DEPARTMENT OF THE INTERIOR.
UNITED STATES GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES.
F. V. HAYDEN, U. S. Geologist-in-Charge.

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EXTRACTED FROM BULLETIN OF THE GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE TERRITORIES, VOL. II, No. 4.

WASHINGTON, July 1, 1876.

GEOGRAPHICAL VARIATION AMONG NORTH AMERICAN MAMMALS, ESPECIALLY IN RESPECT TO SIZE.

By J. A. Allen.

FERÆ (Suborder FISSIPEDIA).

Having recently had an opportunity (through the kindness of Professor Baird) of studying with some care the magnificent series of skulls of the North American *Mammalia* belonging to the National Museum (amounting often to eighty or a hundred specimens of a single species), I have been strongly impressed with the different degrees of variability exhibited by the representatives of the species and genera of even the same family. The variation in size, for instance, with latitude, in the Wolves and Foxes is surprisingly great, amounting in some species (as will be shown later) to 25 per cent. of the average size of the species, while in other species of the *Ferœ* it is almost *nil*. Contrary to the general supposition, the variation in size among representatives of the same species is not always a decrease with the decrease of the latitude of the locality, but is in some cases exactly the reverse, in some species there being a very considerable and indisputable *increase southward*. This, for instance, is very markedly true of some species of *Felis* and in *Procyon lotor*. Consequently, the very generally-received impression that in North America the species of *Mammalia* diminish in size southward, or with the decrease in the latitude (and altitude) of the locality, requires modification. While such is generally the case, the reverse of this too often occurs, with occasional instances also of a total absence of variation in size with locality, to be considered as forming "the exceptions" necessary to "prove the rule".

That there are such exceptions, both among Birds and Mammals, I have been long aware, and long since noticed that where there is an actual increase in size to the southward it occurs in species that belong to families or genera that are mainly developed within the tropics, there reaching their maximum development, both in respect to the number of their specific representatives, and in respect to the size to which some of the species attain. This fact seems also to have been observed by others.*

Most of the Mammals of North America belong to families, subfamilies, or genera which have their greatest development in the temperate or colder portions of the northern hemisphere, as the *Cervidæ*, the *Canidæ*, the *Mustelidæ*, the *Sciuridæ* (especially the subfamily *Arctomy-*

* I find that Mr. Robert Ridgway, some two years since, thus referred to this point. In alluding to the smaller size of Mexican specimens of *Catharpes mexicanus* as compared with specimens from Colorado, (*C. mexicanus* var. *conspusus*) he says: "As we find this peculiarity exactly paralleled in the *Thryotharus ludovicianus* of the Atlantic States, may not these facts point out a law to the effect that in genera and species in the temperate zone the *increase in size with latitude is toward the region of the highest development of the group?*"—Baird, Brewer, and Ridgway's Birds of North America, Vol. III, App., p. 503, 1874.

inæ), the *Leporidæ*, the *Castoridæ*, the *Arvicolinæ* among the *Muridæ*, the *Saccomyidæ*, *Geomyidæ*, etc. These rarely present an exception to the general law of decrease in size southward, though the variation is less (in fact, occasionally almost *nil*) in some species than in the others. The more marked exceptions, or those in which there is an actual increase in size southward, occur in those families that reach their highest development with the tropics, as the *Felidæ* and *Procyonidæ*.

In some species (as I have elsewhere noticed), there probably exists a double decadence in size, the individual reaching its maximum dimensions where the conditions of environment are most favorable for the existence of the species, diminishing in size toward the northern (through scarcity of food and severity of climate) as well as toward the southern (in consequence of the enervating influence of tropical or semi-tropical conditions) limit of its distribution.

In a general way, the correlation of size with geographical distribution may be formulated in the following propositions:

(1) *The maximum physical development of the individual is attained where the conditions of environment are most favorable to the life of the species.* Species being primarily limited in their distribution by climatic conditions, their representatives living at or near either of ther respective latitudinal boundaries are more or less unfavorably affected by the influences that finally limit the range of the species. These influences may be the direct effects of too high or too low a temperature, too little or too much humidity, or their indirect effects acting upon the plants or other sources of food. Hence the size of the individual generally correlates with the abundance or scarcity of food. Different species being constitutionally fitted for different climatic conditions, surroundings favorable to one may be very unfavorable to others, even of the same family or genus. Hence

(2) *The largest species of a group* (genus, subfamily, or family, as the case may be) *are found where the group to which they severally belong reaches its highest development, or where it has what may be termed its center of distribution.* In other words, species of a given group attain their maximum size where the conditions of existence for the group in question are the most favorable, just as the largest representatives of a species are found where the conditions are most favorable for the existence of the species.

(3) *The most "typical" or most generalized representatives of a group are found also near its center of distribution, outlying forms being generally more or less "aberrant" or specialized.* Thus the *Cervidæ*, though nearly cosmopolitan in their distribution, attain their greatest development, both as respects the *size* and the *number* of the species, in the temperate portions of the northern hemisphere. The tropical species of this group are the smallest of its representatives. Those of the temperate and cold-temperate regions are the largest, where, too, the species are the most numerous. Most of the species of this family also have a wide geographical range, and their representatives respectively present great differences in size with locality, namely, a very marked decrease in size to the southward. The possession of large, branching, deciduous antlers forms one of the marked features of the family. These appendages attain their greatest development in the northern species, the tropical forms having them reduced almost to mere spikes, which in some species never pass beyond a rudimentary state. Beginning at the northward, we have first, in the subarctic and cold-temperate regions, the Alcine and Sangerine forms, species of the largest size, with heavy, large antlers. Next, in the colder-temperate regions, come the Elaphine species, also of very large size, with nearly the largest antlers of any of the *Cervidæ*. We

next meet, in the temperate and warmer regions generally, the smaller Capreoline and Rusine forms, decreasing in size southward, with a rapid reduction also in the size of the antlers. Finally, in the subtropical and tropical portions of the Old World, we meet with antlerless forms, that constitute the smallest species known among the *Cervidæ* and their allies.

The decrease in the size of the antlers southward among the different genera and species is also well marked among individuals of the same species, especially among the Cariacine deer of North America.

The *Canidæ* form another family, which, while having a nearly cosmopolitan distribution, is most numerously represented in the temperate regions of the northern hemisphere, where also occur nearly all of the larger species, and where are exclusively found the true Wolves and Foxes. In respect to the latter, the larger species of each occur only at the northward, and the smaller at the southward. Thus, in North America, the large Gray Wolf ranges from the arctic regions to Florida and Mexico, while the Coyote is not found much to the northward of the great campestrian region of the interior. The Common Fox ranges also from the subarctic districts southward to the Gulf of Mexico, while the smaller Gray Fox finds its northern limit near the parallel of 42°, while a third still smaller species is confined within the warmer-temperate latitudes. At the extreme northward, we find, however, a smaller arctic form, on the extreme northern confines of the habitat of the family. In the Wolves and Foxes, decrease in size to the southward is strongly marked, being probably not exceeded in any other group, though perhaps nearly equaled in some of the Cariacine Deer.

The *Ursidæ*, while having a wide geographical range, are confined mainly to the north hemisphere, throughout which they have representatives. Here again the larger species are northern, while all the warm-temperate and subtropical forms are small. There is also a corresponding decrease in size southward among the representatives of the several species. (See later portions of the paper for a somewhat detailed discussion of the North American species.)

The *Mustelidæ*, while mainly confined to the northern hemisphere, have also representatives south of the equator. Of the *Mustelinæ* proper, all the larger species are boreal, though some of the smaller extend also to the arctic regions. The Wolverine, the largest of the group, is the most boreal; the Fisher and the Marten, the next in size, are mainly confined to the subarctic and cold-temperate regions; the Mink, next in size, extends farther southward; the Weasels range also into the middle-temperate latitudes, with a single species occurring (only at considerable altitudes) under the tropics. *Galictis* is its single tropical representative, and is also the most specialized (though not the smallest) type of the group. The *Melinæ* and *Enhydrinæ*, each with a single American representative, and both boreal, are also among the largest representatives of the family. The *Mephitinæ*, of medium or rather small size, are strictly a warm-temperate and tropical group, with representatives extending from the northern parts of the United States southward to the southern parts of South America. The *Lutrinæ* have a wider range, being found throughout the tropics as well as in the temperate and colder regions, and apparently present not a very great range of geographical variation.

The *Felidæ*, while possessing an almost cosmopolitan range, have their greatest development within the tropics, where they attain their maximum size and number of species. The single boreal genus found in America is one of the most specialized forms of the family. As will be shown later, the American representatives of this family present a notable exception to the general law of decrease in size toward the

south, and confirm the law of increase in size toward the geographical center of the group to which they belong.

The *Procyonidæ* are essentially a tropical family, in which regions are found the largest species and the greatest variety of forms. The single North American species presents a marked *increase in size southward*, as will be fully shown later.

The *Glires*, or *Rodentia*, are found throughout the greater part of the world, but are represented by special groups in different regions. Being strictly herbivorous, they are most numerously developed in the temperate and warmer latitudes. The largest known species are tropical, but others of large size are more or less boreal. In the northern hemisphere, the largest species is the Beaver, which formerly ranged throughout the temperate latitudes. Of the *Muridæ*, the larger species are southern, the smaller northern; and there is a tendency (among some of the species, at least) to an increase in size southward, as in some of the varieties of *Hesperomys leucopus*. The *Arvicolinæ*, on the other hand, are subarctic and temperate in their distribution, and markedly increase in size to the northward. Here, likewise, the largest species of the group are met with.

The *Sciuridæ* are also a nearly cosmopolitan group, with different genera and subfamilies specially characteristic of different regions. The *Sciurinæ* are most numerously represented in the warm-temperate and subtropical latitudes, where also occur the largest species. Yet some of those of the more northern districts show a decided tendency to diminution in size southward, while in others the decrease in this direction is less marked. The *Arctomyinæ* are temperate and subarctic, and the largest species occur at the northward. Parry's Marmot is the most boreal and much the largest. Franklin's Spermophile next succeeds, and is one of the largest of the group. *Spermophilus grammurus* (with its varieties *Beecheyi* and *Douglassi*), of about the same dimension, occupies the elevated interior and the Pacific slope, extending, however, quite far southward. The smallest of the group, *S. Harrisii*, *S. spilosoma*, and *S. mexicana*, have a more southern range. In all of these species, there is a marked decrease in size to the southward in their respective representatives, as there is among the species themselves. *Arctomys* and *Sciuropterus* are boreal genera, with their larger species and varieties occurring at the northward, and a northward increase in size in the representatives of their several forms.

The *Leporidæ* of America are mainly restricted to the northern continent, their center of development as respects the number of species, being the United States. Here occur also nearly all of the larger forms. The Polar Hare, one of the largest, is strictly arctic; three or four others of nearly equal size find their northern limit, with one exception, south of the forty-ninth parallel. The most remarkable trait of the family is the rather small degree of geographical variation its representatives present, both as respects size and coloration. The difference in size between the largest and smallest species is less than is often found in any co-ordinate group having the same number of species, and the species themselves present great constancy of character. There is generally a slight decrease in size southward among individuals of the same species, but sometimes the difference is scarcely perceptible. In the most northerly but one* of the species (*Lepus americanus*), there is apparently a very slight decrease (certainly no increase) in size northward.

* The material at hand is too scanty to afford grounds for any satisfactory generalization respecting the Polar Hare.

With these general remarks, we will pass now to a more special examination of geographical variation in size in several of the more common species of the North American *Feræ*, based on the abundant material in the National Museum.

CANIS LUPUS.

The common Gray Wolf of the northern hemisphere presents a range of individual variation in color exceeded by but few known species of Mammals; gray, white, and black individuals, with various intermediate stages of coloration, occurring with greater or less frequency wherever the species abounds, several of these varieties sometimes occurring in the same litter. Black and white wolves seem to occur more frequently at some localities than others, but gray is generally nearly everywhere the prevailing color. Cream-colored and rufous varieties are also said to have a wide prevalence over some parts of the great plains of the interior. To what extent these variations in color are to be considered as geographic is not yet well established.* With such an evident tendency to variability, it is not surprising that geographical variation in size is displayed in this species to a marked degree. The variation in this respect constitutes a pretty uniform decrease in size southward, as shown (see the subjoined table) by the size of the skull, only fully adult skulls being here taken. The largest are from Fort Simpson and other localities in or near the Mackenzie River district, six of which, out of a series of nine specimens, exceed 10.25 inches in length (one reaching 11.50!), and the other three average above 9.50, the whole averaging 10.38. The next in size are from the region about Puget Sound, a series of three (the only ones in the collection), averaging nearly 10.50. Of sixteen specimens from Forts Benton, Union, and Randall, on the Upper Missouri, the average is 9.45, the extremes being 10.50 and 8.50. Nine specimens from Forts Kearney and Harker (chiefly from Fort Kearney, and all pretty old) average a little larger than the Upper Missouri specimens, the extremes being 10.15 and 9.35. A single specimen from the mountains of New Mexico reaches 10.00, while the three most southern (from the Rio Grande and Sonora, Mexico) average only 8.37, being the smallest of the whole series, and averaging 2.00 shorter than the series of nine from the Mackenzie River region. This difference is fully 25 per cent. of the average size of a series of upward of eighty specimens; while the difference between the smallest (from Saltillo, Mexico) and the largest (from Fort Simpson) is 3.75, or nearly 40 per cent. of the average size of the whole series!

* See further on color variation in this species, Bull. Mus. Comp. Zoöl., vol. i, pp. 154–158.

Measurements of forty-five North American skulls of CANUS LUPUS.*

Catalogue-number.	Original number.	Locality.	Sex.	Total length.	Greatest width.	Distance between orbits.	Nasal bones, length.	Upper incisors from front to hinder margin of palate.	Upper incisors, width between external edges.	Lower jaw, length.	Lower jaw, height.	Remarks.
9001	.....	Fort Simpson, Hudson's Bay Territory	.....	11.50	6.20	2.08	4.45	5.50	2.10	8.00	3.34	
9003	.....	.....do	.....	10.75	5.85	2.07	3.94	5.00	2.05	7.75	3.25	
9000	.....	.....do	.....	10.60	5.65	1.85	4.20	4.95	1.95	7.40	3.00	
9002	.....	.....do	.....	10.35	.....	1.87	4.12	.....	.....	.....	.....	"White." Skull imperfect.
6217	1054	100 miles northwest of Fort Yukon	♂	10.35	5.50	1.90	3.87	5.00	1.95	7.60	3.10	
7154	2	Fort Yukon	♀	10.25	5.26	1.80	4.00	5.05	1.85	7.65	3.00	"Black."
6218	.....	Peel's River	.....	9.50	5.35	1.70	3.65	4.65	1.73	7.00	2.75	
6256	.....	Fort Rae	.....	9.20	4.50	1.45	3.57	4.60	1.65	6.85	2.50	
6257	.....	.....do	.....	9.80	4.90	1.67	3.50	4.50	1.75	7.00	2.82	
1194	.....	Minnesota	.....	9.95	5.15	1.65	3.87	4.90	1.85	7.45	2.80	Very aged.
1804	.....	Adirondack Mountains, New York	.....	9.20	4.95	1.73	3.50	4.35	1.55	6.85	2.70	Rather young.
3438	.....	Puget Sound	.....	10.55	5.67	2.07	4.07	5.12	1.90	.....	.....	
4114	.....	Oregon	.....	9.50	5.00	1.80	3.42	4.65	1.75	7.10	2.86	Marked "*L. gigas*".
	.....	.....do	.....	10.70	5.90	.....	.....	.....	.....	.....	.....	"*Lupus gigas* Townsend." Measurements from Baird.
13949	.....	Little Chief Mountain, forty-ninth parallel	.....	9.15	5.00	1.75	3.55	4.60	1.75	6.80	2.65	
13965	.....	Fort Benton	.....	9.80	5.35	1.80	3.70	4.75	1.83	7.20	2.92	
13966	.....	.....do	.....	9.40	5.20	2.15	3.50	4.45	1.95	7.00	2.92	
13967	.....	.....do	.....	9.60	5.35	1.77	3.50	4.70	1.70	7.00	3.00	
2972	.....	Fort Union	.....	10.50	.....	1.80	3.88	4.85	2.05	7.20	2.90	
3037	.....	.....do	.....	9.90	5.15	1.84	3.70	4.75	1.78	6.92	2.85	
3031	.....	.....do	.....	9.50	5.00	1.85	3.33	4.70	2.00	6.85	2.70	
4124	.....	.....do	.....	8.85	4.75	1.50	3.40	4.35	1.55	6.30	2.50	
3020	.....	.....do	.....	9.15	.....	1.53	3.35	4.60	1.62	6.80	2.68	
3005	.....	.....do	.....	8.50	4.50	1.30	3.12	4.27	1.45	6.00	2.33	
2954	.....	.....do	.....	9.70	5.50	2.05	3.70	4.85	1.88	7.10	2.85	A short, very broad skull.
2984	.....	.....do	.....	9.40	5.25	1.98	3.20	4.48	1.85	.....	.....	Six others in the same lot of similar dimensions.
2994	.....	.....do	.....	9.50	.....	1.92	3.45	4.75	1.87	6.75	2.75	Very old.
12906	.....	Fort Randall, Dak	.....	9.00	4.85	1.70	3.20	4.37	1.75	6.65	2.58	
12907	.....	.....do	.....	9.42	4.75	1.50	3.53	4.53	1.68	6.80	2.75	
12302	.....	.....do	.....	9.75	5.25	1.72	3.62	4.57	1.78	7.00	2.95	
2611	.....	Fort Kearney, Nebr	.....	9.35	5.00	1.50	3.50	4.57	1.62	6.70	2.62	
884	.....	.....do	.....	10.15	5.40	1.85	3.80	4.98	1.87	7.35	3.20	
1314	.....	.....do	.....	9.65	5.35	1.83	3.50	4.75	2.00	6.90	2.85	
3521	.....	.....do	.....	9.85	4.87	1.68	3.75	4.80	1.80	7.05	2.90	
887	.....	.....do	.....	9.80	5.35	1.85	3.65	4.80	1.90	.....	.....	

