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IN

ZOOLOGY

WILLIAM EMERSON RITTER
AND
CHARLES ATWOOD KOFOID

EDITORS

VOLUME 5

WITH 34 PLATES

(Contributions from the Museum of Vertebrate Zoology of the University of California)

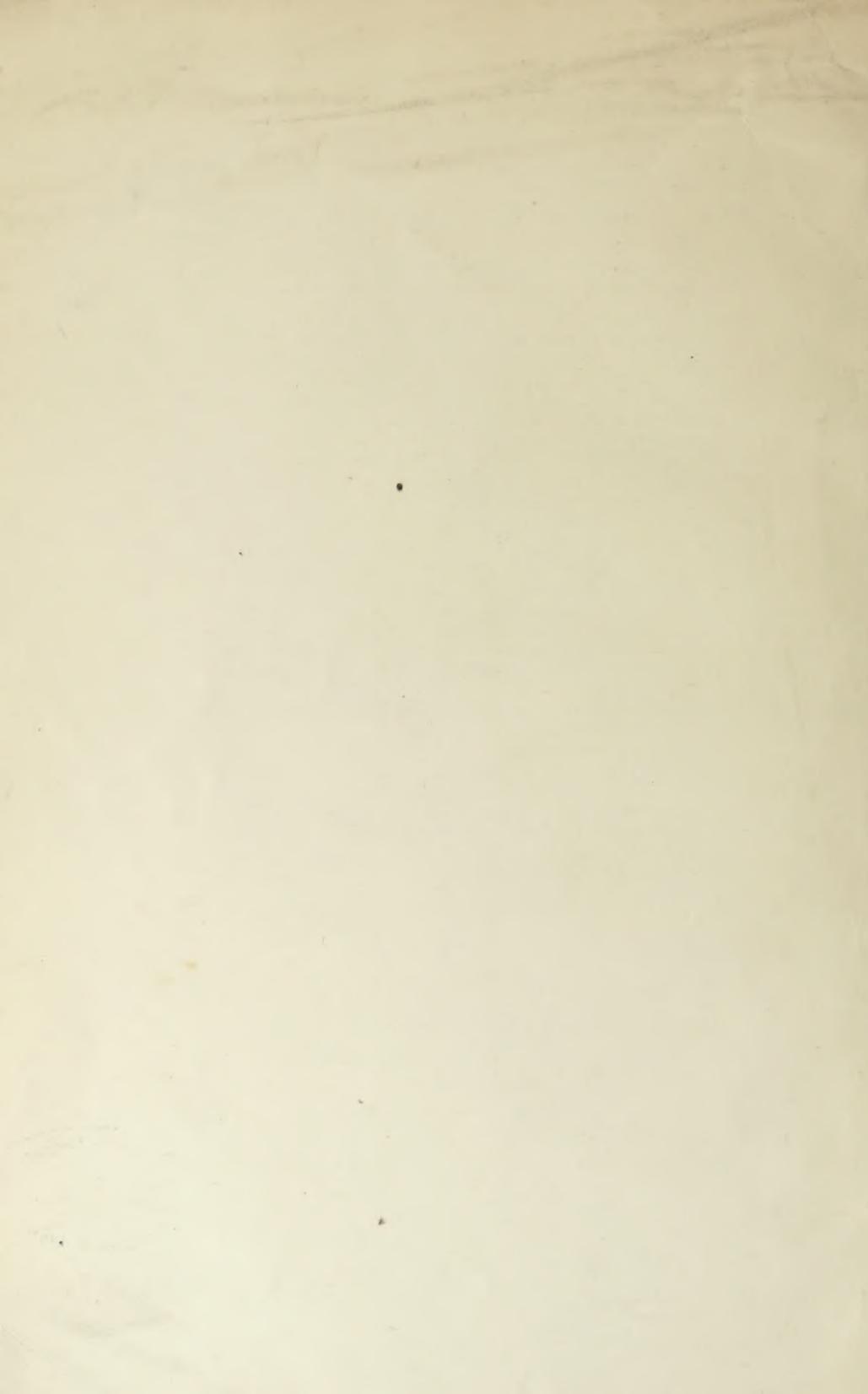
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IN

ZOOLOGY

Vol. 5, No. 1, pp. 1-170, Pls. 1-24

December 31, 1908

THE BIOTA OF THE SAN BERNARDINO
MOUNTAINS

BY

JOSEPH GRINNELL

BERKELEY
THE UNIVERSITY PRESS



UNIVERSITY OF CALIFORNIA PUBLICATIONS

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INTRODUCTION: ITINERARY.

The San Bernardino mountains proper constitute the largest high mountain group in southern California, and include the highest peak south of Mt. Whitney. The forested area is more extensive than elsewhere in southern California, and promised a more abundant fauna. Furthermore the isolation of this mountain group from any other of approximately similar altitude

afforded an attractive feature. My interest therefore centered in this region, and I carried on investigations with the purpose of ascertaining the composition of its fauna, and the local distribution of the component species.

I was assisted during the season of 1905 by Mr. Joseph Dixon, and during 1906 and 1907, my wife and certain students from Throop Institute were with me at various times and rendered much assistance.

The trend of the San Bernardino mountains is from east to west; my work was done along a north and south transverse belt from the Pacific base of the range up over the Santa Ana watershed, through Bear valley and down on the desert side to Box S springs.

I did not venture west into the Little Bear valley and Deep creek district at all. The accompanying profile and maps indicate the region worked, and show the localities referred to in the accounts comprising this report. (See pls. 1, 2.)

The following is a brief outline of my itinerary: In 1905 we entered the region June 10, by the way of Mentone and the lower Santa Ana cañon. After working up over the Clarke's ranch road to Seven Oaks, we pushed on through to the valley of the upper Santa Ana to the mouth of Fish creek, where we maintained a base camp until July 6. In the interim, San Gorgonio peak, Dry lake, and the cienaga at the head of the South Fork were visited.

From July 6 to 14 the vicinity of Seven Oaks and Foresee creek were worked, and San Bernardino peak visited. We then moved up over the Clarke's ranch road to Bluff lake, where we collected until July 27. From that date until August 3rd, we camped at Bear lake, then traveled east through Bear valley and around Baldwin lake to Doble, where we stayed until August 9th. From the 9th to the 14th the desert around Cushenbury and Box S springs was worked; August 14th to 17th we spent at Cactus Flat; then went to Doble and across Baldwin lake (then dry) to the north base of Sugarloaf. This locality was worked until the 24th, when we returned to Doble. On the 25th and 26th, we went past Saragossa springs into Holcomb valley. On August 27th, having returned to Doble, we took final leave of that place

and returned through Bear valley to Bluff lake, where we remained until September 4th, leaving the mountains on that date by the way of the Santa Ana cañon.

In 1906, the region was entered June 9th by the Mill creek route to Skinner's, thence over the Mountain Home trail to Seven Oaks. Base camp was made on the upper Santa Ana at the mouth of the South Fork, and from here, Dollar lake, Dry lake, San Gorgonio peak and Sugar-loaf were visited at different times. On August 6th, my field work for that year ended.

In 1907, I arrived in the region June 13, and again camped on the upper Santa Ana, at the mouth of the South Fork, until July 12, then three miles further down towards Seven Oaks, near the Cedar cabin. Dry lake and San Gorgonio peak were again visited, and I left the mountains for good on August 22. During this season a large share of the time was spent in compiling the present report.

LIFE ZONES OF THE REGION.

The Lower Sonoran zone, the Upper Sonoran zone, the Transition zone and at least the two lower divisions of the Boreal zone are represented in the San Bernardino mountain region.

The Lower Sonoran occupies the Mojave desert plateau, which bounds the region on the north, and parts of the much lower San Bernardino valley and San Gorgonio pass which lie to the south. Tongues of this zone extend into the foothills on either slope, and islands of it occupy hot pockets at somewhat higher elevations.

The Upper Sonoran covers the largest area of any of the zones, embracing as it does the vast chaparral belt of the Pacific slope as well as the piñon belt of the desert slope. It interdigitates below with the Lower Sonoran and above with the Transition, while islands of it exist in both.

The Transition is next in point of extent, comprising the major part of the considerable forested area. It predominates above the 6500-foot contour, though tongues and islands of Upper Sonoran invade far above this level on both the Pacific and desert slopes. (See pls. 1, 2.)

The Boreal zone occupies the highest parts of the region

largely above the 9000-foot contour. It is far less in extent than any of the others because of the limited area of so great an altitude. A number of Boreal meadows occur as islands, surrounded by high Transition, in the vicinity of Bluff lake, 7500 feet altitude, and along the ridge eastward to Sugarloaf mountain. This peak is capped by at least one and one-half square miles of Boreal, mostly on its northern slope. There are no other Boreal areas that I know of north of the valley of the upper Santa Ana. But south of this east-west depression lies the lofty San Bernardino ridge, with San Bernardino peak, 10,600 feet altitude, at the west end, and San Gorgonio peak, 11,485 feet altitude, at the east end. This ridge is covered by fully twenty square miles of the Boreal zone.

As to the divisions of Boreal into Canadian, Hudsonian, and Alpine-Arctic, there are plant representatives of each of these zones, the Canadian being best characterized and of largest extent. But I could not decide upon a single species of animal which could be considered separately characteristic of any one of these Boreal divisions. An upper and a lower division of the Transition zone seemed to me far more easily distinguishable on this mountain group, than Canadian from Hudsonian or the latter from Alpine-Arctic. As intimated above, there are no purely Hudsonian animals. Even the Canadian, as far as animals are concerned, has but very few preponderant representatives. Such as it has are: Lincoln sparrow, Mexican crossbill, Williamson sapsucker (occurs also in high Transition), Clarke nutcracker (is a constant resident on certain ranges of southern California where only Transition-zone plants occur), ashy kinglet (occurs also in upper Transition), and *Microtus mordax bernardinus*. A good many others run up from upper or lower Transition through Boreal nearly to the limit of trees. On account of this difficulty of distinguishing the three divisions of the Boreal zone, I hereafter consider them as grouped together into simply "Boreal."

In the descriptions of localities beyond, I have much more to say as regards the local extent of certain of the zones. The general subject of zonal distribution has been thoroughly discussed by Merriam in his "Results of a Biological Survey of Mount Shasta, California" (North American Fauna No. 16. 1899).

and elsewhere, and particularly by Dr. H. M. Hall in his "Botanical Survey of San Jacinto Mountain" (University of California Publications in Botany, Vol. I, 1902, pp. 1-140). It is therefore unnecessary for me to re-discuss a subject to which I feel I could add no new thoughts. One factor, however, is especially important with regard to the San Bernardino mountains; and its results are conspicuous. And that is, the base level to the north is at an altitude of 4000 feet or more, while on the south it is much lower, 1500 to 2500 feet. This results in low zones being carried high up on north-facing slopes of the ranges next to the desert *in spite of slope exposure*. In fact, the Upper Sonoran (north of Sugarloaf, for instance) goes to 7500 feet altitude, while in no place that I know of does it extend quite so high as that, on south-facing slopes on the Pacific side of the mountains. In-flowing desert air-currents from the north also seem to be an important factor, possibly explaining certain local extensions of zones. The extreme aridity of the desert side as compared with the moderate humidity of the Pacific side (greatest at the higher elevations) must also be considered as a factor in temperature modification. (See pl. 2.)

In the following list I have included only plants of the most conspicuous kinds, for plants are the best indicators of zones. Throughout the lists of plants, birds, mammals, and reptiles, I have referred to the habitat of species by zones, wherever practicable. I have often ignored the straggling occurrence of a plant or animal in one zone when its characteristic habitat is another zone.

LOWER SONORAN.

<i>Yucca arborescens</i> ‡	<i>Adenostoma fasciculatum</i> †*
<i>Populus Fremontii</i> ‡	<i>Prosopis juliflora</i> ‡
<i>Eriogonum fasciculatum</i> †*	<i>Covillea tridentata</i> ‡
<i>Grayia spinosa</i> ‡	<i>Lycium Andersonii</i> Wrightii‡
<i>Platanus racemosa</i> †	<i>Ramona polystachya</i> †

* In another zone also.

† Pacific slope only or chiefly.

‡ Desert slope only or chiefly.

UPPER SONORAN.

<i>Juniperus occidentalis</i> ‡*	<i>Cercocarpus ledifolius</i> ‡*
<i>Pseudotsuga macrocarpa</i> †	<i>Prunus fasciculata</i> ‡
<i>Pinus Coulteri</i> †	<i>Rhus trilobata</i> †
<i>Pinus monophylla</i> ‡	<i>Ceanothus divaricatus</i> †
<i>Ephedra viridis</i> ‡	<i>Ceanothus integerrimus</i> †
<i>Populus trichocarpa</i> †*	<i>Ceanothus perplexans</i>
<i>Salix lasiolepis</i> *	<i>Garrya Veatchii</i>
<i>Alnus rhombifolia</i> †*	<i>Arctostaphylos manzanita</i>
<i>Quercus dumosa</i>	<i>Eriodictyon trichocalyx</i> *
<i>Quercus chrysolepis</i>	<i>Monardella lanceolata</i>
<i>Eriogonum fasciculatum</i> †*	<i>Salvia carnosa compacta</i> †
<i>Umbellularia californica</i> †	<i>Nicotiana attenuata</i> ‡
<i>Purshia glandulosa</i> ‡	<i>Pentstemon ternatus</i> †
<i>Adenostoma fasciculatum</i> †*	<i>Artemisia tridentata</i> ‡*
<i>Amelanchier alnifolia</i> ‡	<i>Tetradymia canescens</i> ‡*
<i>Cercocarpus betulafolius</i> †	

TRANSITION.

<i>Juniperus occidentalis</i> ‡*	<i>Prunus demissa</i> †
<i>Abies concolor</i>	<i>Amorpha californica</i> †
<i>Libocedrus decurrens</i> †	<i>Linum Lewisii</i> †
<i>Pinus ponderosa</i>	<i>Acer glabrum</i> †
<i>Pinus Jeffreyi</i>	<i>Ceanothus cordulatus</i>
<i>Pinus Lambertiana</i> †	<i>Cornus occidentalis</i>
<i>Lilium Parryi</i> †	<i>Sarcodes sanguinea</i>
<i>Populus trichocarpa</i> †*	<i>Arctostaphylos patula</i>
<i>Populus angustifolia</i>	<i>Eriodictyon trichocalyx</i> *
<i>Salix Bigelovii</i> †	<i>Monardella linoidea stricta</i>
<i>Salix lasiolepis</i> *	<i>Pedicularis semibarbata</i>
<i>Alnus rhombifolia</i> †*	<i>Pentstemon Palmeri</i>
<i>Castanopsis sempervirens</i> *	<i>Pentstemon labrosus</i>
<i>Quercus californica</i>	<i>Antennaria speciosa</i> †
<i>Urlica holosericea</i>	<i>Artemisia tridentata</i> ‡*
<i>Aquilegia truncata</i>	<i>Chrysothamnus tortifolius</i>
<i>Clematis ligusticifolia</i> †	<i>Tetradymia canescens</i> *
<i>Ribes cereum</i>	<i>Carduus Drummondii acaules-</i>
<i>Cercocarpus ledifolius</i> ‡*	<i>cens.</i> †
<i>Rubus parviflorus</i> †	<i>Solidago californica</i>
<i>Fragaria californica</i> †	

* In another zone also.

† Pacific slope only or chiefly.

‡ Desert slope only or chiefly.

BOREAL.

<i>Pinus Murrayana</i>	<i>Viola blanda</i>
<i>Pinus flexilis</i>	<i>Bryanthus Breweri</i>
<i>Veratrum californicum</i>	<i>Dodecatheon alpinum</i>
<i>Populus (sp.?)</i>	<i>Mimulus pilosellus</i>
<i>Populus tremuloides</i>	<i>Orthocarpus pilosus</i>
<i>Castanopsis sempervirens*</i>	<i>Pentstemon caesius</i>
<i>Spraguca umbellata</i>	<i>Symphoricarpus Parishii</i>
<i>Ranunculus oxynotus</i>	<i>Hulsea vestita pygmaea</i>
<i>Draba corrugata</i>	<i>Erigeron compositus discoi-</i>
<i>Potentilla Wheeleri</i>	<i>deus</i>
<i>Oxytropis oreophila</i>	

DESCRIPTION OF LOCALITIES.

LOWER SANTA ANA CANYON.

The Lower Sonoran zone prevails in the wash below the exit of the Santa Ana river from the foothills near Mentone. And along the lower course of the Santa Ana cañon up through the Narrows to the mouth of Bear creek, Lower Sonoran elements remain in evidence, though less and less so, giving way to Upper Sonoran. 'Sycamores are the most conspicuous trees of the cañon bottom, except close along the stream, which is usually overhung with willows or alders. The cañon wall is more or less densely clothed with chaparral, including the usual shrubby plants of that belt in southern California. Common breeding birds along the lower Santa Ana, from just below its mouth up through the Narrows, 2500 feet elevation, were: white-throated swift, Costa hummingbird, black-chinned hummingbird, roadrunner, Texas nighthawk, black-chinned sparrow, Bell sparrow, Bullock oriole, Arizona hooded oriole, Anthony towhee, green-backed goldfinch, least vireo, western warbling vireo, lazuli bunting, dotted cañon wren, rock wren and sparrow hawk. The Stejneger whip-tailed lizard was very common, as were also the fence lizard and the brown-shouldered lizard. We found the days, June 11 and 12,

* In another zone also.

1905, very hot and glary in the open cañon, though the night brought a down-cañon breeze of refreshing coolness.

MOUNTAIN HOME CANYON.

A much-used route into the San Bernardino mountains is by the way of Redlands, up Mill creek to Skinner's, and from there up Mountain Home creek, over the divide, and down into the upper Santa Ana. Where Mountain Home creek joins Mill creek the region is purely Upper Sonoran; but even at Skinner's (elevation 4000 feet), a few hundred yards from the mouth of the former, Transition elements begin to appear, and as one follows the Mountain Home trail up towards the divide, one after another come into prominence, while Sonoran species are gradually left behind. The lower part of Mountain Home cañon is lined with alders of great height and remarkable straightness and slenderness. This habit of growth is doubtless a result of the deepness of the cañon, which means protection from the wind and a reaching for the light. Other plants of the lower cañon are the bay tree, big-leaf maple, golden oak, and big-cone spruce. Associated with these are such birds as the western tanager, California purple finch, black-chinned hummingbird, Cassin vireo, western flycatcher, California yellow warbler, black-throated gray warbler, western wood pewee, and olive-sided flycatcher. Further up the cañon incense cedars begin to appear, and almost simultaneously Sierra juncos become numerous. Soon yellow pines are met with, and finally, at the head of the cañon, around the collection of cabins known as Glen Martin, the woods consist chiefly of black oak, yellow pine, sugar pine, and silver fir. In this open woods, intermixed with some deer-brush and manzanita, a new set of birds are to be seen, as follows: Audubon warbler, mountain chickadee, blue-fronted jay, Cassin purple finch, slender-billed nuthatch, and Sierra junco. The gray squirrel is a conspicuous mammal. In passing up a graded ascent, such as Mountain Home cañon, especially where moisture conditions are apparently about the same all the way, the approximate zone boundary is impossible to locate even within a mile or more. The mergence is slow and gradual.

SEVEN OAKS.

Seven Oaks is a summer resort on the upper Santa Ana at an elevation of 5000 feet. It is at the north base of San Bernardino peak, on the opposite side of the stream. To the northward rises the ridge separating the upper Santa Ana valley from Bear valley. Faunally Seven Oaks is practically on the border between Upper Sonoran and lower Transition. In the immediate vicinity of the group of cabins and tent-houses constituting the resort, the Upper Sonoran elements prevail, as they do even more purely on the south-facing slopes of the valley side to the north. North-facing slopes and ravines, on the contrary, are almost pure lower Transition. In the near neighborhood of Seven Oaks the following are some of the more conspicuous trees: Coulter pine, yellow pine, big-cone spruce, black oak, golden oak, scrub oak, cottonwood, alder, the latter forming a dense interlacing canopy over most of the stream courses, willows, of at least two species, and Upper Sonoran species of ceanothus and manzanita.

In such an intermediate region, zonally, it is not surprising to find a peculiar association of birds. The following are the more abundant of those I have reason to believe to breed in the neighborhood, that is, within a mile, say, of the resort: western robin, western gnatcatcher, California bush-tit, western wood pewee, Triall flycatcher, western warbling vireo, Cassin vireo, violet-green swallow, western bluebird, western chipping sparrow, San Diego song sparrow, spurred towhee, California purple finch, linnnet, Bullock oriole, California yellow warbler, black-throated gray warbler, Parkman wren, Nuttall woodpecker, Sierra sapsucker, San Diego wren, lutescent warbler, black-headed grosbeak, Lawrence goldfinch, blue-fronted jay, and Cooper hawk. Among reptiles, the fence lizard, horned toad, and brown-shouldered lizard are common, all being Sonoran species. Wood rats (*Neotoma f. mohavensis*) are extremely common; and other mammals numerous in the locality are *Peromyscus boylii*, ground squirrel, the Merriam chipmunk (*Eutamias merriami*), *Perognathus californicus dispar*, skunk (*Mephitis occidentalis holzneri*), fox (*Urocyon californicus*), gopher (*Thomomys alvallis*), brown bat (*Vesperugo fuscus*), and mole (*Scapanus latimanus*). These lists, it

must be understood, can be easily extended by a short excursion out onto the chaparral-clothed slopes to the westward, where such birds as the Bell sparrow and black-chinned sparrow are plainly in evidence, or by a few thousand feet climb towards San Bernardino peak, which would carry one through a Transition set of animals well into the Boreal zone. As to individuals, Seven Oaks is within a region of perhaps as abundant animal life as any locality of like extent in the San Bernardino mountains. Its moist meadows, densely-wooded stream-bottom, and chaparral slopes combine to furnish an abundant shelter and food-source for its large population.

UPPER SANTA ANA CANYON.

The upper Santa Ana river flows west through a broad valley, not at all of the character of a true cañon, separating the range on the north, of which Sugarloaf is the culminating peak, from the more lofty one on the south, which includes San Bernardino and San Gorgonio peaks. The main stream heads in a broad, nearly level, depression, at 6700 to 7000 feet altitude, known as Big Meadows, and in the space of ten miles down to Seven Oaks makes a descent of 2000 feet, so that the grade is not very steep. The south-facing north wall of this upper course of the Santa Ana is relatively hot and arid, only a few intermittent streams flowing from it; while the shaded south wall is always at least one zone higher at the same level, and is drained by several large and permanent streams. These in their order of importance are: South Fork, Fish creek, Barton creek, and Lost creek. The first-named stream heads in the great amphitheatre on the northwest side of San Gorgonio peak, where the snowfall is heavy, and where snow-banks last nearly, if not quite, all summer. And this stream carries as much water, especially late in the summer, as all of the others combined. It was along this upper reach of the Santa Ana, and along its tributaries, that I did more work than anywhere else, partly because the region is an exceptionally inviting one to the camper, as well as to the naturalist.

The life zones show a decided response to the law of slope exposure. The shaded south wall below 9000 feet altitude is almost entirely lower and upper Transition; while the sunny north wall

is chiefly upper Sonoran below an altitude of 7500 feet, save for the immediate bed of the valley, which is Transition in most places. (See pls. 1, 2, 6, 10, 22, 23.)

This Upper Sonoran intrusion along the north wall is characterized by the usual chaparral association of plants, as listed elsewhere for the Pacific slope, except that toward its east end the more arid conditions seem to account for an extensive admixture of piñon and service-berry. Such Upper Sonoran birds as the Bell sparrow, black-chinned sparrow, spurred towhee, San Diego wren, pallid wren, California jay, California bushtit, and dusky poorwill, were regularly noted there during the breeding season; while among mammals and reptiles the Merriam chipmunk, True white-footed mouse, brown-shouldered lizard, and Blainville horned toad appeared to be characteristic.

Along the bed of the valley and up the north-facing south wall extends an almost continuous though not dense Transition-zone forest. This consists largely of the yellow and Jeffrey pines, with a lesser amount of sugar pine, and, along streams, incense cedar; while on the most shaded slopes the silver fir prevails. On the benches or flats black oaks are the only deciduous trees present, they being interspersed with conifers. Along the streams cottonwoods of two or three species, alders and willows are abundant. In the dryer open woods, birds are plentiful, especially chickadees, nuthatches and woodpeckers. Along shaded streams the rarer Sierra hermit thrush, calliope hummingbird, Townsend solitaire, and dipper build their nests; while throughout this wooded tract generally the gray flycatcher, western bluebird, Audubon warbler, Cassin purple finch, and many other Transition-zone species are characteristic and abundant. Along streams the Mojave wood rat and Rowley white-footed mouse are numerous, and in the higher woods the gray squirrel and San Bernardino chipmunk, the latter almost always above 7500 feet altitude.

The above brief outline gives but a very limited idea of the biotic complexion of the upper Santa Ana valley. The fact that a three hours' walk from the stream may lead one through three distinct life-zones, each with an almost totally distinct flora and fauna, will give the reader an idea of the great variety of life within a short distance.

DRY LAKE.

At 9000 feet altitude, situated among the ridges at almost the very base of San Gorgonio peak, and almost due north of it, lies Dry lake. It is so called because during dry seasons what water there is seeps away entirely through the loose moraine material composing its basin. But during 1905, 1906, and 1907 the lake has been constantly full, and overflowing most of the time in summer. The outlet ravine leads down into the South fork of the Santa Ana. Within half a mile to the westward is a series of low intersecting moraine-like ridges, of granite blocks and weathered detritus, with intervening basins, though the latter probably never held water because of the porosity of the ground. Over fully a square mile there is no sign of a drainage channel. I am unable to explain these peculiar surface features, except by the action of glaciers. Yet I saw no polished rock surfaces or striae which I should expect to show plainly in a recently glaciated region. Over this broken stretch and around three sides of Dry lake, extends an almost continuous, though not dense, growth of tamarack pine with a scanty undergrowth of chinquapin, though often the forest floor is bare of any vegetation whatever for long stretches. On the remaining side of the lake this Canadian forest is broken by an upper Transition intrusion along the sun-facing slope of the ridge to the northward. Yellow pines, silver firs, and heavy manzanita brush (*Arctostaphylos patula*) characterize this encroachment of the lower zone. On the east side of the lake the shore is low and gravelly, with many dead tamaracks, killed by submergence, fallen or standing. This is also the most open and warmest side (next to the water), and insects, algæ scum, and good drinking places make it a point of attraction at some time during the day for most of the birds of the neighborhood. By watching this mecca, from a place of concealment behind the brushy top of a fallen pine, one can detect the presence of species which would be far less easy to find in the woods. Birds are not numerous in the tamarack pine forest. The following species were found in the pure Boreal zone of the near vicinity of Dry lake: western chipping sparrow, Mexican crossbill, mountain chickadee, Sierra hermit thrush, Townsend solitaire, gray fly-

catcher, slender-billed nuthatch, ashy kinglet, western bluebird, Cassin purple finch, olive-sided flycatcher, calliope hummingbird, golden eagle, Cabanis woodpecker, Williamson sapsucker, Clarke nutcracker, Sierra junco, Audubon warbler, western wood pewee, Pacific nighthawk, and Sierra creeper. In the tongue of Transition on the north side of the lake, there were noted, in addition to many of the above, green-tailed towhees, Stephens fox sparrows, and western robins. The western red-tailed hawk, rock wren, and red-shafted flicker were also noted in the near vicinity, as well as a few other birds undoubtedly out of their breeding range. Among mammals the two chipmunks (*Eutamias speciosus* and *Callospermophilus bernardinus*) were abundant; and workings of moles (*Scapanus latimanus?*) and meadow mice (*Microtus mordax bernardinus*) were seen. Gophers (*Thomomys altivallis*) were common about the little cienaga on the north bank of the lake. Although snowbanks remained in shady places around the lake until the end of June, we found the days decidedly warm, and the nights not uncomfortably cool, in fact not nearly so chilly as 3000 feet lower, on the Santa Ana, at the same season. (See pls. 3A, 7, 9.)

DOLLAR LAKE.

Dollar lake is a much smaller body of water than Dry lake. As its basin is small and situated at the foot of a steep mountain wall, down which talus material is constantly sliding, it looks as though its existence will come to an end before long. Dollar lake is in the right-hand head of the South Fork at 9200 feet altitude, and about two miles in an air line due west of Dry lake. Its faunal surroundings are purely Boreal.

SAN GORGONIO PEAK.

San Gorgonio peak, or as it is more familiarly known in southern California, Grayback, is the highest point of the San Bernardino mountains, and in fact, of California south of the Mt. Whitney region in the southern Sierra Nevada. The elevation of San Gorgonio Peak, as given by the U. S. Geological Survey, is 11,485 feet above the sea. From it can be distinguished the San Pedro Martir mountains of Lower California, the San Fran-

ciseo mountains of Arizona, Mt. Whitney, and the Pacific ocean, with a vast area of intervening mountains, valleys, and deserts. The nearer San Jacinto, San Antonio, and Santiago peaks stand out in clear profile, while, of course, only on the clearest days can the more distant points be distinguished. I cannot imagine a more fascinating object lesson in zoögeography than that afforded by an hour's survey of this great region spread out around one, especially if he has traversed a good part of it, and can recall the main features of its varying fauna. The immediate crest of San Gorgonio peak is excessively barren—a ridge strewn with granite blocks, some rectangular as if hewn out, others weathered and rounded. Between these rocks is a coarse gravelly soil of the same yellowish gray color as the boulders, so that the crest of the mountain stands out in contrast to the darker timbered slopes below; whence its popular name. Most of the snow seems to blow off the top in winter as it falls, so that but few drifts remain long on the top crest; but over the north side, especially in the gulches protected from the sun and wind, vast quantities accumulate, and remain nearly always all through the summer. Straggling up the ridges is a dwindling growth of limber pines, those on the more exposed slopes prostrate and excessively gnarled. There is an approximate timber-line marking the limit of thrifty growth, but even on the very summit, within fifty feet of the stone monument, several limber pines exist among the rocks, though as shrubs only. I do not believe the elevation (11,485 feet) would be above the limit of tree growth, if protection from wind and snowslides were afforded. In other words, I can see little reason for recognizing an alpine-arctic life zone on San Gorgonio peak, unless it be at the margins of the most nearly permanent snowbanks in the northern shaded slideways. I found the following plants on or very close to the summit of San Gorgonio peak: *Erigeron compositus* (blooming July 16); *Draba corrugata* (blooming June 19 to July 16); *Ranunculus oxynotus* (blooming July 16 near the edge of a snowbank on the north side); *Oxytropis oreophila* (in bloom July 16); and *Potentilla wheeleri* (in bloom July 16).

But one species of mammal was noted, the yellow-headed chipmunk (*Callospermophilus bernardinus*), one of which was seen

on the summit, and others among the dwarfed limber pines on the slopes. I hardly think any birds breed on or very near the summit, unless it be the rock wrens. Yet on June 19, 1907, I saw a male Sierra junco perched on the tip of the monument, from which he uttered his song. On two occasions I could hear from the summit the nasal calls of the Clarke nutcrackers, which were feeding among the pines far down the slopes. In July a number of birds were to be seen, wanderers from below, and altogether I noted: Audubon warbler, rock wren, golden eagle, California horned lark, and white-throated swift, besides the two species above mentioned. The rapidly rising air currents brought with them an amazing number of insects, especially of the slow-flying sorts such as winged ants and millers, and many of these were to be seen lying benumbed on the snow banks. This cold-storage food supply doubtless accounts for the families of rock wrens, juncos, and horned larks which were seen around the snowbanks in July. (See pls. 8A, 8B, 10.)

BLUFF LAKE.

The ridge separating Bear valley from the valley of the upper Santa Ana is cut off to the west by the deep cañon of Bear Creek, which below joins the Santa Ana. The crest of this ridge is broad and rolling, and in its western portion varies from 7500 to 8000 feet in altitude. Bluff lake is a locality-name applied to the neighborhood of a large meadow at about 7500 feet altitude a little to the north of the crest of the ridge, and about midway between Clarke's ranch on the south and Bear lake to the north. There is no "bluff" at Bluff lake, nor is there a "lake," though at the west end of the big meadow there is a tule-filled pond which is probably the remnant of what was once a small lake. The meadow is used as a pasture, and at the south margin is Thurman's "hotel," which is supplied with good water from a spring. Parts of the big meadow are wet and grown to veratrum and other plants of the upper Transition cienagas. The whole region is very well watered, most of the swales being floored by cienagas; and at the north, towards Bear lake where the slope steepens, numerous small streams have formed shallow ravines. The region is further characterized by rather heavy timber, con-

sisting of silver fir, and yellow pine, with some sugar pine, tamarack pine (chiefly around the margins of the meadow), and incense cedar (mostly down towards Bear lake). On the top of the ridge to the south there is a dense undergrowth of chinquapin, *Ceanothus cordulatus* and *Arctostaphylos patula*. This brush also occurs on the little hills and ridges throughout the region. Along the depressions and margining the cienagas are luxuriant growths of a species of willow. The life-zone of the Bluff lake region is extreme upper Transition, with a large Boreal element around the wettest and most shaded cienagas. Doubtless because of the abundance of water this locality proved to possess a prolificacy of animal life scarcely equalled anywhere else in the San Bernardino mountains. The two chipmunks (*Eutamias speciosus* and *Callospermophilus bernardinus*) fairly swarmed over the brushy knolls, as well as in the open woods. The cienagas were overrun by meadow mice (*Microtus californicus* and *M. mordax bernardinus*), and shrews (*Sorex ornatus*) were also doubtless common, though we were able to catch but few. Pocket gophers were common. Among birds the following were some of the more characteristic or abundant species, roughly in the order of importance in these respects: gray flycatcher, Stephens fox sparrow, Sierra junco, mountain chickadee, Audubon warbler, western robin, Cassin purple finch, western bluebird, Pacific nighthawk, pine siskin, Sierra creeper, Sierra and Williamson sapsuckers, Cabanis and white-headed woodpeckers, green-tailed towhee, Lincoln sparrow, blue-fronted jay, olive-sided flycatcher, western wood pewee, and western chipping sparrow. Of much less abundance were: ashy kinglet, Townsend solitaire, Sierra hermit thrush, and dwarf flammulated screech owl.

Besides these, there was a large influx of transients and lower zone visitants, which began to appear at least as early as the middle of July. The first of September the bird population was at least 4500 individuals to the square mile, while of the two species of chipmunks there were at least 2000 to the square mile. The Bluff lake region is so nearly level, and therefore easy to traverse, that I cannot recommend a more attractive spot in the mountains for the naturalist. The student of bird ecology or life histories will find here an excellent field for work. He should

arrive in the region early in April, though it is then still largely covered with snow, which does not all leave as a usual thing until June 1st, so I was told. (See pls. 4B, 11A, 11B, 12, 14, 17.)

BEAR VALLEY.

Bear valley comprises something like 16 square miles of nearly level plateau at from 6750 to 7000 feet altitude. Its trend is east-and-west and it is bordered by ridges 500 to 1500 feet higher. At its east end is the depression occupied by the shallow or often altogether dry Baldwin lake; while its west end is occupied by Bear lake impounded by the artificial Bear valley dam. The lake is some $5\frac{1}{2}$ miles long by a mile or less in width, and empties westward over or through the dam into Bear creek, which in turn flows into the lower Santa Ana. Over half of its area at the east end is so shallow as to be more or less marshy, and this portion is the breeding place of numerous mudhens and American eared grebes, besides a few ducks and perhaps other water birds. Around Bear lake, up Rathbone creek, and on the south side of Baldwin lake, are several thousand acres of pasture land, interspersed with large areas of sage brush. The pine forest which clothes the walls of the valley in but few places encroaches on the level floor of the valley. Occasionally the latter is punctuated by a solitary western juniper, or yellow pine. Among mammals the two chipmunks (*Eutamias speciosus* and *Callospermophilus bernardinus*) were common through the woods and in places down to the shore of the lake. Ground squirrels were numerous on the pastures, and trapping showed the presence of many Sonora white-footed mice in the sage tracts. My visits at Bear lake and through Bear valley were too late in the summer for the determination of the breeding land birds. Considerable numbers of species and individuals were present, but a good many of them were plainly visitants from various directions. (See pls. 5, 18, 4A.)

SUGARLOAF (NORTH SIDE).

Sugarloaf, 9842 feet in altitude, is the highest point of the mountains north of the Santa Ana river. It is at the east end of the ridge which separates Bear valley and the depression occupied in part by Baldwin lake from the valley of the upper

Santa Ana. The north base of Sugarloaf merges into the gentle slope leading down to Baldwin lake, at about 7500 feet altitude. This gentle slope is a typical sage flat. The hills to the east are largely upper Sonoran in spite of the high altitude; for this is on the side influenced by the desert air currents, and shut off from the cooling Pacific breezes. It is a very arid region, too. A small stream gushes out at the upper end of the sage flat, and a cienaga of a few acres relieves the saginess along its course; but it shortly soaks away. I found only one spring (in August) on the north side of Sugarloaf, in the deepest cañon on the east side. There are as many belts of plant life on the north face of Sugarloaf, an altitudinal distance of only 2300 feet, as there are on the north side of San Bernardino peak in 6000 feet. In a morning's climb up the former I passed from the sage and piñon (Upper Sonoran), into black oak and yellow pine (Lower Transition); then through silver firs (Upper Transition), into the pure tamarack pine woods of the Boreal zone. On the crest of the ridge are a good many limber pines, which might be considered an indication of the middle division of Boreal (Hudsonian). My visit to this interesting region was too late in the season to be at all sure that the birds were in their breeding zones. In fact, they had very evidently moved up and down, and many migrants were also in evidence. On August 22, 1905, in the one hour from 10 to 11 a.m., I hid myself in a willow thicket near the spring at 8500 feet altitude on the north side of Sugarloaf, and took a census of all the birds visiting the spring during that time. Eighty-five individuals were noted, representing the following species: four red-shafted flickers, two Cabanis woodpeckers, one Clarke nutcracker, three blue-fronted jays, two Allen hummingbirds, two Stephens fox sparrows, three green-tailed towhees, twenty-five Sierra juncos, twenty-five Audubon warblers, one slender-billed nuthatch, six mountain chickadees, six lutescent warblers, two Parkman wrens, two golden pileolated warblers, and one Tolmie warbler.

Towards the north base of the mountain and out on the flat, mixed with the sage, were extensive thickets of service-berry bushes, loaded with ripening fruit. Here birds from all directions fairly swarmed, and to enumerate them here would be to

list nearly everything of the region. Green-tailed and spurred towhees, mountain quail, Cassin purple finches, linnets, and blue-fronted jays were among those of conspicuous abundance. In the black oak and fir belts *Eutamias speciosus* and *Callospermophilus* were abundant; and in the piñon and service-berry, *Eutamias merriami*. Out on the sage flat *Ammospermophilus leucurus* and *Perodipus agilis* formed a curious association of mammals and both at a very high altitude.

DOBLE.

Doble is a deserted mining town just east of Gold mountain and north of Baldwin lake. It is about 6900 feet in altitude, in the sage and piñon Upper Sonoran zone. The antelope chipmunk, Merriam kangaroo rat, and desert jackrabbit show the desert nature of the mammal fauna. Among birds, two species were more abundant in this vicinity than anywhere else we went, the piñon jay and Brewer sparrow. Rock wrens, Say phoebes, California sage sparrows, mourning doves, mountain bluebirds, and linnets were also conspicuous members of its fauna. The region is extremely arid, and the few drinking places, water piped from wells, were the points where the birds of the region were sure to be seen, if hard to find elsewhere.

SARAGOSSA SPRINGS.

Saragossa springs is at an elevation of 7500 feet on the southwest side of Gold mountain. The watershed there is entirely towards the desert, and the region is very arid. It is about on the boundary between Upper Sonoran and Lower Transition. There is a mixture of Jeffrey pine, western juniper, and mountain mahogany, with plenty of sage; while on the south sides of the surrounding low ridges the piñon prevails. Desert jackrabbits and Merriam chipmunks, pigmy nuthatches, western chipping sparrows, Cassin purple finches, Sierra juncos, and Brewer sparrows were some of the most abundant animals observed.

HOLCOMB VALLEY.

Holcomb valley, altitude 7200 to 7500 feet, is very similar in faunal and floral complexion to Bear valley. It is very arid, presenting long stretches of sage, interspersed with considerable yellow and Jeffrey pine. There are two small cienagas, called Upper and Lower Holcomb. On the ridges the pines are mixed with piñon and mountain mahogany. On the north sides of the highest eminences on the south rim of the valley are a few firs. I saw quite a number of chipmunks (*Eutamias speciosus*) and yellow-headed spermophiles (*Callospermophilus bernardinus*) in the western part of the valley; but birds were few in both species and numbers. During my visit, August 26, I saw: rock wren, linnet, western bluebird, Audubon warbler, Cassin purple finch, Sierra junco, blue-fronted jay, and Cabanis woodpecker.

CACTUS FLAT.

Cactus Flat is a nearly level pocket on the desert side of the mountains at about 6000 feet elevation. To the south rise the steep slopes leading up to the crest of the ridge back of Doble, some 1500 feet higher; and to the north it is drained off into the Mojave desert, 2000 feet lower, by two divergent cañons, Cushmanbury and Blackhawk. The "cactus" at Cactus Flat is a species of tree yucca (looking to me quite different from the *Yucca arborescens* of the desert proper, lower down) which grows in clumps and solitary trees of large size. This is seen conspicuously from the road above, as soon as one gets within sight of the flat. The flat itself is much hotter than the surrounding mountain sides, with the result that we find almost an island of desert life (Lower Sonoran) surrounded by Upper Sonoran. The only conifers are the piñon and juniper which grow abundantly on the slopes. In a few shaded cañons good-sized golden oaks flourish. The sage (*Artemisia tridentata*) and scrub oak are conspicuous elements of the flora; and several desert species of plants are found in close company with species of the Pacific division of their zones. A small ranch, where lives Captain James C. Johnston, for many years a resident of Santa Catalina island, occupies a small tract on the west side of the flat. The only

water at the time of our visit in August had been developed in a ditch cut into a ravine back of the ranch. We found characteristic mammals of the vicinity to be: Mojave wood rat, Merriam chipmunk, Merriam kangaroo rat, antelope chipmunk, ground squirrel, and Bangs pocket mouse. Birds presumed to have bred in the neighborhood were: rock wren, pallid wren-tit, Brewer sparrow, black-throated sparrow, California sage sparrow, Texas nighthawk, California jay, roadrunner, California bushtit, western gnatcatcher, linnet, black-chinned sparrow, poor-will, and Nuttall woodpecker—a peculiar association of Upper and Lower Sonoran species. Besides these, at the time of our visit, there were a host of transient birds.

CUSHENBURY SPRINGS.

Cushenbury springs is at the north base of the San Bernardino mountains and on the southern edge of the Mojave desert. It is located at about 4000 feet altitude, on the upper slope of an alluvial fan which spreads out from the mouth of Cushenbury cañon. There are barren foothills on either side, while down to the north some two miles lies a broad desert plain with dry yellow lake beds hemmed in by rocky ranges beyond. Cushenbury springs is in the Lower Sonoran zone, the surrounding desert being sparsely covered by tree yuccas, three species of cactus, extensive areas of the creosote bush, occasional clumps of mesquite, and various spiny shrubs belonging to the Mojave desert flora. The seepage area at the springs proper is rather extensive, there being several acres of meadow, with considerable willow thicket, and a fine large clump of Fremont cottonwoods. A Mr. McFee, who owns several mining prospects in the adjacent foothills, lives there, and treated us very hospitably. He cultivates an acre or more of ground, which produces abundantly, and the small peach orchard looks thrifty. By all odds the most abundant bird of the surrounding desert was the desert black-throated sparrow. Other characteristic species were: Texas nighthawk, Costa hummingbird, rock wren, mourning dove, mockingbird, cactus wren, California shrike, and Scott oriole. Besides these, a great number of transients, and visitors from the nearby Upper Sonoran

mountain slopes, were noted at this watering place. Among mammals we noted the desert jackrabbit, Arizona cottontail, antelope chipmunk, Merriam kangaroo rat, desert wood rat, Arizona grasshopper mouse, Stephens white-footed mouse, long-tailed pocket mouse, and western bat. The rough-scaled lizard, fence lizard, and pallid rattlesnake were conspicuous reptiles.

GENERAL CONSIDERATIONS.

BIRD POPULATION AND ITS MODIFYING INFLUENCES.

In the coastal lowlands of southern California a condition manifests itself which has been commented upon several times, but which as far as I am aware has not been explained. I refer to the almost universal exodus in July of many of the birds of the "summer-visitant" category, which have bred and raised broods during April, May, and June. Such birds as the Bullock oriole, lazuli bunting, Parkman wren, California yellow warbler, black-headed grosbeak, and many others to a more or less extent, become scarce, or disappear altogether, towards the end of July. Even such "resident" species as the California bushtit, California jay, black phoebe, Anna hummingbird, and others, are reduced in numbers, although they appear again in early winter. The reason for this early summer exodus seems plain: The months from July to October constitute the winter season at the lower altitudes in southern California as far as food supply is concerned. Everything becomes excessively dry; among plants most annuals have died, and the perennials have ceased active growth; insects become relatively rare, except along watercourses. The May bird population, which is abundant, cannot continue to be supported after this "winter" season sets in, and the result is, they must move elsewhere.

This condition is without a parallel in eastern North America; at least I have been unable to find recorded mention of it, if it exists.

But where do our birds go? My three summer's work in the San Bernardino mountains determined this to my own satisfaction. My field note-book, under date of August 2, 1906, contains

the following entry: "Many species which bred far below us are now moving up the mountains. Families of black-headed grosbeaks, bush-tits, western gnatcatchers, scores of Parkman wrens, and even a good many linnets, are moving up along the Santa Ana where, a month ago, none of these species were to be seen. The western and Traill flycatchers have invaded the domain of the gray flycatcher; and California yellow, lutescent, golden pileolated and black-throated gray warblers are passing in regular migratory fashion, though not necessarily as yet going beyond the confines of the mountains. The great majority of these are birds-of-the-year, many in full first-winter plumage, but some in the midst of moult, or even still in complete juvenal plumage. Black phoebes, all closely enough scrutinized being juvenals, have become excessively common along the streams, the first having been seen July 5.

"All this influx of population appears to be mainly due to the conspicuous abundance now of both vegetable and insect food, particularly the latter. Geometrid larvæ are abundant on the foliage of willows and oaks; even the various conifers harbor myriads of larvæ; and the air teems with gnats, flies, and beetles. Normally seed-eating birds are taking advantage of this supply, and such species as the western chipping sparrow and lazuli bunting are seen carrying larvæ to their full-grown but teasing offspring.

"A special feature of the past three weeks or more has been the influx of numerous hummingbirds (black-chinned, Anna, rufous, and Allen). Those taken have their gullets crammed with gnats and small spiders, and are many of them inconveniently fat to make into good skins. A significant thing has been the bursting into bloom of vast quantities of scarlet pentstemons (*P. labrosus* and *P. bridgesii*) at just about the time of the arrival of the hummers. Was this merely coincidence, or is it a case of chronological co-adaptation? The structure of these pentstemons seems to show a clear condition of ornithophily, and I have never seen these flowers visited by any sort of insect. The red-plumaged rufous and Allen hummingbirds, of rapid and erratic flight, harmonize to a surprising degree with the shimmering patches of scarlet pentstemons."

All this invasion of the higher altitudes occurs when spring and summer are just dawning there, but when the foothills and plains below are becoming dry and barren under the July heat, no longer productive of the food-supply which they were in a condition to offer earlier in the season. I believe these relative conditions prevail throughout southern California. Without the mountains to accommodate the excess of bird population, which could not be supported in late summer on the withered lowlands, we would have far fewer birds in the spring. The "resident" species return to the lowlands when the cold begins to reduce the food supply in the mountains; and, what is also noteworthy, so do the "summer visitants," which thus become transients for a few days in the fall as they pass back through the lowlands on their way south, or rather, southeastward. These latter, therefore, undertake three distinct migratory journeys during the year: from their winter habitat northwestward to their spring breeding-place, from the latter up, and often northwards, to their summer feeding-grounds, and from there back down and then southeastward to their winter habitat.

And this brings up for consideration another phase of the subject of bird population and its modifying influences. Considering only the breeding birds of the region, it would be interesting to know how many individuals there are in early June, before the population begins to augment any. It is, of course, impossible to get at an exact census enumeration. But I made estimates in different parts of the region, which will furnish an average from which an approximate idea can be obtained. The region under consideration is about 16 by 24 miles in extent, which would make its area 384 square miles. In some parts of this area, as around mountain meadows and along streams, I judged that there were twenty birds of all kinds to the acre; while over larger tracts on the mountain sides and desert slopes there may have been but one bird or even less to the acre. As a very conservative average let us say that there was one pair of breeding birds to the acre all over the 384 square miles. That would be 491,520 birds in the region at the time of least bird population (that is, just previous to the appearance of young-of-the-year).

The following are some Transition and Boreal species, with

very rough estimates of their numbers in the region under consideration: golden eagle, 8; Williamson sapsucker, 180; Pacific nighthawk, 360; calliope hummingbird, 360; gray flycatcher, 3760; Clarke nutcracker, 250; Cassin purple finch, 6000; Sierra junco, 10,000; Stephens fox sparrow, 680; Cassin vireo, 4480; Audubon warbler, 10,000; American dipper, 24; Sierra creeper, 840; mountain chickadee, 8000; ashy kinglet, 50; Townsend solitaire, 360; Sierra hermit thrush, 360; western robin, 650; western bluebird, 4000.

Some birds, such as nuthatches and chickadees, raise broods of six young; others, like gray flycatchers, warblers, fox sparrows, and juncos, raise four young; still others, such as wood pewees, only three; and others like hummingbirds and nighthawks, only two. Taking all this into consideration, and also the accidents and fatalities on the one hand, and the probability of there being two broods in a season with juncos and some other species on the other, I believe a very conservative estimate would place the full-grown young-of-the-year appearing up to the end of the breeding season, at an equal number to the adults. In other words, the population will have at least doubled by the middle of July, when there will therefore be nearly one million birds in the region. Now, if we take into consideration the vast hordes of July invaders from elsewhere, spoken of above, I should consider the population to have then consisted at the very minimum of two million individual birds. And yet there appeared to be a bountiful food supply at all times during the summer, enough to support easily a still larger population. Now what becomes of this population?

It is almost needless to recall that the aggregate population probably remains constant from year to year. For some species may be increasing, some decreasing, while others remain in a stationary status; and then, of course, the entire population may dwindle below the average during unfavorable years (dry years or when forest fires ravage the region), or it may swell during series of propitious years. But we can take the average from all this as a maintained constant population. In the area under consideration, take the above estimate as 491,520 breeding birds at the time of least population, or in round numbers half a mil-

lion. Then, as above shown, at least half a million birds must succumb to various causes before the next breeding season. For if the population remains constant the death rate must equal the birth rate.

The factor that undoubtedly determines the maximum number of birds that can exist seems to me to be food supply. The young are produced at the beginning of the season of plenty, which, as pointed out above, consists of the months of July, August, and September. After this, the cold season rapidly comes on and the food supply suddenly diminishes to a minimum, probably reached at the time of the first snows, say in November. As a result the vast bulk of the bird population, all except the few permanently resident species, emigrate to lower zones for the winter. The numbers of birds, all categories, which can exist throughout the year anywhere must be determined by the amount and availability of food supply at the season of extremest shortage. With permanently resident species, then, such as woodpeckers, nutcrackers, nuthatches, etc., the number we find in June is practically an index of the maximum food-supplying power of the region during the season from November to March. In the case of breeders which have come to the region only for the summer, their numbers must have been determined by the sustaining power of their winter habitat, wherever that may be.

The intricate system of summer and winter habitats of migratory birds I believe to have resulted from a gradual process of elimination of those individuals finding themselves in a region of relative food scarcity, and a preservation and perpetuation of those individuals finding themselves in regions of best food conditions. Competitive struggle between species has led to the adoption of remote and otherwise unexplainable habitats, temporary or constant. It has also led to the development of various and perfected means of food-getting. The geometric ratio of reproduction makes the population of a species an elastic quantity, expanding into any favorable food area presenting itself. And the masses of different species press against one another, like soap-bubbles, crowding and jostling, as one species acquires, through modification of food-getting powers and perfected adaptability to other conditions, some advantage over another.

The vast mortality in even the more slowly reproducing birds is a result of the equally large birth rate which is essential to provide the host of individuals factoring in this process. The phenomena of migration and limited habitats are results, as well as the evolution of new species through geographic variation because of isolation.

To discuss an instance: The Audubon warbler is a common breeding bird of the Transition and Boreal zones of the San Bernardino mountains and other ranges of southern California. It winters in the Upper and Lower Sonoran zones of the nearby lowlands. Now, as far as I could see, during the summer months in the San Bernardino mountains, twice or thrice the Audubon warbler population could have gained a thrifty living. The birds became at least doubly numerous from the last of July on, when the families of young came into prominence. When and where does the pinch come which reduces this great augmentation back to normal spring limits?

I have on many occasions from year to year, at Pasadena in December and January, noted a great mortality among Audubon warblers, here, of course, in their winter habitat. This mortality occurs in dry cold weather, the dead birds being found in the morning on sidewalks beneath trees, or along hedges where presumably the birds had gone to roost for the night. The general impression among people is that these birds have been chilled to death in the night from exposure to the frost. But nothing has impressed itself more forcibly on my mind than the conclusion that well-fed birds do not die from exposure to cold. I have examined a great many of the dead Audubon warblers, and invariably found them emaciated, with not a trace of fat. This means that they had succumbed from ill-nourishment because of the scarcity of the food to which they are adapted. The cold may have been the final factor ending the struggle of their impoverished systems for sustenance. It is a common thing in the late autumn to see these warblers pecking away at withered and even hard-dried apples still clinging to the trees, or feeding on persimmons or belated figs. I have even found weed seeds in the stomachs of Audubon warblers. All of this shows that as their normal insect supply wanes past sufficiency, the same

ground being gleaned over again and again, the birds resort to any other possible food source.

