

(Amur Reise, II, 141, tab. ix, fig. 16), and the antennæ are also similar in having the intermediate joints elongated. The fifth ventral is more strongly emarginate than in the ♂ of the other two species. The following table will serve to distinguish the three species known to me:

A. Appendage of claws broad, rounded at tip :—

Outer joints of antennæ gradually broader, not elongated.

1. *lepturides*.

Four outer joints slightly wider, joints longer, especially the intermediate ones.

2. *tenuicorne*.

B. Appendage of claws slender, curved, acute :—

Antennæ very long and slender, nearly filiform.

3. *ungulare*.

February 4, 1874.

Vice-President, Mr. R. C. Greenleaf, in the chair. Forty-four persons present.

The following paper was read :—

ON GEOGRAPHICAL VARIATION IN COLOR AMONG NORTH AMERICAN SQUIRRELS; WITH A LIST OF THE SPECIES AND VARIETIES OF THE AMERICAN SCIURIDÆ OCCURRING NORTH OF MEXICO. BY J. A. ALLEN.

Some months since¹ I had the pleasure of calling the attention of the Society to the subject of geographical variation in size, proportions and color among North American birds, and of illustrating the subject by an exhibition of specimens. At the same time I also referred incidentally to variations of a similar character among North American mammals. As remarked on these occasions, the law of geographical variation in size with locality (representatives of the same species decreasing in size with the altitude and latitude of the locality) was satisfactorily established by Prof. Baird in 1857 and 1858,

¹ At the meetings of April 17 and June 19, 1872.

in respect to both mammals and birds. The occurrence of variations in the proportion of parts and in color at certain localities among individuals of the same species, was also at the same time brought to notice, and again alluded to by Prof. Baird in 1866. These observations led to a further examination of this interesting subject, and the discovery of hundreds of additional facts of a similar character. The instances noticed prior to 1866 proved to be by no means exceptional cases, but to be the result of other geographical laws of variation, as universal and almost as well pronounced as that of the variation of size with locality. These I have termed the laws of (1) the enlargement of peripheral parts at the southward; (2) of the increase in intensity and extent of dark colors at the southward, and (3) increase of color with increase of humidity, or the correllation of intensity of color with the mean annual rainfall.¹ I now propose to refer more especially to the variation of color with locality among the North American *Sciuridæ*, and to briefly notice some of the results that have attended a recent examination of the group.

First, in respect to the increase in intensity of color from the north southward. Among the squirrels this increase is finely illustrated in *Sciurus hudsonius* and in *Tamias striatus*, representatives of which from the southern parts of New York and Pennsylvania are much more highly colored than are those from northern New England and

¹ See Bull. Mus. Comp. Zool., Vol. II, pp. 229-242, 369-375, April, 1871; — *Ibid.* Vol. III, pp. 114-119, July, 1872. Also, Proc. Bost. Soc. Nat. Hist., Vol. xv, pp. 156-159, Sept., 1872 (Communicated Apr. 17, 1872); — *Ibid.* xv, pp. 212-219, Dec., 1872 (Communicated June 19, 1872); — Amer. Nat., Vol. VI, pp. 559-560, Sept., 1872. For other reference to the subject see COUES (Dr. ELLIOTT), Proc. Acad. Nat. Sci., Phila., 1872, p. 60, July, 1872; RIDGWAY (ROBERT), Amer. Journ. Arts and Sci., 3d Ser., Vol. IV, pp. 454-460, and Vol. V, pp. 39-44, Dec., 1872, and Jan., 1873; containing a further development of the subject of geographical variation in color, and the addition of many new corroborative facts. Also the critique of Dr. Coues, on Mr. Ridgway's article (Amer. Nat., Vol. VII, pp. 415-418, July, 1873), and Mr. Ridgway's reply (*Ibid.*, pp. 548-555, Sept., 1873).

In this connection I feel called upon to notice briefly Mr. Ridgway's important paper in the American Journal of Arts and Science, and his defence of it in the American Naturalist. In respect to the original article, the general laws of geographical variation in color, previously worked out by others, are here restated without any intimation whatever that anything had been previously done on the subject. The ample apology, however, subsequently made, renders it clear that this omission was an inadvertance rather than any intended wrong, and would not be here alluded to except for its historical connection with a matter now to be noticed. In his reply to Dr. Coues' rather pointed criticism, his anxiety to exonerate himself, seems (to me, at least,) to have misled him into a somewhat unfair statement of the points at issue as respects the originality of some of my own work.

the British Provinces. *Sciurus carolinensis* is perhaps a still more marked example, in which the color varies from the light pure gray of the upper parts in New England specimens, with a restricted pale yellowish brown dorsal area, to the rusty gray dorsal surface of the Florida type, in which the whole upper surface is usually strongly yellowish-rusty. This increase of color southward is, however, still more strongly marked in the fox squirrels of the Mississippi Basin, the so-called *Sciurus "ludovicianus."* In specimens from Ohio, Northern Illinois, Southern Michigan, Wisconsin and Iowa, the lower parts are pale fulvous, varying in some specimens to nearly white. In Southern Illinois, and at St. Louis, Mo., the color has increased to a strong bright fulvous, while in specimens from lower Louisiana the color has become reddish fulvous or deep orange. At the same time, the color of the dorsal surface becomes proportionally darker at the southward, through the greater breadth of the black annulations at the tips of the hairs, the dorsal surface in Louisiana specimens being many shades darker than in those from the Upper Mississippi. This variety also finely illustrates the variation in color seen in specimens from comparatively dry and moist regions, its habitat extending up the Missouri and its western tributaries to a point considerably above Sioux City. Beginning with Ohio specimens and passing westward, we find an increase of color in those from Northern Illinois, Wisconsin and Iowa, west of which point the color rapidly