3686	.....	.....do.....	.....	10.00	5.50	1.87	3.80	4.80	1.97	7.18	3.00		
1312	.....	.....do.....	♂	9.75	5.25	1.78	3.67	5.00	1.80	7.38	3.15	"Gray."	
11592	.....	Fort Harker, Kans.....	.....	9.50	5.06	1.72	3.50	4.65	1.80	.....	.....		
11591	.....	.....do.....	.....	10.15	4.85	1.62	3.80	5.00	1.85	7.20	3.00		
3341	.....	New Mexico.....	.....	10.00	4.92	1.65	3.65	4.90	1.75	7.35	2.93		
8098	.....	Fort Cobb, Ind. Ter.....	.....	9.25	4.85	1.72	3.50	4.50	1.65	6.60	2.65		
1380	.....	Matamoras, Mexico.....	.....	8.75	4.62	1.65	3.18	4.25	1.53	6.35	2.63		
2193	.....	Santa Cruz (Sonora), Mexico.....	.....	8.60	4.55	1.55	3.07	4.20	1.57	6.30	2.63		
1379	.....	Saltillo, Mexico.....	.....	7.75	4.05	.....	.....	.....	.....	.....	.....	Measurements from Baird.	

* The measurements in this and the following tables are all taken either with calipers or dividers, and are expressed in hundredths of the English inch. They hence always indicate the length in a straight line between the points indicated.

CANIS LATRANS.

The Coyote, or Prairie Wolf, the nearest American affine of the Gray Wolf, is as remarkable for its constancy of character, especially in respect to color, as the latter is for its variability. The individual variations in the color of *Canis latrans* consist generally in the depth or intensity of the shadings of black or rufous that more or less pervade the pelage of certain parts of the head and body. Although considerable variations have been noticed in respect to the form of the skull, they are small in proportion to those presented by *Canis lupus*. It is also much less influenced apparently by locality. The species has, however, a less extended range than *Canis lupus*, and the specimens at command represent localities less widely separated than do the series of skulls of *Canis lupus*.

Measurements of forty skulls are given below, mainly from Nebraska, Dakota, and Wyoming. The most distant localities are Columbia River and Fort Tejon, California, Southern Texas, and Fort Union, Montana. Of this series of forty skulls, the average is 7.40; only two attain a length of 8.00, one of which (measuring 8.00 in length) is from Fort Union, and the other (8.05 inches in length) is from Fort Massachusetts, New Mexico. Only two fall below 6.95, one of which measures 6.65 and the other 6.50; the smaller being from the Coppermine River, New Mexico, and the other from Fort Randall, Dakota. Of thirteen specimens from Fort Randall, the largest measures 7.60 in length and the smallest 6.65, the majority (more than three-fourths) falling between 7.00 and 7.50, thus presenting a remarkable uniformity in size. Ten others from Fort Kearney average fully as large, the extremes being 6.95 and 7.60, while four-fifths of them fall between 7.00 and 7.50. Three specimens from Fort Tejon, California, measure respectively 7.95, 7.60, and 7.45, or above the average of those from Dakota and Nebraska! Four specimens from Wyoming Territory, however, measure each 7.80. A single San Diego specimen measures 7.75, and two specimens from Southern Texas respectively 6.95 and 7.00, or but little below the average of northern specimens. Of four specimens from New Mexico, three attain or exceed 7.40, one reaching 8.05 and forming the largest of the series; the other, with a length of only 6.50, forms the smallest of the series, both the largest and the smallest being from New Mexico. It thus appears that in *Canis latrans* there is comparatively little decrease in size southward, instead of the southern averaging fully 25 per cent. smaller, as is the case in *Canis lupus*. The difference between the extremes is only 1.55, or about 20 per cent., against twice that amount in *Canis lupus*. Throwing out the two skulls that fall below 6.95 would reduce the difference between the extremes to 1.10, and the variation to only 15 per cent. of the average! In both *Canis latrans* and *Canis lupus*, the width of the skull averages about one-half the length, ranging in *Canis latrans* from 0.49 to 0.52, while in *Canis lupus* the range in this proportion is from 0.48 to 0.56.

A glance at the table shows that while the Upper Missouri specimens are rather younger than those from Fort Kearney, they rather exceed them in size, and the difference would be somewhat greater if they were of strictly corresponding ages. The single very large skull from New Mexico is also that of a very old individual.

Measurements of forty skulls of CANIS LATRANS.

Catalogue number.	Locality.	Sex.	Total length.	Greatest width.	Distance between orbits.	Nasal bones, length.	Upper incisors from front to hinder margin of palate.	Upper incisors, width between external edges.	Lower jaw, length.	Lower jaw, height.	Remarks.
3025	Fort Union		8.00	3.95	1.30	2.82	4.10	1.48			
12902	Fort Randall, Dak	♂	7.40	3.43	1.13	2.80	3.60	1.15	5.25	1.95	Rather young.
12893	....do	♂	7.50	3.65	1.18	2.82	3.67	1.15	5.50	2.06	Do.
12905	....do	♂	7.50	3.77	1.18	2.80	3.67	1.20	5.50	2.16	Do.
12899	....do	♂	7.60	3.80	1.25	2.87	3.75	1.20	5.53	2.25	Do.
12897	....do	♂	7.40	3.80	1.15	2.80	3.60	1.19	5.30	2.00	Do.
12896	....do		7.25	3.70	1.15	2.75	3.60	1.19	5.32	1.95	Do.
12888	....do		7.15	3.52	1.20	2.70	3.53	1.10	5.27	1.85	Do.
12903	....do		7.10	3.45	1.18	2.88	3.50	1.15	5.05	1.85	Quite young.
12904	....do	♀	7.00	3.56	1.15	2.50	3.53	1.09	5.12	1.95	
12892	....do	♀	6.95	3.52	1.14	2.40	3.27	1.12	5.02	2.10	
12901	....do	♀	6.65	3.38	1.12	2.37	3.38	1.04	4.95	1.85	
12887	....do	♀	7.25	3.70	1.16	2.70	3.58	1.12	5.25	2.08	Aged.
1327	Fort Kearney, Nebr	♀	7.00	3.65	1.26	2.65	3.38	1.15	5.10	1.90	"Eight to ten years old."
1335	....do	♀	6.95	3.75	1.25	2.60	3.45	1.15	5.15	2.06	"Ten or eleven years old."
1336	....do	♀	7.40	3.80	1.25	2.90	3.93	1.13	5.27	2.00	"Four years old."
1338	....do	♀	7.12	3.62	1.20	2.62	3.63	1.20	5.15	1.88	"Two to four years old."
1322	....do	♀	7.35	3.62	1.23	2.75	3.63	1.13	5.30	1.90	"Eight years old."
1332	....do	♀	7.10	3.62	1.20	2.58	3.74	1.18	5.37	2.00	"One to two years old."
1328	....do	♀	7.50	3.62	1.05	2.95	3.65	1.18	5.40	2.18	"One and a half to three years old."
1341	....do	♂	7.60	3.62	1.30	2.70	3.75	1.18	5.38	2.00	
1323	....do	♂	7.25	3.50	1.20	2.70	3.57	1.12	5.15	1.97	"Eight to twelve years old."
1339	....do	♂	7.30	3.68	1.20	2.88	3.65	1.15	5.40	2.00	
11552	Wyoming Territory		7.80								
11554	....do		7.80	3.95							
11559	....do		7.80	3.82							
11558	....do		7.80	3.95							
1916	Columbia River		7.80	3.78							
4113	Oregon		7.25	3.75							
3323	Nebraska	♂	7.80	3.80							
3332	Fort Massachusetts, N. Mex		8.05	3.94							
1000	Coppermine River, N. Mex		7.40								
1001	....do		6.50	3.28							Very aged.
1019	Texas	♂	6.95	3.53							
975	Frontera, Tex		7.00	3.62							Rather aged.
2198	San Francisco Mountains, N. Mex		7.60	3.62							Very aged.
1218	San Diego, Cal		7.75	3.77							Do.
3577	Fort Tejon, Cal		7.95	4.00							Do.
3616	....do		7.60	3.65							Do.
3617	....do		7.45	3.48							Adult.
											Rather young.

VULPES ALOPEX ET VARS.

In the Common Fox of North America, we meet with a range of color-variation, irrespective of locality, somewhat akin to that seen in *Canis lupus*. The prevalent tendency, however, is toward melanism, which tendency is much more strongly developed in the colder than in the warmer latitudes. Frequently, individuals of the melanistic type occur in litters of the common variety. The varying degrees of melanism occurring in this species have given rise to several commercial varieties, which have received at the hands of naturalists systematic designations, and been regarded more or less generally as valid species. Generally, these melanistic varieties are more fully furred, with larger and heavier tails, than the common form. The difference in the fineness and softness of the fur is recognized to such an extent by furriers as to greatly affect the price of the skins, the so-called "Silver" and "Cross" furs being considered far more valuable than the fulvous type.

The so-called "Cross Fox" (*Vulpes "decussatus"*) is more or less frequent as far south as Northern New England and Northern New York, and throughout the more elevated portions of the great Rocky Mountain plateau, where it constitutes a large proportion of the representatives of the so-called *Vulpes "macrurus"*. More rarely, the Black or so-called "Silver Fox" (*Vulpes "argentatus"*) is met with over the same regions, becoming frequent in the higher parts of the Rocky Mountains* and northward. The fulvous form seems, however, to be generally the more prevalent form throughout the range of the species. To the southward, it is the form exclusively met with; but near timber-line in the Rocky Mountains, and throughout the "fur countries", it seems to be not much more frequent than the melanistic forms.

With this tendency to great variability in color, we meet, as usual in such cases, a great variation in size. In the present case, the variation in color may be properly regarded as geographical, through an increasing tendency to melanism northward. The variation in size is also chiefly of the same character, the size uniformly increasing toward the north, as shown by the subjoined table of measurements. A glance at this table shows at once the nature of this variation. The largest specimens come from the Aleutian Islands and Alaska; the smallest from Essex County, New York, which is the most southerly locality well represented in the collection.

A series of nine skulls from Alaskan localities range in length from 5.70 to 6.20, five out of the nine having a length of 6.00 to 6.20 (two 6.15 and two 6.20), and give an average of 5.98. In another series of eighteen from the Mackenzie River district (mainly from Fort Anderson), the range is from 5.55 to 6.10. Only one, however, exceeds 6.00, and three only reach this size, the average being 5.80. These series consist about equally of the so-called "Silver" and common fulvous varieties, and, as may be seen from the table, there is no material difference in size between the two so-called varieties.

A third series of nine skulls, of the so-called "*macrurus*", chiefly from the Upper Missouri country (including two, however, from the Pacific slope), ranges from 5.40 to 6.00, with an average of 5.75. Two only reach 6.00, and two only fall as low as 5.50. Hence the series forms a third appreciable step in the southward decrease in size. Though the latitude is much less, the elevation of the region is much greater than that of the localities more to the northward. With a similar altitude, the decrease would have been more marked, as is proven by the series

*See Bulletin Essex Institute, vol. vi, p. 54.

next to be considered. A fourth series of twelve specimens, from the Adirondack region of New York, ranges from 5.20 to 5.68, with an average of 5.40. Only three specimens range above 5.50, while four fall below 5.30. A fifth series of five skulls, from European localities, ranges from 5.50 to 5.70, with an average of 5.58.

In the Alaskan series, the width ranges from 2.90 to 3.32, averaging 3.20; in the Mackenzie River district series, from 2.87 to 3.28, averaging 3.02; in the "*macrurus*" series, from 2.70 to 3.20, averaging 2.90; in the Adirondack series, the width ranges from 2.70 to 2.95, averaging 2.80; in the European series, from 3.05 to 3.15, averaging 3.08. Hence—

	Average length.	Average width.
Alaskan series	5.98	3.20, or 0.535 of length.
Mackenzie River District series	5.80	3.02, or 0.521 of length.
"*Macrurus*" series	5.75	2.90, or 0.504 of length.
Adirondack series	5.40	2.80, or 0.518 of length.
European series	5.58	3.08, or 0.552 of length.

It thus appears that in the American specimens there is not only a well-marked southward decrease in size, but also a decrease in the relative breadth of the skull, through the greater elongation of the facial portion; also that the relative breadth is quite appreciably greater in the European form, as noticed long since by Professor Baird.*

While the European *Vulpes vulgaris* may be considered as subspecifically distinct from the American (*Vulpes vulgaris* subsp. *fulvus*), through its wider skull, less pointed and shorter muzzle, harsher and more reddish fur, etc., the different so-called American "species" or "varieties" (*fulvus*, "*decussatus*", "*argentatus*", and "*macrurus*") do not have the same claim to subspecific recognition. The Foxes of the colder regions, it is true, have a fuller and softer pelage, a greater tendency to melanism, shorter muzzles, and are larger, yet these differences are so inconstant, especially the differences of color, and so insensibly intergrade, that any attempt at their subspecific recognition seems impracticable, the most diverse varieties in color occurring at the same localities and even among individuals of the same litter.†

* Mam. N. Amer., pp. 126, 130.

† On this point see Bulletin Mus. Comp. Zoöl., vol. i, pp. 159, 160.

Measurements of fifty-three skulls of VULPES ALOPEX *et vars.*

Catalogue-number.	Locality.	Sex.	Length.	Width.	Remarks.
9481	Kinai, Alaska	.....	6.20	3.03	
8039	Kodiak, Alaska	.....	6.20	3.32	
8037	....do	.....	5.90	3.00	
8417	Aleutian Islands	.....	6.15	3.25	
6037	Yukon River	♂	6.15	3.00	Silver.
6039	....do	♀	6.00	3.15	Do.
6040	....do	♀	5.70	3.05	Do.
6034	....do	.....	5.80	3.00	Fulvous.
6035	....do	.....	5.70	2.90	Do.
4300	Fort Liard	.....	5.95	3.14	Silver.
6221	Peel River	.....	5.87	3.10	Fulvous.
6038	....do	.....	5.65	2.88	Silver.
7175	Fort Good Hope	♂	6.00	3.00	Do.
6221	....do	.....	5.90	3.07	Fulvous.
7179	....do	♂	5.75	2.94	Silver.
6264	Fort Anderson	♂	6.10	3.28	Black.
1485	....do	.....	6.00	3.25	Fulvous.
6262	....do	♂	5.95	3.00	Silver.
7186	....do	.....	5.80	2.90	Fulvous.
1484	....do	.....	5.75	2.95	Do.
6225	....do	♀	5.75	3.00	Silver.
1492	....do	♂	5.75	3.10	Do.
6263	....do	♂	5.66	2.87	Do.
1519	....do	.....	5.65	3.00	Fulvous.
6259	....do	♂	5.60	3.00	Silver.
6258	....do	♂	5.55	2.90	Do.
1518	....do	.....	5.55	.....	Fulvous.
11573	Wyoming Territory	.....	6.00	3.20	"*Macrurus*."
11297	....do	.....	6.00	3.00	Do.
11296	....do	.....	5.82	.....	Do.
11218	....do	.....	5.50	2.78	Do.
7855	Fort Berthold	.....	5.90	3.03	Do.
12909	Fort Randall, Dak	.....	5.65	2.85	Do.
1325	Fort Kearney, Nebr	.....	5.77	2.85	Do.
2014	Fort Dalles, Oreg	♂	5.70	2.83	Do.
4191	Fort Crook, Cal	.....	5.40	2.70	Do.
3078	Essex County, New York	.....	5.65	2.87	
3073	....do	.....	5.68	2.85	
3067	....do	.....	5.60	2.85	
3719	....do	.....	5.50	2.95	
3695	....do	.....	5.50	2.87	
3698	....do	.....	5.30	2.70	
3709	....do	.....	5.30	2.70	
3716	....do	.....	5.37	2.75	
3701	....do	.....	5.27	2.80	
3715	....do	.....	5.25	2.75	
3074	....do	.....	5.25	2.73	
3075	....do	.....	5.20	2.78	
1038	Sweden	.....	5.70	3.10	
790	England	.....	5.65	3.04	
868	Germany	.....	5.62	3.15	
869	....do	.....	5.62	3.05	
870	....do	.....	5.50	3.07	

UROCYON VIRGINIANUS.

