobasal				
Males	20	57.53± 0.77	1.73	53.8–60.0
Females	7	51.82± 1.00	1.32	50.2–54.3
Occipitonasal				
Males	20	51.80± 0.60	1.33	48.3–53.6
Females	7	47.68± 0.67	0.89	46.6–48.7
Zygomatic				
Males	21	37.87± 0.55	1.26	35.2–40.1
Females	8	33.06± 0.50	0.71	32.0–34.2
Mastoid				
Males	21	32.94± 0.48	1.10	31.2–34.7
Females	7	29.39± 0.38	0.50	28.7–30.2
Interorbital				
Males	20	16.53± 0.39	0.87	15.2–18.6
Females	8	15.19± 0.35	0.50	14.2–15.5
Postorbital				
Males	20	16.60± 0.34	0.76	14.9–18.0
Females	7	15.89± 0.48	0.63	14.9–16.5
Palatilar				
Males	22	21.66± 0.35	0.83	20.0–23.2
Females	8	19.81± 0.44	0.62	18.8–20.7
Postpalatal				
Males	20	29.25± 0.48	1.07	27.0–31.2
Females	7	26.11± 0.81	1.07	24.8–27.2
Cranium height				
Males	21	18.27± 0.26	0.60	17.2–19.5
Females	7	17.18± 0.26	0.35	16.9–17.7
Tooth row				
Males	22	18.59± 0.21	0.49	17.7–19.7
Females	8	17.63± 0.33	0.47	16.9–18.2

a young adult. Of the eight females, one is subadult. Six of the 13 specimens from Santa Cruz Island are females. Specimens collected in the months of July (one), August (three), September (three), January (three), and February (three) from Santa Cruz Island have been examined. One female captured in September is a young adult, and another from that month is recorded as having "five uterine scars." Two males captured on the last day of August had testes measuring 13 and 14 mm. Only one adult from each of the islands lacked lesions or other signs of injury to the frontal sinuses caused by worms; the percentage of infection was 96 per cent in adults and 100 per cent in subadults; one of the three juveniles also had frontal lesions.

SPECIMENS EXAMINED: Fifty-one, from the following localities:

CALIFORNIA: *Santa Barbara County:* Santa Rosa Island, 17 (12 D.R.D., 5 L.A.C.M.); Deckers Bay, Santa Rosa Island, 12 (L.A.C.M.); Skunk Point, Santa Rosa Island, 1 (L.A.C.M.); 1 mile southwest of ranch, Santa Rosa Island, 3 (D.R.D.); ¼ mile north of ranch house, Santa Rosa Island, 2 (D.R.D.); ¼ mile west of ranch house, Santa Rosa Island, 1 (D.R.D.); 1 mile southeast of ranch house. Santa Rosa Island, 1 (D.R.D.); 2 miles southeast of ranch house, Santa Rosa Island, 1 (D.R.D.); Santa Cruz Island, 2 (D.R.D., U.S.N.M.); Prisoner's Harbor, Santa Cruz Island, 8 (5 M.V.Z., 3 D.R.D.); Sur Ranch, 3 miles east of main ranch, Santa Cruz Island, 2 (D.R.D.); Stanton Ranch headquarters, Santa Cruz Island, 1 (M.V.Z.).

Spilogale putorius martirensis Elliot

Figures 42 and 43

Spilogale arizonae martirensis ELLIOT, May 7, 1903, Field Columbian Mus. Publ., no. 74, zool. ser., vol. 3, no. 10 (April), p. 170. Type: C.N.H.M. No. 10572; adult male; collected by Edmund Heller, September 23, 1902; original no. 1653; from Vallecitos, Sierra San Pedro Martir, Baja California, Mexico.

Spilogale microdon A. H. HOWELL, November 24, 1906, North Amer. Fauna, no. 26, p. 34. Type: U.S.N.M. No. 145887; adult male; collected by E. W. Nelson and E. A. Goldman, November 8, 1905; original no. 18501; from Comondu, Baja California, Mexico.

DISTRIBUTION: Northern and central parts of Baja California, from Comondu north at least to Alamos. Known on the west coast only from San Quintin, and only from Mulege on the east coast. Intergrades with *phenax* in extreme northern Baja California and southern California; possibly intergrades with *lucasana* in the southern portion of the Sierra de la Giganta (fig. 4). Lower Austral to Transition Life Zones; California, Vizcaino Desert, and Southern Baja California Biotic Provinces. Known from 40 to 9000 feet.

EXTERNAL MEASUREMENTS: Males, 383.0 (350–412), 145.7 (127–166), 43.6 (36–48); females, 355.8 (320–382), 140.6 (106–153), 40.0 (37–41).

CRANIAL MEASUREMENTS: Males: basilar length, 46.5 (44.4–49.8); condylobasal length, 52.9 (49.9–56.4); zygomatic breadth, 32.8 (30.8–35.7); interorbital breadth, 14.1 (12.4–16.4); height of cranium, 16.9 (14.9–18.0); length of tooth row, 17.6 (16.0–18.4); females (in same order): 42.8 (39.4–44.2), 48.6 (44.6–50.4), 30.1 (28.9–31.0), 13.3 (12.4–14.4), 15.8 (14.8–16.5), 16.3 (15.4–17.0).

WEIGHT: Males, 422.3 (371–453); females, 340.6 (334.8–346.2).

COLOR PATTERN: Nasal patch medium, slightly longer than broad. Dorsal stripes narrower than intervening black area, slightly narrower than shoulder stripes; dorsals usually not connected to first vertical stripes; dorsals interrupted at level of posterior shoulder stripes, reappearing at level of first vertical stripes as spots, or continuing much constricted, to join second vertical stripes. Shoulder stripes not broad, about same width as black shoulder stripes; pre-auricular patches large, broader than anterior end of shoulder stripe, and without branching chin stripes. Lateral stripes varying from narrow to broad, reaching upper foreleg in some. Second vertical stripes as broad distally as first verticals, reaching dorsal stripes proximally. Third vertical stripes varying from medium-sized rump patches to absent. No white on forefeet or hind feet. Tail-base patch generally U-shaped, broken medially in some. Tail averages about one-third white middorsally, white extending about halfway on edges, and tail about two-thirds white ventrally.

Spilogale putorius martirensis differs from *S. putorius phenax* to the north and *S. p. lucasana* to the south in being smaller than either of these bordering subspecies. *Spilogale p. martirensis* provides a break in a size cline that extends from the vicinity of San Francisco, California, to central Baja California. Specimens of *martirensis* from San Ignacio are the smallest in this cline; specimens from both north and south of San Ignacio are larger.

Comparison of seven males from San Ignacio with 10 males from Comondu, type locality of *Spilogale microdon*, reveals that in none of the characters studied is there sufficient difference to warrant the subspecific separation of *microdon* from *martirensis*. The specimens from Comondu average from 4.4 per cent (length of tooth row) to 1.7 per cent (interorbital breadth) larger in both external and cranial measurements than the sample from San Ignacio. In the means of basilar,

condylobasal, occipitonasal, and tooth row lengths, and zygomatic breadth, the specimens from Comondu are significantly larger, but the amount of overlap between these two populations is greater than 25 per cent in all measurements except that of the tooth row, in which it is 19 per cent, but still below the 84 per cent level of subspecific recognition. Table 27 shows the T values for the comparison of these two populations, and it should be noted that none of these differences is greater than those found between other adjacent populations of spotted skunks, such as between the two insular populations of *S. p. amphiala*.

Hall and Kelson (1952, p. 334) stated "that there is an increase in size of animal and its skull within the range of *S. p. martirensis*