A means of tiding over the season of greatest stress (in other words, of raising the number of birds which can survive) is the storing up of energy during the preceding season of plenty. The majority of Audubon warblers in October and November, when they first appear around Pasadena, are excessively fat, and those taken at Bluff lake the first of September were already very fat.

If the winter mortality of warblers were as great over other similarly wooded areas as it has been at times in my own doorway in Pasadena, I have figured that in one season there were 1280 deaths within the limits of this city alone. Most of these dead birds are promptly picked up by cats, so that they are not noticeable for long.

We begin to see, then, what becomes of the bulk of the yearly increase. Of course there are other factors, such as enemies among both birds and mammals; but these I deem of small account (except locally) as a fundamental cause of death; for I thoroughly believe that it is the slowest, least alert bird in sight that is caught by the cat or hawk. And this bird is the one whose vitality is at a low ebb, and this is not liable to be a well-fed bird. There must be much variation in the individual ability of birds to secure an adequate living when food is scarce. And, by the process of natural elimination, it must be that species are becoming more and more intensely developed in their food-getting ability, along the line of greatest advantage.

SOME PLANTS OF THE REGION.

The observer of animals must familiarize himself to some extent with the flora of the region in which he works. For the distribution and habits of practically all vertebrates, as well as of the lower animals, are so dependent on certain plants which are part of their environment that to pay attention to the animals alone really means a very incomplete understanding of them. Neither should the botanist ignore the fauna of a region.

The list of plants here presented includes only a very small

part of the whole flora of the region. The species listed were those which came to my attention either because they were food-plants of certain birds or mammals, or because their distribution seemed to coincide with that of certain animals. It is to the plants that one must turn for the surest indexes of the zonal position of a locality. Though familiar with the appearance of the plants in the field, I know nothing of systematic botany, and must here acknowledge complete dependence upon the information as to names, given me by specialists in that department.

During each of the three seasons I took in specimens of such plants as interested me, and in all some 600 sheets were obtained. Duplicate sets were given to the authorities who named the species. I am indebted for the determination of species to Miss Alice Eastwood, of the California Academy of Sciences, to Dr. Harvey M. Hall of the University of California, to whom I am also grateful for reading the manuscript of this portion of my report, and to Dr. J. N. Rose, of the United States National Museum.

***Juniperus occidentalis* Hooker.**

The western juniper was a common tree in the more arid parts of the region. It occurred sparingly on the upper Santa Ana, and more abundantly around Sugarloaf and the high ridge to the eastward as high as 9500 feet altitude, where very large examples were seen. In Bear valley it was conspicuous, because often isolated on the sage flats. Around Doble and Gold mountain and down the desert slope past Cactus Flat, 6000 feet altitude, it was common. I should consider it a native of arid Upper Sonoran and Transition. (See pl. 4A.)

***Abies concolor* (Gordon) Parry.**

The white or silver fir was what may be called a typical Upper Transition tree. It was abundant along the north side of the San Gorgonio-San Bernardino ridge up to 9000 feet altitude on south-facing slopes, and down as low as 5500 feet altitude along the upper Santa Ana on shaded north slopes. It was an important component of the woods around Bluff lake and all along the

north-facing slope to the south of Bear valley. I saw a few in some ravines on the north side of Bear valley, and on the south side of Holcomb valley. All around Sugarloaf, especially on the north slope from 8000 to 9000 feet altitude, it was abundant. On the north side of Gold mountain near the top I saw a number of fir trees, a few of which were loaded at their summits with green cones, August 26, 1905. In no other place and in no other year did I see this tree fruiting. The largest fir we saw was at Bluff lake; it measured 23 feet in circumference 4 feet above the ground, and 167 feet in height. (See pls. 4B, 10, 11A, 11B.)

***Libocedrus decurrens* Torrey.**

The incense cedar was a conspicuous conifer along cañons and streams on the Pacific side of the mountains from 5000 to 7000 feet altitude. Along upper Mountain Home creek, and along the Santa Ana from Seven Oaks nearly to Big Meadows, and in lower Fish creek, Lost creek, and South Fork cañons it was common. Around Bluff lake and on either side of Bear lake it was less numerous, and I did not note it at all farther toward the desert. This is a Lower Transition species. (See pl. 11A.)

***Pseudotsuga macrocarpa* (Torrey) Mayr.**

The big-cone spruce was found only on the Pacific side of the mountains growing on shaded slopes in the Upper Sonoran zone and up into the lower part of the Transition, 2000 to 5700 feet altitude. In all the lower cañons it was common, the highest being seen in lower Bear creek cañon, along the upper Santa Ana nearly as far as Seven Oaks, and along the north base of San Bernardino peak well up Foresee creek, as high at least as 5700 feet.

***Pinus Coulteri* Don.**

The Coulter or big-cone pine was seen along lower Mill creek, and on dry slopes, often in the chaparral belt (Upper Sonoran), in the vicinity of Clarke's ranch and Seven Oaks. A few were noted as high as 5600 feet altitude in the Lower Transition zone near our Cedar Cabin camp on the upper Santa Ana.

***Pinus ponderosa* Douglas.**

The yellow pine was one of the commonest and most widespread trees of the region, on both the Pacific and desert slopes, marking well the Transition zone. I saw it as high as 9000 feet altitude on south-facing slopes such as the south face of Sugarloaf, and near Dry lake, and on north slopes down as low as 5000 feet. An example on the South Fork of the Santa Ana, near its mouth, was 218 feet in height (average of three tests). The tallest trees elsewhere measured were 175 feet in height or less. (See pls. 3B, 17, 18.)

***Pinus Jeffreyi* Murray.**

The Jeffrey or black pine occurred often with the last and seemed to hybridize with it freely; at least intermediate examples were often noted. Tracts composed exclusively of the form *Jeffreyi* were common along the upper Santa Ana, marking the Transition zone. Trees which bore cones heavily in 1906 were entirely barren in 1907. (See pl. 12.)

***Pinus Lambertiana* Douglas.**

Sugar pines always occurred intermixed with other conifers, and in the Transition zone in its upper portion. It was numerous along the north base of San Bernardino peak, 6000 to 7800 feet altitude, along the south side of the Santa Ana in many places, in the neighborhood of Bluff lake and between there and Bear lake, and more sparingly on the north slope of Sugarloaf up to 8000 feet.

***Pinus monophylla* Torrey & Fremont.**

The piñon I should call a strictly arid Upper Sonoran species. It occupied a broad belt on the desert slope of the mountains, from 5000 feet altitude up over the ridges on that side to as high as 8000 feet, especially to the eastward of Sugarloaf. A tract extended down the north (south-facing) slope of the upper Santa Ana across the south face of Sugarloaf, at least down to 5700 feet altitude. And I saw quite a number of piñons as low down on the Pacific side as 4600 feet in the brush belt on the sides of the Santa Ana, two or three miles below Seven Oaks. (See pl. 23.)

***Pinus Murrayana* Balfour.**

The tamarack or lodge-pole pine marked the lower division of the Boreal zone, and woods consisting of that species alone covered a large part of the highest ridges from San Bernardino peak to the neighborhood of San Gorgonio peak. From an altitude of 8500 feet to 10,000 feet on north slopes and from 9500 to 11,000 feet on south slopes, it was the prevailing tree. On the north face of Sugarloaf from 9000 feet to the summit, 9800 feet, was an extensive tract, and scattering individuals occurred in company with firs and yellow pines around Bluff lake, 7500 feet. A queer misplacement of the species, apparently out of its zone, was the occurrence of small groves on both the north and south shores of Bear lake, 6700 feet altitude. (See pls. 3A, 4B, 7.)

***Pinus flexilis* James.**

The limber pine marked a higher division of the Boreal zone than the tamarack pine, and in dwarfed or prostrate form extended to the summits of the highest peaks. On north slopes I saw large well-formed trees down among the tamaracks as low as 9200 feet (near Dry lake). Towards the upper part of San Gorgonio peak and adjacent ridges the limber pine occurred exclusively, and became gnarled and dwarfed in the extreme. Several examples grow near the monument on the very summit, 11,485 feet altitude. I saw many limber pines along the ridge from San Bernardino peak eastward, and on the crest of Sugarloaf, but not elsewhere. (See pls. 3A, 8A, 8B.)

***Ephedra viridis* Coville.**

The desert tea was an abundant shrub on the desert slope of the mountains, as high as a little above Cactus flat, 6000 feet altitude; also down on the desert around Cushenbury springs.

***Lilium Parryi* Watson.**

This handsome lily is abundant in the shaded cañons above the 5500-foot contour south of the Santa Ana. We found it in bloom the last of July in Fish creek, Lost creek, and South Fork cañons. In the latter it was noted up to 8000 feet altitude.

Lilium Humboldtii Roezl & Leichtlin.

The tiger lily was blooming in profusion in the upper portion of Mountain Home cañon, July 22, 1907.

Calochortus invenustus Greene.

The mariposa lily was blooming abundantly in Junç along the upper Santa Ana. It occupied open spaces among the pines in the Transition zone, 6000 to 7500 feet altitude.

Veratrum californicum Durand.

The false hellebore was an abundant and conspicuous plant growing in rank clumps two to five feet tall in the cienagas around Bluff lake at the head of the South fork of the Santa Ana, and Fish creek, 7400 to 8500 feet altitude. (See pl. 14.)

Yucca brevifolia Engelmann.

The tree yucca was abundant, though not so large as I have seen it farther east near Hesperia, all along the desert base of the mountains. It extended up onto the ridges and along the cañons to as high as Cactus Flat, 6000 feet altitude, a hot pocket in which the yuccas were large and conspicuous over at least fifty acres. (Two other species of yuccas were noted on the desert slope.)

Populus Fremontii Watson.

This Lower Sonoran species of cottonwood formed beautiful bright green groves wherever there were springs at the desert base of the mountains, 3600 to 4300 feet altitude. Cushenbury springs is refreshingly shaded by this tree. I saw several examples below the mouth of Mill creek at the Pacific base of the mountains, but I am quite sure that they had been purposely planted, as they have been about the town of San Bernardino.

Populus trichocarpa Torrey & Gray.

The black cottonwood was an abundant tree along the cañons of the Pacific slope of the mountains from the foothills up to 6700 feet altitude on the upper Santa Ana. In the vicinity of Seven Oaks, 5000 feet, groves of large cottonwoods are an attractive feature of the river bottom.

Populus species (?).

In Fish creek cañon, from 7200 to 8000 feet altitude, there are many cottonwoods which looked to me decidedly different from *P. trichocarpa* of lower altitudes. The leaves were very much larger and fewer in number, and there was a far greater amount of balsam in the winter buds, so that the unfolding leaves were extremely sticky with it. The air in the vicinity was strongly charged with the characteristic odor, far more so than with *trichocarpa*. The trunk was larger in proportion to the height of the tree, smooth barked, and mostly green. I am advised by botanists that this is probably but a "variety" of *trichocarpa*. If it were a bird or mammal we should call it a subspecies, due, as the characters of the cottonwood evidently show, to difference in temperature, rate of evaporation, etc. I saw similar trees at 8000 feet altitude on the upper South Fork, and at 7600 feet east of Bluff lake.

Populus angustifolia James.

Small groves of the narrow-leaved cottonwood occurred along the valley bottom of the upper Santa Ana, from 6100 feet (one-half mile or so below the mouth of the South Fork), up nearly to Big Meadows, 6600 feet altitude. They were mostly small-sized trees, the largest measured being thirty-five feet in height. I regret very much to say that although I tried each of the three summers, I failed altogether in finding any signs of fruiting.

Populus tremuloides Michaux.

Several groves of the slender aspens of striking appearance grew on the west side of the upper Fish creek cañon, north of San Gorgonio peak, at altitudes of 7000 to 7600 feet. This was the only point in the whole region where I saw the species; nor have I ever seen aspens anywhere else in the mountains of southern California. (See pl. 13A.)

Salix lasiolepis Bentham.

The arroyo willow was an abundant species along all streams from the southern foothills to the head of the Santa Ana, 6800 feet altitude.

Salix Bigelovii Torrey.

This was a conspicuous and easily recognized species, by its peculiar growth in circumscribed clumps, with bare grayish trunks and leafy crowns. The leaves were grayish green and obovate. This willow appears to be wholly confined to the upper half of the Transition zone, and occurred south of the Santa Ana from 6500 feet (sparingly) up to 9000 feet. It grew in pockets on the mountain side, and at the edges of the cienagas. The above determination was made by Dr. J. N. Rose. (See pl. 14.)

Salix lasiandra Benth.

This willow grew to large trees, a grove of which grew on the upper Santa Ana a mile below the mouth of the South Fork, 6000 feet altitude. I saw black willows elsewhere along the upper Santa Ana, and on Fish creek at about 6900 feet. (Besides the three willows here listed I saw others, but their names are in doubt.)

Alnus rhombifolia Nuttall.

Alders grew luxuriantly along the water-courses of the Pacific slope of the mountains. Either side of the upper Santa Ana was lined with alders, meeting overhead to form a dense and almost continuous canopy. In deep cañons, such as Mountain Home creek, sheltered from the wind, these trees became exceedingly tall and straight. In broad open valleys they were more scrubby. Alders extended up Fish creek, Lost creek, and South Fork cañons to about 7500 feet altitude, where they became smaller, and within a short distance disappeared. (See pl. 22.)

Castanopsis sempervirens (Kellogg) Dudley.

The chinquapin was an important brush plant occupying a belt overlapping the Transition and Boreal zones, only the upper margin of the former and the lower division of the latter. South of the Santa Ana all along the lofty San Bernardino ridge, it formed dense but low thickets from 8500 to 10,000 feet altitude. At the latter elevation it was prostrate and more scanty. On the north side of Sugarloaf above 8500 feet it was abundant, as it also was in the vicinity of Bluff lake and eastward. In the

latter neighborhood, on the north-facing slope down toward Bear valley, the chinquapin grew as low as 7000 feet altitude. (See pl. 12.)

***Quercus chrysolepis* Liebman.**

The golden oak was a conspicuous component of the flora of the upper part of the Upper Sonoran zone, and in places extended up into the Transition mingling with the black oaks and conifers. Along all the cañons of the Pacific slope it was abundant, scrubby in exposed places, and becoming a large tree in sheltered cañons. It was almost as numerous, though looking somewhat different (smaller leaves, etc.), in the piñon belt on the desert side of the mountains. In shaded cañons on the north side of Gold mountain and near Cactus Flat I saw large trees like those on the Pacific side of the mountains.

***Quercus dumosa* Nuttall.**

The scrub oak was an abundant species characterizing the Upper Sonoran zone, on both the Pacific and desert slopes, though less conspicuous on the latter. It ran up on south-facing slopes north and east of Seven Oaks to at least 6500 feet altitude. It was seldom that I noted this species in close proximity to any pines excepting piñons. (Other less common forms of oaks were seen and may have represented distinct species.)

***Quercus californica* (Torrey) Cooper.**

The California black oak was a characteristic Transition zone species in the least arid parts of the region. If such a term be considered in a general sense I should say it thrived best at about middle Transition; at least it did not extend as high as the lower margin of the chinquapin belt. Black oaks were abundant intermingling with the pines over the gently sloping mesa bounded on the north by the upper Santa Ana and on the south by the abrupt high San Bernardino ridge. This belt extended from the head of Mountain Home creek to beyond Fish creek, and from an altitude of as low as 5000 feet on north slopes up to 7500 feet. There was a similar belt along the ridge south of Bear valley from the vicinity of Bluff lake to the north base of Sugarloaf. And I saw a few black oaks in some ravines on the north side of Bear lake, and on the north side of Gold mountain.

***Urtica holosericea* Nuttall.**

Nettles were abundant along streams wherever shaded by the alder canopy. They grew to be five or six feet tall, reaching that height by the middle of August, making it extremely disagreeable for the trout-fisherman. I saw nettles in Fish, Lost, and South Fork cañons to 7500 feet altitude.

***Eriogonum fasciculatum* Benth.**

The wild buckwheat was abundant on hot dry slopes on the Pacific side of the mountains in the Lower and Upper Sonoran zones, not reaching quite the upper limits of the latter zone. The highest that I saw it was on the north side of the upper Santa Ana, at about 6000 feet. (See pl. 6.)

***Grayia spinosa* (Hooker) Moquin.**

An abundant shrub on the desert around Cushenbury springs.

***Polygonum bistortoides* Pursh.**

Abundant in small cienagas, around Bluff lake, 7500 feet, where specimens were taken, July 26, 1905.

***Polygonum amphibium* Linnaeus.**

Growing abundantly in the marshy east end of Bear lake, where large patches were in bloom the first of August, 1905. These pink areas were so bright as to be readily discerned from the summit of Sugarloaf, ten miles away.

***Spraguea umbellata* Torrey.**

Bare open ground, Dry lake, 9000 feet; summit of San Bernardino peak, 10,600 feet; blooming in June and July.

***Aquilegia truncata* Fischer & Meyer.**

The columbine was a conspicuous flower throughout the summer along all shaded streams of the Pacific slope above 5000 feet altitude, and up to 8000 feet on the upper South Fork.

***Clematis ligusticifolia* Nuttall.**

Clematis came into profuse bloom along the upper Santa Ana as high as 6500 feet altitude, by August first. It clambered over willows and alders.

***Delphinium gracilentum* Greene.**

A blue larkspur was abundant in the Upper Sonoran and Lower Transition zones along the upper Santa Ana on dryish slopes, blooming in June.

***Ranunculus oxynotus* Gray.**

This beautiful buttercup was collected at the edge of a snow-bank on a rock slide on the north face of San Gorgonio peak, 10,500 feet, July 16, 1906.

***Umbellularia californica* (Hooker & Arnott) Nuttall.**

The bay tree was observed only in Mountain Home cañon at the upper edge of the Upper Sonoran zone. It was not abundant.

***Argemone platyceras hispida* (Gray) Link & Otto.**

This prickly poppy was met with only along the upper Santa Ana on dry open gravel beds, 5000 to 5600 feet altitude, nearly to Big Meadows.

***Draba corrugata* Watson.**

Common in the Upper Transition and Boreal zones; summit San Bernardino peak, summit San Gorgonio peak, Dry lake, Fish creek, etc., 7000 to 11,480 feet altitude.

***Erysimum asperum* De Candolle.**

One of the most abundant and conspicuous flowers throughout the pine woods of the Transition zone, blooming in June and early July. Seen as high as Dry lake, 9000 feet; also down into Upper Sonoran.

***Ribes cereum* Douglas**

Abundant in the upper Transition zone on mountain sides; specimens taken at Dry lake, 9000 feet, and on Sugarloaf, 9500 feet.

***Ribes ascendens jasperae* Eastwood.**

Abundant along Fish creek, Lost creek, and South Fork, 6500 to 7000 feet altitude; blooming from the middle to the last of June.

***Platanus racemosa* Nuttall.**

The sycamore seems to be most thrifty in the Lower Sonoran and lower portion of the Upper Sonoran zones. It was common in the washes at the mouth of Mill creek and the Santa Ana river cañons, and extended up these courses in the open places in dwindling size to 3000 feet altitude.

***Purshia glandulosa* Curran.**

A common shrub in the piñon brush belt around Doble and south to the north base of Sugarloaf up to 7500 feet altitude in the sage tract. Noted only on the desert slope of the mountains.

***Adenostoma fasciculatum* Hooker & Arnott.**

The chamisal was abundant on the foothills of the Pacific side, extending to as high as 6000 feet altitude on south-facing slopes above Clarke's ranch, Seven Oaks, and to the east of the latter point some four miles.

***Amelanchier alnifolia* Nuttall.**

The service-berry was abundant at the upper margin of the Upper Sonoran zone, and extended a ways into the Transition. It is most characteristic of the desert slope of the mountains, such as the north base of Sugarloaf and around Gold mountain where its abundant fruits were ripening after the 10th of August. I also saw it on the upper Santa Ana down the Pacific slope as low as 5600 feet altitude.

***Cercocarpus betulaeifolius* Hooker.**

Abundant in the Upper Sonoran brush belt on the Pacific slope of the mountains. It was a conspicuous element in the chaparral on the north wall of the upper Santa Ana, as high as 6000 feet altitude. (See pl. 6.)

***Cercocarpus ledifolius* Nuttall.**

The mountain mahogany was a striking and conspicuous feature of a certain area on the desert side of the mountains. It seemed to occupy a belt of high Upper Sonoran and Lower Transition and occurred intermingled with either piñons or

yellow pines. The high ridges east of Sugarloaf, from 7500 to 9000 feet altitude, were in places covered almost purely with mountain mahogany, some examples being very large. The same plant was abundant around Gold mountain, and the eastern end of Holcomb valley. I saw small groups and solitary trees along the upper Santa Ana down to 6000 feet altitude, though not so thrifty as those farther towards the desert. As an exception, there was a grove of quite large trees in the lower Fish creek cañon, 6600 feet altitude. (See pl. 13B.)

Fragaria californica Chamisso & Schlechtendal.

Strawberries were plentiful along streams in the Transition zone. Beds of large extent were found in Lost creek cañon, 6600 feet altitude; also along Fish creek and South Fork, where berries were ripening from July 15 into August.

Potentilla Wheeleri Watson.

Taken on the summit of San Gorgonio peak, 11,450 feet, July 16, 1906; named by Miss Eastwood.

Rubus parviflorus Nuttall.

The thimbleberry was an abundant plant in damp and shaded cañons from the head of Mountain Home cañon eastward to the South Fork of the Santa Ana, 5000 to 8000 feet altitude. Fruits were ripe in August.

Rosa californica glabrata Parish.

The wild rose was widely distributed near water up to an altitude of 8000 feet in places. Most conspicuous in dense low thickets along the upper Santa Ana from 6200 to 6700 feet altitude; also around a cienaga at the north base of Sugarloaf, 7500 feet.

Prunus demissa (Nuttall) Walpers.

Extensive thickets of the chokecherry were noted in the upper part of the brush belt between lower Bear creek and Clarke ranch. We found the abundant and agreeable fruit ripening there, September 4, 1905.

Prunus fasciculata (Torrey) Gray.

The desert almond was abundant at Cactus Flat, 6000 feet, and farther down towards the desert base of the mountains. It was taken in fruit August 17, 1905.

Prosopis juliflora (Swartz) De Candolle.

The mesquite occurred in isolated bushes quite commonly on the desert washes about Cushenbury springs; but no extensive thickets were seen.

Amorpha californica Nuttall.

An abundant bush in the black oak belt (Lower Transition) south of the Santa Ana, from the head of Mountain Home creek to Fish creek. I saw less thrifty looking shrubs down into the scrub oak belt. It bloomed in the latter part of July.

Lupinus albifrons Bentham.

Abundant in the Upper Sonoran and lower Transition zones all along the upper Santa Ana, especially among the sage-brush; blooming in June and early July.

Oxytropis oreophila Gray.

A dwarf loco weed taken on the summit of San Gorgonio peak, 11,450 feet, July 16, 1906, is thus determined by Miss Eastwood. It was common on the gravel between the granite blocks.

Linum Lewisii Pursh.

This flax was abundant among the pines of the lower Transition zone in the region of the upper Santa Ana, flowering early in June.

Rhus trilobata Nuttall.

Very abundant in parts of the Upper Sonoran brush belt. Its vermilion-hued fruits were so profuse in August on the north wall of the upper Santa Ana, 5500 feet altitude, as to render the clumps of this plant discernible for at least a mile.

***Acer macrophyllum* Pursh.**

I saw this maple only in the middle portion of Mountain Home creek cañon, where it is not uncommon.

***Acer glabrum* Torrey.**

I saw the Sierra maple as a small tree only on the steep north side of San Bernardino peak in deep dark ravines at about 7000 feet altitude. Identified by Miss Eastwood.

***Ceanothus cordulatus* Kellogg.**

In low dense thickets, mere mats at the higher parts of its range, this buckthorn or buck-brush, was a conspicuous feature of the upper Transition zone, 6500 to 9000 feet, according to slope. Its distribution coincided quite precisely with that of *Arctostaphylos patula*, though it occurred perhaps a trifle lower. Its white inflorescence came into prominence the latter half of June at higher altitudes, earlier lower down. (See pl. 11B.)

***Ceanothus divaricatus* Nuttall.**

This blue-flowered mountain lilac was abundant in the Upper Sonoran brush belt, on south-facing slopes as high as 5700 feet altitude on the north side of the upper Santa Ana. All over the Pacific foothills this plant was in conspicuous bloom the middle of June. The sticky clusters of berries became an unpleasant feature of a tramp through the brush belt in August.

***Ceanothus integerrimus* Hooker & Arnott.**

This white-flowered deer-brush was an abundant member of the Upper Sonoran brush belt flora, especially on shaded or moist slopes. Very conspicuous on the north side of the divide at the head of Mountain Home creek, among the big-cone spruces, where it was in conspicuous blossom the middle to the last of June, 1907. I saw this lilac as high as 6600 feet on a sun-facing steep slope on the south fork of the Santa Ana.

***Ceanothus perplexans* Trelease.**

Common in a tongue of the Upper Sonoran brush belt along the south wall of the upper Santa Ana, is high as 6300 feet altitude.

Covillea tridentata (De Candolle) M. Vail.

The creosote bush was the most abundant plant on the desert around Cushenbury springs, 4000 feet, at the desert base of the mountains.

Sphaeralcea ambigua Gray.

This conspicuous red-flowered mallow was blooming commonly during the middle of August on desert-facing slopes; Cactus Flat and Doble up to 7300 feet altitude.

Viola blanda Willdenow.

This small white violet was scattered profusely over the Boreal cienagas at the head of the South Fork of the Santa Ana, 8000 to 8500 feet. It was in bloom the last of June and early July.

Oenothera Hookeri Torrey & Gray.

This large yellow evening primrose was abundant in pastures around Seven Oaks, and along the upper Santa Ana to 6200 feet altitude.

Oenothera californica Watson.

This large white evening primrose was abundant in July at the head of Mountain Home creek and along the upper Santa Ana in the lower Transition zone.

Cornus occidentalis (Torrey & Gray) Coville.

I saw the dogwood only in Fish creek cañon, where it was in bloom along the main stream and its tributaries, 6600 to 7000 feet altitude, June 15 to 30.

Garrya veatchii Kellogg.

The ironwood was common in the Upper Sonoran brush belt, towards its upper margin, but not encroaching upon the Transition zone. It was conspicuous in the chaparral near Seven Oaks and along the north wall of the upper Santa Ana to an elevation of 6000 feet. It was also common on the north side of Gold mountain at about 7000 feet.

***Sarcodes sanguinea* Torrey.**

The snow plant was abundant throughout the Transition zone, but neither above or below. It was in bloom in early June and had largely disappeared by the first of July.

***Arctostaphylos patula* Greene.**

This species of manzanita was characteristic of the upper half of the Transition zone. It formed dense rather low thickets from 6500 feet, in cool places, up to 9000 feet altitude, south of the Santa Ana, according to slope. Its range overlapped that of the chinquapin above, and around Bluff lake these two brush plants were intimately associated. I also saw this manzanita on the north and south slopes of Sugarloaf.

***Arctostaphylos manzanita* Parry.**

Abundant on the Pacific slope in the Upper Sonoran zone toward its upper limits and extending in places well into lower Transition. At the head of Mountain Home creek and over the divide toward Seven Oaks, it was blooming profusely June 13, 1907. By August 12 the fruits were full grown. In the vicinity of Seven Oaks, in the scrub oak belt, and up the Santa Ana on the north side to at least 5700 feet, it was conspicuous. (Other manzanitas were noted in the Upper Sonoran zone, but they remain unidentified.)

***Bryanthus Breweri* Gray.**

The mountain heather was found common and blooming on the north side of San Geronio Peak, 9500 to 10,500 feet, July 16; and on San Bernardino peak, 10,600 feet, July 12.

***Dodecatheon alpinum* Greene.**

This shooting star was flowering abundantly on the Boreal meadows at the head of the south fork of the Santa Ana, 7500 to 8500 feet altitude, June 15 to July 15.

***Eriodictyon trichocalyx* Heller.**

This white-flowered yerba santa was abundant in open places along the upper Santa Ana, blooming the latter half of June and

first half of July. It appeared to occupy only the upper half of the Upper Sonoran and the lower part of the Transition.

***Lycium Andersonii Wrightii* Gray.**

A shrub occurring commonly on the desert around Cushenbury springs.

***Monardella lanceolata* Gray.**

This pennyroyal was conspicuous in the region of the upper Santa Ana, coming into flower the second week of July. It was most noticeable along the lower edge of Transition, and extended down through Upper Sonoran.

***Monardella linoides stricta* Parish.**

This lavender-flowered pennyroyal was abundant in the upper Transition zone. I saw it in bloom the middle to the last of August, on the north side of Gold mountain, 7500 feet, the north side of Sugarloaf, 8000 to 8500 feet and south of the upper Santa Ana, 7000 to 8000 feet altitude. Specimens determined by Miss Eastwood.

***Mentha canadensis* Linnæus.**

This peppermint was abundant at the edges of cienagas and along streams, blooming in August and September; taken at Bluff Lake and along the upper Santa Ana, 5000 to 7500 feet altitude.

***Ramona polystachya* (Bentham) Greene.**

The white sage was abundant in the Lower Sonoran and lower part of the Upper Sonoran on the Pacific side of the mountains. I saw some very thrifty looking patches near Seven Oaks, 5000 feet, and further east on the north side of the Santa Ana in hot hillside pockets to 6000 feet altitude. (See pl. 6.)

***Salvia carnosa compacta* Hall.**

Abundant in the Upper Sonoran zone on the desert slope of the mountains, as at Cactus Flat, around Doble, etc. I also saw it among the *Artemisia tridentata* towards the head of the upper Santa Ana down to 5500 feet elevation, but not lower on the Pacific slope.

Nicotiana attenuata Torrey.

The wild tobacco was an abundant door-yard weed at Doble, and along the road down to Cactus Flat. Noted rarely on the upper Santa Ana. It was blooming in August. Identified by Dr. Hall.

Solanum xanti Gray.

This nightshade was abundant in a dwarfed form on the south face of Sugarloaf near the summit, 9500 feet, and about the head of the south fork of the Santa Ana, 7500 to 8500 feet altitude.

Adenostegia rigida Benth.

Extremely abundant everywhere in dryish open places on both desert and Pacific slopes; Cactus Flat, Doble, valley of the upper Santa Ana, Upper Sonoran and lower Transition; blooming in August.

Castilleia montana Congdon.

Abundant at edges of semi-wet meadows and near streams, in June; South Fork, Fish creek, Lost creek, etc., 6200 to 7000 feet.

Castilleia stenantha Gray.

Common in wet meadows near Bluff lake, on the south base of Sugarloaf and along the upper Santa Ana.

Castilleia Martini Abrams.

Abundant in June on dry slopes in the region of the upper Santa Ana, from lower Transition down into Upper Sonoran. Determined by Miss Eastwood.

Mimulus brevipes Benth.

Upper Santa Ana in Upper Sonoran and lower Transition on dryish slopes, blooming the last of June.

Mimulus cardinalis Douglas.

Noted along several cañons on the Pacific slope, the highest being Fish creek, at 6600 feet altitude.

Mimulus nasutus Greene.

Abundant in cienagas at Bluff lake, and on the upper Santa Ana, 6000 to 8000 feet altitude, blooming in July.

Mimulus pilosellus Greene.

Blooming abundantly in small cienagas near Bluff lake. Specimens taken July 26, 1905, determined by Miss Eastwood.

Orthocarpus pilosus Watson.

This species was found only on the summit of Sugarloaf, 9800 feet altitude, where it was collected in bloom, July 11, 1906.

Pedicularis semibarbata Gray.

Common throughout the Transition and lower Boreal zones, blooming in June and early July. Taken near the summit of San Bernardino peak, at Dry lake, on Sugarloaf, and along the upper Santa Ana, 6000 to 10,000 feet altitude.

Pentstemon caesius Gray.

Abundant in the lower Boreal zone, blooming in July; Sugarloaf, 9800 feet; Dry lake, 9000 to 9500 feet; San Bernardino peak, 9000 to 10,000 feet.

Pentstemon Bridgesii Gray.

Fairly common in the region of the upper Santa Ana, where its blossoms appeared the last of July; more common in the arid Transition, as around Gold mountain, where specimens were taken August 26, 1905.

Pentstemon labrosus Hooker.

The scarlet bugler was the most abundant and conspicuous pentstemon in lower Transition and Upper Sonoran zones, where its brilliant flowers appeared about the first of July.

Pentstemon Palmeri Gray.

An abundant lower Transition plant in the region of the upper Santa Ana, blooming June 25 to July 15.

***Pentstemon ternatus* Torrey.**

This climbing pentstemon was abundant in the Upper Sonoran brush belt along the upper Santa Ana, at least to 5700 feet altitude, where it was in conspicuous blossom in August. I found it also sparingly among the pines and black oaks in the lower Transition zone south of the Santa Ana.

***Symphoricarpos Parishii* Rydberg.**

Abundant around Bluff lake, 7500 feet altitude; Dry lake, 9000 feet altitude; and near the summit of Sugarloaf, south slope, 9000 to 9700 feet. Bloomed July 10 to 30. (See pl. 7.)

***Achillea lanulosa* Nuttall.**

The yarrow was abundant on level cañon bottoms and edges of meadows everywhere south of Bear valley.

***Arnica Bernardina* Greene.**

Growing abundantly in cienagas about Bluff lake, where it was taken in full flower July 26, 1905.

***Antennaria speciosa* Nelson.**

This plant was noted only in the region of the upper Santa Ana, where I collected it on the south base of Sugarloaf and in the lower Fish creek and South Fork cañons, 6300 to 7000 feet altitude. Its bright rose-colored flowers were freshly bloomed July first.

***Artemisia dracunculoides* Pursh.**

A tall weed of great abundance along the upper Santa Ana, coming into bloom the first of August.

***Artemisia Ludoviciana* Nuttall.**

An abundant plant in shaded sandy places along the upper Santa Ana and elsewhere. Specimens in full bloom were taken near Bluff lake September 2.

Artemisia tridentata Nuttall.

The true sage-brush was abundant over the upper levels and slopes facing the desert, but not nearly down to the desert itself. It occupied only the lower Transition and Upper Sonoran zones. Large tracts in Bear and Holcomb valleys were occupied by it almost exclusively. It occurred commonly down the upper Santa Ana, especially along the north wall, to as low as Seven Oaks, 5100 feet altitude. (See pls. 3B, 24, 16B.)

Chrysothamnus tortifolius (Gray) Greene.

This shrub was common in sandy washes in the Transition zone both on the desert and Pacific slopes, blooming in August. It was collected in Bear valley and on the upper Santa Ana.

Chrysothamnus nauseosus graveolens (Nuttall) Piper.

The rabbit brush was abundant in sandy washes both on the desert and Pacific slopes. Along the upper Santa Ana it was abundant, as also from Bear lake eastward, mingling with the sage. Named by Dr. Hall.

Tetradymia canescens De Candolle.

Noted commonly in the sage belt, Upper Sonoran and lower Transition, mostly on the desert slopes. It was taken at Big Meadows, head of the Santa Ana, and at Doble; bloomed the last of July.

Carduus Bernardinus Greene.

This tall thistle was abundant in the lower Transition zone, 5000 to 7000 feet altitude, in the region of the upper Santa Ana.

Carduus Drummondii acaulescens (Gray) Coville.

The stalkless thistle was common in the region of the upper Santa Ana (Transition zone), growing in grassy, but not very wet, swales. Noted from 6000 to 7000 feet altitude.

Erigeron compositus discoideus Gray.

Collected on gravel among rocks on the summit of San Geronio peak, 11,450 feet, July 16, 1906. Determined by Dr. Hall.

Erigeron divergens Torrey & Gray.

An extremely abundant flower in the lower Transition woods in June. Taken at Bluff lake, and in the region of the upper Santa Ana.

Helenium Bigelovii Gray.

The Bigelow sneezewood was common in the cienagas about Bluff lake, and on the south base of Sugarloaf.

Hulsea vestita pygmaea Gray.

Taken on the summit of San Gorgonio peak, 11,450 feet, July 16, 1906. Determined by Dr. Hall.

Solidago californica Nuttall.

The goldenrod was abundant in the Transition zone about Bluff lake and in the region of the upper Santa Ana, 5500 to 8000 feet. Its earliest blossoms were noted August 5 (1906).

THE BIRDS.

The author of this paper was more interested in the birds than in any other class of animals; hence during each of the three summer's work more attention was paid to birds, with the result that the bulk of this report pertains to them. Over 1200 birds' skins (1261, to be exact) were obtained, as well as many nests and eggs, and the bulk of these are now a part of the author's cabinet series. One hundred and thirty-nine species were detected in the region, of which specimens were secured of 121 species. Those not secured were mostly such large species as turkey vulture, golden eagle, western red-tailed hawk, and some of the water birds. It is believed that extremely few birds escaped detection. Yet I failed to find several species which probably occur in the region now, or which have occurred there within recent times, namely: pigmy owl, spotted owl, California condor, band-tailed pigeon, and Lewis woodpecker. I refer, of course, to suspected breeding species. Of the 139 species I found in the region, 48 are believed to be permanently resident, 68 summer visitants, and 23 transients only. It is certain that all-

year observations would add many more transients, besides a large list of winter visitants.

The ornithology of the San Bernardino mountains, in common with that of the other high mountains of southern California, bears closest resemblance to that of the Sierra Nevada of east central California. A tendency toward increase in size of such San Bernardino species as are subject to geographical variation is quite noticeable; so that in certain cases, such as the hermit thrush and creeper, the San Bernardino birds are somewhat intermediate in the direction of the Rocky Mountain races. Other species, like the Stephens fox sparrow and gray flycatcher, show large size, but are without parallels in the Rocky Mountain region. With variable birds in the mountain systems of California, there seems to be a general increase in size from the north towards the south, a reversal of the case on the Atlantic coast.

***Colymbus californicus* (Heermann).** American Eared Grebe.

American eared grebes were met with in only one place, on Bear lake. Here from July 28 to August 3, 1905, adults, and young of various sizes, could be seen or heard on the marshy east end of the lake at almost any hour of the day or night.

One of the most interesting sights on the lake was that of an old grebe swimming about with one and often even two young on her, or his back; for the two parents were equally attentive to their young. The smallest downy young could dive readily for long distances at the approach of danger, and the half grown young were nearly as expert at diving as the adults. These young birds kept up a continual peeping, very similar in sound to that of a young turkey.

Although very young grebes were seen daily swimming about with their parents we did not succeed in finding any nests or eggs until the last time we explored the marsh. We finally rowed into a nest among a thick mass of a water plant at the extreme east end of the lake. This plant (*Polygonum amphibium*) grew in thick mats on the surface of the water, and the patches of pink blossoms harmonized pleasingly with the dark green foliage and blue water. From a distance the lake had the appearance of an old patchwork quilt with pink, green and blue blocks. The nest

was composed of tules and stems of this water plant. These had been accumulated until the top of the floating mass was three or four inches above the surface of the water. In a slight depression there were four considerably incubated eggs. Four nests were located within an area of 100 square feet, but only two of them contained eggs. The eggs were nearly covered by strands of decaying vegetation which the birds had evidently placed there to conceal them. We estimated that there were about 100 pairs of adult grebes on the lake.

Ten adults and ten young were secured and preserved. A young female, $6\frac{1}{2}$ inches long, in full natal plumage (No. 6879, Coll. J. G.) presents the following coloration: Lower surface plain white, becoming dusky along the sides; upper surface sooty, marked with narrow longitudinal whitish lines; there are seven of these down the back, the medial three being most clearly indicated; four rather broader white stripes extend down the back of the neck, and are indicated brokenly over the top of the head; a white line starts back from the middle of the forehead, but divides into two which diverge around the bare pinkish crown spot; there are flecks of dusky along the malar region, but none on the throat; the bill is crossed vertically by two dusky bands, the remainder, including the tip of both mandibles, being horn-color.

The adult with the brightest chestnut on the sides is a male, and one of the females has considerable white in the throat. But I am unable to see any constant sex difference in the plumage of either adults or young.

***Sterna forsteri* Nuttall. Forster Tern.**

Forster terns were seen daily from July 28 to August 2, 1905, flying back and forth over the marshy east end of Bear lake. Four adults were secured, but we obtained no evidence that the species was breeding; yet this was altogether possible.

***Hydrochelidon surinamensis* (Gmelin). Black Tern.**

A single individual of this species was seen several times over the east end of Bear lake, July 30, 1905. It was usually flying in the wake of a company of Forster terns, as they coursed up

and down the marsh on foraging expeditions. A tern likes company, even if of another species.

Anas platyrhynchos Linnaeus. Mallard.

A pair of mallards were seen June 12, 1905, in Bear creek near its confluence with the Santa Ana. These were the only ones positively identified, the male being secured. We saw what we felt confident were mallards on Bear lake.

Nettion carolinensis (Gmelin). Green-winged Teal.

A small flock was flushed from a mud hole at Cushenbury springs, August 12, 1905, and a specimen was secured. Several flocks of ducks were seen migrating eastwardly over this place on about the same date.

Querquedula cyanoptera (Vieillot). Cinnamon Teal.

Cinnamon teal were seen on the marshy east end of Bear lake, where an adult male was secured, July 30, 1905, and a brood of small young seen.

Erismatura jamaicensis (Gmelin). Ruddy Duck.

Several male ruddy ducks were seen on Bear lake, their conspicuous markings making them readily distinguishable at a long distance. Great numbers of the various species of ducks are said to visit Bear lake in the fall and spring.

Ardea herodias herodias Linnaeus. Great Blue Heron.

At the east end of Bear lake, July 30 to August 2, 1905, we saw several times a great blue heron flying up or down the marsh.

Butorides virescens anthonyi (Mearns). Anthony Green Heron.

A green heron was seen several times about a pond at Cushenbury springs, August 10, 1905. It was without doubt a migrant.

Nycticorax naevius (Boddart). Black-crowned Night Heron.

One was seen at Bear lake flying up the marsh, July 30, 1905; and the familiar "squawk" of the bird was heard several times during the evenings of the few days following.

Fulica americana Gmelin. Mudhen; American Coot.

Mudhens were found to be breeding in considerable numbers on Bear lake, but the species was met with nowhere else. July 28 to August 3, 1905, many families of small young were seen and several nests found in which the eggs were just hatching. One nest near camp contained nine eggs on July 27. Two of them hatched on July 28, and then one or two hatched each day until August 2, when the last one hatched. The young birds left the nest shortly after appearing and swam vigorously about, but keeping near the nest.

The nests were usually built in a kind of tule, and consisted of tules woven together rather firmly so as to form a basket-shaped nest. There was usually a sort of gangway, composed of tules, leading to the nest; and in the above instance the old coot always entered and left the nest by this route.

Other nests containing eight and ten eggs respectively were found, as well as a set of eleven, which was taken. The eggs in the latter set were in various stages of incubation, some being fresh, while in others incubation was variously advanced. Incubation evidently began about as soon as the first egg was laid.

The throat, neck, wings and back of the coots when hatched were covered with erinkled, fuzzy feathers with hair-like terminations. These were of a chinese orange shade, brightening to orange vermillion about the head. The terminal portion of the bill was of the same color, except that the extreme tip of the bill was black. These orange-colored feathers stand out beyond the blackish down that covers the body of the young. The head becomes pale in the older youngsters by the colored feathers separating as the bird grows larger, and finally wearing off altogether.

A quite significant and interesting fact was noted in that the feet of the young grew far more rapidly in proportion than the rest of their body. A half-grown mudhen has astonishingly large feet, and after observing the ease with which the youngsters swam and dived (apparently just as well as the adults), the relative importance of those members to the early success of the individual seemed plain. The young of a family near camp returned with both parents to the old nest each evening at dusk, but much

squabbling and jostling, accompanied by various toots, grunts, and cries, took place before they were all finally settled for the night. The setting coots returned to their nests almost as soon as we left after having disturbed them, but they were not often found on the nest at midday.

We judged that there were about seventy-five pairs of coots breeding on the lake in 1905. Two adults and sixteen young were preserved.

Steganopus tricolor Vieillot. Wilson Phalarope.

Several flocks of from four to twenty individuals were encountered in the marshy east end of Bear Lake July 28 to August 2, 1905. They were usually discovered swimming lightly among the scattered tules and were rather tame, finally taking flight when closely approached with a faint "peet, peet." Of the five specimens preserved, four are evidently birds-of-the-year and I think very likely were raised in the immediate vicinity. None in the bright chestnut breeding dress were seen, and all those taken were in complete winter plumage.

Himantopus mexicanus (Müller). Black-necked Stilt.

A large flock, fully twenty-five, were seen on a mud flat at Bear lake, July 30, 1905. Other scattering individuals were seen. A two-thirds grown young was secured, which makes it seem probable that the species bred there.

Helodromas solitarius cinnamomeus (Brewster).

Western Solitary Sandpiper.

One specimen was shot by Joseph Dixon on August 12, 1905, at Cushenbury springs. It was a female in first winter plumage, and evidently a migrant, as it was flying right on with no apparent intention of stopping.

Catoptrophorus semipalmatus inornatus (Brewster).

Western Willet.

Western willets were quite common at Bear lake July 28 to August 2, 1905. They were very noisy, especially at dusk, flying back and forth overhead with ringing calls.

The three specimens taken are all apparently birds of the year, and were probably migrants.

Actitis macularia (Linnæus). Spotted Sandpiper.

Several individuals were seen around the shores of Bear lake July 27 to August 2, 1905, and an adult female was secured. I think it probable that the species breeds there, though no young were found.

On July 15, 1906, a pair of spotted sandpipers were discovered on the shores of Dry lake, 9000 feet altitude, at the north base of San Gorgonio peak. The birds on being hunted kept flying out over the water in wide semi-circles, as is the habit of the species. One was finally shot, and we had to wait patiently for the light breeze to drift it ashore. This proved to be a male in full first winter plumage, and undoubtedly a migrant. The spotted sandpiper was the only kind of water bird met with at Dry lake.

Oxyechus vociferus (Linnæus). Killdeer.

Killdeers were abundant along the muddy shores of the east end of Bear lake, where they had evidently bred. A nearly full-grown young was taken July 28, 1905. A flock was seen near the west end of Baldwin lake, August 27 of the same year.

Oreortyx pictus plumiferus (Gould). Mountain Quail.

The mountain quail was widely distributed on both slopes of the San Bernardino mountains. It ranged from the Upper Sonoran zone up through Transition. In the upper part of the chaparral belt on the Pacific side of the mountains it was fairly common; but it was far more so in the piñon belt on the desert side of the range, where in August coveys of young with their parents were nearly always to be seen about watering places. On the north side of Gold mountain, at Cactus Flat, Doble, and at the north base of Sugarloaf they were abundant. In the latter locality they were feeding on service-berries wherever these were obtainable. Several large coveys of half-grown young were encountered at Cushenbury springs on the desert early in August. A covey of small young and parents were seen at Bluff lake on July 23, and another at Fish creek on June 17. Along the upper Santa Ana, to Big Meadows, and on the south face of Sugarloaf, quail were fairly common, especially so the last of July and in

August, when the large coveys of young began to make their increased numbers noticeable.

No other species of quail were encountered by us anywhere in the region under consideration.

Zenaidura macroura carolinensis (Linnaeus). Mourning Dove.

Mourning doves were abundant about Bear lake, east through Bear valley, and about Baldwin lake and Doble. At the latter locality they were constantly visiting the few springs, as usual in pairs, both adult and full-grown young. They were also abundant on the desert at Cushenbury springs, to which they kept coming for water. August 11, 1905, I found a nest of this species on the bare desert two miles west of that point. It was located on the ground, between and partially shaded by two small bushes not over a foot high. It was composed of a scanty collection of fine round weed stems which barely separated the newly hatched squabs from the hot ground. The distracted parent tumbled from the nest and lit on a tree yucca near by.

In the higher mountains doves were either wanting or very scarce. Several were seen along the upper Santa Ana, some as high as 6500 feet, on the south side of Sugarloaf. But none were observed above the lower Transition zone.

Cathartes aura septentrionalis (Wied). Turkey Vulture.

The turkey vulture does not venture into the highest mountains, although cattle are grazed onto the uppermost meadows, and we saw several carcasses which ordinarily prove sufficiently attractive to the vultures. One turkey buzzard was seen circling over the meadow at Bluff lake, 7500 feet. The species was common around Bear lake, and a number were seen around the slaughter pens at Knight's ranch, about one mile south of Baldwin lake; several were noted at Doble.

None were seen above Transition and the species seems most at home below even that zone.

Accipiter cooperi mexicanus (Swainson). Cooper Hawk.

The Cooper hawk was the bird of prey most frequently met with in the region, extending its range up through the Transition zone. It was common along the Santa Ana, and two nests were

found near Seven Oaks. One nest examined on June 13, 1905, was situated thirty-five feet above the ground in an alder and contained four eggs in which incubation was nearly complete. Another nest found on July 9 was thirty feet up in a cottonwood. This contained three nearly full-fledged young, one of which was preserved. This species was also seen at Fish creek, Lost creek, South Fork, Bluff lake, Saragossa springs, Doble, north base of Sugarloaf and Cushenbury springs. At each of the last three locations specimens were obtained. All were in the streaked immature plumage.

An adult female was shot near our South Fork camp, July 8, 1906. It held in its talons half of a freshly-killed ground squirrel (*Otospermophilus beecheyi fisheri*). It also had about its plumage a strong odor of skunk, and this odor obtrudes itself just as strongly now, a year later, whenever the hawk-skin is handled. On July 16, 1907, on Mountain Home creek, I surprised a Cooper hawk in the act of tearing to pieces an adult California woodpecker.

Buteo borealis calurus (Cassin). Western Red-tailed Hawk.

Western red-tails were quite common all around Bear lake. Several were seen at Gold mountain and one or two at Bluff lake. On July 12, 1905, a pair of adults and full-grown young were seen toward the head of Foresee creek, on the north side of San Bernardino peak, at an elevation of about 7500 feet. A red-tail was seen flying over Clark's ranch, June 13, 1905. In 1906 and 1907 individuals were repeatedly seen in the cañons at the head of the Santa Ana, Fish creek, Lost creek, and South Fork. None were seen above the Transition Zone.

Aquila chrysaetos (Linnæus). Golden Eagle.

Golden eagles were seen quite often about the head of the Santa Ana. Two were seen flying over the summit of Sugarloaf, 9840 feet altitude, July 11, 1906. A pair were watched for several minutes soaring over San Gorgonio peak, 11,500 feet altitude, June 19, 1907. At Dry lake, 9000 feet, June 15, 1906, I saw a golden eagle attempt to alight on a dead tamarack pine, standing at the margin of the lake. The branch he chose, however, was

brittle, and his weight sent it crashing to the ground, while the eagle had to flap furiously to regain his balance and resume his flight.

On August 2, 1906, we were making our way up the ridge between Lost creek and the South Fork, when an adult, and almost black, golden eagle alighted, unaware of our presence, on a pine stub not more than fifty yards from us. We kept still and enjoyed a minute's close view of his majesty. But he was safe as far as our gun was concerned, for we needed no specimens of his size to pack through the mountains!

Falco sparverius sparverius (Linnaeus).

American Sparrow Hawk.

Sparrow hawks were notable for their scarcity in most of the region. We found them noticeably common only around the east end of Bear lake and the west end of Baldwin lake, where many were seen foraging for grasshoppers, August 2 to 4, 1905. One was seen on the south slope of Sugarloaf July 3; and on the Upper Santa Ana, in the vicinity of our South Fork camp, 6200 to 6600 feet altitude, I knew of two families being raised both in 1905 and 1906. The nest-cavities were in tall dead yellow pines. The species was also seen on the lower Santa Ana, June 11, 1905, and an individual was seen on the desert two miles west of Cushenbury springs, August 11.

Asio wilsonianus (Lesson). American Long-eared Owl.

The long-eared owl was met with but once, at Cushenbury springs, 4000 feet altitude, where I "auxed" one as he flew over the willow patch on the evening of August 12, 1905.

Otus flammeola idahoensis (Merriam).

Dwarf Flammulated Screech Owl.

On the evening of July 15, 1905, at Bluff lake, I obtained an adult male specimen of this rare species. During the preceding two evenings we had repeatedly heard a peculiar note, different from that of any other owl we had ever heard. It consisted of a single mellow "whoot," repeated at regular intervals, something like the call note of the phainopepla in this respect. These

notes began to be heard at early dusk, by seven o'clock; but on account of their ventriloquial quality gave little clue as to distance. Although far-reaching the notes proved to have been uttered really close at hand. By careful stalking the point of origin was located in the top of a tall yellow pine 200 yards from camp; and presently a small bird with a true owl silhouette flew across an open space and lit in the top of a tall tree fully 100 feet from the ground. A charge of number 7 shot started it down and after a few minutes lodgement, it fell to the ground at my feet, my first and only specimen of the dwarf screech owl, and one of the rarest birds of California.

We had previously heard exactly the same notes at Dry lake, 9000 feet, on the night of June 21. I saw a little owl there by the camp-fire light, among the tamarack pines close at hand, but failed to secure it. The specimen obtained is a male in full adult plumage (No. 6730 Coll. J. G.). I submitted it to Mr. H. C. Oberholser of the United States Department of Agriculture, who identified it as nearest to, but not quite, *idahoensis*. It possibly represents a slightly differentiated race. I have compared it with two flammulated owls in the collection of Mr. G. Frean Morecom, from the Huachuca mountains, Arizona, and find extremely close similarity. I have no true *flammeola*, however, for comparison.

Bubo virginianus pacificus Cassin. Pacific Horned Owl.

Horned owls were frequently heard in July at Bluff lake, and along the upper Santa Ana, below the mouth of the south fork, and at Seven Oaks. The species seemed common at Bear lake, where an adult male specimen (No. 6916, Coll. J. G.) was secured by camp-fire light, July 30, 1905. The stomach of this bird contained three "Jerusalem crickets" and two beetles. Elsewhere this owl was heard at the north base of Sugarloaf and at Doble.

Geococcyx californianus (Lesson). Roadrunner.