Measurements of a series of fifteen skulls of this species (all of the available material) form a series grading by slight differences in length from 3.73, the smallest, to 4.77, the largest. The largest specimens are from Pennsylvania, Washington, and Virginia; all these exceed 4.60 in length. The next in size are from Southern Texas and Southern California, which range in length from 4.63 down to 4.50. Next come three specimens from Tehuantepec, Southern Mexico, which range from 4.40 to 4.15. Between these and the next—a series of three "*littoralis*" skulls from the islands off Southern California—is an interval of three-tenths of an inch, the three "*littoralis*" skulls ranging from 3.85 to 3.75. The smallest of all, however, is a single well-matured skull from Merida, Yucatan, 3.73 in length, and hence smaller even than the smallest "*littoralis*" skull, its breadth being only 1.98 against a breadth of 2.05 in the narrowest "*littoralis*" specimen. The localities represented

are few and widely separated; there being no specimens from points between Virginia and Southern Texas, and none between Texas and Tehuantepec, Mexico, nor between these two last-named localities and Fort Tejon, Cal. The small insular race known as "*littoralis*", from the islands off the coast of Southern California, come in between the Tehuantepec specimens and the example from Merida. While there are no very considerable breaks in the chain, the gradation would be more complete if specimens could be included from other intermediate localities. The specimens at hand are sufficient to show a very great but still very gradual decrease in size southward, amounting to over 25 per cent. of the mean size. The mean of the two extremes is 4.25, with a difference of 1.04; while, with a single exception, there is a gap at no point of more than 0.08.

With this rapid decrease in size may be noticed a considerable range of variation in breadth in specimens of nearly the same length, indicating the existence of an unusual amount of individual variation, the ratio of width to length varying from 0.54 to 0.59.

Measurements of fifteen skulls of UROCYON VIRGINIANUS.

Catalogue number.	Locality.	Sex.	Length.	Width.	Remarks.
4729	Pennsylvania		4.77	2.70	
968	Washington, D. C	♀	4.70	2.56	
671	White Sulphur Springs, Va		4.62	2.65	
7491	Washington County, Texas		4.60	2.70	
1175	Eagle Pass, Texas		4.50	2.58	
3543	Fort Tejon, Cal		4.63	2.53	
3545	do		4.55	2.65	
4140	Cape Saint Lucas, Lower California		4.50	2.43	
8659	Tehuantepec, Mexico		4.40	2.35	
8662	do		4.27	2.37	
13851	do		4.15	2.25	
2275	San Miguel Island, California		3.85	2.23	Var. *littoralis*.
2154	San Nicolas Island, California		3.80	2.05	Do.
6323	do		3.75	2.10	Do.
13477	Merida, Yucatan		3.73	1.98	

FELIS CONCOLOR.

The amount of material available for the study of variation in size with locality in the present species is too small to yield very satisfactory results. In the eight specimens of which measurements are given below, it will be noticed that there is a decided increase in size southward. Between the three skulls from northern localities (one each from Northern New York and Washington and Oregon Territories) and the three (mature) skulls from southern localities (Louisiana and the Rio Grande, Texas), the average difference is fully an inch, or about one-eighth of the mean size.

Measurements of eight skulls of FELIS CONCOLOR.

Catalogue-number.	Locality.	Sex.	Length.	Width.	Remarks.
3811	Essex County, New York		7.40	5.25	Old.
8597	Puget Sound		7.50	5.05	
3267	Oregon		7.80	5.15	
1148	Eagle Pass, Texas		7.75	4.95	Quite immature.
1356	Rio Grande, Texas		7.50	5.00	Do.
1355	....do....		8.40	5.35	
1895	Brazos River, Texas		8.50	5.60	
1158	Prairie Mer Rouge, Louisiana		8.75	5.50	

FELIS PARDALIS.

Fourteen skulls of *Felis pardalis* show a most decided southward increase in size. A series of five skulls from the Lower Rio Grande average about an inch shorter than another series of nine from Southern Mexico and Central America. The largest of the Rio Grande skulls has a length of 5.25, while the smallest of the Mexican and Central American series (excluding one rather young specimen) has a length of 5.20, and the largest a length of 6.20. The three largest (6.00 to 6.25) are from Costa Rica, while one other from Panama and another from Surinam are but little smaller. The smallest of the Rio Grande series (a rather young specimen) is but 4.50 in length; the smallest of the tropical series (a specimen of corresponding age) 5.35.

The difference in size with locality is thus as great in this species and in *Felis concolor* as it is in the Wolves and Foxes; but the increase is in the opposite direction,—to the *northward* in the former and to the *southward* in the latter; the one group being a northern type, the other a tropical.

Measurements of fourteen skulls of FELIS PARDALIS.

Catalogue-number.	Locality.	Sex.	Length.	Width.	Remarks.
1363	Matamoras, Mexico		4.50	3.05	Mature but not very old.
1362	....do....		4.90	3.35	
1361	....do....		5.05	3.35	
1359	....do....		5.20	3.50	
1358	....do....		5.25	3.40	
6023	Panama		5.60	3.75	
7080	Mirador, Mexico		5.70	3.55	
13852	Tehuantepec, Mexico		5.50	3.70	
11743	Isthmus of Darien		5.85	3.80	
14182	Costa Rica		6.00	3.73	Very old.
14179	....do....		6.00	3.94	Do.
14180	....do....		6.20	4.19	Do.
14178	....do....		5.35	3.60	Adult but not very old.
13005	Surinam		5.80	3.83	Very old.

LYNX RUFUS ET LYNX CANADENSIS.

In the subjoined table are given measurements of thirty-four skulls of North American Lynxes, namely, seven of *L. fasciatus*, ten of *L. rufus*, eight of *L. maculatus*, and nine of *L. canadensis*, representing localities as distant from each other as Alaska and Northern Mexico on the one hand, and New York and Fort Tejon, Cal., on the other. Yet the

extremes of variation met with at single localities are as great as those from the most widely separated of the above-named localities; in other words, no geographical variation in size is perceptible. The largest northern specimen (*canadensis*), from Peel River, Arctic America, with a length of 5.30, a little exceeds in size the largest specimens from any locality south of the latitude of 40°; but it in turn is slightly smaller than a specimen (*fasciatus*) from Fort Townsend, Wash., which has a length of 5.50, and by another of the same dimensions (*rufus*) from the Big Sioux River. Eight specimens of the most southern type (*L. maculatus*), all from Texas and the Mexican side of the Lower Rio Grande, differ in the average from nine specimens of the most northern type (*L. canadensis*), all from Arctic or sub-Arctic America, almost inappreciably, the *canadensis* series having an average length of 5.01 and the *maculatus* series of 5.00! The difference in breadth is also only about one-tenth of an inch, which the addition of a single specimen to either series might cancel. This is certainly a surprising result when it is remembered that one of the chief alleged distinctive characters of *L. canadensis* has been its supposed larger size!

The average dimensions of these several series are as follows:

Species.	Number of specimens.	Length.	Breadth.
L. canadensis	9	5.01	3.52
L. fasciatus	7	5.03	3.56
L. maculatus	8	5.00	3.40
**L. rufus*	10	4.91	3.41
Mean of all	34	4.98	3.47

* The specimens placed under *rufus* are those that are so marked in the collection, being the specimens so identified by Professor Baird.

The *fasciatus* series is the largest, but this series happens to include more very old specimens than the others, and hence its higher average. Such a constancy of size as is here shown to prevail over an area embracing more than 40 degrees of latitude is probably without a parallel in any other conspecific group of North American Mammals.

The difference between these heretofore commonly recognized "species" of the genus *Lynx* must hence be sought elsewhere than in size. The specific distinctness of *L. canadensis*, the most northern type, has been heretofore scarcely questioned, in consequence of its supposed larger size, larger limbs, longer, softer pelage, longer ear-tufts, more indistinct markings, and generally lighter or grayer color. The longer ear-tufts correlate with the longer, softer pelage, that always characterizes the boreal representatives of species having a wide latitudinal range. The difference in coloration is not greater than, or even so great as, that which obtains between *fasciatus* and *rufus*, or between *fasciatus* and *maculatus*, which forms naturalists now seem disposed to refer to one and the same species under the name *L. rufus*. *Maculatus*, the most southern form, differs from the "typical" or eastern *rufus* in its shorter, coarser fur, more reddish tints, and more distinct markings. Its reputed range extends from the Lower Rio Grande westward across the continent to Southern California; but in the National Museum collection are also specimens marked *rufus* from many points within this area, including a considerable series from Fort Tejon. The gradation from the "typical" *rufus* type into *maculatus* is complete and by almost insensible stages.

The *L. fasciatus* or Columbia River race differs from *rufus* in its more uniform and darker (chestnut rather than reddish) coloration, by the markings on the dorsal surface and sides of the body being nearly obsolete, and the fuller, softer fur, which is about as heavy and soft as in *canadensis*. We have hence, in this form, only another instance of the duller, darker, and more uniform coloration that characterizes the greater part of the Mammals (and many Birds also) from the humid, heavily-wooded Columbia River region, as compared with their conspecific allies of the other portions of the continent.

L. canadensis differs from these several southern races mainly as the northern representatives of a given species usually differ from its southern representatives, namely, in its softer and longer pelage, more heavily-clothed feet, longer ear-tufts, paler or grayer general color, and more indistinct markings, and especially in a tendency to entire obsolescence of the markings on the lower surface of the body and inner side of the legs. The tail has a shorter area of black at the end, and lacks the white on the lower surface at the extreme tip, so constantly seen in the other forms. The tail is but little, if any, shorter, although the greater length and thickness of the fur give it that appearance. There is, however, a tendency to a greater length of tail to the southward. Its supposed greater size and larger limbs are also due almost wholly to the greater fullness and length of the pelage, the fresh carcass (in a specimen from Houlton, Me.) with the skin removed giving the same measurements as in *L. rufus* (a specimen from Colorado).

The prior name for the group of American Lynxes is undoubtedly *rufus* of Guldenstädt (1776), which antedates by about forty years Rafinesque's names of *canadensis*, *montanus*, and *floridanus* (1817). The *L. maculatus* of Horsfield and Vigors (1829), which was admitted as a valid species by Baird, but regarded as merely a variety of *rufus* by Audubon and Bachman, is evidently subspecifically indistinguishable from the true *rufus* of authors. *L. fasciatus* of Rafinesque (based on the "Tiger Cat" of Lewis and Clarke, from the Columbia River region) is far more tangible, sufficiently so to be properly recognizable as a subspecies (*Lynx rufus* subsp. *fasciatus*). The *L. canadensis* of authors seems to have even still stronger claims for nominal recognition, though the differences are still clearly such as characterize geographical races. We hence believe its relationship to the rest of the group is better indicated by a name (*L. rufus* subsp. *canadensis*) indicating subspecific rather than specific rank.

A single adult skull (from Sweden) of the large Lynx of the northern parts of the Old World (*Lynx borealis*) exceeds in size by an inch the largest specimens of the American Lynxes, and hence seems to indicate an animal fully one-fifth larger than even exceptionally large specimens of *L. rufus*.

Measurements of thirty-four skulls of LYNX RUFUS *et vars.*

Catalogue-number.	Locality.	Sex.	Length.	Width.	Remarks.
8599	Puget Sound, Wash	.....	4.80	3.45	"*fasciatus.*"
8600	....do	.....	4.65	3.30	Do.
3426	Steilacoom, Wash	♀	5.20	3.60	Do. Very old.
3197	....do	.....	5.45	3.95	Do.
3427	Fort Umpqua, Wash	.....	.....	3.32	Do.
3426	....do	.....	4.90	3.50	Do.
2032	Shoalwater Bay, Wash	.....	4.75	.....	Do.
3147	Fort Townsend, Wash	.....	5.50	3.82	Do. Very old.
2883	Big Sioux River	♀	5.50	3.82	"*rufus.*" Very old.
3775	Mississippi	.....	4.95	3.38	Do.
7465	Arizona	.....	5.10	3.55	Do.
3120	Florida	.....	4.85	3.22	Do. Quite young.
2391	Louisiana	.....	4.90	3.27	Do.
3574	Fort Tejon, Cal	♂	4.80	3.32	Do.
3542	....do	.....	4.80	3.50	Do.
3541	....do	♂	4.93	3.38	Do.
3570	....do	.....	4.65	3.37	Do.
3576	....do	.....	4.65	3.37	Do.
1887	Fort Belknap, Tex	.....	5.12	3.72	"*maculatus.*"
1109	Eagle Pass, Texas	.....	5.27	3.51	Do.
7493	Washington County, Texas	.....	4.72	3.25	Do.
1376	Matamoras, Mexico	.....	4.55	3.10	Do. Rather young.
1367	....do	.....	5.10	3.40	Do.
1368	....do	.....	4.80	3.25	Do.
1006	Texas	.....	5.15	3.57	Do.
1159	Prairie Mer Rouge, Louisiana	.....	4.80	3.28	Do.
9478	Kinai, Alaska	.....	4.85	3.35	"*canadensis.*"
6031	Yukon, Alaska	.....	4.95	3.53	Do.
6030	....do	♀	4.75	3.35	Do.
6216	Peel River	♀♂	4.95	3.53	Do.
6211	....do	♂	5.30	3.70	Do.
4468	Fort Simpson	.....	5.15	3.60	Do.
4296	Liard River	.....	5.00	3.45	Do.
3279	Red River Settlement	.....	5.00	3.52	Do.
2570	Medicine Bow Creek, Wyoming	.....	5.15	3.60	Do.

PROCYON LOTOR.

The present species presents another well-marked case of gradual increase in size southward. In a series of fifteen skulls from the Atlantic States (New York, Pennsylvania, and Georgia), only a single specimen exceeds 4.38 in length or 3.00 in width, the largest specimen being from Saint Simon's Island, Georgia. Three from Essex County, New York, average 4.28; five from Pennsylvania average 4.29; seven from Saint Simon's Island, Georgia, average 4.26 (or 4.29, excluding one very small one). Six specimens from the interior (Nebraska, Missouri, Indian Territory, and the Lower Rio Grande) average 4.49, two only falling below 4.50, and the largest (Rio Grande) 4.70. Three from California ("*hernandezi*") average 4.63, the largest reaching 4.78, with a width of 3.38. Six from Southern Mexico average 4.58, the largest reaching 4.73 in length, with a width of 3.42. Three from Costa Rica average 4.69, the largest reaching 4.85.

In addition to the above, there is a single very aged specimen from Detroit, Mich., which has a length of 4.35, and two others from Alaska (one middle-aged, the other rather young) which measure, respectively, 4.25 and 4.05 in length, the latter being the smallest of the whole series, although it contains others equally young.

Between the three specimens from Essex County, New York, and the three from Costa Rica, specimens of corresponding ages and constituting the two extremes, the average difference is nearly six-tenths (0.57) of an inch, or about one-seventh of the size of the northern examples.

Besides the difference in size, there is also a considerable range of variation in respect to the general form of the skull in the ratio of width to length, in the shape, degree of concavity of the palate, in specimens

from the same locality, the ratio of width to length varying from 0.65 to 0.73.