As I have felt it proper to notice this already somewhat at length in the American Naturalist (Vol. VIII, pp. 227-229, April, 1874), I need not go into details here. Suffice it to say, then, that he seems to have failed to appreciate the difference between calling attention to a few instances of variation with locality in respect to proportions and color, and their combination with hundreds of others of a similar character, and noting their correlation with differences in the physical conditions of the localities at which these variations occur. In short, I think he hardly fairly states the case when he assumes that Prof. Baird, in stating, in 1866, that the representatives of certain species of birds in Florida and Lower California had relatively larger bills than their more northern relatives, and that in several instances the western representatives of certain species had longer tails than their eastern relatives, anticipated my announcement in 1871 and 1872 of a law of enlargement of peripheral parts to the southward, including in birds the lengthening of the tail and claws, as well as the lengthening and enlargement of the bill (the lengthening of the tail really occurring at the southward, rather than at the westward); or, in stating again that the birds of the plains were apt to present a bleached or weather-worn appearance, and were darker again on the Pacific Coast, that he also anticipates my announcement of the laws of the greater intensity, depth and extent of the dark colors southward, and their increase also in depth and extent at localities varying in longitude with the increase of atmospheric humidity.

decreases in intensity, Nebraska specimens being much paler than those taken on the same parallel near the Mississippi River. Specimens from the Indian Territory are also very much paler than those from St. Louis, as are Texas ones than those from Louisiana. Even between specimens from the prairies of northwestern Louisiana and others from the lowlands of the same State, near the Mississippi River, the difference in color is very strikingly marked.

The variation in color occurring in representatives of the same species at localities differing in longitude, is well shown in quite a number of groups. But few specific forms, however, have a sufficiently wide range to illustrate the variations that obtain along a given parallel throughout the whole breadth of the continent, the *Sciurus hudsonius* group being the only instance among the squirrels. Others, however, show the transition that obtains in passing from the moist, fertile prairies of the Mississippi Valley to the dry plains, or from the deserts and mountainous districts of the interior to the moist region bordering the Pacific Coast north of the parallel of 40°. *Spermophilus tridecem-lineatus* furnishes a good illustration of the differences in color that occur between representatives of the same species living on the moist, fertile prairies and those inhabiting the dry, barren plains, those from Illinois, Wisconsin, Minnesota and Iowa being much darker than those from Western Nebraska, Western Kansas and Colorado. Even specimens from Eastern Kansas are much darker than those from the middle and western portions of the same State. In this species the color is varied, in passing from the prairies to the plains, not only by the lighter shade of the dark ground color, but by the considerably greater breadth of the light spots and stripes in the specimens from the plains. The *Spermophilus grammurus* group (composed of the *S. grammurus*, *S. Beecheyi*, *S. Douglassi*, etc., of authors) illustrates not only a similar variation in intensity of color between the inhabitants of dry and moist regions, but also a somewhat changed style of coloration. Beginning with the nearly uniformly gray or grizzled type of Texas and Southeastern New Mexico, we pass to the more rufous or reddish phase of the central portions of the Rocky Mountains (in Colorado), which also has an increased amount of hoariness on the sides of the neck and shoulders, to the form west of the Sierra Nevada Mountains, typically representing the *Spermophilus Beecheyi*, in which the hoariness forms broad lateral bands separated by a narrow brown medial stripe. This form in Northern California passes into the so-called *Spermophilus*

Douglassi, which differs chiefly from *S. Beecheyi* in having the medial stripe darker, or nearly black.

But two of the most instructive and interesting groups of the *Sciuridæ*, in this connection, are those of which the common *Sciurus hudsonius* and *Tamias quadrivittatus* are respectively familiar examples, the former ranging over the northern half of the continent, and the latter extending over the western half of North America and Eastern Asia. In the *Sciurus hudsonius* group, we have at the east the well-known chickaree (*S. hudsonius*), extending westward to the Plains, and northwestward to Alaska, with its brighter and smaller southern form in the eastern Atlantic States. On the arid plains of the Platte and Upper Missouri Rivers it presents a markedly paler or more fulvous phase, well illustrated by specimens from the Black Hills. This form becomes even still paler and more fulvous at the eastern base of the main chain of the Rocky Mountains, between latitude 43° and 47°, where it begins to pass by insensible stages of gradation into the so-called *Sciurus Richardsons*i of the Rocky Mountains north of 45°, and the so called *Sciurus Fremonti* of the Rocky Mountains south of about the same parallel. In the collections made in Western Wyoming, near the Yellowstone Lake, occur many specimens which are so exactly intermediate between the three forms (*S. hudsonius*, *S. Richardsons*i and *S. Fremonti*) whose habitats here meet, that it is impossible to say which of the three forms they most resemble. At the same time specimens can be selected which will form a series of minute gradations from the pale form of *hudsonius* from the Plains, on the one hand, to the *Richardsons*i and *Fremonti* forms on the other. To the southward of this district we soon pass into the region of the typical *Fremonti*, and to the westward and northward into the habitat of the *Richardsons*i type. Even the country about the sources of the Gros Ventres Fork of the Snake River, is already within the range of the true *Richardsons*i.¹ The habitat of *S. Richardsons*i extends from the main chain of the Rocky Mountains, north of latitude 44°, to the Cascade Range. Here it becomes mixed with *S. Douglassi*, which scarcely differs from *S. Richardsons*i, except in being a little darker

