

ARTICLE IV.—*A Review of Some of the North American Ground Squirrels of the Genus Tamias.* By J. A. ALLEN.

"But does not the difficulty rest much on our silently assuming that we know more than we do? I have literally found nothing so difficult as to try and always remember our ignorance."—C. DARWIN, *Life and Letters*, Am. ed., Vol. II, p. 209.

"We know in part, and we prophesy in part."—PAUL, I. Cor., xiii: 9.

Since the publication of my revision of the genus *Tamias*, in 1877,\* our knowledge of the group has greatly increased. Several new forms have been described, and the material for study is not only vastly increased, but immensely improved in quality. Many important localities from which there was then no material are now represented by fine series of beautifully prepared specimens; and generally, in place of the few distorted and more or less imperfect skins of fifteen years ago, often without dates of capture, we have now carefully-prepared specimens in large numbers, with full data respecting locality and season of capture, and generally measurements of the specimens taken before skinning.

The credit for this greatly improved condition of affairs, not only in respect to the present group, but to North American mammalogy at large, is due mainly to Dr. C. Hart Merriam, Chief of the Division of Economic Ornithology and Mammalogy in the United States Department of Agriculture, who for the past six or eight years has devoted much time, money, and energy to the formation of an ideal collection of the smaller mammals of North America. Recognizing at the outset the importance of well-prepared material, he has taken great pains to instruct his collectors as to the best methods of collecting and preparing cabinet specimens. He has thus not only secured for himself specimens of the best quality in large series, but has educated collectors up to a high standard of excellence in all that relates to field work in mammalogy, and in this way done much to improve the quality of the mammalogical material supplied to our public and private museums. It is safe to say that seven-eighths of the really good material forming the basis of the present paper owes its origin, directly or indirectly, to Dr. Merriam's influence.

The present paper is simply a revision of the "*Tamias asiaticus*" group of my former monograph. It therefore does not

\* Coues and Allen's "Monographs of North American Rodentia" (Hayden's Rep. U. S. Geol. Sur., Vol. XI), 1877, pp. 779-819.

cover the *striatus*, *lateralis*, and *harrisi* groups of the genus *Tamias*. Of the "*T. asiaticus*" group I had in hand, in 1877, about 225 specimens (excluding skulls), of which only 75 are again before me. The number of skins forming the basis of the present review is over 650 (besides a large number of skulls), of which at least five-sixths are in fine condition, with complete field data. The greater part of this material has been gathered during the last four years, and is principally from the following sources: (1) the American Museum of Natural History; (2) the Museum of Comparative Zoölogy, Cambridge, Mass., received through Mr. William Brewster, Curator of the Department of Mammals and Birds; (3) the United States National Museum, Washington, D. C., through Mr. F. W. True, Curator of the Department of Mammals; (4) the United States Department of Agriculture, through Dr. C. Hart Merriam, Chief of the Division of Economic Ornithology and Mammalogy; (5) the private collection of Dr. C. Hart Merriam. I am also indebted to Mr. F. Stephens, of Santa Ysabel, Cal., and to Mr. W. E. Bryant, of San Francisco, Cal., for the loan of valuable material. To each of these gentlemen my hearty thanks are tendered for their kind offices. I am especially under obligations to Dr. Merriam, to whom I am indebted for fully one-half of the material forming the basis of the present paper, and without which its preparation would have been impossible.

In 1877 six forms were associated under the specific name *Tamias asiaticus*, as follows:

1. *Tamias asiaticus*.—*Hab.* Northeastern Europe and Northern Asia.
2. *Tamias asiaticus borealis*.—*Hab.* Northern North America, south to the northern border of the United States.
3. *Tamias asiaticus quadrivittatus*.—*Hab.* Middle and southern portions of the Rocky Mountains, and in the mountain ranges thence westward to the Pacific coast.
4. *Tamias asiaticus pallidus*.—*Hab.* The dry plains of the Upper Missouri and Yellowstone Rivers, and the desert plains and badlands thence westward to and including the Great Basin.

5. *Tamias asiaticus townsendii*.—*Hab.* Pacific coast, from Central California north to British Columbia.

6. *Tamias asiaticus dorsalis*.—*Hab.* The Great Basin, and southward and eastward to Mexico and New Mexico.

To these six forms have recently been added four others, as follows :

7. *Tamias macrorhabdotes*.<sup>\*</sup>—*Hab.* Sierra Nevada, Placer Co., California.

8. *Tamias asiaticus bulleri*.<sup>†</sup>—*Hab.* Sierra de Valparaiso, Zacatecas, Central Mexico.

9. *Tamias asiaticus merriami*.<sup>†</sup>—*Hab.* San Bernardino Mountains, Southern California.

10. *Tamias asiaticus hindsii*.<sup>†</sup>—*Hab.* Coast region of Northern California, and probably of Oregon. (A southern form of *T. townsendii*.)

Only the last named of these four recently added forms was represented in the material studied by me in 1877.

In considering the relationship of the form from Central Mexico, some months since,<sup>‡</sup> the material then at hand in the collection of the American Museum of Natural History showed the necessity of a thorough revision of the nomenclature and status of the forms of late currently associated under the name *Tamias asiaticus*.

As has been previously recognized,<sup>§</sup> the components of the genus *Tamias* are "peculiarly susceptible to environmental influences," and the question of how best to treat the various series of specimens from different localities, showing recognizable phases of variation—often slight, but frequently quite pronounced—is the difficult problem in the present investigation. In the material before me not less than 21 localities are represented by from 8 to 40 specimens each ; about 13 other localities are represented by from 3 to 6 specimens, and many others by a single specimen each. These localities are scattered from the Fur

<sup>\*</sup> Merriam, Proc. Biol. Soc. of Washington, Vol. III, p. 25, Dec. 26, 1885.

<sup>†</sup> Allen, Bull. Am. Mus. Nat. Hist., Vol. II, No. 3, pp. 173-179, Oct. 21, 1889.

<sup>‡</sup> See Bull. Am. Mus. Nat. Hist., Vol. II, pp. 173-179, Oct., 1889.

<sup>§</sup> See Merriam, Proc. Biolog. Soc. Washington, Vol. III, p. 28 ; also the present writer, Bull. Am. Mus. Nat. Hist., Vol. II, p. 178.

Countries of the far North to the State of Zacatecas in Central Mexico, and from the Pacific coast to the eastern base of the Rocky Mountains in Colorado, and thence further eastward to the Dakotas, and even to Northeastern Minnesota, Northern Michigan, and Western Ontario. The localities best represented are the following: Zacatecas, Mexico, 12; San Pedro, Lower California, 8; Apache County, Arizona, 7; San Francisco Peak and adjacent Mogollon Mountains, Arizona, 34; San Bernardino Mountains, Southern California, 46; Blue Cañon, Placer Co., California, 40; Donner, Placer Co., California, 45; Coast Region of Northern California, 40; Coast Region of Oregon, 11; Fort Klamath, Oregon, 12; Coast Region of Washington, 24; Coast Region of British Columbia, 17; interior of British Columbia, 16; Helena, Montana, 14; Chief Mountain Lake, near the northern boundary of Montana, 9; Ogden (and vicinity), Utah, 16; Green River, Wyoming, 20; Colorado (chiefly Boulder and Park Counties), 38; San Pedro, New Mexico, 9; Black Hills, South Dakota, 15; Turtle Mountain, North Dakota, 8; vicinity of Lake Superior, 8; British America east of the Rocky Mountains (various localities), 11.

On the other hand, there is practically nothing from Idaho, Nevada, and Utah (except the northern border); in short, very little from the vast Great Basin area north of Utah.

There is almost nothing from the main Rocky Mountain chain between Helena, Montana, and Central Colorado; nothing from the Big Horn Mountains of Wyoming, the Bitter Root Range of Idaho, or the Blue Mountains of Oregon; and nothing from Mexico north of Zacatecas; large areas east of the Rocky Mountains are represented by only a few scattered specimens; and about a dozen specimens comprise all of the material from British North America, outside of British Columbia. Three specimens comprise the total from the "Palæarctic Region."

The series from different localities are not always strictly comparable in respect to season, in some cases representing but a single month, so that in a few instances there is no clue to the amount and character of the seasonal variation in color. In a number of instances, however, the series from a single locality includes specimens in both winter and summer pelage, and often specimens in changing pelage. Less than a dozen specimens

represent the period from December 1 to May 1, and these are nearly all *Tamias dorsalis* from Arizona, and *Tamias hindsii* from Northern California. This, however, is not strange, since the various forms of *Tamias* hibernate for a longer or shorter period, according to the locality, in winter. The month of May is represented by 58 specimens; June by 117; July by 68; August by 66; September by 63; October by 78; November by 17. Consequently about nine-tenths of the specimens are in summer pelage, and thus fairly comparable as regards season, four-fifths having been collected between June 10 and November 1. The April, May, and many of the June specimens are in winter coat, but show occasionally traces of the summer pelage; some of the May, and many of the June specimens are changing, and are consequently highly instructive. In general the evidence in hand indicates that there is marked seasonal change in color in all of the forms here considered.

*Seasonal Variation in Color.*—In the preceding article (pp. 41-44) attention has been called to the striking seasonal variation in color in our common eastern Red Squirrel (*Sciurus hudsonius*), where even the pattern of coloration undergoes great change in the transition from winter to summer pelage, and *vice versa*. In the Ground Squirrels (genus *Tamias*) the seasonal change of color is less marked, affecting mainly the tints and not the pattern, which remains constant. Yet the change is so great from the faded condition of the breeding season—May and June—to the fresh bright tints of late summer and early autumn that it would sometimes be difficult to believe that the two phases are simply seasonal conditions of the same animal, were it not that certain specimens of the series were collected during the season of moult, and thus show both conditions in the same individual, the new coat with its bright tints appearing as patches interspersed with the old. Otherwise May and September specimens of the same species might easily be regarded as representing distinct species.

The process of change is evidently so gradual as to usually occupy several weeks; it also occurs earlier or later in different individuals at the same locality, so that specimens may be taken, the same day and at the same place, some of which will be in the

bleached pelage just preceding the moult, and others in the fresh, post-breeding dress, showing little or no trace of the faded breeding dress. In this way, were it not for intermediate examples showing the change in progress, or in the case of limited material with such examples absent, one might easily be misled into a theory of dimorphism to account for the two phases often met with in a large June or July series of specimens.

The moult occurs, in females, mainly after the close of the nursing period, and may thus be delayed by late parturition. The season of moult also varies with locality, and perhaps somewhat with the species. In New Mexico, as shown by a series from San Pedro, the change occurs in May, and is completed before July 1; in the mountains of Central Arizona it occurs mainly in June, covering the period from about the middle of May to the middle of July; in Colorado and British Columbia it seems to be at its height in July.

The young resemble in coloration the post-breeding phase of the adults; in the half-grown young the pelage is thin and silky, and the colors rather dull; but as the season advances the coat thickens and the tints brighten, so that by September the young of the year are generally indistinguishable in color from the adults, and differ from them only in slightly smaller size.

In the young the tail is narrower and more thinly haired than in the adults; the same is true of the tail soon after the moult, in August and September, the tail becoming fuller and more bushy as the coat thickens later in the season. Hence season and condition must be considered in allowing the fullness or slenderness of the tail to have weight as a diagnostic feature.

*Cranial Characters.*—The size and form of the skull vary much with age in all the forms, the skull continuing to thicken and increase in size after the animal has practically attained maturity. This is especially the case with the auditory bullæ, well illustrated in the series of skulls of both *T. dorsalis* and *T. merriami*, in both of which the bullæ are normally very large in comparison with other forms. In these two species the skull (especially the dentition) is heavily developed, strongly in contrast with the thin papery skull of *T. hindsii* and other allied large forms.

There is some variation in respect to the general form of the skull, the proportion of width to length varying in the different forms from .53 to .60—this difference scarcely exceeding the individual variation in a series of ten skulls of *T. dorsalis*. A similar variation is seen in respect to the relative length of the nasal bones, in which also there is too much individual variation to render the average difference between any two forms of much diagnostic importance. There is also some variation in respect to the posterior extension of the nasals in reference to the fronto-premaxillary suture; but here again a series of some twenty skulls of *T. macrorhabdotes* covers the full range of variation presented by all of the forms collectively. Hence it has proved impracticable to make much use of cranial characters as a basis for specific distinctions.

The table of measurements given beyond (p. 67) shows in a general way the size, length of nasals, relative proportion of breadth to length, etc., of average full-grown skulls.

*Classification and Geographical Distribution.*—The material in hand seems to require the provisional recognition of not less than twenty-four forms, of which thirteen are here for the first time described. This material, while apparently so abundant, is in reality too limited to render the present survey of the field more than a superficial reconnoissance, owing to the small number of localities represented, and generally their wide separation, leaving large and very important areas wholly unrepresented. Consequently each locality presents a phase or form more or less peculiar to itself. The forms from distant points are thus unconnected by intermediates, and stand out more or less sharply from their nearest allies. This is presumably due, in not a few cases at least, to the absence of specimens from intervening areas; but some of the forms have in effect, in consequence of physiographic conditions, a truly insular habitat, and must be treated as fully segregated species. On the other hand, several of the forms from the great Rocky Mountain plateau must almost of necessity intergrade more or less fully, but how and at what points cannot at present be determined. It is also quite evident that several additional forms must exist in some of the at present unknown areas of the continent, the relation of which to those

already known can be only conjectured. In a diagram on a subsequent page is indicated what appears to be the probable relationships and lines of intergradation of the several forms (see p. 63).

Even the most nearly related of the phases here recognized are easily distinguished when single average specimens are compared, but the differences become cumulative in effect when series are compared. Yet it is difficult to clearly indicate these differences in words, so that the various forms, even when quite distinct, can be identified from a description. This indeed may be true where the forms in question are beyond doubt specifically separable.\*

The difficulty of drawing up a distinctive diagnosis is due to the almost exact similarity in the pattern of coloration running throughout the group, leaving as characters only differences of size, the relative size of the ears and tail, distinctness of markings, and tones of color, all, of course, more or less subject to individual variation, and more or less affected by age and season.

The difference in size between the largest and smallest members of the group is about thirty-three per cent. of the average for the group, as regards linear measurements; while in respect to bulk and weight, the largest forms exceed the smallest by at least three-fold. The length of the tail, as compared with the length of the head and body, varies from .65 to .87. The size of the ear is equally variable, independently of the general size of the animal. These variations, variously combined with differences of color, form the differences characterizing the various forms.

An average member of the group has the dorsal surface marked with five dark and four light longitudinal stripes, and on each side of the head are three dark and three light stripes; the general color above is some shade of gray, more or less suffused with yellowish or rufous, with the flanks washed more or less heavily with some shade of rufous; the ears are more or less distinctly tricolor externally—rufous on the front edge, whitish on the posterior border, and blackish centrally and at the base; behind each ear, on the sides of the nape, is a light patch, varying greatly in size, lightness, and sharpness of definition. The tail pattern is the

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\* For example, I myself mistook for *Tamias macrorhabdotes* what is below named *T. speciosus*, and I find others have made the same mistake, as shown by the labels on various specimens of *T. speciosus*, yet no two forms of the group are more distinct than these.



same in all—above mixed blackish and light, the hairs individually black at the extreme base, then ringed more or less broadly with buff or rufous, followed by a broad zone of black, and tipped with whitish or yellowish; below with a central area of some shade of rufous, bordered with a broad line of black and a whitish or yellowish external fringe.

From this average type the variations seem interminable; the dorsal stripes vary from the utmost sharpness and distinctness to almost complete obsolescence; the outer dark stripe may be well-defined or wholly absent, or merely obsolescent. The ground color above varies from slate gray to rufous, and also to dull yellowish brown; the color of the flanks varies from the brightest golden rufous to dark umber brown, or to a faint wash of buff; the tipping of the tail hairs varies from strong yellowish to pure silvery white. The ventral surface of the body varies from snow-white to orange buff; and so on in respect to every feature of coloration, the variations being mainly of tone and degree of intensity. It can thus be seen that while two forms may strike the eye as widely different, it may be a difficult matter to clearly convey in words the exact degree and nature of the difference.

From the extreme susceptibility of this plastic group to the influences of environment, it is one of the most instructive and fascinating groups among North American mammals. No one can doubt its comparatively recent differentiation from a common stock, and its dispersion from some common centre. Whether the type originated at some point in North America, or in the northern part of Eurasia, it is perhaps idle to speculate, but that it has increased, multiplied, spread, and become differentiated to a wonderful degree in North America is beyond question; as it is found from the Arctic regions to the high mountain ranges of Central Mexico, and has developed some twenty to thirty very palpable local phases. Some of them easily take rank as species, others as subspecies. Probably a more striking illustration of evolution by environment cannot be cited.

In treating this group of forms certain general facts must evidently be borne in mind: their eminently sedentary habits; their dependence upon the presence of scrub or forest growth, preferably coniferous in character; their habit of hibernation;

and especially the great physiographic diversity of the area covered by the general habitat of the group. Three or four of the forms inhabit the bad-lands, sparsely wooded ravines, and cañons of the interior Great Basin and the Plains ; several are confined respectively to isolated mountain ranges ; others to the Pacific coast belt. The State of California, extending through 800 miles of latitude, with numerous sharply contrasted physiographic regions, has apparently no less than six strongly differentiated forms, while the region east of the Rocky Mountains, from a little below the northern boundary of the United States northward to the limit of trees—a slightly diversified region of at least ten times the area of California—has only one.

The status of several of the California forms here recognized, and their distribution, cannot be satisfactorily made out, owing to the character and sources of the material, it being nearly all from a few limited areas, and collected either in the months of June or October ; only one seasonal phase of pelage is generally represented from any one locality ; while in some instances distant localities are represented, the one by June specimens only, and the other exclusively by July to October specimens. In this way the difficulties of the case are greatly complicated.

In this connection a word or two in further explanation of the conclusions here reached, with special reference to my former revision of the group some fifteen years ago, may not be out of place. At that time it was generally presumed that the exploration of the Great West had been carried far enough to bring to light nearly all its forms of mammal life, and to reveal the leading facts of their distribution and environment, and that little more was to be done than to fill in the details respecting their distribution. Doubtless most of the leading writers of that day on North American mammals and birds had great confidence in the finality of their work. What a commentary on that conceit are the revelations, in both these fields, of the last five years ! Only within the latter part of this period have we come to realize the meagreness and inexactness of the information which previously had proved so satisfying. We are beginning to realize our ignorance, and gather, catalogue, and label with some minuteness the facts illustrative and explanatory of the great problem of the

evolution of animals by environment. To give point to this little homily, it is only necessary to cite the group of Ground Squirrels here under consideration. Of *twelve* of the twenty-four forms here recognized not a specimen was extant in any collection, public or private, so late as *five years ago*! Nor were any specimens of *Tamias* known from the areas these forms inhabit. Five more of these twenty-four forms were each represented in the material before me in 1877 by from one to four imperfect specimens, so poor in quality that their real character was only made apparent by the acquisition of better material from the same localities. That they were more or less peculiar was then recognized to the extent of treating them as intergrades between the forms they most resembled.

These twenty-four forms fall into several more or less well-marked groups, somewhat as follows :

I. The *hindsii* group, consisting of (1) *T. hindsii* of the coast region of Northern California ; (2) *T. townsendii*, of the coast region of Washington and British Columbia ; (3) *T. macrorhabdotes* of the Sierra Nevada in Placer County ; (4) *T. senex*, of the eastern slope of the Sierra, from Placer County northward to Fort Klamath ; (5) *T. quadrimaculatus*, of the Sacramento Valley, California, northward to Fort Klamath ; (6) *T. merriami*, of the mountains of Southern California. These are the largest forms, the more southern one (*merriami*) being the largest of the whole group here under consideration. It is possible that *T. senex* and *T. quadrimaculatus* may prove to be seasonal phases of the same species, though, judging by analogy from other species, this seems highly improbable.

II. The *dorsalis* group, consisting of (1) *T. dorsalis* of the desert regions of Utah and Arizona, and (2) *T. obscurus* of Lower California.

III. The *umbrinus* group, consisting of (1) *T. umbrinus* of the Wahsatch and Unitah Mountains ; (2) *T. cinereicollis*, of the Mogollon Mountains of Central Arizona ; (3) *T. bulleri* of the Sierra Madre of Central Mexico.