In addition to the increase in size southward, there is a tendency to an increase in the intensity of the colors in the same direction, with a stronger contrast between the light and dark markings. These differences, taken collectively, have given rise to several nominal species, of which the *P. hernandezi* of Wagler and *P. psora* of Gray have become the most prominent. The species normally presents a considerable range of color-variation, tending on the one hand more or less to melanism and on the other to albinism. On these extreme phases of coloration have also been based other nominal species, as the *P. obscurus* of Wiegmann and the *P. nivea* of Gray. All these names have been already placed by Gray, in his later notices of the group, under the head of *P. lotor*, but separated as being varietally distinct. It seems doubtful, however, whether even the large southern form, usually called *hernandezi*, is really entitled to subspecific recognition.

Measurements of thirty-six skulls of PROCYON LOTOR.

Catalogue number.	Locality.	Sex.	Length.	Width.	Remarks.
8690	Alaska		4.25	2.87	Middle-aged.
8693	do		4.05	2.92	Young.
1068	Detroit, Mich		4.35	.....	Very old.
3723	Essex County, New York		4.25	2.87	Do.
3722	do		4.27	2.70	Middle-aged.
3079	do		4.32	3.00	Very old.
898	Pennsylvania		4.35	3.00	Do.
6025	do		4.12	2.51	Do.
4817	do		4.38	2.64	Do.
575	do		4.25	2.88	Do.
766	do		4.35	2.93	Do.
2443	Saint Simon's Island, Georgia		4.25	2.62	Middle-aged.
2437	do		4.38	3.03	Very old.
2447	do		4.06	2.65	Do.
2450	do		4.30	2.87	Do.
2444	do		4.12	.....	Do.
2446	do		4.12	2.90	Do.
2202	do		4.57	3.00	Do.
8649	Nebraska		4.50	3.07	Do.
8085	Fort Cobb, Indian Ter		4.50	3.03	Do.
3325	Independence, Mo		4.23	2.78	Young.
7739	Long Point, Tex		4.32	2.98	Old.
1386	Lower Rio Grande		4.52	2.90	Young.
1387	do		4.70	3.15	Old.
3224	San Francisco, Cal		4.42	.....	Very old; "*hernandezi*."
3933	Sacramento, Cal		4.78	3.38	Do.
13312	California		4.70	3.12	Very old.
7081	Mirador, Mexico		4.75	3.15	Middle-aged.
6119	Colima, Mexico		4.50	3.33	Old.
6481	do		4.46	3.15	Middle-aged.
9706	Tehuantepec, Mexico		4.50	2.83	Young.
13853	do		4.52	.....	Old.
13854	do		4.73	3.42	Very old.
13300	Costa Rica		4.55	3.03	Middle-aged.
14190	do		4.78	3.32	Old.
14191	do		4.85	3.00	Do.

PUTORIUS VISON.

Eighteen skulls from the northern parts of the continent, mainly from Alaska, average 2.66 in length and 1.58 in width, the extremes being, length, 3.02 and 2.30; width, 1.90 and 1.40. Thirteen skulls from the highlands of Northeastern New York average 2.40 in length and 1.34 in width, the extremes being, length, 2.60 and 2.17. Three skulls from Pennsylvania (undoubtedly males) average 2.49 in length and 1.48 in width. In the northern series, the sex of the skull is given by the collector, whence it appears that the twelve males have an average

length of 2.81, and the six females an average length of 2.48, showing a considerable sexual variation in size. Yet the smallest males (2.64 and 2.63) fall below the largest female (2.68), if the skulls are all correctly marked. None of the other females, however, exceed 2.55, and only three of the males fall below 2.70. In the New York series, the sex is not indicated; but, judging from the proportion of the small to the large skulls, the sexes are about equally represented in the two series, but in the New York series there is a very gradual decline from the largest to the smallest. The northern series of eighteen is selected from a series of twenty-three; the New York series of thirteen from a series of thirty. In each case only very old skulls were chosen, the immature specimens in each case being thrown out in order to have a fair basis for comparison. The immature and middle-aged specimens greatly predominate in the New York series, owing, doubtless, to the species being more closely hunted there than in the more unsettled districts of the far north.

Taking these two series as a basis for a general comparison, there is indicated a considerable decrease in size from the north southward, amounting to 0.26 in length and 0.24 in width, or about one-tenth of the average size of the New York series. A single specimen, marked "Brookhaven, Miss.", and another marked "Tuscaloosa, Ala.", however, have a length respectively of 2.60 and 2.80, the former equaling the largest New York specimens, and the latter nearly equaling the average size of the males of the northern series, while a single male skull from Fort Randall, D. T., 2.90 in length, is the second in size of the whole series; one Fort Yukon specimen only being larger! Other specimens from the Upper Missouri region, however, are much smaller, as are other specimens from Prairie Mer Rouge, La., indicating that the specimens above mentioned are much above the average for their respective localities.

Measurements of thirty-seven skulls of PUTORIUS VISON.

Catalogue number.	Locality.	Sex.	Length.	Width.	Remarks.
6530	Fort Yukon, Alaska	♂	3.02	1.90	Very old.
8709	Alaska	♂	2.82	1.64	Do.
8797	....do	♂	2.83	1.62	Do.
8796	....do	♂	2.75	1.61	Do.
8707	....do	♂	2.73	1.62	Do.
8703	....do	♂	2.75	1.57	Do.
8702	....do	♂	2.68	1.62	Do.
8798	....do	♂	2.64	1.55	Do.
8648	Alaska (Kadiak)	♂	2.63	1.52	Do.
8708	Alaska	♂	2.68	1.58	Do.
6531	....do	♀	2.55	1.50	Do.
8704	....do	♀	2.45	1.45	Do.
8706	....do	♀	2.32	1.40	Do.
8705	....do	♀	2.30	1.40	Do.
3284	Nelson River	♂	2.86	1.62	Do.
4309	Fort Simpson	♂	2.70	1.51	Do.
8132	....do	♂	2.90	1.78	Do.
4305	....do	♀	2.55	1.46	Do.
12915	Fort Randall	.....	2.90	1.61	Do.
3730	Essex County, New York	.....	2.60	1.48	Old.
3824	....do	.....	2.60	1.38	Do.
1169	....do	.....	2.40	1.32	Old. *P. "nigrescens"* A. & B.
3085	....do	.....	2.40	1.38	Do.
3084	....do	.....	2.40	1.31	Do.
3823	....do	.....	2.32	1.32	Old.
3822	....do	.....	2.30	1.23	Do.
2242	Saranac Lake, New York	.....	2.47	1.37	Do.
2243	....do	.....	2.40	1.30	Do.
2241	....do	.....	2.35	1.31	Do.
2244	....do	.....	2.20	1.18	Do.
2250	....do	.....	2.40	1.48	Do.
2267	....do	.....	2.17	1.20	Do.
1847	Pennsylvania	.....	2.50	1.48	Do.
4834	....do	.....	2.50	1.48	Do.
4835	....do	.....	2.47	1.48	Do.
1894	Tuscaloosa, Ala	.....	2.80	1.61	Do.
11315	Brookhaven, Miss	.....	2.60	1.50	Do.

MUSTELA AMERICANA.

The forty-six male skulls of this species, of which measurements are given below, are mainly from four or five localities differing widely in latitude. A comparison of the average size of a considerable number from each shows a well-marked decrease in size southward. Four skulls from Peel River, the largest, and also from the most northerly locality, have an average length of 3.39, and an average width of 2.07, the extremes being 3.50 and 3.35 in length and 2.12 and 2.02 in width. Nine skulls from the Yukon (probably mostly from near Fort Yukon) give an average length of 3.34 and an average width of 1.98, the extremes being 3.55 and 3.00 in length and 2.15 and 1.73 in width. Five skulls from Fort Good Hope give an average length of 3.24 and an average width of 1.95, the extremes in length being 3.37 and 3.15 and in width 2.05 and 1.73. Ten skulls from the northern shore of Lake Superior average 3.14 in length and 1.76 in width, the extremes in length being 2.23 and 3.02 and in width 1.89 and 165. Eight skulls from the vicinity of Umbagog Lake, Maine (Coll. Mus. Comp. Zoöl.), average 2.96 in length and 1.72 in width, the extremes in length being 3.10 and 2.73, and in width 1.85 and 1.50. Five skulls from Northeastern New York average 3.02 in length and 1.61 in width, the extremes being in length 3.10 and 2.92 and in width 1.68 and 1.50. There is thus a gradual descent in the average length from 3.39 to 3.02, and in width from 2.07 to 1.61. The largest and the smallest of the series are respectively 3.55 and 2.92 in length. Several fall as low as 3.00, and an equal number attain 3.50. The difference between the

largest and the smallest, excluding the most extreme examples, is one-sixth of the dimensions of the smaller and one-seventh of the size of the larger.

The sexes differ considerably in size, relatively about the same as in *Putorius vison*; but the above generalizations are based wholly on males, and in each case on those of practically the same age, only specimens indicating mature or advanced age being used.

The series of fully one hundred skulls of this species contained in the National Museum presents a considerable range of variation in details of structure, involving the general form of the skull, the relative size of different parts, and the dentition, especially the form and relative size of the last molar. In a former paper,* I had occasion to notice somewhat in detail the variations in color our American Martens present, and the difficulty of finding any features of coloration that seemed to indicate more than a single American species, or that would serve to distinguish this even from the Martens of the Old World. Dr. J. E. Gray, it is true, had already called attention to the small size of the last molar in the American Martens as compared with the size of the same tooth in the Old World Martens; but, as his observation was apparently based on a single American skull, and as I was at the time strongly impressed with the wide range of individual variation I had found in allied groups, even in dental characters, and also with the great frequency of Dr. Gray's characters failing to be distinctive, I was misled into supposing all the Martens might belong to a single circumpolar species, with several more or less strongly-marked geographical races. My friend Dr. Coues some months since kindly called my attention to the validity of Dr. Gray's alleged difference in respect to the size and form of the last molar, which I have since had opportunity of testing. This character alone, however, fails to distinguish *Mustela foina* from *Mustela americana*, in which the last molar is alike, or so nearly so that it fails to furnish distinctive differences. The size and general form of the skull in the two are also the same, the shape of the skull and the form of the last upper molar failing to be diagnostic. The second lower true molar, however, in *Mustela foina* presents a character (shared by all the Old World Martens) which serves to distinguish it from *Mustela americana*, namely, the presence of an inner cusp not found in the latter. In *Mustela flavigula*, the last molar is relatively *smaller* than even in *Mustela americana*, and of the same form. *Mustela martes* differs in its more massive dentition and in the heavier structure of the skull, but especially in the large size of the last molar and the very great development of its inner portion. Hence, while the size and shape of the last upper molar serves to distinguish *Mustela martes* from *Mustela americana*, it fails as a valid distinction between *Mustela americana* and *Mustela flavigula* and *Mustela foina*. As already remarked, however, *Mustela americana* lacks the inner cusp of the second lower molar, which is present in the Old World Martens, or at least possesses it only in a very rudimentary condition.

* "Mammals of Massachusetts", Bull. Mus. Comp. Zoöl., vol. i, pp. 161–167, Oct., 1869

Measurements of forty-six skulls of MUSTELA AMERICANA.

Catalogue number.	Locality.	Sex.	Length.	Width.	Remarks.
6043	Yukon River	♂	3.55	2.15	
6049	....do	♂	3.50	1.85	
6085	....do	♂	3.45	1.83	
6047	....do	♂	3.37	1.82	
6044	....do	♂	3.30	1.85	
6051	....do	♂	3.00	1.73	
6048	....do	♂	3.28	.....	Imperfect.
6046	....do	♂	3.28	1.82	
9099	Kenai, Alaska	♂	3.30	2.03	
7159	Fort Good Hope	♂	3.37	2.05	
7167	....do	♂	3.25	1.98	
7168	....do	♂	3.25	1.93	
7164	....do	♂	3.25	1.76	
7163	....do	♂	3.15	1.73	
6081	Peel River	♂	3.50	2.02	
6080	....do	♂	3.37	2.12	
6063	....do	♂	3.35	.....	Imperfect.
6059	....do	♂	3.35	.....	Do.
3285	Red River	♂	3.40	1.94	
4670	Lake Superior (north shore)	♂	3.23	1.75	
4668	....do	♂	3.18	1.65	
4664	....do	♂	3.15	1.65	
4668	....do	♂	3.16	1.65	
4666	....do	♂	3.15	1.87	
4675	....do	♂	3.15	1.83	
4674	....do	♂	3.15	1.85	
4667	....do	♂	3.10	1.89	
4672	....do	♂	3.12	1.65	
4681	....do	♂	3.02	1.83	
	Washington Territory	♂	3.23	1.90	
	....do	.....	3.15	1.72	Rather young.
	....do	.....	3.03	1.55	Do.
	....do	.....	3.00	.....	Do.
1668	Essex County, New York	♂	3.10	1.57	
1163	....do	♂	3.03	1.63	
3819	....do	♂	3.00	1.68	
3818	....do	♂	2.92	1.50	
2245	Saranac Lake, New York	♂	3.03	1.68	
541	Umbagog Lake, Maine	♂	3.10	1.85	
550	....do	♂	3.00	1.70	
542	....do	♂	3.00	1.72	
552	....do	♂	3.00	1.72	
553	....do	♂	3.00	1.78	
543	....do	♂	2.90	1.78	
545	....do	♂	2.92	1.68	
544	....do	♂	2.73	1.50	

TAXIDEA AMERICANA.

The subjoined measurements of eleven skulls of this species (embracing all at present available) show also a well-marked southward decrease in size. A fuller series would be more satisfactory, but would doubtless only confirm what is here indicated. Six of the specimens are from rather northern localities and five from rather southern localities, the region represented extending from the Upper Missouri southward to the Lower Rio Grande. The specimens composing the two series are of very nearly corresponding ages. The northern series (four from different points on the Upper Missouri, one from Iowa, and one from Oregon) average 5.00 in length and 3.18 in width, the extremes being, in length, 5.22 and 4.92 (4.75 if we include one rather young example), the width ranging from 3.50 to 2.97. The southern series (including two or three from the vicinity of Matamoras, Mexico, and one each from New Mexico and California) averages 4.62 in length and 2.92 in width, the extremes being, in length, 4.75 and 4.50, and in width, 3.07 and 2.80.

The skulls, and especially the molar teeth, in the American Badgers, vary considerably in different individuals, as long since pointed out by

Professor Baird.* Southern specimens differ from northern ones not only in being smaller, but somewhat in color, so that the *T. berlandieri* of Professor Baird may perhaps be entitled to subspecific rank (*T. americana* subsp. *berlandieri*), though the material at hand indicates that the two forms will be found to thoroughly intergrade. The chief differences in coloration consist in the more reddish-gray tint of the southern form, with a decided tendency to a continuous light dorsal stripe, instead of this stripe being restricted to the head.

Measurements of eleven skulls of TAXIDEA AMERICANA.

Catalogue number.	Locality.	Sex.	Length.	Width.	Remarks.
11505	Upper Missouri		5.22	3.50	
1178	do		5.12	3.12	
2148	do		4.75	3.07	Rather young.
2078	Quisquaton, Iowa		5.06		Imperfect.
12908	Fort Randall, Dak		4.95	3.25	
2033	Upper Des Chutes, Oreg		4.92	2.97	
4196	Fort Crook, Cal		4.60	3.07	
3767	New Mexico		4.50	2.80	Rather young; *berlandieri*.
1390	Matamoras, Mexico		4.75	2.94	*berlandieri*.
	do		4.66	2.85	Do.
4135	Texas		4.57	2.94	Do.

LUTRA CANADENSIS.

Specimens of this species from northern and southern localities do not differ materially in size; skulls from Newfoundland, Maine, Lake Superior, Washington, and Georgia agreeing very closely in dimensions. In a series of eighteen (mainly from northern localities), nine attain or exceed a length of 4.25, and three reach 4.50, while two only fall as low as 4.00. Seven specimens from the vicinity of Lake Umbagog, Maine, (in Mus. Comp. Zoöl.) average 4.28 in length and 2.93 in width; two of these reach 4.50 in length and two fall slightly below 4.00 (3.96 and 3.97). Two specimens from Washington, D. C., have a length respectively of 4.45 and 4.50; one specimen from Saint Simon's Island, Georgia, is nearly as large (4.32), while a Fort Cobb specimen has a length of 4.22. These four are the only ones from very southerly points. Four other specimens, from as many localities, range from 4.05 to 4.15; while three specimens from Newfoundland range from 4.03 to 4.25. While these specimens are too few to warrant positive conclusions as to geographical variations, they seem to point to a great constancy of size throughout a wide range of latitude.