Roadrunners were seen only on the northern and southern foothills of the San Bernardino mountains. At Cushenbury springs (4000 feet) and Cactus Flat (6000 feet), on the desert

side of the mountains, they were common. At the former locality one was "auxed" by the collector as he sat at the skinning table. At the mouth of the Santa Ana, near Mentone, two were seen, June 11, 1905. Each was scared from an old cactus wren's nest, in cholla cactus. As this was 6 a.m., the roadrunners may have been occupying the wrens' nests during the night as roosting places. The species was also seen in the wash at the mouth of Mill creek, August 22, 1907.

Ceryle alcyon (Linnaeus). Belted Kingfisher.

This bird was seen but twice, on July 30 and August 2, 1905, at Bear lake, where solitary individuals flew along the shore near our camp.

Dryobates villosus hyloscopus (Cabanis). Cabanis Woodpecker.

This was the most widely distributed species of woodpecker in the region, occurring throughout the timbered portions, irrespective of zones. It was common from the Santa Ana Cañon to the summit of Sugarloaf, 9800 feet, and nearly to timber line on San Gorgonio peak. On the desert side the species was noted as low as Cactus Flat, 6000 feet, where one was seen in some golden oaks in a ravine, August 16, 1905. On Gold mountain and west through Holcomb valley, in Bear valley and around Bluff lake, and throughout the region at the headwaters of the Santa Ana, the Cabanis woodpecker seldom failed to be heard or seen within a half-hour's tramp.

The resonant rattling drum identified this species from any other of this region. Near Dry lake, 9000 feet altitude, dead tamarack pines were selected for this purpose, and on June 23, 1905, I listened for many minutes to a remarkable demonstration of this kind. Different branches were tattooed in rapid succession, so that a xylophone-like variety of tones was produced, very impressive and far-carrying through the otherwise quiet forest.

Ten specimens of this species were secured.

Dryobates scalaris bairdi (Malherbe). Texas Woodpecker.

This species was found only in the vicinity of Cushenbury springs, on the desert at the north base of the mountains. Four specimens were taken there August 10 to 13, 1905, and several

others seen among the cottonwoods surrounding the springs, and among the tree yuccas of the surrounding desert.

Dryobates nuttalli (Gambel). Nuttall Woodpecker.

In June and July of each year, Nuttall woodpeckers were quite common on the upper Santa Ana in the vicinity of Seven Oaks (5000 feet). They were evidently breeding there among the alders and cottonwoods. After the young were full grown individuals wandered up along the Santa Ana as far as the south fork and even Fish creek, where examples were seen and taken, August 2 to 4, 1906. This species was encountered in only one other portion of the mountains, on the desert slope at Cactus Flat (6000 feet), where a pair were seen August 17, 1905. These were in golden oaks, a limited tract of which occur in a ravine on the northeast side of the range. This record station is of interest as being so near the range of *D. scalaris bairdi*.

Four specimens of the Nuttall woodpecker were obtained.

Xenopicus albolarvatus gravirostris (Grinnell).

Southern White-headed Woodpecker.

White-headed woodpeckers were unexpectedly scarce in the San Bernardino mountains. In no place were they as numerous as I have found them elsewhere in the mountains of Southern California. They were seen only in the Transition zone, none being observed above the fir belt, and but very few down into pure yellow pine tracts. In the vicinity of Fish creek, 6500 feet, a few pairs were breeding in June. On July 5, 1905, I found a nesting hole seven feet up in a dead pine stub, which contained four half-fledged young. We did not see the species anywhere higher than about 8000 feet, except on the south slope of Sugarloaf, where on July 11, 1906, one was seen among the silver firs at about 9000 feet altitude. About Bluff lake they were more common than anywhere else, and a few were seen on the northern slopes of Sugarloaf at about 8000 feet, in August. Young and adults taken before the fall moult set in were in some cases fearfully smeared with pitch ventrally. A full-grown juvenal, taken at Bluff lake, July 25, 1905, is a freak in that it has a patch of white feathers in the normally black belly region. Their food

seems to consist in summer largely of wood-ants. The five adult specimens possess the relatively large bill of *gravirostris*, showing unmistakably the existence of this race as separable from that of the Sierras north of Tehachapi.

Sphyrapicus varius daggetti Grinnell. Sierra Sapsucker.

This species was in no place common. Its quiet behavior may have resulted in its being overlooked in some places where it should have been found. It appeared to be restricted to the Transition zone, preferably the lower Transition in the vicinity of water. Several were met with along the upper Santa Ana from two miles below Seven Oaks nearly to Big Meadows, as well as up into the lower Fish creek cañon as high as about 7000 feet. One was seen at the upper South Fork cienaga, 8500 feet, June 18, 1907. A full-grown juvenal was taken a mile or so above Seven Oaks on July 10, 1905; and others in process of moult August 29 and 30, 1905. A family of young and adults were discovered near the north shore of Bear lake July 31, 1905.

The characteristic borings of this species were to be seen plentifully in alders, willows, and young pines and firs. Near Bluff lake a species of willow (*Salix bigelovii*) grows in good-sized clumps around the numerous cienagas, and these willows seem to offer especial attraction to the sapsuckers. But, curiously enough, the attentions of the birds are confined to a single clump in a locality and not distributed among many. The operations evidently prove fatal in time to the willows, and then perhaps another clump is attacked. The following instance came under my notice, August 30 to September 3, 1905, and through the kindness of Professor H. B. Perkins, of Throop Polytechnic Institute, then stopping at the Bluff lake resort, the accompanying photographs were secured. (See pls. 14, 15.) The incisions in the bark were generally rectangular, the long axis horizontal, and in vertical rows. These up-and-down rows of incisions often ran together, making vertical grooves; and sometimes also the rows were so close together as to obliterate the interval, so that the bark was completely gone over a considerable space. The trunk above this zone of attack was always partly or entirely dead. I twice watched the sapsucker at work at these borings, and it seemed to

me plain that it was the sap which collected in the newest (lowest) perforations which the bird was after, and appeared to sip. This single willow clump, among dozens of other unaffected ones at the end of the cienaga, was rendered conspicuous by all of its upper branches and stalks, above two to four feet from the ground, being dead, with the bark weathered off and the stems left bare and shining. This clump must have been worked upon for at least three years; for on several of the trunks, which were from three to five inches in diameter, there were three zones of borings, the latest one lowest. Just below each of these girdlings was a ring of sprouts. Of what advantage is it to the birds to confine their attention to *one* clump of willows until it is exhausted?

Of the seven specimens of this sapsucker obtained, four are adults, and these bear out well the characters I originally assigned to this race. As to the availability of the name *daggetti*, I have recently gone over the whole question again and proven to my own satisfaction that either the names *notkensis* and *flaviventris* are pure synonyms of *ruber*, or else *ruber* must be thrown out altogether as unidentifiable. In either case *daggetti* is the name to be reasonably employed for the southern race of the red-breasted sapsucker.

Sphyrapicus thyroideus (Cassin). Williamson Sapsucker.

The Williamson sapsucker appeared to be restricted to the Canadian zone and upper edge of Transition. We found it only among the tamarack pines on the slopes and ridges of San Geronio peak, and among the silver firs, tamarack and yellow pines around Bluff lake. In the former locality the species was common for a woodpecker, especially around Dry lake, 9000 feet altitude, where several nests were found. Tamarack pines were selected as nest trees, usually old ones with the core dead and rotten but with a live shell on the outside. In one found June 22, 1905, there were four holes drilled one above the other about eighteen inches apart, and one of these holes contained three small young and two infertile eggs. These eggs were preserved and are pure glossy white, measuring $.98 \times .67$ and $.99 \times .69$ inches. Later on in the same day another nest was found similarly located containing four half-fledged young. A nest with half-grown

young was found in the same locality, June 14, 1906; and on June 26 of the same year a nest twenty feet up in a half-dead tamarack held five two-thirds-grown young and one rotten egg. So that a full set of eggs probably varies from four to six in number. On June 18, 1907, a nest with small young was located ten feet up in an exceptionally large nearly dead tamarack pine. This was one of the lowest of a series of forty-seven well-formed holes of similar external appearance, which penetrated this one tree trunk on all sides up to an estimated height of thirty-five feet. Besides these there were many smaller drillings. When once selected by sapsuckers a tree is surely doomed. But there is probably no more than one tree in five hundred that is appropriated by the birds. We usually located the nests by watching the movements of the parent birds, which flew from their foraging places, often far distant, direct to the nest tree. The young uttered a whinnying chorus of cries when fed, and the adults, though generally very quiet, had a not loud explosive cry, more like the distant squall of a red-tailed hawk. The bill and throat of an adult male, shot as it was approaching a nest, was crammed with large wood ants, not the kind, however, that are common at lower altitudes and smell so foully.

Many grills of borings were seen in the bark of yellow pines and firs at Bluff lake which I ascribed to this species. Full-grown juvenals were secured at Bluff lake July 15 and 17, 1905. An adult male, taken August 30, was just completing the fall moult. A female taken September 2 was in complete new plumage. Twelve specimens of this woodpecker were secured.

***Melanerpes formicivorus bairdi* Ridgway.**
California Woodpecker.

This species was seen in only two localities; near Seven Oaks, where in June and July a few individuals were noted among some tall yellow pines in a ravine a mile to the northward; and at the head of Mountain Home cañon around Glen Martin, 6300 feet, where two were seen June 10, 1906, and in July, 1907. At the latter place the characteristic borings of this species were conspicuous on the trunks of yellow pines and black oaks. At Seven Oaks, June 24, 1906, we had been watching a Sierra sapsucker

industriously running a line of bark-pits around the branch of an alder, when a California woodpecker, which we will presume had been watching operations from his perch on a tall dead pine across the ravine, flew down and drove off the sapsucker; the former then went the rounds of the borings himself, "dipping" from each!

***Colaptes cafer collaris* (Vigors).** Red-shafted Flicker.

Flickers were found in the region but sparingly, as compared with their usual abundance in other parts of the country. At 8500 feet elevation on the upper South Fork of the Santa Ana, a nest was found 78 feet up in a dead yellow pine. The bird visited it regularly, giving three notes each time to announce his coming, sounding like "claiip;" then he inserted his head into the hole and "pumped" three times, evidently delivering a consignment of ants. Occasional flickers were noted throughout the black oak belt from Fish Creek to Foresee creek. One was seen at Dry lake, 9000 feet, June 22, 1905. Flickers were noted around Bluff lake, a few around Bear lake and several on the north side of Sugarloaf. A specimen which was taken at a spring at Cactus Flat, August 17, 1905, smelt very pungently of a kind of strong-smelling ant, usually altogether passed over by birds.

***Phalaenoptilus nuttalli californicus* Ridgway.** Dusky Poor-will.

Poor-wills were heard along the road, 4500 feet altitude, below Clark's ranch on the evening of June 12, 1905. Later in the month others were heard in the vicinity of our camp at Fish creek, 6500 feet, where a tongue of piñons extend along the south-facing cañon-side. They were not seen again until we reached Doble, August 5 to 6, where they proved common, and two specimens were secured. On the evening of August 22 we secured a pair at the edge of the sage flat at the north base of Sugarloaf at 7500 feet altitude. The specimens taken are all in juvenal plumage. One of these, taken August 22, shows many feathers of the full adult plumage in the throat and breast. The juvenal plumage is characterized by having the throat patch buff and the back conspicuously mixed with cinnamon-rufus.

Chordeiles virginianus hesperis Grinnell. Pacific Nighthawk.

The Pacific nighthawk proved to be a common species of the Boreal and upper Transition zones. During their evening insect hunts we noticed the birds flying overhead down even onto Upper Sonoran grounds.

We first noticed this nighthawk on the evening of June 12, 1905, flying above the road below Clark's ranch, about 4500 feet altitude. The species was recognized by its unmistakable nasal "peé-ark," which is very different from the note of the Texas nighthawk. On June 18, of the same year, as I was ascending a northern spur of San Gorgonio peak, at about 9000 feet altitude, I flushed a female nighthawk from her two eggs. These were laid on the bare ground in an open place among the pines. Nothing but a few pine needles separated them from the granite gravel. The female bird tumbled away down the mountain side and disappeared; but the male bird made his appearance and flew about overhead uttering the usual nasal rasping note and occasionally diving down, and giving the peculiar "whoof" which is described of the eastern bird. These eggs were fresh, and are somewhat smaller and much paler than those of the race *virginianus*, from the Atlantic coast. They measure $1.18 \times .83$ and $1.10 \times .85$ inches, and are considerably paler than the palest of the six specimens figured in Bendire's "Life Histories of North American Birds," Vol. II, Plate III. The abundant pale lavender markings are scarcely obscured by the sparser markings of pale brown.

Another bird was flushed from a single egg on June 27, 1905. It was on a trail on a ridge near the south fork of the Santa Ana at about 7500 feet elevation. This single egg was slightly incubated and measured $1.17 \times .85$ inches. It is of the pale type, but very slightly darker than the first set; the brown markings are somewhat more numerous.

We noted nighthawks in the evening on each visit to Dry lake at the north base of San Gorgonio peak. Along the Santa Ana below Fish creek many nighthawks came in the evening from the higher ridges to feed on the abundant insect life. A specimen shot at dusk, July 4, 1906, was skinned at 11 o'clock the next day. The capacious throat and gullet were found to be crammed with

large winged white ants. By actual count there were forty-three of these and many of them were still alive, although it was at least fifteen hours since they had been captured by the nighthawk.

At Bluff lake in July large numbers of nighthawks made their appearance over the extensive meadow just after sundown, and it was here that we obtained the majority of the series of seventeen specimens secured. Male birds were seen or heard flying about above the pines at almost any hour of the day. A few individuals were discovered roosting lengthwise on pine branches. Nighthawks of this species also appeared in the evening over Bear lake. They were not noted however further on the desert side of the mountains than Baldwin lake, where one was heard on the evening of August 8, 1905. At the cienaga at the north base of Sugarloaf nighthawks were common, August 19 to 22 of the same season. On the morning of August 20 at 7 o'clock I saw twenty-six nighthawks flying east in a scattering flock high overhead. This was doubtless a migratory movement, for none were seen anywhere in the mountains after August 23, when I took a full-grown juvenal at the same place. August 28 to September 3, where nighthawks had previously been so plentiful around Bluff lake, we saw none.

The new race *hesperis* described by me in *The Condor* (Vol. VII, Nov. 1905, p. 170) was based on my San Bernardino mountain series of skins. The type was shot at Bear lake, July 30, 1905. As previously intimated in the original description, I feel confident that this is the race occurring all along the Pacific coast region, from the San Bernardino mountains, through the Sierra Nevada to Oregon and Washington.

Chordeiles acutipennis texensis (Lawrence). Texas Nighthawk.

The Texas nighthawk was common in the wash at the mouth of the Santa Ana Cañon near Mentone, June 11, 1905. At Cushenbury springs, 4000 feet altitude, August 9 to 14, the species was also numerous and two adults were taken. One of them contained in its stomach four of the immense seven-lined June beetles. At Cactus Flat, 6000 feet, a pair was seen on the evening of August 16, and an adult male secured. Finally a specimen

was taken at the north base of Sugarloaf, 7500 feet, August 20. Nighthawks were seen flying over Doble early in August, which were thought to have been this species.

The Texas nighthawk is a characteristic breeding bird of the Lower Sonoran zone, but like several other species of the same zone wanders up even into Transition during the late summer.

Cypseloides niger borealis (Kennerly). Black Swift.

On the afternoon of July 16, 1906, I saw two black swifts flying down the Santa Ana, over our South Fork camp. There was a brisk up-the-cañon wind at the time, and the birds beat back and forth against it, advancing rather slowly. Their large size, and uniformly black color, glancing silvery in certain positions of the wings, made identification unmistakable. The next day one of these, or possibly another bird, was plainly seen similarly beating down the valley.

Under precisely similar conditions in 1907, I saw three black swifts in the same locality, July 5. And on July 7 I saw possibly the same three fly past the cienaga on the south face of Sugarloaf, 6700 feet altitude.

Aëronautes melanoleucus (Baird). White-throated Swift.

The white-throated swift was abundant along the lower Santa Ana cañon June 11 and 12, 1905, and many colonies were nesting in the precipitous rocky sides of the cañon. Birds were frequently seen to enter crevices. Most of these were inaccessible; but one nest was discovered by Joseph Dixon though the eggs could not be secured. The nest was in a crack about two inches wide at the outlet but narrowing back inside to only about $1\frac{1}{4}$ inches near the nest, except at the bottom of the crevice which was weathered considerably wider, forming a small cavity. The nest was placed on the floor of the cavity and rested on the gravel which composed the bottom. The nest was about three feet from the outer face of the rock. It could not be seen until one had shaded his eyes for a minute or two so as to become accustomed to the dim light. The nest was a shallow saucer, we judged about four inches across. It was composed of a soft felt-like substance

loosely put together. There were three eggs in plain view and it seemed as though there would be room for two more out of sight. One egg was finally secured by the aid of a tin teaspoon and a long piece of telephone wire; but the operation resulted in badly denting the egg. It was pure white and was fresh at this date, June 12. This nest crevice was about twenty feet above the stream-bed in a wall of broken granite slabs. There were doubtless other nests near by, but probably fully as inaccessible.

White-throated swifts were seen elsewhere in the San Bernardino mountains always flying overhead. I saw a pair on June 18, 1905, over the summit of San Gorgonio peak, 11,500 feet altitude. They were also seen on Fish creek, Mill creek, and at Bluff lake. At Cushenbury springs on August 14, 1905, several of these swifts were seen. One taken was in perfect newly acquired plumage. Five skins in all were secured.

Trochilus alexandri Bourcier & Mulsant.

Black-chinned Hummingbird.

This hummingbird was common in June in the lower foothill cañons on the Pacific side of the mountains. It was nesting in the lower Santa Ana cañon at least as far up as the Narrows, and along Mill creek up to the mouth of Mountain Home creek. At the latter point a nest was seen June 9, 1906, on an alder bough overhanging the stream within a few feet of the dining-room at Harvey's.

The black-chinned hummingbird was thus an upper Sonoran species, as it was not observed higher in the mountains until the last of July, when the general scatter-movement begins. At Bluff lake, 7500 feet altitude, a juvenal was taken July 23, 1905. On the upper Santa Ana, near the mouth of the south fork, an adult male was taken July 31, 1906; and others were seen near our Cedar Cabin camp during August. At Cushenbury springs, on the desert side of the mountains, the species was identified August 11, 1905; and it was common at Cactus Flat, August 15 to 17, where young males in process of moult were secured. Several were noted at the north base of Sugarloaf, August 20. Nine specimens of this hummingbird were secured.

Calypte costae (Bourcier). Costa Hummingbird.

The Costa hummingbird was a common species along the Pacific base of the mountains in June, 1905. Along the lower course of the Santa Ana as far up as the Narrows, about 2500 feet altitude, the species was numerous, and three nests were found June 11. These were all above the road on the cañon side, two on twigs of bushes and one in a sycamore. The latter contained two fresh eggs.

A number of this species were seen, and a specimen secured, August 10 to 13, at Cushenbury springs, at the desert base of the mountains. Four examples of this species were obtained in the region.

Calypte anna (Lesson). Anna Hummingbird.

The Anna hummingbird was common in the Upper Sonoran chaparral belt and lower cañons in June and July. It was seen, and an adult male secured, in the lower Bear creek cañon, June 12, 1905, and it was noted commonly on the brushy slopes above, up to Clark's ranch, about 5000 feet elevation, both on this date and September 4. The species was noted at, and down the Santa Ana from, Seven Oaks, in June, 1907. On the twenty-first I found a nest, with the female sitting, in an alder near Ball's ranch.

Later in the summer this hummingbird became spread broadcast throughout almost all altitudes. It was first seen out of its breeding zone July 2 (1907), when a full grown juvenal poised for a moment in front of a red sweater at our South Fork camp, on the upper Santa Ana. It was taken August 14, 1905, at Cushenbury springs; at Cactus Flat, August 16; at the north base of Sugarloaf, August 21; and at Bluff lake, August 31. Six examples were preserved.

Selasphorus alleni Henshaw. Allen Hummingbird.**Selasphorus rufus** (Gmelin). Rufus Hummingbird.

Owing to the impossibility of distinguishing at a distance adult females and young of *Selasphorus alleni* and *S. rufus*, I will have to group the field observations on the two species, except where specimens were secured. Adult males were extremely

scarce, and even when seen a chance was seldom given to take note of the color of the dorsum. I took eighteen specimens of the two species, all adult females and immatures. I have assorted these into twelve skins of *alleni* and six of *rufus*, though with the immature birds positive identification is difficult, and I am uncertain in two or three of the cases. If the proportion of specimens taken is any criterion, then *alleni* is much the more common of the two. At any rate, I am confident that neither species breeds anywhere in the region which I explored; both occur as transients, though tarrying perhaps two months in summer during the season of abundant flowers and plentiful insect food. This is at a season when the earlier spring of lower altitudes has given way to the dry and barren summer, compelling the birds to move into more productive zones, wherever these may be reached.

The earliest (of either or both species) seen in the region were two observed about flowering gooseberry bushes, June 28, 1905, near the head of the south fork of the Santa Ana, 8500 feet altitude. In 1906 the first was noted at about 9000 feet altitude on Sugarloaf, July 11. This was an adult male *rufus*, sipping at castillejas; its back was plainly seen to be uniform bright rufous. In 1907 the first *Selasphorus* seen, species indeterminable, was at our South Fork camp on the upper Santa Ana, July 5. By the middle of July and on through August, *Selasphori* were common almost everywhere we went. They were numerous in the vicinity of Bluff lake, July 16 to 26; and again August 29 a few were seen there. The species were well represented at Cushenbury springs, August 10 to 14; and at Cactus Flat August 15 to 17. On the north side of Sugarloaf, August 22, two were seen at about 8500 feet altitude, and several were noted August 26, on the north side of Gold mountain, 7500 feet altitude.

***Stellula calliope* (Gould).** Calliope Hummingbird.

This, the smallest of the six species of hummingbirds regularly visiting or inhabiting California, and the rarest, proved to be a common breeding species of the higher San Bernardino mountains. It appeared to be exclusively confined to the upper Transition and Canadian zones; and it was the only species of hum-

mingbird ascertained to nest in those belts, though the mistake might easily be made of assigning to them others which enter the region early in July only as transients. The dryer desert ranges did not seem to offer quite the right combination of attractions for this hummer; for we found none north or east of Bear lake, where on the north shore, in the vicinity of a group of tamarack pines, several were seen, and a full grown juvenal taken July 31, 1905. A very few were noted earlier in the same month in the vicinity of Bluff lake.

But it was in the region lying between the upper Santa Ana and the San Gorgonio ridge, that the Calliope hummingbird was observed to best advantage. Here it was noted as high as 9300 feet altitude, above Dry lake. In certain places, such as the lower Fish creek cañon, and the cienagas towards the head of the South Fork, these birds were actually abundant—fully as numerous as I have ever seen the Anna hummingbird in the valleys of California.

The females of *Stellula calliope* have a decidedly rusty-red-dish color at a distance, thus resembling the females of *Sceloporus rufus* or *S. alleni*, and it would be difficult for one unfamiliar with it to recognize the former with certainty, if there were no means of judging the size. But a collector's familiarity with the birds in the field brings with it the conviction that I can always distinguish a female Calliope, even when I would not be so sure of the relative size of the bird in question. There are certain peculiarities of poise and flight, impossible to describe intelligibly, which characterize it; and the attenuated squeaky notes, so faint and difficult to locate, have a quality all their own. Of course with the brightly-gorgeted males there is no trouble at all in recognition.

The female Calliopes are wont to stay in the ravines and cañons, where the streams are lined with columbines; while the dashing males each have a valiantly defended patch of gooseberries or manzanitas, high on the mountain side. The males are pugnacious, and each has his own flower preserve and regular perch (on some bush-tip) from which he drives all intruders, whether of his own species or another. As far as my observations went I saw not the least evidence that the male has anything

whatever to do with nest-building or caring for the young. And on only one or two occasions did I ever see a male invade the cañon-bottom where the females were nesting, and then he was routed out by an irate mother. There were, however, neutral tracts on the upper slopes, red with castillejas and pentstemons, where the males and females were seen together, the former often in pursuit of the latter so swiftly as to give one but a moment's impression of a filmy streak.

The time of nesting seems to vary somewhat. Nests with eggs, fresh or nearly so, were found June 11 to June 30 (1906); and nests with young, June 12 (1906) to July 4 (1905). Nine nests that I have record of varied in height above the ground from twenty-two inches (measured) to seventy feet (estimated); I should judge the average height to have been about thirty-five feet, as the majority were above that height. The nests were all in cañons, though none were directly over or very near the water, as with some other species of hummingbirds. One was located in an alder, two in silver firs, and six in yellow and Jeffrey pines. They varied somewhat as to composition and bulk, but were of similar consistency. An average nest has an internal diameter of .84 inch, and depth of .55; it consists externally of bits of bark, seed capsules, fibers and web, and internally of plant down, fibers, and a few down feathers.

The eggs of the Calliope hummingbird are decidedly the smallest of any of our California species. Four sets of two eggs each measure as follows: .48 × .33, .47 × .33; .47 × .35, .46 × .35; .48 × .32, .48 × .32; .49 × .33, .48 × .33.

Nineteen skins of this species were taken.

Tyrannus verticalis Say. Western Kingbird.

This species did not appear in the region until after the breeding season, save for a pair seen at Big Meadows, 6800 feet altitude, July 6, 1907, and I was not sure these were nesting there. Around the east margin of Bear lake several kingbirds were seen July 27 to August 2, 1905. The prevailing west wind swept swarms of insects across the lake and the birds were taking advantage of the abundant supply. At Cushenbury springs at the desert base of the mountains the western kingbird was seen daily, August 9 to 14. Two skins were taken, both juvenals.

Myiarchus cinerascens cinerascens (Lawrence).

Ash-throated Flycatcher.

Several ash-throated flycatchers were seen in June in the scrub oak belt in the vicinity of Seven Oaks, 4800 to 5300 feet altitude, where they were doubtless breeding. The species was seen at the mouth of Mountain Home creek June 9, 1906; and one was taken on the mesa above the south fork of the Santa Ana, elevation about 6400 feet, July 20, 1906. Full-grown juvenals were fairly common around the east end of Bear lake, August 2, 1905, feeding on the numerous insects that the west wind drifted across the lake. At Cushenbury springs, August 9 to 14, several of these flycatchers made their appearance, evidently in migration.

Five examples in all were obtained.

Sayornis saya (Bonaparte). Say Phoebe.

Say phoebes were not seen outside of the pinyon belt. At Doble, 7000 feet altitude, and around the north side of Baldwin lake, 6800 feet, they were seen every day during our stay there early in August, 1905. One was seen as far south as the cienaga at the north base of Sugarloaf, 7500 feet, August 18.

The four specimens secured are all fully-grown juvenals, probably raised somewhere on the desert slope of the mountains.

Sayornis nigricans (Swainson). Black Phoebe.

The black phoebe appeared not to breed above the lower cañons on the Pacific side of the mountains. A pair were nesting at Skinner's, near the confluence of Mountain Home and Mill creeks, the second week in June in both 1905 and 1906. The nest was built under the north gable of the dining room.

By the first week in July the species began to appear all along the upper Santa Ana. It was noted at Seven Oaks July 6 and later, at the mouth of the South Fork July 5, and at Big Meadows, 6800 feet altitude, the highest we saw the species, July 4. By July 15, it was frequently seen about our South Fork camp. All that we were able to determine with certainty were juvenals. The rusty wing bars in this stage of plumage serve to show the age, if the observer is within, say, forty feet of the bird.

Several black phoebes were seen along the shores of Bear lake the last of July, 1905, and two at Baldwin lake, August 8; also a single individual at Cushenbury springs, August 11, and one at the north base of Sugarloaf, August 21.

Nuttallornis borealis (Swainson). Olive-sided Flycatcher.

As we entered the mountains we met with the first olive-sided flycatcher in the Santa Ana cañon, 2500 feet altitude, along with the first big-cone spruces. From this point up to the head of the Santa Ana the characteristic call-notes of this species were almost constantly within hearing distance. It seemed to be a bird of the cañons and did not appear to range far up the sides of the mountains. The highest we saw the species was at Dry lake, 9000 feet altitude, where a nest was found June 23, 1906. There were three slightly incubated eggs, and these together with the nest and female parent were preserved. The nest was on an outstretching tamarack pine limb twenty feet above the ground and over a steep creek bank. It is a very shallow, somewhat frail-looking affair, more like a tanager's than a wood pewee's, and consists externally of coarse pine twigs, within which is a layer of fine plant stems; the lining is of long bark ravelings and the finest plant stems. The eggs are striking in appearance, being deep cream buff in ground color, with a conspicuous ring of blotches and spots around the large ends. These are of burnt umber, hazel, clay color, and vinaceous buff. The eggs measure: .95 × .70, .94 × .70, .94 × .68.

Near the mouth of the South Fork a nest was located twenty-five feet above the ground at the extremity of a lower drooping branch of a yellow pine. On July 10 it contained three half-fledged young.

In the vicinity of Bluff lake, 7500 feet, in July, 1905, this flycatcher was fairly numerous and young were noted. The species was still there August 29. On the north side of Bear lake, in a clump of tamarack pines, a pair of olive-sided flycatchers were seen July 31; and a specimen was taken on the north side of Sugarloaf, 8000 feet altitude, August 22. Eleven examples of this species were taken.

Myiochanes richardsonii richardsonii (Swainson).

Western Wood Pewee.

This was a common species along the whole length of the Santa Ana. It ranged on the Pacific side of the mountains from Upper Sonoran well into the Boreal zone. A nest was seen near the upper power house in the lower Santa Ana cañon, June 12, 1905, and many others were noted between Seven Oaks and Big Meadows during June of each of the three years. Full sets of eggs consisted invariably of three. At Dry lake, 9000 feet altitude, the species was common, and on June 22, 1905, a nest was located twelve feet above the ground on a horizontal dead branch of a limber pine. A bird was sitting, but was not disturbed. The notes of the wood pewee were to be heard before there was a trace of light early in the morning, and with the exception of owls and nighthawks this was the last bird to be heard at night.

Wood pewees were common at Bluff lake as late as September 1, though then very quiet. The species was common around Bear lake the first of August, and one individual was seen on the north slope of Sugarloaf August 21. One migrant in juvenal plumage was taken at Cushenbury springs August 12, 1905. Otherwise we failed to find the wood pewee anywhere on the desert side of the mountains. Ten skins of this species were obtained.

Empidonax difficilis Baird. Western Flycatcher.

In the breeding season the western flycatcher seemed to be altogether limited to the lower cañons of the Pacific slope of the mountains. An interesting association was that of the western flycatcher with the big-cone spruce. For the former was never seen during June more than a hundred yards from the latter. The two evidently require similar conditions of shade and moisture at about the line of mergeence between Upper Sonoran and Transition.

In Mountain Home cañon at about 5000 feet elevation, June 23, 1906, I found a nest of the western flycatcher with four partly incubated eggs. This was six feet above the ground, supported against a dead alder trunk by an out-turned flake of bark, a very common site for the nest of this species in other parts of California. The nest was close to the stream, and also near a trail.

the bird flushing as the horses passed by. Many more western flycatchers were noted along this cañon at other times in June and July.

The species was also evidently nesting along Foresee creek, at 5000 to 6000 feet elevation at the north base of San Bernardino peak, where I saw or heard several July 12, 1905. Elsewhere in the region the species occurred, as I believe, only as a transient. It appeared on the upper Santa Ana in the willow thickets along the stream August 1, 1906. It was noted at Cushenbury springs, at the north base of the mountains, August 10 to 13, 1905; at Cactus Flat, August 16; on the north side of Sugarloaf at about 8000 feet elevation, August 22; at Saragossa springs, near Gold mountain, August 26; and at Bluff lake, August 28. Eight specimens were secured.

Empidonax traillii traillii (Audubon). Traill Flycatcher.

In only one locality was the Traill flycatcher met with during the breeding season. This was along the Santa Ana river in the vicinity of Seven Oaks, where it was decidedly common and nesting in the alders and willow thickets from 4800 to 5200 feet elevation in June and July of each year. It was the only *Empidonax* of that locality; in fact the breeding ranges of no two of the *Empidonaces* indigenous to the San Bernardino mountains overlapped at any point.

Later in the summer the Traill flycatcher was found as a transient at many points. It appeared on the upper Santa Ana, near the mouth of the South Fork, August 2, 1906. It was noted at Doble, August 7, 1905; at Cushenbury springs, August 10 to 14; at Cactus Flat, August 15 to 17; at the north base of Sugarloaf, August 20; and about Bluff lake, August 29 to September 2. Eight examples were taken.

Empidonax griseus Brewster. Gray Flycatcher.

The Gray flycatcher proved to be the only *Empidonax* breeding in the upper Transition and Boreal zones of the region; and its abundance in favorable localities was remarkable. Around Bluff lake and on the south side of the upper Santa Ana towards San Gorgonio peak, there was scarcely an area of five acres with-

out a pair of gray flycatchers. Computing from the area known by me to be inhabited by this species, I estimated that there were, at the beginning of each breeding season of 1905, 1906, and 1907, before young-of-the-year began to appear, not less than 3760 gray flycatchers in the San Bernardino mountains. While they were confined to the less arid parts of the region, they were not particularly attached to the immediate vicinity of water. I found them no less abundant far up the mountain side south of the upper Santa Ana, than in Fish creek cañon.

To enumerate stations of occurrence, I found the species plentiful in the tamarack pine belt around Dry lake, 9000 to 9500 feet altitude, and around Dollar lake, at the head of the South Fork; on the north slope of San Bernardino peak, 8500 to 9000 feet altitude; in the black oak belt from Fish creek west across Hathaway Flat and down along the south wall of the upper Santa Ana to as low as 5500 feet, near our Cedar Cabin camp. At Bluff lake and in the same belt to the eastward for at least three miles they were abundant in July 1905 and up to the time we left the country, September 4. But further towards the desert they were scarce. I took one juvenal at the north edge of Bear lake, July 31. A number were observed and several taken on the north side of Sugarloaf, August 18 to 24, mostly young-of-the-year. And I noted three individuals at Saragossa springs, 7500 feet, near Gold mountain, August 26.

This flycatcher is a noisy bird. At daybreak, especially through June and July, its extended song was to be heard,—a querulous jumble of twitters, with rising and falling inflection here and there, which reminded me a bit of the song of the black phoebe. But the gray flycatcher's song is different from that of any other bird I ever met with. Then there was an oft-repeated, resounding "ker-whit', ker-whit', whit', whit'," uttered at times by birds apparently foraging through the forest, so as to keep track of one another. Then there was a faint musical twitter of two or three syllables, repeated, given by a bird on leaving or approaching its nest. The commonest note, a sort of location note I should judge, was a soft low "pit," reminding one of the Traill flycatcher, yet with a quality of its own. This is the note I first learned on making the acquaintance of the species, and it

was rather with surprise that I found out the others, one after another.

The gray flycatcher does a good deal of its foraging about the tall conifers. I have followed individuals many minutes, which stayed far above gunshot range in the lofty pines. Then again I found them in the willow thickets of the cañon bottoms, and at the edges of cienagas. This was especially true after the young were out, these repairing to the thickets rather than to the open woods.

As to nesting time, the latter half of June seemed to be the most favored time for fresh eggs. But a nest was found June 15 (1905) with three newly-hatched young; and another with four heavily incubated eggs the same day; while on July 14 (1906) I found a nest of four eggs in which incubation was moderately advanced. Altitude and zone may make a little difference; for the earliest eggs and young were found at 6000 to 7000 feet altitude, while around Dry lake, June 14 and 15 (1906), six nests were found all in process of construction. In the matter of nesting sites there was much variation. I found two nests within ten feet of the water; but the majority were on cañon sides, or mountain sides (the same thing), in some cases fully a mile from water in an air line. Out of twenty-two nests of which I have record in my field note-book, three were in willow, three in cottonwood, five in black oak, three in incense cedar, four in tamarack pine, one in fir, one in buckthorn, one in manzanita, and one in mountain mahogany. The average height above the ground of twenty-two nests was $7\frac{1}{2}$ feet. The highest, in an incense cedar, was forty feet, and the two lowest, one in a chinquapin and the other in a small cedar, was two feet. Some nests were saddled on horizontal limbs of as much as two inches diameter, or into large upright crotches; others were built among diverging upright twigs, or on the side of the main stem, supported by small outstanding branches. The latter was the case usually in young cedars.

In shape the nests were all deeply cupped. The inside measurements in several cases averaged 1.80 inches across by 1.60 inches in depth. While the size of the nest cavity remains practically constant, the outside dimensions of the nests varied great-

ly, depending a good deal on the nature of their support and surroundings. Some were fluffy externally, with shreds of material straggling down loosely. Others were built very compactly. After the thunder-stormy weather set in, in July, 1906, nests became perceptibly smaller, the material matting together closer than ever. It was a wonder to me how small birds and their nests were able to stand the pelting of hail and heavy rain; yet I knew of no case where I suspected the elements of being to blame for destroying a home.

In composition there was remarkable uniformity among the gray flycatchers' nests. The chief constituent was not by any means the most readily obtained material; at least one would have to search diligently to find it in the near vicinity of some of the nests. The stuff selected by the birds was the dry, weathered and more or less finely shredded inner bark of the willow. Occasionally weathered grasses entered into the make-up and other fibrous vegetable materials. The lining was of the same material as the main structure, only of finer texture, sometimes mixed with down feathers. In one case the center of the floor of the nest was occupied by a penny-sized tuft of flying-squirrel fur. This incidentally kept the four eggs from quite touching one another. By nature of their component material the nests were of a delicate silvery gray color. When built on cottonwood or willow branches, this rendered them very difficult to discern, but when built in the dark foliage of fir or tamarack, the light color rendered the nests conspicuous. The material chosen was the same whatever the site.

Out of twenty nests on record in my note-book, twelve contained four eggs or young each, five held three, and three held two. There is a fair chance that in some of the latter cases the set was incomplete. In one case I know of, a nest held three eggs and two days later there were but two; the bird was sitting at both times. The depredations of chipmunks and jays possibly account for this, and also for three nests which I was watching and which were altogether destroyed by some agency.

In color the eggs of the gray flycatcher are plain cream-buff, or, to express it in another way, white tinged with cream-buff. In all of sixty eggs seen by me, there was not a trace of spot-

ting,—with one exception. One of a set of four fresh eggs, taken June 23, 1906, is sparsely but very distinctly dotted, chiefly about the larger end, with burnt umber. It resembles in this respect the spotted type of black phoebe's eggs. Eggs found in July after the rains began were more or less discolored by a brownish tint from contact with the wet nest materials. In shape the eggs are usually ovate, sometimes short-ovate or even rounded-ovate. Forty-three eggs average in size $.69 \times .54$ inches. Extremes are $.75 \times .56$ and $.65 \times .51$. It will be observed that the short diameter of eggs is much less subject to variation than the length.

Ninety skins of the gray flycatcher were taken, of which the majority are young. In this series there is a considerable amount of variation in coloration. Some, both adults and young, are extremely pale gray above and below; others, irrespective of sex, are sulphur yellow abdominally, and more greenish or olive dorsally. Mr. Ridgway's suggestion (Bds. N. & Mid. Am., Pt. IV, 1907, pp. 568, 570) that a sort of dichromatism exists in this species (as well as in *E. wrightii*) seems to be sustained by my specimens. I cannot see that the light and dark phases are correlated with either age, sex, or season. The only drawback to the dichromatism idea is that there are intermediates between the extremes, so that it might better be considered a wide-ranging individual variation.

Otocoris alpestris actia Oberholser. California Horned Lark.

One juvenile was seen on the meadow at Bluff lake, July 27, 1905, the only record for that place. During the succeeding week several were seen in the pastures along the south side of Bear lake. In August large numbers were seen on the north side of Baldwin lake. Seven specimens were secured including young and adults in various stages of moult. Two adult males have enough of the new plumage to warrant their identification as *actia*.

The most unexpected record for this bird was obtained on the very summit of San Gorgonio peak, 11,485 feet altitude. On July 16, 1906, I found fully twenty horned larks there, about the edges of the snowbanks. They were in companies of six or eight, or else in pairs. The one taken was an adult male in worn

post-breeding plumage; other adults were seen closely, and I felt sure of also seeing full-grown juvenals. These could not possibly have bred there; in fact I saw the species there but the once. They probably wandered up from San Gorgonio pass, a very short distance away horizontally, but 8000 feet below vertically, or else from Bear valley.

Cyanocitta stelleri frontalis (Ridgway). Blue-fronted Jay.

This jay was unexpectedly scarce in many parts of the San Bernardino mountains, where conditions appeared to be of the sort to suit it. Only along the upper Santa Ana was it conspicuously common. In the vicinity of Fish creek and South Fork, 6200 to 6500 feet altitude, adults and full-grown young were noted in June and July along streams. Several old nests were noted in the willow thickets.

They regularly robbed our mammal traps, and were very seldom caught themselves; we blamed them for robbing a nest of the gray flycatcher that we were watching. But in spite of such mischief they were extremely interesting visitors about camp. At our South Fork base camp, the jays were never molested, and they became very familiar, visiting our cook-table for anything eatable—and that was anything we could eat ourselves. One bird, in particular, was always recognizable by his peculiar note, which sounded like a creaking wheel-barrow or windmill. His presence was always announced by this unusual note, both in 1906 and 1907. I have often heard this species give a squalling note like that of a red-tailed hawk, and occasionally one just like a sparrow hawk; but the South Fork camp jay had a note of his own.

August 19, 1905, a company of blue-fronted jays were encountered on the summit of Sugarloaf, at 9800 feet altitude. Specimens taken were still in full juvenal dress. A few were seen at 7500 feet altitude, August 20 to 23, 1905, on the north side of Sugarloaf, feeding on service-berries. A very few were seen around Bear lake.

This bird seems to be a strictly Transition zone species, as only the above recorded Sugarloaf station was outside.

Ten examples were taken.

Aphelocoma californica californica (Vigors). California Jay.

With the exception of the one case noted beyond, this species was seen only in the Upper Sonoran zone. California jays were numerous on the south side of the mountains in the scrub oak belt up to the lower limit of the pines. It was also noted in the piñon belt on the north side of the mountains down to 5500 feet, below Cactus Flat, and up to 7500 feet on the north base of Sugarloaf. In the latter place August 19 to 23, 1905, they were feeding on service-berries in company with blue-fronted jays. They were seen in a tongue of Upper Sonoran on the south face of Sugarloaf, 6800 feet altitude, July 3, 1905. Late in the summer these jays were noted outside of their usual range. Several were seen in the willow thickets at Bluff lake, 7500 feet, among the firs and pines, from August 29 to September 3. In July in the same locality none were seen. The inference is that these had wandered up and over temporarily from the scrub oak belt on the south side of the ridge.

Five specimens were taken.

Corvus corax sinuatus (Wagler). American Raven.

Several ravens were seen sitting around on dead trees near a slaughter pen at Coombs's ranch just south of Bear lake, August 28, 1905. They were not as wary as usual, and I suppose are usually let alone, along with the turkey vultures. Several were seen at different times flying over Bear lake, and one was seen at Knight's ranch a mile or so south of Baldwin lake.

Nucifraga columbiana (Wilson). Clarke Nutcracker.

The Clarke nutcracker was met with chiefly from the fir belt (upper Transition) up to timber limit (through Boreal). It was particularly noticeable about San Gorgonio peak. Early in June young were full-grown, so that it must have been long past the breeding season. The plumage of the young is softer and their bills shorter, than with the adults. In two juvenal specimens out of eight taken the tips of the feathers on the breast are white, giving a spotted appearance. I do not find this previously noted in the case of our North American *Nucifraga*; but it has

been noted in the adult European bird. This seems of genetic significance.

We found young and adult nutcrackers together foraging in small companies of five to ten. They were easily attracted within range, by the collector uttering a harsh rasping sound between the tongue and roof of the mouth.

The species was seen on San Bernardino peak July 12, 1905. Several were seen on the north side of Gold mountain, 7500 feet altitude, August 26. Down on the lower edge of the piñon belt at Cactus Flat, 6000 feet, a pair were seen to visit a spring on August 16. The species was frequently seen in June and July at the head of the Santa Ana near the mouths of Fish creek and South Fork, and down to 6000 feet altitude. It was seen once at Bluff lake, and a few were seen at a spring on the north side of Sugarloaf at 8500 feet altitude; also a few at a cienega at the north base of the same mountain at 7500 feet elevation. An adult male taken August 26, 1905, on Gold mountain, has the fall moult nearly completed.

Eleven specimens were secured.

Cyanocephalus cyanocephalus (Wied). Piñon Jay.

The piñon jay was met with only among the arid northern ridges and valleys of the San Bernardino mountains. The first were met with at the east end of Bear lake, August 13, 1905, where a few in company with Brewer blackbirds were moving through the pines along the shore. The same day a very large flock containing perhaps 100 birds was encountered at the east end of Bear valley. In the vicinity of Doble and about the north shore of Baldwin lake, 6700 to 7200 feet altitude, piñon jays were the most conspicuous birds to be seen during August. They seemed to belong normally to the piñon belt, although the troops when on foraging excursions wandered out on to the meadows and sage flats far from conifers of any sort. None were seen lower down than Cactus Flat, 6000 feet, on the desert slope, where a small flock was seen August 9. This was well within the piñons.

These jays were remarkable for their indifference to a person's presence, and unless on the open ground paid little atten-

tion, even if shooting was going on at a lively rate. I secured most of the specimens with the "aux" from junipers where the birds came to preen themselves after visiting springs. A large scattering flock may be absolutely quiet for minutes at a time, and then again indulge in a concert of nasal, mewling calls, which can be heard a long ways. In their method of spreading out over a sage flat, and working zigzag over the ground in search of insects, they closely resemble Brewer blackbirds both in flight and general behavior. The flocks of piñon jays consisted of adults and young mixed; but the latter could not be distinguished until secured. Out of twenty-four specimens taken, seven are adults and seventeen are juveniles with loose-textured gray body-plumage. Several of the latter have the lower surface smeared with pitch mixed with fine earth, so that the plumage is stringy and dirty. Both juvenals and adults (August 3 to 9) show much new plumage replacing the old ragged feathers. Some of the young are much further along in the process of moult than any of the adults.

Sturnella neglecta Audubon. Western Meadowlark

A moulting male in nearly complete first winter plumage was obtained from a grass patch at the edge of Baldwin lake (then dry), 6700 feet altitude, August 27, 1905. The probabilities are that it was a newly arrived migrant, as none were seen in Bear valley or anywhere else in the region at any time.

Icterus parisorum Bonaparte. Scott Oriole.

This species was found only at the desert base of the mountains. During our stay at Cushenbury springs, 4000 feet elevation, August 9 to 14, 1905, I saw among the tree yuccas there and at Box S springs several orioles in immature plumage which I was quite sure belonged to this species. But they were all too shy to permit of close enough approach to shoot, except in the case of one individual secured from the group of cottonwoods at Cushenbury, August 11 (No. 7098, Coll. J. G.). This is a full-grown female *parisorum* in juvenal plumage. This specimen shows the looseness of feather structure, especially about the head and ventrally, characteristic of the juvenal stage of plum-

age. It can be readily distinguished from juvenals of both *Icterus bullocki* and *Icterus cucullatus nelsoni* of corresponding age, by its larger size and much darker coloration. The lower surface is dusky olive green, acquiring a gamboge yellow tint abdominally. And the back, wings, and tail are deeper toned than in either of the other species.

Icterus cucullatus nelsoni Ridgway. Arizona Hooded Oriole.

The Arizona hooded oriole was nearly as common as the Bullock oriole in the lower Santa Ana cañon. But it was met with nowhere else during our entire trip. In the locality mentioned several nests were noted June 11 and 12, 1905. The greatest elevation at which this Lower Sonoran species was seen was about 4000 feet on the brushy mountain side above the mouth of Bear creek. Here an adult male was seen by the roadside, June 12. No orioles of any kind were seen on our return down the Santa Ana cañon, September 4, by which date they had evidently departed.

Two specimens were taken.

Icterus bullocki (Swainson). Bullock Oriole.

We found Bullock orioles common in the Santa Ana cañon below the 3500-foot contour level, June 11 and 12, 1905. Several nests were seen in sycamores. One examined was twenty feet above the ground nicely hidden in a mistletoe clump. This, on June 12, contained three newly hatched young and two eggs. The species was again seen in the same cañon at the mouth of Foresee creek (below Seven Oaks), 4800 feet, July 13; and two males in full song were noted in the willows about the group of tent-houses at Seven Oaks, 5100 feet, June 14, 1907. But we found this Upper Sonoran species nowhere higher until the migratory movements began. Several immature birds were seen around Bear lake, August 1 and 2, 1905. We found Bullock orioles numerous on the desert side of the mountains, at Cushenbury springs, 4000 feet, August 9 to 14, and at Cactus Flat, 6000 feet, August 14 to 17. About our camp at the north base of Sugarloaf (7500 feet) several were seen in the willow clumps each day from August 18 to 21. Finally, the last one for the

trip was seen at Doble (7000 feet), August 25. All of these August birds were in either female or young plumage. Two specimens were taken.

Euphagus cyanocephalus (Wagler). Brewer Blackbird.

At Big Meadows (6800 feet), which is at the head of the Santa Ana, a colony of Brewer blackbirds were evidently breeding, June 14, 1905. July 4, adults were seen there feeding nearly grown young; and the species was again in evidence there in July, 1907. A lone young male was shot from the border of Dry lake, 9000 feet altitude, June 18, 1907, evidently a straggler from somewhere far below. Around Bear lake in the latter part of July and in August large flocks of adults and young were feeding along shore, where insects, snails, and tadpoles were abundant. A few were seen at Knight's ranch, between Baldwin lake and Sugarloaf, at about 7000 feet elevation, August 25.

Carpodacus purpureus californicus (Baird).

California Purple Finch.

This species impressed me as being one of the rarer birds of the region. In fact I failed to detect it at all in 1905. In 1906 I saw a male at Schneider's ranch, below Seven Oaks, June 18; and on July 6 and 17 I saw several young in the willows just above Seven Oaks, 5100 feet. An adult female was taken on the Santa Ana below our South Fork camp, July 14; and on the 20th a full-plumaged male was secured on the South Fork, 300 yards above its mouth, at about 6300 feet altitude. The latter bird was alone, feeding on the ground beneath the willows and cedars near the stream, and both individuals had probably wandered up the valley from a lower level. On August 4 an adult female and a juvenal were taken in a willow thicket on the Santa Ana, at about 6000 feet elevation. On June 13 and 22, 1907, I saw and heard California purple finches in Mountain Home cañon a mile or so above Skinner's, 4300 feet, and also about Seven Oaks.

To summarize, the California purple finch in this region appears to be confined to a narrow belt on the Pacific side of the mountains at about the line of merge²nce between Upper Sonoran and lower Transition; preference seems to be shown for the near

vicinity of streams. While at certain points all three species of *Carpodacus* were to be noted late in summer within sound of each other, it is plain that each is characteristic of a separate breeding area.

***Carpodacus cassini* Baird.** Cassin Purple Finch.

The Cassin purple finch was a very common bird in most parts of the higher mountains. It was exclusively confined to the Transition and Boreal zones, and was found practically everywhere we went within these zones below 10,000 feet altitude. Along the upper Santa Ana above about 5500 feet altitude this species was very abundant, as also at Bluff lake and around Bear lake and Dry lake. Small companies composed solely of male birds were often met with, feeding in open places among the pines. These bachelor parties were in evidence all through June and July at the same time that other individuals were paired off and occupied with their nests and young. The male of this species as far as I could judge was just as attentive to his own mate and young as a linnnet; so I would not accuse him of desertion. The question might be raised whether or not in this species more males than females come to maturity. At any rate there seemed to be a large excess of males. Full-grown young were found about Bear lake on July 31, 1905; and on Sugarloaf they were common in August. Young were noted at Saragossa springs, 7500 feet, on the northwest side of Gold mountain, and in Holcomb valley, August 26; but none were seen lower down on the desert side.

Three nests were found near Dry lake, 9000 to 9200 feet altitude, June 23 and 26, 1906, each containing four eggs. One of the sets was fresh, and the other two were incubated to an advanced stage. As full-grown young were seen in the same locality June 18, 1907, the breeding season must cover at least two and a half months, which is a long period for the Boreal zone. All three nests were in tamarack pines, near the bushy ends of outstretching branches. They were forty-five, fifty, and fifteen feet above the ground, respectively. The three nests are so much alike that a description of one will apply to all. Externally it consists of a foundation-work of coarse, dry, crooked weed stems

and gooseberry twigs, in this respect something like a tanager's. But the internal cup is much better formed and deeper. It consists of fine yellow and brownish rootlets and grass stems, with an intermixture of finely slivered plant fibers, probably bark from small stems. The inside diameter of the cup is 2.30 inches, the depth 1.10.

The eggs are quite distinctive in size, color, and markings, not for a moment to be confused with those of the California purple finch, or the linnet. The ground color is a far deeper blue, and the markings more numerous. One of the sets may be described as follows: The ground color is Nile blue, of the exact tint of No. 23, Plate IX, of Ridgway's *Nomenclature of Colors*. The markings are condensed into a broadish ring about the larger end, the small end being almost immaculate. The markings consist of spots and blotches of pale lavender with a few bold punctuations of bistre. In another set the surface markings are in the nature of minute lines and dots. The three sets measure in inches as follows: .74×.60, .72×.61, .75×.60, .73×.61; .85×.60, .82×.60, .83×.60, .83×.61; .79×.63, .78×.62, .77×.62, .80×.62.

Thirty-one skins of this species were taken.

Carpodacus mexicanus frontalis (Say). Linnet or House Finch.