IV. The *quadrivittatus* group, consisting of (1) *T. quadrivittatus* of the central portion of the Rocky Mountains (Colorado and

probably Wyoming); (2) *T. luteiventris*, of the Rocky Mountains in Montana; (3) *T. affinis*, of British Columbia, east of the Cascades; (4) *T. neglectus*, of the region immediately bordering Lake Superior; (5) *T. borealis*, of the great wooded plateau region east of the Rocky Mountains, from near the northern boundary of the United States northward; and (6) possibly also *T. gracilis*, of the mountains of Central New Mexico. The last two, however, are much less closely related to *T. quadrivittatus* than are the others.

V. The *minimus* group, consisting of *T. minimus*\* of the plains of the Upper Missouri, Yellowstone, and Upper Green Rivers; (2) *T. consobrinus*, of the semi-wooded region of the eastern border of the Great Basin; (3) *T. pictus*, of the Great Basin at large. These three forms are the smallest of the group; they are only about one-third to one-half the size (as regards bulk and weight) of the species of groups I and II.

VI. The *frater* group, consisting of (1) *T. frater* of the Sierra Nevadas of Central California; (2) *T. amoenus*, occurring with the last and northward to Fort Klamath. These two species greatly resemble each other, but differ in size and in some other features. Additional material may show that they are only sub-specifically separable.

*T. speciosus* is a rather isolated species, more closely resembling *T. frater* than any other form. *T. asiaticus* has no close affiliation with any of the American forms.

The geographical distribution of these forms and their relation to the leading physiographic features of the portions of the continent that the group as a whole occupies, may be thus briefly presented, beginning at the northward:

1. *Tamias quadrivittatus borealis*.—This form appears to occupy the region bounded north by the limit of trees, and west by the Rocky Mountains, whence it extends eastward nearly or quite to Hudson's Bay, and southward to about the northern boundary of the United States, with isolated colonies in the mountains as far south as the Black Hills in South Dakota. The specimens from

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\* *Tamias asiaticus palidus* of my former monograph = *T. minimus* Bach., 1837.

British America are few, but from widely separated points, as Forts Simpson and Liard, at the eastern base of the Rocky Mountains, the Mackenzie River District, Nelson River, and thence southward to Pembina, and the Turtle and Bear's Paw Mountains. It is a form of medium size and dull, rather dark coloration, confined apparently to well-wooded districts.

2. *Tamias quadrivittatus neglectus*.—This form seems restricted to the very heavily forested region bordering Lake Superior, occurring along its eastern border in Ontario, in the northern peninsula of Michigan, in Northern Wisconsin, and in Northeastern Minnesota. Its range to the northward, and its relationship to *borealis*, remain undetermined, though it would seem that the two forms must somewhere intergrade. It is characterized by the intensity and depth of its tints. While it probably intergrades with *borealis* to the northward, it is entirely cut off from all of the other forms by a broad region of prairies and plains where no form of the *Tamias quadrivittatus* group occurs.

3. *Tamias quadrivittatus affinis*.—This highly-colored form is at present known only from the well-wooded interior of British Columbia, east of the Cascades. How far it extends either north, south, or east is unknown, as is also its relationship to the form occurring in the Rocky Mountains to the eastward, there being no material from the intervening region. To the southward and westward it is replaced by very different forms.

4. *Tamias quadrivittatus luteiventris*.—This is the form of the main chain of the Rockies in Northern Montana. How far it extends northward into British America there is no material to show. It is a forest form, of deep colors, and distinctively characterized by a strong fulvous wash over the ventral surface. It is based on a series of specimens from Chief Mountain Lake, with which specimens from Mystic Lake also agree. Specimens from Helena, Montana, are not quite the same, though referred to it, having also fulvescent underparts, but paler sides and grayer upperparts.

5. *Tamias quadrivittatus*.—This form was originally based on specimens collected in Colorado, in the mountains at the head of the Arkansas River, and seems to prevail throughout the main

chain of the Rockies in Colorado. Specimens from the same chain further north in Wyoming, including the Yellowstone Park region, are somewhat different, though apparently much better referable here than to *luteiventris*. The specimens, however, are few and poor in quality. The region is about equally isolated from the habitat of both *luteiventris* and *quadrivittatus* by breaks in the continuity of the physical features.

A small series from the outlying Laramie range in Eastern Wyoming is also different from any specimens from elsewhere, but in the absence of proper material the series is provisionally referred to *quadrivittatus*.

The still more isolated Big Horn Mountains of Northern Wyoming are unrepresented. Whether the form occurring there will be referable to *borealis* or require separate recognition is thus a matter of conjecture.

6. *Tamias quadrivittatus gracilis*.—This is a slender, bright colored form of the main Rocky Mountain chain, occurring in Central New Mexico, more different from true *quadrivittatus* than any of the preceding forms except *borealis*. Specimens from Apache County, Arizona, are quite similar, so it is probable that the form inhabiting the intervening mountains in northwestern New Mexico may be also referable here—a point not now determinable from lack of specimens.

7. *Tamias umbrinus*.—This is a very large heavily-colored form of the well-wooded Uintah and Wahsatch ranges, forming the eastern border of the Great Basin. It is very different from any of the Rocky Mountain forms, with which there is no possibility, owing to the isolated nature of its habitat, of its direct intergradation. The same is true in respect to its relationship to other mountain forms to the southward and northward.

8. *Tamias minimus*.—This is one of the very small, pallid, desert forms, which, so far as the present material goes, cannot be said to intergrade with any other, though it would seem, from its distribution, that it might intergrade with *borealis*, as it probably also does with the other small desert forms of the Great Basin. This form occupies the plains from (probably) the Saskatchewan region southward, and westward to the Rocky

Mountains, inclosing within its range colonies of *borealis*, occupying isolated wooded mountains rising abruptly from the plains, as the Turtle Mountains, Black Hills, etc. At the southwestward, in Southern Wyoming, it crosses the broad forestless depression of the main divide separating the drainage areas of the North Platte and Green Rivers, spreading over the sage plains of the upper Green River basin. It is here cut off on the west and south by the well-wooded ranges of the Wahsatch and Uintah chains. It thus extends across and cuts in two the habitat of *T. quadrivittatus*, if the forms inhabiting the Laramie chain and the Yellowstone Park region be referred to that species.

9. *Tamias minimus consobrinus*.—This form inhabits the foothills and edges of the plains bordering the Uintah and Wahsatch ranges, and thence appears to extend southward and eastward over the half-wooded region of western and southwestern Colorado to the San Luis Valley. Specimens from old Fort Massachusetts, in Southern Colorado, are certainly not satisfactorily distinguishable from those from about Salt Lake City and Fort Bridger. Much more material is necessary to definitely establish the boundaries of its habitat. It is of about the size of *minimus*, but is not nearly so pallid, differing markedly from it in coloration. Though found with *umbrinus* at certain localities, and to some extent resembling it in its tones of color, it differs from *umbrinus* in such a manner as to render their intergradation wholly improbable.

10. *Tamias minimus pictus*.—This is a small, pale, desert form of the Great Basin, differing from all others in the slate gray tint of the general coloration above, its sharply contrasted dorsal streaks, and almost entire absence of the usual wash on the flanks. It ranges from the sage plains of the Columbia River, in Washington, southward to Central Utah and Southern Nevada, and as far east as the northern end of Great Salt Lake. Over how much of this general area it occurs cannot now be stated, owing to lack of material.

11. *Tamias dorsalis*.—This is a large, gray, desert form, occupying the interior arid region, from Northern Utah southward to at least the Mexican boundary, and probably much beyond it, and

from southwestern New Mexico westward to the southeastern border of California. It differs from the other pallid forms (one of which it overlaps in distribution) in being twice their size, in having a heavy, bushy, instead of a slender, narrow tail, and in the dorsal streaks being nearly obsolete. It ranges but a short distance up the slopes of the wooded mountains of Central Arizona, which form the home of a wholly isolated species of very marked characteristics.

12. *Tamias obscurus*.—This form, known at present only from the San Pedro Martir Mountains of Lower California, is a large form with the dorsal streaks very nearly obsolete. It is closely related to *T. dorsalis*, but seems to be too different to be specifically united with it.

13. *Tamias cinereicollis*.—This is a large, very strongly colored form of the heavily wooded mountains of Central Arizona, wholly isolated, as regards its habitat, from any of the other mountain forms.

14. *Tamias bulleri*.—This is a geographically widely separated form of the Sierra Madre Mountains of Central Mexico. Its closest resemblance is to *cinereicollis*, with which, however, intergradation can scarcely be expected on any grounds.

15. *Tamias merriami*.—This is the largest member of the group, well characterized by its very peculiar coloration and relatively very long tail. Its habitat is the sparsely wooded San Bernardino Mountains and neighboring ranges in Southern California, westward and northward into Monterey County.

16. *Tamias speciosus*.—This is a peculiar form, of medium size, differing strongly in various features from all others. It occurs in the San Bernardino Mountains of Southern California, sharing its habitat with *T. merriami*.

17. *Tamias frater*.—This is a rather bright-colored, medium-sized, short, bushy-tailed species of the central portion of the Sierra Nevada, California, most of the specimens in hand being from Placer County and the neighboring mountain region to the eastward in Nevada. It much resembles the next in coloration, and the two forms may intergrade.



18. *Tamias amoenus*.—This is a very small form of the Sierras of Central California and Nevada (Lake Tahoe district), northward at least as far as Fort Klamath. It is quite as small as the small desert forms, but has otherwise no close resemblance to them. Specimens from Lassen and Shasta Counties, California, seem to indicate its habitat as the eastern slope of the wooded Sierra Nevada and Cascade ranges. How far northward in the latter it extends cannot be determined, since there are no specimens available from any part of the Cascades north of Fort Klamath.

19. *Tamias senex*.—This is a large gray form of the Sierra Nevada of Central California, to which a single specimen from Fort Klamath, Oregon, is distinctly referable. Further than this its distribution cannot be defined. It occurs with the last in the Lake Tahoe district. Only May and June specimens are available for examination, the post-breeding pelage being unrepresented. It is apparently quite different from the next, which it adjoins in habitat.

20. *Tamias macrorhabdotes*.—This very distinct, easily characterized form has, so far as known, a very limited habitat, all of the numerous specimens known (except one from Carson City, Nevada) being from Blue Cañon, on the western slope of the Sierra Nevada, in Placer County, California. As now known it has no close relationship with any other form, though it may eventually prove to intergrade with the next.

21. *Tamias quadrimaculatus*.—This form is thus far known from only a few specimens, mostly in bad condition, from the Sacramento Valley, California, from Michigan Bluff, Sacramento County, northward to Shasta County, and Fort Klamath, Oregon. It is the reddest of all the forms; has very large ears and a white-edged tail.

22. *Tamias townsendii hindsii*.—This is a southern form of *T. townsendii*, confined to the heavy rain-fall belt of the coast of California, from San Francisco northward into Oregon. It is characterized by a rufous instead of yellowish suffusion of the dorsal surface.

23. *Tamias townsendii*.—This is the large fulvous form of the heavy rain-fall belt of the northwest coast, from Oregon northward to British Columbia, excluding Vancouver Island. It is apparently not found east of the Cascade Mountains. The northern limit of its distribution in British Columbia is not known. Although very different from *hindsii* of Northern California, the two forms probably intergrade, but from lack of specimens from the intermediate districts intergradation is not shown by the material in hand.

The last five form a group of rather closely-related forms, several of which may eventually be found to intergrade.

24. *Tamias asiaticus*.—This Euro-Asiatic form differs markedly from any American form, as shown later on in the present paper. It is also separated from them geographically by a wide area in Northwestern North America, where no form of *Tamias* occur.

The accompanying diagram indicates the status, relationships, and lines of probable intergradation of the forms here considered, so far as can be judged by the material in hand, and also rudely their geographical relations. The forms connected by dotted lines may be found to intergrade, though at no very distant date, geologically speaking, they were doubtless all local forms of a common species, which has become broken up and differentiated in comparatively modern times, through climatic changes and the consequent modifications in the character of the vegetation.



The following "key" gives the salient features of the various forms of *Tamias* here under consideration, based on average adult specimens, generally in the post-breeding pelage. Owing to the great amount of seasonal variation in color, and of individual variation in this and other features, and of variation in size with age, it is impracticable to attempt the construction of a "key" that will fit all conditions and seasons. The characters given below are to be understood as indicating the average differences shown by a fairly representative series of the forms in question.

*Key to the Species and Subspecies.*

- A. Very large; total length about 270 mm. (10.50 in.); tail with hairs nearly as long as head and body; dorsal streaks sub-equal and strongly contrasted; *flanks not rufous; head and lower back rufescent, in contrast with the flanks and anterior dorsum*.....*asiaticus*.
- B. Very large; total length about 260 to 280 mm. (10 to 11 in.); tail very long, the vertebræ alone equal to about 83 per cent. of length of head and body; ears large, 11 to 14 mm. in length; tail-hairs tipped with white.
  - a. Dorsal streaks distinct.
    - a<sup>1</sup>. General color above strong yellowish brown or olivaceous rufous; the light dorsal streaks of the same color as the general ground color; post-auricular patches gray, very small, nearly concealed by surrounding fur.....*townsendii*.
    - b<sup>1</sup>. General color above reddish brown; outer light dorsal streaks more or less whitish, much lighter than the ground color; post-auricular patches white or grayish white, conspicuous.....*hindsii*.
    - c<sup>1</sup>. General color above gray, with a slight yellowish cast; outer light stripes broad, nearly white; post-auricular patches large, light gray, not sharply defined.....*merriami*.
  - b. Dorsal streaks obsolete.
    - a<sup>1</sup>. Median dorsal streak alone distinct; above whitish gray, the hairs broadly ringed subterminally with rusty yellow, which color shows more or less through the gray of the surface; post-auricular patches large, clear white, conspicuous; thighs dull rusty yellow, in contrast with the general dorsal surface.....*dorsalis*.
    - b<sup>1</sup>. All of the dorsal streaks obsolete; above gray mixed and suffused with brown; post-auricular patches whitish, not conspicuous; thighs uniform with the general dorsal surface.....*obscurus*.
- C. Large; total length about 254 mm. (10 in.); tail vertebræ equal to about .70 of head and body; ears very large, about 14 to 16 mm.; tail hairs conspicuously tipped with white.
  - a. Sides of shoulders and anterior dorsal surface deep reddish brown, in contrast with the gray rump and thighs.
    - a<sup>1</sup>. Ears very large; pure white post-auricular patches very large; sides and back dull brownish red.....*macrorhabdotes*.
    - b<sup>1</sup>. Ears and post-auricular patches smaller; sides and back strong rusty red.....*quadrifasciatus*.
  - b. Sides of shoulders and anterior dorsal surface gray, like the rump and thighs; ears and auricular patches as in the last.....*senex*.

- D.* Size medium; total length 235 to 250 mm. (about 9.20 to 9.80 in.); tail vertebrae .80 to .87 of head and body; ears of medium size, about 10 to 13 mm.; tail hairs tipped with yellowish; the four light dorsal streaks of about equal breadth.
- a.* Five dark dorsal streaks, the outer pair nearly as well defined as the others, though much shorter.
- a*<sup>1</sup>. Sides of neck and nape gray, in strong contrast with the rufous flanks; tail hairs tipped with yellowish. . . . . *cinereicollis*.
- ♂*<sup>1</sup>. Sides of neck and nape more or less suffused with rufous; tail hairs tipped with rusty yellow.
- a*<sup>2</sup>. Ventral surface yellowish buff. . . . . *luteiventris*.
- ♂*<sup>2</sup>. Ventral surface white or grayish white.
- a*<sup>3</sup>. Size large; flanks orange rufous; central area of tail below deep orange. . . . . *neglectus*.
- ♂*<sup>3</sup>. Size large; sides golden; central area of tail below pale orange. . . . . *affinis*.
- c*<sup>3</sup>. Smaller; sides golden; central area of tail below pale orange. . . . . *quadrivittatus*.
- d*<sup>3</sup>. Smaller; sides dull yellowish brown; dark dorsal streaks seal brown instead of black (as in the preceding); the light streaks more tinged with yellowish. . . . . *borealis*.
- b.* Only three distinct dark dorsal streaks, the outer pair obsolete or absent.
- a*<sup>1</sup>. Tail hairs tipped with yellowish buff; central area of tail below deep reddish orange; eye-stripe narrow.
- a*<sup>2</sup>. Sides of neck and flanks dull umber brown. . . . . *umbrinus*.
- ♂*<sup>2</sup>. Sides of neck and flanks bright golden brown. . . . . *gracilis*.
- ♂*<sup>1</sup>. Tail hairs tipped with gray; central area of tail pale yellowish orange; eye-stripe very broad; sides of neck and body gray, with a small area of rusty chestnut on flanks . . . . . *bulleri*.
- E.* Size medium; total length about 235 mm. (9.20 in.); tail vertebrae about .74 of head and body; ears of medium size (12 mm.), with large clear white post-auricular patches; tail with a conspicuous black tip, both above and below; outer light dorsal streaks pure white, two to three times as wide as the very narrow gray inner streaks. . . . . *speciosus*.
- F.* Size small; total length about 200 to 220 mm. (8 to 8.75 in.); ears variable (8 to 11 mm.).
- a.* Tail short, bushy, about .65 of head and body; ears large (11 mm.).
- a*<sup>1</sup>. Smaller; hairs of upper surface of tail pale buff at base, much paler than the central area of the tail below. . . . . *amoenus*.
- ♂*<sup>1</sup>. Larger; hairs of upper surface of tail strong reddish orange at base, much redder than the central area of the tail below . . . . . *frater*.
- b.* Tail long, narrow, .73 to .86 of head and body.
- a*<sup>1</sup>. Sides of body dull strong umber brown; dark dorsal streaks dark seal brown; tail long, .86 of head and body. . . . . *consobrinus*.
- ♂*<sup>1</sup>. Sides of body chocolate brown; dark dorsal streaks dull yellowish brown; tail short, about .73 of head and body. . . . . *minus*.
- c*<sup>1</sup>. Sides slate gray, faintly buff on middle of body; dark dorsal streaks seal brown, nearly black; tail medium, about .80 of head and body. . . . . *pictus*.

## External Measurements.\*

	Total length.		Head and body.		Tail vertebrae.		Tail to end of hairs.		Hind foot.		Height of ear.		Perc. of tail vert. to head and body.
	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	
<i>Tamias merriami</i> .....	285	11.13	140	5.51	117	4.61	146	5.75	34	1.34	13	.51	88
“ <i>asiaticus</i> *.....	271	10.58	146	5.75	100	3.94	125	4.92	35	1.38	10	.39	69?
“ <i>senex</i> *.....	264	10.31	146	5.75	98	3.86	118	4.65	35	1.38	14	.55	67?
“ <i>townsendii</i> hindsi.....	264	10.31	133	5.24	110	4.33	131	5.16	34	1.34	11	.43	83
“ <i>townsendii</i> .....	257	10.33	131	5.16	107	4.21	126	4.96	34	1.34	12	.47	82
“ <i>macrorhabdotes</i> .....	260	10.03	134	5.67	97	3.82	126	4.57	34	1.34	16	.63	72
“ <i>dorsalis</i> .....	253	9.96	125	4.92	104	4.10	132	5.20	33.5	1.32	14	.55	83
“ <i>bulleri</i> *.....	250	9.84	127	5.00	98	3.86	125	4.92	33.5	1.32	12	.47	77
“ <i>umbrinus</i> .....	249	9.80	125	4.92	100	3.94	124	4.88	32	1.26	10	.39	80
“ <i>cinereicollis</i> .....	247	9.73	121	4.73	101.5	4.00	126	4.96	35	1.38	13	.51	84
“ <i>quadrinaculatus</i> *.....	249	9.80	134	5.28	98	3.66	115	4.53	30	1.18	14	.55	70
“ <i>quadrivittatus affinis</i> *.....	245	9.65	125	4.92	95	3.74	120	4.73	31.5	1.24	10	.39	78
“ <i>quadrivittatus luteiventris</i> .....	243	9.57	128	5.04	93	3.66	117	4.60	33	1.30	11.5	.45	73
“ <i>speciosus</i> .....	234	9.21	123	4.84	91	3.58	111	4.37	32	1.26	12	.47	74
“ <i>obscurus</i> *.....	230	9.06	125	4.92	80	3.15	105	4.13	32	1.26	12	.47	74
“ <i>quadrivittatus gracilis</i> .....	235	9.27	115	4.53	100	3.94	120	4.73	31	1.22	12	.47	87
“ <i>quadrivittatus borealis</i> .....	230	9.06	113	4.45	99	3.90	117	4.62	31	1.22	9	.36	87
“ <i>quadrivittatus</i> .....	223	8.78	115	4.53	82	3.23	108	4.23	31	1.22	10	.39	71
“ <i>quadrivittatus neglectus</i> *.....	225	8.86	115	4.53	90	3.54	110	4.33	30	1.18	9	.36	78?
“ <i>frater</i> .....	225	8.78	119	4.68	77	3.03	97.5	3.84	32	1.26	11	.43	65
“ <i>amoenus</i> .....	207	8.15	116	4.57	70	2.76	91	3.58	30	1.18	11	.44	67
“ <i>minimus consobrinus</i> .....	214	8.43	103	4.06	90	3.54	111	4.37	29.5	1.16	9	.36	87
“ <i>minimus pictus</i> .....	210	8.37	110	4.33	89	3.50	109	4.29	29	1.14	8	.32	81
“ <i>minimus</i> .....	202	7.95	117	4.61	85	3.35	106	4.17	29	1.14	8	.32	73

\* The measurements here given are averages, based on measurements taken by the collector before skinning, of generally 8 to 20 or more specimens, except where the names are marked with an asterisk, where the measurements are based on skins, and must be considered as only approximate.