* U. S. and Mex. Bound. Survey, Zoöl., p. 21.

Measurements of eighteen skulls of LUTRA CANADENSIS.

Catalogue-number.	Locality.	Sex.	Length.	Width.	Remarks.
501	Newfoundland	.....	4.20	2.75	
498	.....do	.....	4.03	2.53	
500	.....do	.....	4.15	2.57	
490	.....do	.....	4.35	2.90	
555	Umbagog Lake, Maine	.....	4.40	3.00	
556	.....do	.....	4.27	2.85	
557	.....do	.....	4.50	2.90	
559	.....do	.....	3.97	2.70	
558	.....do	.....	3.96	2.70	
489	.....do	.....	4.50	3.00	
4446	Lake Superior	.....	4.15	2.85	
11839	Fort Berthold, Dak	.....	4.25	2.82	
2247	Saranac Lake, New York	.....	4.05	2.57	
13671	Bayfield, Wis	.....	4.06	2.82	
8097	Fort Cobb, Indian Ter	.....	4.22	2.87	
	Washington, D. C	.....	4.50	2.95	
433	.....do	.....	4.45	.....	Imperfect.
3142	Saint Simon's Island, Georgia	.....	4.32	2.75	

MEPHITIS MEPHITICA.

The twenty-nine skulls of this species of which measurements are given below show a wide range of variation in size, and a decided decrease southward. The localities embrace such distant points as California and the Atlantic seaboard on the one hand, and Maine and Texas on the other; but, with one or two exceptions, the specimens from any single locality are unsatisfactorily few. The specimens range in length from 2.60 to 3.50, and in width from 1.60 to 2.25! Yet there is not a specimen included in the series that is not so old as to have all the cranial sutures obliterated. A portion of the difference is doubtless sexual, but the specimens, unfortunately, have not the sex indicated. Ten of the specimens may be considered as western, coming mainly from Utah and California; ten others are from Maine and Massachusetts, and one from Northeastern New York; three are from Pennsylvania; and of the remaining five, four are from Texas, and one from Louisiana. The western series of ten average 3.10 in length and 1.95 in width, ranging in length from 2.85 to 3.50 and in width from 1.70 to 2.25. The New England series of ten average 2.88 in length and 1.72 in width, ranging in length from 2.70 to 3.25 and in width from 1.53 to 1.85. The single New York specimen scarcely varies from the average of the New England series, while the Pennsylvania specimens fall a little below. The five southern specimens average 2.73 in length, or a little below the New England series, ranging in length from 2.60 to 290.*

It thus appears that the western specimens are decidedly the largest of all, and that the northern are somewhat larger than the southern, the specimens compared being of corresponding ages, though of unknown sex, but doubtless comparable in this respect also.

The difference in size amounts to above one-fourth the size of the largest specimen and above one-third the size of the smallest. Between the western and southern series, the average difference amounts to one-third of the average size of the larger series! The western series includes the so-called *Mephitis occidentalis* of Baird, based on California specimens, and whose chief difference is merely that of larger size; yet the four specimens from Ogden, Utah (Coll. Mus. Comp. Zoöl.), considerably

* The range in width is not fairly indicated, owing to two of the smaller specimens being imperfect.

excelled in size the three from California. The southern series represents the so-called *M. varians* of Gray and Baird.

The unsatisfactory character of the several species of North American Skunks of the *mephitica* group, and the wide range of color-variation among individuals from the same locality, I have previously had occasion to notice,* and a re-examination of the subject confirms the conclusions then announced, which, I am happy to find, have recently received the support of Dr. Coues, who has lately made a study of this group.† As Dr. Coues has remarked, and as the subjoined measurements show, few species of animals vary so much in size and in cranial characters as the present, independently even of sex and age. Some specimens are not only more than one-fourth larger than others, but "there is a corresponding range of variation in contour. Compared with an ordinary ratio of osteological variability," says Dr. Coues, "the discrepancies are almost on a par with those exhibited by the coloration of the animal when set over against the more constant markings of most animals." In view of this great degree of variability, however, Dr. Coues has ventured to describe a "new species" (*M. frontata*), based on a fossil skull from one of the bone-caves of Pennsylvania, as it seems to me, unadvisedly. The specimen, though that of a very aged individual, is scarcely larger (see subjoined table) than the average of specimens from the Eastern States, its chief difference from the average skull consisting in an abnormal tumidity of the frontal region, arising evidently from disease. It is a feature by no means confined to the present example, but is merely an extreme enlargement of the sinuses of the frontal region often seen in specimens of the existing animal, evidently resulting from disease. In No. 917 (Albany, N. Y.), No. 8099 (Fort Cobb, Ind. T.), No. 1878 (Calcasieu Pass, La.), and No. 1620 (Indianola, Tex.), the same tendency is strongly marked, which, in some of these specimens, had they attained equal age, must have resulted in a malformation nearly or quite as great as is seen in the fossil skull in question.

In this connection, I may add that a pretty careful examination of the fossil remains of *Carnivora*, collected by Professor Baird many years since from the bone-caves of Pennsylvania (of which this fossil skull of the Skunk forms a part), has failed to show any of them to be specifically different from the species now or recently living in the same region. Many of them are remains of individuals of large size, but not exceeding the dimensions of specimens of the recent animal from the same or contiguous regions. These remains include, among others, the following species:—*Lynx rufus*, *Urocyon virginianus*, *Mustela pennanti*, *Mustela americana*, *Putorius vison*, *Lutra canadensis*, *Mephitis mephitica* (other specimens than the "*frontata*" skull), *Procyon lotor*, *Ursus americanus*, etc.

* See Bull. Mus. Comp. Zoöl., vol. i, pp. 178–181, Oct., 1869.

† Bull. U. S. Geol. and Geog. Surv. of the Territories, vol. i, No. 1, pp. 7–15, 1875.

Measurements of twenty-nine skulls of MEPHITIS MEPHITICA.

Catalogue-number.	Locality.	Sex.	Length.	Width.	Remarks.
2617	Petaluma, Cal	.....	3.30	2.07	
3271	.....do	.....	3.08	2.04	
2434	Port Townsend, Oreg	.....	2.93	1.70	
4195	Fort Crook, Cal	.....	2.85	.....	
417	Ogden, Utah	.....	3.12	1.87	
419	.....do	.....	3.50	2.25	Very old.
416	.....do	.....	3.10	1.90	
418	.....do	.....	2.98	1.85	
10008	Wyoming Territory	.....	3.15	2.05	
3327	Fort Laramie	.....	2.96	1.78	
575	Upton, Me	.....	3.25	.....	Very old.
580	.....do	.....	3.00	1.85	
577	.....do	.....	2.87	1.75	
574	.....do	.....	2.85	1.73	
583	Norway, Me	.....	2.90	1.75	
578	.....do	.....	2.70	1.70	
569	.....do	.....	2.87	1.78	
567	Massachusetts	.....	2.70	1.53	
568	.....do	.....	2.75	.....	
576	.....do	.....	2.72	1.70	
3816	Essex County, New York	.....	2.88	1.78	
2232	Bone-caves, Pennsylvania	.....	2.90	.....	Fossil; *M. frontata* Coues.
610	Carlisle, Pa	.....	2.87	.....	Imperfect.
4833	Chester County, Pennsylvania	.....	2.60	1.65	
1620	Indianola, Tex	.....	2.80	1.78	
1004	Eagle Pass, Tex	.....	2.60	.....	Imperfect.
1113	.....do	.....	2.68	1.60	
1395	Matamoras, Tex	.....	2.90	1.90	
1878	Calcasieu, La	.....	2.68	.....	Imperfect.

URSUS ARCTOS, ET VARS.

In a series of seventeen rather aged skulls of *Ursus arctos* and its varieties (all but one of the specimens being American), the largest specimens are from California, the great metropolis of the "Grizzlies". Of the eight skulls from this State, five attain a length of 14.50 or more, three exceeding 15.00, and one reaching 15.60, while the smallest falls as low as 13.25. Of five specimens from different localities in the Rocky Mountains, three reach or exceed 14.40, the extremes being 14.75 and 13.25. Of three specimens from the Arctic coast, one has a length of 13.40, and the others respectively 12.40 and 12.35. A single specimen from Russia has a length of 13.75. These I regard as being all unquestionably conspecific, though perhaps referable to two or three subspecies. Whether strictly so or not, we have the fact of the culmination in size in the region where the Grizzlies are most abundant, namely, in California; these two facts, greatest abundance and largest size, seeming to indicate this region as presenting the most favorable conditions for the existence of these animals. The Rocky Mountain specimens average considerably smaller than the Californian; and though the species is pretty frequent here it is far less abundant than on the Pacific slope, especially in California and Oregon. The Franklin Bay specimens, representing the so-called "Barren Ground Bear", and indistinguishable from the true *arctos* of the Old World, are smaller even than the specimens from the Rocky Mountains.

Measurements of seventeen skulls of URSUS ARCTOS (*chiefly subsp.* HORRIBILIS).

Catalogue-number.	Locality.	Sex.	Length.	Width.	Remarks.
3837	Sacramento, Cal	.....	15.60	9.05	Very old.
1218	Monterey, Cal	.....	15.75	.....	Do.
7401	....do	.....	14.05	7.75	
3630	....do	.....	16.00	8.50	Very old.
6905	....do	♂	15.40	8.10	Do.
3538	Fort Tejon, Cal	♀	13.25	7.45	
3537	....do	♂	14.75	8.90	
3536	....do	♀	14.50	9.20	
2086	Los Nogales, Sonora	.....	14.40	8.00	Var. "*horricæus*" Baird.
990	Coppermines, N. Mex	♂	14.50	8.25	Do.
3818	Medicine Bow Mountains (eastern slope)	.....	14.75	8.50	
13245	Big Porcupine Creek, Mont	♀	13.25	7.40	
14785	Nebraska	.....	13.45	6.90	
7146	Franklin Bay, Arctic Sea	♂	12.35	7.30	"Barren Ground Bear."
6551	....do	.....	13.40	8.65	Do.
6548	....do	.....	12.45	7.25	Do.
4441	Russia	.....	13.75	7.53	

The question of the relationship of the large Bears of North America to those of the Old World has long been a vexed one, and is, of course, one not easily settled. In the present collection are thirty-three skulls, representing various ages, but the greater part are adult. These include two only from the Old World, six from the Arctic coast, eleven from California, and fourteen from various localities in the Rocky Mountains, from Idaho Territory to Arizona.

Among the American specimens are two rather easily distinguishable forms, one of which is the large Grizzly, or *U. horribilis* of authors, from the western parts of the United States; the other, the smaller so-called Barren Ground Bear of Arctic America; both being undoubtedly specifically distinct from the *Ursus americanus*. The Barren Ground form* differs from the more southern Grizzly not only in its smaller size, but in its strong tendency to a depression of the frontal region of the skull, where the simple flattening of this region in the Grizzly is here often carried so far as to form a well-marked concavity as in the true *arctos* of the Old World. Sometimes, however, *U. horribilis* also presents a considerable depression between the postorbital processes, as great even as in average specimens of *U. arctos*, as is the case in No. 7401 from Monterey, Cal. The Barren Ground Bear's skull generally presents a more dog-like aspect, in consequence of the thickening superiorly of the postorbital border of the frontals, than is seen in *U. horribilis*, it approaching in this respect to the form seen in *Ursus spelæus*, where this feature attains its highest development, resulting in the very strong frontal depression so characteristic of the skulls of that species.

The dentition of *U. arctos*, *U. richardsoni*,† and *U. horribilis* presents no important differences, the chief difference being the relatively rather smaller size of the teeth in the latter. The form of the last upper molar is almost precisely the same in the two first named, and the differences presented by *U. horribilis* are both slight and inconstant. In *U. richardsoni*, this tooth narrows gradually, and about equally, on each side posteriorly, almost exactly as in *U. arctos*, it being widest at or near its extreme anterior border. While this is sometimes the case in *U. horribilis*, its greatest breadth is generally one-fifth the length of the tooth behind the anterior border, and the tooth is relatively broader posteriorly

* Named by Captain Mayne Reid, in one of his stories, "*Ursus Richardsoni*"!

† The Barren Ground Bear skulls in the collection are labeled with this name.

than in the others. Specimens of *U. horribilis*, from the same locality, however, differ more among themselves in this respect than the average difference between *U. horribilis* and *U. arctos*. The teeth, however, in *U. arctos* are relatively larger than in *U. horribilis*, the difference being quite appreciable. The teeth of the Franklin Bay specimens (*U. richardsoni*), on the other hand, are of the same relative size as in the Old World examples of *U. arctos*.

After a careful consideration of the subject, I believe the Barren Ground Bear of Richardson (*U. richardsoni* of Mayne Reid) to be not even subspecifically distinct from the true *U. arctos* of the Old World. The Grizzly, from its larger size, widely different geographical distribution, apparently larger claws, slight differences in the dentition and in the form of the frontal region of the skull, may be so regarded (*U. arctos* subsp. *horribilis*), as it can hardly be doubted that it gradually passes into the Barren Ground form.

The subjoined table of detailed measurements of the skulls of *U. arctos horribilis* indicates the wide range of individual variation that may be looked for among skulls from the same locality. These variations not only affect the ratio of width to length, through the greater or less elongation of the facial portions of the skull as compared to the rest, but also all the other proportions are more or less variable, including even the teeth themselves. Thus, two specimens from California, of practically the same length (15.60 and 15.40), vary in breadth from 8.10 to 9.05, while two others vary still more, one, with a breadth of 9.20, having a length of only 14.50, while another, with a breadth of 8.50, has a length of 16.00! In these last, the ratio of width to length varies from 0.53 to 0.63. In two California specimens of practically the same length (15.60 and 15.75), the length of the last molar varies from 1.43 to 1.58. In the series of California specimens alone, the length of the last molar varies from 1.35 to 1.66, and the width of the same from 0.67 to 0.80, the widest tooth being, furthermore, *not* the longest. As already stated, the last upper molar attains its greatest width near the anterior border, but in several specimens the width of the anterior third is nowhere greater than the width of the tooth at its middle; and the same is also sometimes true in *U. richardsoni*.

Measurements of seventeen skulls of URSUS ARCTOS (*belonging chiefly to subsp.* HORRIBILIS).