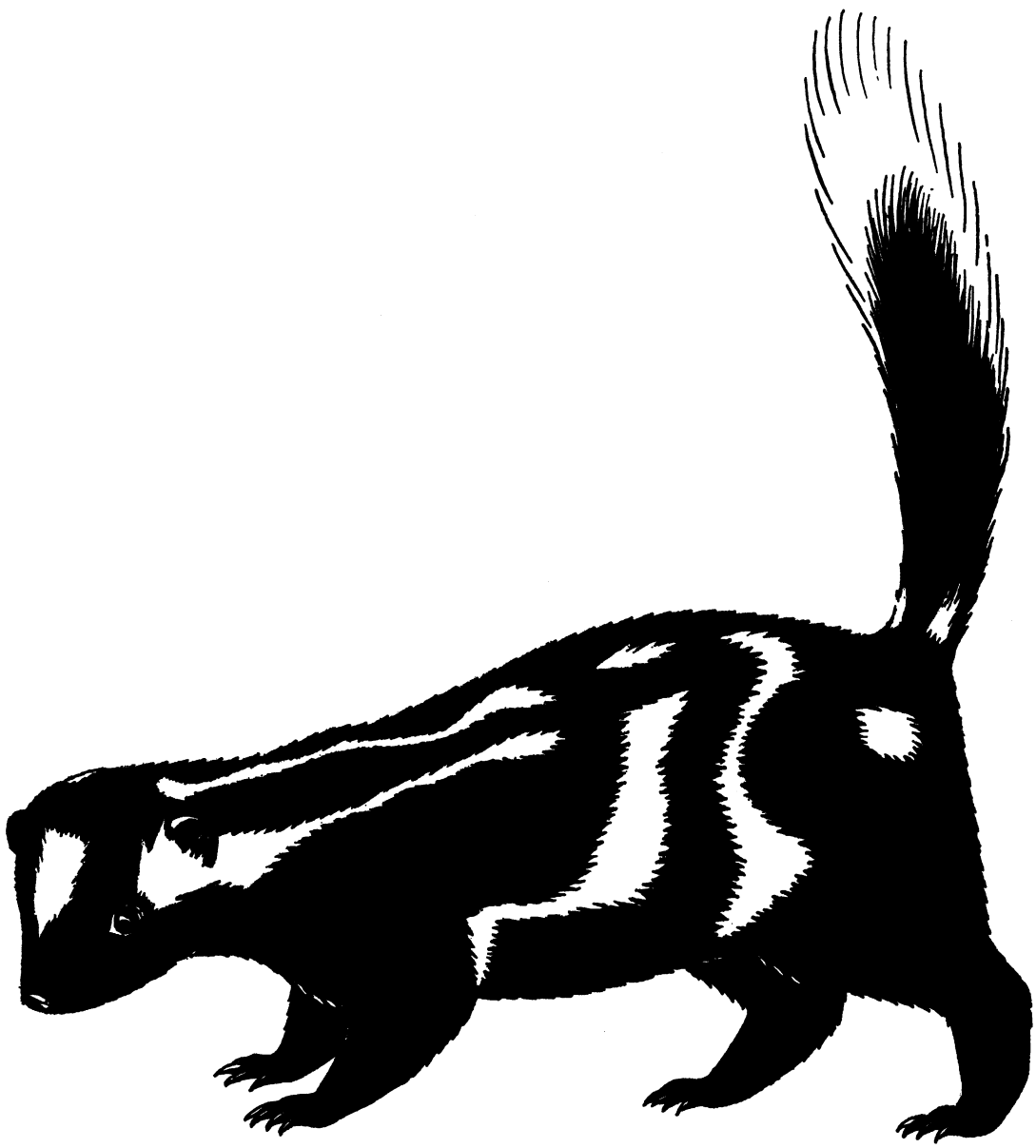

FIG. 42. Color pattern of *Spilogale putorius martirensis*. Drawn from a subadult-young adult male, C.N.H.M. No. 10573, from Vallecitos, Baja California, Mexico. Not to scale.

TABLE 27

DIFFERNCES BETWEEN MALES OF *Spilogale putorius martirensis* FROM COMONDU, BAJA CALIFORNIA, AND THOSE FROM SAN IGNACIO, BAJA CALIFORNIA

	T Values
Total length	1.397
Tail	1.047
Hind foot	0.936
Head and body	0.691
Basilar	2.269[a]
Condylobasal	2.481[a]
Occipitonasal	2.500[a]
Zygomatic	1.747[b]
Mastoidal	1.548
Interorbital	0.698
Postorbital	0.984
Palatilar	1.646
Postpalatal	1.604
Cranium height	1.000
Tooth row	3.551[c]

[a] Significant at the 5 per cent level (p=less than 0.057).

[b] Significant at the 10 per cent level (p=less than 0.089).

[c] Significant at the 1 per cent level (p=less than 0.019).

southward to Cape St. Lucas." Actually, within the range of *martirensis* there is a decrease in size of animal and its skull southward to San Ignacio, and only to the south of San Ignacio does the increase in size begin. A specimen from Mulege is the only spotted skunk collected from between San Ignacio and Comondu, and this specimen is intermediate in size between the two populations. Because of the slight differences in size between specimens from Comondu and those from San Ignacio and the lack of separability at the 84 per cent level, *Spilogale microdon* is here regarded as synonymous with *martirensis*.

That specimens from Comondu are intermediate in size between those from San Ignacio and those from Cape San Lucas (Hall and Kelson, 1952, p. 334) is evident, but they do not seem to be intermediate in the taxonomic sense, for they are but slightly different from San Ignacio animals (averaging 3 per cent larger in both external and cranial measurements), but markedly smaller than specimens of *lucasana* (20 per cent smaller in external measurements and 15 per cent smaller in cranial measurements). Until additional material from the region between Comondu and La Paz is available, the specimens from Comondu must be regarded merely as tending towards *lucasana*, not as intergrades between *martirensis* and *lucasana*.

North of San Ignacio the animals are larger in external and cranial measurements, and this gradual increase in size continues northward as far as the vicinity of San Francisco Bay, California, before there is a decrease in any measurement. Two subspecies have been recognized along the northern segment of this cline, *phenax* from Nicasio, Marin County, California, and *microrhina* from

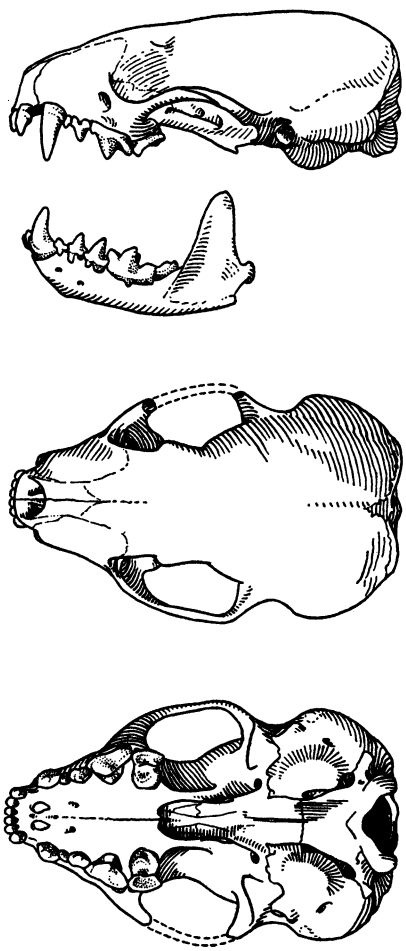

FIG. 43. Lateral, dorsal, and ventral views of the skull of *Spilogale putorius martirensis*, subadult-young adult male, C.N.H.M. No. 10573, from Vallecitos, Baja California, Mexico. ×1.

TABLE 28

MEASUREMENTS OF *Spilogale putorius martirensis* FROM BAJA CALIFORNIA

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Comondu				
Total length				
Males	10	389.00±13.80	21.80	357–412
Females	4	364.70		332–382
Tail				
Males	10	149.00± 8.13	12.84	127–166
Females	4	149.20		142–153
Hind foot				
Males	10	44.10± 2.26	3.57	36–48
Females	4	40.75		40–41
Head and body				
Males	10	240.50± 7.51	11.87	220–260
Females	4	215.50		190–230
Basilar				
Males	10	47.20± 1.11	1.75	44.4–49.8
Females	4	43.65		42.8–44.2
Condylobasal				
Males	10	53.55± 1.30	2.06	50.8–56.4
Females	4	49.60		48.5–50.4
Occipitonasal				
Males	10	50.30± 1.07	1.69	48.5–52.8
Females	4	47.03		46.0–48.0
Zygomatic				
Males	10	33.35± 0.68	1.08	31.6–35.7
Females	4	30.43		29.9–31.0
Mastoid				
Males	10	31.30± 1.03	1.63	28.5–33.4
Females	4	29.03		28.4–30.4
Interorbital				
Males	10	14.35± 0.50	0.79	13.5–16.4
Females	4	13.50		12.5–14.4
Postorbital				
Males	10	14.70± 0.59	0.93	13.3–16.1
Females	4	13.45		13.9–14.4
Palatilar				
Males	10	18.85± 0.55	0.87	17.8–19.9
Females	4	17.38		16.9–17.7
Postpalatal				
Males	10	28.35± 0.73	1.15	26.7–30.0
Females	4	26.10		25.4–26.6
Cranium height				
Males	10	17.20± 0.46	0.72	16.0–18.0
Females	4	15.58		14.8–16.0
Tooth row				
Males	10	17.30± 0.37	0.59	16.5–18.4
Females	4	16.65		16.0–17.0
San Ignacio				
Total length				
Males	7	377.50± 8.98	11.90	350–385
Female	1	320		
Tail				
Males	7	142.50± 6.54	8.66	133–151
Female	1	106		

TABLE 28—(*Continued*)