*Measurements of the Skull.\**

	Total Length.		Greatest Width.		Per cent. of width to length.	Length of nasals.		Length of upper molar series.	
	Mm.	In.	Mm.	In.		Mm.	In.	Mm.	In.
<i>Tamias dorsalis</i> .....	41.7	1.64	22.8	.90	55	12.2	.48	6.4	.25
" <i>merriami</i> .....	40.9	1.61	23.6	.93	58	12.7	.50	6.9	.27
" <i>townsendii hindsi</i> ..	40.0	1.56	22.4	.88	57	11.9	.47	5.8	.23
" <i>townsendii</i> .....	38.6	1.52	22.1	.87	57	11.2	.44	6.1	.24
" <i>quadrimaculatus</i> ..	38.9	1.53	22.1	.87	56	11.9	.47	6.1	.24
" <i>macrorhabdotes</i> ..	38.1	1.50	20.6	.81	54	12.7	.50		
" <i>senex</i> .....	37.6	1.48	21.1	.83	53	12.5	.49	5.8	.23
" <i>obscurus</i> .....	38.1	1.50	20.8	.80	53	11.9	.47		
" <i>bulleri</i> .....	37.6	1.48	20.8	.82	53	11.9	.47	6.6	.26
" <i>cinereicollis</i> .....	37.3	1.47	20.7	.81	53	12.2	.48	5.6	.22
" <i>umbrinus</i> .....	37.1	1.46	19.5	.77	53	10.9	.43	5.1	.20
" <i>quadrivittatus gracilis</i> ..	36.1	1.42	19.0	.75	55	11.4	.45	5.3	.21
" <i>speciosus</i> .....	35.0	1.38	19.8	.78	57	11.4	.45	5.6	.22
" <i>frater</i> .....	35.0	1.38	19.6	.77	57	10.9	.43	5.1	.20
" <i>quadrivittatus luteiventris</i> ..	33.8	1.33	19.6	.77	58	10.2	.40		
" <i>quadrivittatus affinis</i> ..	33.8	1.33	18.4	.73	55	10.2	.40	5.3	.21
" <i>quadrivittatus borealis</i> ..	32.5	1.28	18.4	.73	57	10.4	.41	5.3	.21
" <i>quadrivittatus</i> .....	32.8	1.29	18.3	.72	56	10.2	.40	4.6	.18
" <i>amoenus</i> .....	32.3	1.27	18.4	.73	58	9.0	.35	4.6	.18
" <i>minimus</i> .....	31.8	1.25	19.0	.75	60	10.2	.40	5.1	.20
" <i>minimus consobrinus</i> ..	30.5	1.20	17.3	.68	57	9.4	.37	4.8	.19
" <i>minimus pictus</i> .....	30.0	1.18	17.0	.67	57	9.0	.35	4.6	.18

\* Based on single average fully adult specimens.

**Tamias dorsalis.**

(GILA CHIPMUNK.)

*Tamias dorsalis* BAIRD, Proc. Acad. Nat. Sci. Phila., VII, 1855, p. 332; Mam. N. Am., 1857, p. 300, pl. xlvi; U. S. and Mex. Bound. Surv., II, pt. ii, 1859, p. 37.—GRAY, Ann. and Mag. Nat. Hist., 3d ser., XX, 1867, 436.—COUES, Amer. Nat., I, 1867, p. 358; Proc. Acad. Nat. Sci. Phila., 1867, p. 134.

*Tamias quadrivittatus*, var. *dorsalis* ALLEN, Proc. Boston Soc. Nat. Hist., XVI, 1874, p. 290.

*Tamias quadrivittatus dorsalis* COUES & YARROW, Wheeler's Rep. Geogr. Expl. and Surv. West of 100th Merid., V, 1876, p. 119.

*Tamias asiaticus*, var. *dorsalis* ALLEN, Mon. N. Am. Roden., 1877, p. 794.

*Tamias quadrivittatus pallidus* COUES & YARROW, Wheeler's Rep. Geogr. Expl. and Surv. West of 100th Merid., V, 1876, p. 118 (specimen examined).

*Hab.*—Great Basin, from Northern Utah southward to Mexico, west to the Sierra Nevada Mountains, east to the Mimbres in New Mexico.

*Autumnal Pelage* (Sept.-Dec.).—Coat very soft and thick. Above whitish gray, varied with black hairs, and with a faint vinaceous cast, due to the color of the underfur showing through the whitish general surface, the hairs being broadly ringed subterminally with tawny; ventral surface soiled white, the fur plumbeous at the base; sides, at the junction of the dorsal and ventral areas, dull yellowish brown (very pale, almost obsolete, in some specimens, quite strong in others), extending from the sides of the head to, and including, the hind limbs. Dorsal streaks obsolete, except the single, narrow, half-concealed black median stripe; the four light stripes are indistinctly outlined by slightly darker interspaces, so that rudimentary traces of the usual five dark and four light stripes are, as a rule, faintly outlined. Facial stripes well defined, the light ones very broad, grayish white, the dark ones much narrower, the upper dusky; the eye-stripe pale brown, blackish for a short distance just behind the eye; the lower or malar stripe brownish, slightly varied with dusky, widening and becoming more rufous posteriorly, where it forms a rather broad rusty mark below the base of the ear and the post-auricular patch. Ears rather large, pointed, the front third externally rusty, the posterior third whitish, the intervening triangular space at the base of the ear blackish. Post-auricular patches large, whitish. Tail very broad and bushy, above black varied with white, the hairs being broadly ringed near the base with pale buffy white, with a broad sub-apical zone of black, and tipped with nearly pure white; below, central area orange rufous, edged and tipped with a broad band of black, fringed with soiled white.

*Breeding Pelage* (April and May).—Generally similar to the autumnal pelage, but all the tints paler, the general color above much more ashy, without the vinaceous effect, the subterminal zone of the underfur narrower, paler, and more yellowish.



*Young*.—Pelage thin, silky. In the young of the year (one-fourth to nearly full grown) the dorsal stripes are all very distinct, quite as much so as in several of the forms of the *quadrivittatus* group. The median dark stripe is often deep black; the middle pair strong rufescent brown, more or less mixed with dusky or even black; the outer pair more faintly indicated, brownish. The middle light stripes are broad, clear whitish gray; the outer pair narrower, often nearly pure white. Sides of body strong yellowish tawny, varying to dull cinnamon; hind feet cinnamon rufous, which color strongly washes the hind legs. As the season advances the coat thickens, the stripes become more and more obsolete, the colors changing by the growth of the new fur, which is lighter at the tips and more broadly ringed with tawny beneath the surface.

*Measurements*.—Length (average from measurements of 12 specimens in the flesh by collectors), 253 mm.; head and body, 125 mm.; tail vertebræ, 104 mm.; tail to end of hairs, 132 mm.; hind foot, 33.5 mm.; height of ear (from skins) 14 mm.

*Specimens examined*, 42; collected as follows: Ogden, Utah, Oct. 9–19, 1888, Vernon Bailey (Coll. C. H. Merriam), 7; Provo, Utah, Nov. 12, 1888 (same collector and collection), 2; Manti, Utah, Dec. 1, 1888 (same), 1; Ogden, Utah, June 14, 1872, Dr. C. H. Merriam (U. S. Nat. Mus.), 1 (young); Santa Catalina Mountains, Arizona, May 29–June 3, 1889, V. Bailey (Dept. of Agric.), 8; Santa Catalina Mountains, Arizona, Nov. 4–6, 1886, W. E. D. Scott (Am. Mus. Nat. Hist.), 4; Grand Cañon, Cohinini Plateau, Arizona, Sept. 14, 1889, Merriam and Bailey (Dept. of Agric.), 2; various localities, Central Arizona, April 21, May 22, June 4, Aug. 11 and 30, Nov. 11–19, Dr. E. A. Mearns (Am. Mus. Nat. Hist.), 11; Prescott, Arizona, Oct. 7, 1889, Dr. L. Stejneger (U. S. Nat. Mus.), 1; same locality and collection, Sept. 8, 1866, Dr. E. Coues, 1; Fort Wingate, New Mexico, Feb. 23, 1887, Dr. R. W. Shufeldt (Nat. Mus.), 1; El Moro, New Mexico, July 23, 1877, H. W. Henshaw (Nat. Mus.), 1; Copper Mines, Gila River, New Mexico, J. H. Clark (Nat. Mus.), 2, including type of the species.

The specimens from Arizona average somewhat larger than those from Northern Utah, as shown by the collector's measurements of the adults in the two series, but they seem not to be otherwise different.

This form is so distinct from all others that it only needs comparison with the next, which is its nearest ally, and with which it may be found to intergrade.

From the dates on the labels it would seem to be active nearly throughout the year, retiring for a brief period during the severest weather. Dr. Mearns informs me that it is preëminently an inhabitant of cañons and rocky country, though ranging upward

into the lower edge of the pine belt in the mountains of Arizona, where it is sometimes found at an altitude of 6500 feet, its habitat, however, not overlapping that of *T. cinereicollis*.

***Tamias obscurus* Townsend, MS.**

(LOWER CALIFORNIA CHIPMUNK.)

*Tamias obscurus* TOWNSEND, MS.

*Hab.*—San Pedro Mountains, Lower California, Mexico.

*Breeding Pelage* (May).—Pelage very soft and thick. General color above gray, rather darker and browner than in *T. dorsalis*; subterminal band of underfur browner; central area of tail below darker, more chestnut brown; median dark dorsal streak less well defined, distinctly traceable for only a short distance on the middle of the back, in front of the hips. Outer pair of light stripes indistinct, but evident. Thighs and hind legs similar in coloration to back and sides—not tawny, in contrast with back and sides, as in *T. dorsalis*. In other respects similar in coloration to May and June specimens of *T. dorsalis*. Size, however, apparently much smaller.

*Measurements.*—Length (approximate from skins), 230 mm.; head and body, 125 mm.; tail vertebræ, 80 mm.; tail to end of hairs, 105 mm.; hind foot, 32 mm.; height of ear, 12 mm.

Type, No. 18,050, Coll. U. S. Nat. Mus., ♀ ad., San Pedro Mountains, May 1, 1889, C. H. Townsend.

*Specimens examined*, 8 (U. S. Nat. Mus.), San Pedro Mountains, Lower California, April 29–May 6, 1889; collected by Mr. C. H. Townsend, who has generously placed them in my hands, under the above manuscript name, for description.

The eight specimens are all adults in the faded pelage of the breeding season, but none of the four or five females among them appear to have been nursing young when killed, the date (about May 1) being perhaps too early for the young to have been born. The series presents considerable individual variation in color, mainly in respect to the amount of brownish suffusion beneath the surface of the pelage, in some it being quite strong and in others nearly absent, in which latter the general color of the dorsal surface is somewhat paler and grayer than in the others.

This species, while evidently closely allied to *T. dorsalis*, may well be treated as distinct, in the light of present material. It is evidently much smaller than *T. dorsalis*, browner in coloration, with the thighs and hind legs uniform with the back, and the

median dorsal stripe obsolete except for a short distance on the lower part of the back. In *T. dorsalis* this stripe, though narrow, is generally well defined from the middle of the crown to the base of the tail; the hind legs and thighs are also tawny, in more or less strong contrast with the color of the back, the reverse of what occurs in *T. obscurus*. The two forms are, however, much more nearly related to each other than are either to any other form.

### **Tamias asiaticus.**

(SIBERIAN CHIPMUNK.)

*Sciurus striatus* PALLAS, Nov. Glires, 1778, p. 378 (not *S. striatus* of LINN., ex CATESBY).

*Sciurus striatus*, *a. asiaticus* GMELIN, Syst. Nat., I, 1788, p. 150.

*Sciurus uthensis* PALLAS, Zoog. Rosso-Asiat., I, 1831, p. 189 (melanistic).

*Tamias pallasi* BAIRD, Ann. Rep. Smiths. Inst. for 1856 (May, 1857), p. 55; Mam. N. Am., 1857, p. 295.

*Tamias quadrivittatus*, var. *pallasi* ALLEN, Proc. Boston Soc. Nat. Hist., XVI, 1874, p. 290 (in part only).

*Tamias asiaticus* ALLEN, Mon. N. Am. Roden., 1877, p. 793 (in part only).

*Tamias asiaticus*, var. *borealis* ALLEN, *ibid.*, p. 793 (in part—only the Old World specimens and references).

*Hab.*—Siberia; from the east coast westward to the White Sea and Dwina River.

General color above pale yellowish gray, passing into dull dark rufous on the head and lower part of the back and thighs; sides of body only slightly or not at all more suffused than the middle of the dorsal region. Dorsal dark stripes five, black, a little broader than the lighter interspaces, the three median ones extending from the nape to the base of the tail, the outer pair nearly as broad and distinct as the others, and nearly as long, extending from the middle of the shoulder to a point a little posterior to the acetabulum. Middle pair of light stripes white, suffused more or less with fulvous or rufous for their posterior half; outer pair slightly broader than the median ones, whiter, and less suffused posteriorly. Facial stripes very distinct, the light ones grayish white, the dark ones blackish brown, the lower one very broad and strong, broadening posteriorly and continued to the sides of the nape. Below clear white, or pale fulvous white. Tail above mixed black and whitish; central area below pale buffy yellow, edged narrowly with black, with an external broad fringe of white. Ears small, narrow, and pointed.

*Measurements.*—Length, 271 mm.; head and body, 146 mm.; tail with hairs, 125 mm.; hind foot, 35 mm.; height of ear, 10 mm.

*Specimens examined*, 4, "Siberia."—They vary somewhat in color, especially in the amount of rufous on the head and lower back, and probably represent different seasons of the year.

With the material now before me, I consider that the reference of certain American forms of *Tamias* to the Old World *T. asiaticus*, made by me in 1874 and 1877 (l. c.), was hasty and unwarranted. In 1877 I had practically only a single skin of the Siberian Chipmunk, a second example (completing the series) being in too poor condition to be of any value. I now have in addition two mounted specimens (Coll. Am. Mus.) in very fair condition, which show the characters of the species to good advantage.

The Siberian Chipmunk proves to be of about the size and general proportions of *T. townsendii*, with somewhat the general appearance of *T. borealis*, having similar small ears and pale coloration. A close comparison, however, shows it to be a heavier, larger animal than the latter, as shown especially by the size of the feet, and that it also differs in certain features of coloration. The facial dark streaks are more pronounced, especially the lower one. The light dorsal bands are whiter, and the upper surface of the head and the lower back and rump are strongly washed with rufous, in contrast with the general dorsal surface, while there is very little rufous suffusion on the sides. Larger size, and the rufous head and rump, however, form the chief distinctions separating it from *T. borealis*, while the marked difference in coloration easily distinguishes it from *T. townsendii*. In the color of the head and rump it somewhat recalls *T. striatus*, which it also resembles in size; but from which it differs in its very much longer tail, and in the very different character of the dorsal streaks, both in color and extent.

As no form of *Tamias* has as yet been either taken or reported from any part of Alaska, so far as I have been able to ascertain, there is a wide geographical hiatus at present separating *T. asiaticus* from any of its congeners, however the case may have been in comparatively recent times, geologically speaking.

### ***Tamias townsendii.***

(TOWNSEND'S CHIPMUNK.)

*Tamias townsendii* BACHMAN, Journ. Acad. Nat. Sci. Phila., VIII, 1839, p. 68; also, in part, of BAIRD, and others prior to 1874.

*Tamias quadrivittatus townsendi* ALLEN, Proc. Boston Soc. Nat. Hist., XVI, 1874, p. 290 (in part).

*Tamias asiaticus townsendi* ALLEN, Mon. N. Am. Roden., 1877, p. 794 (in part).

*Tamias cooperi* BAIRD, Proc. Acad. Nat. Sci. Phila., 1855, p. 334; Mam. N. Am., 1857, p. 301.

*Hab.*—Coast region (west of the Cascade Mountains) of Washington and British Columbia, from about the mouth of the Columbia River northward.

*Post-breeding Pelage.*—Above, general color nearly uniform yellowish-olivaceous rufous, the flanks only slightly deeper in tone than the back. Dark dorsal stripes five, black, the median three deep black and broad, the middle one extending from the centre of the crown to the base of the tail, the next on either side beginning at the shoulder and terminating at the base of the tail, the outer much shorter (extending from the posterior border of the shoulder to the hip) and narrow, usually more or less suffused with the ground color, and sometimes obsolete. The median pair of intervening light stripes usually uniform with the general ground color, sometimes slightly lighter; outer pair of light stripes usually barely perceptibly lighter than the median pair, but occasionally distinctly grayish, and hence more or less in contrast with the general ground color. Facial markings not strongly contrasted, but of the usual pattern, consisting of a band of yellowish gray above the eye, and another similar band below the eye, the two separated by an ocular stripe of yellowish brown mixed with dusky, the portion in front of the eye usually obsolete; the light superciliary stripe is bordered above with an edging of blackish; the light subocular stripe is bordered below by a yellowish brown malar stripe, mixed with blackish. Ears large, externally blackish, with a broad posterior margin of grayish white; a small grayish spot behind the base of the ear, partly concealed by the surrounding fur. Ventral surface of the body grayish white, often nearly pure white centrally. Tail above black fringed with silvery white, the hairs being dark reddish brown at base, subterminally broadly ringed with black and tipped with white; below, central area bright chestnut, bordered with black, and an outer fringe of white.

*Breeding Pelage.*—Specimens taken in May and June differ only in having all of the tints paler, with the light dorsal streaks grayish, especially the outer pair, which are often pure light gray.

*Young.*—The half-grown young are similar in color to the adults in fall, except that the tints are duller, and the pelage finer and softer. The outer light stripes are, however, much lighter than the ground color.

*Measurements.*—Length, 257 mm.; head and body, 131 mm.; tail vertebrae, 107 mm.; tail to end of hairs, 126 mm.; hind foot, 35 mm.; height of ear, 12 mm. (Measurements, except of ear, from specimens in alcohol, from *Baird*, *Mam. N. Am.*, p. 303).

*Specimens examined*, 44, from the following sources: Mt. Lehman, British Columbia, June 5–15, 1889, Clark P. Streater (*Am. Mus. Nat. Hist.*), 9; Westminster, B. C., May 15, 1889, C. P. Streater (*Am. Mus.*), 1; Kalama, Washington, Oct. 15–20, 1889, C. P. Streater (*Am. Mus.*), 4; Cape Disappointment, Wash., Nov. 1–11, 1889, C. P. Streater (*Am. Mus.*), 5; Chilliwhack, B. C., April 2, 1882, A. C. Brooks (*Coll. Dr. C. H. Merriam*), 1; Port Townsend, Puget Sound, Wash., Aug. 27, 1888, Dr. C. H. Merriam (*Coll. C. H. M.*), 1;

Neah Bay, Wash., Sept. 3, 1888, Dr. C. H. Merriam (Coll. C. H. M.), 1; Pacific County, Wash., March 17 and July 22, 1885, A. H. Helme (Am. Mus.), 3; Fort Steilacoom, Wash., June, 1854, Dr. Geo. Suckley (Nat. Mus.), 1; Cascade Mountains (western slope, lat. 46°), Dr. J. G. Cooper (Nat. Mus.—types of *T. cooperi* Baird), 2; Shoalwater Bay, Wash., Aug. 20, 1855, Dr. J. G. Cooper (Nat. Mus.), 2; Mount Vernon, Wash., Sept. 7, 1889, T. S. Palmer (Dept. of Agric.), 2; Aberdeen, Wash., Aug. 10–12, 1889, T. S. Palmer (Dept. of Agric.), 2; Astoria, Oregon, July 25–Aug. 2, 1889, T. S. Palmer (Dept. of Agric.), 8; Astoria, 1885, Lt. W. P. Trowbridge (Nat. Mus.), 1; Elk Head, Oregon, June 29, 1881, A. Todd (Nat. Mus.), 1.