¹ While the prevailing color above in *S. hudsonius* is light yellowish-brown, varying to bright ferrugineous along the middle of the back, in *S. Richardsons*i it is dull rusty or dark chestnut-brown, and in *S. Fremonti* pale brownish-gray. The prevailing color of the tail in *S. hudsonius* is usually yellowish-rusty, varying to dark ferruginous, with broad annulations of black; in *S. Richardsons*i it is black, varied more or less with rusty; in *S. Fremonti* black varied with gray.

above, and in having the ventral surface more or less strongly tinged with buff, varying in different specimens from cinerous to pure buff. This form prevails from the Cascade Range to the Pacific Coast, southward to Northern California, and northward probably to Sitka. In Northern California the *S. Douglassi* meets the range of the true *S. Fremonti*, between which two forms there is here the most gradual and intimate intergradation. In this group we have hence four forms which, in their extreme phases of mutual divergence, appear as diverse as four good, congeneric species need to, but which, at points where their respective habitats join, pass into each other as gradually as do the physical conditions of the localities at which their extreme phases are developed.

The *Tamias quadrivittatus* group¹ presents an equally or even more striking range of variation in color, and also varies to an unusual degree in size. Beginning at the northward, we find that specimens from as far south as Pembina, and thence northward, are quite undistinguishable from specimens from Northeastern Asia, or the so-called *Tamias "Pallasi"* (*T. Pallasi* Baird = *T. striatus* of most European authors). This form is found to only a limited extent south of the northern boundary of the United States, where on the plains of the Upper Missouri it passes into the blanched, pallid form of *T. quadrivittatus* (*T. quadrivittatus*, var. *pallidus* nobis,— see beyond), and further westward into the true *T. quadrivittatus* of the Rocky Mountains, and still further westward into the so-called *T. Townsendi* of the Pacific Coast. In this group the greatest pallor is reached on the plains of the Yellowstone, and in the deserts of Nevada, Utah and Arizona. In the central portions of the Rocky Mountains (Colorado and portions of New Mexico) a form is developed distinguished by its generally bright, strong colors, but especially for the rich fulvous tints of the sides of the body, to which there is but a slight tendency either in the northern form or the pallid form of the plains. Both, however, very gradually pass into the rufous-sided type, the pallid form wherever the plains approach the mountains (as along the eastern base of the Rocky Mountains, the Uintah, Sierra Nevada, and others of the more southern ranges), gradually becoming fulvous, while the darker northern form grades into the larger fulvous race of the more northern portions of the Rocky Mountains in Montana and Idaho. This larger fulvous race west of the main divide soon begins to assume a duller, more

¹ *Tamias quadrivittatus*, *T. Pallasi*, *T. Townsendi* and *T. dorsalis* of American authors.

fuscous shade, deepening finally into the very fuscous form (*T. Townsendi*) of the region between the Cascade Range and the Pacific Coast. In this form the general color increases so much in depth as to become dusky yellowish-brown, and both the light and the dark stripes become obscure, and occasionally almost entirely obsolete, through the gradual accession of color. Between the extreme phase of this fuscous type and the extreme phase of the pallid type of the plains, in which the stripes are sometimes again partially obsolete through the extreme lightness of the general color, the differences are very great indeed. Yet in placing the scores of specimens I have had the opportunity of examining in a geographical series, or arranging them simply according to their localities, a most thorough and minute intergradation becomes at once apparent. The difference in size, too, between northern and southern specimens is also unusually great; the pale, southern form of the plains, and the extremely bright, fulvous form of Colorado and New Mexico, being very much smaller than the northern, darker form, or than the fuscous type of the northwest coast.

As corroborative evidence that these varied types of coloration are but geographical races, it becomes interesting to observe that the light and dark and the fulvous and rufous forms, respectively of the different species, occur over the same areas. With the fuscous type of *Tamias quadrivittatus* occur the dark types of *Sciurus hudsonius*, and the dark-backed form of *Spermophilus grammurus*, and also a peculiar, dusky form of *Arctomys* and of *Lepus*, and a dark form of *Spermophilus richardsoni*. On the plains occur pallid forms of *Sciurus ludovicianus*, *Sciurus hudsonius*, *Tamias quadrivittatus*, and *Spermophilus richardsoni*. With the fulvous type of *Tamias quadrivittatus* occurs a rufous form of *Spermophilus grammurus*; but the form of *Sciurus hudsonius*, occurring over the same area, presents the exceptional condition of a minimum amount of rufous.