This species was to be found with fair certainty during the breeding season in the Upper and Lower Sonoran zones; later its wanderings led it up through Transition. It was noted on the lower Santa Ana, where a nest was located in a crevice of the cañon wall near the Narrows, June 11, 1905. Linnets were common around Seven Oaks, on the upper Santa Ana at 5000 feet altitude. This is just at the border between Sonoran and Transition. A nest with eggs was found here June 24, 1906, built on the projecting end of a log over the front door of the biggest cabin. Linnets were not seen along the Santa Ana above Seven Oaks until well along in July, when a regular wave of adults and young in small companies advanced up at least as far as Big Meadows, 6700 feet altitude. A few were seen in Bear valley August 2, 1905. On the desert slope of the mountains the species proved common in August, 1905, at Cushenbury springs, 4000 feet, where old nests were seen in tree yuccas; at Cactus Flat,

6000 feet; around Doble, 7000 feet; through Holcomb valley; and at the north base of Sugarloaf, 7500 feet. At the latter point August 18 to 22, they were feeding on service-berries in company with Cassin purple finches. One unparalleled and remarkable occurrence was the taking of an adult male linnet on the extreme summit of Sugarloaf, 9842 feet altitude, June 24, 1905.

Eight examples of this bird were taken.

Loxia curvirostra stricklandi Ridgway. Mexican Crossbill.

Although I thought I heard crossbills in the same locality in June, 1905, it was not until July 15, 1906, that I secured specimens confirmative of this record. On the curiously ridged and basined stretch of country immediately west of Dry lake, from 9100 to 9400 feet elevation, stands a mixed growth of limber and tamarack pines. In this timber I first heard the calls of a party of crossbills and then saw them flying past overhead. But it took patient search to locate them; for when perched and feeding they were absolutely quiet and almost motionless. A company of about eight, all told, were working on the green (year-old) cones in the tops of two or three limber pines. Three of the birds were shot before the flock was lost track of. These were adults, but I thought I saw streaked juvenals as well. I heard the notes later, a loud chirp with a peculiar twang, repeated several times in rapid succession, goldfinch-fashion, when flying, but failed to locate the birds. None were detected during an hour's hunt through the same neighborhood June 18, 1907. But there is a large extent of the same kind of woods, and scores of the birds may be scattered about, and yet defy immediate discovery.

I sent the three skins to Mr. Harry C. Oberholser of the U. S. Department of Agriculture, who pronounces them *stricklandi*. They measure in millimeters as follows:

No., Coll. J. G.	Sex	Wing	Tail	Culmen	Depth of Bill	Bill from Nostril
7584	♀	91	62	18.7	10	15.6
7585	♂	98.5	67	20	11	17
7586	♂	97	65	21.5	11.1	18

This is by far the southernmost summer record of the crossbill for California.

***Astragalinus psaltria hesperophilus* Oberholser.**

Green-backed Goldfinch.

A very few individuals were noted in the upper Santa Ana, where a specimen was taken as high as Fish creek, 6500 feet, June 23, 1905; and a nest was found on the mesa above the mouth of the South Fork, at about 6400 feet altitude, July 9, 1906. This is of note as being well within the Transition zone; for the bird according to my experience is ordinarily a strictly Upper Sonoran species. The date is also noteworthy, suggesting that the pair may have nested lower down earlier in the season; for no green-backed goldfinches were previously seen in the locality. The nest was situated nine feet above the ground in a black oak, and contained four fresh eggs of the usual type.

In the vicinity of Seven Oaks several of these goldfinches were seen. In the lower Santa Ana, below the confluence of Bear creek, the species was numerous June 11 and 12, and several nests were found along the cañon. It was also noted in July and August in the lower Mill creek cañon. At Cushenbury springs, at the desert base of the mountains, this was a fairly common bird August 10 to 14, 1905. Four skins of this species were taken.

***Astragalinus lawrencei* (Cassin). Lawrence Goldfinch.**

This bird ranged up through the Transition zone in several portions of the region. On the upper Santa Ana from Seven Oaks as high as Fish creek, 6500 feet altitude, it was commonly noted; and on June 30, 1905, one individual was seen as high as the South Fork cienaga, 8500 feet. The species was undoubtedly nesting along the Santa Ana; juvenals became common in July, 1906, and on July 26, 1907, I found a brood of one-third-grown young in a sage clump. In the piñon belt around Baldwin lake and at Doble, 6700 to 7000 feet altitude, several were seen in August. Seven specimens were obtained.

***Spinus pinus* (Wilson). Pine Siskin.**

Pine siskins were more or less abundant from the lower Transition zone up into Boreal. They were common along the upper Santa Ana above Seven Oaks and in Fish creek and South

Fork cañons; up the latter to 8500 feet elevation, June 29, 1905. Several pairs were seen on San Bernardino peak, 10,600 feet altitude, on July 12, 1905, where they were singing volubly among the limber pines. They were abundant on the meadow at Bluff lake where they were feeding on grass seed; full-grown young were taken there on July 25. A solitary individual was taken at a spring on the north side of Baldwin lake August 4, 1905. Otherwise none were noted on the desert side. Eleven skins of this species were secured.

***Passerculus sandwichensis alaudinus* (Bonaparte).**

Western Savanna Sparrow.

At Cushenbury springs, 4000 feet altitude, August 12, 1905, an immature specimen in full fall plumage was secured, and another seen. These were evidently migrants.

***Chondestes grammacus strigatus* (Swainson).**

Western Lark Sparrow.

This species was met with at Doble, 7000 feet altitude, August 6, 1905, when a full-grown juvenal was taken, the only one seen. It was noted commonly on several dates in June, July, and August, 1907, on the stubble fields at the mouth of Mill creek cañon.

***Spizella socialis arizonae* Coues.** Western Chipping Sparrow.

The western chipping sparrow was a common species from the lower limit of the yellow and Jeffrey pines up nearly to timber limit on the highest mountains. It was constantly abundant all along the Santa Ana from Seven Oaks to Big Meadows. In June and July the species was noted regularly and in fair numbers up the ridges toward San Gorgonio peak. June 18, 1905, I saw males in full song among the limber pines up to fully 10,000 feet altitude. Several were met with on the very summit of San Bernardino peak, 10,600 feet, July 12, 1905. At Dry lake, 9000 feet altitude, June 14, 1906, a nest was found containing four much incubated eggs. The nest was in bulk and structure typical for the species, and was situated fourteen feet above the ground in a tuft of needles near the extremity of a branch of a tamarack pine. Full-grown young were numerous

around the margin of Dry lake July 15, 1906. In Bear valley the last of July large flocks of full-grown young of this species were feeding along the lake shore. Only one individual was seen in the piñon belt. This was an immature taken at a spring a little below Cactus Flat, August 9, 1905. At Saragossa springs, northwest of Gold mountain, and through Holecomb valley, August 26, chipping sparrows were noted, especially near watering places. Twenty-six specimens in all were taken.

It seems strange that we have to call this in the San Bernardino mountains a strictly Transition and Boreal species, when it is at the same time a common breeding species in the gardens of many of the valley towns of southern California, Upper and perhaps also Lower Sonoran.

***Spizella breweri* Cassin.** Brewer Sparrow.

This was a characteristic and abundant bird in the Artemisia belt on the desert slope of the mountains. In the vicinity of Doble, 7000 feet altitude, and at Cactus Flat, 6000 feet, the species fairly swarmed in August, especially about the few springs. As early as August 4, birds-of-the-year were in complete winter plumage. They were also met with in small numbers at Cushenbury springs, at the desert base of the mountains, August 10 to 14, 1905, and a few at Saragossa springs, northwest of Gold mountain, August 26. On the sage flat at the north base of Sugarloaf a few were noticed August 21. On the Pacific side of the mountains several full-grown juvenals were met with in a sage flat at the lower end of Big Meadows, 6700 feet altitude, on July 4. A small company of young was found on a mountain side near the South Fork, 7500 feet, June 30. In the brush belt at Seven Oaks full-fledged juvenals were common July 7 to 10. The species appeared the first of August, 1906, along the upper Santa Ana, between the mouths of Lost and Fish creeks, and a bird-of-the-year in full first winter plumage was taken on the third of that month. In the latter four localities I concluded that the birds had made their appearance after the breeding season, moving over the short distance from the sage belt on the north side of the divide, at the head of the Santa Ana. Sixty-eight specimens were secured.

***Spizella atrogularis* (Cabanis).** Black-chinned Sparrow.

The characteristic song of the black-chinned sparrow was heard at suitable places along the walls of the lower Santa Ana cañon June 11 and 12, 1905. On the brushy south-facing mountain side between Clarke's ranch and Seven Oaks, 4500 to 5000 feet elevation, the species was numerous June 13, and some time was spent in searching for nests, but without success. The birds were again seen on the road above Clarke's ranch on September 4, when specimens in full winter plumage were taken. They were also frequently seen and heard in June and July along the north side of the upper Santa Ana, as far as the south face of Sugarloaf, about 6800 feet altitude. Several were heard and seen in the wash at the mouth of Mill creek, June 13, 1907. The only other place that we found them was at Cactus Flat, 6000 feet altitude, where on the desert slope of the mountains, at various times between August 9 and 17, many were seen and several taken on the brushy mountain side. Both adults and birds-of-the-year were secured and all had nearly or quite completed the fall moult even as early as August 9. Adults as well as young in the winter plumage lack entirely the black chin patch. Nine examples were taken.

***Junco hyemalis thurberi* Anthony.** Sierra Junco.

Sierra juncos occurred in more or less abundance throughout the Transition and Boreal zones. They favored the margins of cienagas and stream banks, in preference to the dry open woods, especially as breeding places. They were excessively numerous among the cienagas at the head of the South Fork of the Santa Ana, and at Bluff lake. They were fairly common in the breeding season along the upper part of Mountain Home creek, and along the upper Santa Ana from Seven Oaks to the heads of the tributary streams. At least twenty-five nests were found, containing eggs or young. The nest complement was usually four, though quite frequently only three. Nearly fledged young were noted as early as June 15 (1907), so that nesting must begin early in May. Fresh eggs were found from June 11 to 28; and at Bluff lake, July 27, 1905, a female junco was flushed from her

nest and one fresh egg, so that possibly two broods are reared in a season.

The nests were all on the ground. One, found June 17, in the black oak belt above Fish creek was built far back under the end of a log on a hillside, so that no part of it could be seen from any viewpoint. I flushed the bird casually by stepping on the log. Most nests were in depressions in the turf under overhanging grass tufts, preferably on slopes. A nest found June 12, 1906, in the cañon of the South Fork is typical of the usual style. It consisted outwardly of weathered leaves, bark strips, and grass blades, in quantity to suit the depression in the sod where it was located. Inwardly it consisted of fine straw-yellow grasses and a few horse hairs. The inner cavity of the nest was 1.25 inches deep and 2.22 in diameter.

The eggs of the Sierra junco seem to be subject to no great amount of variation in either size or color. The set taken with the above described nest is colored as follows: The ground-color is white with palest tint of Nile blue; the markings vary in color through various tints from hazel to vinaceous; these markings are spread all over the eggs, but are agglomerated into a denser belt about the large ends, where they run together, giving a blurred effect, especially with the deeper-set dots and blotches of vinaceous. Two sets of eggs measure in inches as follows: $.80 \times .62$, $.79 \times .61$, $.80 \times .61$, $.79 \times .61$, and $.76 \times .58$, $.76 \times .58$, $.77 \times .59$, $.75 \times .59$.

Juncos were noted in August sparingly around Bear lake, and on the north side of Sugarloaf clear to the summit. A few were noted on the north side of Gold mountain and through Holecomb valley, August 26, 1905, but not farther down on the desert side. Sierra juncos were always common in the tamarack pine belt around Dry lake, and they were often seen up the slopes toward San Gorgonio peak. Several parties of adults and full-grown juveniles were seen about the snowbanks on the summit of this peak July 16, 1906; and on June 19, 1907, a male was perched on the tip of the rock monument on the very summit, 11,485 feet altitude, singing repeatedly and vigorously. The species was also observed on the summit of San Bernardino peak, 10,630 feet altitude, July 12, 1905. Forty-eight skins of the Sierra junco were obtained.

Amphispiza bilineata deserticola Ridgway. Desert Sparrow.

The desert black-throated sparrow was the most abundant bird on the desert around Cushenbury springs, 4000 feet altitude, August 10 to 14, 1905. Full-grown juveniles, young and adults in many stages of moult, were secured. At Cactus Flat, 6000 feet, the species was also common, and on August 16 a family of young scarcely able to fly was met with among the tree yuccas. A single full-grown juvenal was taken at Doble, 7000 feet altitude, August 8. Twenty-two specimens in all were taken.

Amphispiza belli (Cassin). Bell Sparrow.

This sparrow appeared to be breeding commonly in the grease-wood brush in the vicinity of Clarke's ranch, 4000 to 5000 feet altitude. Full-grown young were taken there June 12, 1905. Young were also found in the brush belt near Seven Oaks on July 10. They were again seen on September 4, 1905, a little below Clarke's ranch.

The species was also noted in full song at the mouths of Mill creek and the Santa Ana. Full-grown young were seen at the latter place, June 11. The Bell sparrow seems to be strictly confined to the Sonoran zone on the Pacific side of the mountains. Its range does not overlap that of the allied form *canescens*. Nine skins were secured.

Amphispiza nevadensis canescens (Grinnell).

California Sage Sparrow.

This species was met with sparingly on the *Artemisia* flats north of Baldwin lake and near Doble, 6700 to 7000 feet altitude. Full-grown young were taken there August 7 to 9, 1905. Several were seen at Cactus Flat, 6000 feet, and two taken August 15; and another was secured at Cushenbury springs, August 12. The latter three had completed the fall moult and were in full winter plumage.

The five specimens secured agree exactly in size and color with the race *canescens* described by me from Mount Pinos, Ventura county, California. And they here occupy the same sort of grounds faunally—the belt of *Artemisia tridentata* and piñon.

Melospiza melodia cooperi (Ridgway).

San Diego Song Sparrow.

Song sparrows were fairly common and undoubtedly breeding each year in the immediate vicinity of Seven Oaks. Adults taken there June 13 and July 8, 1905, present the characters of *cooperi*, the race occupying the San Diegan district of southern California. Several were noted June 9, 1906, about a cienaga and ranch on Mill creek near the mouth of Mountain Home creek. A full-grown juvenal was secured at Bluff lake July 24, 1905, and another in the process of moult near the same place August 30. A bird-of-the-year in moulting plumage was taken at the cienaga at the north base of Sugarloaf on August 19. In each of these latter cases we presumed that the birds had wandered up from their breeding grounds in the lower cañons. It is generally the young which strike out soonest after the nesting season, in search of new feeding grounds. No adults were taken at these higher altitudes. Six examples of this species were secured.

Melospiza lincolni lincolni (Audubon). Lincoln Sparrow.

The Lincoln sparrow was met with in only two general localities, at the extensive cienagas at the head of the South Fork of the Santa Ana, 8000 to 9000 feet altitude, and around Bluff lake, 7200 to 7500 feet altitude. In the former locality on June 27 to 30, 1905, when I was camped there, fully a dozen adults were seen, some carrying bills full of insects and others singing a wheezy, incoherent song from the tips of dead willow stalks. They were very secretive and kept pretty much out of sight in the rank *Veratrum* patches and willow thickets. The species was noted in the same locality at various other times during June and July. I saw a brood of bob-tailed young at a cienaga just over the divide from the upper South Fork towards Hathaway Flats, about 7500 feet altitude, August 17, 1907, and obtained one. In the Bluff lake cienaga itself, where a full-grown young one was taken July 22, we saw but few; but the last of August and up to September 3, 1905, we learned more of their haunts and habits, and found them relatively numerous in the many marshy cienagas to the northeastward, down on the slope towards Bear valley.

Several in the process of moult were secured August 28 to September 3. One specimen still in complete juvenal plumage was taken August 31.

Twenty-three specimens of this species were secured, in both worn and fresh fall plumages, as well as juvenals, and these I have carefully compared with a large series from many localities, loaned me by the United States National Museum. I am unable to detect any constant differences, except that the San Bernardino birds have on an average slightly larger bills. In coloration they appear to be exactly like the birds from eastern North America. I found Rocky Mountain specimens to be slightly paler. All are totally different from *M. l. striata* of the humid coast belt farther north on the Pacific coast.

Passerella stephensi (Anthony). Stephens Fox Sparrow.

Stephens fox sparrows were found in families about Dry lake, 9000 feet altitude, on June 22, 1905. These groups were made up of adults and three or four young which were just able to fly. Several other similarly constituted families were noted at the South Fork cienaga, 8500 feet altitude, June 27. One young fox sparrow had evidently just left the nest, as it was unable to fly more than a few feet, and was easily caught. These instances go to show that the species breeds at least as early as the latter half of May. We failed to find a nest, or to gain any clue to the nest-location. Judging from the actions of the birds during June, I presumed that the nests were located on the ground beneath bushy thickets.

Fox sparrows were found to be more numerous in the vicinity of Bluff lake than anywhere else in the San Bernardino mountains. Here they were often heard in full song and many young were seen from July 14 to 27, 1905. They were seen in small numbers at Bluff lake as late as September 3, when the full song was also heard. Specimens taken August 29 are in complete fall plumage. On the north side of Sugarloaf from August 19 to 21 a few were noted at 8500 feet altitude. But that region was too dry, as the species prefers the neighborhood of streams or cienagas.

The Stephens fox sparrow was an inhabitant of the upper

edge of the Transition zone, and the lower border of the Boreal. Its distribution seemed to be co-extensive with that of the chinquapin (*Castanopsis sempervirens*), provided that there was water in the near vicinity. These birds are like song sparrows in so many ways that it seems strange that they should be allotted to a separate genus.

Since only the worn breeding plumage has been described, as far as I am aware, I take this opportunity of offering a detailed description of the fresh fall plumage and also the juvenal. It will be remembered that there is in this genus but one moult per year, after the post-juvenal, and that, as shown from my series of forty-two skins of *Passerella stephensi*, takes place during August. In naming the color shades I follow Ridgway's "Nomenclature of Colors."

Male, adult (as determined by skull characters); No. 7311, Coll. J. G.; Bluff lake, August 29, 1905.—This bird is in full newly-acquired annual plumage. The whole dorsum, top and sides of head and neck are uniform clear slate-gray with a faint hair-brown cast. The upper tail-coverts and exposed surfaces of tail and wings are dusky walnut brown, brightest on the edge of the feathers. A spot on each side of forehead, shaft streaks in the auricular and loreal regions, and whole lower surface white; except that the feathers of the crissum are dark hair-brown, broadly margined with pale buffy white; and the whole breast and throat are flecked rather profusely with abrupt deltoid spots at the tips of the feathers, of the same color as the dorsum; these spots are smallest in the throat and even wanting altogether on many of the feathers of that tract; they are largest on the sides and more of a longitudinal cuneate form, while on the flanks the extreme is reached in that the feathers are broadly streaked with dark hair-brown and margined with a lighter shade of the same; in the maxillary region the many deltoid spottings are agglomerated into a mass; in the lower center of the jugulum several feathers have their terminal spots extended over the whole ends of their inner webs, the combined result being a pectoral spot conspicuous at a distance, as with the song sparrows; the bill is dusky olive above and dusky straw-yellow beneath towards base.

Birds-of-the-year in full first annual plumage differ from the above described only in being less of a clear slate-gray dorsally, there being a slightly more hair-brown cast to the dark parts of the plumage generally; the wings and tail are slightly brighter, being left over from the juvenal crop of feathers.

The spring or nuptial plumage of this species is the same as the fresh fall (annual) plumage described above, except for changes due to fading and abrasion. Taking as an example No. 6547, male, South Fork, 8500 feet, June 27, 1905: The wings and tail are paler, more of a prouts brown shade, evidently due to fading; the dorsal slatiness is not quite so clear, due both to fading and abrasion; the spots below are much smaller, and actually fewer in number, for abrasion has removed a certain amount of the ends of the feathers, so that the originally small spots have disappeared altogether, and the rest are much smaller; in some cases the centers of the ends of the feathers have worn back farther than the lateral edges, so that the remainder of the original deltoid spot has become harpoon-shaped, the point of the harpoon of course anteriorly directed; as is usual with ground-and-grass-frequenting birds, the ends of all exposed feathers are much frayed.

Female, juvenal (tail- and wing-quills not yet fully grown out); No. 6732; Bluff lake, July 16, 1905. The body-plumage has the usual soft fluffy texture, common to this stage. The wing- and tail-quills, wing-coverts and rump are brighter walnut brown than in the adult; the back and top of head lack most of the slaty color, being dark prouts brown with sooty tips to the feathers; this sootiness is most pronounced on the top and sides of the head; the ground color beneath is dull grayish-white, becoming buffy posteriorly; the crissum is clear cream-buff without any markings; the deltoid markings of the adult over the breast are replaced by smaller, less clear-cut terminal spots, which become narrow shaft-streaks on the flanks; the under surface of the juvenal thus presents a dull brownish mottled appearance rather than a white surface flecked with clear-cut deltoid slaty spots.

It may be suggestive to note that in its brighter brown color on wings and tail the young of this species approaches the adult

condition in *Passerella iliaca iliaca*, whence it might be inferred that *iliaca* is more nearly like the ancestral stock of *stephensi*.

Passerella stephensi is the largest of any of the nine recognized forms of *Passerella*; the bill is proportionately much larger—a huge affair, in fact, almost as bulky as that of the black-headed grosbeak. The following measurements in millimeters of a few selected adults show extreme and average dimensions:

No.	Sex	Wing	Tail	Culmen	Bill along Ramus of Lower Mandible	Depth of Bill at Base
6547	♂	87	95	15	17.4	14
6800	♂	87	99	15.2	17.5	14.6
7311	♂	88	101	14.4	15.7	13.8
6775	♂	88	99	15	17	14.5
6874	♀	82	90	14.3	16.7	13.6
6561	♀	85	92	15	17.4	14
6755	♀	84	98	14.2	16.9	13.6
6510	♀	84	91	14.6	17.2	14

***Pipilo maculatus megalonyx* (Baird).** Spurred Towhee.

This bird was a characteristic inhabitant of the Upper Sonoran scrub oak belt. It was found on the south side of the ranges as high as 7000 feet. A few were seen as far up the Santa Ana as the mouth of Fish creek, 6500 feet.

A nest containing four eggs was found near the "Cedar Cabin," 5500 feet altitude, on the Santa Ana, July 14, 1907. It was in a depression in the ground at the base of a sage and consisted of weathered grasses and cottonwood bark strips, lined with fine round grasses. There were three husky looking young in this nest ten days later and these had left the nest by July 27. On the opposite side of the sage stalks, and only seven inches from the occupied nest, was another very similar nest, somewhat dilapidated, doubtless used the previous year. (See pl. 16A.)

That the young-of-the-year are inclined to wander is shown by an occasional straggler noted out of the usual range of the species. For instance a full-grown juvenal was taken on July 27, 1905, between Bluff lake and Bear lake in a chinquapin patch. The species was sparingly met with in the pinyon belt, being noted around Doble, north slope of Sugarloaf, and at Cactus Flat. Several juvenals were seen at Cushenbury springs on the edge of the desert early in August. Six specimens were taken.

Pipilo crissalis senicula (Anthony). Anthony Towhee.

Anthony towhees were seen only on the Pacific side of the mountains in the main part of the brush belt. I saw four individuals on the north side of the upper Santa Ana, at about 5500 feet altitude, August 5, 1907, this being the highest point of record. A single pair were seen near Seven Oaks 5000 feet altitude, July 9, 1905; and a pair with full-grown young were seen at Clarke's ranch, nearly 5000 altitude, September 4. One individual was seen near the mouth of Foresee creek July 13. Further down toward the mouths of the Santa Ana and Mill creek the species was more common. It seems to be strictly an Upper and Lower Sonoran species.

Oreospiza chlorura (Audubon). Green-tailed Towhee.

Green-tailed towhees were common birds of the Transition zone, especially in its upper half. A few were taken on the desert side of the mountains in the piñon belt; but this was late in summer, when those noted there may have come down from their breeding grounds higher up. Several individuals of this species were noted in the vicinity of Dry lake, 9000 feet altitude, which was the highest station. They were there in the manzanita brush (Transition) on a south-facing slope. Young were noted there in July. On the north side of San Bernardino peak, 7000 to 8500 feet altitude, they were common July 12, 1905. Along the upper Santa Ana, above the 5500-foot contour elevation, green-tailed towhees were fairly common breeding birds. A nest found June 16, 1907, near the mouth of the South Fork was built in a slight hollow in the ground at the base of a small and scraggly specimen of the sage (*Artemisia tridentata*). This was in an open space on the cañon bottom fully twenty feet from any more pretentious bush, such as we had expected to find this bird selecting as a shelter for its home. The rim of the nest was flush with the surface of the ground, and almost touching the main stalks of the sage which partially overhung it. The nest consisted of a basement-formation of weed stems, coarse grasses and some strips of cedar bark, with a lining of fine brown plant stems. The nest held four young about half grown. The

parents showed mild solicitude, by uttering their kitten-like mew, varied with the sharp "peep," from a neighboring bush.

These birds were quite plentiful at Bluff lake among the brush patches, where many small young were noted in July. They were also noted at Doble, and Saragossa springs (at the northeast and northwest sides of Gold mountain); and they were actually abundant at the north base of Sugarloaf, 7500 feet altitude, from August 19 to 23, 1905. Here they were feeding on service-berries in company with many other birds. Specimens taken at this time were in various stages of the fall moult. Some individuals, both adult and young, had completed the fall moult by August 21. When we left Bluff lake September 4, green-tailed towhees were still in evidence, though quiet and less noticeable than in July. Thirty-eight skins in all were obtained.

***Zamelodia melanocephala capitalis* (Baird).**

Pacific Black-headed Grosbeak.

The black-headed grosbeak was common along the Santa Ana near Seven Oaks in June and July. A nest was found there June 13, 1905, ten feet above the ground in a willow. It contained four eggs in which incubation was far advanced. Another nest was found June 14 containing three fresh eggs. Grosbeaks were also seen in the breeding season along the upper Santa Ana as high as the mouth of the South Fork, 6200 feet altitude. They also became quite common in that section after the middle of July. The species was not met with elsewhere until late summer. On the desert side of the mountains migrants, presumably, were fairly common in August, 1905. They were noted from the 11th to the 16th at Cactus Flat, and Cushenbury springs. The species was also noted at the north base of Sugarloaf, 7500 feet, on August 21. Eight specimens were obtained.

***Passerina amoena* (Say).** Lazuli Bunting.

All along the Santa Ana cañon from its mouth near Mentone up to Big Meadows, 6800 feet altitude, nearly at its head, lazuli buntings were conspicuously common. Several nests were found in the vicinity of Seven Oaks and Fish creek. One on June 16, 1905, contained three fresh eggs, and another on July 10 (1907)

contained three heavily incubated eggs. Another June 13, held four small young. The nests were all located in the cañon bottom in rose bushes or sage, six inches to three feet above the ground. The lazuli bunting was also seen near the head of the South Fork, at nearly 8500 feet altitude, though only once, and the bird may have been a straggler. It was common in migration at Cushenbury springs and Cactus Flat on the desert slope of the mountains, August 9 to 18, 1905. Nineteen examples were taken. (See pl. 16b.)

Piranga ludoviciana (Wilson). Western Tanager.

The western tanager was a common species throughout the Transition zone, being perhaps most numerous at its lowest border. It was numerous along Mountain Home cañon, and along the upper Santa Ana from Seven Oaks to Fish creek and South Fork cañons, where it was noted as high as 8000 feet altitude. A nest was found at the mouth of Fish creek, 6500 feet, on the 17th of June, 1905. This nest was twelve feet from the ground at the end of a drooping branch of the Jeffrey pine, and contained four eggs in which incubation was at an advanced stage. Another nest, found June 13, 1906, was thirty feet from the ground in a silver fir, and held three fresh eggs.

The species was not seen above the fir belt at any point; but toward the latter part of August immature individuals were noted down into and below the pinyon belt. At Cactus Flat, August 14 to 17, and at Cushenbury springs August 13, 1905, many tanagers were seen migrating; and again, August 21, at the north base of Sugarloaf, many were observed. In July tanagers were moderately common at Bluff lake and around Bear lake. At the latter place they were feeding upon the berries of the western juniper. None of the species were seen in the mountains anywhere after August 22. Nine specimens were obtained.

Progne subis hesperia Brewster. Western Martin.

We were surprised to find the western martin a very rare species in the San Bernardino mountains. In fact we saw it but once, near the east end of Bear lake on August 2, 1905, when a

family of five appeared near camp, circling about and alighting on the bare branches of a dead pine, and uttering their usual full warbling notes.

***Petrochelidon lunifrons* (Say).** Cliff Swallow.

Cliff swallows were noted in rather small numbers in Bear valley. A colony had built their nests on the trunk of a live yellow pine near Bear lake, and through the kindness of Prof. H. B. Perkins I am able to present the accompanying photo of it. (See pls. 18, 19.) Several nests were seen on a mill-building at Gold mountain, and a few birds were nesting on the rocky wall of the lower Santa Ana cañon, near the narrows. Many cliff swallows, mostly young-of-the-year, were coursing over the meadow near Seven Oaks, July 15, 1907; many were perching on bushes on the hillsides, twittering loudly. A great many were seen migrating at Cushenbury springs August 10 to 14, 1905; and the last for the season at the north base of Sugarloaf, 7500 feet elevation, August 20. They were not seen at a greater altitude anywhere than the last named station.

***Hirundo erythrogaster palmeri* Grinnell.**

Western Barn Swallow.

Barn swallows were seen only after the fall migration had set in. At Cushenbury springs, at the desert base of the mountains, August 13 to 14, 1905, several were seen flying about over the pasture, and an immature male was taken. Again, on August 21, I saw three barn swallows flying southeast over the cienega, 7500 feet altitude, at the north base of Sugarloaf.

***Tachycineta thalassina lepida* (Mearns).** Violet-green Swallow.

Violet-green swallows were more abundant than any other species of swallow in the region covered. They were not seen above nor much below the Transition zone. Large numbers were nesting in the vicinity of Seven Oaks and Fish creek, where nests were examined containing young. These nests were, without exception, in old woodpeckers' excavations in dead pines. One nest on the Santa Ana close to the mouth of Fish creek was looked into July 11, 1907. It was a very scanty lining of weathered

grasses and a few feathers in a cavity of a rotten pine stub, eight feet above the ground. There were three half-grown young and one infertile egg.

Many adults and full-grown young were found congregated about the shore of Bear lake July 30 to August 2, 1905. On the bare branches of one dead pine on the north shore of the lake, July 31, hundreds (without exaggeration) of violet-green swallows were perching, mostly young-of-the-year. Individuals were constantly coming and going, and occasionally nearly the entire flock would launch out with loud twitterings, only to gather again within a few minutes. It made me dizzy to watch the restless throng. A similar gathering, though on a smaller scale, was witnessed near the South Fork of the Santa Ana, July 24, 1906.

This species was common about the cienaga at the north base of Sugarloaf, August 19 to 23, 1905; and they were still numerous in the vicinity of Bluff lake up to August 31st. Five examples were taken.

Riparia riparia (Linnaeus). Bank Swallow.

The bank swallow was observed only at Cushenbury springs, 4000 feet, where it was seen migrating on August 13, 1905. An immature male was taken.

Stelgidopteryx serripennis (Audubon).

Rough-winged Swallow.

Four swallows of this species were seen in flight over the wash at the mouth of the Santa Ana, near Mentone, June 11, 1905. It seems probable that they were nesting in the vicinity. The species was again noted at Cushenbury springs, August 13, when an immature female was taken, and several more were seen flying over the meadow, evidently in migration. Two were also seen flying southeast over Cactus Flat, August 16.

Phainopepla nitens (Swainson). Phainopepla.

August 16, 1905, I saw a straggling flock of about twenty-five phainopeplas flying southeast high overhead. This was at Cactus Flat, 6000 feet elevation, on the desert slope of the mountains. The course of the flight suggested that the birds were on their

way from the Mojave desert over to the Colorado desert by the way of Morongo pass. August 13, 1905, a lone individual of this species paid a visit to the peach orchard at Cushenbury springs. July 16 and 23, 1907, several were noted in the wash at the mouth of Mill creek, at the Pacific base of the mountains.

Lanius ludovicianus gambeli Ridgway. California Shrike.

Butcher-birds were common on the wash at the mouth of the Santa Ana, near Mentone, July 11, 1905; and again at the desert base of the mountains, at Cushenbury springs, August 10 to 14, several were seen. None were noted in the mountainous regions between these two stations.

Vireosylva gilva swainsonii (Baird).

Western Warbling Vireo.

The western warbling vireo was a common species on Mill and Mountain Home creeks, and all along the Santa Ana cañon from its mouth to its source at Big Meadows. A nest containing four considerably-incubated eggs was found in the lower Santa Ana July 11, 1905. This nest was fifteen feet above the ground in an alder. Another nest was found in an apple tree at Clarke's ranch, June 13, six feet from the ground. This contained three somewhat incubated eggs. Several other nests containing from two to four eggs were found during June along the upper Santa Ana, from Seven Oaks to Fish creek. These were in cottonwoods varying from six to twenty feet above the ground. The nests were all much alike in construction, being composed externally of plant fibers and bleached grasses bound together with spider web and lined internally with fine round grass stems. One nest had a large amount of paper fragments woven into the walls.

The eggs of this species are perceptibly smaller than those of the Cassin vireo, with the markings more minute and fewer.

A pair of warbling vireos were seen at the South Fork cienaga, 8500 feet altitude, June 29, 1905, which we thought had a nest near by. This was the highest point at which the species was noted. At Bluff lake a few were seen in July, 1905, and again the last three days in August. At Cushenbury springs several

were noted August 11 to 13 evidently in migration; also at Cactus Flat, August 14 to 16, and at the north base of Sugarloaf, August 21. Fifteen specimens of this vireo were taken.

Lanivireo solitarius cassinii (Xantus). Cassin Vireo.

This vireo ranged well up through the Transition zone chiefly along cañons. It was nesting commonly along Mountain Home creek and along the upper Santa Ana from Seven Oaks to Fish creek, then up this latter stream to nearly 7000 feet altitude. A great many nests were found in this region. The nests were of the usual pensile type, common to vireos generally, and averaged in height from the ground (estimated) eight feet, extreme heights being two and one-half feet and fifteen feet. Perhaps golden oaks at lower levels and cottonwoods at higher altitudes were the trees most often selected; but nests were also found in the incense cedar, silver fir, Jeffrey pine, black oak, and alder.

A single nest and set may be described as typical of all. The nest was twelve feet from the ground in the lower outer foliage of an incense cedar growing among firs at the mouth of Fish creek. The nest was suspended by the rim, on opposite sides, from a V-forking twig. Externally the nest consists of gray inner willow bark, weathered grasses, bits of plant down, spiders' egg cocoons, and plenty of web, so that the parts of the mass adhere together tenaciously. The material constituting the inner lining is wholly fine, brown, round plant stems. The dimensions of the nest-cavity are: depth 1.25 inches, diameter 2.02. The eggs measure in inches $.77 \times .56$, $.78 \times .57$, $.79 \times .56$, and $.77 \times .56$. They were plain white, sparsely marked with bold smallish spots of burnt umber and drab. These markings are mostly congested into a belt about the larger end.

Small young were found near Skinner's on Mountain Home creek, June 9, 1906; and a set of four fresh eggs at the mouth of Fish creek, June 29, 1906. These indicate the range of the breeding season. Four is the usual full set of eggs laid, occasionally only three.

We found a few Cassin vireos at Bluff lake in July, 1905, and again the last three days of August and up to September 3. Several were also seen at the north base of Sugarloaf, August 19

to 22. But the species seemed to shun the dryer regions, even after the late-summer migratory movements had set in. It was found along Foresee creek, up to 6000 feet altitude, at the north base of San Bernardino peak, on July 12. Thirty-one specimens of this vireo were obtained.

Vireo huttoni huttoni Cassin. Hutton Vireo.

Upon only one occasion did I detect the presence of the Hutton vireo anywhere in the region. This was across the river from Schneider's ranch, down the Santa Ana from Seven Oaks about two miles. My attention was attracted by the characteristic note of this vireo—"zee'-y, zee'-y"—and without any difficulty I obtained a good view of the bird, to my mind confirming the record. I was on horseback at the time, and without means of collecting the bird. The locality is about on the boundary between the Upper Sonoran and Transition zones. The species in southern California belongs strictly to the Upper Sonoran, on the Pacific side of the mountains.

Vireo belli pusillus (Coues). California Least Vireo.

This Lower Sonoran species was found only at the mouth of the Santa Ana, where an adult male was taken in a patch of poison oak and water-mootie, and others heard. These were well within the cañon mouth.

Helminthophila rubricapilla gutturalis (Ridgway).
Calaveras Warbler.

I feel satisfied that this warbler does not occur as a breeding bird in the San Bernardino mountains, as we kept a special lookout for it on the higher cienagas in June and July, without success. The species made its appearance the last of August as a migrant. The first were seen and taken at Cactus Flat, 6000 feet, August 17, 1905. They were common among the tamarack pines on the summit of Sugarloaf, 9800 feet, August 19. At Bluff lake, August 30 to September 3, the species was fairly common in the willow thickets. Five specimens were secured, four birds-of-the-year, in full first winter plumage, and one adult male, the latter being one of those secured at Cactus Flat, August 17.

***Helminthophila celata lutescens* (Ridgway).**

Lutescent Warbler.

Lutescent warblers were evidently breeding on the upper Santa Ana in the vicinity of Seven Oaks, as a nearly full-fledged juvenal was taken there June 13, and several more were noted the first of July. Adults and young were seen as far up the Santa Ana as the mouth of Lost creek, 6400 feet altitude, where an immature specimen was taken July 31, 1906. In the vicinity of Bluff lake birds-of-the-year in various stages of moult were common in the willow thickets July 17 to 26, 1905. I hardly think that these were reared there, they having probably moved up from the lower cañons. The species was still common around Bluff lake up to September 3, though then in full winter plumage. In company with other warblers in roving bands it was common on the summit of Sugarloaf, 9800 feet altitude, August 19; and several were seen about a spring on the north slope of Sugarloaf on August 22. All of the eighteen specimens secured are strictly referable to *lutescens*.

***Dendroica aestiva brewsteri* Grinnell.**

California Yellow Warbler.

This species was common in June along the Santa Ana among the willows, alders and cottonwoods as high as Seven Oaks, 5000 feet altitude. It was also noted on Mill creek and doubtless occurs in most of the lower cañons on the Pacific side of the mountains. A nest was found near Seven Oaks June 13, 1905. It was nine feet above the ground in an alder and contained four slightly incubated eggs. An immature male, already in complete winter plumage, was taken at Fish creek, 6500 feet altitude, July 4, 1905; and later in the season the species was liable to be found in migration almost anywhere. At Cushenbury springs, at the desert base of the mountains, yellow warblers were common in the cottonwoods, August 11 to 14. They had also appeared commonly about the springs at Cactus Flat, August 15 to 17; and in the willow thickets at the north base of Sugarloaf, August 20, many were noted. The seven specimens secured all belong to the race *brewsteri*, which is easily distinguishable from the bird

of the Rocky Mountains and eastward. I cannot see why the existence of this race should be ignored by anyone who has taken the pains to compare a reasonable amount of pertinent material.

Dendroica auduboni auduboni (Townsend).

Audubon Warbler.

This was one of the most abundant birds of the San Bernardino mountains, and was widely distributed from the lower edge of the Transition zone up through the Boreal. It was numerous and nesting about Dry lake, 9000 feet altitude. On June 18, 1905, it was seen on the north slopes of San Gorgonio peak almost to timber limit, 10,500 feet elevation, at least. It was likewise met with commonly among the tamarack and limber pines about the summit of San Bernardino peak, July 12. Along the upper Santa Ana from the lower limit of the Jeffrey pines, about 5500 feet, up into the fir belt, Audubon warblers were numerous in June and nesting, but because of the difficulty of locating their nests we found only five. A nest was found in Fish creek cañon June 21, 1905, with half-fledged young. It was twenty feet above the ground in the thick foliage of a short drooping fir bough. It was compactly composed of weathered grasses, frayed-out plant fibres, and tail and wing feathers of juncos and other small birds. Internally it was thickly lined with mountain quail feathers, some of the chestnut-colored ones sticking above the rim conspicuously. This feather feature seems to be characteristic of Audubon warblers' nests, as it was noticeably present in all those we saw. Another nest was found June 10, 1906, on the Santa Ana, near our South Fork camp. This was twenty-five feet from the ground on one of the lowest branches of a yellow pine. The nest was ensconced within a tuft of needles five feet out from the trunk of the tree. This nest was composed after the same fashion as the other, and held four considerably incubated eggs. A third nest was found at Dry lake, June 14, 1906. This was at the end of a drooping tamarack pine branch, and held four fresh eggs.

We were astonished to find one case of the Audubon warbler's nesting low down, almost at the upper edge of Sonoran. This

was at Skinner's on Mountain Home creek, near its mouth, about 4000 feet altitude. The nest was not more than 100 feet from Harvey's dining-room, and was snugly tucked away in a small clump of mistletoe on an alder branch twelve feet above the ground. The female was sitting, and the tail protruding over the edge of the nest was sufficient identity, though to cinch the record I took the bird. This was the only bird of this species even seen below the pine belt. The nest contained three eggs in which incubation was far advanced, and was constructed as usual, there being a considerable proportion of feathers from Harvey's chickens.

The eggs of the Audubon warbler are distinctively colored. The ground color is distinctly pale Nile blue, though so pale as to warrant the description grayish-blue. The markings are chiefly in dense rings about the large ends of the eggs, and vary from large blotches to fine points. These markings vary in color from bistre through drab and eery drab to pale lavender. Three sets measure as follows: .72×.55, .70×.54, .70×.53; .69×.55, .69×.56, .69×.55, .69×.55; .66×.52, .69×.53, .68×.54, .68×.52.

Audubon warblers were not seen as low as Seven Oaks, though a short distance south of there, a few hundred feet higher, on the north base of San Bernardino peak they were numerous. At Bluff lake the species was abundant in July, and again the last of August and up to September 4, when we left. The first young out of the nest were noted there on July 17, and within a week many noisy families congregated in the willows about the meadows. A youngster barely half-grown was found on the ground July 24. The juvenal plumage is streaked dusky on a whitish ground, without a trace of yellow. But this plumage is of very short duration, not more than fifteen days, I should say, for it is then replaced by the first winter plumage, such as is worn by the majority of individuals we see in the valleys of California all winter. The majority of Audubon warblers at Bluff lake, September 1 to 3, judging from those shot, were adults. This accounts for the fact that all those shot down on the lower meadows, at Sugarloaf cienaga, for instance, were birds-of-the-year; and it lends support to the idea that it is really the young birds that become restless first and leave the breeding grounds.

I several times saw what I thought a significant performance: an adult bird apparently resenting vehemently the food-petitioning advances of immatures, flying at them and driving them off. Perhaps this discouraging procedure on the part of the parents hastens the early departure of the young, which then invade beyond the confines of their birth-locality, in search of new forage.

Adults were beginning to moult July 24. The first young out of the nest were seen on the upper Santa Ana in 1906 on July 8; and in 1907 on July 3. The young have a loud impatient twittering call, which they utter as they follow their parents about, and this note readily calls one's attention to them. Audubon warblers were common around Bear lake, and the meadows in Bear valley, July 28 to August 3, 1905, but were not seen in the piñon belt or anywhere on the desert slope of the mountains. All over the north slopes of Sugarloaf, from the summit, 9800 feet altitude, down to the cienaga at the north base, 7500 feet, Audubon warblers were numerous, August 19 to 23, nearly all then being in full winter dress. A series of fifty-one specimens of this species was obtained to show moults and plumages.

***Dendroica nigrescens* (Townsend).**

Black-throated Gray Warbler.

This warbler appeared to be confined exclusively to the golden oak belt during the breeding season. It was first met with in the lower Bear creek cañon near its confluence with the Santa Ana, June 12, 1905, when a nest with young was found. In the vicinity of Seven Oaks the species was very common and in full song June 13 and 14. In the same locality July 7 to 12 families of moulting adults and young were frequent. A pair were seen on the south side of Sugarloaf in a tract of golden oaks June 24, 1905, and others in the same vicinity July 11, 1906. By the last of July birds-of-the-year began to scatter out generally over the mountains. They appeared commonly along the upper Santa Ana by July 24, 1906. One was taken at Bluff lake July 25, 1905, and many were seen around Bear lake July 31 to August 2. They were frequently met with in the piñon belt about Doble,

August 5 to 9, and at Cactus Flat August 15 to 17. On the summit of Sugarloaf August 19, 1905, and at the north base of Sugarloaf the same day, several were noted. The species was also seen at Saragossa springs, near Gold mountain, August 26. Thirty specimens in all were secured.

Dendroica occidentalis (Townsend). Hermit Warbler.

An adult male of the hermit warbler was taken and another individual seen early in the morning of September 3, 1905, in a willow clump near Bluff lake. These were doubtless migrants, for we failed to find the species anywhere earlier in the season.

Seiurus noveboracensis notabilis (Ridgway).

Alaska Water-thrush.

On August 16, 1905, I obtained an example of *Seiurus noveboracensis notabilis* which provided the second record known to me for this State. The bird was flushed from a tangle of bushes which surrounded a spring in a ravine, a hundred yards or so back of Jim Johnston's house at Cactus Flat, 6000 feet elevation.

The region is an arid one, and I was at the spring on purpose to scrutinize the hordes of birds which were constantly visiting it for a drink and a bath. A good part of these were transients, which reminds us again that to stand the best chance of finding northern stragglers one must strike the fall migration early in August.

The water-thrush was among a throng of warblers and small sparrows, several of the latter in streaked juvenal plumage, and I did not recognize it as anything noteworthy, until it flew up out of the shade and perched with other small birds, drying themselves in the open branch-work of a fire-killed oak. Then my attention became fixed on it because of the peculiar recurrent dipping movement of its body, and its identity flashed into my mind. I promptly "auxed" the bird, and found upon skinning that it was a bird-of-the-year, as shown by the large "windows" in the skull yet ungranulated. To be more explicit, the specimen (No. 7157, Coll. J. G.) is in complete first-winter plumage. It is precisely like examples from northern Alaska in both coloration and measurements.

Oporornis tolmiei (Townsend). Tolmie Warbler.

We failed to detect the presence of this warbler except as a migrant; I obtained no evidence whatever that the bird breeds anywhere in the region. The first was taken at Cushenbury springs, at the north base of the range, August 13, 1905. Several were noted in the brush at Cactus Flat, 6000 feet, August 15. On the north side of Sugarloaf many were seen in the chinquapin thickets at 8500 feet altitude, and down among the service-berry bushes and willow thickets at 7500 feet, August 19 to 22. The species was common in the vicinity of Bluff lake August 28 to September 3. The nine specimens of the Tolmie warbler secured are all birds-of-the-year, in their first winter plumage.

Geothlypis trichas arizela Oberholser. Pacific Yellow-throat.

A single immature male was taken and others heard in a small alfalfa patch at Johnston's ranch on Cactus Flat, 6000 feet, August 16, 1905. These were doubtless migrants.

Wilsonia pusilla chryseola Ridgway.

Golden Pileolated Warbler.

All of the thirteen specimens secured in the San Bernardino mountains, both breeding birds and migrants, are referable to this race. Golden pileolated warblers were common in willow thickets at the head of the South Fork of the Santa Ana, 8000 to 8500 feet elevation, June 27 to 30, 1905. Males were then in full song, and from their behavior we had no doubt that there were nests close at hand, although we failed to find any. This was the only place where we were sure this warbler was breeding. This is curious; for it makes the species in these mountains a strictly Boreal bird. Yet it breeds abundantly in the nettle and willow thickets in the lowlands (100 to 700 feet altitude) of Los Angeles county, certainly not higher than Upper Sonoran. I have carefully compared specimens from the two places and fail to see the slightest differences.

As a migrant the species was distributed widely. On July 31, 1905, the first transients were seen on the north side of Bear lake and a bird-of-the-year in complete winter plumage was taken.

The same date in 1906 the first was taken on the upper Santa Ana near our South Fork camp. The species was observed on Sugarloaf August 19, 1905, where it was common among the tamarack pines on the very summit in mixed companies of other warblers. It was also numerous August 20 to 23 in the willow thickets at the north base of Sugarloaf. Around Bluff lake August 28 to September 3, the species was still more plentiful.

Cinclus mexicanus unicolor (Bonaparte). American Dipper.

Dippers were seen only on the head waters of the Santa Ana, where four examples were taken. A family of full-grown young were seen near the head of the South Fork, 8500 feet altitude, June 29, 1905. June 19, 1907, a family of young with their parents were followed along the ravine, then containing a considerable stream, which leads down from Dry lake and carries its overflow. This was near 9000 feet altitude, the highest we saw the species in the region. The habit shown by this bird of assuming a motionless, statuesque, attitude on a rock renders it easily overlooked until one happens to approach close enough to scare it into movement, when it flies rapidly off with sharp clucking notes.

Mimus polyglottos leucopterus (Vigors). Mockingbird.

Mockingbirds were seen at Cushenbury springs, 4000 feet altitude, which is in the Lower Sonoran zone at the desert base of the mountains. Not over three individuals were seen, of which one, a full-grown juvenal, was taken August 12, 1905. The species was also noted at the Pacific base of the mountains, near the mouth of the Santa Ana, June 11.

Toxostoma redivivum pasadense (Grinnell).

Pasadena Thrasher.

Several Pasadena thrashers were noted along the road through the scrub oak belt between Bear creek and Clarke's ranch, 3500 to 4500 feet altitude, June 12, 1905. And on August 5, 1907, I saw a pair and heard others in the brush belt on the north wall of the upper Santa Ana, at 5500 feet altitude. These were the

only places in the San Bernardino mountains where the species was detected by our party. Yet it doubtless occurs in much of the Upper Sonoran chaparral belt on the Pacific foothills of the range.

***Heleodytes brunneicapillus couesi* (Sharpe).** Cactus Wren.

Cactus wrens were common at the mouth of the Santa Ana cañon, near Mentone, June 11, 1905, when several nests were noted and a bird taken. One nest contained five considerably-incubated eggs, and another held one fresh egg. The species was also noted in the wash at the mouth of Mill creek, July 16 and 23, 1907. At the desert base of the mountains, at Cushenbury springs, August 10 to 14, several were seen among the tree yuccas and a moulting juvenal was secured.

***Salpinctes obsoletus obsoletus* (Say).** Rock Wren.

The rock wren was the most widely distributed of any bird of the region. Even during the breeding season it seemed utterly to ignore zone limitations. It was found in full song June 11, 1905, along the water flumes in the lower Santa Ana cañon, almost at its mouth, and several were seen near the mouth of Mountain Home creek, June 9, 1906. On the very summit of San Geronio peak, June 18, 1905, a pair held undisputed possession of a retreat among the broken blocks of a granite ledge projecting above the snow banks. On the 29th of June, as well as on other occasions, adults and full-grown young were very conspicuous on the same mountain. On the summit of San Bernardino peak on July 12 full-grown young were actually abundant. Their tameness and curiosity were remarkable. When I sat down for lunch they came up almost within arm's length. They crept about among fallen logs in the tamarack and limber pine forest, as well as among the rocks of the barren ridges. They were then quiet, save for the "trill" note at intervals. Their inquisitiveness made it difficult to secure specimens. It was hard to get far enough away to shoot, without mutilation. As fast as I retreated they would approach, squatting and bowing, as is their habit, at every change of position.

In the vicinity of Bluff lake the species was common; also around the dam at Bear lake. It was found on the summit of Sugarloaf July 11, 1906, and August 19, 1905. At Doble, Gold mountain, Cactus Flat, in Holcomb valley and on the desert around Cushenbury springs, rock wrens were very common in August. By the last of this month birds were in the full winter plumage, which is then very abundant, loose and fluffy. Twenty specimens of this wren were obtained.

***Catherpes mexicanus punctulatus* Ridgway.**

Dotted Cañon Wren.

Dotted cañon wrens were noted in fair numbers in the lower Santa Ana cañon June 11 and 12, 1905, and again in the same locality September 4. One was seen in the sandstone quarry near the mouth of Mill creek cañon, July 23, 1907. A pair were seen in Foresee creek cañon, on the north side of San Bernardino peak, about 7000 feet altitude, July 12. A full grown juvenal was taken in a rock-pile near Bluff lake, July 15; and several were observed on rocky hillsides and in ravines in the vicinity of Cactus Flat, on the desert slope. This species seems to belong chiefly to the Upper Sonoran zone, though apparently ranging up through Transition on suitable ground, as well. The species was not met with frequently enough in the San Bernardino mountains, however, to warrant any decided conclusions in this regard.

***Thryomanes bewickii charienturus* Oberholser.**

San Diego Wren.

The San Diego wren was common in the scrub oak belt on the Pacific side of the mountains. Along Mill creek and the lower Santa Ana it was numerous; less so at Clarke's ranch and in the brush belt near Seven Oaks. A full-grown juvenal was taken at the latter point July 7, 1905. One individual was seen as high as 6700 feet altitude, in a tongue of the Upper Sonoran zone on the south face of Sugarloaf, July 3, 1905. On the desert slope of the mountains at Cactus Flat, 6000 feet, and at Cushenbury springs, 4000 feet, several San Diego wrens were seen in August. Six specimens in all were taken.

Troglodytes aëdon parkmanii (Audubon). Parkman Wren.

The Parkman wren was met with commonly in June and July of each year in the vicinity of Seven Oaks, where broods of full-grown young were often seen. The species was also nesting in the lower part of Mountain Home cañon, where, near Skinner's, June 9, 1906, a nest with four eggs was found in a hole in an alder seven feet from the ground; and another nest with young was located. I do not believe the species breeds much above the upper edge of Upper Sonoran—the lower Transition at highest. Early in July a general scattering began, and Parkman wrens were noted almost everywhere we went thereafter. In Foresee creek cañon, up to 7000 feet altitude, several were seen on July 12. By July 15, 1906, they had appeared commonly along the upper Santa Ana, and its tributaries, one being seen as high as the South Fork cienega, 8500 feet. At Bluff lake Parkman wrens were common in the willow thickets in July and up to September 3, 1905. They were also numerous in August at the north base of Sugarloaf, about springs at Doble, Cactus Flat, and Cushenbury springs. A series of twenty-one examples were taken.