There is no very decided variation with season or locality, the individual variation shown by the larger series from a single locality fully covering the whole range of variation shown by the whole series collectively.

The outer pair of light dorsal stripes are generally appreciably lighter than the median light stripes, but in a few specimens the lateral light stripes are not different in tint from the general ground color. Occasionally the light dorsal stripes are all distinctly lighter than the ground color. The outer pair of dark stripes are sometimes broad and well-defined black bands, but generally they are much narrower and duller than the median bands, being less black and more mixed with brown; occasionally they are almost wholly obsolete, or are represented by a very narrow dusky brown streak. The color of the sides and the general color above varies considerably in intensity, independently of season and locality.

It is noteworthy that there is no admixture of gray in the general dorsal pelage, even on the rump, a feature so characteristic of *T. hindsii* and other allied forms.

The two specimens forming the types of what Professor Baird at one time called *Tamias cooperi* are embraced in the series before me. They “were procured on the west side of the Cascade range of mountains, in Washington Territory,” and are the two palest specimens in the series. They are, however, very nearly matched by a specimen from Fort Steilacoom and by two others from near the mouth of the Columbia River. Although without date, they have the faded appearance of specimens taken late in the breeding season.

There are no specimens of *Tamias* from any part of the coast region of Oregon south of the vicinity of Astoria; from this

point northward to Mt. Lehman, British Columbia, *T. townsendii* is represented from numerous localities, all situated west of the Cascade Mountains. Here it appears to be the only form of the genus. How far northward it extends along the coast cannot now be determined. It is, however, apparently not found on Vancouver Island, as Mr. Streater did not meet with it there, and was informed by old residents that no Ground Squirrel occurred on the island.

### ***Tamias townsendii hindsii.***

(REDWOOD CHIPMUNK.)

*Tamias hindei* [err. typ.] GRAY, Ann. and Mag. Nat. Hist., X, 1842, p. 264.

*Tamias hindsii* GRAY, List Spec. Mam. Brit. Mus., 1843, p. 145; Zool. Voy. Sulphur, I, 1844, p. 34, pl. xii, fig. 1; Ann. and Mag. Nat. Hist., 3d ser., XX, 1867, p. 435 (in part only).

*Tamias townsendii* BAIRD, Mam. N. Am., 1857 (in part).

*Tamias asiaticus townsendi* ALLEN, Mon. N. Am. Roden., 1877, p. 794 (in part).—TOWNSEND, Proc. U. S. Nat. Mus., X, 1887, p. 171 (the entry under this name at the bottom of the page).

*Tamias asiaticus hindsii* ALLEN, Bull. Am. Mus. Nat. Hist., II, No. 3, 1889, p. 178.

*Hab.*—Coast region of California, from San Francisco northward. Restricted to the narrow coast belt west of the Coast Range.

*Breeding Pelage* (April and May specimens).—General color above dull dark reddish brown, mixed strongly with gray; brighter red and less gray on the flanks, darker and more mixed with gray on the lower back, rump, thighs, and sides of shoulders; anterior half of the dorsal region much more rufous than the posterior half. Dark dorsal stripes three or five, the outer pair, as a rule, obsolete or barely traceable; the median stripe broad, black, edged and more or less suffused both anteriorly and posteriorly with chestnut rufous; the next on either side shorter, beginning at the shoulders, broad, black, much suffused with rufous toward the anterior end; the outer dark stripe indistinct, often wholly wanting, and generally barely traceable as a slight mixture of blackish hairs along the upper border of the red of the flanks. Median pair of light stripes mixed rufous and gray, the former greatly predominating; outer pair of light stripes whitish, sometimes clear silvery, but generally soiled whitish gray. Facial stripes strongly contrasted, the light supra- and subocular lines whitish gray, often stained on the edges with yellowish; ocular stripe blackish brown edged and mixed with chestnut, well defined in front of the eye, but much broader and darker behind the eye; malar stripe dark chestnut brown, mixed with blackish. Ears narrow, long, the external surface dusky brown on the anterior half, silvery gray on the posterior half, including the apical portion. Post-auricular patches small, whitish gray. Ventral surface of body white,

varying to soiled yellowish white. Tail, above blackish, the hairs ringed broadly with pale chestnut near the base, and subapically with black, the extreme tips silvery white; below, central area dark reddish chestnut, bordered with black, and externally fringed with white.

*Post-breeding Pelage* (July).—General color above cinnamon rufous, stronger and deeper on the sides, *with no admixture of gray*. Median pair of light stripes like the general ground color; outer pair whitish, the hairs white subapically and tipped with pale yellowish rufous. Ventral surface of the body white, usually more or less washed with buff or pale rusty.

From this phase to that of late autumn, in which, as in the April and May specimens, there is a general admixture of gray throughout the dorsal surface (especially posteriorly), the change is very gradual, as is well illustrated by the material now in hand. The gray admixture first appears on the rump and thighs, and gradually extends to the middle of the back, and later over the sides of the shoulders and anterior half of the back, in part replacing the cinnamon hairs, which appear gradually to fall out. Some of the November specimens are thus indistinguishable from others taken in February, March, and April. May specimens are generally somewhat paler. In October specimens there is a strong contrast between the anterior and posterior dorsal regions, a scapular mantle of cinnamon rufous covering the anterior half of the dorsal area, from the middle of the back to the nape, and including the sides of the shoulders, in contrast with grayish dark brown of the lower back, rump, and thighs.

*Young*.—The half-grown young are colored nearly like the adults in the breeding season, except that the tints are duller; the light dorsal stripes are distinctly whitish, in strong contrast with the general ground color. The pelage, as usual in the young, is much finer and softer than in the adults. When nearly full grown they moult into a red phase of pelage similar to the July phase of the adults, as shown by a specimen taken May 18, at Nicasio, in process of change, and having patches of both phases of pelage.

*Measurements*.—Length, 264 mm.; head and body, 133 mm.; tail vertebrae, 110 mm.; tail to end of hairs, 131 mm.; hind foot, 34 mm.; height of ear, 11 mm. (Collector's measurements, taken from the specimens before skinning, except those of hind foot and ear.)

*Specimens examined*, 39, from the following sources: Nicasio, Marin Co., California, Feb. 7, 13, March 13, April 25, 27, May 10, 18, June 30, July 13, 20, Oct. 4, 6, 12, 22, Nov. 2, 11, 23, C. A. Allen (Am. Mus., 9; Nat. Mus., 5; Coll. C. H. M., 4=), 18; Olema, Marin Co., June 10, 1888, W. E. Bryant (Cal. Acad. Sci.), 1; Redwood, Sonoma Co., Oct. 15, 1883, W. E. Bryant (Coll. C. H. Merriam), 1; Redwood, spring of 1856, E. Samuels (Nat. Mus.), 1; Healdsburg, Sonoma Co., Oct. 14, 1888, W. E. Bryant (Cal. Acad.), 1; Cloverdale, Sonoma Co., April 3, 1885, W. E. Bryant (Nat. Mus.), 4; Cahto, Mendocino Co., May 8-11, 1889, T. S. Palmer (Dept. of Agric.), 4; Cahto, May 18, June 4, 11, A. C. McGregor (Cal. Acad.), 3; Humboldt Bay, Hum-



boldt Co., Oct., 1885, C. H. Townsend (Nat. Mus.), 5; Rio Dell, Humboldt Co., May 29, 1889, T. S. Palmer (Dept. of Agric.), 1; Crescent City, Del Norte Co., June 27, 1889, T. S. Palmer (Dept. of Agric.), 1; "Fort Crook, N. Cala., John Feilner" (Nat. Mus.), 1.

The specimens of *T. hindsii* are thus all from the coast region of Northern California, the localities represented being all near the coast, and extend from Marin County north to the northern border of the State. As already stated, there are no specimens of *Tamias* from the coast region of Oregon south of Astoria. Consequently "intermediates," if such exist, connecting this form with *T. townsendii*, are to be expected from this at present unknown region—unknown as regards the *Tamias* question.

The series presents a large amount of seasonal variation, and quite a range of individual variation, in respect to depth of tints. The widest departure from the average or normal condition is the peculiar specimen from the "redwoods.... north of Petaluma," Sonoma County, referred to by Professor Baird\* as remarkable for its generally dark colors and the obscuration of the streaks, this specimen still remaining unique.

Specimens from different localities present no important differences, except the series of five from Humboldt Bay, which are remarkable for their generally dark deep tone of coloration, being of a dull deep brownish red, many shades darker than any specimens from elsewhere. Unfortunately the skins have been made up from specimens preserved in alcohol (probably methylic), to which fact is most likely due their heightened color.

*Tamias hindsii* was originally based on a specimen almost unquestionably taken in the immediate vicinity of San Francisco, Cal., in the month of November.† Hence Nicasio specimens may be fairly taken as representing the type locality, and November examples as the phase of pelage of the original specimen. As shown by Gray's "List of the Specimens of Mammals in the Collection of the British Museum" (p. 145), published the year following his description of *Tamias hindsii*, it would seem that of the west coast forms of *Tamias* he had at that time only the single type specimen of *T. hindsii*, which is entered as follows: "a. Cal-

\*Mam. N. Am., p. 302.

† See Surgeon Hinds's "Summary of the Voyage" of the Sulphur, in "Zoology of the Voyage of the Sulphur," Vol. I, p. 3.

ifornia.—Presented by Capt. Sir E. Belcher, R. N.” Unfortunately his description of *T. hindsii* is vague and unsatisfactory, and his figure of it, in the Voyage of the Sulphur, obviously worthless. The description, however, so far as it is distinctive, better fits *hindsii* than *townsendii*. Thus, “Rufous brown, with three rather close black streaks on the middle of back, the outer ones edged with a white streak, having an indistinct black edge to it on its outer side,” is not at all applicable to *townsendii*, but agrees perfectly with *hindsii*.

In 1867,\* however, Gray thoroughly confused the two forms, he including both under *T. hindsii*, and giving “California” as the habitat of his *townsendii*, which is in reality the exclusive home of *hindsii*.

*T. hindsii* differs from *T. townsendii* in the strongly reddish instead of olivaceous brown of the dorsal surface; the larger, more conspicuous post-auricular patches; the stronger contrast between the light dorsal streaks (the outer in *hindsii* being distinctly whitish) and the general ground color; the much more frequent obsolescence of the outer dorsal stripes; the much redder color of the basal portion of the hairs of the upper surface of the tail, and of the central area of the lower surface; the strong admixture of gray in the winter pelage (which is absent in *townsendii*); in the belly being usually washed with yellowish or pale rufous instead of clear white; the very strong contrast in color of the anterior and posterior portions of the dorsal area in late summer and early autumn; and in the very great seasonal changes in color as compared with the slight seasonal changes in *townsendii*.

### ***Tamias macrorhabdotes.***

(LONG-EARED CHIPMUNK.)

*Tamias macrorhabdotes* MERRIAM, Proc. Biol. Soc. Washington, III, 1884–86, p. 26 (author's extras issued Jan. 27, 1886).

*Hab.*—Sierra Nevada Mountains, Placer County, Central California.

*Breeding Pelage.*—General color above, from nape to hips, including sides of body, pale cinnamon rufous, paler on flanks and shoulders; lower back, rump, and thighs dark gray. Dark dorsal streaks five, the outer pair short and more or less indistinct, the three median ones seal brown mixed and edged with pale

\* Ann. and Mag. Nat. Hist., 3d ser., Vol. XX, 1867, p. 435.

chestnut, the middle one darkest. Inner pair of light stripes narrow, gray, more or less tinged with pale rusty; outer pair broader, nearly pure white. Facial stripes strongly contrasted; superciliary stripe narrow, white, bordered above by a narrow band of dusky chestnut; ocular stripe narrow, seal brown, edged with rufous; subocular stripe broad, white, confluent with the very large pure white post-auricular patch; malar stripe broad, dark chestnut, varied with rusty, passing into seal brown posteriorly, and extending beneath the ear to the white post-auricular patch. Ears very high and pointed, blackish externally, edged with rusty on the front border, and very broadly margined with white on the posterior edge; tip clothed internally with short rusty hairs. Tail above blackish, fringed with silvery, the hairs black at base, sub-basally ringed broadly with pale cinnamon or tawny, then with black, and tipped with white; below central area bright cinnamon rufous, varying to orange rufous, bordered broadly by black, with a conspicuous outer fringe of white. Feet grayish buff; ventral surface of body white.

*Post-breeding Pelage.*—Whole sides of body, from sides of neck to hips, very light cinnamon rufous, varying to very dark cinnamon rufous, the same tint also suffusing the dark dorsal streaks throughout their extent, this color prevailing over the dusky, in some specimens almost to the exclusion of the latter; buttocks and thighs fuscous brown, with a slight intermixture of gray; median pair of light streaks narrow, whitish, tinged with pale fulvous; outer pair of light streaks white, often with a faint yellowish tinge; ears, both internally and externally, and the dark facial stripes, strongly tinged with rusty, much more so than in the breeding pelage.

*Young.*—Similar to adults in post-breeding pelage, but the tints are all much duller, and the pelage is thinner, softer, and more woolly.

*Measurements.*—Total length (average of collector's measurements of 25 adult specimens in the flesh), 260 mm.; head and body, 134 mm.; tail vertebrae, 97 mm.; tail to end of hairs, 126 mm.; hind foot, 34 mm.; height of ear, 16 mm. (last two taken from skins).

*Specimens examined*, 40; collected as follows: Blue Cañon, Placer Co., Cal., May 25–June 4, 1886, C. A. Allen (Am. Mus., 3; Coll. C. H. Merriam, 2 =), 5; same locality and collector, Oct. 6–19, 1885 (Coll. C. H. M.), 10; same locality and collector, Oct. 3–15, 1886 (Am. Mus.), 24; Carson City, Nev., June 11, 1887, H. G. Parker (Cal. Acad. Sci.), 1.

The October series presents quite a range of color variation, mostly, however, seasonal, some of the specimens being practically indistinguishable from those killed in May, while others are still in the phase of late summer and early autumn. While the seasonal variation is less marked than in *T. hindsii* it is similar in character, and the change in autumn from the post-breeding to the winter and early spring phase progresses in the same manner,

giving rise in early fall specimens to a well-marked contrast between the anterior and posterior dorsal regions, the rufous suffusion of the anterior half resulting in a similar mantle-like effect.

The breeding season is evidently protracted over a long period, there being in the collection specimens less than half grown taken respectively June 11 and Oct. 8.

Mr. C. A. Allen, of Nicasio, Cal., who has collected nearly all of the specimens of this species known to be extant, kindly writes me that he has found the Long-eared Chipmunk at Blue Cañon, at an altitude of about 4700 feet, and also at Cisco, thirteen miles further east on the line of the Central Pacific Railroad. He speaks of it as a shy animal, hard to capture, living in dense brush, and taking shelter in a hole in the ground when disturbed, instead of resorting to a tree, as do some of its allies. He says further that during thirteen years collecting at Blue Cañon he has found there no other form of *Tamias*.

The single specimen from Carson City renders it probable that this species may yet be found at various intermediate points between Blue Cañon and Carson City.

### ***Tamias quadrimaculatus.***

(SACRAMENTO CHIPMUNK.)

*Tamias quadrimaculatus* GRAY, Ann. and Mag. Nat. Hist., 3d ser., XX, 1867, p. 435.

*Tamias asiaticus quadrivittatus* TOWNSEND, Proc. U. S. Nat. Mus., X, 1887, p. 171.

*Hab.*—Valley of the Sacramento River, California, north to Shasta Co., Cal., and Fort Klamath, Oregon.

*Post-breeding Pelage.*—Entire sides of the body strong ferruginous, the same tint also suffusing the dark dorsal stripes; head above, nape, and rump gray. Ventral surface intense white, sometimes faintly tinged with fulvous. Dark dorsal stripes five, the outer pair indistinct, forming a dark brown edging to the rufous of the flanks; middle stripe black, the next on either side centrally black edged with rufous. Median light stripes gray, outer pair white, sometimes tinged with a fulvous wash. Dark facial streaks narrow, rusty brown, the upper and middle one much darker than the lower one; light streaks fulvous white, varying to grayish white. Ears blackish externally, faintly edged with rusty on the front edge and broadly bordered with white posteriorly. Post-auricular patches of medium size, white. Tail above blackish, fringed with white, the hairs at the extreme base narrowly ringed with black, then broadly with pale rusty orange,

and then very broadly with black, and narrowly tipped with white; below, central area orange rufous, bordered broadly with a band of black, and a narrow external fringe of white. Feet orange buff.

*Fall Pelage* (October).—Similar to the post-breeding phase, except that the rufous suffusion of the flanks is darker, and the gray of the rump occupies the posterior half of the dorsal region, the anterior half being strong rufous, forming a scapular mantle. Ears much more reddish in front, and the dark facial streaks darker, the malar streak terminating in a dusky patch beneath the ear.

*Young*.—A single one-third-grown young example (Fort Klamath, August) is like the August adults in coloration, but in other respects presents the usual characters of juvenility.

*Measurements* (based on skins).—Length, 249 mm.; head and body, 134 mm.; tail to end of vertebræ, 93 mm.; tail to end of hairs, 115 mm.; hind foot, 30 mm.; height of ear, 14 mm.

*Specimens examined*, 9, as follows: Nevada City, Cal., Oct., 1872, E. W. Nelson (Coll. C. H. Merriam), 1; Fort Crook, Cal., Sept. 27, 1860, D. F. Parkinson (Nat. Mus.), 2; Baird, Shasta Co., Cal., June 17, 1883, C. H. Townsend (Nat. Mus.), 1; Mt. Shasta, Siskiyou Co., Cal., July 14, C. H. Townsend (Nat. Mus.), 3; Fort Klamath, Oregon, Aug., 1883, Capt. C. E. Bendire (Coll. C. H. Merriam), 2.

The nine specimens (mostly in very poor condition) referred to this form are all in summer pelage, except one taken in October. The latter is in the "mantled" stage common to *T. hindsii* and *T. macrorhabdotes* at the same season, and is of a darker shade of rufous than the July and August specimens.

This species differs from *T. macrorhabdotes* in its smaller ears, much smaller post-auricular patches, blacker dark dorsal streaks, and clear ferruginous tint of the flanks. It is thus in general features, as in habitat, intermediate between *T. hindsii* and *T. macrorhabdotes*.

The Nevada City specimen agrees so evidently with Gray's description of his *T. quadrimaculatus*, and so nearly with it in locality, that I have adopted Gray's name for this form, although at first inclined to identify Gray's species with *T. macrorhabdotes*. The two are closely related, but one is apparently a valley form, the other a mountain form, their habitats thus entailing very different physiographic conditions—a difference one familiar with the very diverse topographic and climatic conditions of the two regions can well appreciate. Gray's specimen came from Michi-  
[June, 1890.]

gan Bluff, in the Sacramento Valley, and was collected by F. Gruber, Nov. 1, 1862. His description in full (l. c.) is as follows :

“ *Tamias quadrimaculatus*.

*T. Townsendi*, GRUBER.

Fur dark grizzled ; shoulders and sides reddish ; the pale dorsal streaks broad, indistinctly marked, grizzled ; outer one narrow and more marked ; the dark streaks broad, short, the outer ones scarcely defined ; neck with a large white spot on each side of the nape, behind the ear, and with a large black spot beneath it at the end of the very distinct dark under face-streak ; tail black, white-washed, beneath orange, blackish-edged. Young like adult, but dark streaks more marked. Same size as *T. Hindsii*.

“ *Hab.* California, Michigan Bluff (Gruber). B. M.”