Measurement	No.	*M.*±2 *S.E.*	*S.D.*	Extremes
Hind foot				
Males	7	42.93± 1.06	1.41	40–44
Female	1	37		
Head and body				
Males	7	235.40±12.70	16.96	202–245
Female	1	214		
Basilar				
Males	7	45.68± 0.76	1.02	44.4–47.4
Female	1	39.4		
Condylobasal				
Males	7	51.61± 0.86	1.15	49.9–53.3
Female	1	44.6		
Occipitonasal				
Males	7	48.75± 0.63	0.84	47.3–49.7
Female	1	41.8		
Zygomatic				
Males	6	32.33± 0.95	1.16	31.0–35.1
Female	1	28.9		
Mastoid				
Males	7	30.32± 0.73	0.98	29.4–32.2
Female	1	27.8		
Interorbital				
Males	7	14.11± 0.47	0.63	13.1–14.6
Female	1	12.4		
Postorbital				
Males	7	14.32± 0.50	0.67	13.0–15.4
Female	—	—		
Palatilar				
Males	6	18.33± 0.31	0.38	17.7–18.8
Female	1	15.9		
Postpalatal				
Males	7	27.46± 0.84	1.12	26.4–29.2
Female	1	23.6		
Cranium height				
Males	7	16.89± 0.42	0.56	15.8–17.3
Female	1	16.5		
Tooth row				
Males	7	16.54± 0.21	0.28	16.0–16.9
Female	1	15.4		

Julian, San Diego County, California, but in this study only *phenax* is recognized (see account of *phenax*). Intergradation of *martirensis* with *phenax* commences in northern Baja California. Specimens from lower altitudes resemble the southern subspecies, *martirensis*, while those from higher elevations have characters more like those of the northern *phenax*. The type specimen of *martirensis*, from Vallecitos at an elevation of 9000 feet, while resembling the population of animals from San Ignacio most closely, shows some tendency towards *phenax* in the great postpalatal length and high cranium, as well as in having a greater zygomatic breadth and total length. Two specimens from Laguna Hansen in Baja California, north of Vallecitos and at an elevation of 5400 feet, resemble *phenax* in external and cranial measurements, but in the proportions of the skull and in the proportion of the length of tail to length of head and body, resemble the population of *martirensis* from San Ignacio and are regarded as intergrades between the two subspecies. Speci-

mens from south of latitude 31° 30′ N. in Baja California are assigned to *martirensis*, while those from north of this latitude and south of Los Angeles are regarded as intergrades with *phenax*.

In color pattern *martirensis* is, in general, darker than *lucasana* and whiter than *phenax*. Animals from the higher elevations, such as the type and a topotype, seem to be darker than those from the lower, desert regions. Specimens from Comondu differ to a slight degree from those from San Ignacio in having wider stripes, particularly the laterals, and thus again show some tendency towards the much whiter *lucasana*.

The differences between the population from San Ignacio and that from Comondu are somewhat greater than usual for animals considered to be con-subspecific. However, it is probable that these two populations were isolated from each other for some periods during the Pleistocene in the same way that *lucasana* was isolated from *martirensis*, which would account for the differences. I do not believe that the two populations of *martirensis* were isolated from each other for so long a time as *lucasana* was isolated.

No specimens collected in the months of January, May, June, or August have been examined. All the specimens collected in April (11), July (two), and December (one) are adult. The age composition of specimens from the other months is: February, one young adult; March, one young adult, two adults; September, one subadult, one adult; October, one juvenile-subadult, two subadults, one subadult-young adult, one young adult, two adults; November, one subadult, one young adult, and two adults. This distribution of age groups, particularly for the month of October, suggests that this subspecies has an extended breeding season or that more than one litter per year is born. The young adults taken in February and March probably were born in November and December, while the juvenile-subadult from October probably was born in August. The absence of any specimens younger than adult in the sample of 11 specimens from April suggests that young are not born in January and February. Lesions or other signs of parasitic infection of the frontal sinuses are present in 88 per cent of the adults and young adults and in one of the four subadults. Seventy-seven per cent of the specimens examined are males.

SPECIMENS EXAMINED: Thirty-two, from the following localities:

MEXICO: *Baja California:* Ten miles southeast of Alamos, 1 (S.D.S.N.H.); Comondu, 700 and 1000 ft., 16 (11 M.V.Z., 5 U.S.N.M.); Mulege, 40 ft., 1 (U.S.N.M.); San Ignacio, 10 (4 U.S.N.M., 4 S.D.S.N.H., 2 M.V.Z.); San Pablo, 1000 ft., 1 (U.S.N.M.); San Quintin, 1 (M.C.Z.); Vallecitos, 2 (C.N.H.M.).

Spilogale putorius lucasana Merriam

Figures 44 and 45

Spilogale lucasana MERRIAM, October 8, 1890, North Amer. Fauna, no. 4, p. 11. Type: U.S.N.M. No. 3970/4219; adult, probably male; collected by John Xantus, prior to October, 1860; original no. 603/610; from Cape San Lucas, Baja California, Mexico.

DISTRIBUTION: Southern part of Baja California, north to Santo Domingo on the west coast and to La Paz on the east coast (fig. 4). Arid Tropical to Upper Austral Life Zones; Southern Baja California Biotic Province. Known from sea level to 6130 feet.

EXTERNAL MEASUREMENTS: Males: 488.8 (425–530), 188.8 (146–210), 54.9 (48–59); females: 420.8 (370–470), 147.8 (133–160), 46.5 (45–48).

CRANIAL MEASUREMENTS: Males: basilar length, 55.3 (51.3–58.0); condylobasal length, 62.5 (57.8–65.7); zygomatic breadth, 41.0 (38.8–42.8); interorbital breadth, 17.5 (16.4–18.4); height of cranium, 18.0 (17.7–19.8); length of tooth row, 20.0 (18.9–20.5); females (in same order): 49.6 (45.7–53.3), 56.2 (53.0–60.2), 34.8 (33.1–38.1), 14.6 (13.6–15.3), 17.6 (16.7–18.6), 18.4 (17.4–19.3).

WEIGHT: Males, 868.3 (678.6–997.2); females, 467.7 (358.0–481.0).

COLOR PATTERN: Nasal patch medium, longer than broad. Dorsal stripes generally broader than intervening dorsal black stripe, and wider posteriorly than anteriorly; dorsals connected to first verticals in about three-fourths of specimens; dorsal stripes interrupted at level of anterior part of first vertical stripes and continuing posteriorly from level of posterior part of first verticals, generally constricted before joining second vertical stripes. Shoulder stripes as broad as broadest

part of dorsals; pre-auricular patches generally as wide as or wider than anterior part of shoulder stripes; narrow chin stripes present in some. Lateral stripes broad, always as broad as and usually broader than first vertical stripes, and long, always reaching to top of foreleg and to elbow in some; a few specimens showing a ventral branch off laterals. First vertical stripes generally broad and usually connected to dorsals. Second vertical stripes variable, wider or narrower than first verticals, and connected to dorsals. Third vertical stripes varying from medium-sized rump patches to stripes extending onto hind legs, but never distal to knees. No white on forefeet or hind feet. Tail-base patch well developed, usually U-shaped. Tail about one-fifth white middorsally, extending halfway

FIG. 44. Color pattern of *Spilogale putorius lucasana*. Drawn from an adult male, A.M.N.H. No. 32309, from Miraflores, Baja California, Mexico. Not to scale.

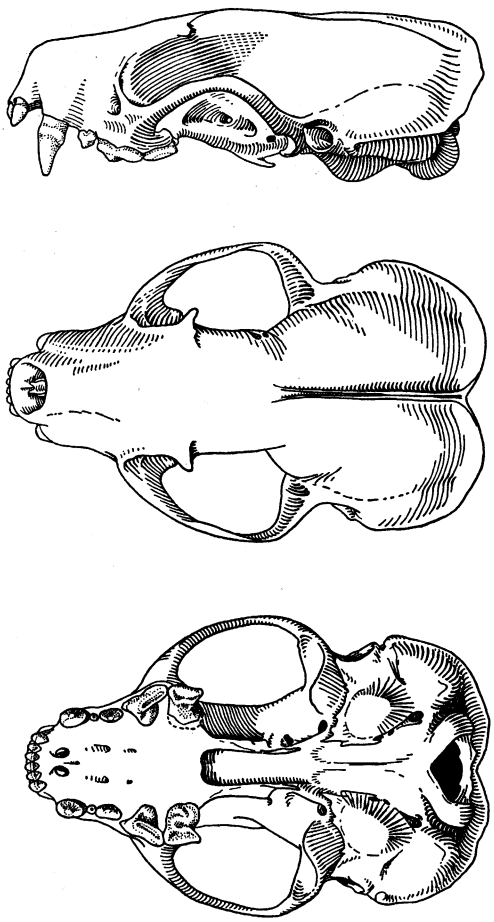

FIG. 45. Lateral, dorsal, and ventral views of the cranium of *Spilogale putorius lucasana*, adult male, A.M.N.H. No. 32309, from Miraflores, Baja California, Mexico. ×1.

on edges, and about three-fifths white ventrally.