In all these localities they were doubtless purely migrants. I had in previous years wondered what became of the many Parkman wrens with their large families, which had been reared in the foothill cañons of Los Angeles county. They were wont to forsake the region in July almost completely. It is now plain that there is an upward movement in summer into the higher mountains where food conditions are better at that season.

Certhia americana zelotes (Osgood). Sierra Creeper.

The Sierra creeper was found to be chiefly an upper Transition bird, though it ranged into lower Transition below and into Boreal above. It was very common along the upper Santa Ana and the tributary cañons running down from the San Gorgonio ridge. It was noted at Dry lake, 9000 feet elevation, up to 8500 feet near the head of the South Fork, on the north side of Sugarloaf at 8500 feet elevation, and on San Bernardino peak at the same altitude. It was also common at Bluff lake, both in July and the last of August and the first of September. It was seen

once at Bear lake, July 31, and on the north side of Gold mountain August 26.

A nest was found near the confluence of the South Fork and the Santa Ana on June 26, 1905. It was only three feet above the ground behind a piece of loosened bark of a live Jeffrey pine. The nest was fitted into the narrow crevice and was composed basally of cedar bark and internally of very fine shreds of the inner bark of a dead willow, this being the same material that was found in nests of the wood pewee, gray flycatcher, and lazuli bunting. The nest held six half-fledged young. While we were there one of the parents came with a large white miller. The bird lit on the base of an adjoining tree, then flew to the base of the nest tree and crept up to the nest aperture.

It was in the incense cedars that the majority of creepers' nests were found. While the Sierra creepers themselves were most often seen and heard high above, scaling the massive trunks of the huge firs, pines, and cedars, yet their nests ranged not higher than twenty feet above the ground. Myself and companions examined fully thirty nests, easily discovered after we once learned how to find them, and of these I should judge the average height to have been six feet. In other words, the majority could be at least touched by the hand as we stood on the ground. One nest, as noted above, was only three feet from the ground.

Although the majority of nests found were on cedar trunks, one was on a Jeffrey pine, and at least five were on silver firs. In the latter cases the trees were dead and rotting, for it was only on dead trees that the bark had become loosened and separated enough from the trunk to afford the narrow sheltered places sought by the creepers for nesting sites. But the huge living cedar trunks furnished the ideal situations. For the bark on these is longitudinally ridged and fibrous, and it frequently becomes split into inner and outer layers, the latter hanging in broad loose strips. The narrow spaces behind these necessitate a very compressed style of nest. A typical nest closely studied by me may be described as follows: The material employed externally was cedar bark strips one-eighth to one-half inch in width. This material had been deposited behind the loosened

bark until it packed tightly enough to afford support for the nest proper. The bark strips extended down fully a foot in the cavity, and some of them protruded through the vertical slit which served the birds as an entrance. The main mass of the nest consisted of shredded, weathered inner bark strips of the willow, felted finest internally, where admixed with a few small down-feathers. This nest proper was six inches wide in the direction permitted by the space, and only one and three-fourths across the narrow way. The nest cavity was one and one-third by two and one-fourth inches, so the sitting parent probably always occupied one position diametrically.

No nests with eggs were found later than June 11, but young were found, yet unable to fly, until July 20. Two sets of eggs found on June 11, consisted of four and five eggs, respectively. Broods of young were of three to six individuals, one of the latter number being noted on June 26.

The ground color of the eggs is pure white. The markings are elongated in shape lengthwise of the egg. The brightest markings are burnt sienna, the tint varying from this towards vinaceous as the depth of the markings in the shell-substance increases. The darkest markings average one millimeter in diameter, while the vinaceous ones vary down to mere points. The markings are most crowded around the large ends of the eggshells, and radiate from this pole in lesser numbers towards the opposite pole. The nine eggs are quite uniform in appearance, though certain ones are to be distinguished as more sparsely, more boldly, or more minutely marked. The markings on one set are not so dark as on the other, approaching pale hazel at darkest and ranging to vinaceous-cinnamon.

In shape the eggs of the Sierra creeper vary from ovate to elliptical ovate. The two sets measure, in hundredths of an inch: $.61 \times .45$, $.63 \times .42$, $.61 \times .44$, $.60 \times .44$ and $.56 \times .43$, $.57 \times .44$, $.59 \times .44$, $.55 \times .43$, $.58 \times .43$.

The twenty-two skins of this species secured agree in being slightly larger than birds from the Sierra Nevada, and several have the dorsal white streaks broader. In these respects they show a slight approach toward the race *montana*, of the Rocky Mountain region of the United States.

Sitta carolinensis aculeata (Cassin). Slender-billed Nuthatch.

The slender-billed nuthatch was fairly common wherever black oaks abounded, also among the pines in places much higher. It was often met with along the upper Santa Ana from Seven Oaks up. Around Dry lake as high as 9400 feet altitude, I saw a good many in June and July, and located several nests containing young. These were always in excavations made by the Williamson sapsucker in tamarack pines. The species was fairly common at Bluff lake and around Bear lake, on the north side of Sugarloaf and around Gold mountain. One bird was seen at the spring at Cactus Flat, 6000 feet altitude, August 16, 1905, this being the farthest toward the desert we saw the species. Fourteen specimens in all were secured.

Sitta canadensis Linnæus. Red-breasted Nuthatch.

We agreed that the red-breasted nuthatch was one of the rarest birds in the San Bernardino mountains. The peculiar nasal call-note, so unmistakable when one has become familiar with it, was heard at Dry lake, 9000 feet altitude, on June 21, 1905, on the north side of San Bernardino peak among the silver firs at 7500 feet, July 12, and on several occasions during July at Bluff lake. Finally, on September 2, 1905, I shot a single specimen from a tall pine at the latter place. These birds seemed to prefer the tops of the loftiest conifers, where they were very difficult to discern. In fact, the one secured was the only one that I am sure of having seen.

Sitta pygmaea Vigors. Pigmy Nuthatch.

The pigmy nuthatch was most numerous in the lower Transition zone, in the Jeffrey and yellow pine belt. It was fairly common near Seven Oaks, and up the Santa Ana to Big Meadows. On the south base of Sugarloaf and in the vicinity of Fish creek and South Fork the species was found nesting. Full-grown young were noted in the second named locality on July 9, 1905. On the flat to the west of South Fork, at about 7000 feet altitude, June 12, 1906, a nest was found in a rotten pine stub eight feet above the ground. The cavity seemed to have been excavated by

the birds themselves. Two blows on the stub brought out the setting bird, which at once disappeared. After a while what proved to be the male nuthatch made his appearance with an insect in his mouth, an indication that the male feeds the female on the nest. The nest was a felted mass of rodent fur and plant down. There were seven slightly incubated eggs, measuring in inches: .60×.48, .60×.47, .64×.49, .65×.49, .63×.49, .62×.50, and .65×.48. They are pure white, spotted with hazel and vinaceous-cinnamon. The spottings are most numerous and of largest size over the larger ends of the eggs.

A very few pigmy nuthatches were noted at Bluff lake; but around Bear lake they were decidedly common. On the north slope of Sugarloaf they were common clear to the summit, 9800 feet altitude, August 19, 1905. Many were seen at Saragossa springs on the northwest side of Gold mountain, August 26, but none were seen further towards the desert. Twelve specimens in all were taken.

Baeolophus inornatus murinus Ridgway. San Diego Titmouse.

This race of the plain titmouse was met with in but few places. At Cactus Flat, 6000 feet altitude, two specimens were secured and others seen in a clump of golden oaks on August 16 and 17, 1905. I saw one in a golden oak on the north wall of the upper Santa Ana, about 5300 feet altitude, July 27, 1907. And I heard the note of a titmouse in Mountain Home cañon, August 22, 1907.

Penthestes gambeli baileyae (Grinnell).

Bailey Mountain Chickadee.

The mountain chickadee was found practically everywhere there were coniferous trees. It was most plentiful in the Transition zone, but ranged well above and somewhat below in places. On the upper Santa Ana it was an abundant species, and its clearly-whistled song of four notes, the two first pitched higher than the others, was a very familiar sound during June and July. A nest found June 17, 1905, near the mouth of Fish creek, occupied a vertical slit in a dead black-oak stub. The nest was not more than three feet from the ground and was made of soft,

downy plant fibers, and contained six newly-hatched young. Another nest was found June 21 on a ridge near Dry lake. This was twenty feet from the ground in a dead fir stub, and was encooned behind the loosened bark. It consisted of fur, apparently from the woodrat and chipmunk, and contained five eggs in which incubation was well advanced. Another nest containing seven young was found the same day in a cavity of a pine stub even with the surface of the ground. A fourth nest in the same locality contained six small young. In this case the nest was a felted mass of deer hair and woodrat fur, intermingled with a few feathers. It was in a knot-hole of a dead fir sapling, two and one-half feet from the ground. In 1906, at Dry lake, June 15, a set of five slightly incubated eggs of this species was taken from an old sapsucker hole twenty feet above the ground in a dead tamarack pine. The nest was a large mass of reddish deer hair. All of the eggs of the mountain chickadee I saw up to that time were white, distinctly, though not densely, dotted with pale tints of hazel; but in 1907 I found a set of seven fresh eggs absolutely unmarked, as white as bushtits' eggs. The nest was four feet above the ground in a rotted-out knot-hole of a tamarack pine and consisted of a rather scanty accumulation of fur and down-feathers. This was at about 9200 feet elevation, towards San Gorgonio peak from Dry lake; and there were at the time (June 18) numerous deep snowbanks among the trees of the scattering forest.

Chickadees were noted through the tamarack pine belt as high as 10,000 feet altitude on the slopes of San Gorgonio peak, and on San Bernardino peak to the summit, 10,600 feet. We found the species common at Bluff lake, around Bear lake and to the summit of Sugarloaf. It was common in August in the piñons and chaparral around Doble and Gold mountain, and as far down the desert slope as Cactus Flat, 6000 feet elevation.

The series of twenty-five skins of this species secured present certain slight differences from northern California specimens in that the general size is greater, the bill especially being larger, and the colors more leaden dorsally and along the sides. Hence they agree with the race *baileyae* described by me in *The Condor*, Vol. X, Jan., 1908, p. 29.

Chamaea fasciata henshawi Ridgway. Pallid Wren-tit.

This bird was a characteristic inhabitant of the Upper Sonoran brush belt on the south slope of the mountains. It was noted throughout the chaparral slopes on the north side of the upper Santa Ana from Clarke's ranch, past Seven Oaks, clear to the south face of Sugarloaf, 7000 feet, across which extends a tongue of the Upper Sonoran zone. A pair was also seen in the willow thickets at Bluff lake, July 23, 1905; these were full-grown juvenals and had doubtless wandered over the short distance from the brush on the south side of the mountain. The species was seen on the north base of Sugarloaf, 7500 feet altitude, among the service-berry bushes, on August 19 to 23; and it was fairly common at Cactus Flat earlier in the same month. Four specimens were taken.

Psaltriparus minimus minimus (Townsend).

California Bushtit.

The California bushtit in the nesting season was strictly confined to the scrub oak belt of the Upper Sonoran zone. It was common in this belt near Seven Oaks, 5000 feet, where a nest was found July 12, 1905, with young. July 3 we saw a flock on the south face of Sugarloaf, 6500 feet. At the north base of Sugarloaf, 7500 feet, flocks were seen August 20, 1905; and it was common at Cactus Flat August 15 to 17. The last of July and the first of August, 1906, large companies of bushtits, families of young and adults, appeared along the Santa Ana as high as Fish creek and South Fork. One flock was seen July 30 among the black-oaks and pines above South Fork, at an elevation of fully 7500 feet. These latter records doubtless pertain to birds which had wandered up temporarily during the season of plentiful insect life, from much lower levels. None were seen in the same place during June. Four examples were taken.

Regulus satrapa olivaceus Baird.

Western Golden-crowned Kinglet.

This bird was met with but once, August 19, 1907, near our Cedar Cabin camp on the upper Santa Ana, altitude 5500 feet. I was scrutinizing a mixed company of chickadees, nuthatches,

vireos, and warblers, which were foraging high above in some firs, cedars and pines, on a shaded north slope, when I became aware of the presence of some smaller birds. Two specimens were obtained which proved to be *Regulus satrapa olivaceus*, a species I had never expected to find in the region. There must have been at least eight individuals scattered about through the tree tops, but their great height from the ground prevented my shooting any more. Their occasional faint lispings notes were barely audible above the moan of the pines, and altogether these kinglets were about the most difficult to follow up of any bird met with. One of the specimens (male, No. 7961, Coll. J. G.) is in complete juvenal plumage with the sooty olive crown, and the other (male, No. 7962) is a bird-of-the-year in nearly full annual plumage. I cannot discern the slightest differences between these and corresponding plumages from Sitka and elsewhere in the northwest coast belt.

This constitutes the southernmost record for California, and moreover most certainly marks a breeding station.

***Regulus calendula cineraceus* Grinnell. Ashy Kinglet.**

The ashy kinglet was not common anywhere and might have been easily overlooked, if special pains had not been taken to detect its presence. It was much oftener heard than seen; for the loud ringing song of the male carried a long distance. But it is difficult to discern the singers even when one can trace their notes, for they usually keep far up in the heavy foliated tops of the firs. The species seemed to be confined to the extreme upper Transition and Boreal zones. Kinglets were noted each year in June and July in Fish creek cañon at about 7000 feet altitude. Here in one particular cluster of tall silver firs two male birds¹ could be heard answering one another almost any time. We spent hours watching for clues as to the nesting site, but in vain. The birds were also noted at Dry lake, June 21 and 22, and at the upper South Fork cienaga, 8500 feet altitude, June 27; and at Bluff lake in July and again the last of August the species was with certainty observed. Three males were secured. These specimens present the characters of the race *cineraceus* of the arid mountains of the southwestern United States.

Poliophtila caerulea obscura Ridgway. Western Gnatcatcher.

At Seven Oaks, in the chaparral belt, several gnatcatchers were seen July 9, 1905, and a nest in process of construction located twenty feet up among the bare branches of a dead Jeffrey pine. Both birds were building, bringing material and moulding the nest alternately. The male was singing meanwhile almost constantly.

This species was noted in June on Mill creek. A single gnatcatcher was seen at Bear lake on July 31; and the species was fairly common August 16 to 17 on Caetus Flat, 6000 feet. At Saragossa springs, 7500 feet, two were seen August 26. It was also noted on the desert at Cushenbury springs, August 10 to 14; and at the north base of Sugarloaf, August 20. Three specimens were secured.

Myadestes townsendii (Audubon). Townsend Solitaire.

The Townsend solitaire proved to be represented in moderate numbers on the higher parts of the San Bernardino mountains. It seemed to be exclusively confined to the upper Transition and Boreal zones. Birds were often seen in full song at 8500 to 9500 feet altitude on the ridges north of San Gorgonio peak in June and July. Often when singing they soared about high overhead, at the same time indulging in an ecstasy of bubbling song. Several were noted on the north side of San Bernardino peak at about 9000 feet altitude, July 12, 1905. Although usually noted much higher they seemed to be nesting altogether on rocky cañon sides 2000 to 3000 feet lower. But here the birds were remarkably quiet; I repeatedly passed up and down the cañon by a nesting place, without suspecting that a solitaire was anywhere in the vicinity.

In Fish creek cañon, at about 7000 feet altitude, we found two nests on June 16, 1905; one of these contained three newly-hatched young. This was located under an overhanging rock on a shelving bank about ten feet above the stream. The nest was composed entirely of pine needles which straggled down below the nest proper for fully a foot. The hollow of the nest was shallow, about three inches across and one inch deep. The young

were nearly full-grown and had left the nest on July 4. The other nest in the same cañon contained four considerably incubated eggs. This was similar in structure to the one described above, but was only four feet above the level cañon bed, in a niche in the face of a rock. Still another nest was found June 17, in the same neighborhood, similarly constructed and located. This contained four eggs in which incubation was far advanced. In 1906, two sets of four eggs each were found on the 22nd and 24th of June, respectively, the first well incubated, the second fresh. One nest was in the face of a dirt bank and held in place by a tangle of roots. This was more elaborate, being composed of twigs and bark, lined with fine dry grasses; but, lacking any system of weaving or interlacing, it was so fragile as to fall to pieces readily when handled. The remaining nest was on a hillside, under an overhanging rock, and shaded by a young fir, and was constructed as the last.

The four sets of eggs taken, conform to one general type of coloration, though there is some variation. All the eggs of each of the four sets are practically identical among themselves. Two extremes of coloration may be described. In one style the ground color is white, with the palest possible tint of grayish-blue. The markings are so profuse as nearly to obscure the ground, doing so completely about the larger ends. These markings vary from brick red, through an unbroken series of tints to very pale lavender; but a vinaceous tint prevails. The markings are in the nature of blotches and finer dots and points, often blurred together. In the other style of egg the ground is white with a decided pale blue tint, spattered with blotches and spots of lengthwise trend. These are thickest at the large end, bold and distinct, not running together, and are in color lavender, vinaceous, brick red and burnt sienna. Sixteen eggs average in inches, $.94 \times .70$, extremes being $.90 \times .68$ and $1.04 \times .71$.

At Bluff lake in July, 1905, the conspicuously spotted young of the solitaire were taken, but the species could not be considered common there. A single individual was seen in a clump of silver firs on the north side of Gold mountain, August 26. Ten specimens of the solitaire were obtained.

Hylocichla guttata sequoiensis (Belding).

Sierra Hermit Thrush.

Sierra hermit thrushes were common only in the cañons among the northern spurs of San Gorgonio peak. They were in full song among the tamarack pines and snowbanks around Dry lake in June of each year. This mellow tinkling song to me sounds cold and lonesome, and yet it always brings a thrill of pleasure. It was heard to best advantage at the higher altitudes where quiet reigned. In the lower cañons the noise of the brooks drowns most other sounds; at least spoils their impressiveness.

Many nests of this species, both old and new, were found in the cañons of Fish creek, Lost creek, and South Fork, above an altitude of 6300 feet. They were all built in small firs or cedars usually growing in the shade of taller trees not far from the streams. The nests varied from eighteen inches to five feet in height above the ground, the average being about three feet. A nest found in Fish creek cañon, 7000 feet altitude, June 16, 1905, was three feet above the ground near the top of a diminutive fir tree growing a yard from the stream. It contained four eggs in which incubation was nearly complete.

This nest may be described as typical of all those examined. It was snugly ensconced against the main stem and was supported by horizontal branches. It was a compact structure deeply cup-shaped. The inside diameter was 2.40 and the depth 1.65 inches. Externally it measured 4×4.75 inches. It was composed largely of pine needles and weathered grass stems, and the cavity was lined with strips of cedar bark and fine dry rootlets. Nests found June 18 and 30, 1905, in South Fork cañon held 3 and 4 half-grown young, respectively. In 1906, on June 12, I found a set of five considerably incubated eggs of the Sierra hermit thrush in the lower South Fork cañon, and on June 25 a set of four moderately incubated eggs in the same cañon. These eggs are plain unspotted Nile blue and measure $.90 \times .65$, $.92 \times .66$, $.90 \times .65$, $.91 \times .66$, $.89 \times .67$; $.86 \times .64$, $.89 \times .67$, $.87 \times .66$, $.90 \times .68$.

In 1907, on June 15, in the same cañon, I found a nest containing two eggs, with the parent sitting. The next day there were three, which proved to be the full complement in this case.

On June 30 there were three young apparently just hatched, which makes the incubation period for this species fifteen days at most. The bird was a very close sitter and I nearly touched her several times in my manipulations to secure photographs. At one time three deer flies at once were industriously prospecting in her nostrils, but she never flinched. Her only movement was an occasional instantaneous wink of the eye.

A very few hermit thrushes were seen about Bluff lake in July, 1905. Full-grown young were taken July 23 and 25. On the north side of Sugarloaf, 8000 feet altitude, I took a full-grown juvenal August 22, and on the same date I secured two other birds-of-the-year in complete first winter plumage. These birds were feeding on service-berries which at this place extended on an exposed ridge up into the fir belt.

Twenty-four specimens in all were obtained. The following table of measurements shows the San Bernardino mountain thrushes to belong to the race *sequoiensis* described by Belding from the central Sierra Nevada of California. They are two or three per cent. larger, but in color they are identical. (See Grinnell, *Auk* XVIII, July, 1901, pp. 258-260.)

No.	Sex	Wing	Tail
7920	♂	96	77
6506	♂	95	73
6508	♂	100	84
6507	♂	95	78
6543	♂	100	82
6722	♂	100	82
7654	♂	95	77
7256	♂	100	80
7945	♂	99	82
7946	♂	96	79
Average of 10	♂ ♂	97.6	79.4
7255	♀	94	76
6563	♀	93	77
6577	♀	94	77
7539	♀	93	74
7530	♀	95	81
6505	♀	92	77
Average of 6	♀ ♀	93.5	77

Planesticus migratorius propinquus (Ridgway). Western Robin.

The western robin, early in the summer, was nowhere abundant. A very few pairs were seen along the upper Santa Ana, near the confluence of South Fork, where a nest was located June 12, 1906, containing three eggs in which incubation was nearly complete. The nest was of the usual mud-and-straw composition, and was situated six feet above the ground in a young incense cedar. The eggs are of the regulation "robin's egg" blue, but are large for the species. They measure $1.16 \times .84$, $1.14 \times .87$, and $1.15 \times .86$.

A pair of robins were noted at Seven Oaks, and several were seen on Big Meadows in June and July; also at the South Fork cienega, 8500 feet altitude. At Dry lake, 9000 feet, a few were always to be seen; a full-grown juvenal was taken there June 18, 1907. Several were seen around Bear lake the last of July, 1905, and a nearly fledged juvenal was taken there July 31. Young were seen at Bluff lake in July; and in the same vicinity, August 28 to September 3, considerable numbers of young-of-the-year in small flocks were noted. These were in almost complete first winter plumage. Adults taken at the same time were in the midst of the fall moult. It was interesting to note that the moulting adults were off by themselves solitarily in the dense willow thickets and not mingling with the flocks of full-plumaged young birds.

Fifteen specimens of the western robin were taken, and seem to be in no way different from examples from elsewhere in the west.

Sialia mexicana occidentalis (Townsend). Western Bluebird.

The western bluebird was an abundant and conspicuous bird throughout the Transition zone; and in places it ranged somewhat above and below. It was noted not uncommonly in the tamarack pines of the Boreal zone, around Dry lake, 9000 feet, where several pairs were nesting, and on San Bernardino peak, 10,600 feet. A pair had a nest June 9, 1906, in a sycamore stub, near the mouth of Mountain Home creek, which is rather within the Upper Sonoran zone. Along the upper Santa Ana, from Seven Oaks to Big Meadows, no bird was commoner. A nest

found near the mouth of Fish creek, June 16, 1905, contained five fresh eggs. It consisted of finely shredded bark strips and was located in a deserted flicker's hole in an incense cedar nine feet above the ground. Other nests containing eggs or young were found in cavities of dead pines from five to twelve feet above the ground.

Full-grown young in small flocks became numerous by July 5th. The species was common about the meadows at Bluff lake in July and up to September 4. Adults and young were extremely numerous in August at the north base of Sugarloaf, around the north side of Baldwin lake, about Gold mountain and through Holcomb valley.

A series of twenty-nine specimens was taken, most of them being juvenals. Of the ten adult males, but one (No. 6741) has the back continuously blue, this being one of the main characters of the subspecies *anabellae* lately ascribed to California by Mr. Ridgway (Bds. N. & Mid. Am., Part IV, 1907, pp. 150-152). The same specimen shows the chestnut pectoral patch almost, but not quite, completely divided by blue medially. This example is a July bird and much worn. I believe that wear has a good deal to do with the extent of the chestnut. A fresh fall bird is broadly chestnut both dorsally and pectorally; but examination of the individual feathers, which are blue and then chestnut towards their tips, shows that judicious clipping with the scissors would make an example of *anabellae* out of it! Yet the character of greater size of southern California birds is quite evident in the San Bernardino series as compared with northern specimens, and it may be that these will prove separable on this character alone. It is obvious that taking into account all the characters they are intermediate between *anabellae* of the San Pedro Martir mountains of Lower California and *occidentalis* of the northwest coast region. I am putting them under the latter name for the present.

***Sialia currucoides* (Bechstein).** Mountain Bluebird.

The mountain bluebird proved to be fairly common about Doble and Baldwin lake, 6700 to 7000 feet altitude, in August, 1905. A full-grown juvenal was taken on the 8th, and adults at that time were in the midst of the fall moult. An adult male

taken had its tail quills worn down to stiff stumps, probably from incubatory functions in close quarters. The species was seen at Knight's ranch, a mile or so south of Baldwin lake, August 24, and at Bear lake, where on August 27 a small flock was seen and an adult male in full fall plumage secured. The mountain bluebird must be considered rare in the region as compared with the western bluebird; the former was detected only in the more arid Transition of the desert slope. Five examples in all of the mountain bluebird were taken.

THE MAMMALS.

The majority of the 812 specimens of mammals (skins with skulls) from the San Bernardino mountains were taken during the three months of continuous work in the summer of 1905. Mr. Joseph Dixon, my assistant that year, deserves especial credit for his industry in running long lines of traps, and for his painstaking work in the preparation of skins. The present report does not do justice to this relatively large collection, which is now a part of the mammal collection of the University of California Museum of Vertebrate Zoology; the series will increase in systematic value as material from others of our southern California mountain groups becomes available for comparison. No such material has been accessible to me in preparing this paper; so that the collection will bear thorough re-working at some future time. Especially to be desired is a geographic study of the genera *Thomomys*, *Neotoma*, *Perognathus*, and *Peromyscus* based upon extensive field work and large series of specimens.

For the determination of a number of species I am indebted to members of the Bureau of Biological Survey, Washington, through its Chief, Dr. C. Hart Merriam. Their decisions have been nearly always adhered to. In fairness to them it should be known that but one or two examples of a species were submitted to them. I must myself bear the responsibility for this report throughout, and, as intimated above, further working of the collection with adequate material for comparison may be expected to alter the nomenclature in some cases.

Besides the thirty-five species formally listed below with anno-

tations, several large mammals which were not secured by us were reported by residents and hunters in the region. Along the upper Santa Ana in the vicinity of Seven Oaks wildcats are said to occur, probably *Lynx californicus*. They should be common in the Upper Sonoran cañons along the Pacific base of the mountains. We saw no signs of them anywhere at the higher altitudes. Mountain lions (*Felis* sp?) are yet reported to occur sparingly in the region. We saw tracks in Fish creek cañon in 1905. In January, 1907, Charlie Martin, who lives at Big Meadows, 6800 feet altitude, poisoned one near his place after it had killed a burro. The lion was sold to a San Bernardino resident, and was prepared by a taxidermist, but I have not followed up the specimen. The tracks of another were seen in June, 1907, in the same vicinity.

We saw no signs of coyotes in the region of the upper Santa Ana, though previous to our visit in 1905 two are said to have been poisoned at Big Meadows. At the north base of Sugarloaf, the latter part of August, 1905, we heard coyotes almost every night, but failed to trap any; the same was true at Cactus Flat and Cushenbury springs. The form at the latter place, at least, is probably *Canis estor* Merriam; but what those of the higher localities and of the Pacific slope should be called I have no idea. The species of the San Diegan district seems to be doubtfully classified, as yet.

We saw the tracks of coons (probably *Procyon lotor hernandezii*) along the lower Santa Ana, and on the upper Santa Ana near Seven Oaks. But no signs of them were noted higher up, nor on the desert slopes.

Bears have long since disappeared throughout the region. We were told by old residents that both "grizzlies" and "brown" bears used to abound in these mountains. But the distinction between "brown" bears and "grizzlies" in the average mountaineer's mind, in this section at least, I found to be rather cloudy.

Mountain sheep (*Ovis nelsoni*?) are said yet to roam the barren precipitous ridges south and east of San Gorgonio peak, at the heads of Mission and Whitewater cañons. We failed to find signs of them anywhere we went.

Odocoileus hemionus californicus (Caton).

California Mule Deer.

Deer are becoming scarce in this region where a few years ago, from all accounts, they were plentiful. The steadily and rapidly increasing invasion of hunters each season is of course the cause of this; for their original enemies, the mountain lions and coyotes, have almost disappeared in their domain. More stringent hunting laws, and especially the enforcement of whatever ones are on the statutes, will go a long way toward saving the deer from complete extermination. A five-year close season would be the best means, if adequately enforced. In all our field-work not more than half a dozen were seen each summer. I personally saw but three bucks in all of the three seasons. Does were usually seen down along the upper Santa Ana and adjacent cienagas, while the bucks were high on the ridges. I saw no signs higher than Dry lake, 9000 feet altitude; and the deer occurred down into the Upper Sonoran brush belt, the latter affording better cover than the open pine woods higher up. I had no rifle and never even shot at a deer, but the bland curiosity displayed by some of those "jumped," which led them to return over a ridge and look at me, like tame deer in the "zoo," convinced me that there would be no sport, for me, at least, in shooting one.

Sciurus griseus anthonyi (Mearns). Anthony Gray Squirrel.

The gray squirrel was a common species in most parts of the Transition zone. I failed to find it either above or below this zone, and found it but sparingly in the most arid parts of it. It was common along the upper Santa Ana above the 5300-foot contour line. We saw young early in July in Lost creek cañon. In the lower Fish creek cañon one could hardly fail to note one or more in an hour's walk. At our South Fork camp, in 1906, the group of Jeffrey pines which shaded the site was loaded with large green cones. Before we had been there long the continually falling cone-scales and drops of fresh pitch told us of activities overhead. This annoyance was replaced by a desire for immediate action on our part when one of the three-pound green

cones landed with a thud on the bedding exactly where one of us had been reclining a few minutes before. It was not an easy matter to locate the perpetrator, and it took a lot of neck-cranning as well as patient waiting before the squirrel was brought to the ground. I was several times subsequently startled when hunting in the woods by the falling of heavy cones close to me. It seemed that any alarm, such as when I fired the gun in collecting birds, was often sufficient to cause the release of a cone that may have been hanging by a mere fiber. For of course the squirrel could not have been expected to have been supporting and at the same time shelling out so heavy an object.

The gray squirrel fed on the ground also a good deal, and was often seen dissecting the cones which they, perhaps, had purposely detached from above. Many little heaps of "kitchen middens" marked sites of these feasts. It was solely the soft, unripe seeds they were after.

Gray squirrels were common in the black oak belt on the flat (Hathaway or Barton Flat) which extends along the upper Santa Ana south to the base of the high San Bernardino ridge, 5500 to 7000 feet altitude. Around Bluff lake and in Bear valley the species appeared to be scarce, or wanting. We saw but three individuals in the vicinity of Bluff lake. Probably the large number of campers who visit that section of the mountains each summer and fall have to do with this scarcity. I saw one example in Holcomb valley, August 26, 1905, and several on the north side and base of Sugarloaf, August 19 to 24. The six examples taken of this squirrel show the following measurements:

No.	Sex	Total length	Tail vertebrae	Hind foot
999	♀ ad.	497	191*	78
1136	♀ ad.	574	278	77
1089	♀ ad.	558	270	80
1159	♀ ad.	541	262	79
1650	♀ ad.	574	274	80
1566	♂ ju.	477	258	75

In recognizing the southern California subspecies *anthonyi*, I am following the latest study of the case, as presented in Mearns' "Mammals of the Mexican Boundary," Part I, 1907, pp. 264-267.

* Tail probably injured at some time.

Sciuropterus californicus (Rhoads).

San Bernardino Flying Squirrel.

Flying squirrels are doubtless far more plentiful than one would judge from our experience with them. None of my party ever saw one outside of a trap, and they were reported by campers and others very rarely. Their strictly nocturnal habits doubtless account for this. We heard of flying squirrels having been caught at Bear lake, on Fish creek, and on Barton (or Hathaway) flats. In the last case a wood-chopper had found one in a dead tree. All of the summer of 1905 we kept traps out in every likely locality we visited; but it was not until August 29 that we were finally successful. We had been told of some little animal which had been heard at night on the roof of the creamery at Mr. Coombs's house on the south side of Bear lake; also that these or other animals had visited a garbage box back of the house carrying off musk-melon rinds. I accordingly sent Dixon down August 28, 29, and 30, and he set several "out o' sight" rat traps and No. 0 steel traps on the roof and on branches of a pine standing close by. The first night a trap was sprung, and on each of the next two nights a female flying squirrel was secured in a rat trap. Meanwhile we had run traps at Bluff lake and at our camp a mile east of there; and on September 2 about midnight a third female was captured in a figure-4 trap within ten feet of where we were lying. We had used a variety of bait, but the only thing which proved attractive was dried prunes.

The last individual I took back to Pasadena alive, and it lived in my mother's house, a very attractive pet, until April 24, 1907, when it died and I skinned it. It had been allowed the freedom of an upper screened porch, as well as other parts of the house at different times. It made nests of all sorts of different material, in drawers of bureaus, and in a box put for the purpose on a high shelf. The two years of captivity amid anything but normal surroundings brought about no decided changes in color that I can discern, except that the pelage of the captive animal is less worn and slightly less ochraceous about the head, and this may be entirely due to the difference in season.

The three specimens show the following measurements:

No.	Sex	Total length	Tail vertebrae	Hind foot
1591	♀	304	136	38
1606	♀	312	140	39
2163	♀	297	135	36

Eutamias speciosus (Allen). San Bernardino Chipmunk.

This chipmunk proved to be abundant in the upper Transition and lower Boreal zones. South of the Santa Ana we found it more or less abundant above the 7500-foot contour. Many were trapped or "auxed" around Dry lake, where the species occurred in the tamarack pine woods up at least to 9500 feet altitude; also at the heads of South Fork and Fish creek, and on the north side of San Bernardino peak. On the upper South Fork, June 28, 1905, I heard the scolding of a chipmunk accompanied by the excited calling and bill-snapping of a pair of wood pewees. I arrived on the scene in time to see the nest of the birds being robbed by a chipmunk; in fact the job was complete, only parts of the egg-shells being in evidence when I climbed up. The nest was ten feet from the ground and six feet out towards the end of a horizontal pine branch. From all I can learn this nest-robbing propensity of the chipmunks is evidenced as often as the opportunity offers.

On the north side of the Santa Ana, the species was excessively numerous about Bluff lake, 7500 feet altitude. As early as July 16 families of small young were abroad, and these at least doubled the population extant earlier in the season. It was less common around the margins of Bear lake and in Holcomb valley; but on the north side of Sugarloaf down to 7800 feet altitude it was as well represented as at Bluff lake. (See pl. 17.)

The species was a noisy one, having a variety of "chips," and a sputtering series of notes given when alarmed, or when quarreling. The latter seemed to be a favorite occupation when there was nothing else to do. This chipmunk was a great climber and usually took to tall timber in preference to hiding in logs or rock piles. An individual would rapidly ascend a yellow pine or fir on the opposite side from the intruder, now and then peeping around to see what was happening. It would often climb as high as thirty or forty feet, finally taking refuge on top of a branch, and sitting there motionless peer down over the edge. But if a

person made any sort of a squeaking noise, the animal's curiosity would generally bring it out into plain view, its excitement being shown by the jerking of the tail, and explosive chipping. Juvenals of very small size were seen clambering about awkwardly, but their parents seemed to take no notice of them whatever. On the north side of Sugarloaf, August 19 to 24, this species, with other members of the family, was busy garnering in seeds of a lupine, and the fruits of a gooseberry (*Ribes*) and *Ceanothus*. These were being carried into and beneath old logs, and into rock piles, doubtless to serve a need the following spring, which is the season of food scarcity with these animals. A series of 113 skins of this species was obtained.

Eutamias merriami (Allen). Merriam Chipmunk.

This species belongs to the high Upper Sonoran and lower Transition zones. We found it common in the mingled scrub and golden oaks on the Pacific slope of the mountains as low as 3000 feet altitude on the walls of the lower Santa Ana cañon. It was numerous around Seven Oaks, 5000 feet, and from there along the upper Santa Ana nearly to Big Meadows, 6700 feet. A few were noted in the black oak belt south of the Santa Ana (Barton Flats) as high as 7000 feet. But they were scarce or wanting in the pines at even lower altitudes. I found a family of three one-third grown young in a rotten stump at the mouth of Fish creek, June 16, 1905. From that date on, a good proportion of those trapped were young-of-the-year. The species was common in the piñon belt on the desert slope of the mountains. We took it as low as Cactus Flat, 6000 feet altitude; also at Saragossa springs, around Doble, and at the north base of Sugarloaf, 7500 feet. At the latter place, August 19 to 24, they were gathering service-berries and the fruits of a *Ceanothus*, climbing the stems often until their weight bent them to the ground. Thirty-one specimens of this chipmunk were secured.

Ammospermophilus leucurus leucurus (Merriam).

Antelope Chipmunk.

This was a characteristic species all over the desert at the north base of the mountains. We found it abundant at Cushenbury springs, August 10 to 14, 1905. That the range of this

species extends high up over the range in some places, was shown by our finding it at Cactus Flat, 6000 feet altitude, August 15 to 17, around Doble, 7000 feet, and at the north end of Baldwin lake, 6800 feet. At the latter places adults and small young were trapped or shot on the sage flats, August 5 and 6.

The extremest extension of the range of this desert species was shown by its discovery, August 22 to 24, on the sage-covered fan at the north base of Sugarloaf, 7500 feet altitude. Here we found it to be common though shy and seldom seen among the close-set bushes. Our traps, however, showed its abundance; for instance, August 22, out of a line of thirty day-time traps set across the sage slope, eight were sprung and three "Amnos" secured. I first became aware of their presence through the characteristic note, which may be unsatisfactorily described as a weakish trill with descending inflection.

Seventeen examples of this species were preserved. They seem to be precisely like others from Palm Springs on the Colorado desert.

***Callospermophilus bernardinus* (Merriam).**

San Bernardino Spermophile.

This yellow-headed, short-tailed, terrestrial squirrel is a characteristic and abundant species in the higher San Bernardino mountains. We found it most numerous in the upper Transition zone and above, though in Bear valley it ranged down almost to the lower edge of Transition, 6700 feet altitude. South of the Santa Ana we found none below an elevation of 8000 feet altitude, and the belt of greatest abundance was that wherein the chinquapin was the prevailing brush plant, 8500 to 9500 feet altitude. At the head of the south fork of the Santa Ana and around Dry lake we shot and trapped a great many in June. Up to this date only adults in very pale and worn pelage came to our notice. I saw several on the upper slopes of San Gorgonio peak among the gnarled and prostrate limber pines and rock slides; and on June 19, 1907, I got a good view of one among some rocks within a hundred yards of the monument on the very summit of the peak, 11,485 feet altitude. This species thus ranged highest of any of the mammals we found in the region. (See pls. 8b, 17.)

North of the Santa Ana the species ranged commonly from Bluff lake around the margins of Bear lake, and all through Bear valley, nearly but not quite as far as the west end of Baldwin lake. It was abundant on the north slopes of Sugarloaf, down to the north base where the sage begins, about 7000 feet. I saw a number in Holecomb valley; but this was as far as it was noted towards the desert. At Bluff lake the earliest young we saw made their appearance above ground July 17 (1905). These were only about one-third grown, bright-pelaged, and behaved much like their parents. The latter paid no attention whatever to the youngsters, only giving a sharp alarm note if an intruder was sighted.

This species acts much like a ground squirrel, which it is in fact. They do not climb higher than the top of a boulder or low stump, where they sometimes sit bolt upright, motionless for minutes at a time. Save for the single sharp alarm note, they are quiet, very different in this respect from the chipmunks. They live in burrows beneath logs, rotten stumps or boulders and often out in the open, though there is seldom any mound of earth to mark the entrance. The last of August and the first of September at Bluff lake they were very active, gathering and carrying into their burrows quantities of green chinquapin burrs and berries of *Ceanothus cordulatus*. At the north base of Sugarloaf earlier in August they were gathering cheek-pouches full of the seeds of a lupine and the smooth reddish fruits of a gooseberry.

Just as we were leaving the mountains we trapped two of the young spermophiles alive, and brought them to Pasadena. They did not live harmoniously together in the cage provided, and early in the fall one killed the other. The remaining individual is yet alive and active. It now inhabits a rock pile in my mother's yard. Each winter it has spent seven months in hibernation, though this period is occasionally broken for a day or two in warm weather.

Nearly one-half of the 109 examples of this species preserved are young-of-the-year. The remaining 57 adults present the following measurements:

		Total length	Tail vertebrae	Hind foot
21 ♂ ♂	{ Average	256	78	40
	{ Greatest	278	94	43
	{ Least	225	47	37
36 ♀ ♀	{ Average	249	78	38
	{ Greatest	271	90	42
	{ Least	235	54	35

Otospermophilus beecheyi fisheri (Merriam).

Fisher Ground Squirrel.

Ground squirrels proved more or less common over a surprisingly large extent of the region under consideration. They ranged from the Lower Sonoran zone, at both bases of the mountains, well up through the Transition zone. Along the whole length of the Santa Ana, from the wash near Mentone up to Big Meadows, 6800 feet altitude, they were represented in fair numbers. After the middle of July, when families of half-grown young were abroad foraging for themselves, they became especially noticeable. It did not take them long to discover a camp, which they stealthily visited to carry away cheek-pouches bulging full of scraps of various sorts. We often caught them in our larger mammal traps baited with meat.

To enumerate localities of occurrence, we found ground squirrels around the mouth of Foresee creek, and near Seven Oaks; at the mouths of Fish creek and South Fork; on the big meadow at Bluff lake, 7500 feet, where their large burrows and mounds of earth interfered considerably with pasturage; in Bear valley and at the north base of Sugarloaf; in Holecomb valley, at Saragossa springs, and around Doble; at Cactus Flat; and finally on the desert itself close about Cushenbury springs.

The eight specimens preserved show a general paleness of coloration, as compared with examples from the Santa Cruz sub-faunal area. On this account I am putting them under the race-name *fisheri*.

Onychomys torridus (Coues). Arizona Grasshopper Mouse.

We found this species only at Cushenbury springs, at the desert base of the mountains. Here an adult male (No. 1404) and an immature female (No. 1414) were trapped August 11 and 12, 1905, on a sandy place on the desert.

Peromyscus sonoriensis sonoriensis (LeConte).

Sonora White-footed Mouse.

We found *Peromyscus s. sonoriensis* to be the most widespread mouse of the region. Its range appeared to be coincident with that of the sage (*Artemisia tridentata*), except that we found the mouse sparingly at higher elevations, well through the Transition zone. We trapped the species June 28 and 29, 1905, at 8500 feet altitude at the margins of the cienaga at the headwaters of the south fork of the Santa Ana; and a very few were taken in the vicinity of Bluff lake, 7500 feet altitude, in July and again the first of September. These were the highest stations zonally for this species. We found it abundant in the sage flats along the upper Santa Ana from a little above Seven Oaks, 5100 feet altitude, to the mouth of Fish creek, 6500 feet. At three of our camps the mice came into our grub tent, and continuous trapping was necessary to keep them from doing damage. Fully thirty-five were trapped in our tent at the mouth of the South Fork, in 1906. It was surprising how soon the little animals would start in housekeeping. Large globular nests, of cotton and bits of paper, would appear in our boxes overnight.

We found the species common in the sage on the margin of Bear lake, the first of August, 1905. It was also taken in August at Saragossa springs, and at Doble, 6800 to 7500 feet altitude; and they were abundant in the tract of sage at the north base of Sugarloaf. But we failed to find them farther over towards the desert.

In the series of eighty-six specimens secured there is a great amount of variation shown, much of it due to age apparently. This form is very closely related to *P. s. gambelii* which is so common in the Pacific coastal slope of southern California. But the San Bernardino mountain form, *sonoriensis*, is appreciably paler-colored and slightly larger than *gambelii*. The Mojave desert form *deserticola* seems to me most similar, in fact identical as far as external characters are concerned. However, I forwarded three San Bernardino mountain specimens to Mr. W. H. Osgood, who marked them *sonoriensis*, and I accept his determination.

***Peromyscus boylii rowleyi* (Allen).**

Rowley White-footed Mouse.

Mr. W. H. Osgood gives me the above determination for specimens from the San Bernardino mountains. We found these mice abundant in June and July, 1906, along the upper Santa Ana at the mouth of South Fork, 6200 to 6300 feet altitude. Our line of thirty small traps brought in as many as a dozen in one night, from settings under the willow clumps near the stream. Elsewhere this species was found but sparingly. A few were taken under golden oaks, near Seven Oaks, in July, 1905. On August 17 I trapped an adult male and two young (in the slaty pelage) near Cactus Flat, 6000 feet altitude. Although this is on the desert slope of the range, the ravine back of Johnston's where these mice were taken is lined with golden oaks and other plants of the Pacific slope flora. The mice were taken along a little stream among the oaks.

A series of fifty-three examples of this species were obtained.

***Peromyscus truei truei* (Shufeldt).** True White-footed Mouse.

This mouse was not found common anywhere, and was only detected at all in three places. On the south-facing slope on the upper Santa Ana, opposite the mouth of Fish creek, 6500 feet altitude, three adults of this species were trapped June 24, 1905. They were taken around a deserted wood rat's nest, and some fallen and rotting logs. Other specimens were taken in the scrub oak belt above Seven Oaks, 5100 to 5500 feet. A female containing six embryos was trapped at Saragossa springs, 7500 feet, near Gold mountain, August 26. Ten examples in all were preserved.

***Peromyscus stephensi* Mearns.** Stephens White-footed Mouse.

I know nothing of this species beyond the capture of two adult specimens August 13 and 14, 1905, near Cushenbury springs, 4000 feet altitude, at the desert base of the mountains. These little mice look more like pale miniatures of *Peromyscus truei* than anything else I have seen comparable to them. Their size will be appreciated from the following statement of measurements:

No.	Sex	Total length	Tail vertebrae	Hind foot
1421	♂	172	95	20
1428	♀	175	90	20

***Neotoma desertorum* Merriam.** Desert Wood Rat.

We found this species abundant on the desert around Cushmanbury springs, 4000 feet altitude, at the north base of the mountains. Six specimens were trapped there August 11 to 14, 1905. Some were found among rocks, in which cases the house was merely a very scanty accumulation of stuff under or between the boulders. Others had fairly large rubbish houses about the bases of mesquite bushes.

***Neotoma intermedia gilva* Rhoads.** Banning Wood Rat.

This wood rat appeared to be a rare species in the region. At least in all of our trapping we secured but two examples, taken July 8 and 11, 1905, a little ways above Seven Oaks, altitude 5100 feet. They were trapped along the northwest wall of the Santa Ana at the margin of the scrub oak belt.

***Neotoma fuscipes mohavensis* Elliot.** Mojave Wood Rat.

This was an abundant mammal throughout the Upper Sonoran zone, both on the Pacific and desert slopes of the mountains. It ranged less commonly along willow-lined cañons up through the Transition zone as well. It was in the scrub oak and piñon belts that the stick houses were most numerous and conspicuous. Along the south-exposed north wall of the upper Santa Ana these nests were usually built up from the ground about the bases of bushes, and were in some cases three feet high and at the base twice as broad. They consisted of chunks such as result from the breaking up of dead and brittle pine branches, rather than of long sticks. Along the streams beneath the alders and willows the other style of house prevailed, made of long sticks and twigs put together into a steep stack.

We trapped this animal at as high an elevation as 9000 feet, near Dry lake. This was on a south-exposed slope across which a well-characterized tongue of the Transition zone extended, though Boreal elements preponderated both above and below.

A house was noted there, and one of the occupants trapped, June 22, 1905.

No other evidences of the presence of wood rats were seen elsewhere higher than 7500 feet. Houses were seen up to this elevation in both Fish creek and South Fork cañons. This species was trapped just below the narrows on the lower Santa Ana, 2500 feet altitude, June 12, 1905; and it was taken in numbers in the vicinity of the mouth of Foresee creek and Seven Oaks in June and July; also in August at the north base of Sugarloaf, at 7500 feet, where nests were common in willow clumps and service-berry bushes; and at Doble, Saragossa springs and Cactus Flat. In the latter localities quantities of piñon shells were seen in the nests. Small young were taken on the upper Santa Ana opposite the mouth of Fish creek, 6500 feet, as early as June 20 (1905).

Mr. E. A. Goldman, of the Bureau of Biological Survey, has determined this form as *mohavensis*. I have a number of examples from Victorville, on the Mojave river, very close to the type locality of *mohavensis*, with which the San Bernardino mountain form looks to me to be identical. Elliot's description of *mohavensis* makes comparison only with *N. f. macrotis*. But it seems to me much nearer the *N. f. simplex* (True), described from Fort Tejon, Kern county. Elliot (Check List N. Am. Mammals, 1905, p. 206) considers *simplex* a synonym of *macrotis*; but judging from my specimens there are two widely distinct forms to which these names are separately applicable.

Out of my series of eighty-two examples from the San Bernardino mountains, forty-one selected specimens (fully adult, with unmutilated tails) measure as follows:

		Total length	Tail vertebrae	Hind foot
21 ♂ ♂	{ Average	359	168	35.6
	{ Greatest	394	187	38
	{ Least	330	150	33
20 ♀ ♀	{ Average	357	171	35.4
	{ Greatest	380	195	38
	{ Least	340	160	34

In spite of my having thrown out all skins with obviously broken tails, it will be noted that the females show greater caudal

length than the males. Doubtless many of the latter have suffered so slight caudal amputations as to have been included in the measured list unnoticed. The males alone appear to be subject to such mutilations (which are probably incurred during fights) as not a single female unquestionably so marked was obtained. As compared with a series of *N. f. macrotis* from the Pacific slope of Los Angeles county, *mohavensis* is very much paler, the rump redder, the tail more distinctly bi-color, the dorsal surface of the hind feet usually pure white (25 per cent. of adults have partial dusky cloudings). Several females taken along the upper Santa Ana in June and July had a distinct sulphur yellow tinge to the lower surface; but this has entirely faded out during the two years since those specimens were obtained.

***Microtus californicus californicus* (Peale).**

California Meadow Mouse.

This was an abundant mammal in many of the Transition zone cienagas, especially those around Bluff lake. The majority of our specimens were trapped in that vicinity in the latter half of July, and the last of August and first of September, 1905. Their runways through the short grass and beneath the rank *Veratrum* herbage and willow thickets were numerous; our traps baited with rolled oats brought plentiful returns as far as this species was concerned. Strangely enough the majority of our specimens were captured in the daytime, showing that here, at least, the species does most of its foraging by daylight. Some of those so taken were youngsters, not over one-fourth grown, their fur yet very short.

We did not find meadow mice over towards the desert; but along the upper Santa Ana they were fairly common. A cienaga at 6700 feet altitude on the south base of Sugarloaf showed plentiful signs of them.

***Microtus mordax bernardinus* Merriam.**

San Bernardino Meadow Mouse.

This species we found only in the highest and coldest meadows; in other words, those of the Boreal zone. I trapped

eight adult specimens in the cienaga at the head of the South Fork of the Santa Ana, 8500 feet altitude, June 28 to 30, 1905. They were taken among reeking-wet grass tufts on the banks of the icy streamlets which issue from the mountain sides. June 19, 1907, a *Microtus*, probably of this species, was seen at Dry lake, 9000 feet altitude, and fresh burrows noted among the *Symphoricarpus* bushes along the west bank. We trapped there in 1905 without finding meadow mice. June 11, 1906, I found a nest under the end of a drift log in a clover bed five feet from the stream near the mouth of South Fork. This nest was of the usual globular style, of fine dried grass blades, and contained three newly-born young with eyes yet closed. There was a conspicuous system of runways through the clover down to the water's edge, but the female parent, which left the nest as the log was turned over and was thoroughly frightened, would not, as I had expected, take to the water as an avenue of escape. This example was preserved and seems to me to be *M. mordax bernardinus*, rather than *californicus*, though down within the zonal range of the latter. A few, at least, of this species were taken by us the latter part of July in a certain cienaga near Bluff lake, 7500 feet, along with *Microtus californicus*.

Out of my series of seventy-four San Bernardino mountain meadow mice about one-third are immature, and even of the remainder I must confess my inability to allocate several under one or the other category. I sent two of the *mordax* type (from the head of South Fork, where that form only was found) to Dr. C. Hart Merriam. He wrote me under date of January 14, 1907, that they belonged to a new subspecies collected several years ago for the Biological Survey by F. Stephens on the ridge south of Bear valley at an altitude of 7500 feet. This was probably in the vicinity of Bluff lake. Dr. Merriam further stated that he had described the form under the name *Microtus mordax bernardinus*, but was holding the description to publish with others later in the year. (The form has since been described, in the *Proceedings of the Biological Society of Washington*, Vol. XXI, June 9, 1908, p. 145.)

Thomomys altivallis Rhoads. San Bernardino Gopher.

Judging from the series of 108 skins and skulls secured, this was the only species of gopher occurring over the higher parts of the San Bernardino mountains. It appeared to be a typically Transition species, though its workings were seen well up into the Boreal zone. June 22, 1905, we trapped two specimens, adult male and female, at Dry lake, 9000 feet altitude, which was the highest station at which the species was actually taken. These were among the first we secured in the region, and we were struck by the immense size of the teeth and claws, especially as compared with those of *Thomomys bottæ pallescens*, with which species we had become familiar in the low coastal plains region of southern California. The latter species is doubtless found along the Pacific foothills of the San Bernardino mountains, but we failed to trap at the low altitudes where we would have expected to find it.

We found *Thomomys altivallis* common in the extensive meadows at the head of the south fork of the Santa Ana, 7500 to 8500 feet altitude. Here, on June 28, I found a youngster, only 130 mm. long, groping about through the short grass in broad daylight. He was evidently lost and began to dig a hole for himself in the sod. A conspicuous feature of all these higher cienagas is the multitude of dirt casts of branching burrows scattered over the green sward. These have evidently resulted from the filling in with earth of burrows through the snow in winter; melting leaves them exposed. A few gophers were taken along the upper Santa Ana, from Seven Oaks, 5000 feet altitude, to the mouth of Fish creek, 6500 feet. On the many cienagas around Bluff lake, 7500 feet altitude, gophers were plentiful and a large series of them were taken, many of them, July 15 to 26, being young-of-the-year. The ground worked in was so wet that gophers were often taken from traps completely submerged under water which had seeped in since they were set.