Gray's type of his *T. quadrimaculatus* is still fortunately extant, and I am greatly indebted to Mr. Oldfield Thomas, Curator of Mammals in the Natural History Department of the British Museum, for kindly comparing with it a specimen of *T. macrorhabdotes*, sent over to him for the purpose. He says : “ The type of *T. quadrimaculatus* is unquestionably the same as the *T. macrorhabdotes* you send over. I had not recognized it as distinct, partly on account of the shrunk state of the original skin. The date of the type is 1/11/62, and its locality Michigan Bluff, Cal.” He further writes on the back of the label of the specimen of *T. macrorhabdotes* sent to him : “ Certainly identical with the type of *T. quadrimaculatus*, Gr., which only differs by more yellowish and less sharply defined underside, and more fulvous flanks and shoulders.” As these are part of the differences distinguishing the two forms, it seems quite proper to retain Gray's name for the Sacramento Valley form.

Mr. Townsend's specimens from Siskiyou and Shasta Counties seem, as well as can be judged (they are in poor condition, and part of them made up from alcoholic specimens), all referable to this form, which Mr. Townsend found to be quite abundant in Siskiyou County, and in the northern part of Shasta County, on the western side of the Sierras.\*

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\* As shown by the labels, part of these specimens are erroneously entered, in Mr. Townsend's paper (l. c.), as from Lassen County. The specimens thus entered evidently belong to two lots, collected at different times and places, the June series alone belonging to the form mentioned as “ abundant on the eastern slope of the Sierras in Lassen County,” and referable to the *T. amoenus* of this paper.

***Tamias senex*, sp. nov.**

*Hab.*—Sierra Nevada Mountains, Placer Co., California, north to Fort Klamath, Oregon.

*Breeding Pelage.*—Above general color gray, darker on head, lower back, and thighs, lighter on nape, and washed with yellowish on sides of neck and shoulders. Flanks rather strongly washed with yellowish brown. Median dark dorsal stripe brownish black, edged and mixed with rusty brown; the next dark stripe on either side rusty, mixed with blackish; outer dark stripes dull dark rusty brown, darker than the sides below. Median pair of light stripes narrow, light gray; outer pair rather broader, but of nearly the same tint—clear light gray. Ventral surface dull soiled white. Light facial stripes grayish white; dark ones rusty brown, somewhat mixed with blackish. Ears externally blackish, posterior border broadly edged with whitish, confluent with the rather small grayish white post-auricular patches. Tail above blackish, the hairs yellowish ochraceous at the base, subterminally broadly ringed with black and tipped with white; below, central area pale orange, edged with a band of black, the hairs tipped broadly with white.

*Measurements.*—Total length (from collector's measurements), 263 mm.; head and body, 149 mm.; tail to end of hairs, 114 mm.; hind foot, 35 mm.; height of ear, 14 mm. (last two from the skins).

Type, No. 1133 (Coll. C. H. Merriam), Summit of Donner Pass, Placer Co., Cal., July 1, 1885, L. Belding.

*Specimens examined*, 7; collected as follows: Summit of Donner Pass, Placer Co., Cal., July 1, 1885, L. Belding (Coll. C. H. Merriam), 1; Donner, Placer Co., June 25, 1886, C. A. Allen (Coll. C. H. Merriam), 3; Glenbrook, Douglas Co., Nev., May 29, 1889, C. A. Keeler (Dept. of Agric.), 2; Fort Klamath, Oregon, May 19, 1887, Dr. J. C. Merrill (Nat. Mus.), 1.

The seven specimens referred to this form are all adults taken in May and June, and hence represent the pelage of the breeding season. Probably in the late summer phase they are more suffused with fulvous, especially on the flanks.

This is apparently a large pale form of the *T. hindsii* stock, and hence allied to both *T. macrorhabdotes* and *T. quadrimaculatus*, which separate it widely, geographically and otherwise, from *T. hindsii* of the coast region. It differs from *T. macrorhabdotes*, its geographically near neighbor, in having smaller ears, very much smaller and gray, instead of white, post-auricular patches, and in having only a faint suffusion of pale yellowish brown above (in the breeding phase of pelage) instead of a strong suffusion of dark cinnamon or pale chestnut brown. It is probably an alpine

form, occurring with the much smaller *T. frater* of the Sierras in Placer County, and eastward to the eastern border of Lake Tahoe in Nevada. It also ranges northward to the region about Fort Klamath, whence there is a specimen in the material in hand, and also two of *T. quadrimaculatus*, and several examples of the small *T. amoenus*.

Mr. C. A. Allen kindly writes me that the three specimens he obtained at Donner were taken at an altitude of about 7000 feet. He recognized this form as differing greatly in habits, as well as size, from the ordinary Donner Chipmunks (*T. frater*), as will be noticed later under that species. He speaks of it as very scarce, and says he thought the few individuals he saw might be stragglers of the long-eared form (*T. macrorhabdotes*) occurring lower down the mountain at Blue Cañon, which it resembles in habits.

### ***Tamias merriami.***

(MERRIAM'S CHIPMUNK.)

*Tamias asiaticus merriami* ALLEN, Bull. Am. Mus. Nat. Hist., II, No. 3, p. 176 (Oct. 21, 1889).

*Hab.*—Mountains of Southern California, from San Diego County north to Tulare and Monterey Counties.

*Breeding Pelage.*—General color above cinereous gray, tinged faintly with yellowish by the admixture of pale rusty-colored hairs. All of the dorsal streaks dull; not sharply contrasted. Dark streaks dusky brown, mixed with pale yellowish rufous, the outer pair dull yellowish brown, slightly mixed with dusky. Inner pair of light streaks pale gray, mixed with pale yellowish; outer pair light silvery gray. Light facial streaks broad, gray, the dark ones narrow, rusty brown. Sides of body slightly suffused with pale yellowish brown. Post-auricular patches small, indistinct, grayish, but little paler than the surrounding fur. Ventral surface whitish gray. Tail above blackish, fringed with gray, the hairs apically and basally black, with a broad intermediate zone of pale yellowish white; below, central area deep reddish chestnut, paler at the edges, and bordered with a broad band of black, the latter fringed with whitish.

*Post-breeding Pelage.*—Flanks golden rufous; dark dorsal streaks yellowish rufous, the median one centred posteriorly with black; light dorsal stripes silvery gray, the outer pair broader and whiter; light facial bands ashy gray, the dark ones dull rusty brown. Central area of tail below orange chestnut; sub-basal zone of the hairs of the upper surface orange yellow.

*Young.*—In general effect the coloration resembles that of the adults in May, but the flanks are more rufous, and the dorsal streaks better defined and stronger,



the outer light streaks being nearly pure white. The pelage, however, is very fine and soft, strongly in contrast with the rather coarse, heavy pelage of the adults.

*Measurements.*—Size very large, tail very long, ears high and pointed. Total length (average of 10 specimens measured in the flesh by the collector), 285 mm.; head and body, 140 mm.; tail vertebrae, 117 mm.; tail to end of hairs, 146 mm. (longer than head and body); hind foot, 34 mm.; height of ear, 12–14 mm. (measurements of hind foot and ear taken from skins).

*Specimens examined*, 30; collected as follows: San Bernardino Mountains (altitude 7000 feet), San Bernardino Co., June 10–13, 1887, F. Stephens (Coll. Am. Mus., 8; other collections, 2 = ), 10; Cuyamaca Mountains, San Diego Co., June 6–8, 1889, F. Stephens (Coll. F. Stephens), 2; Ballena, San Diego Co., March 7 and June 4, 1889, F. Stephens (Coll. F. Stephens), 2; Smith Mountain, San Diego Co., June 27–29 and July 5, 1889, F. Stephens (Coll. F. Stephens and C. H. Merriam), 4; Volcan, San Diego Co., Aug. 26, 1884, F. E. Blaisdell (Nat. Mus.), 1; Wilson's Peak, San Gabriel Mountains, Los Angeles Co., May 8 and June 25, 1889, E. C. Thurber (Coll. M. M. Green), 4; Fort Tejon, Tulare Co., John Xantus (Nat. Mus.), 1; near Mt. Whitney, Tulare Co., Sept. 10, 1875, H. W. Henshaw (Nat. Mus.), 1; Bixby Creek, Monterey Co., July 4–6, 1889, Walter E. Bryant (Coll. Cal. Acad.), 3.

The specimens from the San Gabriel Mountains, especially the young examples, are rather more highly colored than those from the San Bernardino Mountains. The Fort Tejon specimen, collected many years since (without date and in poor condition) is similar to the San Gabriel and Volcan specimens; though rather more suffused with yellow. The specimen from "near Mt. Whitney" \* is in autumn dress, presenting the golden rufous on the sides and in the dorsal streaks characterizing the post-breeding pelage. It closely resembles the August specimen from Volcan. One of the specimens from Bixby Creek, Monterey Co., collected July 4, is similar, having nearly completed the moult from the breeding pelage. Another specimen from the same locality, taken July 6, which has also moulted, is darker, with flanks browner, and the dark dorsal streaks less mixed with golden.

Specimens in breeding dress also vary in the amount of yellowish suffusion, some showing very little, even on the flanks, and none in the back, while in others it is quite pronounced.

The habitat of this strongly-marked species appears to be the mountain ranges generally of Southern California, from about 5000 feet upward.

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\* Other specimens, labeled as from near Mt. Whitney, are referable to *T. speciosus*.

***Tamias speciosus* Merriam, MS.**

(SAN BERNARDINO CHIPMUNK.)

*Hab.*—San Bernardino Mountains, Southern California.

*Post-breeding Pelage.*—"Stripes all bright and distinct. Outer light stripe on each side *pure white*; inner light stripe on each side grizzled gray; dark stripes dark brown, strongly suffused with ferruginous; sides ferruginous, continuous with external lateral stripe, which is thus not defined below. Post-auricular patches white, about as large as the ears, and nearly meeting posteriorly. Face stripes bright and distinct from nose to ear; supra- and infra-orbital stripes pure white; superior and inferior dark stripes dusky, obscured with rusty; eye-stripe black with rusty suffusion at end of nose and base of ear, the latter continuous with a rusty patch on anterior convexity of ear. Tail about as long as body, without the head, moderately bushy, deep bright chestnut on both sides, obscured above by black hairs, and edged with yellowish; below, with terminal fourth or fifth and a lateral subterminal border black edged with yellowish. Ear tricolor; rusty at base anteriorly; anterior three-fourths black; posterior fourth grayish.

"Size medium or rather small. Head and body, 120 mm.; tail vertebrae, 79 mm. (measured in the flesh). Hind foot, 32 mm. (taken from the dry skin).

"Type, No.  $\frac{1148}{1885}$ , ♂ ad., Merriam Collection, San Bernardino Mts., Cal., June 22, 1885, collected by F. Stephens." (*Merriam, MS.*)

*Breeding Pelage.*—Above dull, faded, yellowish gray, with two broad stripes of clear white. The dark stripes are only a little darker than the general surface, having lost nearly all of the bright ferruginous of the fresh autumn coat, which color has also nearly all disappeared from the flanks, which are only faintly suffused with pale yellowish brown, the outer dark stripe alone showing a little pale ferruginous.

*Young.*—Similar to the adults in breeding pelage, but colors rather brighter and markings stronger.

*Measurements.*—Total length, 234 mm.; head and body, 123 mm.; tail vertebrae, 91 mm.; tail to end of hairs, 111 mm.; hind foot, 32 mm.; height of ear, 12 mm. (Average of 9 adults measured by collector before skinning.)

*Specimens examined*, 24, as follows: San Bernardino Mountains, Los Angeles Co., California, June 9–22, 1885, 1886, 1887, F. Stephens (Coll. C. H. Merriam, 1; Am. Mus., 4; Nat. Mus., 6; Coll. F. Stephens, 6=) 17; same locality and collector, Aug. 17, 1885 (Coll. C. H. M.), 1; Alpine City, Bear Valley (San Bernardino Mts.), Cal., A. Forrer (Coll. C. H. M.), 1; San Bernardino Mts., June 12, 1889 (Cal. Acad. Sci.), 1; Cañon las Uvas, Cal., J. Xantus (Nat. Mus.), 1; "near Mt. Whitney," Tulare Co., Cal., Sept. 6–10, 1875, H. W. Henshaw (Nat. Mus.), 3.

Of the 17 San Bernardino specimens before me taken in June, only one (Dr. Merriam's type, described above) is in the post-breeding dress. In this specimen the pelage is very short, and

there are slight traces of the faded breeding pelage still remaining. Five of the remaining 16 specimens are young-of-the-year, nearly full grown.

Of the other 11, all except the one above described (No. 15,967, U. S. Nat. Mus.), show more or less traces of the new coat, either in the form of irregular patches on the sides and back, or as new hairs intermixed more or less generally with the old. The specimens from the vicinity of Mount Whitney and Cañon las Uvas, taken in September, differ from the more advanced (in respect to moult) June specimens from the San Bernardino Mountains only in having the sides washed a little heavier with rufous.

In coloration, particularly in the faded breeding pelage, this species somewhat resembles *T. merriami*, but the latter is nearly one-fourth larger, and has a disproportionately longer tail. The character of the pelage in the two species, however, is very different, and the resemblance in coloration is only in general effect, differing in detail at nearly every point. It more closely resembles *T. frater* from Donner, Placer County, from which, however, it is readily separable by various characters, as noticed under that species.

The striking features of *T. speciosus* are the very unusual extent of black at the tip of the tail, both above and below, and the great breadth of the pure white outer pair of light dorsal streaks.

In the San Bernardino Mountains this species occurs with *T. merriami*. Mr. F. Stephens, who has collected nearly all of the specimens of both these forms thus far obtained, writes me that they occur together at altitudes of from five thousand to nine thousand feet, but that above nine thousand feet he met with only *T. speciosus*. At Ballena, and on Smith and Cuyamaca Mountains he found only *T. merriami*. *T. speciosus*, however, occurs, as shown by specimens obtained by Mr. Henshaw, "near Mount Whitney"; Xantus also collected it at Cañon las Uvas, Kern County, and it doubtless occurs at suitable localities between these points and the San Bernardino Mountains.

***Tamias frater*, sp. nov.**

(SIERRA NEVADA CHIPMUNK.)

*Tamias quadrivittatus* HENSHAW, Ann. Rep. Wheeler's Geogr. Sur. West of 100th Meridian, 1876, p. 311 (in part—except spec. No. 721).

*Hab.*—Sierra Nevada Mountains, Placer County, California.

*Breeding Pelage.*—General color above pale gray, darker, more leaden gray on lower back and thighs, lighter, more whitish gray on nape, side of shoulders, and interscapular region. Sides more or less faded rusty brown; ventral surface whitish gray. The three median dark stripes more or less blackish, edged and mixed with chestnut; the outer stripe on each side lighter rufous, rarely with any mixture of dusky, distinct only on the upper border, the lower blending with the rufous of the flanks. Median pair of light stripes, narrow, ashy; outer pair very broad, and clear white. Light facial stripes white or grayish white; dark ones rusty brown, mixed with dusky; the eye-stripe is black in front of the eye, and forms a blackish spot immediately behind the eye, passing posteriorly into bright rusty brown. Outer surface of ears black, with a rusty spot in front at the base, and the posterior border broadly grayish white. Post-auricular spot quite large, nearly pure white (in some specimens grayish white) and conspicuous. Tail, above, rusty orange varied with black, the hairs being orange at base, subterminally broadly ringed with black, and tipped with buff; below, central area orange, bordered narrowly and tipped broadly with black, the tips of the hairs forming an outer fringe of pale yellow or yellowish white.

*Post-breeding Pelage.*—Dorsal region generally more suffused with rufous, with a much heavier wash of bright rufous on the sides.

*Measurements.*—Length (average of collector's measurements of 20 specimens in the flesh), 223 mm.; head and body, 119 mm.; tail to end of hairs, 97.5 mm.; hind foot, 32 mm.; height of ear, 11 mm. (last two from skins).

Type, No. 1308 (Coll. Am. Mus. Nat. Hist.), ♀ ad., Donner, Cal., June 7, 1886, C. A. Allen.

*Specimens examined*, 28; from the following sources: Donner, Cal., June 7–8, 1888, C. A. Allen (Am. Mus. Nat. Hist.), 4; same locality and collector, June 10–22, 1886 (Coll. C. H. Merriam), 15; same locality and collector, June 10, 1888 (U. S. Nat. Mus.), 2; Glenbrook, Nev., May 29, 1889, C. A. Keeler (Dept. of Aric.), 2; Lake Tahoe, Nev., H. W. Henshaw, Oct., 1876 (Nat. Mus.), 1.

The two Glenbrook specimens are quite small, but are better referred here than elsewhere.

This species finds its nearest ally in *T. speciosus*, from which it differs in the worn breeding pelage, in stronger colors, having more black in the dark dorsal stripes, and the flanks more heavily washed with a brighter rufous. The tail is much less black above,

the central area below much paler, and the black tip much shorter. It is also appreciably smaller, with a disproportionately shorter and more bushy tail.

It also closely resembles, in general coloration, when in the faded breeding pelage, *T. amœnus*, from which, however, it notably differs in much larger size, in the large white (instead of small gray) post-auricular patches, and in the color of the tail, both above and below, but especially above, the basal portion of the hairs being deep orange, varying to rufous orange, this color much *stronger* than that of the central area of the tail below, while in *amœnus* the base of the tail hairs above is buff (often very pale buff), much *paler* than the central area of the tail below.

The large series from Donner (about 40 specimens, all taken in the month of June), proves most unexpectedly to contain representatives of three apparently very distinct species, four of the specimens being referable to the large gray *senex*, 21 to the present species, and 16 to *amœnus*, to which latter are also referable specimens from neighboring localities, as Bronco, Nevada Co., Cal., and Glenbrook, Douglas Co., Nev. Both *senex* and *amœnus* occur also together at Fort Klamath, and doubtless at intermediate points. The *amœnus* series from Donner I at first regarded as young of the year of *frater*, although the character of the pelage seemed to indicate maturity, it having the same worn faded appearance as that of the *frater* series. On closer examination traces were seen in some specimens of a change of pelage, and also females that had evidently nursed young.

The Lake Tahoe specimen seem satisfactorily referable to *frater*, allowing for difference of season, and the usual brighter tints of the autumnal phase of coloration, traces of which is shown in some of the June specimens from Donner.

Mr. C. A. Allen, the collector of the Donner series, kindly writes me, in answer to inquiries, as follows respecting the habits of this species as compared with those of *T. macrorhabdotes*. "These smaller Chip Squirrels, as I called them at the time, are somewhat different in their habits from the Long-eared Chip; they are not shy like the latter, and are very fond of running over fallen logs and up living standing trees, and when they are alarmed will run right by, or through, or over a ledge of rocks or stones,

and take shelter by running up the first tree; or if in a tree will go up higher instead of coming down to hunt for a hole, more like the Red Squirrel of the East. This is the most striking feature I noticed about them. I have seen as many as three run up one tree at once, when they could much easier have taken shelter among rocks or stones. I also noticed they inhabit the standing live trees from choice more than any other Chip Squirrel I have ever met. The Long-eared Chip is much more shy. I have not seen it climb a tree more than two or three times in all my collecting, for a period of thirteen years, about Blue Cañon. I have seen them on a dead stump eight or ten feet high, but they always run down and scramble for a hole in the ground when alarmed."

***Tamias amoenus*, sp. nov.**

(KLAMATH CHIPMUNK.)

*Hab.*—Fort Klamath, Oregon, and southward to Placer County, California.

*Spring Pelage* (April).—General color above vinaceous gray, including head, neck, sides of shoulders, rump, and thighs. A small area on the flanks bright ochraceous brown. Ventral surface white, in some specimens tinged with yellow. Dark dorsal streaks five, the three median ones dark seal brown, varied at the edges and anteriorly with rufous; outer pair chestnut, varying to dusky and to chestnut rufous in different specimens. Median light stripes light gray, with a vinaceous tinge; outer clear white. Tail above black varied with ochraceous, the hairs being black at the extreme base, then ringed narrowly with pale ochraceous, then more broadly with black, and tipped with ochraceous; below central area pale orange yellow, edged and broadly tipped with black, and with the tips of the hairs ochraceous yellow. Ears rather large, blackish externally, with a slight tinge of pale rust at the base anteriorly, and broadly edged posteriorly with grayish white, confluent with the rather large whitish post-auricular patches. (Fort Klamath specimens.)