Catalogue number.	Original number.	Locality.	Sex.	Total length.	End of intermaxillaries to occipital condyles.	Greatest width.	Distance between orbits.	Expanse of orbital processes.	Nasal bones, length.	Nasal bones, width before.	Least width of muzzle behind the canines.	Upper incisors from front to molars.	Upper incisors from front to hinder margin of palate.	Distance between external edges of canines.	Upper molars, length taken together.	Upper molars, distance between.	Lower jaw, length.	Lower jaw, height.	Anterior end of intermaxillaries to anterior end of nasals.	Anterior end of intermaxillaries to the orbit.	Anterior end of intermaxillaries to postorbital processes.	Anterior end of nasals to postorbital processes.	Length of crown of last molar.	Nature of specimen.
3837	.....	Sacramento, Cal.....	....	15. 60	14. 45	9. 05	3. 25	4. 65	....	1. 48	3. 28	3. 30	7. 50	3. 32	2. 92	2. 10	10. 50	4. 65	2. 80	5. 65	7. 85	5. 00	1. 43	Very old.
1218	.....	Monterey, Cal	....	15. 75	14. 50	....	3. 40	5. 20	....	1. 45	3. 05	3. 52	7. 85	3. 65	3. 15	1. 92	10. 55	4. 70	3. 17	6. 05	8. 05	5. 15	1. 58	Do.
7401	.....	.....do	....	14. 05	13. 25	7. 75	3. 00	4. 15	3. 70	1. 35	2. 70	3. 00	7. 40	2. 90	3. 00	1. 75	9. 60	4. 25	2. 90	5. 35	7. 35	4. 65	1. 52	
3630	.....	.....do	....	16. 00	14. 75	8. 50	3. 25	4. 70	....	1. 58	3. 27	3. 48	8. 15	3. 50	3. 26	1. 95	10. 90	4. 78	3. 20	6. 20	8. 52	5. 50	1. 57	Very old.
6905	.....	.....do	♂	15. 40	14. 20	8. 10	3. 25	4. 58	4. 05	1. 50	3. 25	3. 40	7. 40	3. 40	3. 08	2. 13	10. 45	4. 43	2. 90	5. 75	7. 75	5. 15	1. 53	
3538	$\frac{1322}{134}$	Fort Tejon, Cal	♀	13. 25	12. 40	7. 45	2. 97	4. 40	3. 70	1. 32	2. 75	2. 87	6. 60	2. 87	2. 75	1. 92	.....	.....	2. 57	5. 05	7. 25	4. 72	1. 35	
3537	$\frac{1333}{1332}$	.....do	♂	14. 75	13. 75	8. 90	2. 93	4. 65	3. 78	1. 45	3. 00	3. 22	7. 40	3. 37	3. 08	1. 87	10. 15	4. 40	2. 90	5. 50	7. 75	4. 90	1. 55	
3536	$\frac{1985}{763}$	.....do	♀	14. 50	13. 65	9. 20	3. 20	5. 00	4. 12	1. 52	3. 12	3. 15	7. 75	3. 60	3. 10	2. 10	10. 00	4. 60	2. 93	5. 60	7. 65	4. 80	1. 50	
2086	.....	Los Nogales, Sonora	....	14. 40	13. 65	8. 00	2. 95	4. 50	3. 35	1. 48	2. 77	3. 00	6. 80	2. 95	2. 87	1. 85	9. 45	4. 07	3. 15	5. 25	7. 45	4. 38	1. 42	Variety "*horricæus*" Baird.
990	.....	Copper Mines, N. Mex	♂	14. 50	13. 05	8. 25	3. 15	4. 72	....	1. 45	2. 76	3. 12	6. 90	3. 15	2. 83	1. 80	9. 45	4. 30	3. 10	5. 65	7. 60	4. 67	1. 37	"*horricæus*" (type).
3818	.....	Medicine Bow Mts., east slope.	....	14. 75	13. 55	8. 50	3. 10	4. 45	....	1. 35	2. 90	3. 10	7. 15	3. 00	2. 63	1. 73	10. 65	4. 45	2. 94	5. 50	7. 45	4. 58	1. 35	
13245	.....	Big Porcupine Creek, Mont...	♀	13. 25	12. 60	7. 40	2. 75	3. 75	3. 55	1. 33	2. 75	2. 85	6. 40	2. 80	2. 85	1. 80	9. 00	3. 85	2. 82	4. 90	6. 80	4. 20	1. 47	Very old.
14785	.....	"Nebraska".....	....	13. 45	12. 80	6. 90	2. 57	3. 73	3. 90	1. 35	2. 50	3. 08	6. 90	2. 57	2. 87	1. 60	9. 25	3. 75	2. 62	5. 32	7. 25	4. 67	1. 43	Middle-aged.
4441	.....	Russia.....	....	13. 75	13. 20	7. 53	2. 78	4. 20	3. 50	1. 33	2. 83	2. 98	6. 85	2. 97	3. 00	1. 80	9. 40	3. 75	3. 08	5. 62	7. 50	4. 62	1. 47	Do.
7146	.....	Franklin Bay, Arctic Sea.....	♂	12. 35	11. 85	7. 30	2. 88	4. 00	3. 32	1. 16	2. 80	2. 60	6. 25	2. 70	2. 78	1. 82	8. 43	3. 65	2. 20	4. 53	6. 25	4. 23	1. 40	Rather young.
6551	.....	.....do	....	13. 40	12. 70	8. 65	3. 08	4. 50	3. 40	1. 38	3. 05	2. 80	6. 70	3. 08	2. 90	2. 25	9. 25	4. 12	2. 90	4. 87	6. 65	3. 90	1. 33	Middle-aged.
6548	.....	.....do	....	12. 45	.....	7. 25	2. 75	4. 05	3. 30	1. 20	2. 55	2. 72	6. 05	2. 55	2. 72	1. 82	8. 20	3. 60	2. 63	4. 65	6. 42	3. 93	1. 37	Do.

Measurements of the molar teeth of URSUS ARCTOS *et var.*

Catalogue number.	Locality.	Sex.	Upper first molar.		Upper second molar.		Upper third molar.		Remarks.
			Length.	Width.	Length.	Width.	Length.	Width.	
13245	Big Porcupine Creek, Mont.	.....	0.60	0.52	0.91	0.63	1.40	0.65	Subsp. *horribilis.*
3318	Medicine Bow Mountains, Wash.	.....	0.57	0.48	0.74	0.60	1.36	0.67	Do.
990	Copper Mines, N. Mex	.....	0.60	0.54	0.92	0.70	1.35	0.70	Do.
7401	Monterey, Cal	.....	0.67	0.52	0.91	0.65	1.50	0.74	Do.
3630	.....do	.....	0.72	0.65	0.97	0.75	1.66	0.75	Do.
6905	.....do	.....	0.67	0.53	0.93	0.64	1.56	0.80	Do.
3537	Fort Tejon, Cal	.....	0.65	0.50	0.93	0.69	1.52	0.75	Do.
3536	.....do	.....	0.65	0.51	0.93	0.67	1.43	0.72	Do.
3538	.....do	.....	0.55	0.45	0.87	0.66	1.35	0.67	Do.
6557	Arctic coast	.....	0.66	0.51	0.95	0.70	1.37	0.70	"*richardsoni.*"
6548	.....do	.....	0.57	0.45	0.88	0.64	1.41	0.68	Do.
7146	.....do	.....	0.62	0.48	0.92	0.65	1.40	0.71	Do.
4441	Russia	.....	0.68	0.57	0.94	0.72	1.40	0.75	*arctos.*
1033	Northern Sweden	.....	0.63	0.40	0.90	0.65	1.27	0.67	Do.

URSUS AMERICANUS.

Seventeen skulls of this species, embracing all the aged ones in the collection, seem to indicate a slight increase in size to the southward. Four aged skulls from Louisiana and Florida range in length from 12.50 to 13.10, and three others, more or less immature, would doubtless have attained an equal size had they lived to be as old. A Georgia specimen, also not full-grown, has a length of 11.15, and in old age would probably have considerably exceeded 12.00. The other specimens, all full-grown and some of them very old, range from 9.90 to 12.15, most of them falling between 10.25 and 11.75. The largest (12.15) is from Puget Sound. A New York specimen comes next in size (11.90); New Mexican specimens next, the Alaskan being the smallest. This certainly points to a southward increase in size; but a much larger series would, of course, be necessary in order to establish positively whether the increase is in this direction. It would seem natural to expect it to be so, since the Bear is a hibernating animal, and is active for a much shorter period in northern than in southern localities.

It seems worthy of remark that only a small proportion of the skulls of Bears, and even of other *Carnivora*, including the Minks, Otters, and Martens, seen in collections, are specimens of mature age. The proportion of fully adult and very aged specimens is much greater among those from the unsettled parts of the continent than among those from the older States, owing, doubtless, to these animals being so closely hunted in the more settled districts that they rarely live to a very great age.

Measurements of seventeen skulls of URSUS AMERICANUS.

Catalogue-number.	Locality.	Sex.	Length.	Width.	Remarks.
3834	Key Biscayne, Fla	....	13.10	.....	Very old.
1155	Prairie Mer Rouge, La	....	12.90	7.40	Do.
1156	....do	....	12.70	7.45	Do.
987	....do	....	12.50	7.35	Do.
1154	....do	....	11.10	6.10	Middle-aged.
988	....do	....	10.60	5.95	Rather young.
3894	Georgia	....	11.15	6.10	Middle-aged.
3798	New York	....	11.80	7.35	
2250	....do	....	11.00	7.55	
994	Copper Mines, N. Mex	....	9.90	6.07	Very old; brown.
992	....do	....	11.35	7.05	Do.
991	....do	....	11.75	6.85	Very old; black.
12398	Henry's Lake, Wyo	♂	11.40	7.40	
3650	Puget Sound	....	12.15	7.40	
6949	....do	....	10.20	6.00	
8695	Alaska	....	10.25	6.30	
9477	....do	....	10.07	5.15	

The range of variation not dependent upon locality is more fully indicated in the table of detailed measurements of these skulls given below, but certain of the most prominent points of variation are not well shown by any series of measurements. Especially is this the case in respect to the amount of convexity different specimens present, in which individual variation is strongly marked. One of the most prominent distinctions of *U. americanus* as compared with *U. arctos* and its varieties is the great convexity of the upper outline of the skull, both antero-posteriorly and transversely. Another feature is the constriction of the facial portion, giving a concave outline to the nasals when viewed in profile. But there are exceptions, even to the first of these distinctions, one or two specimens occurring (especially No. 2250 from New York) in which the flattening of the frontal region is as marked as in average skulls of *U. horribilis*. This flattening is also well marked in Nos. 1155 and 1156, from Louisiana. The greatest convexity is reached in No. 3484, from Key Biscayne, Fla.; this and No. 2250 (New York) presenting the two extremes in respect to convexity. No. 3894, from Georgia, has about the same degree of convexity as the Florida specimen. No. 2250 is also remarkable for the shortness of the facial portion of the skull, thereby imparting to it a greater than the usual ratio of width to length. In this specimen (mentioned by Professor Baird as remarkable for its width*), the width is 0.69 of the length. In another, from Louisiana (No. 1155), it falls as low as 0.54! The average ratio of width to length is about 0.56 to 0.60.

The teeth of *U. americanus* seem, in looking at them, to be relatively much smaller than in *U. arctos*, but, upon careful measurement, the difference is quite small, while they are of the same relative size as those of *U. horribilis*. In *U. americanus*, the temporal ridges pass more abruptly inward toward the medial line of the skull than in either *U. horribilis* or *U. arctos*.

The most important distinction presented by *U. americanus* is the form of the last upper molar. In *U. americanus*, the crown is widest at the middle, narrowing both anteriorly and posteriorly, but most rapidly posteriorly. The inner border is nearly straight; the outer has a prominent medial convexity, while in *U. horribilis* and *U. arctos* both outlines are nearly straight and generally about equally convergent. In *U. americanus*, the anterior third of the last molar is generally narrower

*Mam. N. Amer., p. 227.

than the middle third, though sometimes equaling it; but it is never wider, as it almost invariably is in *U. horribilis* and *U. arctos*. The Puget Sound specimens have the anterior third the narrowest; in Alaskan specimens, it reaches its extreme width, while New York and Louisiana examples present the medium phase.

The skulls of *U. cinnamomeus* do not seem to be in any way distinguishable from average skulls of *U. americanus*, the distinction between them being one of color only and inconstant as characterizing any particular locality or region.

The upper molar teeth of *U. americanus*, as shown by the subjoined measurements, differ considerably in size in fully adult specimens. The first molars range in length of crown from 0.40 to 0.52, and in the width of the same from 0.27 to 0.42. The second ranges in length from 0.67 to 0.78; the third from 0.94 to 1.22, and in width from 0.51 to 0.67! In two specimens, with the first 0.44 in length, the third in one has a length of only 0.94 and the other 1.07! In another, the length of the first molar is 0.41 and the third 1.11. In still another, with the length of the first molar 0.43, the length of the third is 0.96. In two others, while the length of the first molar is 0.50 in each, the third molar in one has a length of 1.22 and in the other 1.15.

The largest skulls of *U. americanus* nearly equal in size the smaller skulls of *U. arctos horribilis*, and actually overlap the series from Franklin Bay and the measurements given by authors of the true *arctos* of the Old World. In view of this fact, and of the great range of individual variation in size, cranial and dental characters, and the unreliability of color as a specific character, I too hastily, in former papers,* referred all the American land-bears, including the *U. americanus*, to the *U. arctos*, which I am now convinced was a mistake; *U. americanus* being, I now believe, unquestionably specifically distinct, and the Grizzly subspecifically separable from the *U. arctos* of the Old World.

* Bulletin Mus. Comp. Zoöl., vol. i, pp. 184–192, Oct., 1869; Bulletin Essex Institute, vol. vi, pp. 46, 54, 59, 63, 1874.

Measurements of seventeen skulls of URSUS AMERICANUS.

Catalogue-number.	Locality.	Sex.	Total length.	Anterior end of intermaxillaries to occipital condyles.	Greatest width.	Distance between orbits.	Expanse of postorbital processes.	Nasal bones, length.	Nasal bones, width before.	Least width of muzzle behind the canines.	Upper incisors, from front to molars.	Upper incisors, from front to hinder margin of palate.	Distance between external edges of canines.	Upper molars, length taken together.	Upper molars, distance between.	Lower jaw, length.	Lower jaw, height.	Anterior end of intermaxillaries to anterior end of nasals.	Anterior end of intermaxillaries to the orbit.	Anterior end of intermaxillaries to postorbital processes.	Anterior end of nasals to postorbital processes.	Length of crown of last molar.	Remarks.
3650	Puget Sound	....	12.15	11.35	7.40	2.80	4.00	3.00	1.10	2.32	2.85	5.82	2.53	2.14	1.64	8.03	3.18	2.55	4.52	6.15	3.80	1.08	Very old.
6949	do	....	10.20	9.80	6.00	2.48	3.45	2.54	1.12	2.18	2.35	4.93	2.15	2.07	1.35	7.10	2.74	2.22	3.75	5.32	3.25	1.00	Do.
8695	Alaska	....	.....	9.75	6.30	2.50	3.60	2.70	1.10	2.08	2.43	5.30	2.15	2.00	1.25	7.15	3.03	2.07	4.00	5.50	3.47	0.98	Do.
9477	do	....	10.07	9.25	5.15	2.33	3.07	2.40	0.90	1.95	2.33	4.85	1.95	2.00	1.37	6.57	2.50	1.98	3.68	5.00	3.10	0.93	
3798	New York	....	11.80	11.10	7.35	2.57	3.80	3.13	1.15	2.35	2.74	5.53	2.63	2.22	1.55	7.50	3.30	2.60	4.35	6.00	3.70	1.00	
2250	do	....	11.00	10.50	7.55	2.77	4.12	2.55	1.18	2.25	2.50	5.33	2.43	1.85	1.75	7.50	3.33	2.12	3.78	5.34	3.35	0.90	
3484	Key Biscayne, Fla	....	13.10	11.75	.....	2.70	4.25	.....	1.20	2.53	2.75	5.85	2.62	2.22	1.72	8.60	4.03	2.80	4.57	6.35	3.85	1.06	
1155	Prairie Mer Rouge, La	....	12.90	12.10	7.40	2.65	3.80	2.55	1.02	2.68	2.57	6.20	2.78	2.48	1.66	8.80	3.73	2.70	4.57	6.20	3.50	1.21	
1156	do	....	12.70	11.60	7.45	2.65	4.00	2.90	1.19	2.37	2.50	5.85	2.70	2.38	1.78	8.05	3.75	2.80	4.30	5.90	3.35	1.18	
987	do	....	12.50	11.75	7.35	2.85	3.80	3.12	1.03	2.50	2.70	6.10	2.65	2.36	1.62	8.25	3.70	2.30	4.45	6.20	4.00	1.15	
1154	do	....	11.10	10.30	6.10	2.44	3.35	2.83	1.10	2.06	2.30	5.30	2.07	2.00	1.35	7.05	3.15	2.07	3.90	5.45	3.50	0.96	Middle-aged.
988	do	....	10.60	10.15	5.95	2.32	3.25	2.73	1.00	2.23	2.25	5.45	2.20	2.25	1.57	7.20	3.05	2.03	3.62	5.20	3.27	1.11	Rather young.
3894	Georgia	....	11.15	10.50	6.10	2.35	3.27	2.80	0.96	2.03	2.46	5.60	2.10	2.20	1.35	7.30	3.15	2.20	4.05	5.62	3.50	1.08	Middle-aged.
994	Copper Mines, N. Mex.	....	9.90	9.20	6.07	2.25	3.30	2.80	1.12	1.95	2.30	5.00	2.10	2.03	1.55	6.75	2.73	2.00	3.60	5.25	3.40	1.03	Very old; brown.
992	do	....	11.35	10.60	7.05	2.45	3.60	2.92	1.08	2.20	2.55	5.60	2.57	2.07	1.54	7.75	3.00	2.50	4.26	6.00	3.50	1.02	Do.
991	do	....	11.75	10.60	6.85	2.56	3.70	2.87	1.12	2.30	2.40	5.75	2.56	2.05	1.56	7.75	3.35	2.30	4.00	5.65	3.65	1.07	Very old; black.
12398	Henry's Lake, Wyo.	♂	11.40	10.60	7.40	2.55	3.82	2.75	1.12	2.35	2.60	5.70	2.45	2.00	1.70	7.80	3.35	2.30	3.95	5.50	3.35	0.95	

Measurements of the molar teeth of URSUS AMERICANUS.