Spilogale putorius lucasana needs comparison only with *S. p. martirensis* to the north. From *martirensis*, *lucasana* differs in being larger in both external and cranial measurements and in having broader white stripes. Although the ranges of these two subspecies are within 40 miles of each other (Santo Domingo and Comondu), there are no clear-cut signs of intergradation. Only in palatilar length is there any appreciable (more than 25%) overlap in measurements of these two subspecies, and in most measurements there is less than 4 per cent theoretical overlap and no actual overlap (see figs. 31, 32, and 33).

Spilogale putorius lucasana diverges markedly from the cline that extends from northern California to central Baja California. Animals decrease in size from north to south in the cline, the smallest being from San Ignacio, Baja California. The only population of *S. p. martirensis* from south of San Ignacio is from Comondu (named *microdon* by Howell, but regarded as synonymous with *martirensis* in this study), and these specimens show some approach to *lucasana* in being from 2 to 5 per cent larger than those from San Ignacio. Males of *lucasana* average 20 per cent larger than those from Comondu in external measurements and 14 per cent larger in cranial measurements.

In ratios of the external measurements, *S. p. lucasana* does not differ significantly from *martirensis*. In some cranial ratios there are significant differences in the means, but the amount of overlap in these is great, and in proportions of the external measurements, the two subspecies are not distinguishable at the 84 per cent level. The skulls of *lucasana*, compared with those from Comondu, show the greatest increase in zygomatic breadth, mastoid breadth, interorbital breadth, and palatilar length. The least increase in size of skull is in postorbital breadth and in height of the cranium.

Despite the marked distinction of *lucasana* and the absence of clear-cut signs of intergradation, *lucasana* is regarded as a subspecies, rather than a species, for the following reasons: no material is available from the southern part of the Sierra de la Giganta where intergradation may occur; the increase in size from San Ignacio to Comondu suggests that animals from between La Paz and Comondu may show intermediate characters; the large size of males of *lucasana* is disproportionate when compared with the size of females, which suggests that large size is emphasized in the males, thus increasing the apparent differences between the two subspecies (table 29).

The great difference in size between *lucasana* and *martirensis* may have resulted in several ways. The Cape San Lucas region of Baja California differs from the more northern parts of the peninsula in being less arid and in having denser vegetation. In 1957 I traveled by ship along both coasts of Baja

California, and, as seen from the sea, the cape region appeared quite different, structurally and vegetationally, from the peninsula north of La Paz. The more abundant vegetation and the absence of competition from other skunks (*Mephitis* is found in the northern part of the range of *martirensis* and may occur farther south) could have permitted *lucasana* to attain a greater size. Furthermore, the cape region of Baja California was most probably isolated from the northern part during periods of the Pleistocene. West of La Paz is the narrowest part of the peninsula, approximately 20 miles wide. In addition to being narrow, this area is composed of low desert, the highest elevation being less than 600 feet. At present this low desert does not seem to be a barrier to the northward dispersal of *lucasana*, as evinced by the specimen from Santo Domingo. During the Pleistocene, however, it is postulated (Beal, 1948, p. 119) that the sea level in this region rose as much as 1600 feet, which would isolate the cape region from the remainder of the peninsula. Beal cites three stages in the Quaternary of the peninsula, starting with post-Pliocene emergence during which spotted skunks could have populated the peninsula if they were not already there. The emergence was then followed by submergence. Although Beal's suggestion of a 1600-foot rise in sea level may be extreme, the generally accepted figure of 300 feet for a rise in Pleistocene sea level would also have isolated the spotted skunks of the cape. The submergence was then followed by emergence and uplift, which may be continuing at present.

Isolation combined with a slightly more suitable habitat, or either one, could account for the large size of *lucasana*. The emergence of the lowland west of La Paz would permit the northward movement of spotted skunks from the cape, which seems to have occurred. Likewise, *martirensis*, which was restricted to the higher portions of the Sierra San Pedro Martir and Sierra de la Giganta, could move southward. The greater size of the specimens from Comondu, as compared with those from San Ignacio, may indicate that this secondary intergradation is already taking place. Specimens from eastern Baja California between La Paz and Comondu would help to prove or disprove this.

TABLE 29

PER-CENT DIFFERENCE BETWEEN MALES AND FEMALES OF *Spilogale putorius lucasana* AND *Spilogale putorius martirensis*

Measurement	Females, *martirensis* / Females, *lucasana*	Males, *martirensis* / Males, *lucasana*
Total length	84.6	78.4
Tail	95.1	77.2
Hind foot	86.0	79.4
Head and body	78.8	80.2
Basilar	86.3	84.1
Condylobasal	86.5	84.7
Occipitonasal	88.5	86.4
Zygomatic	86.2	80.1
Mastoid	89.2	82.9
Interorbital	91.1	80.5
Postorbital	90.6	91.2
Palatilar	82.2	82.1
Postpalatal	88.0	85.2
Cranium height	89.8	89.2
Tooth row	89.1	87.9
Weight	72.8	48.6

Females of *S. p. lucasana* are from 94 per cent (postorbital breadth) to 78 per cent (length of tail) as large as males. In the four external measurements, females average 85 per cent as large as males, and in 11 measurements of the skull, 89.6 per cent. For all 15 measurements, females of *lucasana* average 88 per cent as large as males. In weight, females are 54 per cent as heavy as males.

Specimens collected in all months except February, July, and September have been examined. One of five animals captured in October is a subadult. One of four specimens taken in November and one of three taken in January are young adults. Lesions or other signs of infection of the frontal sinuses by parasites are present in 81 per cent of the adults and young adults, and in the one subadult examined. Fifty-nine per cent of the specimens examined are males.

SPECIMENS EXAMINED: Twenty-five, from the following localities:

MEXICO: *Baja California:* Agua Caliente, 1 (M.V.Z.); Cape San Lucas, 8 (6 U.S.N.M., 1 A.M.N.H., 1 D.R.D.); Eureka, 1 (M.V.Z.); 2 miles southwest of La Paz, 3 (M.V.Z.); Miraflores,

TABLE 30

MEASUREMENTS OF *Spilogale putorius lucasana* FROM THE CAPE SAN LUCAS REGION, BAJA CALIFORNIA

Measurement	No.	*M.* ±2 *S.E.*	*S.D.*	Extremes
Total length				
Males	8	488.75±31.83	45.04	425–530
Females	5	420.8		370–470
Tail				
Males	8	188.75±15.05	21.29	146–210
Females	5	147.8		133–160
Hind foot				
Males	8	54.93± 2.65	3.51	48–59
Females	4	46.5		45–48
Head and body				
Males	8	296.25±24.43	34.57	245–334
Females	5	273.0		220–337
Basilar				
Males	13	55.32± 1.23	2.22	51.3–58.0
Females	9	49.58± 1.66	2.49	45.7–53.3
Condylobasal				
Males	13	62.48± 1.34	2.41	57.8–65.7
Females	9	56.19± 1.59	2.38	53.0–60.2
Occipitonasal				
Males	13	57.25± 1.25	2.25	53.8–60.7
Females	9	52.03± 1.19	1.79	49.9–55.4
Zygomatic				
Males	12	41.00± 0.73	1.27	38.8–42.8
Females	9	34.75± 1.07	1.61	33.1–38.1
Mastoid				
Males	13	37.17± 0.60	1.08	35.4–38.7
Females	9	32.25± 0.93	1.40	30.7–35.0
Interorbital				
Males	12	17.46± 0.43	0.74	16.4–18.4
Females	9	14.64± 0.41	0.61	13.6–15.3
Postorbital				
Males	12	15.79± 0.48	0.83	14.7–17.9
Females	9	14.86± 0.45	0.67	13.8–15.8
Palatilar				
Males	13	22.75± 0.60	1.09	20.2–24.1
Females	9	20.75± 0.65	0.97	18.9–21.8
Postpalatal				
Males	12	32.74± 0.77	1.34	30.6–35.4
Females	9	29.14± 1.34	2.01	25.7–32.2
Cranium height				
Males	13	18.90± 0.39	0.70	17.7–19.8
Females	8	17.56± 0.50	0.71	16.7–18.6
Tooth row				
Males	13	19.98± 0.35	0.64	18.9–20.5
Females	9	18.42± 0.44	0.66	17.4–19.3

6130 ft., 3 (A.M.N.H.); Santa Anita, 3 (U.S.N.M.); Santo Domingo, latitude 25° 30′ N., 1 (S.D.S.N.H.); Todos Santos, 4 (M.V.Z.); near Todos Santos, 1 (M.V.Z.).