Taking the mammals and the birds of the continent collectively, we may recognize, in a general way, at least five more or less well-marked areas characterized by certain peculiarities of color variation, and also a correlation between these areas and the prevalent tendencies of color increase and the amount of aqueous precipitation. Other lesser areas, characterized by certain peculiarities of color variation, will doubtless be recognized when the material at hand is sufficient to admit of a more detailed examination of the subject, such indications, in fact, being already more or less apparent. The first region we

propose now to define is that of the Atlantic Slope, which will include not only the country east of the Alleghanies, but a large part of the British Possessions, extending westward at least as far as Fort Simpson, and thence northward and westward to Alaska, including, apparently, all of that territory north of the Alaskan Mountains, with an annual rain-fall throughout the whole of this extended region of about thirty-five to forty-five inches. Over this region (to which we may give the general term of *Atlantic Region*) the colors may be regarded as of the average or normal type, those of other regions being either of a diminished or increased intensity.

The second region will embrace the Mississippi Valley, or more properly the Mississippi Basin, and may hence be termed the *Mississippi Region*. Here the annual rain-fall reaches forty-five to fifty-five inches, and over a small area east of the Lower Mississippi even exceeds sixty inches. The tendency here is so often to an increase of fulvous and rufous tints, that we may regard this as the distinctive chromatic peculiarity of the region, these tints reaching their maximum in the limited area of greatest humidity, but a general increase in intensity of color is also more or less characteristic of the region. A third region embraces the central portion of the Rocky Mountains, and being developed most strongly within the present territory of Colorado, and being also mainly included within that territory, may be termed the *Colorado Region*. The tendency here again, as compared with the immediately adjoining districts, is to a general increase of intensity of color, with also a marked inclination to the development of rufous and fulvous tints, this region being also within the influence of a comparatively high temperature, at least in summer. The humidity is here less than in either of the other regions already defined, the annual aqueous precipitation amounting to only about twenty-four to thirty inches; but it is yet greatly in excess of that of the districts immediately surrounding it.

The fourth region may be regarded as made up of the arid plains and deserts of the great central plateau of the Continent, including not only the "Great Plains," usually so called, but the deserts and plains of Utah, Nevada, Western Colorado, New Mexico, Arizona, and southwestward to Lower California, and may hence be appropriately termed the *Campestrian Region*. The annual rain-fall is generally below fifteen inches, but ranges, at different localities, from three inches to twenty. Here a general paleness of color is the distinctive feature. The fifth region begins on the Pacific Coast

at about the 40th parallel, embracing a comparatively narrow belt along the coast from Northern California to Sitka. Its peculiarities are most strongly developed west of the Cascade Range, north of 45° ; they also prevail eastward nearly or quite to the main chain of the Rocky Mountains. It may hence be termed the *Columbian Region*. With an average annual rain-fall of fifty-five to sixty-five inches, the prevalent tendency in color is to dusky and fuscous rather than rufous tints. The district between the Cascade Range and the main chain of the Rocky Mountains presents features that may almost entitle it to rank as a distinct region, as might also the region of maximum rain-fall in the Mississippi Region. The southern half of Florida is also perhaps entitled to recognition as a distinct region, being characterized by excessive humidity and a sub-tropical intensity of color. It may also be necessary to eventually recognize as distinct districts the almost rainless portions of the Campestrian Region.

In respect to the correllation of intensity of color in animals with the degree of humidity, it would perhaps be more in accordance with cause and effect to express this law of correllation as a *decrease* of intensity of color with a *decrease* of humidity, the paleness evidently resulting from exposure and the blanching effect of intense sunlight, and a dry, often intensely heated atmosphere. With the decrease of the aqueous precipitation, the forest growth and the protection afforded by arborescent vegetation gradually also decreases, as of course does also the protection afforded by clouds, the excessively humid regions being also regions of extreme cloudiness, while the dry regions are comparatively cloudless districts.

In addition to the tendency to change of color with locality, there is another phase of color variation that requires, in this connection, a passing notice, — namely, *Melanism*. It is now well known that almost every species of mammal may be expected to present melanistic individuals, instances of its occurrence in the majority of the North American species being now well established. Indeed, the very fact of a melanistic phase of coloration may be looked upon as almost *a priori* evidence that the individuals presenting it belong to a melanistic race of some species whose normal color is some other tint than black, as Prof. Baird long since remarked in respect to the American squirrels. It has been supposed that the tendency to melanism is more prevalent at the northward; but such does not appear to be necessarily the case. Among the *Sciuridæ*, for instance, a

group rather remarkable for a tendency to melanistic varieties, the black and dusky forms are as often southern as northern. In some species melanistic individuals are as rare as are the cases of albinism, as in *Sciurus hudsonius*, the species of *Tamias*, and in many of the *Spermophili*, while in others they are sometimes the common, if not the prevalent, form over a considerable area, as occurs in *Sciurus carolinensis* and *Sciurus cinereus*. Melanism is also of frequent occurrence in *Sciurus Aberti*, and in *Spermophilus grammurus*, which presents a melanistic form both in Texas and Lower California. *Spermophilus Parryi* has also a black race along the Youkon River, and frequent instances of melanism are well known in all the species of *Arctomys*. In numerous instances these melanistic individuals and melanistic forms have been described as distinct species, while in reality they are generally so sporadic in their occurrence as to render them hardly worthy of recognition, even as varieties.