Catalogue-number.	Locality.	Sex.	Upper first molar.		Upper second molar.		Upper third molar.	
			Length.	Width.	Length.	Width.	Length.	Width.
897	Saint Lawrence County, New York	.....	0.50	0.42	0.78	0.60	1.22	0.64
3857	Pennsylvania	.....	0.52	0.35	0.75	0.54	1.17	0.60
8161	Nulato, Alaska	.....	0.50	0.33	0.76	0.54	1.15	0.64
9477	Alaska	.....	0.45	0.38	0.72	0.48	1.00	0.52
8695	do	.....	0.44	0.27	0.67	0.46	0.94	0.51
1155	Prairie Mer Rouge, La	.....	0.42	0.33	0.69	0.47	1.00	0.53
1156	do	.....	0.50	0.39	0.76	0.55	1.18	0.67
987	do	.....	0.50	0.38	0.76	0.58	1.15	0.65
1154	do	.....	0.43	0.35	0.70	0.52	0.96	0.57
988	do	.....	0.41	0.35	0.75	0.57	1.11	0.63
3894	Georgia	.....	0.40	0.32	0.71	0.51	1.08	0.57
991	Copper Mines, N. Mex	.....	0.44	0.33	0.68	0.50	1.07	0.57
994	do	.....	0.43	0.32	0.70	0.50	1.03	0.54

TABULAR SUMMARY.

Species.	Locality.	Number of specimens.	Sex.		Length.	Width.	Remarks.
Canis lupus	Forts Simpson, Yukon, and Rae.	9	....	Average	10.38	5.40	
Do	Forts Benton and Union	16	.....	do	9.45	5.07	
Do	Forts Kearney and Harker.	9	.....	do	9.69	5.18	
Do	Rio Grande and Sonora	3	.....	do	8.37	4.31	
Do	Forts Simpson, Yukon, and Rae.	9	....	Maximum	11.50	6.20	
Do	Forts Benton and Union	16	.....	do	10.50	5.50	
Do	Forts Kearney and Harker.	9	.....	do	10.15	5.50	
Do	Rio Grande and Sonora	3	.....	do	8.75	4.62	
Do	Forts Simpson, Yukon, and Rae.	9	....	Minimum	9.20	4.50	
Do	Forts Benton and Union	16	.....	do	8.75	4.50	
Do	Forts Kearney and Harker	3	.....	do	9.35	4.85	
Do	Rio Grande and Sonora	9	.....	do	7.75	4.05	
Canis latrans	Fort Randall	12	....	Average	7.23	3.61	
Do	Fort Kearney	10	.....	do	7.25	3.65	
Do	California	4	.....	do	7.69	3.75	
Do	Fort Randall	12	....	Maximum	7.60	3.80	
Do	Fort Kearney	10	.....	do	7.95	4.00	
Do	California	4	.....	do	7.60	3.80	
Do	Fort Randall	12	....	Minimum	6.65	3.38	
Do	Fort Kearney	10	.....	do	6.95	3.50	
Do	California	4	.....	do	7.45	3.48	
Vulpes alopex	Alaska	9	....	Average	5.98	3.20	Var. *fulvus.*
Do	Mackenzie River District	18	.....	do	5.80	3.02	Do.
Do	Upper Missouri	9	.....	do	5.78	2.90	"*macrurus.*"
Do	Essex County, New York	12	.....	do	5.40	2.80	Var. *fulvus.*
Do	Europe	5	.....	do	5.58	3.08	Var. *alopex.*
Do	Alaska	9	....	Maximum	6.20	3.32	Var. *fulvus.*
Do	Mackenzie River District	18	.....	do	6.10	3.28	Do.
Do	Upper Missouri	9	.....	do	6.00	3.20	"*macrurus.*"
Do	Esex County, New York	12	.....	do	5.68	2.95	Var. *fulvus.*
Do	Europe	5	.....	do	5.70	3.15	Var. *alopex.*
Do	Alaska	9	....	Minimum	5.70	2.90	Var. *fulvus.*
Do	Mackenzie River District	18	.....	do	5.55	2.87	Do.
Do	Upper Missouri	9	.....	do	5.40	2.78	"*macrurus.*"
Do	Esex County, New York	12	.....	do	5.20	2.70	Var. *fulvus.*
Do	Europe	5	.....	do	5.50	3.04	Var. *alopex.*
Urocyon virginianus	Pennsylvania, Washington, and Virginia.	3	....	Average	4.97	2.64	Var. *virginianus.*
Do	Texas	2	.....	do	4.56	2.64	Do.
Do	Southern California	3	.....	do	4.56	2.54	Do.
Do	Tehuantepec, Mexico	3	.....	do	4.20	2.32	Do.
Do	Islands off California	3	.....	do	3.80	2.03	Var. *littoralis.*
Do	Merida, Yucatan	1	.....		3.75	1.98	Var. *virginianus.*
Do	Pennsylvania, Washington, and Virginia.	3	....	Maximum	4.70	2.70	Do.
Do	Texas	2	.....	do	4.60	2.70	Do.

TABULAR SUMMARY—Continued.

Species.	Locality.	Number of specimens.	Sex.		Length.	Width.	Remarks.
Urocyon virginianus.	Southern California	3	....	Maximum.	4.63	2.65	Var. *virginianus.*
Do.	Tehuantepec, Mexico	3	....	....do	4.40	2.37	Do.
Do.	Islands off California	3	....	....do	3.85	2.23	Var. *littoralis.*
Do.	Pennsylvania, Washington, and Virginia.	3	....	Minimum.	4.62	2.56	Var. *virginianus.*
Do.	Texas	2	....	....do	4.50	2.58	Do.
Do.	Southern California	3	....	....do	4.50	2.43	Do.
Do.	Tehuantepec, Mexico	3	....	....do	4.15	2.25	Do.
Do.	Islands off California	3	....	....do	3.75	2.05	Var. *littoralis.*
Felis concolor.	New York and Oregon	3	....	Average.	7.57	5.15	
Do.	Texas and Louisiana	3	....	....do	8.72	5.48	
Do.	New York and Oregon	3	....	Maximum.	7.80	5.25	
Do.	Texas and Louisiana	3	....	....do	8.75	5.60	
Do.	New York and Oregon	3	....	Minimum.	7.40	5.05	
Do.	Texas and Louisiana	3	....	....do	8.40	5.35	
Felis pardalis.	Matamoras, Mexico	5	....	Average.	4.98	3.33	
Do.	Costa Rica	4	....	....do	5.89	3.86	
Do.	Southern Mexico and Central America.	8	....	....do	5.78	3.74	Includes the Costa Rican series.
Do.	Matamoras, Mexico	5	....	Maximum.	5.25	3.50	
Do.	Costa Rica	4	....	....do	6.20	4.19	
Do.	Southern Mexico and Central America.	8	....	....do	6.20	4.19	
Do.	Matamoras, Mex	5	....	Minimum.	4.50	3.05	
Do.	Costa Rica	4	....	....do	5.35	3.60	Includes the Costa Rican series.
Do.	Southern Mexico and Central America.	8	....	....do	5.35	3.60	
Lynx rufus	British North America	9	....	Average.	5.01	3.52	"*canadensis.*"
Do.	Washington and Oregon Territories.	7	....	....do	5.03	3.56	"*fasciatus.*"
Do.	Texas and Matamoras, Mex	8	....	....do	5.00	3.40	"*maculatus.*"
Do.	United States (mainly Ft. Tejon, Cal.)	10	....	....do	4.91	3.47	"*rufus.*"
Do.	British North America	9	....	Maximum.	5.30	3.70	"*canadensis.*"
Do.	Washington and Oregon Territories.	7	....	....do	5.50	3.95	"*fasciatus.*"
Do.	Texas and Matamoras, Mex	8	....	....do	5.27	3.72	"*maculatus.*"
Do.	United States (mainly Ft. Tejon, Cal.)	10	....	....do	5.50	3.82	"*rufus.*"
Procyon lotor.	New York, Pennsylvania, and Georgia.	15	....	Average.	4.27	2.91	
Do.	Southern Texas and California.	6	....	....do	4.57	3.11	
Do.	Southern Mexico and Costa Rica.	9	....	....do	4.60	3.15	
Do.	New York, Pennsylvania, and Georgia.	15	....	Maximum.	4.57	3.03	
Do.	Southern Texas and California.	6	....	....do	4.78	3.38	
Do.	Southern Mexico and Costa Rica.	9	....	....do	4.85	3.42	
Putorius vison.	Alaska (chiefly)	18	♂♀	Average.	2.68	1.58	
Do.	New York	13	♂♀	....do	2.40	1.34	
Do.	Alaska (chiefly)	12	♂♀	....do	2.81	1.63	
Do.	....do	6	♂♀	....do	2.48	1.46	
Do.	....do	12	♂	Maximum.	3.02	1.90	Male.
Do.	New York	6	♂	....do	2.60	1.48	Do.
Do.	Alaska (chiefly)	2	♀	Minimum.	2.30	1.40	Female.
Do.	New York	4	♀	....do	2.17	1.18	Do.
Mustela americana.	Peel River	4	♂	Average.	3.39	2.07	
Do.	Yukon River	9	♂	....do	3.34	1.98	
Do.	Fort Good Hope	5	♂	....do	3.24	1.95	
Do.	Lake Superior	10	♂	....do	3.14	1.76	
Do.	Umbagog Lake, Maine	8	♂	....do	2.96	1.72	
Do.	Northern New York	5	♂	....do	3.02	1.61	
Do.	Peel River	4	♂	Maximum.	3.50	2.12	
Do.	Yukon River	9	♂	....do	3.55	2.15	
Do.	Fort Good Hope	5	♂	....do	3.37	2.05	
Do.	Lake Superior	10	♂	....do	3.23	1.89	
Do.	Umbagog Lake	8	♂	....do	3.10	1.85	
Do.	Northern New York	5	♂	....do	3.10	1.68	
Do.	Peel River	4	♂	Minimum.	3.35	2.02	
Do.	Yukon River	9	♂	....do	3.00	1.73	
Do.	Fort Good Hope	5	♂	....do	3.15	1.73	
Do.	Lake Superior	10	♂	....do	3.02	1.65	

TABULAR SUMMARY—Continued.

Species.	Locality.	Number of specimens.	Sex.		Length.	Width.	Remarks.
Mustela americana ..	Umbagog Lake	8	♂	Minimum .	2.73	1.50	
Do	Northern New York	5	♂	....do	2.92	1.50	
Taxidea americana ..	Northern localities	5	....	Average ..	5.00	3.18	
Do	Southern localities	5	....	....do	4.62	2.92	
Do	Northern localities	5	....	Maximum.	5.22	3.50	
Do	Southern localities	5	....	....do	4.75	3.07	
Do	Northern localities	5	....	Minimum .	4.92	2.97	
Do	Southern localities	5	....	....do	4.50	2.80	
Lutra canadensis	Newfoundland and Umbagog Lake, Maine.	10	....	Average ..	4.24	2.79	
Do	Southern localities	4	....	....do	4.37	2.86	
Do	Newfoundland and Umbagog Lake, Maine.	10	....	Maximum.	4.50	3.00	
Do	Southern localities	4	....	....do	4.50	2.95	
Do	Newfoundland and Umbagog Lake, Maine.	10	....	Minimum .	3.96	2.53	
Do	Southern localities	4	....	....do	4.22	2.75	
Mephitis mephitica..	Western localities	10	....	Average ..	3.10	1.95	
Do	New England	10	....	....do	2.88	1.72	
Do	Southern localities	5	....	....do	2.73	.....	
Do	Western localities	10	....	Maximum.	3.50	2.25	
Do	New England	10	....	....do	3.25	1.85	
Do	Southern localities	5	....	....do	2.90	.....	
Do	Western localities	10	....	Minimum .	2.85	1.70	
Do	New England	10	....	....do	2.70	1.53	
Do	Southern localities	5	....	....do	2.60	.....	
Ursus arctos	California	8	....	Average ..	14.81	8.42	Subsp. *horribilis.*
Do	Rocky Mountains	5	....	....do	12.07	7.81	Do.
Do	Arctic coast	3	....	....do	12.77	7.73	Subsp. *arctos.*
Do	California	8	....	Maximum.	16.00	9.20	Subsp. *horribilis.*
Do	Rocky Mountains	5	....	....do	14.75	8.50	Do.
Do	Arctic coast	3	....	....do	13.40	8.65	Subsp. *arctos.*
Do	California	8	....	Minimum .	13.25	7.45	Subsp. *horribilis.*
Do	Rocky Mountains	5	....	....do	13.25	6.90	Do.
Do	Arctic coast	3	....	....do	12.45	7.25	Subsp. *arctos.*
Ursus americanus ...	Georgia, Florida, and Louisiana.	7	....	Average ..	12.01	6.72	
Do	New York	2	....	....do	11.40	7.45	
Do	New Mexico	3	....	....do	11.00	6.66	
Do	Puget Sound and Alaska	4	....	....do	10.67	6.21	
Do	Georgia, Florida, and Louisiana.	7	....	Maximum.	13.10	7.40	
Do	New York	2	....	....do	11.80	7.55	
Do	New Mexico	3	....	....do	11.75	7.05	
Do	Puget Sound and Alaska	4	....	....do	12.15	7.40	
Do	Georgia, Florida, and Louisiana.	7	....	Minimum .	10.60	5.95	
Do	New Mexico	3	....	....do	9.90	6.07	
Do	Puget Sound and Alaska	4	....	....do	10.07	5.15	

SEXUAL, INDIVIDUAL, AND GEOGRAPHICAL VARIATION IN LEUCOSTICTE TEPHROCOTIS.

By J. A. Allen.

Some months since, my attention was called by Capt. Charles Bendire, U. S. A., to the fact of the existence of a well-marked difference in color between the sexes of two varieties of *Leucosticte tephrocotis*, namely, *littoralis* and *tephrocotis*. Under date of January 28, 1876, Captain Bendire wrote me, "There is a good deal of difference between the sexes of both varieties; so much that they can in almost every case be separated before dissection. The brown on the breasts of the females is much duller than that of the males." This statement, he added, was based on a series of seventy specimens of variety *littoralis* and on a series of about a dozen specimens of variety *tephrocotis*. Under date of April 18, Captain Bendire wrote me further on the subject, he in the mean time having sent me two lots of specimens, about two dozen examples in all, which seemed to fully confirm his statements. In the later account, in speaking of a series of eighty-five specimens of variety *littoralis*, of which the sex of each had been determined by careful dissection, he says there was not a single female in the whole lot that was as bright as the palest-tinted males. He says further, "I have examined over two hundred skins of variety *littoralis* and about thirty of variety *tephrocotis*. I find a constant difference, and have never yet obtained a female which I could not readily distinguish from a male before skinning; but, nevertheless, every specimen was dissected, and the sex not guessed at." With this letter was forwarded to me by Captain Bendire a series of thirteen skins of variety *littoralis* and three of variety *tephrocotis*, which were selected impartially by himself and Lieut. George R. Bacon, to show the extreme ranges of variation in color in the two sexes of each variety. The series of variety *littoralis* was taken from a lot of eighty-two skins, and is stated to embrace two of the brightest females and several of the dullest males of the whole lot. Separating the series by color, without reference to the labels, I found, on looking at the labels, that I had placed all the females in one series and all the males in the other. In the case of only one specimen was there any reason for hesitancy in making the separation; but this even, I found on reference to the label, I had placed in its proper series. The general aspect of the two series I found was quite different, noticeably so at a considerable distance, through the much paler tints of the females. "Several of the skins", adds Captain Bendire, "are poorly prepared; but they will answer every purpose for description, and I repeat my statement *that they represent the brightest females and dullest males of the whole lot.*" Lieutenant Bacon, who assisted in making the selection, says (writing at the same time) that the series sent to me was made up with great care, so as to show the dullest and brightest of each sex. "I have prepared", Lieutenant Bacon adds, "some eighty skins of variety *littoralis*, and have found no difficulty in distinguishing the sexes before skinning. I have not

found one female as bright as the dullest male. It is my opinion that the same remarks apply to variety *tephrocotis*."