Spilogale pygmaea Thomas

Figures 46 and 47

Spilogale pygmaea THOMAS, April 1, 1898, Proc. Zool. Soc. London, 1897, pt. 4, p. 898. Type: B.M. No. 98.3.2.24; adult female (according to Thomas, but labeled as male by collector); collected by P. O. Simons, April 2, 1897; from Rosario, Sinaloa, Mexico.

Spilogale pygmaea australis HALL, May, 1938, Ann. Mag. Nat. Hist., ser. 11, vol. 1, p. 514. Type: U.S.N.M. No. 70581, subadult-young adult male; collected by E. W. Nelson and E. A. Goldman, January 25, 1895; original no. 7420; from Acapulco, Guerrero, Mexico.

Spilogale pygmaea albipes GOODWIN, March 8, 1956, Amer. Mus. Novitates, no. 1757, p. 13. Type: A.M.N.H. No. 143378; young adult male; collected by Thomas MacDougall, February 2, 1944; original no. 87; from Las Cuevas, east side of Rio Tehuantepec, 17 kilometers northwest of the city of Tehuantepec, Oaxaca, Mexico.

DISTRIBUTION: Pacific coast of Mexico from Rosario, Sinaloa, to the Isthmus of Tehuantepec (fig. 4). Lower Tropical (Arid Lower Tropical Subzone) Life Zone; Sinaloa, Nayarit-Guerrero, and Tehuantepec Biotic Provinces. Known from sea level to 300 feet.

EXTERNAL MEASUREMENTS: Males, 259.5 (248–271), 76.5 (69–84), 34 (33–35); female (*fide* Thomas, 1897, p. 898), 250, 68, 34.

CRANIAL MEASUREMENTS: Males: basilar length, 36.9 (35.9–37.8); condylobasal length, 42.3 (41.3–43.2); zygomatic breadth, 24.8 (24.6–25.0); interorbital breadth, 11.7 (11.6–11.7); height of cranium, 14.4 (13.9–14.9); length of tooth row, 14.2 (14.1–14.2); ? female (in same order): 36.4, —, 25.4, 12.0, 15.2, — (after Hall, 1938, p. 512).

WEIGHT: Not known.

COLOR PATTERN: Nasal patch medium, broader than long, connected laterally to pre-auricular patches. Dorsal stripes medium to broad, generally broader than black dorsal stripe, narrower than lateral stripes; dorsals constricted at level of scapulae; dorsals not interrupted at level of posterior shoulder stripes, continuing uninterrupted to tail or interrupted at third vertical stripes; dorsals connected to first vertical stripes around posterior end of shoulder stripes, generally connected about one-third of length of shoulder stripe anterior to end of shoulder stripe; dorsals connected without interruption to second verticals and usually to third verticals. Shoulder stripes narrow to broad, usually broader than dorsals, always narrower than laterals; pre-auricular patch medium to small, connected anteriorly to nasal patch; chin stripes present. Lateral stripes broad, usually the broadest stripes; laterals extending onto forelegs to toes; laterals broader than first vertical stripes. First vertical stripes medium, connected to dorsals anteriorly; first verticals narrower than laterals, slightly narrower than second verticals. Second vertical stripes medium, broader than first verticals, connected proximally to dorsals, and, in some, connected distally and anteriorly to laterals. Third vertical stripes usually connected to dorsals at tail-base patch; third verticals extending onto hind legs to toes as medium to broad stripe. Forefeet and hind feet wholly white dorsally. Tail-base patch well developed laterally, indistinct, with mixed black and white hairs medially. Tail variable from one-quarter to four-fifths white middorsally, usually with mixed black and white hairs in middle. Tail about five-sixths white ventrally.

Spilogale pygmaea is the smallest and most primitive representative of the genus *Spilogale*. It is readily distinguishable from *Spilogale putorius* by its small size and distinctive color pattern. *Spilogale pygmaea* is the only spotted skunk that has the dorsal stripes continuous to the rump (and usually to the tail), the nasal patch connected to the pre-auricular patches, and the forefeet and hind feet wholly white dorsally. The skull is small and delicate, lacking a sagittal crest, and the cranium is highly arched, the mastoid sinuses are slightly inflated, and the tooth row is short.

The closest approach to *pygmaea* in color pattern is found in *S. putorius tropicalis*, with which *pygmaea* is sympatric in part of its range. None of the specimens of *tropicalis*, however, has the uninterrupted dorsal stripes of *pygmaea*, nor does any have the dorsal surface of the feet wholly white.

In size of skull some specimens of *tropicalis* approach the small size of *pygmaea*, but the

closest approximation of cranial size is found in *S. putorius yucatanensis*. In *yucatanensis* the length of skull is but slightly more than in *pygmaea*, but the great spread of the mastoids in *yucatanensis* immediately distinguishes it from *pygmaea*, and in color pattern there is little resemblance between the two.

Spilogale pygmaea is considered to be a primitive spotted skunk, less evolutionarily advanced than *putorius*. The characteristics of complete color pattern, slight inflation of the mastoids, lack of crests on the skull, high arching of the cranium, narrow interorbital and postorbital regions, and small external size and short tail are all considered to be more primitive than their alternatives. The implication that *Spilogale pygmaea* is the most primitive of the living members of the genus is supported by its close resemblance to one of the oldest known spotted skunks, *Spilogale rexroadi* Hibbard, from the upper Pliocene of Kansas. As can be seen from table 31, *pygmaea* is but slightly different from *rexroadi*.

In many respects the skull of an adult *Spilogale pygmaea* resembles that of an immature *putorius*. The high arching of the cranium, the absence of well-developed crests and orbital processes, and the lack of inflation of the mastoid sinuses all are characters of immature *putorius*. This resemblance to the skulls of immature *putorius* might also be re-

FIG. 46. Color pattern of *Spilogale pygmaea*. Drawn from a young adult male, A.M.N.H. No. 143378, from Las Cuevas, Oaxaca, Mexico. Not to scale.

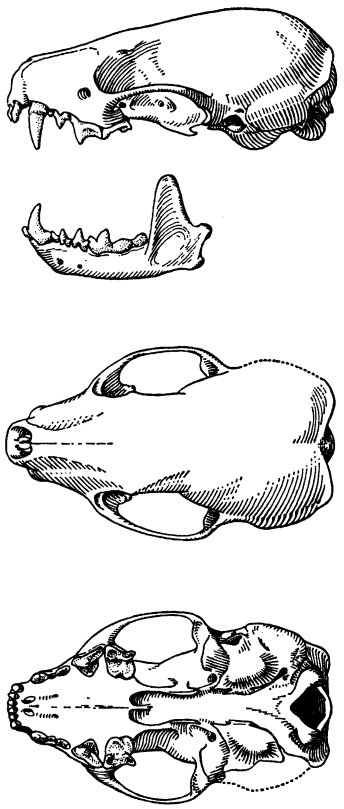

FIG. 47. Lateral, dorsal, and ventral views of the skull of *Spilogale pygmaea*, young adult male, A.M.N.H. No. 143378, from Las Cuevas, Oaxaca, Mexico. ×1.

garded as a reason for considering *pygmaea* to be the more primitive of the two species.

Spilogale pygmaea is known from four specimens which have been assigned to three subspecies. Thomas (1898, p. 898) described the species on the basis of a single specimen. He mentions that the type specimen is an adult female, but Dr. W. P. Crowcroft informs me that the specimen was labeled as a male by the collector. Thomas may have decided that the specimen was a female because of absence of crests on the cranium, or he may have had information from the collector that led him to consider the specimen a female. In the tables of measurements and in the text this specimen is listed as a female, pending additional study of the specimen in question. Howell (1906, pp. 28–29) assigned a male from Acapulco, Guerrero, to this species, and he specified that this specimen was adult. Hall (1938, p. 514) examined the specimen from Rosario and listed it as a female, probably relying on Thomas, and, without examining the Acapulco specimen, and relying on Howell's description, illustrations, and age determination, named the Guerrero specimen *australis*. The type of *australis* is a young animal; the nasal sutures are not fused, the teeth are not worn, and I would call it a subadult-young adult animal or, at the very most, a young adult. The youth of this specimen accounts, then, for the fact that it is smaller in many measurements than the type of *pygmaea*, which, although Thomas states that it is an adult female, may be an adult male.

Goodwin (1956, p. 13) obtained a third specimen of this species from the Isthmus of Tehuantepec and described it as a new subspecies, *albipes*. This specimen, which Goodwin states is a fully adult male, proves to be a young adult, with the nasal sutures fused but still evident, and the teeth not worn. Since Goodwin's description, a fourth specimen of *pygmaea* has been collected at the city of Tehuantepec, Oaxaca. This last specimen appears to be the oldest of the unquestioned males yet captured and has the teeth moderately worn.

It should be apparent from the measurements (table 32) that the differences between these four specimens are very slight and hardly of subspecific worth.