*Breeding Pelage* (June).—Pelage shorter, more worn, and coloration much paler. The vinaceous cast in the gray of the upper parts has disappeared; the median light stripes are paler and more of a yellowish cast; the rufous of the flanks has become much paler, and the ochraceous at the base of the tail hairs above has faded to pale buff. (Donner specimens.)

*Post-breeding Pelage* (October).—Almost indistinguishable from the early spring pelage. (Bronco specimens.)

*Measurements*.—Size, small; length, 207 mm.; head and body, 116 mm.; tail vertebrae, 70 mm.; tail to end of hairs, 91 mm.; hind foot, 30 mm.; height of ear, 11 mm. (Average of 14 specimens, measured before skinning by the collector.)

Type, No. 3469 (Coll. C. H. Merriam), ♀ ad., May 16, 1887, Dr. J. H. Merrill, Fort Klamath, Oregon.

*Specimens examined*, 38; collected as follows: Fort Klamath, Oregon, April 27–May 16, 1887, Dr. J. C. Merrill (Col. C. H. Merriam and Nat. Mus.), 8; Fort Klamath, Oregon, April 18, 1888, S. Parker (Coll. C. H. M.), 1; Lassen Co., California, July, 1884, C. H. Townsend (Nat. Mus.), 2 (skinned from alcohol and discolored); Lassen Co., California, June, 1884, C. H. Townsend (Nat. Mus.), 6 (in bad condition, somewhat discolored from immersion in alcohol); Donner, Placer Co., California, June 11–24, 1886, C. A. Allen (Coll. C. H. M.), 15; same locality and collector, June 7, 1888 (Nat. Mus.), 1; Bronco, Nevada Co., California, Oct. 12, 1888, C. A. Allen (Coll. C. H. M.), 2; Glenbrook, Douglas Co., Nevada, May 28–June 2, 1889, C. A. Keeler (Dept. of Agric.), 3; Carson City, Nevada, June 28, 1887, H. G. Parker (Coll. Cal. Acad. Sci.), 1.

A few of the Donner specimens, although taken in June, are in practically the same condition of pelage and coloration as the Fort Klamath April and May specimens (April 18, May 16); but most of the Donner specimens are more or less bleached and worn; only one (a male), however, shows indications of the new coat, merely a few tufts here and there of new hair. The numerous adult females in the series appear not to have nursed young the season of their capture, having been killed apparently just prior to the breeding season. On the labels of one of the Fort Klamath specimens, taken May 15, is written by the collector, "contained five foetuses." Two of the Glenbrook specimens are much shrunken, apparently by some antiseptic used in their preservation; the other is strikingly similar to Fort Klamath and some of the Donner specimens. The Bronco specimens, in autumn pelage, are indistinguishable from spring Klamath specimens, showing that the coloration and character of the pelage is practically the same in October and April, as is usually the case in this group.

The Lassen County specimens are more or less ragged and distorted, besides having undergone more or less change of color by immersion in alcohol, or some other antiseptic solution. I have, however, little hesitation in referring them to this form.

*Tamias amoenus* finds its nearest ally in *T. frater* of Placer and neighboring counties, California, and adjoining portions of Nevada, from which it differs in being fully one-third smaller,

and in the coloration of the tail, and somewhat in general coloration; although in the latter respect there is little difference when faded June specimens of each are compared. In *amænus* the pale zone on the basal portion of the hairs of the upper surface of the tail is pale light buff or yellowish white, much paler than the rusty yellow orange central area of the lower surface. In *frater* the sub-basal zone of the hairs of the upper surface of the tail is deep rusty orange, generally of a much deeper tint than the central area of the lower surface of the tail. The central dark stripes on the back in *amænus* are nearly deep black, instead of dark chestnut, and the light stripes are strong, pure vinaceous gray, instead of yellowish gray, as in *frater*.

*T. amænus* is also closely allied to *T. pictus* of the adjoining desert region to the eastward, with which, along the borders of this region, it may intergrade.

The habitat of *T. amænus* would seem to include the Sierra Nevada (at least the eastern slope) from about Lake Tahoe northward to Lassen and Shasta Counties, California, and also thence northward to Fort Klamath. The region between Placer and Shasta Counties is at present, however, so far as *Tamias* is concerned, a *terra incognita*.

### **Tamias bulleri.**

(MEXICAN CHIPMUNK.)

*Tamias asiaticus bulleri* ALLEN, Bull. Am. Mus. Nat. Hist., II, No. 3, p. 173 (Oct. 21, 1889).

? *Tamias asiaticus*, var. *quadrivittatus* THOMAS, Proc. Zool. Soc., 1882, p. 372.

? *Tamias asiaticus*, subsp. *quadrivittatus* SCLATER, Biol. Centr. Am., I, p. iii (footnote), Dec., 1882.

*Hab.*—Sierra del Valparaiso, State of Zacatecas, Mexico. (Durango, Central Mexico?)

*Post-breeding Pelage* (July 27–Aug. 2).—General color above gray, very faintly tinged with buff. Sides slightly more buffy; ventral surface white, hairs plumbeous at base. Three median dark dorsal stripes blackish (dark seal brown) edged, and sometimes more or less mixed with yellowish chestnut; outer dark stripes yellowish chestnut, sometimes slightly mixed with blackish hairs, short and not sharply defined below. Median light stripes narrow, gray; outer ones broader, white or grayish white. Light facial stripes very broad, clear white; upper dark stripe blackish, edged with rusty; eye-stripe narrow in front of the eye, very broad behind the eye, black, bordered posteriorly with



rusty; malar stripe broad, rust-brown, centred with dusky, and extending beyond the base of the ear. Ears of medium size, broad and rounded; externally tricolor, bordered broadly in front with pale rust, and apically and posteriorly with a broad margin of white, leaving a blackish basal central area, the white posterior border confluent with the large, conspicuous white post-auricular patch. Ears internally black at base, the posterior and apical two-thirds rusty. Tail narrow, thinly haired; above black varied with light buff and whitish, the hairs being narrowly ringed with light buff at the base and tipped with soiled white; below central area ochraceous, varying from pale to deep ochraceous, narrowly bordered with black and fringed with whitish.

*Young*.—Young of the year, nearly full grown, differ from the adults in being more heavily washed on the flanks with rusty brown, and with the dorsal stripes, particularly the middle pair of light stripes, faintly suffused with rusty.

*Measurements* (approximate, from skins).—Length, 250 mm.; head and body, 127 mm.; tail vertebræ, 98 mm.; tail to end of hairs, 125 mm.; hind foot, 33.5 mm.; height of ear, 12 mm.

*Specimens examined*, 12 (Am. Mus. Nat. Hist., 8; Coll. C. H. Merriam, 4); all collected by Dr. Audley Buller, in the Sierra del Valparaiso (altitude 8000 feet), Zacatecas, Mexico, July 27–Aug. 2, 1889.

This species somewhat resembles *T. cinereicollis* in size and general proportions, in the character and color of the dorsal stripes, and in the general effect of the coloration; but differs from it in its shorter and less pointed ears, in the sides being pale buff brown (amounting in most specimens to merely a faint wash at the end of the hairs) instead of strong yellowish brown, in the central area of the tail being ochraceous instead of orange rufous, and especially in the stronger contrast between the light and dark facial streaks, the superciliary one being much broader and whiter, and all the dark ones much broader and darker, with the eye stripe twice as broad, and *black* instead of pale rusty brown.

Mr. Oldfield Thomas has recorded (l. c.) specimens of *Tamias* from Ciudad, Durango (two specimens, July 6, 1881, A. Forrer), obtained at an altitude of 8100 feet in the Sierra Madre, which may prove to be the same as *T. bulleri*, since they come from a similar altitude and from a not very distant point.\*

\* In my former notice of this species (l. c.), Mr. Thomas's record of a form of *Tamias* from Central Mexico was inadvertently overlooked.

***Tamias cinereicollis*, sp. nov.**

(ARIZONA CHIPMUNK.)

*Hab.*—San Francisco Mountain and neighboring Mogollon Mountains of Central Arizona.

*Autumn Pelage* (August and September).—General color above gray; sides between shoulders and hips yellowish brown; below grayish white; nape, sides of neck, and cheeks (below malar stripe), gray, this color extending back to posterior border of scapular region, but there more blackish, and sometimes with a faint tinge of brownish suffusion. Thighs and buttocks very faintly tinged with pale yellowish brown. Dark dorsal stripes broad, deep black, edged with deep chestnut brown, the outer one on each side narrower, shorter, and less black, but sharply defined and strongly marked. Inner pair of light dorsal stripes clear whitish gray; outer pair broader and clear white. Light facial stripes rather clear white; the dark ones very broad, dull rusty brown, the ocular stripe alone much mixed with black, generally distinctly black immediately before and behind the eye. Ears externally with the central area blackish, the anterior border rusty, and the posterior broadly edged with grayish white; inner surface pale rusty. Light patch behind the ear light gray, scarcely lighter than the surrounding pelage, and hence not conspicuous. Tail above blackish, the hairs ochraceous at base and tipped broadly with buff; below broad central area orange rufous, bounded by a very narrow line of black, fringed with buff.

*Breeding Pelage* (May–July).—Pelage softer and fuller (comparing especially May and August specimens); colors all dull and bleached, the tints of gray, black, and white, all less pure and clear, and the sides only faintly washed with pale yellowish brown, varying in different specimens to pale buff, sometimes not appreciably different from the pale dull yellowish gray of the general color of the dorsal surface.

*Young.*—Half-grown young are similar in color to adults in August and September, but the pelage is thinner and more silky, with the unmistakable look of juvenility.

*Measurements* (average of 14 specimens, measured by the collector before skinning).—Total length, 247 mm.; head and body, 121 mm.; tail vertebrae, 102 mm.; tail to end of hairs, 126 mm.; hind foot, 35 mm.; height of ear, 13 mm.

Type, No. 17,597, U. S. Dept. Agr., ♀ ad., San Francisco Mountain, Arizona, August 2, 1889, Merriam and Bailey.

*Specimens examined*, 46; from the following sources: San Francisco Mountain, Arizona, July 30–August 29, C. Hart Merriam and Vernon Bailey (Dept. of Agric.), 22; Mogollon and San Francisco Mountains, Arizona, May, June, and Oct., Dr. Edgar A. Mearns (Am. Mus. Nat. Hist.), 14; San Francisco Mountain, July 20–22, F. Stephens (Nat. Mus. and Am. Mus.), 4; Springerville, Arizona, September 11, E. W. Nelson (Nat. Mus.), 6.

The seasonal variation in the color and character of the pelage is so striking that May and August specimens might easily be looked upon as representing totally distinct species. Fortunately the large series before me represents nearly every stage of transition from the bleached phase of the breeding season to the freshly acquired autumn coat with its bright strongly contrasting tones and markings. The dates represented are May 25-27 (7 specimens); June 6, 11, 17 (4 specimens); July 20-22 (4 specimens); July 30-31 (3 specimens); August 1, 2, 5, 10, 12-15, 26-29 (18 specimens); September 11 (6 specimens); October 4-5 (2 specimens). This series shows that the date of moult varies widely in different specimens. Some of the May specimens show no trace of the new coat; in others there is a mixture of the new with the old, in the form of bright patches of new short hairs on the sides and a sprinkling of new hairs in the back. Two of the June specimens have not changed, while one is in the transition, patchy phase, and one has nearly completed the change to the new coat. A specimen taken July 20 is in *thin* bleached pelage, having lost much of the old coat without having acquired any distinct traces of the new coat; two others, taken two days later at the same locality, have in great part acquired the new coat. Those taken July 30 and 31, as well as all of the August specimens, are in autumn pelage. September and October specimens are not appreciably different from August ones, except that as the season advances the pelage becomes a little fuller and softer.

This form is most nearly related to *T. umbrinus* of the Wahsatch and Uintah Mountains further north, but differs from it in having the sides of the neck and shoulders rather clear gray, in contrast with the flanks instead of nearly the same color, and in having the outer dark dorsal streak blackish and distinctly defined instead of obsolete, as in the Wahsatch form. The dark facial stripes are also much broader, especially the lower one, and dark rusty brown instead of pale brown. The dark dorsal stripes are blacker, and the light ones whiter, the light and dark stripes being thus much more sharply contrasted.

It bears only a distant resemblance to *T. bulleri*, as already noticed.

According to Dr. Mearns (MS. notes), this mountain species "does not descend to the lower limit of the pine belt, and is most abundant in the fir and spruce forests, at an elevation of from 7000 to 11,000 feet, its range barely reaching that of *Tamias dorsalis*, which is mainly an animal of the plains."

The habitat of this form is the heavily wooded mountain region of Central Arizona, and is thus isolated from all the other forms of *Tamias*, except the desert forms (with which it has no close resemblance) by arid, forestless areas.

### ***Tamias umbrinus*, sp. nov.**

(UINTAH CHIPMUNK.)

*Hab.*—Mountains of Northern and Central Utah (Wahsatch and Uintah Ranges).

*Autumn Pelage.*—General ground color above yellowish-brown gray. Sides dull yellowish brown; top of head and nape more grayish; rump and hind limbs externally dusky yellowish-gray brown; under parts grayish white. Median dark dorsal stripe black, mixed and edged with dull yellowish brown, especially posteriorly; the next dark stripe on either side blackish, much more mixed with dull rusty brown, in some specimens the brown prevailing over the black; outer dark stripes short and very narrow, nearly without black, and generally almost or quite obsolete. The two median light dorsal streaks light gray; the two outer broader and whiter. Facial streaks dull, the light ones gray, the dark ones dusky brown, the lower (malar) one very narrow, and dull brownish dusky. Ears externally black, conspicuously bordered with grayish white. Post-auricular patches of medium size, grayish white. Tail above mixed orange and black; below with an orange rufous central area, rather broadly bordered with black, and an external fringe of yellowish.

*Measurements.*—Size large; tail long, full, and bushy; ears medium. Length, 249 mm.; head and body, 125 mm.; tail vertebrae, 100 mm.; tail with hairs, 135 mm.; hind foot, 32 mm.; height of ear, 10 mm. (Average of 10 specimens, measured by collector before skinning.)

*Specimens examined*, 15; collected as follows: Uintah Mountains, thirty miles south of Fort Bridger, Wyo., Sept. 19–20, 1888, Vernon Bailey (Coll. C. H. Merriam), 7. Fort Bridger, July, 1872, E. W. Nelson (Coll. C. H. M.), 1; Ogden, Utah, Oct. 5, 1888, V. Bailey (Coll. C. H. M.), 3; Wahsatch Mountains, sixteen miles east of Salt Lake City, Utah, Oct. 31, 1888, V. Bailey (Coll. C. H. M.), 1; Uintah Mountains, Sept. 20, 1870, H. D. Schmidt (Nat. Mus.), 4.

Type, No. 4690, ♂, (Coll. C. H. Merriam), Uintah Mountains, south of Fort Bridger, Sept. 20, 1888, V. Bailey.

The Uintah series of 11 specimens presents comparatively little variation in either size or color. Some are a little paler and grayer than others, but the range of variation in any feature of the coloration is slight. The single July specimen is also not appreciably different.

The three specimens from the Wahsatch Mountains are a little brighter and more rufous on the sides, especially on the sides of the neck in front of the shoulders. Between these and the deepest colored example of the Wahsatch series there is, however, no very appreciable difference.

The forms most resembling this are from Helena, Montana, and San Francisco Mountain, Arizona, as will be found noted under *T. luteiventris* and *cinereicollis* respectively. It differs from true *quadrivittatus* in its much larger size, its duller, less contrasted colors, and the obsolescence of the outer dark lateral stripe.

### **Tamias quadrivittatus.**

(COLORADO CHIPMUNK.)

*Sciurus quadrivittatus* SAY, Long's Exped. to Rocky Mts., II, 1823, p. 45.

*Tamias quadrivittatus* WAGNER, Supl. Schreber's Säuget., III, 1843, p. 234 (in part); and of most subsequent writers, at least in part.

*Tamias quadrivittatus*, var. *quadrivittatus* ALLEN, Proc. Boston Soc. Nat. Hist., XVI, 1874, p. 289.

*Tamias asiaticus*, var. *quadrivittatus* ALLEN, Mon. N. Am. Roden., 1877, p. 793 (mainly).

*Hab.*—Mountains of Colorado and Wyoming.

*Breeding Pelage.*—Prevailing color above gray; sides slightly washed with pale yellowish brown; dark dorsal stripes blackish, sparsely mixed with pale rufous hairs; median light stripes ashy; outer light stripes clear white. This is the stage just before the moult, which apparently occurs mainly in June—probably from May into July—in which the pelage is thin, worn and faded. There are three specimens in the series before me, taken July 8–18, which are mainly in this phase, but have begun to acquire traces of the bright summer coat.

*Post-breeding Pelage* (August and September).—General color above rufous, except the head, buttocks, and thighs, the latter plumbeous gray slightly tinged with pale yellowish. Dark dorsal stripes rather broader than the intervening light stripes, blackish, mixed at the edges with bright rufous, the three middle ones continued to the base of the tail, the two outer shorter, browner, less distinctly defined, and sometimes subobsolete. The median black stripe extends forward to the hinder edge of the crown. The inner light stripes are narrow, gray, mixed slightly with rufous, and often tinged with yellow; the outer light

[June, 1890.]

stripes are broader and whiter, the hairs often tipped with a wash of yellowish. Sides of the body bright yellowish rufous, darker and browner along the dorsal edge, lighter and more golden below, and extending from the hips to the sides of the neck; below clear grayish white. Facial stripes strongly contrasted, the light ones grayish white, the dark ones dusky mixed with dark rusty brown. A small grayish white patch behind the ear. Ears blackish, the front external border mixed with pale rusty, the hinder external border broadly edged with dull grayish white. Upper surface of hind feet pale buffy gray. Tail above blackish much mixed with buff; central area below buffy ochraceous, bordered with a narrow line of black, the latter fringed with the same color as the central area.

*Autumn Pelage.*—Unfortunately this is not well shown in the series before me. The nearest approach to it is seen in a specimen from Boulder County, Colorado (No. 5681, Coll. Dr. C. Hart Merriam), collected Sept. 23, 1889, by Mr. Denis Galé, and two (Nos. 5010 and 5011, Coll. C. H. M.), Oct. 12 and 13 (same collector and locality). The two October specimens have the pelage a little fuller and softer, and the tail broader and heavier than August specimens, but they scarcely differ from them in coloration. The September specimen (Sept. 28) seems to be further advanced toward winter condition than the October examples, the pelage being much softer and heavier, the colors duller and more blended, the general effect above being a dull yellowish-gray brown. The rather clear gray of the buttocks and thighs has wholly disappeared, these parts being pale yellowish brown, with a slight admixture of yellowish gray. The dark dorsal stripes are blackish, all but the median one much more brown than black, and the outer pair deep brown with a very slight admixture of dusky. This specimen, besides having lost in life the apical half of its tail, is abnormally large, and may be abnormal in coloration.

*Young* (in first coat).—Similar to the adults in post-breeding dress.

*Measurements.*—Length (average of 17 specimens measured in the flesh), 223 mm.; head and body, 115 mm.; tail vertebrae, 82 mm.; tail with hairs, 108 mm.; hind foot, 31 mm.; height of ear, 10 mm.

*Specimens examined*, 37; collected as follows: Park County, Colorado, July 7–20, 1871, J. A. Allen and C. W. Bennett (Coll. Mus. Comp. Zool.), 12; Boulder County, Colorado, Aug. 3–Oct. 12, Denis Gale (Coll. C. H. Merriam), 7; North Park, Idaho City, Elk Mountain, Denver, Mill City, and Sangre de Christo Pass, Colorado (1 to 2 specimens from each point—Coll. U. S. Nat. Mus.), 12; Laramie Mts., Wyoming, July 21 and Aug. 10, 1857, Dr. W. A. Hammond (Nat. Mus.), 3; Yellowstone National Park, July (Nat. Mus.), 3.

The *Sciurus quadrivittatus* of Say was based on specimens taken in Colorado, on the Arkansas River, near where it breaks through the foothills. Many of the Park County specimens are from near the original locality of Say's specimens, and this series may thus be taken as the standard for reference in considering

specimens from other localities more or less remote, as Wyoming and Montana to the northward, and New Mexico and Arizona to the southward, etc. As each series as a whole presents a more or less different *tout ensemble*, the problem is where to draw the line as to what may be best referred to a restricted *quadrivittatus* form, or to determine at what point the difference has become great enough to render its separate recognition in nomenclature desirable or profitable.