The above statements of Captain Bendire and Lieutenant Bacon are made in reference to some very positive remarks by Mr. Robert Ridgway, in his recent very elaborate monograph of the genus *Leucosticte*, in respect to sexual variation among the different forms of this group. Mr. Ridgway says, "The American species of this genus fall into two distinct groups, according as the sexes do or do not differ in appearance. In *L. tephrocotis*, in all its forms, there is not the slightest sexual difference; but, in *L. atrata* and *L. australis*, the distinction is very marked." * Under the head of *L. tephrocotis* var. *littoralis*, Mr. Ridgway further says, "In regard to the two sexes, as compared to one another, there is *the same absolute similarity in appearance and size*† that exists in *griseinucha* and *tephrocotis*, *many females*† being more brightly colored and some larger than some males. The apparently larger average of the dimensions of the [*seven*] female[s] indicated in the above measurements is no doubt due to the small number of specimens of the sex examined."‡

Mr. Ridgway's tables seem to indicate that the sex was known in only a small proportion of his specimens, namely, in fourteen (seven males and seven females) out of forty-eight in variety *littoralis*, and in about one-third in variety *tephrocotis*. As already stated, Captain Bendire's specimens, in which the sex was carefully determined by dissection, show a very considerable constant sexual difference in coloration, and, as will be presently shown, also in size.

Through some unfortunate inadvertence, an important error has crept into Mr. Ridgway's table of comparative measurements given on page 60 (*l. c.*); the measurements of the two sexes of *L. tephrocotis* being given as, male, wing, 4.21; tail, 3.12; female, wing, 4.16; tail, 3.12; thus apparently sustaining Mr. Ridgway's generalization in respect to the absence of difference in size in the two sexes of this form. In examining Captain Bendire's specimens, however, I was struck with the apparently smaller size of the females; and, on referring to the measurements recorded on his labels, this apparent difference proved to be real. I then turned to Mr. Ridgway's table of the measurements of *L. tephrocotis*, and, carefully computing the averages given by Mr. Ridgway, I met with quite different results, the thirty-four females giving an average length of wing of 4.05, and of tail of 2.97, against the 4.16 and 3.12 given by Mr. Ridgway, and of course giving a considerably smaller average than for the males, namely, 4.05 against 4.21 for the wing, and 2.97 against 3.12 for the tail.

The averages given in the same connection by Mr. Ridgway for the two sexes of *L. littoralis* (seven males and seven females) are borne out by the table of measurements on which they are based, and seem to indicate that there is no sexual variation in size in this form. Through the kindness of Captain Bendire, I have before me measurements (sent to me by my special request) of forty-two males and twenty-six females of *L. littoralis*, in which the wing averages respectively 4.23 for the males and 4.05 for the females. In addition to these, seven males and six females, which he had previously sent me, gave 4.19 for the length of the wing in the male and 4.02 for the same in the female; thus showing that not only in coloration but also in size there is a well-marked sexual variation in this form as well as in *tephrocotis*, about the

* "Monograph of the genus *Leucosticte*," etc., Bull. U. S. Geolog. and Geograph. Survey of the Territories, No. 2, second series, p. 60, May, 1875.

† Not italicized in the original.

‡ Loc. cit., p. 75.

same, in fact, as occurs in *L. australis*, in which and in *L. atrata* Mr. Ridgway admits it to be well marked.

L. griseinucha is the only other American form of *Leucosticte* alleged by Mr. Ridgway to show no sexual difference in size or color.

In respect to individual variation, Mr. Ridgway remarks as follows: "There is no noticeable range of individual variation among typical examples of any form, and it is only the *transitional specimens connecting two races of one species that vary at all from the normal standard*",* etc. (*l. c.*, p. 60). "Regarding the subject of individual variation, we shall say little, since the immense series at our command shows that this is really insignificant" (*l. c.*, p. 58). These remarks are made in reference to statements of mine quoted by Mr. Ridgway, in which I say that "it *seems probable* that some of the differences whereon certain species† of *Leucosticte* have been founded may be only individual variations". This remark had reference to a series of mounted specimens in the Museum of the Boston Society of Natural History, collected at Central City, Colo., by Mr. F. E. Everett. My remarks respecting these Mr. Ridgway also quotes (*l. c.*, p. 55), and, without having seen them, in commenting on them in foot-notes, assigns them, with great positiveness, to his different species and varieties of *Leucosticte*. In point of fact, there is a considerable range of color-variation in birds of the same sex from the same localities, referable, unquestionably, to the same varieties. These affect not only the intensity of the general tints, but the areas of dusky and ashy markings about the head, as Mr. Ridgway's own comments under *L. littoralis* sufficiently show. Whether or not such specimens form the intergrading links between varieties is immaterial to the point at issue.

In respect to individual variation in size, it is sufficient to say that the length of the wing varies in males of variety *littoralis* from 3.90 to 4.50, and in the females from 3.88 to 4.25; in variety *tephrocotis* (see Mr. Ridgway's tables), from 4.00 to 4.40 in the males, and from 3.90 to 4.30 in the females; in variety *griseinucha*, from 4.25 to 4.75 in the males, and from 3.90 to 4.80 in the females! It seems *a priori* improbable that such a wide range of individual variation in size should obtain without there being also considerable variability in color. Such a state of things would certainly be an exceptional and noteworthy fact in our present knowledge of individual variation among birds.

As the present forms a convenient opportunity for noticing some other strictures by Mr. Ridgway on some general remarks of mine respecting this group, I will add a few words respecting geographical variation among the different forms of *Leucosticte*. Mr. Ridgway, in commenting on my attempt "to show a correlation between the distinguishing characters of the different forms of this genus and the recognized general laws of geographical variation", in which I claim the northern forms to be larger, with more ash on the head, etc., says that, respecting these statements, "there is need of correction. *There is no such variation from the north southward as that stated in the passage quoted, for the northern forms are quite as brightly colored as the most southern ones*,‡ while in the gray-headed races of *L. tephrocotis* it is the more southern one (var. *littoralis*) which has the most gray. Thus, in this latter race the throat is more or less gray, frequently entirely gray; while, in var. *griseinucha*, the whole throat is black. Var. *griseinucha* is also much

* Not italicized in the original.

† Referring, among others, to *L. campestris*, a form Mr. Ridgway himself does not regard as even *varietally* distinguishable.

‡ Not italicized in the original.

brighter-colored than its southern ally, the red being not only deeper and more extended, but the brown of the body is darker and richer! ..... The fact that *littoralis* has more gray on the head than *tephrocotis* cannot be explained by stating that the former is more northern in its distribution, for such is not the case, since the breeding grounds of var. *tephrocotis* are quite as far northward in the interior as those of var. *littoralis* is on the coast. We must, therefore, look to some other explanations of these variations than the laws of climatic modifications which are now recognized. The single instance of apparent correspondence to a general rule of geographical variation is seen in *L. griseinucha* of the Alaskan coast, which is more northern in its habitat than *L. littoralis* of the more southern North-Pacific coast, and is also larger in size."—(*Loc. cit.*, pp. 58, 59.)

From much of the above I must beg leave to dissent, as matters of fact. In the first place, *L. australis* was one of the forms to which I especially referred, and which, because it has since been considered by him as a species rather than a variety, Mr. Ridgway leaves wholly out of consideration in this connection. It is, however, one of the "forms of *Leucosticte*" to be considered, and is also the most *southern*, the *smallest*, and by far the *brightest-colored*.* Climatologically considered, *L. tephrocotis* is the *next most southern*,† is the *next in size* (at least is not *larger* than variety *littoralis*), *and has the least ash* on the head. The breeding-range of *L. littoralis is not known*, and this form *has not yet been taken* on the "southern part of the North-Pacific *coast*", unless Alaska can be so considered. In size, it does not appreciably differ from *L. tephrocotis*. It probably passes the summer *in the interior*, to the westward of the breeding-range of *L. tephrocotis*, and hence under rather more northern climatic conditions. *L. griseinucha* is the *most northern* and much the *largest*. Its darker colors are *easily explainable* on climatic grounds, or by "the laws of climatic modification which are now recognized". Its darker colors simply correlate with those of the generality of the varietal forms of Birds and Mammals inhabiting the same region, remarkable for its immense annual rain-fall and great humidity of

*L. "*atrata*" I have purposely omitted in this consideration. If, however, it is anything more than a melanotic phase of variety *tephrocotis*, it finds in that form a very near ally, and if entitled to specific, or even varietal, recognition, gives further proof of the generalization here proposed, it being much darker and smaller than *tephrocotis*. Mr. Ridgway says of *atrata*, "the pattern of coloration is precisely similar to that of *L. tephrocotis*, but the totally different tints (black or dusky-slate, instead of chocolate-brown), *and the very marked difference between the sexes*,* separate it at once as a distinct species. It may be suggested that it is a melanism of *tephrocotis;* but, if this were so, there would be no such entire uniformity of characters as is exhibited throughout the series of five specimens, while in *tephrocotis* there *is not the slightest sexual difference in colors*."* It will be noticed from the above that one of the strong points relied upon by Mr. Ridgway as distinguishing *atrata* from *tephrocotis* is the supposed absence of sexual variation in *tephrocotis*, and its presence in *atrata*, a distinction founded on error.

†In this view I find I am sustained by Mr. C. E. Aiken, who says, "From these facts, and information derived from other sources, I infer that the gray-cheeked variety (*littoralis*) is the most northern race, and that many of them do not find their way so far south [as Cañon City, Colo.] except in severe winters. In this belief I am strengthened by the fact that, of sixty birds killed in Wyoming in 1870, all but one or two were typical *tephrocotis;* that *tephrocotis* occupies, during the breeding season a more southern locality than the preceding [*littoralis*], and winters, regularly, in the Rocky Mount ains of Colorado, and even farther south; that *australis* inhabits the next lower section, breeding in Colorado, and probably extending into the British possessions, but wintering, for the most part—especially in severe winters—south of this Territory; that *atrata*, if anywhere common, must occupy a more southern locality."—(Quoted from Mr. Ridgway's Mon., *l. c.*, pp. 62, 63.)

*Not italicized in the original.

climate;* a fact that Mr. Ridgway seems for the moment to have forgotten.

As a further contribution to the history of *Leucosticte tephrocotis*, I append the measurements of seventy-seven specimens of varieties *littoralis* and *tephrocotis*, kindly sent me by Captain Bendire. As the measurements were made by the collector from fresh specimens, and as the sex of each specimen was determined by actual dissection, they are of special interest in the present connection.

Measurements of LEUCOSTICTE TEPHROCOTIS *var.* LITTORALIS.

Locality.	Date.	Sex.	Length.	Wing.	Tail.	Collected by—
Camp Harney, Oreg		♂	6.75	4.00	2.70	Capt. Charles Bendire.
Do		♂	7.00	4.32	3.00	Do.
Do		♂	6.65	4.00	2.70	Do.
Do		♂	7.00	4.21	2.90	Do.
Do		♂	7.00	4.25	2.75	Do.
Do		♂	6.90	4.25	3.00	Do.
Do		♂	7.00	4.30	3.00	Do.
Do		♂	7.00	4.37	3.05	Do.
Do		♂	7.00	4.00	3.00	Do.
Do		♂	7.00	4.25	2.90	Do.
Do		♂	7.00	4.25	3.00	Do.
Do		♂	6.95	4.20	2.88	Do.
Do		♂	6.60	4.15	2.90	Do.
Do		♂	6.75	4.00	2.90	Do.
Do		♂	6.65	4.00	2.95	Do.
Do		♂	6.50	4.00	2.75	Do.
Do		♂	6.90	4.25	3.00	Do.
Do		♂	6.50	3.90	2.75	Do.
Do		♂	7.00	4.40	2.90	Do.
Do	Mar. 1	♂	7.12	4.25	3.12	Do.
Do	Feb. 26	♂	7.00	4.37	2.94	Do.
Do	Feb. 26	♂	6.94	4.23	2.87	Do.
Do	Jan. 26	♂	6.60	4.00	2.75	Lieut. George R. Bacon.
Do	Jan. 6	♂	6.80	4.00	2.65	Do.
Do	Jan. 20	♂	7.25	4.25	3.00	Do.
Do	Jan. 6	♂	6.87	4.25	3.00	Capt. Charles Bendire.
Do		♂	6.75	4.20	2.75	Do.
Do		♂	7.00	4.30	2.80	Do.
Do		♂	6.93	4.32	2.96	Lieut. George R. Bacon.
Do		♂	7.00	4.45	2.94	Do.
Do		♂	7.00	4.32	2.98	Do.
Do		♂	7.00	4.42	2.90	Do.
Do		♂	7.00	4.25	2.90	Do.
Do		♂	6.45	4.50	2.95	Do.
Do		♂	6.80	4.25	2.75	Do.
Do		♂	7.00	4.13	2.94	Do.
Do		♂	6.80	4.35	2.95	Do.
Do		♂	7.03	4.31	2.93	Do.
Do		♂	6.95	4.32	3.00	Do.
Do		♂	6.30	4.05	2.68	Do.
Do		♂	6.75	4.27	2.70	Do.
Do		♂	6.98	4.35	2.95	Do.
Do		♂	6.94	4.18	2.75	Do.
Do		♂	7.05	4.37	2.87	Do.
Do		♂	6.75	4.32	2.75	Do.
Do		♂	7.05	4.32	2.96	Do.
Do		♂	6.75	4.25	2.90	Do.
Do		♂	6.75	4.25	2.95	Do.
Do		♂	7.00	4.13	2.80	Do.
Do		♀	6.75	4.00	2.65	Capt. Charles Bendire.
Do		♀	6.50	4.12	2.90	Do.
Do		♀	6.60	4.00	2.50	Do.
Do		♀	6.75	4.00	2.75	Do.
Do		♀	6.50	4.00	2.75	Do.
Do		♀	6.70	4.00	2.75	Do.
Do		♀	6.68	4.00	2.80	Do.
Do		♀	6.70	4.00	2.90	Do.
Do		♀	6.60	3.95	2.75	Do.
Do		♀	6.68	3.88	2.78	Do.
Do		♀	6.95	4.12	3.00	Do.
Do	Mar. 1	♀	6.65	4.00	2.75	Lieut. George R. Bacon.
Do	Jan. 6	♀	6.75	4.13	2.75	Capt. Charles Bendire.
Do	Feb. 26	♀	6.75	4.02	2.65	Do.

* See Bull. Mus. Comp. Zoölogy, vol. ii, pp. 237, 239, April, 1871; Proc. Bost. Soc. Nat. Hist., vol. xvi, pp. 279–284, June, 1874.

Measurements of LEUCOSTICTE TEPHROCOTIS var LITTORALIS—Continued.

Locality.	Date.	Sex.	Length.	Wing.	Tail.	Collected by—
Camp Harney, Oreg	Jan. 26	♀	6.70	4.00	2.85	Lieut. George R. Bacon.
Do	Mar. 1	♀	6.75	4.05	2.88	Do.
Do	Mar. 1	♀	6.50	3.92	2.50	Capt. Charles Bendire.
Do	.....	♀	6.65	4.00	2.65	Lieut. George R. Bacon.
Do	.....	♀	6.50	4.12	2.90	Do.
Do	.....	♀	6.60	4.00	2.50	Do.
Do	.....	♀	6.75	4.00	2.75	Do.
Do	.....	♀	6.50	4.00	2.75	Do.
Do	.....	♀	6.70	4.00	2.75	Do.
Do	.....	♀	6.68	4.00	2.80	Do.
Do	.....	♀	6.70	4.00	2.90	Do.
Do	.....	♀	6.60	3.95	2.75	Do.
Do	.....	♀	6.68	3.88	2.78	Do.
Do	.....	♀	6.95	4.12	3.00	Do.
Average of 49 males	.....	.....	6.82	4.22	2.89	
Average of 28 females	.....	.....	6.67	4.01	2.76	

Measurements of LEUCOSTICTE TEPHROCOTIS *var.* TEPHROCOTIS.

Locality.	Sex.	Length.	Wing.	Tail.	Collected by—
Camp Harney, Oreg	♂	6.85	4.25	2.85	Lieut. George R. Bacon.
Do	♂	6.85	4.25	2.85	Do.
Do	♂	6.50	4.12	2.75	Do.
Do	♂	6.75	4.12	2.60	Do.
Do	♂	6.85	4.45	2.95	Capt. Charles Bendire.
Do	♂	6.80	4.08	2.62	Do.
Do	♂	6.75	4.20	2.70	Do.
Do	♂	6.80	4.25	2.78	Do.
Do	♂	6.50	4.25	2.75	Do.
Do	♂	7.18	4.39	3.00	Do.
Do	♂	6.80	4.30	2.75	Do.
Do	♀	6.75	4.00	2.62	Lieut. George R. Bacon.
Do	♀	6.85	4.25	2.90	Do.
Do	♀	6.50	4.00	2.50	Capt. Charles Bendire.
Do	♀	6.60	4.15	2.70	Do.
Do	♀	6.25	4.00	2.50	Do.
Do	♀	6.70	4.16	2.75	Do.
Average of 11 males	.....	6.79	4.24	2.78	
Average of 6 females	.....	6.61	4.09	2.66	