A few were found around the margins of Bear lake; and at the north base of Sugarloaf, on a cienaga at about 7500 feet elevation, they swarmed. Through the industry of Dixon, fifty-six specimens were secured in six days, August 19 to 24, from this one meadow (perhaps four acres in extent), and we felt confident

there were still some left! Only a small proportion of these were juvenals. Our most successful trap was a No. 0 steel, without bait. Gophers are mammals catchable at any time of day or night. The furthest towards the desert this species was obtained was at the north margin of Baldwin lake, 6700 feet altitude, where I secured a pair of adults, quite like those taken elsewhere, August 7.

This is a very dark-colored species of gopher. The broad medial dorsal stripe, from nose to rump, is sooty bistre; the sides are mars brown; the ears black, surrounded by a black patch largest behind; the lower surface is fawn color, the hairs leaden at base; the lining of the cheek-pouches and the wrists are whitish. (This description is taken from a full-pelaged male, No. 1457.) Young are much paler throughout and might easily be taken for a separate species.

Sixty-eight specimens selected as being apparently fully adult present the following measurements:

		Total length	Tail vertebrae	Hind foot
24 ♂ ♂	{ Average	245	77	34
	{ Greatest	267	92	37
	{ Least	222	65	30
44 ♀ ♀	{ Average	223	68	30.5
	{ Greatest	242	83	34
	{ Least	198	42	27

Out of the entire series there are 71 females and 37 males. As the gophers, especially, were very carefully sexed, in every case either by Dixon or myself, this must be accepted as with all probability showing that there are about twice as many females born as males. The same proportion is shown in the young as in the adults. Perhaps the species is polygamous.

Thomomys aureus perpex Merriam. Mojave Desert Gopher.

The workings of gophers were hard to find on the desert slope of the mountains, and the three specimens obtained are all young ones, not full-grown, I should judge. Two of these were taken August 11 and 14, 1905, in the garden and meadow at Cushenbury springs, 4000 feet altitude; and the third was trapped in

the alfalfa patch on Johnston's ranch at Cactus Flat, August 15. The above determination is by no means certain. The skins are extremely pale, almost precisely the same in coloration as examples from Victorville, whence I have specimens identified by Vernon Bailey as *perpes*; but skull comparison with adult specimens might show decided differences, possibly in the direction of *perpallidus*.

***Perodipus agilis* (Gambel).** Gambel Kangaroo Rat.

We detected this species at only one point in the region, though it or a closely related form is to be expected on the Upper Sonoran foothills of the Pacific side of the mountains. At the north base of Sugarloaf, on the sage-covered alluvial fan sloping to the northward, we saw a few signs, such as tail-marks, on dusty places between the bushes, and succeeded in trapping three adults August 23, 1905. This was at an altitude of fully 7500 feet, but the zonal complexion is strongly Upper Sonoran, a tongue of this zone extending southwestward from the desert slope three miles away. This species must, however, have invaded into this region by way of Bear valley; for it is not a desert species.

The three specimens obtained seem to me extremely similar to *agilis* from the vicinity of Los Angeles, the type-locality. They certainly cannot be referred to the recently named *Perodipus stephensi* which Merriam (Proc. Biol. Soc. Wash. XX, July 22, 1907, p. 78) describes from San Jacinto valley; nor do they approach *stricatori* closely. Yet there are slight differences characterizing them: their ears are perceptibly larger than in *agilis*, and not so sooty; the tail is crested further towards the base; the sides are paler tawny; and the skull appears to be broader. Close scrutiny by one familiar with this genus and its features of variation, based upon a larger series, would probably result in the separate recognition of this *Perodipus*.

The measurements of my three examples are:

No.	Sex	Total length	Tail vertebrae	Hind foot
1552	♀	296	175	41
1553	♀	284	181	43
1539	♂	281	167	42

Dipodomys merriami simiolus (Rhoads). Allied Kangaroo Rat.

This species of kangaroo rat was found to be common on the desert around Cushenbury springs, at the north base of the mountains, and also well up over the desert slopes. We found it on Cactus Flat, 6000 feet altitude, where immatures were taken August 15 and 16, 1905. Signs of the species were noted at Doble, 7000 feet altitude, and an adult female (No. 1396) was taken August 9 on a stretch of sand ("tailings" from the quartz mill at Gold mountain). This latter record is one of remarkable altitude for this species, which I had always considered strictly Lower Sonoran. Yet the actual distance up the cañon from Cushenbury springs to Doble, air-line, is not more than six miles. Many desert plants, such as a species of tree yucca, run up on hot slopes to an altitude of 6500 feet.

Perognathus panamintinus bangsi (Mearns).

Bangs Pocket Mouse.

Two immature examples of a small pocket mouse are with scarcely any doubt referred to this form. One (No. 1412) was taken on the desert at Cushenbury springs August 12, 1905; and the other (No. 1442) at Cactus Flat, also on the desert side of the mountains, August 16.

An immature *Perognathus* was found partially eaten in a trap in the sage tract at the north base of Sugarloaf, 7500 feet altitude, August 22, but I have no idea what species it belonged to.

Perognathus formosus Merriam. Long-tailed Pocket Mouse.

A rather large, smooth-coated pocket mouse obtained on the desert at Cushenbury springs, is identified by Mr. W. H. Osgood as of this species. Five specimens were trapped on sandy ground between small bushes. I also took an immature example 2000 feet higher on the desert slope of the mountains at Cactus Flat, 6000 feet altitude. This specimen (No. 1446, Coll. J. G., August 17, 1905) seems to me referable to *formosus*, though its immaturity forbids accurate determination.

Perognathus californicus dispar Osgood. Allen Pocket Mouse.

This pocket mouse was the only species found on the Pacific side of the mountains. We trapped it on the lower Santa Ana, near the Narrows, and on the upper Santa Ana, opposite the mouth of Foresee creek, a mile or so above Seven Oaks, and at the mouth of South Fork. The latter station is at an elevation of over 6200 feet, and well within the Transition zone. Small young were taken there July 12 and 23, 1906, and adults on other dates. An adult male trapped near the mouth of Foresee creek July 13, 1905, held in its left cheek-pouch twelve and in its right sixteen, shelled wild rye seeds. These are long acicular grains, and were laid in the cheek-pouches all one way, like a bundle of bamboo tooth-picks.

The thirteen specimens referred to this species are large as compared with specimens of *dispar* from the Pacific slope of Los Angeles county, and of course very much larger than the related *californicus* from Santa Clara county. It looks as though there is a large mountain form on the Pacific slope of the San Bernardino. I can see no distinctive color characters however.

Ten full-grown examples from along the course of the Santa Ana river, 3000 to 6200 feet altitude, show the following measurements:

No.	Sex	Date	Altitude	Total length	Tail vertebre	Hind foot
977	♀	June 12, 1905	3000 ft.	204	115	25
1130	♀	July 10, 1905	5100 ft.	219	129	28
1163	♀	July 14, 1905	4800 ft.	207	115	27
1121	♀	July 9, 1905	5100 ft.	193	103	26
981	♀	June 14, 1905	5000 ft.	202	110	26
1695	♀	July 8, 1906	6200 ft.	198	118	26
1162	♂	July 14, 1905	4800 ft.	230	134	28
1156	♂	July 13, 1905	4800 ft.	215	121	26
1155	♂	July 13, 1905	4800 ft.	220	128	26
1728	♂	July 21, 1906	6200 ft.	205	122	27

Lepus texianus deserticola Mearns. Desert Jack Rabbit.

Jack rabbits, solely of this species, were common in the sage flats about Doble and the north end of Baldwin lake, 6800 to 7200 feet altitude, where examples were secured and preserved in August, 1905. They were also noted at Saragossa springs, northwest of Gold mountain, and on Cactus Flat, 6000 feet, further

down towards the desert, as well as at Cushenbury springs on the desert proper. That the species ranges well over the divide onto the Pacific slope of the mountains was shown by my securing two examples, adult and young males, July 11, 1906, on the south face of Sugarloaf, about 6700 feet altitude. This was in a stretch of sage near a cienaga and not more than half a mile from the Santa Ana itself. Further than this, on June 18, 1905, I saw a single jack rabbit at the lower edge of the tamarack pine belt at 9000 feet altitude on a ridge a short distance north of San Geronio peak. These were the only cases coming within my own notice of the species wandering so far over to the southwards, though I was told of other instances of a similar nature. All these specimens showed the extreme pale coloration, like examples from the Mojave desert. I cannot see any notable differences in either color or size between these and examples from Antelope valley, Victorville and Palm springs. The adult male obtained on the south face of Sugarloaf measured 28½ inches from the tip of the hind legs to the point of the nose when hung up.

The five specimens taken show the following measurements:

No.	Sex and age	Place and Altitude	Total length	Tail vertebræ	Hind foot	Length of ear
1440	♂ ad.	Cactus Flat, 6000 ft.	530	90	130	145
1388	♂ ad.	Doble, 7000 ft.	543	97	120	147
1377	♀ juv.	Doble, 7000 ft.	492	98	124	126
1714	♂ ad.	Sugarloaf, 6700 ft.	545	100	125	141
1715	♂ juv.	Sugarloaf, 6700 ft.	460	83	112	101

Lepus auduboni arizonæ (Allen). Arizona Cottontail.

Cottontails were abundant in August around Cushenbury springs and Box S springs at the desert base of the mountains, and a few were seen and one secured, at Cactus Flat, 6000 feet altitude. We failed to obtain specimens on the Pacific slope, although I saw one near Seven Oaks, and other people reported seeing them not infrequently in the same vicinity. It is probable that these Pacific slope examples should be referred to the much darker and smaller-eared *L. auduboni auduboni*. We preserved five specimens from Cushenbury springs and Cactus Flat, two of which are half-grown young. The other three seem to be fully adult and measure as follows:

No.	Sex	Total length	Tail vertebrae	Hind foot	Length of ear
1398	♂	342	42	88	76
1409	♂	354	57	76	77
1431	♂	350	48	88	80

Urocyon californicus (Mearns). California Gray Fox.

Fox tracks were noted abundantly along the upper Santa Ana chiefly in the Upper Sonoran zone. We secured an adult male specimen July 8, 1905, a mile or so above Seven Oaks (about 5100 feet altitude). A male specimen was trapped at the edge of the big cienaga at Bluff lake, 7500 feet altitude, July 20. This is high Transition, and signs of foxes were scarce. A third example, also an adult male, was trapped at Cactus Flat in the pinyon belt on the desert slope of the mountains, August 17. All three of these specimens are in worn and faded summer pelage. They measure as follows, in the order given above:

No.	Total length	Tail vertebrae	Hind foot
1108	902	383	131
1238	968	393	130
1445	968	420	128

Mephitis occidentalis holzneri Mearns.

Southern California Skunk.

Striped skunks were in evidence along the upper Santa Ana from Seven Oaks, where an immature female was trapped July 11, 1905, to Fish creek, 6500 feet altitude. A young female was taken near our camp at the latter place July 5; this, or another individual was seen previously about a large prostrate hollow log. A female specimen was captured at Bear lake, August 2.

The little spotted skunk (*Spilogale*) ought to occur in the foothill portion of the region under consideration, but we failed to obtain evidence of its presence.

Sorex ornatus Merriam. Adorned Shrew.

Shrews *may* occur along most of the permanent streams of the San Bernardino mountains, and I do not doubt that diligent and prolonged trapping would result in their discovery very generally in favorable places. But in all our trapping we succeeded in securing shrews only in the vicinity of Bluff lake, 7500 feet

altitude. In several other likely places, such as the extensive Boreal meadows at the head of the south fork of the Santa Ana, we tried every sort of bait we could think of—earthworms, meat, bird brains—but to no avail. And the shrews we did get finally were caught in traps baited with rolled oats. In two cienagas near Bluff lake, the latter part of July and the first of September, 1905, we were trapping assiduously for meadow mice. The open runways of these animals through the grass and beneath the rank *Veratrum* herbage were plentiful, and in these we placed our little “gee-whiz” and “sure-catch” mouse traps, baited mostly with rolled oats. July 18 a female shrew was caught; three males on July 20; and September 2, a male. In all but the last case the shrews were found in the traps at noon (the traps having been visited in the morning), or before dark in the evening. Only the September victim was found in the morning. It would seem from this that these little animals do a great deal of their foraging in the daytime. They got into our traps hardly for the sake of bait, but because the traps were set in roads the shrews were in the habit of following.

I fail to see any difference between these San Bernardino mountain specimens and some from Mt. Pinos, the type locality of *ornatus*.

***Scapanus latimanus* (Bachman). California Mole.**

[For the use of this name instead of *Scapanus californicus* (Ayres), see Osgood, Proc. Biol. Soc. Wash., April 18, 1907, page 52.]

The characteristic workings of this animal were seen plentifully over most of the Pacific slope of the San Bernardino mountains. They were particularly numerous on cañon bottoms and at the margins of cienagas, but were also often seen high on the dryest mountain sides. I saw a much-branching system of mole-ridges, presumably belonging to this species, along a little stream running into Dry lake from the eastward, 9100 feet altitude. Along the upper Santa Ana workings were plentiful, and many fresh ones would appear within an hour after each thunderstorm. I spent much time in trying to dig the animals out, in

setting dead-falls, and in trying various methods in getting specimens, but failed utterly. I had no special mole-trap.

While moles from southern California are somewhat smaller than those from Santa Clara county (Santa Clara = type locality of *latimanus*, *vide* Osgood, *l.c.*), I am not at all sure that the name *anthonyi* (*Scapanus anthonyi* Allen, described from the San Pedro Martir mountains, Lower California) can be properly used for the southern California mole.

Myotis lucifugus longicrus (True). Long-legged Bat.

This bat appeared to be a characteristically Transition species. It was nowhere as abundant as the large brown bat, not more than two or three being seen in one evening. Specimens were shot in June and July, 1906, along the upper Santa Ana in the vicinity of our South Fork camp. Here they appeared after it had become pretty dark, usually quite a while after the *Vespertilios* had come out, and we could get shots at them only as they flitted across between the pines, silhouetted against the sunset sky. I shot one at 8500 feet altitude in the firs near the upper part of the big cienaga at the head of South Fork, June 28, 1905. This was the highest station for any species of bat. Among the pines at Bluff lake during the latter half of July and again the last of August and up to September 3, 1905, the species was fairly common. I shot a specimen at Bear lake, August 2, and another at Doble, August 24.

Ten skins of this species were secured.

Myotis californicus (Audubon & Bachman). California Bat.

This small brown species was probably much commoner than our observations would seem to show. Those seen and obtained were noted flitting close about the foliage of oaks and pines when it was nearly dark. The five specimens secured were taken as follows: Seven Oaks, 5000 feet altitude, July 7 and 8, 1905; mouth of Fish creek, 6500 feet, June 23, 1905; mouth of South Fork, 6200 feet, July 3, 1906; Bear lake, 6700 feet, August 1, 1905. This species appears to belong to the Transition zone.

Vespertilio fuscus Beauvois. Brown Bat.

This large species was the most abundant and generally distributed bat of the region. It came out early in the evening, often very soon after sundown, and was easy to shoot; so that specimens were secured at every point they were seen. The species was numerous in June, July and August along the upper Santa Ana, at the mouth of Foresee creek, 4700 feet altitude, at Seven Oaks, at our Cedar Cabin camp, 5500 feet, and at the mouths of South Fork and Fish creek. It was abundant at Bluff lake the latter half of July, and the last of August and the first of September. At the north base of Sugarloaf many were seen, and one obtained. Much to my surprise several were seen and shot at Cushenbury springs at the desert base of the mountains, August 11 and 12, 1905.

The examples shot late in August were excessively fat, so much so that in some cases oil soaked through the fur, by way of the shot holes, within a few minutes after they were killed. It was impossible to make up decent specimens from animals in such a condition.

The series of thirty skins secured shows much variation in depth of color. Some are very light-colored, and these agree with Rhoads' subspecies *bernardinus*. But others are as dark as the darkest I have seen from elsewhere in central and southern California, so that I cannot perceive the existence of a race *bernardinus* if it is to be based on color characters alone; unless it be that all California examples differ from the eastern animal. I have no eastern material for comparison. Using Ridgway's "Nomenclature of Colors" as a basis for color names and shades. I find that dorsally my San Bernardino mountain examples vary from raw umber to vandyke brown, ventrally from pale wood brown to light bistre.

Pipistrellus hesperus (Allen). Western Bat.

This species was only found at Cushenbury springs at the desert base of the mountains. There, August 10 to 13, 1905, it was abundant, appearing at late dusk among the cottonwoods and over the pasture. Swarms of these little bats darted about over

the surface of a small pond in the garden near Mr. McFee's house. They kept dipping down and touching the surface of the water as if drinking. The five specimens shot, and preserved as skins, were very fat.

THE REPTILES.

During each of the three summers constant lookout was maintained for previously unnoted reptiles, and for items of interest in distribution and habits. Aside from the Pacific rattlesnake, garter snake, and mountain lizard, reptilian species were rare above the Upper Sonoran zone. But in that zone species and individuals were fairly numerous. Out of the twenty species recorded, four were found only in the Lower Sonoran zone on the desert base of the mountains, one was found only in the Transition zone, and fifteen were found in the Upper Sonoran zone on the Pacific side of the mountains, where most of our work was done.

About 160 specimens were taken and these are now deposited in the reptile collection of the University of California Museum of Vertebrate Zoology. Most of them were captured by noosing. They were then put into a mixture of 4 per cent. formalin in 70 per cent. alcohol, and after we got home transferred to 80 per cent. alcohol for permanent preservation. I found this treatment satisfactory in all cases.

Crotaphytus baileyi Stejneger. Bailey Leopard Lizard.

I "auxed" a specimen of this species at about 5000 feet altitude in the cañon between Cactus Flat and Cushenbury springs on the desert slope of the mountains, August 14, 1905. It is $11\frac{1}{8}$ inches in length; the black transverse bands across the shoulders are unusually broad and distinct for the species, and the posterior one is continuous across the nape.

Crotaphytus wislizenii Baird & Girard. Leopard Lizard.

I shot one young specimen beneath a creosote bush on the desert near Cushenbury springs, August 14, 1905. No others were seen.

Uta stansburiana Baird & Girard. Brown-shouldered Lizard.

This lizard was numerous all along the lower Santa Ana and Mill creek. It was noted June 12 on the brushy slopes west of Clarke's ranch, and occurred more sparingly along the upper Santa Ana from Seven Oaks as high at least as the mouth of Fish creek, 6500 feet altitude. Specimens were taken at the latter point the middle of June, 1905. The brown-shouldered lizard appears to be confined to the Upper and Lower Sonoran zones.

Sceloporus graciosus Baird & Girard. Mountain Lizard.

This was found to be the only lizard common above the Upper Sonoran zone, and it appeared to be confined closely to the Transition. About the head of the Santa Ana and its tributaries from 5500 to 8500 feet altitude the species was in places conspicuously abundant. On stumps, logs, and rock piles it was to be seen in the hot part of the day, actively jumping and darting about in search of insects. It was surprising how far one of these little lizards could jump from one rock to another and how quick its movements were in darting after ants or grasshoppers. We found the species on the ridge south of Bluff lake, July 15, 1905, but not further on the desert side of the mountains. A large series was easily noosed. A very nearly constant color character of this species was a strong salmon pink suffusion on the sides just back of the arm-pits. This fades out entirely after the lizards have been in alcohol or formalin a few days.

The food of this lizard may be judged from the following stomach contents in four cases examined July 26, 1907. The lizards were caught about the middle of the forenoon, chloroformed, and dissected at once.

No. 1—♀: 10 wood-ants, 1 small brown June beetle, and 2 geometrid larvæ.

No. 2—♂: 20 small sand-ants, and 2 small fragments of green leaves (possibly taken in incidentally with the ants).

No. 3—♀: 7 large winged ♀ wood-ants.

No. 4—♀: 1 small brown June beetle, 1 small worker wood-ant, and 5 large winged ♀ wood-ants.

Sceloporus bi-seriatus Hallowell. Fence Lizard.

This proved to be an abundant species in both the Upper and Lower Sonoran zones. It was noted all along the lower Santa

Ana and Mill creek, on the brushy slopes from lower Bear creek to Clarke's ranch, and above the latter point along the road leading to Bluff lake, nearly to 7500 feet altitude. But this latter record, based on a specimen taken July 15, 1905, was still within the scrub oak belt on the south slope. Fence lizards were numerous about Seven Oaks and less common up the Santa Ana along the hot north wall of the valley to 6000 feet at least. They were also noted among boulder piles on the desert at the north base of the mountains, where specimens were secured August 11, 1905.

A female fence lizard noosed July 26, 1907, near our Cedar Cabin camp on the upper Santa Ana, and chloroformed and dissected at once, contained in its stomach one lady-bird beetle, one leaf-hopper, one spider, one geometrid larva, two wood-ants, and several unidentified insect fragments.

Sceloporus magister Hallowell. Rough-scaled Lizard.

This large species was found to be common among boulders and tree yuccas on the desert around Cushenbury springs and Box S springs at the north base of the mountains. I "auxed" several specimens in that locality, August 11, 1905, both adults and young.

Phrynosoma blainvillii Gray. Blainville Horned Toad.

Horned toads were actually abundant in the dry open places along the upper Santa Ana above Seven Oaks. Especially on the south exposure among the scrub oaks and rabbit-brush, numbers were seen in July, as many as a dozen being noted along the trail in an hour. I collected specimens as high as 6200 feet altitude near the mouth of South Fork. June 12, 1905, the species was met with along the road through the brush belt between Bear creek and Clarke's ranch, 3000 to 4500 feet altitude, and examples were preserved.

Gerrhonotus scincicauda (Skilton). Alligator Lizard.

Alligator lizards proved fairly common along the upper Santa Ana, particularly in the Upper Sonoran brush-belt along the north wall of the valley. Specimens were noted, several of them being preserved, from the vicinity of Seven Oaks, 5000 feet altitude, to the south face of Sugarloaf, 6800 feet. Several were

seen in the black oak belt (Transition zone) south of the Santa Ana towards San Gorgonio peak, up to an elevation of 7000 feet. I saw one as high as 7500 feet, July 9, 1907, making its way to a hiding place among the fallen leaves beneath a grove of aspens; and this I should judge to have been fairly within the lower division (Canadian) of the Boreal zone. The species was found nowhere on the desert slope of the mountains.

Cnemidophorus stejnegeri Van Denburgh.

Stejneger Whip-tailed Lizard.

Whip-tailed lizards were detected only on the Pacific side of the mountains where they ranged no higher than the Upper Sonoran zone. We saw many of them along the lower Santa Ana cañon June 11, 1905; and June 12 several were noted as high as 4500 feet along the road through the scrub oak and greasewood belt between lower Bear creek and Clarke's ranch. I saw one at about 4000 feet altitude on a sunny slope near the mouth of Mountain Home creek, June 22, 1907. The highest I saw the species was about 5500 feet altitude on the north wall of the upper Santa Ana near our Cedar Cabin camp. I "auxed" one there July 26, 1907. The specimen had not quite completed a moult. It was $13\frac{1}{4}$ inches long.

Eumeces skiltonianus (Baird & Girard). Western Skink.

The Western skink was met with quite often about the upper Santa Ana and its tributaries, altogether in the lower Transition zone. While turning over rocks or rummaging about wood-rats' nests, individuals were usually met with, though not nearly as often caught. During the rainy month of July, 1906, several were seen shortly after showers squirming swiftly to cover between brushy or rocky places. Five examples secured seem to be in no ways different from specimens obtained elsewhere in California.

Eumeces gilberti Van Denburgh. Red-headed Skink.

This smooth-scaled lizard was met with but once, in the lower Santa Ana cañon, where I "auxed" one at about 2000 feet altitude, June 11, 1905. The animal was running rapidly across an open space over the hot rocks and sand.

This specimen is much larger than any example of *E. skiltonianus* I have ever seen. It is $9\frac{1}{2}$ inches long (242 mm.), of which the tail (which may not be of full length) occupies 140 mm., and the body to anus 102 mm. The head seems proportionately short and blunt, this effect being probably due to the remarkably swollen temporal region. This character is far more pronounced than in any other specimens of Eumeces I ever saw, but it may be largely due to extreme age. I can see no decided differences in scale pattern between this and specimens at hand of *skiltonianus* and *gilberti*, the latter from the Stanford University collection. There is not the least trace of stripes or light or dark markings of any sort anywhere. The body and tail are grayish olive, darker dorsally, with a bronzy cast. The whole head, with a patch across the chest between the arms, is now a dull coppery color. When fresh the head was noted as being bright coppery red.

As far as I can now decide this specimen represents the species *gilberti*, which seems to have been based solely on color characters and size. If not a distinct form it establishes a record station far to the south of the previously noted range of *gilberti*. As far as I can find, this species has been recorded hitherto only from the western slope of the Sierra Nevada.

Diadophis amabilis Baird & Girard.

Western Ring-necked Snake.

An example of this species was taken at Skinner's, near the mouth of Mountain Home creek, 4000 feet altitude, June 9, 1906. Another was caught on the upper Santa Ana near the mouth of Lost creek, 6400 feet altitude, July 7, 1907. This individual showed a trait of behavior new to me. When thoroughly alarmed and its escape into the brush for which it headed was prevented, the snake twisted its tail into a tight corkscrew, the vermilion urostegial surface outermost. This caudal contrivance shone out with conspicuous brilliancy, and *might* have some protective significance as a "warning mark." Yet as far as I know this species of snake is perfectly harmless as far as venomosity is concerned. Still another individual of this species was encountered, near our Cedar Cabin camp, 5500 feet altitude, July 15, 1907.

Lampropeltis pyrrhomelaena multicincta (Yarrow).

Coral King Snake.

One specimen of this brilliantly marked snake was obtained at the Cedar Cabin, about 5500 feet altitude, on the upper Santa Ana, July 12, 1907. No others were seen, though we were told of their having been found below Seven Oaks.

Lampropeltis boylii (Baird & Girard). Boyle King Snake.

This species was noted in the region under consideration but once. We saw one individual June 11, 1905, at about 2000 feet altitude in the lower Santa Ana cañon.

Hypsiglena ochrorhynchus Cope. Spotted Night Snake.

A single example of this little snake was secured, the only one of the species I ever saw. It was found about four o'clock in the afternoon of August 21, 1907, in a clover patch within a few feet of the margin of the upper Santa Ana, near our Cedar Cabin camp, 5500 feet altitude.

The specimen conforms quite closely to the description in Van Denburgh's "Reptiles of the Pacific Coast and Great Basin," 1897, page 178. It is $13\frac{9}{16}$ inches (345 mm.) long; there are 21 rows of scales around the body, exclusive of the gastrosteges; urosteges 44, in two series; gastrosteges 180; 8 superior and 10 inferior labials; 2 preoculars and 2 postoculars.

Pituophis catenifer (Blainville). Gopher Snake.

I saw an individual of this species in Mountain Home cañon, at about 4300 feet altitude, August 6, 1906. This one happened to be climbing among the lower branches of a scrubby golden oak a yard or more above the ground. According to my experience this is not a common habit, as I had always before found these snakes on the ground. Another gopher snake was noted at our South Fork camp, 6200 feet elevation, on the upper Santa Ana, July 3, 1907. Shortly after noon the snake was spied squirming swiftly by the work-tent door, and was promptly headed off. In trying to obtain a photo it was put into the hot sunshine in an open space, and prevented from leaving a certain

spot upon which the camera had been focused. The snake of course kept starting off and was repeatedly poked back with a stick, not roughly, however. Suddenly his snakeship appeared to give up completely, and became perfectly quiet. He shortly opened his mouth, gasped quickly several times, assumed a tetanic rigidity and—was dead! At least, he was still rigid four hours later, and his mouth, still open, was pretty well dried up. I consigned him to the formalin can after examining his exterior closely. No trace of any possible injury was noted. He seemed to have suffered sunstroke due to violent exercise in the hot sun! If he had shown any signs of life subsequently I should have considered it a case of "playing 'possum," as has been described of certain other snakes. (See pls. 20A, 20B.)

The species was met with once again on July 15, 1907, when an individual was observed in the road a mile above Seven Oaks.

Thamnophis elegans (Baird & Girard). Elegant Garter Snake.

This was the most abundant snake of the region. Although most noticeable as a "water snake," yet I saw a good many on the dry sagey mountain sides as much as a quarter of a mile from water. Along the shallow margins of the streams and in cienagas they were most abundant. I saw this species of garter snake all along the upper Santa Ana, as far as Big Meadows, 5500 to 6800 feet altitude. Around the marshy east end of Bear lake there were numbers of these little snakes. The abundance of snails, tadpoles, and insects there seemed to indicate an unlimited food supply.

On account of the confusion existing in regard to the applicability of names to the various members of the genus *Thamnophis*, I give a description of the species which I here call *elegans*, though I judge another name will ultimately be found to apply to it. It will then be possible to allocate the present record definitely. The following description was taken July 31, 1907, directly from a freshly caught and chloroformed specimen, apparently typical of all those seen on the upper Santa Ana. This specimen was noosed near our Cedar Cabin camp, elevation 5500 feet. Its total length is 570 mm. (22½ inches); tail from vent 132 mm. The gastrosteges number 160; the urosteges (double

series) 72. There are 8 supralabials on each side, and 10 infralabials. There are 21 rows of scales around the body, besides the series of gastrosteges. Ventrally the snake is pale greenish blue, the distal margins of the gastrosteges becoming pinkish. The throat, sides of head, and snout, are dull pinkish. Dorsally the snake is almost black, more exactly, perhaps, sooty sepia. A conspicuous median dorsal straw yellow line runs from the nape to the tip of the tail, though on top of the tail it becomes narrow and faint. This stripe involves the median scale row, and part of the one on either side, especially anteriorly. A small spot of yellow marks the top of the head, involving the median margins of the two parietal plates. Along each side of the snake its whole length and continuous with the light-colored sides of the head is a pale lemon yellow stripe, brightest anteriorly and becoming dusky and merging with the ventral color-tract posteriorly. This stripe involves the second and part of the third scale rows above the gastrosteges on either side. The sides of the head exhibit several vertical dusky markings; and the otherwise dark brown back is faintly flecked, along either side of the median stripe and just above the lateral stripes, with whitish scale edgings. There is not a trace of red anywhere. The bright yellow median dorsal stripe is a conspicuous feature in the coloration of this snake.

Thamnophis hammondi (Kennicott). California Garter Snake.

I met with this species only in 1907, when four individuals were encountered along the upper Santa Ana. One was taken opposite the mouth of Fish creek, 6500 feet altitude, July 9; two others were seen near our Cedar Cabin camp, 5500 feet, July 24 and August 9; and another near "Lewie's," two miles above Seven Oaks, July 27. All were in or close to the edge of the stream.

So that there may be no doubt to what I here apply the name *hammondi*, I will give a description of a specimen which it is hoped will suffice to identify the species. This description was taken directly from a fresh (chloroformed) specimen caught near our Cedar Cabin camp August 9, 1907. Its total length is 855 mm. (34 inches); tail from vent 210 mm. The gastrosteges num-

ber 169; the urosteges (double series) 84. There are on each side 8 supralabials, and 10 infralabials. There are 21 rows of scales around the body besides the series of gastrosteges. Ventrally the snake is dusky yellow anteriorly, becoming dusky posteriorly, finely mottled with slate; there is a pinkish tinge down the middle of the belly. Dorsally the snake is uniformly dark sepia, without any median dorsal stripe; but on each side involving the second row of scales dorsally from the gastrosteges, a dusky yellowish line runs from the yellowish side of the head back to the region of the vent, where it becomes so dusky as to merge with the uniformly sordid color clear around. Along each side, above the lateral stripes, are flecks of whitish between the scales which show when the skin is stretched a little so as to separate the scales. There are also flecks of black, mostly further down the sides, which likewise show clearest when the scales are parted. On the nape of the neck is a dusky yellow dab, which looks as though it might be the remnant of a median dorsal stripe; also there is a faint occipital spot. The sides of the head are dusky yellowish, with vertical blackish marginings to the supralabials. As compared with the other form described, this is a large dusky brownish snake without median dorsal stripe.

Crotalus lucifer Baird & Girard. Pacific Rattlesnake.

This proved to be the commonest snake, with the single exception of the little striped garter snake, within the entire region. It ranged from the Upper Sonoran zone throughout the Transition, on both the Pacific and desert slopes of the mountains. We saw several around Doble and Gold mountain, in August, 1905, and three were taken at Bluff lake July 21 and 22 of the same year.

During all three summers we found rattlers actually abundant along the upper Santa Ana between Seven Oaks and Big Meadows (5000 to 6800 feet altitude); also in the lower Fish creek cañon (6500 to 7000 feet), and on the south face of Sugarloaf up to 6800 feet. We ran across fully thirty individuals in that neighborhood in the summer of 1906. Most of these were on the cañon bottom near the willow or rose thickets, though some were along the trail that wound through the sage, in places a hundred yards

or more from the stream. The line of cienagas running up the south base of Sugarloaf appeared to be a favorite resort for rattlesnakes, doubtless due to the abundance of gophers and meadow mice there.

In all our experience the rattlers of this region proved to be mild-mannered and always inoffensive, seeking to make their escape in every instance, and only striking when worried to the last degree. Neither myself nor my companions had any "narrow escapes" from being bitten that we were aware of. Many were noosed and a dozen were preserved as specimens.

The size of the rattlesnake of this region seems to average small, judging from reports from elsewhere in California. The following are a series of actual measurements taken by myself, length in inches from fresh (chloroformed) specimens: 19, 22, 24, 26, 27, 37, 38½, 40 and 42. The latter specimen was taken at Bluff lake, 7500 feet altitude, July 22, 1905. A specimen taken on the upper Santa Ana July 6, 1907, and 37 inches long, was four inches in largest circumference, and weighed just 1¼ pounds. I saw one rattlesnake, not the largest either, with 13 rattles; all the others possessed from three to nine rattles, usually incomplete in number, that is, with the "button" and probably later acquired ones missing. In color there was considerable variation, though the majority were very dark, so black above as to show the merest traces of the lighter markings. Some also were heavily mottled on the under surface as well. The lightest specimens, with beautifully contrasted light and dark markings, were obtained at Doble (in the arid belt), though a dark one was also noted there. (See pl. 21.)

The food of the rattlesnake may be judged from the following instances. One caught on the south face of Sugarloaf July 3, 1905, contained an entire adult chipmunk (*Eutamias merriami*), recently swallowed head first. Another from the same locality contained similarly a full-sized gopher (*Thomomys altivallis*). A small-sized individual was found at the mouth of the South Fork, July 18, 1906, with its mouth efficiently gagged by a half-swallowed adult meadow mouse (*Microtus californicus*). Even when handled and worried the snake was unable to extricate himself from his bulging mouthful. At Bluff lake a rattler taken July

21, 1905, contained two chipmunks (*Eutamias speciosus*) tandemly aligned in the alimentary canal, nearer the cloacal opening of the snake than the mouth. The most posteriorly located chipmunk was approaching complete dissolution, much of the hair and bones, even, having disappeared. Another rattler, only 26 inches long, taken on the upper Santa Ana June 20, 1907, contained a $10\frac{3}{8}$ -inch alligator lizard (*Gerrhonotus scincicauda*), extended straight out in the snake's alimentary canal. As is always the case, and of obvious necessity, the lizard had been swallowed head first.

Crotalus mitchellii (Cope). Pallid Rattlesnake.

This pale copper-colored species was detected only at Cushenbury springs, 4000 feet altitude, which is in the Lower Sonoran zone at the desert base of the mountains. There we saw several, and two specimens were obtained. One was 35 inches in length and the other 39 inches. One of these was encountered at very close range in the evening (August 10, 1905) as I was setting a mouse trap beneath a bush out on the desert; and the sudden buzz and rapidly coiling snake, barely discernible in the dusk within arm's length as I knelt on the ground, was, to say the least, startling. Others were seen early in the morning; the species seemed to be inactive during the hottest part of the day.

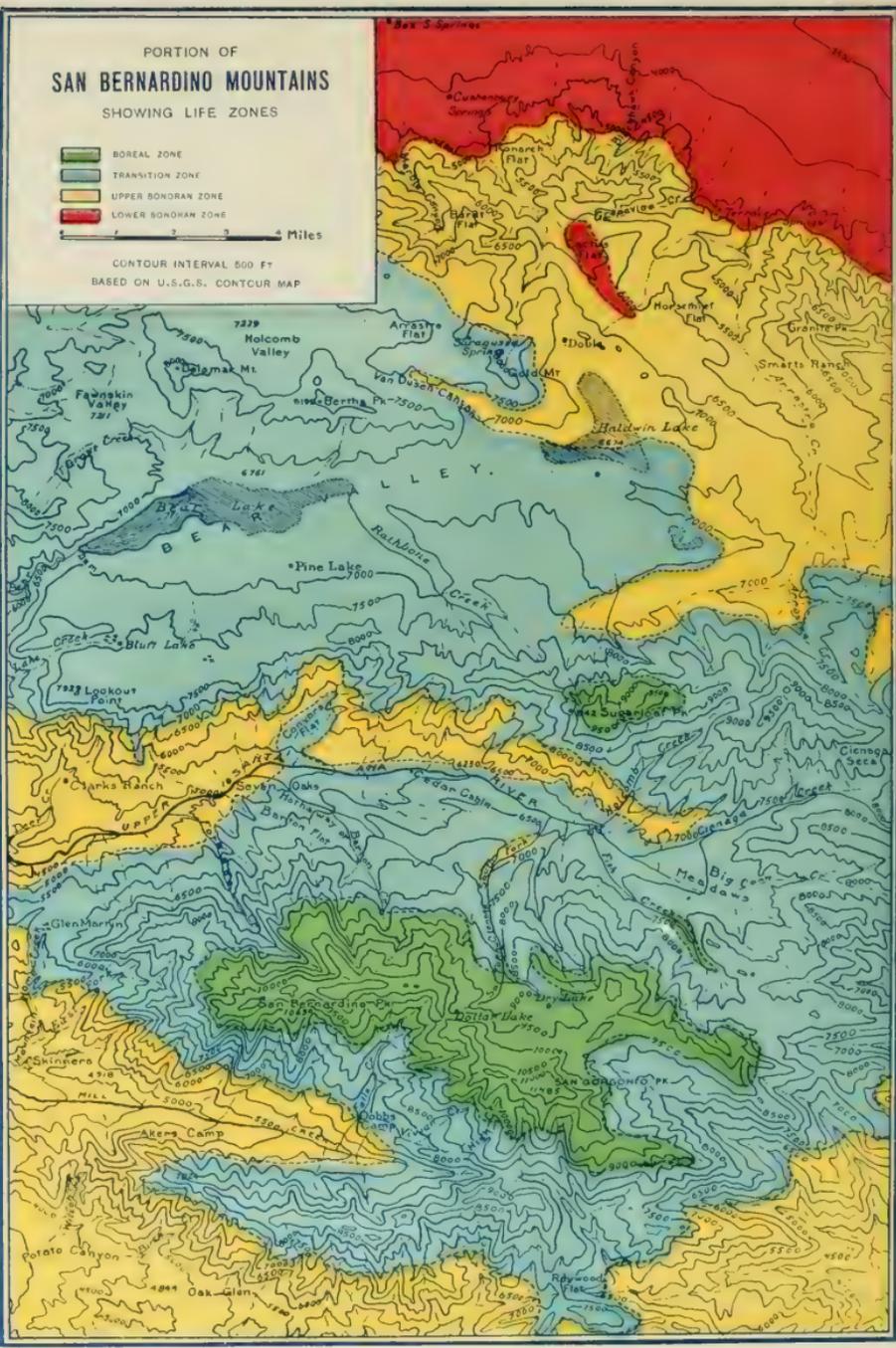
NOTE.—Personal specific names in the botanical portion of this paper (pp. 5-7, 30-50) are capitalized at the request of the Editorial Committee, in conformity to the rules of the Vienna Botanical Congress. *Ribes ascendens jasperae*, p. 38, *Garrya veatchii*, p. 43, *Solanum xanti*, p. 46, *Arnica Bernardina* and *Artemisia Ludoviciana*, p. 48, *Carduus Bernardina*, p. 49, are thus errors in proof reading.

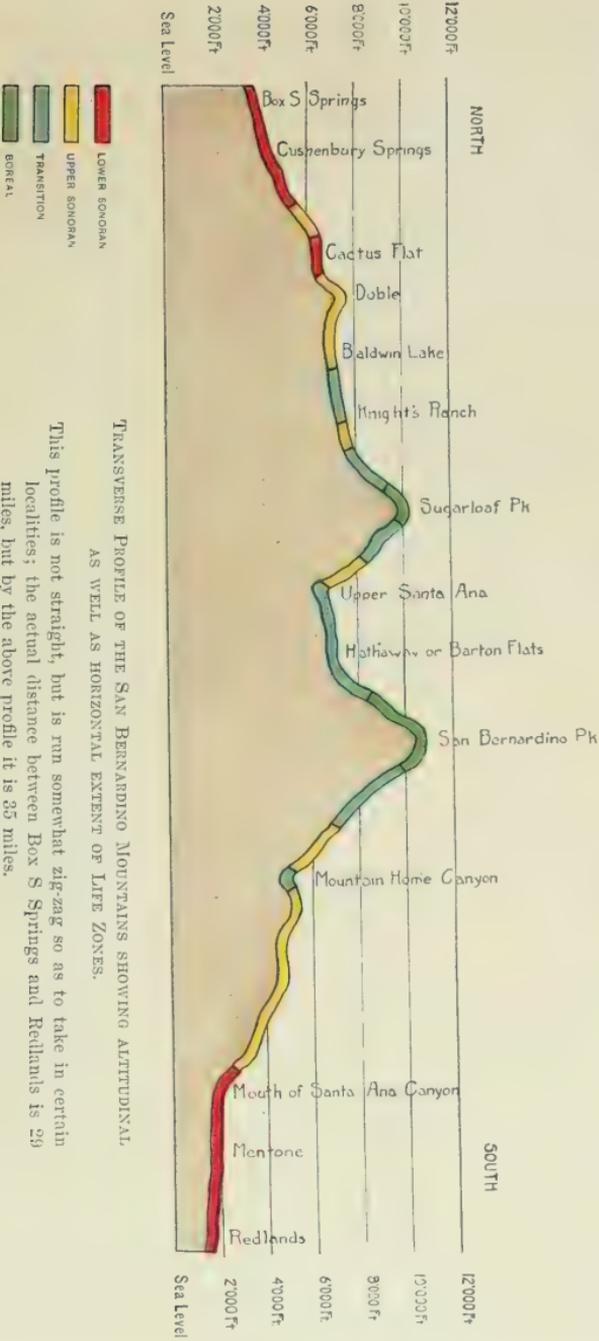
PORTION OF SAN BERNARDINO MOUNTAINS SHOWING LIFE ZONES

- BOREAL ZONE
- TRANSITION ZONE
- UPPER SONORAN ZONE
- LOWER SONORAN ZONE



CONTOUR INTERVAL 500 FT
BASED ON U.S.G.S. CONTOUR MAP





TRANSVERSE PROFILE OF THE SAN BERNARDINO MOUNTAINS SHOWING ALTITUDINAL AS WELL AS HORIZONTAL EXTENT OF LIFE ZONES.

This profile is not straight, but is run somewhat zig-zag so as to take in certain localities; the actual distance between Box S Springs and Redlands is 29 miles, but by the above profile it is 35 miles.



3A. Dry lake, 9000 feet altitude, beyond which are Boreal woods of lodge-pole and limber pines; the west continuation of San Geronio ridge in background. Photographed June 18, 1907.



3B. Cienaga at 6700 feet altitude on the south base of Sugarloaf, surrounded by yellow pines and sage. Photographed July 10, 1907.



4A. A western juniper (*Juniperus occidentalis*) in Bear valley.



4B. Aged silver fir at right, and tamarack or lodge-pole pine (*Pinus contorta*) at left; photographed at edge of bog strewn at Hunt Lake.



Bear valley dam and the east end of Bear lake.



A south-facing slope on the north wall of the upper Santa Ana; although at an altitude of 5700 feet, the zone is purely Upper Sonoran. The plant in the foreground is *Yucca polytachya*; that in dense clumps beyond, *Eriogonum fasciculatum*; and the bushes in the background, *Cercocarpus betulifolia*. Horned toads and brown-shouldered lizards were seen here; and Bell sparrows, California jays, and western gnatcatchers were common. At the same level across the Santa Ana were the pine woods, with their juncoes, blue-fronted jays, and nuthatches.



Tamarack pine woods near Dry lake, 9100 feet altitude; the bushes in the foreground are *Symphoricarpus Parishii*. Photographed June 18, 1907.



SA. Looking due west from San Gorgonio peak. The furthest extremity of the distant ridge is San Bernardino peak, six miles away. The dark patches in the foreground are dwarfed limber pines (*Pinus flexilis*). Photographed June 19, 1907.



SB. The summit of San Gorgonio peak, 11,485 feet altitude, photographed June 19, 1907, at 8 a.m.; the bushes straggling up to the very summit on this, the south side, are dwarfed limber pines (*Pinus flexilis*). Just before this was taken a junco was perched singing on the top of the monument.



Looking due north from the west shoulder of San Geronimo peak: Dry lake in the center; the valley of the upper Santa Ana marked by haze; Sugarloaf is the highest prominence in the ridge beyond; at top, right center; between the two ridges in the distance, upper left corner, is Bear valley. Photographed June 19, 1907.



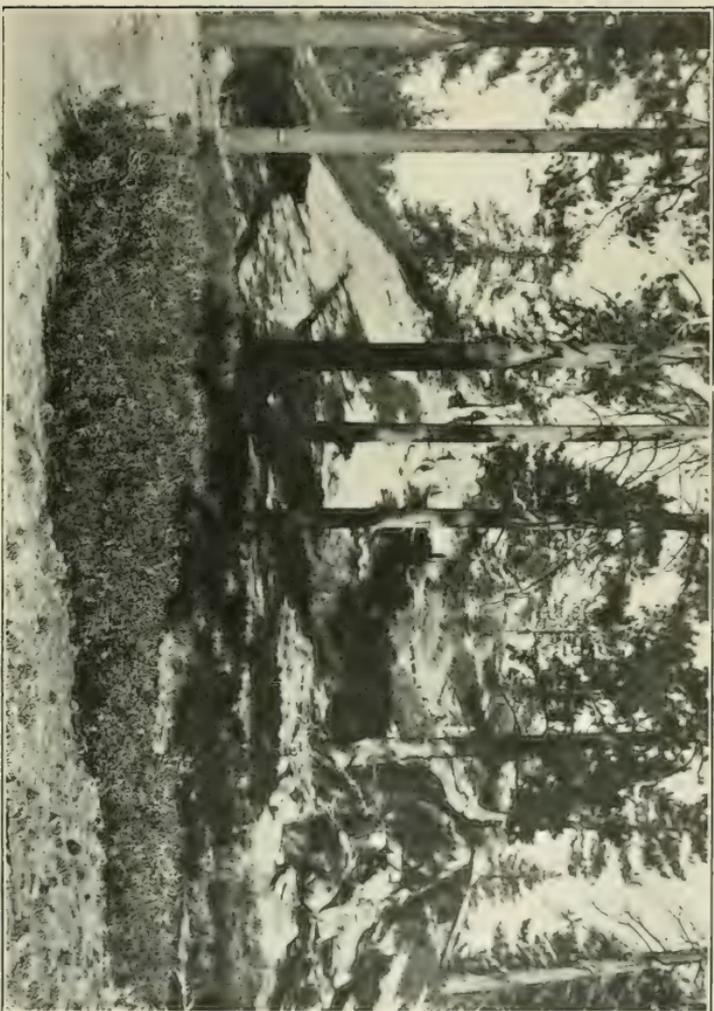
San Geronimo peak from the northwest, looking up the south fork of the Santa Ana. The woods in the foreground consist mainly of silver fir and yellow pine; elevation about 7500 feet. Photographed June 19, 1907.



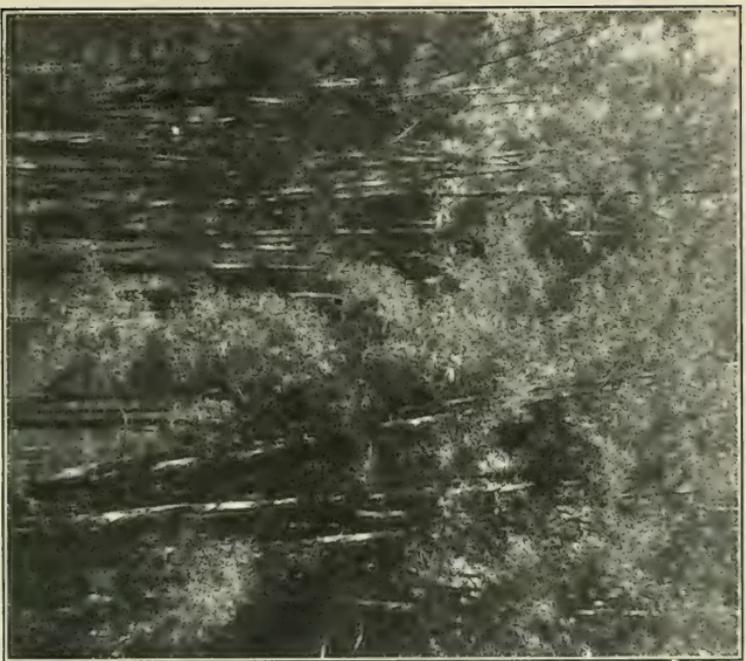
11a. Incense cedar (*Libocedrus decurrens*) at right, and silver fir (*Abies concolor*) at left. Photographed near Bluff Lake, September 2, 1905.



11b. Aged and deformed silver fir (*Abies concolor*); the brush in the foreground is hucklehorn (*Ceanothus cordatus*). Photographed near Bluff Lake, September 2, 1905.



Thickets of the chinquapin (*Castaanopsis sempervirens*) and Jeffrey pines near Bluff Lake. Photographed September 2, 1905.



13A. Grove of aspens (*Populus tremuloides*) in Fish creek cañon, 7500 feet altitude. Photographed July 9, 1907.



13B. Mountain mahogany (*Cercocarpus ledifolius*) in the lower Fish creek cañon, 6000 feet altitude. Photographed July 9, 1907.



The willow clump at right is nearly dead as the result of the work of the *Sirenia sippuckeri*; no other clump in the vicinity had been touched; clumps at left and in background are normally thrifty. Photographed at margin of cenogon near Blind Lake, September 5, 1905.



Grill-work of the Sierra sapsucker on trunk of willow, one of clump shown in plate 14.



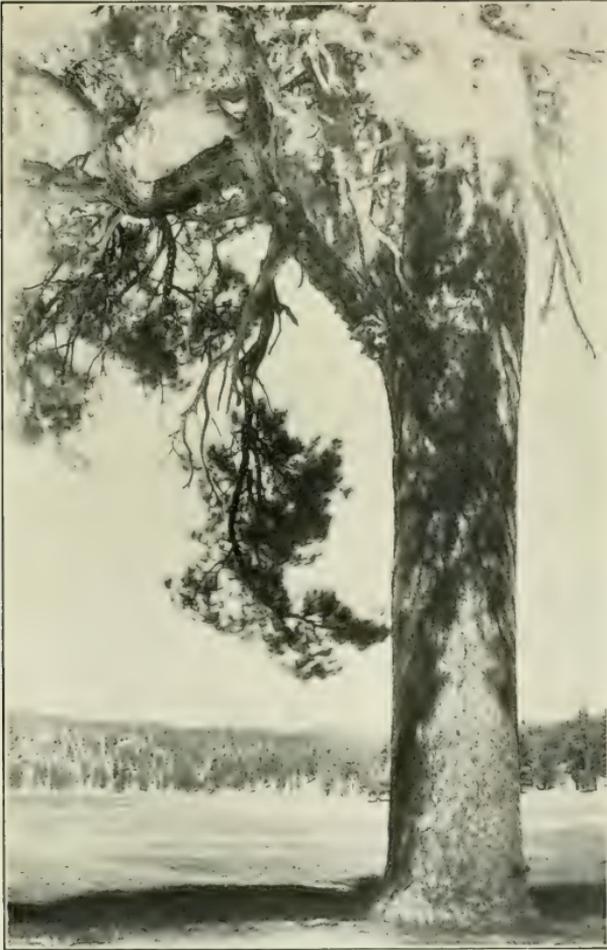
16A. Nest of the spurred towhee at base of sage-bush; photographed at 5500 feet altitude on the upper Santa Ana, July 14, 1907.



16B. Nest of the lazuli bunting, photographed July 10, 1907, near the cienaga on the south base of Sugarloaf, 6700 feet altitude; note also the three-toothed leaves of this, the true sage (*Artemisia tridentata*) in which the nest is built.



Woods near Bluff Lake, the typical home of *Eutamias speciosus* and *Callospermophilus beatus*.



Yellow pine appropriated as a nesting site of the cliff swallow in lieu of a cliff or barn; note the large number of nests on the upper trunk and branches. East end of Bear lake at left of background.



Portion of plate 18 enlarged, showing arrangement of cliff swallows' nests on tree trunk.



20A. Gopher snake (*Pituophis catenifer*), taken near the mouth of the south fork of the Santa Ana, July 3, 1907.



20B. The same gopher snake as shown in the previous figure, photographed a few minutes later after having assumed a tetanic rigidity.



The common rattlesnake of the region (*Grotalus hufferi*); note the obscurity of the light markings anteriorly; some examples are almost uniformly black.



Canopy of alders (*Alnus rhombifolia*) over the upper Santa Ana at about 5500 feet altitude. Photographed August 18, 1907.



A pinyon (*Pinus monophylla*) growing in the chaparral belt at 5700 feet altitude on the south-facing north wall of the upper Santa Ana. At this same altitude on the opposite wall of the Santa Ana two miles away is a dense forest of silver fir, yellow pine, and black oak.



The true sage-brush (*Artemisia tridentata*); photographed at 5500 feet altitude on the upper Santa Ana, July 15, 1907.