The gradual increase of our knowledge in respect to the character of these melanistic forms, and especially in regard to the extent and character of geographical variation, necessarily leads to the modification of our views in respect to the status of many forms that have formerly passed current as more or less well-established species, and also to consequent changes in nomenclature. The representatives of few groups are more variable in respect to color, even among individuals of the same species inhabiting the same locality, than the arboreal squirrels. Add to this the considerable amount of geographical variation that obtains among them, and the very considerable changes attendant upon season in respect to the character of the pelage, and we shall no longer feel surprised at the profusion of synonyms that attach to many of the species. In respect to the North American members of *Sciurus*, Prof. Baird, in his excellent monograph of the group published in 1857, found it necessary to reduce the number of species from *twenty-four*, the number recognized by Audubon and Bachman in 1854, to ten well-established species and two doubtful ones, several of his own species, in this reduction, sharing the fate of those of previous authors. In undertaking recently a monographic revision of the American *Sciuridæ*, I have found it necessary to still further reduce the specific forms to *five*, recognizing, however, *seven* geographical varieties in addition, making the whole number of recognized forms *twelve*. As illustrative of the bearing of the class of facts already noticed, I subjoin herewith a synoptical resumé of the species and varieties of the *Sciuridæ* of North America found north

of the Isthmus of Panama.¹ The synonyms cited will doubtless be sufficient to render clear the changes of nomenclature here introduced (the names of the United States species used in Baird's Mammals of North America being always given), the detailed descriptions of the forms recognized, and the discussion of their character and relations being reserved as the subject matter of the more extended memoir referred to above.

Genus SCIURUS.

1. *Sciurus cinereus*.

a. var. *cinereus*.

Sciurus cinereus Linn., Syst. Nat., I, 64, 1758.—Baird, Mam. N. Am., 248, 1857.

Hab. Atlantic States north of Virginia.

b. var. *niger*.

Sciurus niger Linn., Syst. Nat., I, 64, 1758.—Allen, Bull. Mus. Comp. Zool., II, 176, 1871.

Sciurus vulpinus Gmelin, Syst. Nat., I, 147, 1788.—Baird, Mam. N. Am., 246, 1857.

Sciurus capistratus Bosc., Ann. du Museum, I, 181, 1802.—Bachman, Proc. Zool. Soc. Lond., VI, 85, 1835.

Hab. Atlantic States south of Virginia; Gulf States west to Texas?

¹ I should here state that the following résumé, as well as the proposed monograph, is based mainly on the immense stores of material that for many years have been accumulating at the Museum of the Smithsonian Institution, and which have been kindly placed in my hands by Prof. Baird for elaboration. In addition to this rich material, I am also permitted the use of that contained in the Museum of Comparative Zoology, which, so far as the forms of Eastern North America are concerned, far exceeds that of any other collection. The material at my command hence ranges from thirty to several hundred specimens of each of the greater part of the species of North American *Sciuridae*. As indicative of the recent increase in the material at the Museum of the Smithsonian Institution, I may add that while in 1857 there were but two specimens of *Sciurus* "*Fremonti*" extant, I have had access to more than fifty skins, many skulls and to specimens in alcohol; the five specimens of *Sciurus* "*Richardsoni*" have been increased to forty; of *Spermophilus Harrisii*, from three to thirty-five; of *Spermophilus Richardsoni*, from none to above seventy, etc. Of *Spermophilus tridecemlineatus* I have had before me about one hundred and sixty; of the *Sciurus hudsonius* group, upwards of two hundred and fifty; and of the *Tamias quadrivittatus* group, nearly one hundred and seventy-five, and very large and satisfactory series of nearly all the other species mentioned in the following synopsis.

c. var. ludovicianus.

Sciurus ludovicianus Custis, Barton's Med. and Phys. Journ., II, 43, 1806.—Baird, Mam. N. Am., 251, 1857.

Sciurus macroura Say, Long's Exped., I, 115, 1823.

Sciurus magnicaudatus Harlan, Faun. Am., 178, 1825.

Sciurus texianus, *subauratus* and *Auduboni* Bachman, Proc. Zool. Soc. Lond., VI, 86, 87, 97, 1838.

Sciurus occidentalis Aud. and Bach., Jour. Acad. Nat. Sci. Phila., VIII, 317, 1842.

Sciurus rubicaudatus and *Sayi* Aud. and Bach., Quad. N. Am., II, 30, 274, 1851.

Sciurus limitis Baird, Proc. Acad. Nat. Sci. Phila., VII, 331, 1855.

Hab. Mississippi Basin, west to the Plains.

2. Sciurus carolinensis.

a. var. carolinensis.

Sciurus carolinensis Gmelin, Syst. Nat., I, 143, 1788.—Baird, Mam. N. Am., 256, 1857.