The greatest difference between the largest and smallest specimen in any cranial measurement is 7 per cent of the size of the smallest, which is the subadult-young adult male. It should be mentioned that the measurement for mastoid breadth of the Sinaloa animal as given by Goodwin and Howell is apparently the repetition of this measurement erroneously given by Thomas, which seems to be the measurement of zygomatic, rather than mastoid, breadth, for Hall's measurements indicate this.

The characters cited by Hall as distinguishing *australis* from *pygmaea* are primarily those of age or individual variation. The small size of *australis*, as above indicated, is probably due to the animal's immaturity. The shape of the interpterygoid space, another of Hall's characters, seems to be rather variable, for the two specimens from Oaxaca

TABLE 31

COMPARATIVE MEASUREMENTS OF *Spilogale rexroadi* AND *S. pygmaea*

(All measurements of *rexroadi*, and of the *pygmaea* from the United States National Museum, are after Hibbard, 1941, p. 342.)

	rexroadi			*pygmaea*		
	K.U.M.V.P. No. 4596	K.U.M.V.P. No. 4578	K.U.M.V.P. No. 4573	U.S.N.M. No. 70581 S-Y M	A.M.N.H. No. 143378 Yad M	A.M.N.H. No. 175183 Ad M
Length from anterior border of P_4 to posterior border of M_2	9.1	—	—	9.7	10.1	10.2
Anteroposterior diameter of P_4	2.6	2.7	—	2.4	2.4	2.2
Greatest transverse diameter of P_4	1.7	1.9	—	—	1.9	1.6
Anteroposterior diameter of M_1	5.2	6.0	5.7	5.3	5.3	5.3
Transverse diameter at metaconid of M_1	2.3	2.8	2.5	—	2.6	2.4
Anteroposterior diameter of trigonid of M_1	3.2	3.6	3.2	—	3.0	3.2
Width of talonid across entoconid-hypoconid of M_1	2.0	2.5	2.1	—	2.5	2.6
Anteroposterior diameter of M_2	1.9	—	—	2.0	2.3	2.2
Greatest transverse diameter of M_2	1.5	—	—	—	1.9	2.0
Depth of ramus below metaconid	4.1	—	4.2	—	3.7	3.9
Width of ramus below metaconid	2.4	3.1	2.3	—	2.4	2.3

exhibit both the parallel-sided and spoon-shaped spaces. The variation in the width of the white stripes in *pygmaea* is not well known, but in general the specimens from Oaxaca seem to have slightly more white than the specimen from Guerrero and thus would tend to resemble more closely the Sinaloa animal. I suspect that the reduction in size of white stripes mentioned by Hall as a difference between *pygmaea* and *australis* is a character of individual variation, for a slight reduction in the amount of white is seen when the type of *albipes* is compared with the specimen from the city of Tehuantepec.

Spilogale pygmaea is not known to intergrade with *S. putorius*. The pygmy species is found together with *putorius* in southern Oaxaca at the Isthmus of Tehuantepec. The subspecies whose range it overlaps is *tropicalis*, and the cranial differences and differences in color pattern between some speci-

TABLE 32

MEASUREMENTS OF *Spilogale pygmaea* FROM MEXICO

Locality	Sex	Age	Total Length	Tail	Hind Foot	Basilar	Condylobasal	Occipitonasal	Zygomatic	Mastoid	Interorbital	Postorbital	Palatilar	Postpalatal	Cranium Height	Tooth Row
SINALOA																
Rosario (after Hall, 1938, p. 512)	♀	Ad	250	68	34	36.4	—	40.7	25.4	21.7	12.0	—	14.8	21.6	15.2	—
GUERRERO																
Acapulco	♂	S-Y	240	72	33	35.4	40.4	38.8	23.9	20.8	11.9	12.1	14.2	21.3	14.2	13.8
OAXACA																
Las Cuevas	♂	Y	248	69	33	35.9	41.3	40.4	25.0	—	11.6	12.6	14.7	21.2	15.2	14.1
Tehuantepec	♂	Ad	271	84	35	37.8	43.2	41.3	24.6	22.1	11.7	12.5	15.0	22.7	14.3	14.2

mens in the zone of overlap are quite slight. As pointed out in the account of *tropicalis*, the possibility of hybridization between *pygmaea* and *putorius* in this region has not been obviated. Some specimens of *tropicalis* have the forefeet and hind feet at least half white dorsally, and the nasal patch, which is large in *tropicalis*, comes very close to the also large pre-auricular patches. Some of the smaller adult specimens of *tropicalis* are within a few millimeters of the size of *pygmaea* in some of the cranial measurements, and yet, from the material available, *pygmaea* and *tropicalis* always can be distinguished from each other. The paucity of specimens from the Pacific slopes of the Sierra Madre Occidental makes it impossible to say that intergradation between *pygmaea* and *putorius* does not occur elsewhere in Mexico, but at the Isthmus of Tehuantepec, at least, the two species are distinct.

Little is known of the life history of *pygmaea*. The Guerrero specimen was captured in the burrow of a pocket gopher, and the type of *albipes* was taken from a hollow tree on a rocky hill in the bed of the Rio Tehuantepec. The habitat at the place of capture of the other two specimens is unknown. The habits of *pygmaea* are probably not unlike those of *putorius*.

The specimen from the city of Tehuantepec differs from the other specimens of *pygmaea* in having much shorter hair on the body. The type of *albipes*, for example, has hairs about 15 to 20 mm. long, but the specimen from Tehuantepec has hairs 7 to 10 mm. in length and seemingly lacks guard hairs.

None of the specimens of *pygmaea* has lesions of the frontal sinuses caused by parasites. The subadult-young adult male was captured in January, the young adult in February, and one of the adults (which is not very old) in late March.

SPECIMENS EXAMINED: Three, from the following localities:

MEXICO: *Guerrero:* Acapulco, 1 (U.S.N.M.). *Oaxaca:* Las Cuevas, east side of Rio Tehuantepec, 17 kilometers northwest of Tehuantepec, 1 (A.M.N.H.); Tehuantepec, 1 (A.M.N.H.).

EVOLUTIONARY TRENDS

Size

In general, the largest spotted skunks are from the northernmost portions of the range. The notable exception to this generalization is *Spilogale putorius lucasana*, from the southern tip of Baja California at a latitude of approximately 24° 30′ N., specimens of which approximate the size of the northern specimens. As mentioned elsewhere (p. 376), the large size of *lucasana* is believed to have been caused by long isolation and the absence of competition. Excluding *lucasana*, the subspecies *interrupta*, *putorius*, *phenax*, *latifrons*, and *gracilis* are generally larger in external measurements than the subspecies occurring to the south of them. This is particularly true in the case of total length, length of head and body, and length of hind foot. The short tail of *latifrons* excludes it from ranking high in this measurement. The smallest spotted skunks, *S. putorius tropicalis*, *yucatanensis*, *angustifrons*, *ambarvalis*, and *S. pygmaea*, are generally southern in their range, but south of the Isthmus of Tehuantepec there is a slight increase in size, probably correlated with the cooler climate, which the subspecies *elata* and *celeris* expose themselves to by living at higher elevations in the mountains. In general size, then, spotted skunks seem to follow Bergmann's Rule, the larger animals (which have less surface area in proportion to weight) being found in the cooler climates. Spotted skunks, however, do not seem to follow Allen's Rule, which implies reduction in size of extremities in the animals in the northern part of the range. *Spilogale putorius putorius* and *S. p. interrupta*, the northern populations of which are probably exposed to the severest winter climates of any members of the genus, have the longest tails and hind feet (excluding, again, *lucasana*); proportionately, however, *Spilogale pygmaea* has the largest hind foot (about 19% of head and body), and *putorius* and *interrupta* have proportionately the smallest hind feet (approximately 15 and 16% of head and body, respectively). The tail of *pygmaea*, however, is proportionately the smallest of the genus (37% of head and body in males, 42% in females), while *interrupta* has the largest (64% in males and females).

For the most part, the change in size of spotted skunks is gradual when studied from north to south, but may be abrupt from east to west. This is correlated with the probable post-glacial dispersal of *Spilogale*, in which *latifrons*, *gracilis*, *interrupta*, and *putorius* are presumed to have moved northward independently, so that gene flow was in a north-south direction, rather than east-west. Thus the differences between *latifrons* and *gracilis*, between *gracilis* and *interrupta*, and between *interrupta* and *putorius*, each of which is a northern representative of the genus, are marked; the differences between *latifrons* and *phenax*, between *gracilis* and *leucoparia*, and between *interrupta* and "*indianola*" are slight because of much closer relationships between these north-south populations. The differences between *putorius* and *ambarvalis* are more marked, possibly because *putorius* was separated from *ambarvalis* during the Pleistocene, and intergradation between these two subspecies today may be the result of secondary contact.