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IN

ZOOLOGY

Vol. 5, No. 2, pp. 171-264, pls. 25-26, figs. 1-4

February 18, 1909

BIRDS AND MAMMALS OF THE 1907
ALEXANDER EXPEDITION TO
SOUTHEASTERN ALASKA

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(Contribution from the University of California Museum of Vertebrate Zoology)

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INTRODUCTION.

In the spring of 1907 a party was organized and outfitted by Miss Annie M. Alexander, to go to southeastern Alaska for the purpose of exploiting the fauna of certain islands. The party consisted of Mr. and Mrs. Frank Stephens, Mr. Joseph Dixon, Mr. Chase Littlejohn, and Miss Alexander herself, who headed the expedition. Collecting paraphernalia was brought together at Seattle, and departure from there was made April 10 on the steamer *Jefferson*. Juneau was reached on April 14, where a launch and crew were engaged, and provisions bought. The expedition left Juneau April 16 and the first base camp was established at Windfall Harbor, Admiralty Island, April 17. From this date on until August 9 the entire party was occupied in collecting and exploring at various points on Admiralty, Baranof, and Chichagof islands, and at Glacier Bay. (See map, plate 25.) All but Mr. Stephens then returned to Juneau and

thence to Seattle and home. Mr. Stephens continued to work in the same region until August 27, when he started south, stopping September 3 and 4 at Thomas Bay and from September 10 to 17 at Helm Bay, both being localities on the mainland between Juneau and Dixon Entrance.

The expedition obtained 532 birds, 33 sets of eggs, some with nests, and 476 mammals. Notebooks were kept by most of the party, and upon these as well as the specimens the accompanying reports are based. The halftone illustrations are from photographs taken by Miss Alexander.

Miss Alexander has donated all of this material to the University of California Museum of Vertebrate Zoology, constituting the first accession to its collections.

The region dealt with is wholly within the faunal area first named by Nelson the Sitkan District. It is characterized by excessive humidity of the atmosphere and cloudiness, by relatively warm winters, as compared with the interior of North America on the same parallel of latitude, and by colder summers. The vegetation is abundant and peculiar, the terrestrial animal life relatively less abundant.

JOSEPH GRINNELL.

April 15, 1908.

DESCRIPTIONS OF LOCALITIES.

By FRANK STEPHENS and JOSEPH DIXON.

Windfall Harbor, Admiralty Island.—Windfall Harbor is a bay cut off from the west side of Seymour Canal by Windfall Island, the latter being about a mile and a half long and comparatively flat. The main part of Admiralty Island lies west of Seymour Canal, but Glass Peninsula is in plain sight across the canal to the eastward. We made camp in a little cove opposite Windfall Island at noon, April 17.

The precipitous mountains that surround the harbor on the south and west rise almost from the water's edge, and are heavily covered with spruce and hemlock up to timber-line, which averages in altitude about 1500 feet. There is a fringe of alders along the beach, and in many places in the forest there are thick patches of huckleberry and devil-club, particularly the latter. Birds and mammals were most abundant about the mouth of the creek; during the early morning hours many land birds came down on the beach to feed. The areas of fallen timber which are so conspicuous and which gave the harbor its name are not very productive of animal life.

At the time of our arrival snow was four to six feet deep on the level and covered all the region except the beach below the reach of high tide. Scarcely any plants had come into bloom by the time we left, May 19, and the few noted were found only along the beach. We were in time to see the spring migration of water birds, which were extremely numerous for a time. Land birds were relatively scarce in both species and individuals. Mammals were few in species, and with but one or two exceptions in individuals also.

Mole Harbor, Admiralty Island.—Mole Harbor is a bay on the west side of Seymour Canal, about twenty miles south of Windfall Harbor. It is about two miles deep by a mile and a half wide. Much of the inner end of the harbor runs dry at

low tide, thus leaving extensive tide flats. There is considerable level land surrounding the harbor, and to the west and southwest there are several high mountains.

The principal timber is hemlock, but there is some fir, and in the hills there are yellow cedar and a species of pine. Most of the pines grow in what may be called "parks." These are tracts of more open country, the trees being fewer and smaller. The parks are carpeted with moss like all the region; but in some places a kind of grass grows among the moss, even predominating here and there. If level, these parks are swampy, but on sloping ground they are comparatively dry. There appear to be species of plants in the parks not met with elsewhere, such as the low cranberry, but their growth was not far enough advanced to render them readily recognizable. Birds are here more numerous than elsewhere, except on the beaches. For land work Mole Harbor proved a better collecting ground than Windfall Harbor. Base camp was maintained at Mole Harbor from May 19 to June 10.

Alexander, Beaver, and Hasselborg Lakes, Admiralty Island.—Three miles west of Mole Harbor a chain of three large lakes begins, with outlying small ponds; this system drains into a large stream flowing across Admiralty Island and emptying into Kootznahoo Inlet. The location of these lakes was ascertained from a prospector named Allen E. Hasselborg. The services of this man were secured as guide and he remained with the party until August. As the interior of Admiralty Island appears to be wholly unexplored, we gave to the lakes the names here used: the accompanying map (pl. 25) shows their approximate size and location. Alexander and Beaver lakes are practically one, being separated only by a narrow, shallow channel. The first is about two miles long by one and one-half to three-quarters of a mile wide. The second is about one mile long by half a mile wide. A thirty-foot waterfall and a short, rapid stream connects Beaver Lake with the third of the series, Hasselborg Lake. This is ten miles long with an average width of a mile or more. The region proved notable because of the finding there of the beaver, hitherto unrecorded from any of the islands of southeastern Alaska. Bird-life was also unusually plentiful. Extended visits were

made to the lakes at four different times between May 19 and June 11.

Hasselborg River, Admiralty Island.—On June 11 Miss Alexander, Dixon and Hasselborg left Mole Harbor to cross Admiralty

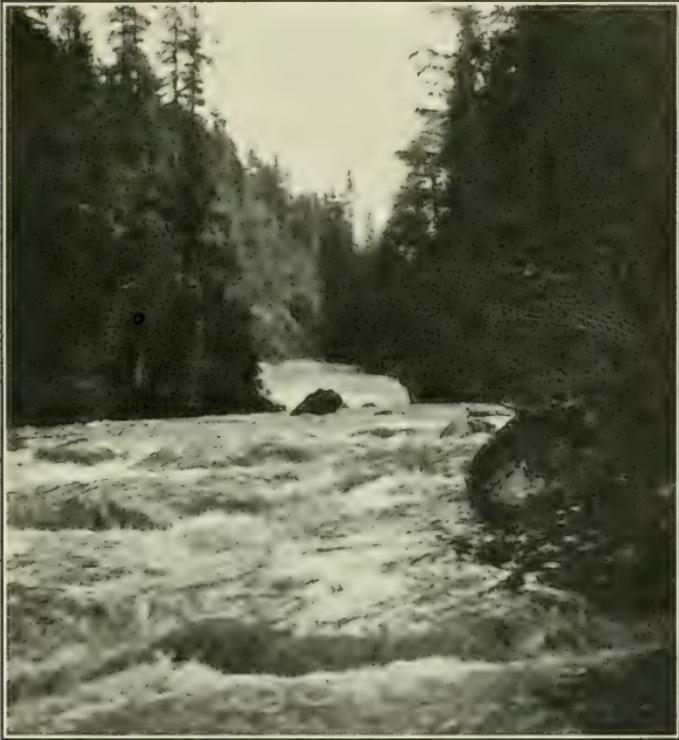


Fig. 1.—Hasselborg River.

Island. The trip was made by canoe from Alexander Lake to Killisnoo, which is near the mouth of Kootznahoo Inlet, and occupied four days. The river draining Hasselborg Lake, and called by us Hasselborg River, was descended to its mouth at the head of Kootznahoo Inlet. Though of large volume the river contained so many rapids that frequent portages were necessary.

Birds were plentiful along the river, and signs of beaver, deer, bear, otter and mink numerous. By the nature of this trip but few specimens were obtained. After a few days collecting at Killisnoo the main party was rejoined at Red Bluff Bay, Baranof Island.

Red Bluff Bay, Baranof Island.—On June 11 the portion of the party not undertaking the trip across Admiralty Island left Mole Harbor and proceeded to Red Bluff Bay, which is on the



Fig. 2.—Red Bluff Bay.

east side of Baranof Island a little south of its middle. This bay is about four miles long by one-quarter to half a mile wide. Except at the head of the bay, the shores are steep or precipitous, and the surrounding mountains are high. At the head of the bay is a mud flat, the terminus of the bottom land bordering a small river coming from the west. There are a few acres of grass land bordering the tide line; but above the reach of the highest tides the bottom is heavily timbered with fir and hemlock, with much underbrush. The mountain sides are well timbered, but the summits are overspread with extensive snowfields. This is evidently the coldest region we had yet visited as there were still a few banks of snow down to sea level. Our departure from here was made on June 20.

Hooniah, Chichagof Island.—We made camp June 21 about five miles northwest of the Indian village at Hooniah, which is situated on a body of water called Port Frederick on the north side of Chichagof Island. A large salmon creek empties into the bay near our camp, causing extensive mud flats which are left bare at low tide. The valley of this stream extends back ten or fifteen miles with an average width of about two miles. The bottom land is thickly covered with salmonberry and willow thickets. The hills slope back gradually from sea level, and are densely clothed with hemlock and spruce, with a thick undergrowth of devil-club and some huckleberry. We climbed to the summit of one of the mountains about five miles back from camp and reached an altitude of 2600 feet. A night was spent there, to permit of trapping for small mammals. This region was worked until June 27.

Glacier Bay.—Glaciér Bay, into the head of which flows the famous Muir Glacier, was worked from June 27 until July 20. Our work was confined to the two mainland shores and intervening islands near the mouth of the bay. Our first camp was made on the eastern mainland opposite the southernmost of the Beardslee Islands, near the mouth of a salmon creek. This stream has filled the strait with boulders and mud until it is too shallow for large boats to pass beyond the islands at low tide. Otherwise this is a good camping ground, with deep water close in front, making a fine harbor. The mainland for several miles around is low but hummocky, evidently a series of recent terminal moraines. The forest is dense but young, there being few trees two feet in diameter and no fallen timber. There are stumps along the beach at a lower level than any trees now grow. These may be accounted for as the remains of a former forest growing there when the land stood higher, and then cut down by glacial ice. Nearly all the trees in the present forest are spruce, there being also a few hemlocks. Alders form a border around the edge of the forest at the beach, and they also grow in places in the forest. There are a few small willows and cottonwoods near the beach, but very little underbrush elsewhere, the ground being thickly and evenly covered with moss. Mammals are most plentiful along the border of the timber, and in the grass near high-

tide line. Land birds are not so plentiful as at some other localities we have visited, and several species found on the islands are not represented here.

Another camp was made on the northernmost of the Beardlee Islands near the "portage." There the forest is still younger, not being as yet fully established. Sea birds are plentiful and breeding on some small islands nearby but a little farther out in the bay.

From July 10 to 20, Dixon and Hasselborg worked at Coppermine Cove on the west shore of Glacier Bay. Numerous trails cut through the woods at this point to reach copper prospects facilitate field work. A trip was made to the summit of a nearby ridge with an approximate altitude of 2100 feet; and on July 5 South Marble Island was visited. It was necessary in order to reach it to crowd the canoe for several miles through or over the floating ice fragments which filled the bay at this point. The island, as the name implies, is a large mound of marble rock, smooth and sloping steeply to the water's edge. A few alders and willows grow in places, and although only about a quarter of a mile long several little streams trickle down the sides. The loftiest part of the island is perhaps 100 feet in altitude. This island was notable because of the colonies of sea birds which nest there. No indications of mammals of any kind were discovered.

Idaho Inlet, Chichagof Island.—Idaho Inlet is a narrow fiord in the northwestern shore of Chichagof Island. It is eight miles long, tapering in width from two miles at its mouth to half a mile at its head. The mountains on each side are moderately steep and run up to an elevation of from 2000 to at least 3000 feet. They are thickly forested at their bases and half way or more up, but are bald topped. We climbed one that was 2250 feet in altitude and found it comparatively smooth on the summit, thickly covered with grass. In spite of its favorable appearance we found neither birds nor mammals on it. The only level ground along the beach is a patch here and there at the mouth of a stream. The general scarcity of animal life at Idaho Inlet is said to be due to the prevalence of violent and cold north winds during the winter. During our stay there, July 20 to 25, the weather was continually stormy.

Port Frederick, Chichagof Island.—Port Frederick, a bay on the north side of Chichagof Island, was again visited from July 25 to August 1. Camp was made this time within three miles of the extreme head of the bay, where a 60-yard portage separates it from the head of Tenakee Inlet. Nearer the mouth of the bay is located the village of Hooniah previously referred to.

Hawk Inlet, Admiralty Island.—Hawk Inlet is a deep fiord in the northern extremity of Admiralty Island. It is surrounded by rolling hills that slope back to high, flat-topped mountains. Timber-line here averages 2500 feet in altitude, fully 1000 feet higher than on Chichagof. The relative warmth of the climate here doubtless accounts for the productiveness of the region. Animal life is fairly abundant in places. Our work here extended from August 1 to 9.

Rodman Bay, Baranof Island.—Rodman Bay is entered from Peril Strait, which is a narrow channel on the north of Baranof Island, separating it from Chichagof Island. This bay is surrounded by mountains with a smooth profile, and thickly timbered up to 2000 feet altitude, the higher summits having an elevation of approximately 3000 feet. Camp was made at the head of the bay at the nearly deserted mining camp of the Rodman Company. A narrow-gauge railway runs up the creek seven miles to the mine. Stephens ascended the mountain east of camp, altitude 2800 feet, but found very little animal life, although the higher part was open and almost level for miles, with an abundance of grass. August 12 to 20 was spent at this place, the party then consisting only of Stephens, Hasselborg and a general camp man, Strassel.

Bear Bay, Baranof Island.—Our camp from August 21 to 27 was on Bear Bay, which is a small cove in the north shore of Baranof Island, on the opposite side of Peril Strait from Deep Bay in Chichagof Island. Peril Strait averages about half a mile wide in this part. The surrounding mountains are rather low, with moderately ascending slopes. There is a little fringe of grass around the bay just below highest tide line; but it is not often more than a dozen feet wide, and is bordered closely by brush and timber. All the streams entering Bear Bay are small. Birds and mammals are not plentiful.

Thomas Bay.—Thomas Bay is in the mainland shore of southeastern Alaska on about latitude 57° . Stephens collected there September 3 and 4.

Helm Bay.—Helm Bay is near the southern end of Cleveland Peninsula, latitude about $55^{\circ} 40'$, and some thirty-five miles northwest of Ketchikan. The bay is about five miles long and averages nearly a mile wide. It is bordered by mountains of moderate slope and of about 2000 feet altitude. On the east side near the entrance there is a flat a mile or so square. In this flat are several fresh-water ponds. There are "parks," usually small, scattered all through the timber, and small areas at the mountain tops are free of large trees. Nearly half the timber is yellow cedar. There is considerable underbrush, chiefly huckleberry bushes, but there is not much devil-club. Stephens worked here September 10 to 17, this being the last Alaskan locality explored in 1907.

THE BIRDS.

By JOSEPH GRINNELL.

In compiling the following report upon the birds of the 1907 Alexander Alaska Expedition, I have depended entirely for other than technical information upon the field notebooks of the members of the party. A preliminary step to compiling the report in its final form was the copying of every reference to each bird from all the field books. These references were then assorted by species, and the information thus obtained was combined, always with a strict regard for accuracy.

The 532 bird skins were catalogued as identified, and University of California Museum of Vertebrate Zoology Bird Department numbers were given them. These are the numbers used in referring to each specimen in the following technical accounts of the species.

Unless otherwise stated, measurements are given in millimeters. In color-descriptions I have adhered as closely as possible to Ridgway's "Nomenclature of Colors."

The following new birds are described: *Lagopus alexandrae*, *Lagopus dixonii*, *Buteo borealis alascensis*, *Picoides americanus fumipectus*, *Loxia curvirostra sitkensis*, *Planesticus migratorius caurinus*. The types of these are in the Museum collection.

Ninety-nine species are recorded in this report, and of these, eighty-one species are represented in the collection by one or more specimens.

Colymbus holboellii (Reinhardt). Holboell Grebe.

A flock of seven grebes seen at Windfall Harbor, Admiralty Island, on the evening of May 7, were thought by both Littlejohn and Dixon to be of this species. On several subsequent occasions the same species was noted, but always out of shotgun range and too wary to approach. These were probably all migrants on their way farther north. On Glacier Bay, July 16, three more were noted by Littlejohn flying inland to the eastward, perhaps toward some lake in the forest.

Colymbus auritus Linnaeus. Horned Grebe.

Only one specimen of this grebe was seen by any of the party. After a long boat-chase by Stephens and Littlejohn among the Beardslee Islands, Glacier Bay, July 14, the bird was fortunately secured. It is a male, No. 86, U. C. M. V. Z., and is in adult summer plumage.

Gavia immer (Brünnich). Common Loon.

This species was of more or less common occurrence around Admiralty Island and on Glacier Bay. In the first-named region, at Windfall Harbor, May 16, an adult male was secured (No. 17), and the species was quite common for the next few days. On the chain of lakes back of Mole Harbor several pairs were seen at various times between May 19 and June 11. They were evidently breeding, though efforts at finding nests failed. Littlejohn's notebook records that loons were seen in numbers at Mole Harbor on May 19 and afterwards. Each morning and evening these birds were occupied in feeding on the herring, an abundant fish in the waters of this, their spawning ground. While the loons were diving for fish, great flocks of glaucous-winged gulls and numerous bald eagles hovered above the water watching for the herring which were driven to the surface. A loon shot in the act of swallowing a herring just caught showed the fish to be swallowed whole. Dissection showed four more fish in the bird's crop. At Coppermine Cove, Glacier Bay, Dixon saw a pair of common loons in a small lake, half a mile back from the beach. A nest and two eggs were reported to have been found on a small island in the lake in May.

Gavia adamsii (Gray). Yellow-billed Loon.

Mr. Littlejohn feels confident of having seen an individual of this rare species at Windfall Harbor, Admiralty Island. The bird was pursued for an hour or more, but could not be approached closely enough for an effectual shot. On several occasions the large yellow bill was plainly seen, so that there seemed little doubt of the identity. It is very regrettable that the specimen was not secured.

Gavia pacifica (Lawrence). Pacific Loon.

No examples of this species were secured; but Littlejohn's notebook records it without question as far outnumbering all the other species of the genus combined, in the waters of Windfall and Mole harbors, Admiralty Island. For two weeks beginning May 5 the loud, siren-like notes of the Pacific loon were almost continually to be heard. Later their numbers decreased, but a few remained in pairs, and may have nested. As no specimens were procured, *Gavia arctica* may have also been represented among those seen.

Gavia stellata (Pontoppidan). Red-throated Loon.

Mr. Littlejohn records that the first red-throated loon for the season was seen at Windfall Harbor, Admiralty Island, May 1; only a few were seen there subsequently. On the chain of lakes back of Mole Harbor a pair or two were seen or heard; and at Glacier Bay several were noted, and a nest found by Stephens on July 16. This was in the rank grass at the edge of a pond a few yards back from the shore of one of the small islands on the east side of the bay. The parent was seen to swim away from the nesting place, and by her peculiar actions indicated its proximity. There were two eggs on the point of hatching. Instead of the usual floating structure, the eggs in this case rested on the bare, wet mud, two feet back from the water's edge, there being no nesting material whatever. Stephens records seeing two red-throated loons in winter plumage at Bear Bay, Baranof Island, the last week of August.

Lunda cirrhata Pallas. Tufted Puffin.

Six skins of this species were obtained, four adult females (Nos. 55-58), and two young in natal down (Nos. 59, 60). These were all secured in Glacier Bay, where the species was found nesting rather commonly on several of the small islands of the Beardslee group. The burrows were dug near the top of sand and gravel bluffs and ran back some four feet beneath the overhanging sod. The nest cavity was about two and one-half feet below the surface of the ground, and its floor was strewn with

a few straws. The single egg, taken by Stephens, July 16, was incubated to an advanced degree. The shell is dirty white and apparently entirely unmarked, this being exceptional with this species. It is ovate and measures 72.5×49.6 . A chick was secured on the same date. Dixon obtained a chick on a small island near Coppermine Cove, July 17, and found the species breeding on South Marble Island, July 5. Both these points are in Glacier Bay, and the tufted puffin was found by the expedition nowhere else in the region explored.

Fratercula corniculata (Naumann). Horned Puffin.

Two adult males (Nos. 83-84) were secured by Dixon at South Marble Island, Glacier Bay, July 5. They were the only individuals of the species observed there. An egg was seen in a burrow on that island but it could not be reached. Littlejohn later in July noted a very few horned puffins out in the open bay among the drifting ice.

Ptychoramphus aleuticus (Pallas). Cassin Auklet.

Mr. Littlejohn feels sure that he saw several of this species from the launch, while crossing Icy Strait just before entering Glacier Bay, June 27.

Synthliboramphus antiquus (Gmelin). Ancient Murrelet.

The only example of this species obtained by the expedition was shot by Dixon near Coppermine Cove, Glacier Bay, July 17. The specimen is a male (No. 85) in some immature plumage and may be described as follows: The whole lower surface is white, except extreme chin and sides under the wings which are ashy; whole dorsal surface slate-gray, becoming slate-black on top of head, wings and tail; a narrow region on each side from above the eye back towards nape flecked sparsely with very slender white plumes; upper and lower eyelids white. No calcareous nodules on bill.

Brachyramphus marmoratus (Gmelin). Marbled Murrelet.

Almost everywhere that collecting was carried on by the expedition and throughout the season, the marbled murrelet proved common; yet no clue was found as to the location of its breeding

places. At Windfall and Mole harbors, Admiralty Island, April 17 to June 10, the species was numerous, and many specimens were taken. Stephens noted it at Red Bluff Bay June 11 to 20, Rodman Bay August 12 to 20, and Bear Bay August 21 to 27, these being localities around Baranof Island. Around Chichagof Island Dixon records it from Idaho Inlet, July 20 to 25; and full-grown young were taken there July 25. At Port Frederick, July 25 to August 1, marbled murrelets were common. Dixon notes that "they had a peculiar habit of flying about in pairs high over the water and forest, in the evening or early morning. During these flights they uttered a sharp, twittering note; but as they flew so swiftly and were anyway almost indistinguishable in the gray clouds, it was some time before we were able to identify the performers." At Hawk Inlet, Admiralty Island, August 1 to 9, the species was quite numerous. And on Glacier Bay, June 27 to July 20, many were noted, as elsewhere, mostly in pairs. Yet dissection of the females secured in no case showed signs of immediate nesting. The belief was held by members of the party that a large proportion of the marbled murrelets in this region are non-breeders, that is, birds of the second year.

In the series of twenty-two skins of this species obtained (Nos. 241-250, 130, 156, 157, 146, 147, 233-239), full summer, juvenal, and transition stages between winter and summer plumages are represented, but no full winter plumage. Skins Nos. 245 and 246, taken at Windfall Harbor April 26, are about half through the pre-nuptial molt. No. 246, a female, has no chestnut except a trace in the scapular region, the whole back being chiefly ashy; the lower surface is only thinly marbled with sooty sepia. No. 245, a male, shows a mixture dorsally of ashy and chestnut-tipped feathers, and the dark marblings ventrally are denser. From these one can pick out a succession of steps leading to the full summer or nuptial plumage, densely marbled below, the chest and sides of head almost solid sepia, and the back closely barred with bright chestnut-hazel. The first young (Nos. 238, 239) were taken July 16, at Glacier Bay. This plumage is characterized by a uniform slate-black dorsal surface, relieved by considerable white in the scapulars, and by a white undersur-

face, finely washed along the sides and across the chest with sepia scalings. Both mandibles are tipped with calcareous nodules.

***Brachyramphus brevirostris* (Vigors). Kittlitz Murrelet.**

One of the surprising results of the 1907 Alexander Expedition's explorations was the discovery of large numbers of the Kittlitz murrelet on the waters of Glacier Bay. Only one specimen was previously known from east of Unalaska, and that one from off the Kenai Peninsula. In fact the species on the American side, at least, has been known only from the capture of a few scattering individuals.

I quote Dixon's notes verbatim: "We saw at least five hundred of these gray murrelets in one flock. They were feeding in the channels among the numerous islands that lie near the mouth of the bay. Their principal diet was a slippery, slug-like animal about an inch long. A number of immature birds were seen, but they formed only a small proportion of the whole. These murrelets get off the water far more rapidly than do the marbled murrelets. They seem to come up flying. Their flight is much swifter than the other murrelets and they were much wilder. A large flock started by us and we began shooting. Sometimes we would drop a bird and all the rest of the flock would settle right down so that we thought we had killed the whole bunch until we came to pick them up."

According to Littlejohn's notebook, nearly all the Kittlitz murrelets seen were paired off; yet no individuals taken (June 28 to July 17) showed signs of immediate breeding. Although looked for everywhere, no clue was obtained as to the location of a breeding ground. It may have been that they had nested earlier in the season; but the failure of the collectors to secure young (although Dixon, as above noted, thought he saw "immature birds") makes the problem all the more puzzling.

The remarkable series of thirty-eight skins of this rare species (Nos. 180, 191-227), taken between June 28 and July 17, shows much variation in the amount of the ventral transverse, dusky vermiculation. Some specimens have the whole belly region posterior to the chest clear white; others are entirely covered ventrally with the dusky-tipped cream-buff-tinted feathers, though

less profusely there than along the sides and across the chest. Both sexes are represented and about evenly; external sexual differences are not apparent. All are surely in full nuptial plumage, though the less-heavily marked individuals in that respect show less departure from what is described as the winter plumage; but I have never seen this. Dorsally there is some variation in the amount of cream-buff streaking. Coues says (Key, 5th Ed., 1903, page 1077), "no white on scapulars"; but there certainly is in the majority of specimens a conspicuous amount of mixed white and buff in the scapular region.

***Cephus columba* Pallas.** Pigeon Guillemot.

The pigeon guillemot was found extensively distributed along the straits and channels among the islands. It was common at Windfall Harbor, April 26 to May 19, and at Mole Harbor May 19 to June 10. It was often seen in pairs at Hooniah, June 21 to 27; but a pair shot, according to Dixon, were both males. Stephens saw several at Idaho Inlet, July 20 to 25; and at Rodman Bay, August 12 to 20, single birds were occasionally seen. At Hawk Inlet, north end of Admiralty Island, Dixon noted it commonly August 1 to 9. On Glacier Bay from June 27 to July 20, pigeon guillemots were common, being noted singly and in small flocks.

Dixon found a number nesting on South Marble Island, Glacier Bay, July 5, at which date eggs were fresh or but moderately incubated. The eggs were laid on the bare rock or on piles of broken rocks in crevices back under boulders. Two sets of two eggs each and three single eggs were taken. These seven eggs show the usual variation in markings and ground color described of this species. The ground is pale cream color to pale olive buff, with bold markings of bistre to burnt umber, and shell markings of ecrû drab to drab-gray. These markings are in the nature of blotches and well-defined spots, mostly at the large ends, or in a ring about the large ends. Two extreme sizes are, 63×43.6 and 59.5×41.7 .

Five skins (Nos. 37, 38, 44, 45, 54) of the pigeon guillemot were obtained, from Admiralty and Chichagof islands and from Glacier Bay. Two of these, a female (No. 38), Windfall Harbor,

May 1, and a female (No. 54), Glacier Bay, June 28, show a curious admixture of white and sooty brown feathers over the whole body, giving a mottled appearance. A close examination shows that this condition is not due to an active transition from a white winter to a dark summer plumage, as might be inferred to be in process, for I fail to find pin-feathers. While a good many feathers are either wholly white or wholly dark, a number in both specimens, especially on the back, are parti-colored.

Uria troile californica (Bryant). California Murre.

The only murre taken was secured at Windfall Harbor, Admiralty Island, May 16. It is a male (No. 69) in transition from winter to summer plumage, the throat, neck, and sides of head being mixed dark sepia and white. A few others were seen there. The species was noted elsewhere but once: a single individual was seen by Littlejohn on Glacier Bay, July 11.

Stercorarius parasiticus (Linnaeus). Parasitic Jaeger.

On Glacier Bay, June 29 to July 14, this species was noted in small numbers. Most of them were seen harassing a flock of arctic terns, compelling the latter to disgorge the small fish which they were catching at the mouth of a stream. Dixon saw a pair of jaegers around South Marble Island, July 5, which kept chasing a duck hawk. Stephens saw two jaegers on Bear Bay, Baranof Island, the last of August.

Five skins of the parasitic jaeger (Nos. 228-232) were secured by the expedition in Glacier Bay, June 29 to July 14. All are in the dark phase of plumage. Number 230 shows several lighter dusky-barred winter feathers in the plumage of the lower surface.

Rissa tridactyla pollicaris Ridgway. Pacific Kittiwake.

A flock of several hundred kittiwakes was encountered among the floating ice on Glacier Bay July 13, and two immature-plumaged specimens were secured (Nos. 81, 82). A flock of about a dozen hung about the camp at Idaho Inlet, Chichagof Island, July 20 to 25; and Stephens saw several kittiwakes over a tide-rip in Bear Bay, Baranof Island, the last week in August.

Larus glaucescens Naumann. Glaucous-winged Gull.

This was a widely-distributed and generally common sea bird throughout the region. At Windfall and Mole harbors, Admiralty Island, the species was seen in numbers almost daily from April 17 to June 10. At the former point an immature male (No. 8) was taken May 8, and an adult male (No. 9) May 9. A few glaucous-winged gulls were seen on the outer beach at Red Bluff Bay, Baranof Island, June 11 to 20. At Port Frederick, Hooniah, and Idaho Inlet, Chichagof Island, the species was more or less common at various times between June 20 and August 1. Individuals were often seen on the mud flats at the mouths of the streams. Stephens found it, but not commonly, at Helm Bay, September 10 to 17.

Only at Glacier Bay was the glaucous-winged gull found breeding. A good many were found nesting on the smaller treeless islands about the bay. On June 28 the first eggs were seen. There were eight or nine nests containing one fresh egg each. These may not have been the first deposited; for at this place the natives rob the nests regularly. On South Marble Island, July 5, Dixon found a colony nesting. There were as yet no young. Sets of two eggs each were about as numerous as sets of three. Incubation at that date was well advanced. On July 14, young only a few hours out of the shell were found by Stephens, and two were prepared as skins (Nos. 25, 26). On the 16th many young were seen about a small lake, though on the same day slightly incubated eggs were taken. The nests consisted of moss and grass, lining a slight excavation scratched in the turf usually beneath a bush of some sort.

A series of twenty-nine eggs of the glaucous-winged gull was secured. Among these is a runt measuring only 43×31.5 mm. Its coloration is no different from that of the rest, though the shell is thicker and rougher-surfaced. It was one of a set of three taken, the others being normal, and it was infertile. In this series the ground color varies from olive-buff to a rather pale broccoli brown. The markings are in the nature of spots and blotches of varying sizes up to a diameter of 7 mm., quite evenly distributed over the entire surface, and of colors grad-

ing from deep vandyke brown and bistre to pale drab-gray, blending with the ground color. The markings have a generally longitudinal trend, in some cases spiral. Relatively to the amount of variation exhibited in series of other gull's eggs, the present series exhibits remarkable uniformity. Two eggs selected as extremes in size (except the runt), measure: 76×52.5 and 66.8×48 .

***Larus argentatus* Brünnich.** Herring Gull.

According to Dixon's notes, gulls believed to be of this species were seen during the latter half of April at Windfall Harbor, Admiralty Island. These were doubtless in migration. A solitary, silent individual was repeatedly seen about the chain of lakes back of Mole Harbor, Admiralty Island, as late as June 11.

***Larus brachyrhynchus* Richardson.** Short-billed Gull.

This gull was met with nearly everywhere the party went. At Windfall Harbor, April 25, a great many were seen passing northward and this flight continued at intervals for several days. At Mole Harbor the species was rather common, May 19 to June 10; and one lone individual was seen about the lakes a few miles inland. At Red Bluff Bay in June, and at Bear Bay and Rodman Bay in August a goodly number were seen. A few were noted at Hooniah and Idaho Inlet in June and July. A large flock of short-billed gulls stayed around the mouth of a salmon creek at Hawk Inlet, August 1 to 9. The species was common on Glacier Bay June 27 to July 20; and a few were noted at Helm Bay, September 10 to 17. In spite of their constant presence throughout the season, however, no inkling was obtained as to their nesting places.

Three adults (Nos. 39, 40, 61) from Windfall Harbor, Admiralty Island, April 24 and 25, and one full-grown juvenal (No. 71) from Peril Strait, Baranof Island, August 23, were secured. Two of the adults show flecks of dusky about the head. These were evidently just completing a pre-nuptial molt, the dusky flecks belonging to the last remaining feathers of the winter plumage.

Larus philadelphia (Ord). Bonaparte Gull.

At Windfall Harbor, Admiralty Island, Bonaparte gulls began to arrive in large flocks, April 29. They remained more or less common well into May, feeding in flocks of a hundred or more on the shallow water close to shore, where small fish were plentiful. The full-plumaged adults were first to appear, and a few days later the immatures arrived. A few immatures were noted by Stephens at Mole Harbor in May. Not until July 23 at Idaho Inlet, Chichagof Island, was the species again seen. Dixon noted a large flock there, and also found it common at Port Frederick July 25 to August 1, and at Hawk Inlet, Admiralty Island, August 1 to 9. Stephens noted a considerable flock frequenting the mud flat at the head of Rodman Bay, Baranof Island, August 12 to 20.

Ten skins of the Bonaparte gull were preserved (Nos. 62-68, 46-48).

Sterna paradisaea Brünnich. Arctic Tern.

This, the only species of tern detected by the expedition, proved to be rather common on Glacier Bay, in the vicinity of which it may have been nesting. A full-grown juvenal was taken there July 10 (No. 89), and adults June 28 and July 11 (Nos. 87, 88, 90). A large flock kept at the mouth of a creek near the eastern mainland camp, where they seemed to be feeding on salmon fry.

Phalacrocorax pelagicus Pallas. Pelagic Cormorant.

At Windfall Harbor, Admiralty Island, April 17 to May 19, several pelagic cormorants stayed around a reef, covered at high tide, a half mile or so off shore. At Mole Harbor the same was true, May 19 to June 10. At Idaho Inlet, Chichagof Island, July 20 to 25, a few were seen. In Glacier Bay the species was much more numerous, being noted commonly fishing among the icebergs. On South Marble Island, July 5, Dixon's notebook records that "there were two colonies of pelagic cormorants, one of breeding birds, the other of non-breeders. There were at least a hundred cormorants breeding on the island, and from

one hundred and fifty to two hundred more were merely roosting there. Only breeding birds were seen during the day, but about 7 o'clock the other black non-breeders began to arrive in bunches of from four to seven. They left about 4 o'clock in the morning. The nests were attached to the sloping marble just before it dropped off into salt water, and were from fifteen to seventy-five feet above the high-tide mark. Most of the nests were not finished, but four contained one egg each. The nests were compactly built of moss gathered nearby, and not of seaweed. The white patches on the flanks and the two crests were very noticeable in the breeding birds, and most of the males also had the white, slender plumes on their necks. The non-breeders had no white flank patches."

The three skins of *Phalacrocorax pelagicus* secured measure as follows:

No.	Sex	Locality	Date	Wing	Tail	Culmen	Depth of bill
53	♂	Glacier Bay	July 5	280	160	50	13
36	♀	Windfall Hbr.	May 10	260	150	46	11
52	♀	Glacier Bay	July 5	247	165	47	11

After comparison with all available material, including some of that in the U. S. National Museum, I must admit my inability to find grounds for recognizing a race *robustus*. As Coues states (Key, 5th ed., 1903, p. 967), it seems to be "an error to attempt to separate Alaska birds from *pelagicus*." On the other hand *resplendens* of the California coast is readily distinguishable, and the feeling in my mind is that the latter is specifically distinct. At any rate, there is no material at hand showing intergradation.

***Mergus americanus* Cassin. American Merganser.**

Mr. Littlejohn's notebook presents the following information in regard to this merganser: "When our party reached Mole Harbor, Admiralty Island, April 16, small flocks of six or eight were constantly passing back and forth about the creek mouths. At Windfall Harbor three days later they had appeared mostly in pairs and sought the waters of the larger streams as far up as the ice had melted away. Not much was learned of their nesting habits, although they evidently breed in the dense forests along the larger streams. According to statements of the

natives, the eggs are deposited in hollow stumps. As soon as the young are out they accompany their parents to salt water." The species was fairly common in the lakes inland from Mole Harbor, May 19 to June 11. At Red Bluff Bay, Baranof Island, Stephens records that two females brought broods of young down to the water near camp on June 19. Dixon secured a downy young there June 17. The American merganser was noted once at Hooniah, Chichagof Island, the last week in June; and it was seen sparingly on Glacier Bay, June 27 to July 20.

The expedition brought home four American mergansers, one adult male (No. 10), two adult females (Nos. 75, 114), and one downy young (No. 76).

***Mergus serrator* Linnaeus. Red-breasted Merganser.**

According to Dixon's notebook, fifteen or twenty individuals of this species were seen at Windfall Harbor, Admiralty Island, during the sojourn of the party there, April 17 to May 19. None were taken.

***Anas platyrhynchos* Linnaeus. Mallard.**

A few mallards were noted at Windfall Harbor, where a male was shot May 8, but not preserved. In the neighborhood of Alexander and Beaver lakes, near Mole Harbor, the species was common, and Dixon records the following of it: "Each outlying beaver pond had its pair of mallards. The females were seen coming into the big lakes to feed at about 6:30 in the evening. On May 25 a very small duckling (No. 13, in natal down) was secured from a flock of six or eight. Although this flock of youngsters was seen on a number of occasions we never found any old birds with them. The mallard was found to raise two broods a year, and it might have been that the parents had already turned the first brood out to rustle for themselves." Littlejohn is of the opinion that the heavy forest along the lake shores formed ideal protection from enemies, so that supervision by their parents was unnecessary.

At Port Frederick, Chichagof Island, a pair of mallards was seen on a mud flat the last of July. On Glacier Bay, June 27 to July 20, several broods of young were noted, and on July 14

Stephens found a set of eight eggs in which incubation was barely commenced. The nest was on the ground under a low, depressed willow on a small island, and was composed of moss. The eggs are pale cream-color, and an average selected example measures 55.9×39.5 mm.

Chaulelasmus streperus (Linnaeus). Gadwall.

On July 16, Littlejohn saw a flock of five gadwalls about a small lake on one of the Beardslee Islands in Glacier Bay. The birds flew within easy identification range, and could have been readily shot, but at the time it was undesirable to make any noise. The species was not noted elsewhere, nor has it been previously recorded from Alaska that I know of.

Mareca americana (Gmelin). Baldpate.

A lone pair of baldpates were seen by Littlejohn at Windfall Harbor, Admiralty Island, May 6. The species was not again detected.

Nettion carolinensis (Gmelin). Green-winged Teal.

From Littlejohn's notebook it appears that this species was noted near Windfall Harbor, Admiralty Island, May 1, when a flock of twenty-five were seen near the mouth of a small stream. On June 4 a pair were discovered at the mouth of a creek in Mole Harbor. At Glacier Bay a small flock was seen July 5; and on July 16 nearly full-grown young were caught in the same locality. None were preserved.

Dafila acuta (Linnaeus). Pintail.

Dixon noted a pair of pintails at Windfall Harbor, Admiralty Island; and Littlejohn found where half a dozen pairs were breeding around a small lake at Glacier Bay. These were discovered on July 16, and on that date the young varied from very small to at least one that was able to fly. This individual was caught hiding in the grass, and on being released flew with much effort across the pond. No examples of this species were preserved.

Marila marila (Linnaeus). Scaup Duck.

A greater scaup duck was shot at Windfall Harbor, Admiralty Island, April 22, but was not preserved. Others were seen there almost daily. Littlejohn records that at Glacier Bay a large flock was frequently seen about the narrow channels among the small islands. They were not paired, and showed no indications of breeding.

Marila affinis (Eyton). Lesser Scaup Duck.

This species was met with only at Glacier Bay, where at the edge of a small pond on one of the islands Littlejohn found a set of ten eggs, July 16. The nest was placed within a heavy growth of grass about a foot from the water's edge, and consisted of grass stems lined with a little down from the parent's breast. Although the eggs were almost on the point of hatching, they were brought home and later successfully prepared. They are plain olive-buff in color. A selected average egg measures 59.7×40.4 . The female was shot as she left the nest and is No. 91 of the University collection. Stephens saw another female with a brood of young. This is the first breeding record of *M. affinis* that I know of for Alaska.

Clangula clangula americana Bonaparte.

American Golden-eye.

A golden-eye thought to be of this species was found only on and about Admiralty Island, where it was seen occupying about the same localities as the American merganser. At Windfall and Mole harbors, and about the lakes inland from the latter place, the species was noted more or less commonly. Both Littlejohn and Dixon believed it to be breeding in the region, but neither eggs nor young were discovered. No skins of this duck were obtained.

Charitonetta albéola (Linnaeus). Buffle-head.

At Windfall Harbor, Admiralty Island, buffle-heads were rather common for a little while during the last of April and early May. A female specimen (No. 70) was preserved. The species was met with nowhere else.

Harelda hyemalis (Linnaeus). Old-squaw.

“At Windfall Harbor, April 17 to May 19,” according to Dixon, “this was one of the most numerous and noisy ducks in the harbor. They were mating when we came, and the courting lasted during our stay. On one occasion six males were seen flying about after one female. They were all intoning ‘auek-quan-dee’ to their utmost capacity and the one that hollowed the loudest seemed to stand the best chance, so there was considerable competition. There seemed always to be about three males to one female.” The old-squaws began to disappear by the middle of May. At Mole Harbor between May 19 and June 10, a few were seen, according to Stephens. And at Glacier Bay, June 27 to July 20, the species was not uncommon. Two specimens were preserved, a male (No. 112) and a female (No. 111), both taken at Windfall Harbor, May 16.

Histrionicus histrionicus (Linnaeus). Harlequin Duck.

This handsome duck proved to occur in small numbers nearly everywhere that observations were carried on. Five adult males and five adult female specimens (Nos. 101-104, 72-74, 49, 92, 93) were obtained from Admiralty, Baranof, and Chichagof islands and Glacier Bay. Many of those seen, as on Glacier Bay, stayed in small flocks around the outer reefs, and were thought to have been non-breeders, as those taken showed no signs of active reproduction. No nests or young were found anywhere. Yet the presence of harlequin ducks in pairs along streams and on inland lakes all through the summer indicates the probability of their nesting. At Hasselborg Lake, Admiralty Island, in June, Dixon noted “three males in persistent pursuit of one female; there did not seem to be females enough to go around.” At Idaho Inlet a harlequin shot by Stephens July 21 showed that it had been feeding on isopod crustaceans apparently gathered under stones along the beach at high tide.

Somateria v-nigra Gray. Pacific Eider.

A single example was secured by the expedition, an adult female (No. 21), found dead by Littlejohn at Glacier Bay, July

16. The bird was discovered lying in the grass at the margin of a small lake on an island in the bay. It had so recently died that it was made up into a good skin. Nothing was learned as to the probable cause of death. The ova were small, so that if the bird had bred in the vicinity it must have been some time before. No others were seen by the party. The species is not known to occur regularly in summer east of the Kenai Peninsula.

Oidemia americana Swainson. American Scoter.

This scoter was noted in flocks of as many as two hundred in the vicinity of Windfall Harbor, Admiralty Island, April 17 to May 19, evidently in migration; and it was common at Mole Harbor from the latter date on to June 10. The species was again seen only at Glacier Bay in July where it was common. It is Littlejohn's opinion that the breeding birds all passed on to the northward; those remaining were many of them faded and bedraggled in appearance, evidently non-breeders. No signs of nesting were detected anywhere. No specimens were saved.

Oidemia deglandi Bonaparte. White-winged Scoter.

From the camp at Windfall Harbor, Admiralty Island, according to Littlejohn, great flocks were constantly in sight during the latter half of April. Males were often noted fighting furiously over the females. At Mole Harbor the species was still in evidence up to June 10. On Glacier Bay it was common in July, but no signs of nesting were noted anywhere. At Hawk Inlet, August 1 to 9, white-winged scoters were numerous but wild. No specimens were secured.

Oidemia perspicillata (Linnaeus). Surf Scoter.

For a while in April and early May this scoter was present at Windfall Harbor, Admiralty Island, in about as large numbers as the other two species. An adult male (No. 113) was preserved on April 20. Stephens records it as still common at Mole Harbor May 19 to June 10, where a flock remained much of the time about a reef at the mouth of the harbor. The same collector noted it on Glacier Bay in July. No evidence of nesting in the region was discovered.

Branta canadensis hutchinsii (Richardson). Hutchins Goose.

According to Littlejohn's notebook, a large flock of this species was seen passing northward at Windfall Harbor, April 18. "The natives say that some years these geese stop in large numbers for a short time to feed upon the herring spawn which is to be seen all along the beach at low tide, where it sticks to the rocks."

Branta canadensis occidentalis (Baird). White-cheeked Goose.

This was the only goose nesting in the region explored by the expedition, and it proved common at most places. Littlejohn's notebook contains the following general account: "When Mole Harbor, Admiralty Island, was reached, on April 16, large flocks were seen about the creek mouth at the head of the bay. On the 18th many were found at Windfall Harbor, and by the 27th nearly all had paired and could be seen passing back and forth to the inland waters every day, remaining a good share of the time in the open water, where their loud notes could be heard at all times; but when night came on I think most, if not all, came to land to roost. They seemed to feed about the shores, especially where small streams and springs were flowing across the gravel. One large creek near our camp was a favorite place to assemble, and each evening they could be seen coming in from all directions to pass the night. At low tide they would remain on the gravel flats at the creek mouth, but when the tide came in they would retreat to the acres of ice inland, which had been formed during the winter; here they remained until morning if not disturbed, and then would break up in pairs, as a rule, and go off again for the day. Several pairs had chosen the lakes back of Mole Harbor for a nesting ground and were seen together when we first went there; but a few days later some old gander was apt to be seen in a secluded cove, or, as happened several times, flushed from the thick timber at some distance from the water. At such times he would fly about, scolding away at a great rate, as if he were alarmed at our presence so near his mate, who was undoubtedly nearby, but in the almost impenetrable forest and underbrush was not to be found."

Dixon found a nest near Hasselborg River, Admiralty Island, June 12, which was under a hemlock in a meadow at least a quarter of a mile from water. It was merely a shallow depression lined with goose down. There had been seven eggs in the nest. A lone gosling (No. 14, in natal down) was found in a beaver pond one-fourth of a mile distant from the nest.

At Port Frederick, Chichagof Island, July 27, a flock of about fifty white-cheeked geese were seen on a tide flat. These were evidently in molt and unable to fly, as they merely flopped off down to the water. The species was also seen at Hooniah and Red Bluff Bay. At Glacier Bay Stephens noted a brood of half-grown young in July. At Windfall Harbor early in the season several were shot and two preserved. Three males weighed 11, 11½, and 12½ pounds, and were not fat. A female was very fat and weighed 9½ pounds.

The two adult males, taken April 22 and 23, measure as follows:

No.	Wing	Tail	Tarsus	Culmen	Bill from nostril
18	473	200	92	50	26
19	490	230	93	51	27

These two specimens are chiefly characterized on comparison with *B. c. canadensis* by very dark colors, especially on the lower surface. The flanks and tibiae darken to deep broccoli brown, while a slightly less intense shade of the same color invades the rest of the underparts between the black neck and the white belly and crissal region. The back too is darker than in *canadensis*, like the color of the flanks with lighter tippings. There is no white half-collar bounding the black neck below in front. The large cheek patches are continuous below across the throat, though somewhat constricted by the opposite medial encroachments of black from the chin and neck.

Ardea herodias fannini Chapman. Northwest Coast Heron.

Great blue herons were not common anywhere, though met with at widely different places. At Windfall Harbor, Admiralty Island, a pair were seen repeatedly the last of April; and at Mitchell Bay, near Killisnoo, June 13, four were seen on a small island and one secured. Stephens saw two twice at Bear Bay,

Baranof Island, the last week of August. At Glacier Bay, June 27 to July 20, a number were seen. A bird-of-the-year taken showed that the species nested in the vicinity.

The four specimens obtained show well the characters of *fannini* as pointed out by its original describer (Chapman, Bull. Am. Mus. Nat. Hist. XIV, April, 1901, pp. 87-90). I saw the type of *fannini* in the American Museum of Natural History, New York, and find that our specimens are extremes of the form, showing a very dark slate dorsal surface and dark rufus tints on the tibiae and edge of wing. There are several examples of this form also in the United States National Museum from the northwest coast region.

No.	Sex	Locality	Date	Wing	Tarsus	Culmen
12	♀ ad.	Admiralty Isl.	June 13	461	145	128
22	♀ ad.	Glacier Bay	June 28	486	150	120
23	♂ im.	Glacier Bay	July 2	451	133	115
24	♂ ad.	Glacier Bay	July 3	487	159	125

Lobipes lobatus (Linnaeus). Northern Phalarope.

Not until July 2, at Glacier Bay, was this bird met with; then Littlejohn secured an adult female (No. 100) in breeding dress, which was feeding alone about some seaweed. On the tenth of July hundreds were encountered among the ice out in the open bay. At Bear Bay, Baranof Island, the last week in August Stephens found the northern phalarope common, feeding on the kelp at mid and low tide; at high tide they stayed out in Peril Strait. Four examples (Nos. 142-145) in winter dress were taken on August 22.

Gallinago delicata (Ord). Wilson Snipe.

A female in high plumage (No. 105) was taken May 4, at Windfall Harbor by Littlejohn. The rusty tones of the under tail coverts, chest, hind neck, and scapulars are brighter than in examples from elsewhere compared with it. The species was observed but the once.

Tringa canutus Linnaeus. Knot.

According to Littlejohn's notebook a number of knots were seen among other small waders in a large mixed flock at Windfall Harbor, Admiralty Island, May 14. They were in full red.

summer dress, in marked contrast to the duller colors of their companions.

Arquatella maritima couesi Ridgway. Aleutian Sandpiper.

In the vicinity of Windfall Harbor, Admiralty Island, from May 1 to 16, flocks of this species were frequently seen along the beach. Ten specimens were secured May 1 to 14 (Nos. 181-190). These are all in transition from the winter to the summer plumage, with the latter predominating. This record probably indicates the winter habitat of this species, as it is not known to breed east of the Alaska Peninsula.

Pisobia bairdii (Coues). Baird Sandpiper.

A male in full nuptial plumage (No. 129) was secured by Dixon, May 12, at Windfall Harbor, Admiralty Island. It was in company with six or eight western sandpipers, and was the only one of its kind seen. At Mole Harbor Stephens saw two sandpipers that appeared to be of this species.

Pisobia minutilla (Vieillot). Least Sandpiper.

According to Littlejohn's notebook, two least sandpipers were seen at Windfall Harbor May 4, and four on the 17th. Three adults (Nos. 171-173) in worn nuptial plumage were taken at Glacier Bay, July 5. These were feeding on sand flats at the head of a long, narrow arm of the bay.

Pelidna alpina sakhalina (Vieillot). Red-backed Sandpiper.

A female (No. 120) in full summer plumage was taken by Littlejohn at Windfall Harbor, Admiralty Island, May 14. It was shot from a great flock of different waders, but none others of this species were recognized.

Ereunetes mauri Cabanis. Western Sandpiper.

Six examples are in the collection from Windfall Harbor, Admiralty Island, May 8 and 14 (Nos. 164-169) and two from Glacier Bay, July 6 (Nos. 174-175), the latter in worn nuptial plumage, the former in fresh nuptial plumage. At both of the above-mentioned localities many were seen in flocks. (For reasons for the adoption of this name see Allen, *Auk*, XXIII, January, 1906, pages 97, 98.)

Actitis macularia (Linnaeus). Spotted Sandpiper.

Seven examples of *Actitis macularia* were taken: an adult and a downy young (Nos. 154, 155) from Port Frederiek, Chichagof Island, July 27; four adults from Glacier Bay (Nos. 176-179), and one from Hasselborg Lake, Admiralty Island (No. 170). A careful comparison of Alaskan specimens with a series from the Atlantic States, shows no differences that I can discover. Besides the above-mentioned localities, the species was observed in pairs at Hasselborg, Alexander, and Beaver lakes, Admiralty Island. This was between May 19 and June 11, so they were doubtless nesting there. According to Dixon, a pair evidently had eggs or young near a stream at the head of Idaho Inlet, Chichagof Island, July 20 to 25. At Glacier Bay, July 16, Littlejohn saw a young spotted sandpiper, but it escaped in the grass. At Coppermine Cove, on the west side of Glacier Bay, Dixon secured a set of four half-incubated eggs with the female parent, July 14. The nest was a slight depression in the surface of a gravel patch and was shaded by three small willow sprouts that happened to grow close together. The nest was lined with dry dead willow leaves. "The female had a way of sneaking off the nest without uttering a note. She would run about twenty feet and then fly silently away." The eggs of the set are light clay color, spotted and blotched with dark shades varying from burnt umber to ecrû drab. They measure: 33×23.8 ; 32.9×23.6 , 31.7×24 , 31.5×24 .

Aegialitis semipalmata Bonaparte. Semipalmated Plover.

At Windfall Harbor, Admiralty Island, May 8, a pair of this species was seen on a sand flat by Dixon. At Glacier Bay, July 5, Littlejohn found a considerable number on a wide gravel flat near the head of a long inlet. He believed them to be breeding there; yet no nests or young unable to fly were discovered. The species was seen on subsequent days at different points on Glacier Bay; four adults (Nos. 96-99) in worn breeding plumage (though probably migrants) were taken July 5, 6 and 17.

Aphriza virgata (Gmelin). Surf Bird.

Eight specimens, 2 females and 6 males (Nos. 121-128), in full summer plumage were taken at Windfall Harbor, Admiralty Island, May 1 and 12. All were secured by Littlejohn. The one taken May 1 was alone, but those taken May 12 were in a flock estimated to contain three hundred waders, fully two-thirds of which were of this species. Two days later the same or another flock was seen, but none thereafter.

Arenaria melanocephala (Vigors). Black Turnstone.