So far as the present material goes, *quadrivittatus* proper seems to occupy the main Rocky Mountain chain from near the southern boundary of Colorado northward through Wyoming to and including the Yellowstone National Park. The three specimens from Yellowstone Park, although in very poor condition, seem to indicate the presence there of a form differing considerably from that inhabiting the mountains of Central Colorado.

Three specimens from the Laramie Mountains (the first two labeled "Black Hills,\* Aug. 10, 1857, Dr. W. A. Hammond;" the other "Black Hills, Neb.,\* July 21, 1857, W. S. Wood,") are provisionally referred to *quadrivittatus*, although differing from Colorado specimens in much stronger tones of color throughout. A single specimen from Elk Mountain, a western spur of the main Rocky Mountains in Colorado, is also fairly typical. A single specimen in winter pelage from the Sangre de Christo Pass, near the New Mexico boundary of Colorado, is also referable here, though shading somewhat toward the San Pedro, New Mexico, series described below under the name *gracilis*. A small series from near old Fort Massachusetts, in San Luis Valley, Southern Colorado, is better referable to the pale small desert form (*conso-brinus*) of the Great Basin.

***Tamias quadrivittatus gracilis*, subsp. nov.**

(SAN PEDRO CHIPMUNK.)

*Hab.*—Socorro County, New Mexico, and Apache County, Arizona.

Rather larger than typical *quadrivittatus*, and of a slenderer, more attenuated form, with a longer, less bushy tail, larger ears, and very different coloration.

*Post-breeding Pelage* (July).—General color of the central portion of the dorsal region, from the front of head to the base of the tail, light gray with no general

\* Not the present Black Hills in South Dakota, but what are now called the Laramie Mountains, an eastern spur of the main Rocky Mountains, north and west of Laramie City, Wyoming.

suffusion of bright rufous, as in *quadrivittatus*. The general ashy gray effect is due to the broad whitish-gray post-auricular patches, the light gray of the nape and interscapular region, and the pure whitish gray of the light dorsal stripes, the outer two of which are clear white. The three median dark dorsal stripes are deep black, with very slight admixture of rufous at their edges. The outer pair of dark stripes, so prominent a feature in typical *quadrivittatus*, is almost obsolete—in some specimens quite absent, in others indicated by a short narrow dusky line, generally very indistinct. The sides are heavily washed with rufous, but of a duller, browner shade than in Colorado specimens. The dark facial streaks are bright rusty, somewhat mixed with blackish, but the bright rust color prevails. Front of ears broadly edged with strong rufous; nose, above the facial streaks, generally rather strongly washed with rufous; all the feet washed with rusty buff externally. Buttocks and thighs nearly as in Colorado specimens—gray, more or less faintly yellowish washed. Tail above blackish mixed with rusty; below the central area is deep orange rufous, several shades deeper than in Colorado specimens, bordered narrowly with black and with an outer fringe of buff.

*Measurements.*—Length, 245 mm.; head and body, 115 mm.; tail with hairs, 120 mm.; hind foot, 34 mm.; height of ear, 12 mm.

*Specimens examined*, 16; collected as follows: San Pedro, New Mexico, July 2–8, Vernon Bailey (Dept. of Agric.), 9; Apache County, Arizona, May 25–31, H. J. M. (Coll. C. Hart Merriam), 7.

Type, No. 17,144, ♀, San Pedro, New Mexico, July 4, 1889, V. Bailey (Coll. U. S. Dept. Agric.).

This form differs from true *quadrivittatus* in its much more grayish and less rufous color above, the purer white and gray of the light dorsal stripes, the absence or obsolescence of the outer pair of dark dorsal streaks, the prevalence of rusty in the dark facial stripes, and the conspicuously rusty rufous of the front edge of the ears; also in being somewhat larger.

The lightest-colored examples of the Colorado series and the most rufous examples of the San Pedro series are quite similar in general effect, but the former may be distinguished by having five well-defined dark dorsal streaks instead of three.

The San Pedro series presents some variation, apparently due mainly to age. Three immature, though nearly full grown specimens, are more ashy gray above, and of a duller shade of brown on the sides; they also have a quite distinct line of dusky below the outer white dorsal stripe. The outer dusky line is absent in four of the nine specimens, rather distinct in two (the youngest of the series), and slightly indicated in the other three.



To this form I also refer a series of seven specimens from Apache County, Arizona, about two hundred miles west of San Pedro, and in a somewhat similar region of country. This series was taken during the last week in May (May 25-31), during the spring moult, and is thus instructive as indicating the changes of color resulting from season. Four of the specimens are adults, two of them in a worn patchy condition of pelage; the other two are still almost wholly in the faded pelage of late spring. The other three specimens are young, about one-third to one-half grown. In none of the seven specimens is there a lateral dusky line below the usual outer white dorsal streak. The bright rufous tint on the ears and in the dark facial streaks is strongly developed. The young specimens do not differ much in color from adults in fresh summer pelage. No. 4247 (Coll. C. H. M.), ♂ ad., has about half acquired the fresh bright summer coat, and thus closely resembles the brighter specimens of the San Pedro series (*e. g.*, No. 17,144). No. 4246 (Coll. C. H. M.), ♂ ad., is less advanced toward the summer coat, broad patches of which cover the shoulders and anterior dorsal region, with smaller patches on other parts. A large part of the body retains the worn bleached winter coat. In Nos. 4245, ♂ ad., and 4248, ♀ ad. (Coll. C. H. M.), there is as yet very little trace of the new coat; the pelage is worn and so much faded as to give a pale yellowish gray effect, very different from the tints of the fresh summer coat.

***Tamias quadrivittatus luteiventris*, subsp. nov.**

(BUFF-BELLIED CHIPMUNK.)

*Tamias quadrivittatus*, var. *quadrivittatus* ALLEN, Proc. Bost. Soc. Nat. Hist., XVI, 1874, p. 289 (in part).

*Tamias asiaticus*, var. *quadrivittatus* ALLEN, Mon. N. Am. Roden., 1877, p. 793 (in part).

*Hab.*—Main chain of the Rocky Mountains in Montana, from Helena northward, probably into British America.

*Post-breeding Pelage* (August).—General color above gray mixed with rufous, gray prevailing on thighs, lower back and nape. Sides heavily washed with ferruginous, extending from the hip to the sides of the neck, strongest on the flanks and paler on the shoulders. *Ventral surface buff*, varying to orange buff, stronger posteriorly. Dark dorsal stripes five, black, edged with rufous, especially anteriorly, the outer pair short but well defined, sometimes black, more fre-

quently mixed with rufous. Middle pair of light stripes gray, the hairs subapically ringed with pale rufous, which sometimes shows through the surface, giving to the gray a slight vinaceous effect; outer pair nearly pure white, sometimes tinged yellowish. Tail full, bushy; above mixed black and buff, the hairs being broadly ringed with buff near the base (extreme base black), then more broadly with black, and tipped with strong yellowish buff. Ears of medium size, externally blackish, tinged with pale rusty anteriorly and with a very broad buffy white posterior border; inner surface grayish buff. Post-auricular patches small, grayish or buffy white. Upper surface of feet orange buff, which color strongly tinges the inner side of both fore and hind limbs.

*Measurements.*—Helena series: Length, 243 mm.; head and body, 128 mm.; tail vertebræ, 93 mm.; tail with hairs, 117 mm.; hind foot, 33 mm.; height of ear, 11.5 mm. (Average of 14 specimens, measured in the flesh by Dr. Merriam.)

Chief Mountain Lake series: Length, 229 mm.; head and body, 112 mm.; tail vertebræ, 92 mm.; tail to end of hairs, 117 mm.; hind foot ("sole"), 32 mm.; "height of ear above notch," 16 mm. (Average of 10 specimens, measured in the flesh by Dr. E. Coues.)

Type, No. 11,991 (Coll. Nat. Mus.), ♂ ad., Chief Mountain Lake, Aug. 24, 1874, Dr. E. Coues.

*Specimens examined*, 28; collected as follows: Chief Mountain Lake, Montana, Aug. 19–26, 1874, Dr. E. Coues (Nat. Mus.), 10; Helena, Montana, Aug. 13–16, 1888, Dr. C. Hart Merriam (Coll. C. H. M.), 14; Mystic Lake, Montana, Sept. 28, 1888, C. W. R. (Coll. C. H. M.), 2; Birch Creek Cañon, Choteau Co., Montana, April, 1889, J. B. Monroe (Coll. C. H. M.), 1; Glacial Lakes, Northwestern Montana, Oct. 4, 1888, Dr. G. B. Grinnell (Am. Mus.), 1.

The ten specimens from Chief Mountain Lake, collected Aug. 19–26, and representing the post-breeding phase of pelage, are very uniform in coloration and size. The two specimens from Mystic Lake, taken a month later, are in little fuller, softer pelage, but present no color variation of note. The single specimen taken at Glacial Lakes, Oct. 4, is in still heavier pelage, and is rather more strongly colored, all the tints being deeper, the black of the dorsal streaks being intense black, the sides orange rufous, and the light stripes are more mixed and washed with yellowish rufous. This specimen doubtless represents the full soft pelage of autumn. There are no specimens in the pelage of spring, which would doubtless be paler and grayer.

The Helena series, taken at the same season (Aug. 13–15), differs very appreciably from the Chief Mountain Lake series, being grayer above, less strongly colored on the sides, and rather

less fulvous below, and with rather larger ears. The difference is quite striking, in the average, but not wholly constant.\*

This form differs from all others in the strong buffy wash of the whole ventral surface, and in the somewhat vinaceous character of the gray of the general ground color above. Its nearest ally is *borealis* of the adjoining region to the eastward, between exceptionally bright-colored specimens of which, and very pale examples of *luteiventris*, there is very little difference in the coloration of the dorsal surface. In the latter, however, the light dorsal stripes are grayer, and all the colors stronger and purer in tone; the ochraceous wash below is absent in *borealis*. While the average difference between the two forms is very striking, judged by the material at hand, it is probable that a series of specimens connecting the localities now represented in the collection will show that the two forms thoroughly intergrade somewhere in the intermediate region. In fact, some of the paler Helena specimens very closely approach some of the brighter Deadwood specimens.

Again, larger size, much duller colors, and the yellowish wash below are the chief distinctions between *luteiventris* and Colorado specimens of true *quadrivittatus*. *T. umbrinus* (from the Uintah and Wahsatch Mountains) differs in its much larger size, the dull fuscous brown of the sides, and clear whitish gray of the ventral surface.

### ***Tamias quadrivittatus affinis*, subsp. nov.**

(COLUMBIAN CHIPMUNK.)

*Hab.*—Interior of British Columbia, east of the Cascade Mountains.

Similar in coloration to true *quadrivittatus*, but larger. Head and body (average of 10 specimens), 125 mm., against 115 mm. in *quadrivittatus* (average of 10 specimens); tail with hairs, 120 mm., against 107 mm. in *quadrivittatus*; hind foot, 31.5 mm., against 30 mm. in *quadrivittatus*; height of ear, about 10 mm., as in *quadrivittatus*.

*Spring Pelage* (April 26–29).—Coat soft, very long and full. General color above yellowish-gray brown, dark and dull; sides, including sides of the neck, dull strong brownish ochre; below dull grayish white, with a slight fulvous tinge.

\* The apparent difference in size indicated by the measurements given above is due doubtless to difference in the methods of measuring. Judging by the skins, the specimens from Chief Mountain Lake appear to be the larger, the skins being over-filled and the Helena skins under-filled.

Light facial streaks brownish white ; dark ones dull brown—dark rusty brown mixed with blackish. Dorsal dark stripes deep black ; median light stripes gray, mixed with yellowish or rufous ; outer light stripes dull yellowish white. Tail full and bushy ; above mixed black and pale ochraceous ; below, central area orange rufous, narrowly edged with black, and broadly fringed with pale ochraceous ; hind feet above strong rusty buff. This is doubtless the winter coat, not much, if any, changed by fading.

*Breeding Pelage* (June and early July before the spring moult).—Pelage scant, thin, much worn, and greatly faded. General color above ashy gray ; sides faintly washed with yellowish, sometimes so slightly as to give the general effect of yellowish gray. Dorsal dark stripes intense black ; median light stripes ashy ; outer light stripes pure white. Tail thin and much worn, the outer fringe of yellowish tipping the hairs mostly worn away, and the central area below pale yellowish rufous. Upper surface of hind feet pale buffy gray.

*Post-breeding Pelage* (July and August phase, immediately after the completion of the moult).—Above general color gray, suffused with yellowish rufous, except rump and thighs, which are ashy gray ; sides deep ochre, varying in different specimens from bright yellow ochre to reddish ochre. Facial stripes similar to the early spring phase, except that the light ones are a little whiter, and the dark ones more reddish. Dorsal stripes intense black ; median light stripes whitish gray mixed and edged with rufous ; outer light stripes white, with a faint yellowish tinge ; feet nearly as in early spring specimens.

*Young of the Year*.—Similar to adults in post-breeding pelage ; all the colors rather duller, especially on the sides, and the general effect above more ashy gray.

Type, No. 2019, Am. Mus. Nat. Hist., Ashcroft, B. C., June 18, 1889, C. P. Streator.

*Specimens examined*, 15 ; collected as follows : Port Moody and Burrard Inlet, British Columbia, Apr. 26 and 29, J. C. Macoun (Coll. C. Hart Merriam), each 1 ; Kamloops, B. C., June 18 (young) and June 20 (adult), J. C. Macoun (Coll. C. H. M.), 2 ; Ashcroft, B. C., June 18–19 and July 3–8, C. P. Streator (Am. Mus.), 10 ; "Columbia River, Oregon, J. K. Townsend," Summer (Nat. Mus.), 1.

One of the most surprising developments in the present study is the close resemblance in coloration of British Columbia and Colorado specimens, specimen after specimen in the one series finding almost its exact counterpart in the other. There are relatively fewer specimens in the gray phase in the Colorado series, and these few are much less gray than are the corresponding British Columbia specimens.

The series from Ashcroft, B. C., consists of 10 specimens, six of which were taken June 18 and 19, and four July 3–8. There

are also two taken at Kamloops, B. C., June 6-8. Of these 12 specimens five are in the post-breeding pelage and correspond in character of coat with July and August specimens from Colorado, and also in coloration, except that the central area of the lower surface of the tail is much paler. Of the remaining seven one is clearly an intermediate, and at the same time in the midst of the moult, having acquired about half of the fresh bright summer coat while retaining much of the faded old pelage. Three others are evidently young of the year (one of them being less than half grown), and much paler (the rufous wash paler and less in amount, giving a grayer general effect). The other three (two females and one male) are in the extreme gray phase above described, due to long retention of the winter coat, these specimens showing here and there a few bright hairs of the approaching summer coat.

On turning to the Colorado series, the three specimens showing extreme grayness, and corresponding to the gray phase from British Columbia, prove on close examination to have tufts and patches of the bright coat of summer mixed here and there with the faded winter dress and partly concealed by it. As these specimens are accompanied by others in full summer dress collected on the same dates, it follows that the time of moult varies greatly in different individuals, probably at least five or six weeks, and also that what on hasty inspection seems like a clear case of dimorphism is due simply to the seasonal change of pelage. It would seem also from the present material that the worn faded coat is retained longest by the nursing females.

I recognize the British Columbia form under a special name for three reasons ; first, the considerable difference in size ; second, its remote geographical separation from the true *quadrivittatus* ; and, third and not least, the fact that it is wholly cut off from *quadrivittatus* by several intervening forms very unlike either. This may or may not be considered a philosophical treatment of the case, according to the point of view ; yet it seems a rational way of recognizing the leading facts involved.

Aside from the distant Colorado form, it seems to have, in the material at hand, no very close resemblance to other forms. It needs no comparison with *T. townsendii*, its near neighbor on the west. It is much larger than *amænus*, the neighboring form to the

southward, and very different from it in color *at all seasons*. It shows no indication of intergradation with the Rocky Mountain form (*luteiventris*) to the eastward; but there is no material to show what occupies the intervening region.

***Tamias quadrivittatus neglectus*, subsp. nov.**

(LAKE SUPERIOR CHIPMUNK.)

*Tamias quadrivittatus* AGASSIZ, Lake Superior, 1850, p. 52 (Ontario, east end of Lake Superior).

*Tamias asiaticus*, var. *quadrivittatus* ALLEN, Mon. N. Am. Roden., 1887, p. 793 (in part).

*Hab.*—Northeastern Minnesota, Northern Wisconsin, northern peninsula of Michigan, and northern shore of Lake Superior.

*Summer (Post-breeding) Pelage.*—Similar in general coloration to true *quadrivittatus* from Colorado, but rather redder on the sides, and generally less gray above, particularly on the rump and thighs, and with the lower lateral dark stripe blacker and stronger. Size apparently rather larger.\*

Type, No. 1575, Mus. Comp. Zoölogy, eastern end of Lake Superior, July 5, 1848, L. Agassiz.

*Specimens examined*, 7; collected as follows: Eastern shore of Lake Superior, summer of 1848, L. Agassiz (Mus. Comp. Zoöl.), 2; North Pacific Junction, Minn. (western end of Lake Superior), July 10, 1877, Dr. T. S. Roberts (Coll. C. H. Merriam), 2; Escanaba, Mich., June, 1883, Wm. Palmer (Nat. Mus.), 3.

Unfortunately the Escanaba specimens have been badly discolored by immersion for a time in some kind of antiseptic solution and are thus of little account for purposes of comparison, while the Minnesota specimens are not fully grown, and the same is true of one of the Lake Superior specimens.

The coloration, while similar to that of Colorado specimens of corresponding age and season, is appreciably different, the general tone being duller and heavier, with the dorsal black streaks blacker and sharper, particularly the outer one.

On geographical grounds it would be expected that the Lake Superior form would be closely allied to, if not identical with, the northern form *borealis*, from which, however, it differs widely. While *borealis* is the dullest and palest of the *quadrivittatus* group, *neglectus* is one of the brightest and strongest colored, the average difference between *neglectus* and *borealis* being very striking;

\* The specimens are not in condition to admit of satisfactory measurement.

much greater than between *neglectus* and true *quadrivittatus* from Colorado, though separated from the latter by over a thousand miles of territory and two intervening forms. Doubtless it will be found to intergrade at the northward with *borealis*.

The specimen here taken as the type of *neglectus* was collected by the late Professor L. Agassiz, in 1848, on his memorable Lake Superior Expedition. It is labeled, in Agassiz's handwriting, "Lake Superior, 1848." In the narrative of the tour (l. c., p. 52) is this reference, under date of July 5, the locality being the mouth of Montreal River, at the eastern end of Lake Superior. "One of our men killed here a squirrel of the kind that takes the place of our 'Chipmunk' in these regions, the *Tamias quadrivittatus*.... We found it afterwards much more abundant than any other species, particularly on hill-sides among broken rocks, attracting the attention by its loud, peculiar cry." Two specimens, now in the Museum of Comparative Zoölogy, were brought home by Professor Agassiz, one of them a nearly full-grown young of the year, the other adult, nearly in post-breeding dress, with the coat still thin but the colors strong.

From the localities given above, and Dr. Hoy's record of its occurrence in northeastern Wisconsin, this form is doubtless common throughout the region bordering Lake Superior, including the contiguous portion of the Province of Ontario, most of the Northern Peninsula of Michigan, northern Wisconsin, north-eastern Minnesota, and thence northward to the habitat of *borealis*.

### ***Tamias quadrivittatus borealis.***

(NORTHERN CHIPMUNK.)

*Tamias quadrivittatus*, var. *pallasi* ALLEN, Proc. Boston Soc. Nat. Hist., XVI, 1874, p. 290 (in part—excluding Siberian references).

*Tamias asiaticus*, var. *borealis* ALLEN, Mon. N. Am. Roden., 1877, p. 793 (in part—American references only).

*Hab.*—Northern North America, east of the Rocky Mountains, from near the northern boundary of the United States northward; also Turtle Mountain, North Dakota; Black Hills, South Dakota; and Bear's Paw Mountain, Montana.