If *Spilogale pygmaea* is presumed to be the more primitive of the two species, it is logical to assume that *putorius* arose from a small spotted skunk, possibly from *pygmaea* itself. The general Sonoran affinities of the genus suggest that the place of origin may have been in central Mexico. If the more advanced members of *Spilogale putorius* spread from the center of origin, and the more advanced members of the genus are larger, then the lowlands of southern Mexico seem to be the present home of the primitive members of *Spilogale putorius*. The subspecies *yucatanensis* and *tropicalis* are the smallest of the species *putorius*, and both to the north and south of these subspecies, the spotted skunks increase in size. Thus, in length of head and body, increased size is found northward as one progresses from *yucatanensis*, *tropicalis*, *angustifrons*, *leucoparia*, and *gracilis*. The average measurements of head and body of males for these subspecies are, respectively, [183], 236, 237, 261, 271, and for females, 166, 209, 220, 230, 238.

The subspecies *S. putorius lucasana*, from

the southern portion of the peninsula of Baja California, does not fit the general pattern of size evident in spotted skunks elsewhere. The climate of the range of *lucasana* is not unlike that of *pygmaea* or even that of *tropicalis*, yet *lucasana* is remarkably different in size from these other spotted skunks. As indicated under the account of *lucasana*, that subspecies is believed to have been isolated from other spotted skunks for a considerable length of time. It was isolated in a region that is relatively free from carnivores of equal size, particularly weasels. Although there are foxes, badgers, bobcats, and coyotes in the region today, it is possible that some of these were not present during the time of isolation. The region has a diverse rodent and lizard fauna, as well as having extensive vegetation, and reduced competition, predation, and a good food supply may have led to the tendency for large size in this population. In having a very large hind foot (the largest in the genus) as well as a long tail (actually and proportionately almost as long as that of *interrupta*), *lucasana* would seem to follow Allen's Rule, but in its great length of head and body (only slightly smaller than *putorius* and *interrupta*) Bergmann's Rule would not seem applicable.

On theoretical grounds, one would also expect the insular subspecies, *amphiala*, to follow the same trend towards large size as is found in *lucasana*. It is suggested above (p. 363) that *amphiala* may have been isolated on the Channel Islands of California since early Pleistocene, but this subspecies is not markedly different in size from the species on the adjacent mainland which are exposed to a similar climate. However, the Channel Islands on which spotted skunks are found comprise a much smaller area than the cape region of Baja California, and the rodent fauna is limited to *Reithrodontomys* and *Peromyscus* on Santa Cruz, and *Peromyscus* alone on Santa Rosa. In addition to *Spilogale* as a predator on these mice, there is also *Urocyon* on these islands, and these foxes are probably in direct competition with the spotted skunks for both animal and vegetable foods. In external measurements, *S. p. amphiala* has its closest resemblance to *latifrons*, and *amphiala* is believed to have become isolated from a population of *latifrons*-like animals or has responded to a cool climate in the Pleistocene in the same fashion as *latifrons* and is not yet well adapted to its present Sonoran environment (see p. 364).

Color Pattern

The general tendency in color pattern is for animals in cool and moist environments to have reduced white markings and those in warm, arid localities to have more extensive white markings. The narrowing of the dorsal stripes seems to be a general response to cool climates. Thus *latifrons*, *gracilis*, *interrupta*, and *putorius* have narrower dorsal stripes than do the populations to the south of them. Also, within each of these subspecies, the more northern animals have the dorsal stripes more reduced than the southern ones. The broadest dorsal stripes are found in spotted skunks of relatively warm climates, particularly in *leucoparia*, *lucasana*, *ambarvalis*, and *tropicalis*. The subspecies *yucatanensis*, however, which is exposed to a climate not markedly different from that of, say, *tropicalis*, is considerably darker than would be expected. In the mountains of Central America, where *celeris* and *elata* are found, and also in central Mexico, in the range of *angustifrons*, spotted skunks have somewhat reduced dorsal stripes. This also may be in response to the cooler climate, or, in the case of *angustifrons*, which is also found on black lava, a response to the substrate.

The tendency for broader white stripes in warmer areas is not restricted to the dorsal stripes alone. The lateral stripes also seem to be particularly responsive to climate, and in the northern populations of *latifrons*, *gracilis*, *interrupta*, and *putorius* the lateral stripes are variously reduced in length and/or width. This is most noticeable in *gracilis*, in which there is a gradual reduction in length of the lateral stripe northward. The broadest lateral stripes are found in *tropicalis* and *leucoparia*, and in the former these stripes occur well down onto the foreleg, even to the foot. Animals with broad lateral stripes generally have extensive rump patches (remnants of the third vertical stripes) and usually have white on the hind feet.

The size of the nasal and pre-auricular patches is generally larger in the whiter animals but does not seem to follow the general

response to climate that the other stripes do. *Spilogale putorius interrupta* and *S. p. putorius* have the smallest nasal patches and most reduced pre-auricular patches in the genus. The close relationship between these two subspecies probably accounts for the resemblance, for *gracilis* and *latifrons*, both of which are northern representatives of the genus and which, particularly in the case of *gracilis*, are exposed to severe winter cold, do not have extremely small nasal or pre-auricular patches.

Gloger's Rule, that animals from warm, humid regions are darker than those from cool, dry areas, probably is not applicable to spotted skunks. *Spilogale p. ambarvalis*, from Florida, occurs in a warm, humid area and has extensive white markings; in the Pacific Northwest, *S. p. latifrons* occurs in a cool, moist climate and is considerably darker. The main difference between the geographical range of *gracilis* and that of *leucoparia* is the cooler climate of the former, as both have comparatively low humidity, and the difference between the two subspecies is in the decreased amount of white of *gracilis*. It would seem, then, that temperature alone is more important than temperature plus humidity in determining the extent of white markings in *Spilogale*.

The extent of the white tip on the tail of *Spilogale* varies from none at all (*interrupta*) to 80 per cent (*pygmaea*); within the species *putorius* the range is almost as great, for the tail of *yucatanensis* is about one-fourth pure white at the tip, and the remainder is mixed black and white hairs. In general the amount of variation in white on the tail is greatest on the ventral surface. The subspecies of *putorius* vary about 38 per cent (0–38) in average amount of white on the dorsal surface of the tail, but vary 80 per cent (0–80) in extent of white ventrally. *Spilogale p. interrupta*, which has the least amount of white on the body, also has the least amount on the tail. Ordinarily the amount of white on the tail of this subspecies varies from none to a few white hairs at the tip, but in the southern portions of the range, near the zone of intergradation with *putorius*, the amount of white increases to as much as 20 per cent. The subspecies *putorius*, while having as much white on the dorsal surface of the tail as some other subspecies, averages about 40 per cent white ventrally, considerably less than is found in most other subspecies. In general, those subspecies that have reduced white markings on the body have relatively little white on the ventral surface of the tail, averaging about 55 per cent, while those subspecies that have extensive white markings on the body average about 75 per cent white ventrally. The greater extent of white on the ventral surface of the tail tends to outline the black dorsal hairs laterally, so that in the darker animals the black of the tail ends distally in more or less a straight line, with little white laterally, while in the whiter animals white hairs on the sides of the tail give an oval outline to the black portions of the tail.

There is a tendency in the whiter subspecies towards a grayish tinge in the dorsal stripes. This is caused by the presence of black hairs, giving a slightly gray appearance to these stripes. It is found as a rule in *Spilogale pygmaea*, and frequently in subspecies *tropicalis*, *yucatanensis*, *leucoparia*, and *ambarvalis* of *Spilogale putorius*.

The evolution of the reduction of white markings in *Spilogale* seems to follow a pattern of loss of specific portions of stripes. If the basic color pattern was similar to that diagrammed (fig. 2), the loss of those portions of stripes seems to be in the following order: a break between the dorsal connections to the third vertical stripes and the tail-base patch; loss of the distal connections between the second verticals and the laterals (both of these breaks occur in *Spilogale pygmaea*); and interruption of the dorsal stripes at the level of the posterior ends of the shoulder stripes and interruption of the connection between the nasal patch and the pre-auricular patches. These last two discontinuities occur in all *Spilogale putorius*, but not in *S. pygmaea*. The next tendency seems to be towards the interruption of the third vertical extension, to result in the production of a rump patch and a small amount of white on the hind feet, with concurrent reduction of the length of the lateral stripe, rarely leaving white on the surface of the forefeet. Past this point reduction in the connection of the white stripes seems to vary with the subspecies. There is a strong tendency for the separation of the first vertical extension from the dorsals, and also for

the isolation of a dorsal spot at the level of the first vertical stripes. The reduction of the tail-base patch takes place as a medial interruption of the U-shaped patch, and then lateral reduction. There is a tendency for constriction of the dorsal stripes at the level of the scapulae, and in *interrupta* this is the most common point of interruption of this stripe anterior to the first verticals. Except for *interrupta*, most of the subspecies of *Spilogale putorius* have more or less the same stripes present, with interruptions at somewhat the same places; the subspecific differences are largely in the length and breadth of the stripes. The shoulder stripes seem to be the most constant and least subject to change. The lateral and vertical stripes, as well as the dorsals, are highly variable. The extreme of stripe reduction is found in *S. p. interrupta*, some specimens having only a few small patches of white remaining to indicate the location of stripes. Reduction of white on the tail seems to take place ventrally more frequently than dorsally, the extreme again being found in some specimens of *interrupta* in which the tail is totally black.