Sciurus cinereus Schreber, Säugt., IV, 766, 1792 (nec. Linn.).

Hab. Southern Atlantic and Gulf States.

b. var. leucotis.

"*Sciurus pennsylvanicus* Ord, Guthrie's Geog., (2d Am. Ed.,) II, 292, 1815."

Sciurus niger Godman, Am. Nat. Hist., II, 136, 1826.

Sciurus leucotis Gapper, Zool. Journ., V, 206, 1830.

Sciurus fuliginosus Bach., Proc. Zool. Soc. Lond., VI, 96, 1838.

Sciurus migratorius Aud. and Bach., Quad. N. Am., I, 265, 1849.

Hab. United States east of the Plains, except the South Atlantic and Gulf States.

3. Sciurus fossor.

Sciurus fossor Peal, Mam. and Birds U. S. Exp., 55, 1848.

Sciurus Hermannii Leconte, Proc. Acad. Nat. Sci. Phila., V, 149, 1852.

Hab. Pacific Coast, from the Columbia River to San Diego; only west of the Cascade and Sierra Nevada Mountains.

4. Sciurus Aberti.

Sciurus dorsalis Woodhouse, Proc. Acad. Nat. Sci. Phila., VI, 110, 1852 (nec Gray).

Sciurus Aberti Woodhouse, Ibid., 220, 1852. — Baird, Mam. N. Am., 267, 1857.

Hab. Southern Colorado, New Mexico, and portions of Arizona.

Sciurus castanotus [*castanonotus*] Baird, Proc. Acad. Nat. Sci. Phila., VII, 332, 1855. — Ibid., Mam. N. Am., 266, 1857.

Hab. San Francisco Mountains.

5. *Sciurus hudsonius*.

a. var. *hudsonius*.

"*Sciurus hudsonius* Pallas, Nov. Sp. Glir., 376, 1778." — Baird, Mam. N. Am., 269, 1857.

'*Sciurus carolinus* Ord, Guthrie's Geog. (2d Am. Ed.) II, 292, 1815."

Sciurus rubrolineatus Desm., Mamm., II, 333, 1822.

Hab. North America, east of the Rocky Mountains; Alaska.

b. var. *Fremonti*.

Sciurus Fremonti Aud. and Bach., Quad. N. Am., III, 237, 1853. — Baird, Mam. N. Am., 272, 1857.

? *Sciurus mollipilosus* Aud. and Bach., Proc. Acad. Nat. Sci. Phila., I, 102, 1841.

Hab. Rocky Mountains, south of about latitude 43°, and westward to the Pacific Coast.

c. var. *Richardsoni*.

Sciurus Richardsoni Bach., Proc. Zool. Soc., Lond., VI, 100, 1838. — Baird, Mam. N. Am., 273, 1857.

Hab. Western slope of Rocky Mountains, north of about latitude 44°, and westward to the Cascade Range.

d. var. *Douglassi*.

Sciurus Douglassi Gray, Proc. Zool. Soc., Lond., IV, 88, 1836. — Bachman, Ibid., VI, 99, 1838. — Baird, Mam. N. Am., 275, 1857.

Sciurus lanuginosus Bach., Proc. Zool. Soc. Lond., II, 101, 1838 (partial albino).

Sciurus Townsendi Bach., Journ. Acad. Nat. Sci. Phila., VIII, 63, 1839 (ms. name).

Sciurus Belcheri Gray, Ann. and Mag. Nat. Hist., X, 263, 1842.

Sciurus Suckleyi Baird, Proc. Acad. Nat. Sci. Phila., VIII, 333, 1855.

Hab. Cascade Range, westward to Pacific Coast, and from Northern California north to Sitka.

Genus SCIUROPTERUS.

6. *Sciuropterus volucella*.a. var. *volucella*.

"*Sciurus volucella* Pallas, Nov. Sp. Glir., 351, 353, 359, 1788."

Pteromys volucella Desm., Mamm., II, 343, 1822:—Baird, Mam. N. Am., 286, 1857.

Hab. North America, south of about the isotherm of 40° F.

b. var. *hudsonius*.

Sciurus hudsonius Gmel., Syst. Nat., I, 153, 1788.

Pteromys hudsonius Fischer, Synop., 365, 1825.—Baird, Mam. N. Am., 288, 1857.

Pteromys sabrinus Rich., Zool. Journ., III, 519, 1828.

Pteromys alpinus Wagner, Suppl. Schreber's Säugt., III, 230, 1843.

Pteromys oregonensis Bachm., Journ. Acad. Nat. Sci. Phila., VII, 101, 1839.

Hab. Northern North America, north of about the isotherm of 40° F.

Genus TAMIAS.

7. *Tamias striatus*.

Sciurus striatus Linn., Mus. Adolphi Fred. Regis., I, 8, 1754.

Tamias striatus Baird, 11th Rep. Smith. Inst., 55, 1857.—Ibid., Mam. N. Am., 272, 1857.

"*Tamias americanus* Kuhl, Beitr. zur Zool., 69, 1820."

Sciurus (Tamias) Lysteri Rich., Faun. Bor. Am., I, 181, 1829.