*Autumn Pelage.*—General color above a dull pale yellowish gray, with five broad, strongly pronounced black streaks, the outer pair short but broad and well defined. Median light stripes yellowish gray; outer light stripes white,

faintly tinged with yellowish. Sides faintly washed with yellowish brown; buttocks and thighs dull yellowish gray; ventral surface rather clear grayish white, sometimes with a faint tinge of buff posteriorly. Light facial stripes grayish white, the dark ones blackish, edged and somewhat mixed with dark rusty brown. Central area of tail below pale orange, bordered narrowly with black and fringed with yellowish.

*Breeding Pelage.*—Much paler than the autumn pelage; above ashy gray with a faint shade of yellowish; sides with only a very pale yellowish wash; dark dorsal stripes darker, less mixed with pale rufous; median light stripes more ashy, the outer ones clearer white. Pelage thin and worn.

The early spring phase is not represented.

*Measurements.*—Length (average of 14 Dakota specimens measured by the collector in the flesh), 206 mm.; head and body, 114 mm.; tail with hairs, 92 mm.; hind foot, 32 mm.; ear (measured from skins), 9 mm.

*Specimens examined*, 36; collected as follows: British America (Fort Resolution, 3; Nelson River, 2; Peace River, Mackenzie River, Fort Liard, and Fort Simpson, 1 each (Nat. Mus. and Mus. Comp. Zool.), 9; Fort Pembina, June 4, 1873, Dr. E. Coues (Nat. Mus.), 1; Bear's Paw Mountain, Mont., July 25, 1874, Dr. E. Coues (Nat. Mus.), 1; Pleasant Valley, Mont., June 29, 1871, F. J. Huse (Nat. Mus.), 1; Bottineau, Turtle Mountain, North Dakota, Aug. 23–26, 1887, Vernon Bailey (Coll. C. H. Merriam), 8; Deadwood, Black Hills, South Dakota, Oct. 26–28, 1887, V. Bailey (Coll. C. H. M.), 10; Buffalo Gap, South Dakota, June 23, 1888, V. Bailey (Coll. C. H. M.), 1; Custer, Black Hills, July 9–14, 1888, V. Bailey (Coll. C. H. M.), 3; Wood's P. O., Medicine Mts., Wyoming, Aug. 8, 1888, V. Bailey (Coll. C. H. M.), 1.

Aside from seasonal variation, this large series is remarkably uniform in coloration. The Black Hills series is indistinguishable in color from the Turtle Mountain series, although the two localities are some six hundred miles apart, in a nearly north and south direction. The conditions of environment, however, are practically the same—an isolated group of heavily-wooded mountains rising from the plains. The Black Hills series averages, however, a little smaller in dimensions than the series from Turtle Mountain. There is also a close agreement in coloration between the specimens from the far north and those from Dakota.

Seasonal variation in color is less marked in this form than in several others, owing doubtless to its rather dull tints at all seasons. The series, however, contains very few specimens in the faded pelage of the breeding season, as it consists mostly of August and October specimens. There are only three excep-



tionally pale examples, as follows : a male (No. 1154, Coll. U. S. Nat. Mus.) taken at Pembina, June 4, and two nursing females (Nos. 4497 and 4498, Coll. C. H. M.) taken at Custer, Black Hills, S. D., July 9 and 11. The two latter already show patches of the bright summer pelage, though still in the worn bleached coat of the end of the breeding season. A third female (No. 4499, Coll. C. H. M.), taken at Custer, July 14, and evidently past the nursing period, had completed the moult, and is one of the brightest, most strongly-colored specimens in the entire series. Hence three specimens, of the same sex, taken at the same locality, and practically at the same date, cover the whole range of variation presented by the entire series, and show further how great a change in color may be due to season ; and also that the time of moult varies greatly in different individuals at the same locality.

This northern form of the *T. quadrivittatus* group is intermediate in color between *T. minimus*, the small pallid form of the Plains, and typical *quadrivittatus* of Colorado. In the Dakotas it probably grades into *T. minimus*, both as regards size and coloration, although in the material before me I have no difficulty in separating the two series.

In the first use of the name *borealis* it was improperly and somewhat inadvertently allowed to cover the Old World *T. asiaticus* as well as the form of the American Fur countries. In now restricting the name to the American form I will indicate as the type specimen No. 6506 (U. S. Nat. Mus.), Fort Liard, British America, W. S. Hardisty ; with which No. 3994 (Coll. C. Hart Merriam), Deadwood, S. Dakota, October 27, 1887, is practically identical.

The habitat of *borealis* is very extended ; in the far north it ranges westward to the eastern base of the Rocky Mountains, and eastward to Hudson Bay, there being specimens in the collection from Fort Liard and Fort Simpson, and from Nelson River. Along our northern border it occurs in the Pembina, Turtle, and Bear's Paw Mountains, with an isolated colony in the Black Hills of South Dakota.

## **Tamias minimus.**

(PALE CHIPMUNK.)

*Tamias minimus* BACHMAN, Journ. Acad. Nat. Sci. Phila., VIII, 1839, p. 71.

*Tamias quadrivittatus*, var. *pallidus* ALLEN, Proc. Boston Soc. Nat. Hist., XVI, 1874, p. 289.

*Tamias asiaticus*, var. *pallidus* ALLEN, Mon. N. Am. Roden., 1877, p. 793.

*Hab.*—"Bad lands" and plains of Dakota, Montana, and Wyoming.

*Summer (Post-breeding) Pelage* (July to Sept.).—General color above light gray mixed with pale rust, except on buttocks and thighs; sides ochraceous buff, varying in different specimens from clear buff to strong ochraceous buff; below clear grayish white. Median dorsal stripe narrow, black, edged with pale rusty yellow; the other dark stripes pale rusty yellow, mixed with blackish, in some specimens the rusty yellow prevailing, in others the blackish; central light stripes whitish gray, outer ones clear white. Dark facial stripes pale yellowish brown; the light ones grayish white. An ill-defined grayish white patch behind each ear. Ears dusky, front half rust color, posterior border whitish. Tail above blackish, the hairs sub-basally ringed and tipped with ochraceous; below, central area ochraceous, varying in different specimens from pale to strong ochraceous, bordered with a line of black, fringed heavily with the same color as the central area.

*Autumn Pelage* (October).—Similar in color, except more suffused with yellow; coat softer and fuller.

*Breeding Pelage*.—A May specimen (Mauvaises Terres, May 25, 1855, Dr. F. V. Hayden), a flat skin in bad condition, has all the colors much faded, the central area of the tail pale yellowish white, the general color above similar, with the dark streaks pale yellowish brown. A Montana specimen (Sunday Creek, Montana, May 15, W. T. Hornaday) is less suffused with yellow, and has more black in the dorsal streaks; the pelage is also fuller and less worn. Three specimens from Bridger's Pass, collected May 14 and 15, 1890 (received as these pages are passing through the press), are similar, and differ from August and September specimens in having all of the tints much paler and in almost wholly lacking the buffy wash on the flanks.

*Spring? Pelage*.—Two specimens without date (Yellowstone River, below Powder River, Lt. G. K. Warren's Exploration of Nebraska), have the appearance of being early spring specimens, judging by analogy from other forms. The pelage is very soft and full, the general color above suffused with yellow or pale ochraceous, with also a faint buffy tinge on the ventral surface. The median dorsal dark stripe is very narrow and brownish black, the other dark stripes brownish ochraceous, scantily mixed with blackish; median light stripes ochraceous buff, faintly mixed with gray; the outer ones yellowish white. In other words, similar to the May specimen above described, except that the coat is fuller and softer, with a stronger ochraceous wash over the whole dorsal surface.

*Measurements.*—Size small; ears medium. Length (average of 10 specimens measured in the flesh by the collector), 200 mm.; head and body, 125 mm.; tail vertebrae, 85 mm.; tail with hairs, 105 mm.; hind foot, 29 mm.; height of ear, 8 mm.

*Specimens examined*, 32; collected as follows: Lower Yellowstone River, May and August, Dr. F. V. Hayden (Nat. Mus.), 4; Upper Missouri, Prince Maximilian (Am. Mus.), 1; Camp Thorne, Lower Yellowstone River, July 18, 1873, J. A. Allen, 2; Sunday Creek, Montana, May 15, 1886, W. T. Hornaday (Nat. Mus.), 1; Calf Creek, Montana, Oct. 16, 1887, Jenness Richardson (Am. Mus.), 1; Green River, Wyoming, Aug., Sept., and Oct. (various Government Expeditions—Nat. Mus.), 6; Green River City, Wyoming, Sept. 12-13, 1888, V. Bailey (Coll. C. H. Merriam), 4; Bridger's Pass, Wyoming, Sept. 1-3, 1887, V. Bailey (Coll. C. H. M.), 3; Bridger's Pass, Wyoming, May 14, 15, 1890, V. Bailey (Dept. of Agric.), 3; Bitter Creek, Wyoming, Oct. 13-16, 1874, Dr. F. V. Hayden (Nat. Mus.), 5; "West Humboldt Mts., Nevada, Oct., 1867, R. Ridgway" (Nat. Mus.), 1.

This is a pallid, depauperate form of the Badlands and more or less open country of the Upper Missouri and Yellowstone region, and the plains of Southern Wyoming. It is easily distinguishable from the neighboring forms of the region to the northward and southward by its small size and pallid colors, but is more nearly related to the pallid forms of the Great Basin, with which it probably intergrades. Its habitat is continuous from near the boundary line of Southwestern Wyoming eastward and northward to the lower Yellowstone and Missouri Rivers.

A single specimen labeled as from the West Humboldt Mountains, Nevada, is indistinguishable from specimens taken at the same season in Southern Wyoming. Specimens from near Fort Bridger and Ogden, however, and also from the Great Basin west of Great Salt Lake, are quite different from the Green River series and those from Eastern Montana, and are respectively referable to two other desert forms characterized below under the names *consobrinus* and *pictus*. These two forms probably intergrade with each other and with *minimus* along the lines of junction of their respective habitats, and are consequently treated as subspecies of *minimus*, though their actual intergradation is not shown by the material at present available.

It is not improbable that intergradation between *minimus* and *borealis* may occur in portions of Montana and Dakota, but in the

absence of satisfactory evidence that such is the case, and in view of the wide difference in size and the striking difference in coloration between *minimus* and *quadrivittatus* proper, it seems best for the present to treat them as specifically separable.

Bachman's *Tamias minimus* has hitherto been considered as based on a young example of the common *T. quadrivittatus*, collected by Mr. J. K. Townsend in 1834, the locality, "Rio Colorado," being rather misleading. Bachman quotes Townsend's notes as saying: "It is found very plentiful along the banks of the Rio Colorado, but, I think, does not inhabit a very extensive range, as I never saw it after leaving the river." Townsend, in his "Narrative of a Journey across the Rocky Mountains to the Columbia River," etc., says, under date of June 19 (p. 72), "We arrived to-day on the Green River, Siskadee, or Colorado of the West." The context shows that this point was not far from the junction of Ham's Fork, in southwestern Wyoming, and hence not far from Green River City. This and neighboring localities are well represented in the present material, as well as in that on which the subspecies *pallidus* was originally founded. Besides, Bachman's description of *T. minimus*, based on a June specimen, accords well with the breeding phase of what I have hitherto called *pallidus*, which name must obviously now be treated as a pure synonym of *minimus*.

### ***Tamias minimus consobrinus*, subsp. nov.**

(WAHSATCH CHIPMUNK.)

*Tamias asiaticus*, var. *pallidus* ALLEN, Mon. N. Am. Roden., 1887, p. 793 (in part).

*Hab.*—Eastern border of the Great Basin (Eastern Utah, Western and Southern Colorado, and Northwestern New Mexico).

*Breeding Pelage* (April–June).—Above gray mixed with pale rufous and blackish; sides very faintly washed with pale buff; below grayish white. Dark dorsal stripes five, all sharply defined, the median one black slightly edged with pale rust; the next on either side broader, less black and more mixed with rust, giving the effect of light seal-brown; outer pair rusty brown, varied with dusky, the general effect being yellowish-chestnut brown. Median pair of light stripes light gray; outer pair broader, white. Light facial stripes grayish white, broad; dark ones narrow, pale brown varied with dusky, not sharply defined. External surface of ears black centrally, edged in front

with pale rufous and gray, the posterior border broadly yellowish white, of the same color as the small post-auricular patches. Tail above black varied with yellowish white, the hairs being ringed narrowly with buff at the base, then broadly with black, and tipped with pale yellowish white; below, central area deep buff, broadly bordered with black, with an outer fringe of pale yellowish white. Feet pale grayish buff.

*Post-breeding Pelage* (Sept.-Oct.).—Above gray, varied with rusty and black; sides with a strong wash of yellowish brown; below white tinged faintly with buff. Dorsal stripes strongly contrasted; the median dark one black, faintly edged with rusty, the others seal brown varied with rusty; median pair of light stripes gray varied with rusty yellow, the outer pair white with a faint yellow tinge. Tail as in the breeding pelage, except that the central area is more rusty and the tips of the hairs much more strongly yellow.

*Measurements*.—Length (collector's measurements from fresh specimens), 203 mm.; head and body, 105 mm.; tail vertebræ, 90 mm.; tail to end of hairs, 103 mm.; hind foot, 30 mm.; height of ear (in skins), 8 mm.

Type, No. 4883 (Coll. C. Hart Merriam), ♂ ad., Wahsatch foothills near Salt Lake City, Utah, Oct. 31, 1888, Vernon Bailey.

*Specimens examined*, 22; collected as follows: Camp Scott, Utah, April 6–June 4, 1858, C. Drexler (Nat. Mus.), 4; Fort Bridger, Wyoming, July, 1872, E. W. Nelson (Coll. C. Hart Merriam), 1; Uintah Mts., thirty miles south of Fort Bridger, Wyoming, Sept. 20, 1888, V. Bailey (Coll. C. H. M.), 2; Fort Bridger, Wyoming, May 22–30, 1890, V. Bailey (Dept. of Agric.), 8; Henry's Fork of Green River (near Fort Bridger), Oct. 2, 1870, H. D. Schmidt (Nat. Mus.), 1; Wahsatch foothills, eighteen miles east of Salt Lake City, Utah, Oct. 31, 1888, V. Bailey (Coll. C. H. M.), 1; Utah, H. W. Henshaw (Nat. Mus.), 1; Fort Massachusetts, Southern Colorado (no date), Capt. Bowman (Nat. Mus.), 4.

Of the 22 specimens above recorded 10 were before me when preparing the revision of the genus *Tamias* published in 1877 (l. c.), and were considered as "intermediates" between *quadrivittatus* and *pallidus* (= *minimus* Bach.) They are very poor, partly filled, distorted skins of the small size characterizing *minimus*, paler and quite different in coloration from *quadrivittatus*, and also very different from true *minimus* of the plains of Southern Wyoming and the Upper Missouri and Yellowstone. In the light of present material it seems necessary to recognize three pallid forms instead of one; namely (1) true *minimus* (= *pallidus* Allen) of the Upper Green River, Missouri, and Yellowstone regions, (2) *consobrinus* of the eastern border of the Great Basin region. [July, 1890.]

and (3) *pictus* of the Great Basin at large, except the eastern border.

From *minimus* this form differs in its somewhat larger size and in its decidedly stronger colors throughout, the gray of the upper parts being of a purer ashy instead of fulvous gray, including the median pair of light stripes; the outer light stripes are whiter, and the dark stripes blacker; the wash on the flanks is a strong yellowish brown instead of buff. The contrast in color in the post-breeding phase is striking, but in the bleached pelage of May the difference is less strong, both forms at this season almost wholly losing the strong buff or brownish wash on the flanks; *consobrinus*, however, may be still distinguished by the much greater amount of rufous and its more rusty tint in the dark dorsal streaks, particularly in the outer one; in *minimus* the dark streaks being dusky mixed slightly with pale yellowish brown, while in *consobrinus* they are blackish strongly mixed with chestnut brown, the outer streak being often almost wholly of this tint. This is the average difference, but, owing to the considerable range of individual variation in the two forms, I find occasionally, in the May series of specimens, a specimen from near Fort Bridger (*consobrinus*) that cannot be readily distinguished from others from Bridger's Pass (*minimus*), showing that in this region the two forms evidently intergrade, as would be expected, this being where their respective habitats merge.

It holds a singular relationship to *T. umbrinus*, the range of the two forms apparently meeting in the foothills of the Uintahs, and of the Wahsatch range east of Ogden and Salt Lake City. They resemble each other in color, except that *umbrinus* lacks the outer pair of dark dorsal streaks, which are well developed in *consobrinus*. There is, however, an enormous difference in size between the two forms, *umbrinus* being nearly twice the size, as regards bulk and weight, of *consobrinus*.

The habitat of *consobrinus* includes the region bordering the Uintah and Wahsatch ranges, from Fort Bridger and Ogden southward, probably including the thinly-wooded country of northwestern and western Colorado, and southward and eastward to the San Luis Park, and portions of northern New Mexico. Four specimens from old Fort Massachusetts (near the present

site of Fort Garland), Colorado, agree very closely with specimens from near Fort Bridger and the vicinity of Salt Lake City, but are still somewhat different, the dark dorsal streaks being more heavily edged with a more yellowish rufous, and the flanks more heavily washed with a more golden shade of rufous.

***Tamias minimus pictus*, subsp. nov.**

(DESERT CHIPMUNK.)

*Hab.*—The Great Basin, from the western border of Great Salt Lake westward, and from Southern Utah and Southern Nevada to the Snake Plains of Eastern Washington.

*Post-breeding Pelage* (Sept. and Oct.).—Above general color slate gray; sides washed, generally faintly, with yellowish buff, confined almost wholly to the region between the hips and shoulders, the latter being clear slate gray, with only the faintest shade of pale buff on the sides of the neck, which are always much paler than the flanks; ventral surface silvery white. Five very distinct dark dorsal streaks, the central one black, the others dark seal brown, edged slightly with rufous; median light stripes slate gray, the outer pair nearly pure white. Facial stripes well defined, the light ones grayish white, the dark ones dusky varied with a slight admixture of dark rufous. Ears externally with the front half blackish, slightly mixed on the edge with rusty; posterior border broadly whitish. Post-auricular patches small, indistinct, whitish. Feet gray, faintly washed with very pale buff. Tail above mixed black and gray or yellowish gray, the hairs being black at the extreme base, then ringed broadly with pale buff and black and tipped with pale yellowish gray; central area below dark yellowish buff, narrowly edged with black, the latter fringed with yellowish gray.

*Breeding Pelage* (May).—Similar to the post-breeding (autumn) pelage but the colors all much paler, and the dark dorsal streaks more rufous.

*Young* (half grown).—Colors similar to those of adults in autumn, but the sides rather more washed with yellowish buff, and the pelage thinner and more silky.

*Measurements.*—Length (measured in the flesh), 219 mm.; head and body, 110 mm.; tail vertebræ, 89 mm.; tail to end of hairs, 109 mm.; hind foot, 29 mm.; height of ear, 8 mm.

Type, No. 4882 (Coll. C. Hart Merriam), ♂ ad., Kelton, Utah, Oct. 25, 1888, V. Bailey.

*Specimens examined*, 8; collected as follows: Carson, Nev., May 16, 1881, W. E. Bryant (Coll. C. H. Merriam), 1; same locality and collector, June 9, 1887 (Cal. Acad. Sci.), 1; same locality, May 24, 1889, C. A. Keeler (Dept. of Agric.), 2 (young); Kelton, Utah, Oct. 25, 1888, V. Bailey (Coll. H. M.), 2; North Yakima, Wash., Sept. 25, 26, 1889, T. S. Palmer (Dept. of Agric.), 2.

*Tamias pictus* is closely related to *T. consobrinus* and *T. minimus*, they all agreeing very closely in size and greatly resembling each other in coloration, all being pallid forms of the nearly treeless plains and deserts, but occupying quite distinct physical areas. *T. pictus* is easily distinguished from the others by the rather pure deep slate gray of the dorsal surface, and the very slight buffy suffusion of the flanks, as compared with either of the other forms, and the very slight amount of rufous bordering the dark dorsal streaks. It is eminently a desert form, inhabiting the greater part of the Great Basin. The present material is too limited to define satisfactorily either its distribution or its relationship to *consobrinus* and *minimus*. The series of specimens is limited to two or three examples each from three widely separated localities—Carson, Nevada, Kelton, Utah (near the northwestern corner of Great Salt Lake, in the “desert,”) and North Yakima, Washington, near the arid plains of the Columbia. Yet the specimens from these distant points are exactly similar.