Skull

The general evolutionary tendencies seen in the skulls of *Spilogale* seem to be in the directions of larger size, greater development of the sagittal and lambdoidal crests and of the postorbital processes, greater inflation of the mastoid sinuses, and increased crowding of the tooth row.

The skull of *Spilogale pygmaea* is small in size, has no sagittal crest and only a slight lambdoidal crest, has minute postorbital processes, slight inflation of the mastoid sinuses, and a relatively uncrowded tooth row. The animals with the largest skulls are found in *Spilogale putorius lucasana*, which is evolutionarily far distant from *S. pygmaea* despite the fact that the two occur in similar climate and habitat on opposite sides of the Gulf of California. *Spilogale p. lucasana* males average more than 6 per cent larger than the next largest subspecies in basilar and condylobasal length (the differences are less in females); the sagittal and lambdoidal crests are well developed (but equaled or exceeded by some other subspecies), the postorbital projections are large, the mastoid processes are greatly inflated, and the teeth are very crowded.

As is true of external size, spotted skunks from the northern parts of the range have larger skulls than do those from the southern parts, excepting, again, *lucasana*. Thus all subspecies from north of latitude 35° N. are larger than those from south of this line. The smallest-skulled subspecies of *putorius* are *yucatanensis* and *tropicalis*, and north and south of their range the spotted skunks have larger skulls. The development of cranial crests is also greater in the northern subspecies and less in the southern ones. The greatest development of crests is in the insular subspecies, *amphiala*, in which sagittal and lambdoidal crests of more than 3 mm. are not unusual.

Postorbital projections are generally better developed in the larger subspecies than in the smaller. The development of crests and of postorbital projections seems to be interrelated, perhaps coincidentally. The smaller subspecies, which have less-developed crests, also seem to have smaller postorbital processes.

Inflation of the mastoid sinuses seems to be greatest in animals from the more arid portions of the range of the genus. The greatest inflation seems to be in *S. putorius leucoparia*, the least in the insular subspecies, *amphiala*. Most subspecies of *putorius* and *pygmaea* show only moderate inflation of the mastoids. The conformation of the skull tends, in some, to obscure the inflation of the mastoids. Thus the high-crowned subspecies (*putorius*, *ambarvalis*, *interrupta*, *tropicalis*, *celeris*, and *elata*, as well as *S. pygmaea*), which usually have no crest extending onto the mastoids, tend to appear narrower across the mastoids, and the inflation of the sinuses makes the mastoids appear as discrete bullae; in the lower-crowned subspecies, which also tend to have crests edging the mastoids, the inflation is less apparent. The small size of the mastoids in *interrupta*, *amphiala*, and *phenax* suggests that in cooler climates there may be a tendency for the reduction of inflation; *elata* and *celeris* likewise have somewhat smaller mastoid sinuses. *Spilogale putorius lucasana* has moderately inflated sinuses, possibly in response to the arid climate, and it might be expected that *amphiala* would also

have at least moderate inflation of the sinuses. However, as indicated under the account of *amphiala*, that subspecies is presumed to have been exposed to cool climate or to be derived from a stock adapted to cooler temperatures, which might account for the reduced mastoid inflation in that subspecies.

The length of the maxillary tooth row is remarkably constant in relation to the condylobasal length of the skull, varying from 31 to 33 per cent in both males and female of *pygmaea* and all subspecies of *putorius*. Whatever crowding of teeth takes place does so at the expense of the first and second upper premolars. The variation within the subspecies is sufficiently great to obscure any differences between them, but a general tendency towards a reduction in size and eventual loss of the anteriormost upper premolar is evident in the genus *Spilogale*. This evolutionary trend is also found in *Mephitis*, which is presumed to be slightly more advanced in evolution than *Spilogale*, and in *Conepatus* in which the loss of the anteriormost premolar is the rule, but exceptionally this tooth is present.

The anteriormost upper premolar in *Spilogale* is the smallest tooth in the skull. Generally the posterior portion of this tooth overlaps the anterior part of the second premolar; frequently this first premolar is rotated at an angle of 45 degrees to the plane of the tooth row on one or both sides, and is not uncommonly absent in one jaw or both. Even in *S. pygmaea* this tooth is sometimes set off the plane of the tooth row, the second premolar being only 0.5 mm. from the canine.

Clines

Clines in size and color pattern are present in spotted-skunk populations in many areas. In *S. p. leucoparia* and continuing into *gracilis* there is a cline of decreasing width and length of the lateral stripes northward. In central and southern Arizona *S. p. leucoparia* has broad (broader than the first verticals) lateral stripes that extend down onto the foreleg. In northern Arizona these stripes reach the upper foreleg and are about the same in width as the first vertical stripes (intergrades between *leucoparia* and *gracilis*). In Utah the lateral stripes rarely reach the forelegs, and they are always narrower than the first verticals. North of Utah the lateral stripes become shorter and narrower, even to the point of being absent in some animals.

Within the range of *S. p. putorius* there seems to be a similar cline in the decreased width of the dorsal stripes northward, and in *interrupta* there is increased reduction of all stripes northward, so that it is not uncommon to find animals from the northern portions of the range almost totally black.

Clines in size, particularly of the skull, are evident in several parts of the range. Increased length of the skull from the range of *tropicalis* northward to that of *gracilis* seems to be somewhat clinal. The average condylobasal measurements of the subspecies in this cline are (females in parentheses): *tropicalis*, 49.6 (45.9); *angustifrons*, 51.1 (46.5); *leucoparia*, 53.9 (49.2); *gracilis*, 55.2 (49.8). A similar cline seems to be present in spotted skunks from the Pacific coast, from the range of *martirensis* to *phenax*. In this cline, there is a gradual increase in size northward from San Ignacio, Baja California, to the vicinity of San Francisco Bay, California. North of San Francisco Bay there is a cline of decreasing size (see figs. 31, 32, and 33).

Within the range of *ambarvalis* there also seems to be a cline of increasing size northward, and this cline may continue through the subspecies *putorius*. Also within the range of *ambarvalis* there is a cline of decreasing white northward, a continuation of which may exist in *putorius*.

The prevalence of clines in *Spilogale* could be in response to climate, genetic flow, or distributional history, but most likely to combinations of these three factors. The general north-south distribution of these clines suggests climate, but also, as indicated above, the distribution of spotted skunks most likely took place in north-south directions also. The genetic flow, then, would tend to be in these directions. Climate is an important factor in these clines, for the same external characters of *Spilogale*, which seem to respond more rapidly to climate than do cranial characters, do not always follow the clines of the latter. For example, in the cranial cline cited above from *tropicalis* to *gracilis*, the average tail measurements for these subspecies are (females in parentheses): *tropicalis*, 123 (119);

angustifrons, 101 (105); *leucoparia*, 143 (131); *gracilis*, 145 (137). Thus *angustifrons*, which occurs at higher elevations in the Valley of Mexico and Transverse Biotic Province, a cool climate, has a shorter tail than the subspecies to the north and to the south of it. Nevertheless, the average measurements of length of head and body for these four subspecies show a clinal increase northward. The influence of gene flow is exemplified in the San Francisco Bay area, California, where specimens of *phenax* from the coastal side of the mountains, on the north side of the Bay, show a strong resemblance to *latifrons* from Oregon and Washington. On the eastern side of the mountains the resemblance is towards the southern population of *phenax*, and it seems likely that *latifrons* characters transmitted are trapped in the peninsula on the north side of San Francisco Bay and cannot readily be dispersed to other populations of *phenax* (see p. 342).

SUMMARY

THE SPOTTED SKUNKS (genus *Spilogale*), which were last revised by Arthur H. Howell in 1906, are restudied on the basis of 1974 museum specimens. Analyses of the distribution, the age, sex, color pattern, and individual variation, the probable prehistory, and the evolutionary trends of spotted skunks are presented. The taxa of the genus are arranged in two species: *Spilogale putorius*, a large-sized, polytypic species of wide distribution with 15 subspecies, and *Spilogale pygmaea*, a monotypic species, small-sized, with a restricted range. The differences between the two species and between the subspecies of *Spilogale putorius* are mainly those of size and color pattern.

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