Hab. Northern Maine to Virginia on the Atlantic Coast; in the interior north to the northern shores of Lakes Superior and Huron; west to the Missouri River.

8. *Tamias quadrivittatus*.a. var. *quadrivittatus*.

Sciurus quadrivittatus Say, Long's Exped., II, 45, 1823.

Hab. Rocky Mountains, and westward in the mountain ranges to the Pacific Coast.

b. var. *pallidus*.¹

Tamias quadrivittatus Baird, Mam. N. Am., 297, 1857 (in part only).

¹ The small, pale form of the high, dry plains of the interior.

Hab. The Great Plains, and the desert region generally of the interior of the continent.

c. var. **Pallasi.**

Sciurus striatus (in part only) of the older authors.

Tamias Pallasi Baird, 11th Rep. Smith. Inst., 55, 1857.

Hab. Northeastern Asia; northern North America, west of Lake Winnipeg, south to United States; not west of the main chain of the Rocky Mountains.

d. var. **Townsendi.**

Tamias Townsendi Bachm., Journ. Phil. Acad. Nat. Sci., VIII, 68, 1839. — Baird, Mam. N. Am., 300, 1857.

Tamias Hindei Gray, Ann. and Mag. Nat. Hist., x, 264, 1842.

Tamias Cooperi Baird, Proc. Acad. Nat. Sci. Phila., VII, 334, 1855.

Tamias quadrimaculatus Gray, Ann. and Mag. Nat. Hist., 3d Ser., xx, 435, 1867.

Hab. Pacific Coast, from Northern California north to Sitka? and east to the Cascade Range.

e. var. **dorsalis.**

Tamias dorsalis Baird, Proc. Acad. Nat. Sci. Phila., VII, 332, 1855.

— Ibid., Mam. N. Am., 300, 1857.

Hab. Arizona; Utah.

9. *Tamias lateralis.*

Sciurus lateralis Say, Long's Exped. R. Mts., II, 46, 1823.

Spermophilus lateralis Baird, Mam. N. Am., 312, 1857.

Hab. Rocky Mountains, from New Mexico northward (to latitude 57°, according to Richardson).

Genus **SPERMOPHILUS.**

10. *Spermophilus Harrisi.*

Spermophilus Harrisi Aud. and Bach., Quad. N. Am., III, 267, 1854.

— Baird, Mam. N. Am., 313, 1857.

Hab. The Great Interior Basin (Utah, Nevada, Arizona?) and Lower California.

11. *Spermophilus Franklini*.

Arctomys Franklini Sabine, Linn. Trans., XIII, 587, 1822.

Spermophilus Franklini Baird, Mam. N. Am., 314, 1857.

Hab. Northern Illinois northward to the Saskatchewan.

12. *Spermophilus tereticaudus*.

Spermophilus tereticaudus Baird, Mam. N. Am., 315, 1857.

Hab. Fort Yuma, California.

13. *Spermophilus tridecem-lineatus*.**a. var. *tridecem-lineatus*.**

Sciurus tridecem-lineatus Mitchell, Med. Repos., XXI, 248, 1821.

Spermophilus tridecem-lineatus Baird, Mam. N. Am., 316, 1857 (in part only).

Arctomys Hoodii Sabine, Linn. Trans., XXI, 590, 1822.

Hab. The prairies of the United States, from Arkansas northward to the Saskatchewan.

b. var. *pallidus*.

Spermophilus tridecem-lineatus Baird, Mam. N. Am., 316, 1857 (in part only).

Hab. The dry plains and deserts of the interior westward to the Great Basin.

14. *Spermophilus mexicanus*.

Sciurus mexicanus Erxleben, Syst. Anim., 428, 1777.

Spermophilus mexicanus Baird, Mam. N. Am., 319, 1857.

Hab. Southwestern Texas and Southern New Mexico, southeastward into Mexico.

15. *Spermophilus spilosoma*.**a. var. *spilosoma*.**

Spermophilus spilosoma Bennett, Proc. Zool. Soc. Lond., I, 40, 1835.

—Baird, Mam. N. Am., 321, 1857.

Hab. Western New Mexico west to the Pacific Coast.

b. var. *obsoletus*.

Spermophilus obsoletus Kennicott, Proc. Acad. Nat. Sci. Phila., 1863, 157.

Hab. Eastern base of the Rocky Mountains north to Western Wyoming.

16. *Spermophilus Parryi*.

a. var. Parryi.

Arctomys Parryi Rich., Parry's Second Voyage, App., 316, 1825.

Spermophilus Parryi Baird, Mam. N. Am., 323, 1857.

Hab. Northern parts of the continent, from Hudson's Bay to Behring's Straits; also on the islands of the Asiatic side of the Strait.

b. var. kodiacensis.¹

Hab. Island of Kodiak.

c. var. erythrogluteia.

Arctomys Parryi var. *β. erythrogluteia* Rich., Faun. Bor. Am., 1, 161, 1829.

Hab. Northwestern America south to Puget Sound.

? *d. var. phœnognatha.*

Arctomys Parryi var. *γ. phœnognatha* Rich., Faun. Bor. Am., 1, 161, 1829.

Hab. Shores of Hudson's Bay.

17. *Spermophilus Richardsoni*.

a. var. Richardsoni.

Arctomys Richardsoni Sabine, Trans. Linn. Soc., XIII, 589, 1822.

Spermophilus Richardsoni Baird, Mam. N. Amer., 325, 1857.

Hab. Plains of the Saskatchewan southward to the Upper Missouri, and west to the Rocky Mountains.

b. var. elegans.

Spermophilus elegans and *armatus* Kennicott, Proc. Acad. Nat. Sci. Phila., 158, 1863.

Hab. From eastern base of Rocky Mountains to a little west of Fort Bridger.

¹ A form with cinerous lower parts, less fulvous above, and more bushy tail, from the Island of Kodiak.

18. *Spermophilus Townsendi*.

a. var. *Townsendi*.

Spermophilus Townsendi Bach., Journ. Acad. Nat. Sci. Phila., VIII, 611, 1839.

Hab. Plains of the Columbia.

b. var. *mollis*.

Spermophilus mollis Kennicott, Proc. Acad. Nat. Sci. Phila., 1863, 157.

Hab. Northern Rocky Mountains, from about lat. 45° north into the British Possessions.

19. *Spermophilus grammurus*.

a. var. *grammurus*.

Sciurus grammurus Say, Long's Exped. R. Mts., II, 72, 1823.

Spermophilus grammurus Baird, Mam. N. Am., 310, 1857.

Spermophilus Couchii Baird, Proc. Acad. Nat. Sci. Phila., VII, 332, 1855.—Ibid., Mam. N. Am., 311, 1857. (Black form from Texas.)

Spermophilus Buckleyi Slack, Proc. Acad. Nat. Sci. Phila., VIII, 314, 1861. (Melanistic form from Western Texas.)

Hab. Western Texas and New Mexico west to Sierra Nevada Mts.

b. var. *Beecheyi*.

Arctomys (Spermophilus) Beecheyi Rich., Faun. Bor. Am., I, 170, 1829.

Spermophilus Beecheyi Baird, Mam. N. Am., 307, 1857.

? *Spermophilus macrourus* Bennett, Proc. Zool. Soc. Lond., I, 41, 1833. (Melanistic.)

Hab. West of Sierra Nevada Mts. from northern California south to Lower California.

c. var. *Doulassi*.

Arctomys ? (Spermophilus ?) Doulassi Rich., Faun. Bor. Am., I, 172, 1829.

Spermophilus Doulassi Baird, Mam. N. Am., 309, 1857.

Hab. Pacific Coast from Northern California to Puget's Sound.

20. *Spermophilus annulatus*.

Spermophilus annulatus Aud. and Bach., Jour. Acad. Nat. Sci. Phila., VIII, 319, 1842.

Hab. Plains of Colima, Mexico.

21. *Cynomys ludovicianus*.

"*Arctomys ludovicianus* Ord, Guthrie's Geog. (2d Am. Ed.), II, 292, 303, 1815."

Cynomys ludovicianus Baird, Mam. N. Amer., 331, 1857.

Cynomys socialis and *grisea* Raf., Am. Month. Mag., II, 45, 1817.

Arctomys missouriensis Warden, Descrip. U. S., v, 627, 1820.

Arctomys latrans Harlan, Faun. Am., 306, 1825.

Hab. The great plains east of the Rocky Mountains, from southern Texas nearly to the British Boundary.

22. *Cynomys columbianus*.

"*Arctomys columbianus* Ord, Guthrie's Geog. (2d Am. Ed.), II, 292, 302, 1815."

Anisonyx brachyura Raf., Am. Month. Mag., II, 45, 1817.

Arctomys Lewisi Aud. and Bach., Quad. N. Am., III, 32, 1853.

Cynomys Gunnisoni Baird, Proc. Acad. Nat. Sci. Phila., VII, 334, 1855. — Ibid., Mam. N. Am., 335, 1857.

Hab. The parks and plains within and west of the Rocky Mountains to the plains of the Columbia.

23. *Arctomys monax*.

Arctomys monax Linn., Syst. Nat. (10th ed.), I, 601, 1758. — Baird, Mam. N. Am., 339, 1857.

Arctomys empetra Schreber, Säugt., IV, 143, 1774.

Arctomys pruinosus Gmelin, Syst. Nat., I, 144, 1788.

"*Arctomys melanops* Kuhl, Beitr., 64, 1820."

Hab. Eastern North America, from Hudson's Bay to Virginia, and west to the Missouri River.

24. *Arctomys caligatus*.

Arctomys caligatus Eschscholtz, Zool. Atlas, II, 1, 1829.

Arctomys pruinosus Richardson, Zool. Journ., III, 518, 1828 (nec Gmelin). (In part only.)

Arctomys okanaganus King, Narr. Back's Journ., II, 257, 1836.

Hab. Puget's Sound northward, west of the Rocky Mountains.

25. *Arctomys flaviventer*.

Arctomys flaviventer Aud. and Bach., Proc. Acad. Nat. Sci. Phila., I, 99, 1841. — Baird, Mam. N. Amer. 343, 1857.

Hab. Rocky Mountains, west to the Pacific Coast.