Eight adults (Nos. 106-110, 161-163) in full plumage were taken at Windfall Harbor, Admiralty Island, May 1, 5, and 12. These were secured from large, mixed flocks of various waders. The species was not seen after May 14.

Dendragapus obscurus fuliginosus Ridgway. Sooty Grouse.

The sooty grouse was found common by the expedition in most wooded regions visited. On Admiralty Island, at both Mole and Windfall harbors and about the lakes inland from the former point, the species was common from sea-level to upper timber limit. According to Dixon's notebook, "the males sat up in moss-covered spruce trees and hooted all day (April, May, and June) and some were heard at all hours of the night. Many were very tame and would allow of close approach before attempting to fly." The crops of those examined contained only fir leaves. A female with her brood of young was noted by Stephens at Red Bluff Bay, Baranof Island, June 19; and at Rodman Bay, August 12 to 20 a few were seen, mostly young-of-the-year. At Hooniah, Chichagof Island, the species was not uncommon; and at Glacier Bay, July 11, Dixon found a female with a brood of small young. "The young promptly flew up on the alder branches, where they sat as if glued to the limbs."

The sixteen specimens of the sooty grouse secured include two in natal down (Nos. 94, 152), one juvenal (No. 79), and five adult males and eight adult females (Nos. 131-138, 80, 141, 151, 153, 95). In the brightest females the whole dorsal surface, the

sides and chest are rich hazel, except for the black barring everywhere and for white wedges in the scapular region. In the most fully plumaged males the dorsum is almost uniform sooty sepia, there being but little of the fine hazel vermiculation. In other words, this Alaskan series exhibits the extreme manifestation of *fuliginosus* characters. A full natal-plumaged chick was taken June 25 at Hooniah, and another chick somewhat larger, molting from natal into juvenal, at Glacier Bay July 10. A half-grown female bird from Rodman Bay, August 13, is still largely in juvenal plumage, but shows a good deal of the adult plumage in the back.

A set of half-incubated eggs was obtained at Pleasant Bay near Mole Harbor, Admiralty Island, June 2. The nest was a mere shallow depression scratched in the moss and fallen bark on the up-hill side of a hemlock, and at its foot. There was a lining of feathers from the female parent. The eggs, which were preserved, are ovate in shape, and measure: 49×35 , 50×34.5 , 51×36 , 50.5×36.7 , 49×35.5 , 52×37 , 50×37 . The ground color is deep cream-buff, profusely and quite evenly covered with dots and smallish spots of isabella color. They resemble most closely fig. 16, pl. 1, of Bendire's *Life Histories*, I, 1892.

***Lagopus alexandrae*, new species.**

Alexander Willow Ptarmigan.

TYPE.—Male adult; No. 319, U. C. M. V. Z.; mountain at Bear Bay (on Peril Strait), Baranof Island, Alaska; August 26, 1907; collected by Frank Stephens (shot by a local hunter).

CHARACTERS.—Similar to *Lagopus lagopus* from northwestern Alaska and Labrador in corresponding plumage, but coloration darker throughout, especially dorsally; bill smaller and relatively much narrower.

REMARKS.—Six willow ptarmigan were obtained within the Sitkan District, whence I know of no examples in summer plumage having been recorded previous to this. These are: an adult male (No. 373) taken near Hooniah, Chichagof Island, June 25; an adult male (No. 357) and two half-grown juvenals (Nos. 358, male, and 359, female) taken on the mainland on the east side

of Glacier Bay, July 14; and one adult male (the type) and one full-grown but immature male (No. 318), taken at Bear Bay, Baranof Island, August 26. The four full-grown birds bear out well the above indicated characters, and with a uniformity usual in ptarmigan from one region, always of course presupposing on the part of the observer a strict attention to the stage of plumage and the tracts of which the feathers are a part. (See Dwight, *Auk*, XVII, April, 1900, pages 147-159, for a detailed study of the molts and plumages in the willow ptarmigan.)

The type is largely in the summer protective or tutelar plumage, but the post-tutelar molt has progressed so far as to render the lower breast and abdomen white. Only two old retrices remain, while there are eight short new ones of varying lengths, the outermost being the longest. In this specimen, as in the three other full-grown birds, the dorsum is very dark, due not only to the depth of the brown coloring (almost burnt umber), but to the extension of the black on the centers of the individual feathers, so that the hazel barring is more restricted; and to the absence of the white terminal margins to the feathers, these being replaced by buffy tipplings or not represented at all.

No. 318; from the same locality as the type, is a bird-of-the-year, largely in first protective, though showing remnants of the juvenal. This is even darker-toned as compared with corresponding stages of *lagopus* from the Kowak Valley, northern Alaska.

No. 373, a male from Chichagof Island, June 25, is in nuptial plumage on the head, neck and chest, while on the back and sides a good deal of the tutelar has appeared. Again the dark tones are conspicuous. The foreneck is uniform deep rich burnt umber with a hazel tinge.

The male from Glacier Bay (No. 357) is in magnificent full summer (tutelar) plumage over the whole body, save for a few white feathers in the posterior ventral region. Dorsally it shows an extreme of blackening, many of the feathers exhibiting large central black areas, with lighter barring at the edges only. The general effect of the whole back is of a black ground with fine irregular transverse hazel barring, and occasional terminal edgings of pale ochraceous. The three adults are short-clawed, showing that these had undergone recent molt. The two young

from Glacier Bay are precisely alike and in full juvenal plumage, except for traces of natal down on the throat, and white feathers of the succeeding plumage in the wings. As compared with two birds in the Grinnell collection (Nos. 3864, and 3865 from Kotzebue Sound) of exactly the same size and stage of plumage, the former show conspicuous differences. The whole dorsal surface is much darker, due to a spreading of the black as in the case of the adults, while the barring and edging is deep hazel instead of buffy. Beneath, the young of *alexandrae* are heavily and closely barred with black even to the flanks. The ground color of the breast and sides is tawny, paling to dusky white on the belly.

This new species is named for the courageous organizer and leader of the expedition, Miss Annie M. Alexander, to whose energetic supervision much of its success was due.

Stephens records that at Bear Bay a man named Strassel shot four out of six ptarmigan seen; they were shot with soft-point balls, and but two were saved. At Hooniah, Chichagof Island, where Stephens shot No. 373, June 25, Dixon records that white ptarmigan feathers and droppings were found in almost every clump of hemlocks near the summit of the mountain. Another was seen to whiz off down the steep slope, and a male was heard calling. But the freezing mist was so thick that the bird could not be found, although it may have been within gun range. Dixon also records that at Coppermine Cove, Glacier Bay, July 10 to 20, the feathers and bones of a ptarmigan were found near a nest of broken eggs on the summit of the mountain, 2100 feet. The nest was under a stunted hemlock. All the feathers were white, so the ptarmigan must have laid early. Littlejohn's notebook contains the following in regard to the Alexander willow ptarmigan found by him there: "While searching for eggs of the glaucous-winged gull on one of the small islands on the east side of Glacier Bay on July 14, I suddenly came upon a flock of ptarmigan in a little opening among some spruce, hemlock, and alders, which covered the ground in dense masses in spots; the remainder of the area supported a thick growth of grass interspersed with patches of moss and low-growing flowering plants. There were about eighteen birds all

told, young and old, and as near as I could determine there were four or five old birds present. Being about ready to leave for California, I had turned over my shotgun to our guide who was then at another camp, so I lost a chance to bag half the flock. Mr. Stephens was nearby, and I secured his gun, but by this time they had scattered and hid in the brush; however, after a long search one old bird and two young were secured. They would not fly after they were first flushed, but kept dodging about on the ground, sheltered by the thick cover; several times I saw them but so near that a shot would have ruined them as specimens. I searched the island again the next day but none were seen, although I could find white feathers from their winter coat, and detect trails through the grass at many points, as if the birds had been feeding there. I think there were many more on this island, but being hard to flush were not easily found. There were several other islands in this group which were not visited by our party, and which appeared from what could be seen to be even more suited to their taste than the one mentioned. Nothing further was learned of their habits."

Lagopus dixonii, new species. Dixon Rock Ptarmigan.

TYPE.—Male adult; No. 371. U. C. M. V. Z.; mountain, 2700 feet altitude, near Port Frederick, Chichagof Island, Alaska; July 30, 1907; collected by Joseph Dixon.

CHARACTERS.—Resembling *Lagopus rupestris nelsoni* in corresponding plumage, but much darker; in extreme blackness of coloration nearly like *Lagopus evermanni*, but feathers of chest and back more or less finely vermiculated with hazel.

DESCRIPTION OF TYPE.—General color of all feathers not white, sooty bistre; throat region about equally barred with this color and white; and in a less amount the feathers of the lower throat, sides of neck and nasal region tipped with white; whole top of head sooty, minutely and sparsely barred with hazel; fore chest barred with tawny, broadest toward the fore neck, the bars becoming narrower posteriorly over the hind chest until obsolete; in the hinder part of the pectoral region the feathers show narrow white tips, and progressively backwards these tips widen

until the hindermost are obtuse wedges of white contrasted against the sooty bistre basal portions of the feathers. The majority of the feathers back of the hind chest are white, but there are some long, flowing parti-colored (sooty and white) feathers in the flanks and some distinctly tawny barred feathers along the sides that I take to belong to the tutelar plumage. This bird seems to be largely in nuptial plumage, but with an admixture of tutelar posteriorly both dorsally and ventrally; in the wing coverts are a number of feathers, sooty with minute flecks of tawny and with obtuse white wedges at their ends. The wings are otherwise white. The back is largely sooty bistre, the feathers showing toward their ends faint and extremely narrow transverse and tawny vermiculation. The tail feathers are lacking, save for two partly grown new ones which are black, tipped narrowly with white.

Another colored adult (No. 372), taken in the same locality and on the same date as the type, has the same sooty bistre ground color, but the tawny is much more extensive, more as in *rupestris* of corresponding plumage from the interior of Alaska. The barring of tawny is wider in pattern, so that it gives this bird a generally lighter coloration. The three remaining birds (Nos. 366-368), taken May 31, on a mountain near Hasselborg Lake, Admiralty Island, are adult males, still in nearly full winter plumage. But over the pileum in each case are many dark feathers showing through the white. These dark feathers are like those on the type, sooty bistre, almost dead black, flecked sparingly with narrow tipplings or barrings of hazel.

This new species of the variable *rupestris* group I judge to be the Sitkan District representative. It shows the same sort of color characters as many other birds of the region. It is named for Mr. Joseph Dixon, through whose persistence and hardihood all of the specimens were collected.

On the mountains around Hasselborg Lake ptarmigan were apparently common, but on account of the precipitousness of the region were very difficult to obtain. On May 30, when the males were yet in almost pure white plumage, females seen were almost entirely gray above. "Their flight was very swift, more like that of a falcon than a quail. The males would fly out over

the mountain side, hover for a moment and then swoop down, and alight on a rock, uttering their loud rasping call, which sounds similar to the noise produced by running a lead pencil over a stiff rubber comb."

Dixon's account of the finding of the species near Port Frederick, July 30, is as follows: "I was crawling down a ledge on the north side of the rocky summit of a mountain at 2700 feet altitude. About twenty-five feet below me a sharp rock jutted out, forming the crest of a hundred-foot cliff. I had glanced along the ledge below but saw nothing, when suddenly a gray-backed ptarmigan rose from a bunch of heather on a narrow ledge and trotted out on a jutting rock, bobbing its head and watching me intently the while. I fired a light charge at the bird which dropped over the cliff. At the report two other ptarmigan jumped up and started swiftly away. I dropped one with the remaining barrel. Then I began the descent to retrieve the birds. By going down to one side of the cliff I had almost reached its base when I came to a sheer drop; so I had to dig my fingers into the crevices and work my way back up again. By going a long way around I finally reached a twenty-foot snow drift at the foot of the cliff and there I found my two birds dead. Both had their crops stuffed with heather buds."

Accipter velox (Wilson). Sharp-shinned Hawk.

Three specimens were secured, male and female (Nos. 268, 269) with nest and eggs at Hasselborg Lake, Admiralty Island, May 25, and an immature (No. 149) at Bear Bay, Baranof Island, August 26. I cannot see any decided characters that would seem to distinguish these from California or Atlantic Coast birds. The immature presents an extreme of darkness, and with perhaps more than the average depth of hazel tippings and edgings to the feathers dorsally, and this might prove constant in a series. The other two, although breeding birds, do not show the clear slaty backs and barred under surface of fully adult sharp-shinned hawks. Instead they look like somewhat faded-out immatures, their backs being dull fuscous, and the lower surface for the most part streaked. Probably they were yearlings. The species

was met with nearly everywhere, but was common nowhere. One was seen at Windfall Harbor, Admiralty Island, May 4. At Rodman Bay, Baranof Island, Stephens saw several, August 12 to 20. One pair kept after a band of jays, but did not catch any so far as could be seen, and the jays did not appear to fear them. A sharp-shinned hawk was seen at Hooniah, Chichagof Island, the last week of June; and at Glacier Bay in July and at Helm Bay in September individuals were noted.

I quote the following from Dixon's notebook: "A pair of sharp-shinned hawks stayed around our camp at Hasselborg Lake and we often heard their plaintive calls. The female was shot May 24, but although she was badly wounded she succeeded in flopping off into the brush. We heard her fluttering around in the dense tangle but failed to find her, although we searched hard and long. Two days later we again heard the low, plaintive whistle, and started out to locate it. Three of us searched for half an hour but the note was very elusive and about the time we thought we had cornered it we would hear it away off in another direction.

"Hasselborg was searching in a clump of small spruce trees, when out darted a small hawk, swooping down at him and endeavoring valiantly to drive him away. The nest was located twelve feet above the ground, and examination showed the female bird on; but her wings were outstretched and she was cold and dead. On the edge of the nest beside her bill there had been carefully laid a small bird, a pine siskin. This was plucked almost free of feathers, and had evidently been placed there by the faithful male." The nest held two fresh eggs, and the oviduct of the female contained another fully formed egg. The nest was built against the main trunk of the tree, and was supported by a small branch. It was composed of small twigs, from a few inches to a foot long, loosely woven into a flattish platform. The eggs are white with a faint tinge of pale blue, and are blotched chiefly about the large ends with burnt umber, with shell markings of fawn color and vinaceous. They are oval and measure 37.6×29 , 39×29.5 , thus being very near the average given by Bendire (*Life Histories* I, 1892, p. 191). In color they are nearest like fig. 13, pl. V, of that work.

Astur atricapillus striatulus Ridgway. Western Goshawk.

A full-grown male in juvenal plumage (No. 77) was taken by Stephens at Bear Bay, on Peril Strait, Baranof Island, August 25. As compared with a series of eastern birds in corresponding plumage in the National Museum, it shows deeper rusty edgings to the feathers wherever such edgings occur. The whole dorsal surface is darker, and the bars across the dorsal surface of the tail are conspicuously blacker.

Buteo borealis alascensis, new subspecies.

Alaska Red-tailed Hawk.

CHARACTERS.—Resembling *Buteo borealis calurus* but smaller throughout, and, keeping in consideration the stage of plumage, dark areas blacker and more extended.

TYPES.—Male adult; No. 51, U. C. M. V. Z.; Glacier Bay, Alaska; July 19, 1907; collected by Frank Stephens. Female juvenal; No. 41, Coll. U. C. M. V. Z.; Port Frederick, Chichagof Island, Alaska; July 28, 1907; collected by Joseph Dixon.

REMARKS.—I compared the male type with the large series of *Buteo borealis calurus* in the U. S. National Museum collection, and found it to be always blackest dorsally, and decidedly smaller; the other three specimens of *alascensis* are at least as black and but a little larger. Even in comparison with the erythro-melanistic plumage of *calurus*, the dorsum of *alascensis* still stood sootier. The three adults all have relatively broad subterminal black bars on the tail, varying from 10 to 16 mm. in width. The dorsal surface of the tail is a dark red, between hazel and chestnut. In two of the adults there is a series of well-defined but irregular and narrow transverse bars within and concentric with the subterminal bar. In the other adults there is but an indication of such markings, chiefly along the shafts of the rectrices. The flanks are strongly barred with hazel. The black shaft streaks in the belt across the middle of the belly in all three specimens are much broader than in any specimens of *calurus* I have seen. It must be emphasized that the examples of *alascensis* at hand are not in a plumage that corresponds with

the erythro-melanistic state of *calurus*. The former are plainly in the light phase, if indeed, *alascensis* possesses a true dark phase at all. No. 41 is a full-grown juvenal and is a bird-of-the-year, because tufts of natal down are still to be observed adhering to the tips of the rectrices and secondaries. This bird is notable for its excessive darkness as compared with the corresponding plumage of *calurus* and *borealis*. The whole dorsal surface is black, scantily relieved by narrow cinnamon-rufous edgings on the hind neck and scapulars. The feathers of the rump and the rectrices are tipped with clay-color. The nine black bars across the dorsal surface of the tail are scarcely set off by the slightly paler intervals. Beneath, a noticeable distinctive character is the heavy and close barring on the flanks and lower tail coverts, the ground color being clay-color. The increased extent of black markings on the neck, chest and sides of belly is also worthy of record. The relatively unmarked chest region is suffused with a strong tinge of cinnamon.

No.	Sex	Locality	Date	Length	Stretch	Wing	Tail	Culmen from cere	Bill from nostril
51	♂ ad.	Glacier Bay	July 19	490	1130	344	195	23.2	21.1
43	♂ (?) ad.	Port Frederick	July 28	515	1215	362	218	25.5	22.3
42	♀ ad.	Port Frederick	July 28	.....	.....	365	207	27	23
41	♀ im.	Port Frederick	July 28	.....	.....	368	235	26	23

The Alaska red-tail was found at several of the points visited, but was nowhere remarkable for its abundance. According to Dixon's notebook a pair were evidently nesting near the head of Alexander Lake, as they were seen there repeatedly between May 19 and June 11. A pair were seen June 13 at the head of Kootznahoo Inlet, also on Admiralty Island. Near Coppermine Cove, Glacier Bay, a pair were noted and one bird secured.

At Port Frederick, Chichagof Island, July 28, two adults and two fully grown young were detected in the forest through the squealing of the latter, and three of the birds secured. The stomachs of these birds, according to Dixon, were filled with meadow mice (*Microtus*); these rodents, abundant at this place, evidently constituted the main food supply of the red-tails.

At Rodman Bay, Baranof Island, August 12 to 20, Stephens saw a red-tail near the summit of the mountain that was climbed, and two others were noted on the opposite side of the bay.

Archibuteo lagopus sancti-johannis (Gmelin).

American Rough-legged Hawk.

At Coppermine Cove, Glacier Bay, July 10, a nest of the rough-legged hawk was located by hearing the plaintive whistle of the birds. This nest was built in a sheltered niche about half-way up the face of a one hundred-foot limestone cliff near the beach. There were three half-grown young, and these were kept alive for some time, being fed on *Microtus* bodies. The latter were swallowed whole by the young birds. Meadow mice were plentiful in this locality and formed the main component of the diet of this hawk, as shown by the stomach-contents of the parents. The species was noted nowhere else but at Windfall Harbor, where one was seen.

Two adults, male and female (Nos. 27, 28), and two young (Nos. 29, 30) were preserved from Glacier Bay, July 10 and 12. All are in the extreme melanistic phase of plumage, that is, sooty both above and below, save where the white or lighter bases of the feathers show through. In such specimens the feathers of the pectoral region are edged rather inconspicuously with hazel, and in the young this color appears similarly on the head, and bend of the wing. It is a significant thing, as pointed out by Beebe (*Zoologica*: N. Y. Zool. Soc., I, September, 1907, page 10) that the so-called "dark phase" of the rough-legged hawk appears to be restricted in the breeding season to humid regions. "The black hawk, * * * while appearing during migration as isolated individuals all over the United States and southern Canada, seems to have a center of abundance in Ungava and Labrador." I compared one of my birds with others in the U. S. National Museum from Labrador, and found them, as far as I could see, identical. The probability seems to be that this "dark phase" is really a geographic form occurring in regions of excessive humidity, and not identical with the "light phase," American examples of which are said to not differ from the European form.¹

¹ See Chapman, Bull. Am. Mus. Nat. Hist., XX, Nov., 1904, p. 402.

Haliaeetus leucocephalus alascanus Townsend.

Northern Bald Eagle.

The bald eagle was found common along the sea shore in nearly all parts of the region explored. At Mole Harbor, Admiralty Island, Stephens records seeing as many as twenty eagles together at one time. At Windfall Harbor and Hawk Inlet they were common; but about the lakes in the interior of Admiralty only one was seen. At Red Bluff Bay, Bear Bay, and Rodman Bay, Baranof Island, they were noted. At the latter point, Stephens saw a nest, August 19, with young able to fly and parents about. At Hooniah, Port Frederick, and Idaho Inlet, Chichagof Island, the species was common, as it was also on the mainland shores at Glacier Bay and Helm Bay. It is undoubtedly permanently resident in the region. The chief diet of the bird everywhere appeared to be rotting salmon; hence it was always more numerous around the mouths of the salmon streams. Occasionally eagles were seen actively catching small fish which were frightened to the surface by loons.

One skin was preserved (No. 11). This is of an adult female and shows the following measurements: wing, 610 mm.; tail, 335; tarsus, 95; chord of middle claw, 43; chord of culmen from cere, 58.5; bill from nostril, 49; culmen, 69. This bird, measured by Dixon when first taken, had a length of 37 inches, and a spread of 6 feet 10 inches; its weight was 13½ pounds. Another female, made into a skeleton, had a length of 37 inches, a spread of 7 feet 9 inches, and weighed 15 pounds. A male had a length of 37 inches, a spread of 6 feet 10 inches, and weighed 13½ pounds, the same as the female above noted.

At Windfall Harbor, April 30, Dixon secured a set of two fresh eggs. The nest was located on the north end of Windfall Island on the broken-off top of a large tree standing on a ridge. The tree was 3½ feet in diameter, and the nest was 116½ feet from the ground. Before it could be reached, three adjacent trees were felled, the last one lodging against the nest tree. The brooding eagle remained on the nest until Dixon was within reach, when she flew off, and the two birds kept circling about and squealing, but offered no active opposition. The nest was

found to be four feet high, and six feet four inches across one way by six feet eleven inches across the other. The cavity was seven inches deep by sixteen inches across and was lined with moss, grass and duck feathers. The eggs are the largest of which I can find any record. (See Bendire, *Life Histories*, I, 1892, page 280.) They measure 78×58.5 and 75.5×60 . They are rounded ovate in shape; the shell is rough, clear white, and slightly nest-stained.

Falco peregrinus anatum Bonaparte. Duck Hawk.

An adult female (No. 32) and three young (Nos. 33-35) were obtained at Danger Point, near Killisnoo, Admiralty Island, Alaska, June 18. Neither the adult nor the young am I able to identify with the form *pealei* generally supposed to take the place of *anatum* in the northwest coast belt. Yet Admiralty Island is in the heart of the Sitkan District. I compared the adult and one of the young with the accessible specimens in the United States National Museum, with the result that they appeared to me identical with the average of corresponding plumages among Atlantic Coast specimens. The differences between *pealei* and *anatum* are claimed at best to be slight.

The young above referred to were taken from their nest June 16, and were kept alive for different lengths of time. The nest was situated under the roots of an alder bush that drooped over the verge of a cliff a hundred feet above the breakers. Duck hawks were noted elsewhere only at South Marble Island, Glacier Bay, July 5, where one was seen by Dixon; and at Bear Bay, and Red Bluff Bay, Baranof Island, where Stephens saw individuals in August and June, respectively.

Pandion haliaëtus carolinensis (Gmelin). American Osprey.

The osprey was strangely scarce in this region, where it is generally supposed to be numerous. A lone individual was seen in May and June about the chain of lakes back of Mole Harbor, Admiralty Island. Dixon noted four or five at Killisnoo, June 14, and on Glacier Bay Stephens records it as occasionally seen. No specimens were taken.

Bubo virginianus saturatus Ridgway. Dusky Horned Owl.

The single specimen taken (No. 78) was shot by Stephens at Rodman Bay on Baranof Island, August 15. It is a male with plenty of plumage, though evidently undergoing molt. Its striking characters of coloration are an extreme of blackness and buffiness. Mr. H. C. Oberholser, to whom I submitted the specimen for his opinion, pronounces it very nearly typical of *saturatus*.

At the same place and time that the above specimen was taken, another was seen by Stephens. One of the birds was hooting about 4 p.m. on a cloudy day, and the sound was followed up. The birds flew about in the timber, but one of them allowed close enough approach for a shot.

At Windfall Harbor, Admiralty Island, the notes of this owl were heard on several evenings. At Hooniah, Chichagof Island, a large owl was being pestered by a bunch of beach crows, but could not be identified with certainty. Notes of small owls were heard on Admiralty Island, but no clew was obtained as to their authorship.

Ceryle alcyon (Linnaeus). Belted Kingfisher.

At Windfall Harbor, Admiralty Island, according to Dixon, a pair of kingfishers were digging a nest-hole in a sand bank, April 18. At Mole Harbor the species was rare, May 19 to June 10. At Baranof Island, Stephens saw one individual at Red Bluff Bay, in June, and one each at Bear Bay and Rodman Bay in August. At Idaho Inlet, Chichagof Island, Dixon saw one July 23; and at Hawk Inlet, Admiralty Island, August 1 to 9, a family of kingfishers were seen fishing along the creek. No specimens of this bird were obtained.

Dryobates villosus harrisii (Audubon). Harris Woodpecker.

The three specimens secured by the expedition, all from Admiralty Island, agree with other examples from the Sitkan District in being slightly larger than *harrisii* from Oregon and Washington, in having the under surface less deeply smoky, and

in having large white spotting on the wing-coverts. The peculiarities of the Sitkan hairy woodpeckers have been commented upon before,² and I prophesy that the race will be ultimately named. I hesitate to do so now because of entire lack of Alaskan examples of *leucomelas*, and scantiness of *harrisii* material from farther south along the Pacific Coast.

Upon this species Dixon comments: "At the three lakes back of Mole Harbor I saw more of these birds than at all other places put together. Their slow drumming sounded so similar to the clicking of a telegraph instrument that we dubbed them 'telegraph woodpeckers' to distinguish them from the sapsuckers." At Windfall Harbor, a laying female (No. 463) was taken May 6; at Hasselborg Lake an adult male (No. 462) May 30; and at Hawk Inlet a juvenile male (No. 464) August 5.

Picoides americanus fumipectus, new subspecies.

Smoky-breasted Three-toed Woodpecker.

TYPE.—Male adult; No. 452, U. C. M. V. Z.; Hooniah, Chichagof Island, Alaska; June 25, 1907; collected by C. Littlejohn.

CHARACTERS.—Similar to *Picoides americanus americanus* (Swainson) but white of head, and lower surface suffused with a distinct pinkish smoky tinge; black preponderating dorsally, that is, white markings reduced far below their average extent in *americanus*.

REMARKS.—If it were not for the fact that the smoky suffusion shown by this, the only specimen secured, is precisely the tint of that on the lower parts in *Dryobates villosus harrisii* of the same humid faunal area, I would not dare to name it as new on the basis of such scanty material. But the analogy is so significant that I have not the slightest doubt that more specimens from the same general region will exhibit the same character. Moreover, two specimens remarked upon by Bangs (*Auk*, April, 1900, p. 135) are through his kindness before me. These are from Saturnia Island, B. C., which is also in the Northwest Humid Coast Belt. As stated by Bangs (l. c.) they are "pinkish smoke gray" beneath, one somewhat more strongly than the

² See Jenkins, *Auk* XXIII, April, 1906, p. 168.

other, though in neither so strongly and extremely as in the Chichagof bird. They, too, show an extreme minimum of white markings dorsally. The three specimens together meet the characters one would assign to a new woodpecker from the region, reasoning solely from analogy with previously known forms. I do not believe the smoky color is due to staining, as is at once suggested by constitutional doubters of new subspecies. It pervades evenly the whole contour portions of the feathers involved, not the distal tips alone—as would be the case were the staining hypothesis to hold.

After studying over the version of the synonymy of *Picoides americanus* according to Bangs (*Auk*, April, 1900, pp. 127-129), I must express myself as agreeing fully with him. The name *americanus* should date from Swainson and not from Brehm. This name therefore applies to the form of interior Alaska and Northwest Territory, previously called successively *fasciatus* and *alascensis*. The New England bird should stand as *P. a. bacatus* Bangs.

Littlejohn, the collector of the type of *Picoides americanus fumipectus* comments on its capture as follows: "On the way up a mountain back of Hooniah, Chichagof Island, June 25, at an elevation of 2300 feet, we had stopped to rest and eat lunch, when the bird was heard, and soon detected clinging to the side of an old stump. I soon brought my gun to bear and succeeded in securing this, the only one of its kind I saw during the season." Dixon records that Hasselborg shot another with his rifle in the same general locality the last of July. Unfortunately the remains were not preserved.

Sphyrapicus ruber ruber (Gmelin).

Northern Red-breasted Sapsucker.

This woodpecker was found commonly at the following points, all on Admiralty Island: Windfall Harbor, April 17 to May 19; Mole Harbor, May 19 to June 10; Hasselborg Lake, May 19 to June 11, where it frequented the alders along the lake shore; and Hasselborg River June 12. At Coppermine Cove, Glacier Bay, July 19, one was shot by Hasselborg with his "bear gun," but the fragments were not preserved.

The seven adult specimens secured (Nos. 1-7) all from Admiralty Island, show extreme brightness of coloration. The ventral yellow is distinct, and in particular, the red of the head and breast is a very bright and dark crimson. This latter is in part due to wear undoubtedly; but even so, the color is deeper than in the corresponding plumage of sapsuckers from further south. The dorsal white stripe is indicated by a restricted series of mere yellowish white flecks. I have at hand no skins of *Sphyrapicus* from Vancouver Island; it would be desirable to make comparisons with material from there.

Selasphorus rufus (Gmelin). Rufous Hummingbird.

The first hummer was seen, according to Dixon, at Windfall Harbor, Admiralty Island, May 1. It was a brilliant male and came and buzzed about some bright red tomato cans that had been thrown out. Stephens records that at the same place, May 2, a male came around camp investigating everything that was red, such as a red-bordered towel, the red places on the end of a fruit box, an empty salmon can, and particularly a red bandana handkerchief hanging on a bush; this the bird went to three times.

At Mole Harbor, June 3, Dixon saw three female rufous hummingbirds around camp. "They kept pecking at the frayed ends of the tent ropes. We put out bits of cotton which the birds soon found and carried off for nest building." A nest with two considerably incubated eggs was found by Stephens, June 4, at this place. The nest was seven feet above the ground in a fir tree on the bank of a creek and three miles inland from the bay. The nest is firmly saddled on a horizontal branch, smoothly finished and rather thick-walled, composed of fine bits of moss and what looks like cottonwood down closely felted together. The outside is profusely covered with scale-like bits of light-colored bark. The nest is 26 mm. high by 50 mm. across; and the cavity is 16 mm. deep by 24 across. One of the eggs was broken. The remaining egg measures 13 by 8.8 mm.

At Hasselborg River, June 12, Dixon saw a bright male hummer. At Red Bluff Bay, June 11 to 20, and at Bear Bay, August 24, both on Baranof Island, Stephens noted the species; also at

Glacier Bay, June 27 to July 20, it was seen at all camps, but was considered rare. On Chichagof Island, July 20 to 25, a female was seen several times at Idaho Inlet; and at Port Frederick, July 29, one was seen. Only females or immatures were seen later than June—the males arrive first, and return south again early in the summer. Two specimens were taken (Nos. 331, 332), both females, on Admiralty Island.

***Empidonax difficilis* Baird.** Western Flycatcher.

At Windfall Harbor, Admiralty Island, the first western flycatchers were seen, and one secured (No. 339) May 15. At Mole Harbor they were occasionally seen and one secured, according to Stephens, May 19 to June 10. Dixon heard them commonly along Hasselborg River, June 12. At Red Bluff Bay, Baranof Island, Stephens collected a male (No. 314) June 14; and at Rodman Bay one was seen between August 12 and 20. At Coppermine Cove, Glacier Bay, July 19, Dixon found a nest with three fresh eggs. The nest was compactly built of moss, and was supported against the trunk of a sapling about six feet above the ground. Two birds were secured (Nos. 329, 330). Finally, Stephens shot an immature (No. 272) at Helm Bay, September 11, and another was seen there.

I cannot discover the slightest differences by which to distinguish the above five birds from a series of *E. difficilis* from California.

***Cyanocitta stelleri stelleri* (Gmelin).** Steller Jay.

Jays were not at all common on Admiralty Island, according to Dixon, and the few seen were as a rule very shy. This was especially true at Windfall and Mole harbors. At Hasselborg Lake one was seen carrying a young varied thrush in its beak, and being closely pursued by the irate male thrush. At Killisnoo a two-thirds-grown juvenal was taken June 16. At Hawk Inlet, August 1 to 9, they were more common and inquisitive, as many as a dozen being attracted by a young duck hawk tethered at camp.

Stephens records the Steller jay as rare at Red Bluff Bay, Baranof Island, in June; three or four were seen at Bear Bay,

August 21 to 27; and at Rodman Bay, August 12 to 20, they were common, mostly young birds. Several frequented the vicinity of inhabited houses, picking up refuse food. At Hooniah and Port Frederick, Chichagof Island, in June and July the species could not be considered common. At Helm Bay, September 10 to 17, jays were rare, according to Stephens.

A series of fifteen skins was brought home by the expedition: ten from Admiralty Island (Nos. 407-416), two from Baranof Island (Nos. 320, 386), two from Chichagof Island (Nos. 393, 394), and one from Helm Bay (No. 278). In absence of material from Nootka Sound, Vancouver Island, the type-locality of *stelleri*, I cannot verify the claim that the *Cyanocittas* from the Sitkan District are aberrant.

Corvus corax principalis Ridgway. Northern Raven.

Ravens were found to be more or less common along the seacoast everywhere the expedition went. At Windfall Harbor, Admiralty Island, Dixon records that they often came around camp to pick up the bird bodies that had been thrown out. "They took particular delight in aggravating the dog by flying along the beach just ahead of him." On the same island ravens were common at Mole Harbor and Hawk Inlet. On Baranof Island Stephens records them as common at Red Bluff Bay, Rodman Bay, and Bear Bay. On Chichagof Island they were present in usual numbers at Idaho Inlet and Port Frederick. On both shores of Glacier Bay they were not uncommon. Finally, Stephens noted them at Helm Bay, September 10 to 17.

The following measurements show the tremendous size reached by this race of the raven; all four are from Admiralty Island:

No.	Sex	Date	Wing	Tail	Tarsus	Culmen	Gonys	Depth of bill at base
20	♂ ad.	April 21	420	242	66	71.5	36	30
16	♂ ad.	April 23	468	263	68	83	39	30
15	♀ ad.	April 23	428	255	65	66	32	26.5
31	♀ ad.	April 24	400	240	67	67	35	28

No. 16 is unworn; the others have their wings and tails more or less abraded. No. 16 was measured fresh—length 670 mm.; spread, 1400 mm.; weight four pounds.

Corvus brachyrhynchos caurinus Baird. Northwest Crow.

The beach crow, as this species is most aptly called locally, was found common throughout most of the sea-coast regions visited. On Admiralty Island it was common at Windfall Harbor, where it nested in trees on the small islands. It was numerous at Mole Harbor, but at Hasselborg Lake, in the interior of Admiralty Island, but one was seen, thus emphasizing the fact of its predilection for salt water. At Killisnoo Dixon records it as abundant and acting as town scavenger. Stephens noted beach crows in flocks at Red Bluff Bay, Rodman Bay, and Bear Bay, Baranof Island. They were noted on both shores of Glacier Bay. At Hawk Inlet, Admiralty Island, August 1 to 9, there were many young; though full-grown, their parents were still feeding them. On Chichagof Island, the species was numerous at Idaho Inlet and Port Frederick. At Hooniah, June 21 to 27, Dixon records beach crows as abundant. "Young were just out of the nest and very noisy, and the old crows were kept busy gathering marine stuff from the tide flats. When a crow found a clam too big to break he would take it in his beak and fly over to a boulder that stood out in the flat. When he was twenty-five or thirty feet above the rock, he would drop the clam, and the shell usually broke when it struck the rock. Sometimes it took several trials to break the shell. Some rocks were seen that were almost surrounded by a ring of the broken shells." This is an interesting confirmation of the similar story told of the crow's near relative, the raven.

Five adult specimens (Nos. 115-119) of the Northwest crow were preserved, all from Admiralty Island, April 24 to May 28.

Pinicola enucleator flammula Homeyer.

Kadiak Pine Grosbeak.

Six specimens were obtained on Chichagof Island (Nos. 281-286), and five at Glacier Bay (Nos. 252-256). Of all these, but one from each locality was a male in bright plumage. The red of these approaches an orange-vermilion rather than a burnt carmine, as in pine grosbeaks from northern Alaska. The grays

of all the specimens are dark, leaden, rather than ashy; and the bills are much larger and heavier than in the case of northern Alaska birds. These are the characters which have been assigned to the race *flammula*, though the type locality of that name is Kadiak Island, and differences may be found between examples from there and the Sitkan District. I have no Kadiak skins to compare with.

Pine grosbeaks were detected by the expedition only on Chichagof Island and at Glacier Bay. Dixon found the first near Hooniah, June 25. "A scattered company were discovered in a patch of windfalls at about 1800 feet altitude. The snow was just melting and many small plants were coming up in the open spaces that were exposed to the sun. The birds in pairs were feeding on these sprouting plants. The song had a clear, snappy, flycatcher-like accent to it." Several pine grosbeaks were seen near the beach at Port Frederick as the party landed there, July 25, and at Idaho Inlet, July 20 to 25, the species was seen twice and heard many times. At Coppermine Cove, Glacier Bay, July 10 to 20, Dixon found it fairly common. "The males would perch on the very tip of some spruce and indulge in a jerky but clear-cut song. Sometimes they were found feeding in the alders, where we saw them tearing the young alder buds apart, and supposed at first they were eating them; but upon examination we found their crops full of small green worms and it was evidently these the birds were after and not the buds themselves."

***Loxia curvirostra sitkensis*, new subspecies. Sitka Crossbill.**

TYPE.—Male adult; No. 472, U. C. M. V. Z.; Windfall Harbor, Admiralty Island, Alaska; May 3, 1907; collected by C. Littlejohn.

CHARACTERS.—Similar in size to the smaller individuals of *Loxia curvirostra minor* (Brehm) Ridgway, of the Atlantic region of North America, but general coloration different: in adult male about orpiment orange, instead of the deep brownish crimson or coral red as in *minor*.

DESCRIPTION OF TYPE.—General body-color orpiment orange (top of head more Chinese orange, rump orange, and throat

saturn red); feathers of mantle, bistre-centered with broad endings of dull orpiment orange and olive-yellow; wings, tail, and upper half of auriculars, dull bistre; scapulars same, washed with color of rest of mantle; belly dull white; lower tail coverts fuscous, broadly edged with dull white; anal area washed with pale orpiment orange. Length (of skin) 132 mm.; wing, 86; tail, 58; culmen, 14; depth of bill at base, 8.6; tarsus, 14.5; middle toe and claw, 19.

REMARKS.—The sixteen specimens secured by the expedition (Nos. 469-484) were all obtained on Admiralty Island, May 3 to June 16. Two of them are full-grown streaked juvenals taken May 15 and June 15; four are adult females; four are "immature" males (that is, they are not fully red); and six are in the full bright plumage. All of the latter are like the type (which is one of them) in essentials; one (No. 478) shows an albinistic tendency in that there are many white feathers in the top of head and neck; at least three show a few wax-yellow feathers among the orange on the breast and back. I cannot see that the females or young differ (except in smaller size) from corresponding plumages of the eastern bird examined. But the four "immature" males are constantly yellower than any of the corresponding plumage in the eastern series examined. For instance, the rump, breast, top of head, in No. 473, is dull saffron yellow. Two of the "immatures" also show a sprinkling of the orpiment orange feathers characteristic of the adults. In the Grinnell collection are six more examples of the newly described form, taken at Sitka in the summer of 1896. Only two of these are males, and these are also in intermixed immature and adult plumages.

Through Dr. C. W. Richmond I have been furnished for examination by the United States National Museum a series of 107 male American crossbills. After a deliberate study of these in comparison with the series from the Sitkan District, and taking into consideration seasonal and individual peculiarities, I feel convinced of the existence of a geographic race in the Sitkan District. It may be remarked that Nelson (Rep. Nat. Hist. Coll. Alaska, 1887, page 173) was inclined to recognize a distinct Alaskan race of *curvirostra*, but on the basis of its diminutive

size only. Later it was found that just as small individuals occur on the Atlantic Coast. But it must be remembered that these do not represent the average size of *minor*. My series of twelve males of *sitkensis* shows an average wing measurement of 85.2 mm. (See also the tables of measurement given by Ridgway, Bds. N. & Mid. Am., Part I, 1901, page 48.) The form *sitkensis* averages smaller than *minor*.

In the National Museum series is one specimen (No. 153244) from Alberni, Vancouver Island, British Columbia, which is practically identical with the Admiralty Island *sitkensis*. It seems probable therefore that the form *sitkensis* extends far southward through the humid Pacific Coast belt.

On Admiralty Island, where the above-described series was taken, the species appeared to be common. At Windfall Harbor Dixon says that "a flock of six or eight were accustomed to come down very early in the morning to feed on the beach, and a number were secured. Birds taken May 3 were evidently breeding." At Killisnoo, June 16, the same collector saw "a family of six, four young and two old ones: the young were fully feathered but were still being fed."

Stephens saw the species occasionally in pairs at Mole Harbor, May 19 to June 10. And at Red Bluff Bay, Baranof Island, between June 11 and 20, he saw a flock in the timber on the side of a mountain at about 1500 feet altitude.

***Loxia leucoptera* Gmelin. White-winged Crossbill.**

Of the eight specimens of the white-winged crossbill obtained by the expedition, one (No. 456) is a full-grown juvenal taken at Hooniah, Chichagof Island, June 25; two are adult females (Nos. 453, 467); and five are full-plumaged males (Nos. 465, 466, 468, 454, 455). No two of the latter are exactly alike in color. Only one (No. 468) is of the deep poppy red like all my series from the Kowak Valley, Northern Alaska. The other four are (No. 465) saturn red, (Nos. 455, 466) coral red, and (No. 454) peach blossom pink mixed with chrome yellow. However, in a series of forty-seven male white-winged crossbills from Labrador and the eastern United States, I find examples almost duplicating each of these styles of coloration. I can see no pronounced differences in size or proportions.

Four of the specimens were obtained at Hooniah on Chichagof Island, and four on Admiralty Island. On the latter island, at Windfall Harbor, this species was found in flocks in company with the Sitka crossbill, but was not so common as the latter. Several pairs of white-winged crossbills were seen in June in the alders margining the lakes back of Mole Harbor, and along Hasselborg River a flock was seen June 13.

***Leucosticte tephrocotis littoralis* Baird.**

Hepburn *Leucosticte*.

Dixon records that at Hooniah, Chichagof Island, June 21 to 27, "several leucostictes were seen around the lower end of the melting snow slides, and the rock slides near the summit of the mountain, 2500 feet altitude. Hasselborg shot one with his bear gun, June 23, and brought back the head which was all there was left of the bird. Three of us hunted for them a good half-day. I saw several and had two good shots at one but did not get him for some unaccountable reason."

The head (No. 50) was all of the specimen obtained. This is sufficient, however, to show it to belong to the race *littoralis*; for the ashy extends continuously down the sides of the head to include the malar region, and the bill is intermediate in size between that of *tephrocotis* and *grisonucha*. This record indicates a probable breeding station for the species.

***Spinus pinus pinus* (Wilson).** Pine Siskin.

On Admiralty Island this species was pronounced by Dixon to be more numerous than any other land bird; this was so at least at Windfall Harbor. Stephens records that at this point a female shot April 19 appeared to have already incubated. At Mole Harbor and around the lakes near there, many siskins were noted. On June 12, about half-way down Hasselborg River, Dixon saw a very large flock, probably over two hundred. At Hooniah, Chichagof Island, June 21 to 27, siskins were abundant, and many families were seen. At Port Frederick, July 25 to August 1, but one family was observed. At Coppermine Cove, Glacier Bay, a lone individual was noted, the only one seen in that region.

Eight examples of the pine siskin were secured, one from Chichagof Island (No. 287), and the remainder from Admiralty Island (Nos. 291-297). They are all in full adult plumage and are quite uniform in the matter of both coloration and size. I can discern no difference between these and the average of series from the mountains of southern California, the Rocky Mountains of Colorado, and the northeastern United States. The pine siskin must be either remarkably resistant to local ecological influences, or it must wander over large areas, adopting new breeding places so often as to prevent the fixation of adaptive characters under any one set of factors. The latter is probably the more nearly true explanation; for the species is wont to appear suddenly in a locality where never before known and breed in numbers.

Passerculus sandwichensis sandwichensis (Gmelin).

Sandwich Sparrow.

Two male sparrows (Nos. 401-402) taken at Windfall Harbor, Admiralty Island, May 5 and 9, are plainly referable to this form. They were evidently transients on their way northward.

Passerculus sandwichensis savanna (Wilson).

Savanna Sparrow.

The eight savanna sparrows secured (Nos. 403-406 from Admiralty Island, Nos. 384 and 385 from Baranof Island, No. 392 from Chichagof Island, and No. 277 from Glacier Bay) are puzzling in the extreme. In the matter of size they are intermediate between *alaudinus* and *sandwichensis*, nearest the former. But in general coloration they are dark, duplicating the eastern *savanna* in yellowness of the eyebrows, general brownness, and more extensive black streaking dorsally. From *savanna* the series is distinguishable only in a slightly greater size, but individual variation renders this difference inconstant. Hence I adopt the name *savanna* for the race breeding in the Sitkan District, although doubtless separated geographically from the range of typical *savanna* by that of *alaudinus*.

The savanna sparrow, according to Stephens, became rather common at Windfall Harbor, Admiralty Island, after May 1.

It was then noticed in trees as well as on the ground. The first were taken April 28. At Mole Harbor, May 19 to June 11, it was seen occasionally in suitable places; and at the head of Has-selborg Lake Littlejohn saw at least four birds in a grassy flat. At Glacier Bay in July they were noted "quite commonly on all the timberless islands, and many young were seen flying about or dodging into the heavy grass along the beaches." The species was found by Stephens at Red Bluff Bay, June 11 to 20; and at Rodman Bay (both places on Baranof Island), August 12 to 20, it was common in the grass at the head of the bay. On Chichagof Island it was evidently breeding in the restricted grassy areas at Idaho Inlet and Hooniah.

A nest of the savanna sparrow was found by Littlejohn, June 25, a few feet below the summit of a mountain 2600 feet in elevation and seven or eight miles southwest of Hooniah, Chichagof Island. The nest was built on the ground among short grass and weeds, the earth beneath being wet, and snow banks close around. Externally it is composed of matted leaves, and internally of fine, yellowed round grasses. It contained five perfectly fresh eggs. These measure: 19.8×14 , 19.1×14.1 , 19.6×14 , 20×14.5 , 19.3×14 . Their ground color is extremely pale bluish white; they are profusely and rather finely dotted and splotted with deep vinaceous and vinaceous-cinnamon. These markings tend to the formation of a distinct zone about the large ends of the eggs.

Zonotrichia coronata (Pallas). Golden-crowned Sparrow.

This species, which I had supposed to occur regularly in the region explored, was not found by the expedition anywhere in the breeding season. It cannot therefore be considered a characteristic component of the Sitkan fauna, as has been intimated. An immature male (No. 271, head only, preserved) was shot by Stephens at Thomas Bay, September 4. This was very probably a migrant.

Junco hyemalis oregonus (Townsend). Oregon Junco.

At no point was the junco abundant, and at only one or two places could it even be considered common. Yet it is a charac-

teristic breeding bird of the region and liable to be found practically everywhere below timber-line. At Windfall Harbor, Admiralty Island, April 17 to May 19, only two individuals were noted, the earliest April 19. At Mole Harbor the species was noted occasionally and Stephens caught a young bird in a trap May 31. At the three lakes back of Mole Harbor Dixon saw about six juncos all told; and on Hasselborg River, June 12, several were seen along the banks. At Hawk Inlet, August 1 to 9, many young birds were seen.

On Baranof Island, Stephens shot a junco at 1500 feet altitude back of Red Bluff Bay, June 17, and others were seen. The same collector saw several at Rodman Bay, August 12 to 20, and at Bear Bay, August 21 to 27.

On Chichagof Island, a few were noted on the mountain sides at Idaho Inlet and Port Frederick in July. On both shores of Glacier Bay juncos were observed, rather commonly on the eastern shore. Well-grown young were taken June 30 and July 9. Finally, Stephens found the species fairly common at Helm Bay, September 10 to 17.

Nine adults and four juvenals were taken, from Admiralty (Nos. 270, 301-305), Baranof (Nos. 150, 311), and Chichagof (No. 288) islands, and Glacier Bay. The four skins from the latter locality, two breeding adults (Nos. 258, 260) and two juvenals (Nos. 257, 259) are identical with those from elsewhere in the Sitkan District. The name *oreganus* was based on a winter bird from Oregon, which Ridgway has determined to belong to the Sitkan bird. I examined this type, now in the National Museum at Washington, and compared it with our skins from Admiralty Island, with the result that I fully agree with Mr. Ridgway. The breeding bird from Oregon is quite different.

Melospiza melodia rufina (Bonaparte.) Sooty Song Sparrow.

The twenty-two song sparrows in the collection are apportioned by locality as follows: Chichagof Island, four (Nos. 524-527); Baranof Island, four (Nos. 506-509); Admiralty Island, five (Nos. 500, 528-531); Glacier Bay, three (Nos. 512-514); Thomas Bay, one (No. 515); and Helm Bay, five (Nos. 532, 516-519). After careful comparison I fail to find any variation

throughout the series other than individual. The individual variation is considerable, both as to coloration, and size of bill. Some examples are much more sooty than others, these latter in point of brownness closely approaching *morphna*; but their generally larger size and longer bill are still diagnostic. One of the Glacier Bay birds, an adult male, is absolutely identical with one in the Grinnell collection from Sitka, both being breeding birds. Of the other two from Glacier Bay, one is a juvenal, and the other is a trifle grayer than Baranof Island birds, with the bill exhibiting an extreme of slenderness, possibly indicating a tendency towards the race *caurina* of Yakutat Bay. But as above stated I can find no alternative but to include the entire series under the name *rufina*.

I quote Bonaparte's description verbatim (*Conspectus Avium*, I, 1850, page 477): "Emberiza rufina, Brandt, Orn. Ross. t. 2.5. e Sitka. Minor: rufo-cinereum, dorso maculis rufo-brunneis; rostro producto, gracili."

It is fortunate that the locality is given, for otherwise the description would be equally applicable to several other North American species of the sparrow family. The description comes nearer fitting the song sparrow than any other of the sparrows occurring at Sitka. The authority of the name *rufina* has been given as Brandt; but apparently the first available description is that of Bonaparte, as quoted above.

At Windfall Harbor, Admiralty Island, April 17 to May 19, song sparrows were scarce, and only a few were seen. At Mole Harbor one was shot, May 27. At Killisnoo Dixon and Miss Alexander found song sparrows common on the beach, June 14 to 16. At Hawk Inlet one was taken and others seen, August 1 to 9.

On Baranof Island it was found only at Bear Bay, August 21 to 27, when Stephens secured four specimens. On Chichagof Island they were noted quite commonly about the old deserted Indian houses at Hooniah, June 21 to 27; young were seen there. At Glacier Bay many were seen on the Beardslee Islands in July; and at Helm Bay Stephens found the species fairly common September 10 to 17.

A nest with a set of four slightly incubated eggs of the sooty

song sparrow was collected by Stephens at Hooniah, Chichagof Island, June 23. It was situated one foot above the ground among dead and living grass under a fallen tree top, just above high-tide line on the beach. The nest is a rather bulky affair, with outside measurements 170 mm. across, by 85 high. The inner cavity is 67 mm. by 43 mm. The main constituent material is dried stems and broad blades of grass. The cavity is lined with fine round grasses. The eggs measure: 20.5×15.6 , 21.4×16.2 , 22.7×16.5 , 20.9×15.6 . These have a distinct pale Nile blue ground color, coarsely and closely blotched and dotted with brick red, vinaceous, and pale lavender. The markings are most crowded at the large ends. These eggs are thus identical in color with certain types of the eggs of *Melospiza melodia cooperi*, *santacrucis* and *heermanni*, but are decidedly larger.

Melospiza lincolni gracilis (Kittlitz). Forbush Sparrow.

The series of six adults and six juvenals, one from Helm Bay (No. 276), eight from Chichagof Island (Nos. 374-380, 391), and three from Baranof Island (Nos. 381-383), are all typical of this form which seems to be restricted during the breeding season to the Sitkan District. (See Grinnell, *Auk* XXI, April, 1904, pages 274-276.) The juvenals are fully as distinct as are the adults, both as to size and tone of coloration. As compared with juvenals of *lincolni*, the same plumage of *gracilis* shows much broader and clearer black-streaking especially dorsally; in fact the top of the head is mostly black. The ground color, too, is more of a tawny ochraceous, instead of clay color. For the reasons for replacing Brewster's name *striata* with *gracilis* of Kittlitz (which seem to me valid), see Oberholser, *Proc. Biol. Soc. Wash.* XIX, 1906, page 42.

This sparrow was detected at but few points. On Chichagof Island it was not uncommon along the edge of the timber near the river at Hooniah, June 21 to 27, where it was breeding. Littlejohn found a nest there June 26, in the moss on the side of a fallen, half-buried log just above high-water mark. It was well concealed by overhanging vegetation. The nest was located by watching the female parent feed the five young which were

thought to be about six days old. She was very shy about approaching the nest, and several visits to the locality were necessary before the nest was found.

The species was again found at Port Frederick, July 25 to August 1; and at Idaho Inlet it was also detected. At Bear Bay, Baranof Island, Stephens found the Forbush sparrow common in the beach grass, August 21 to 27. And at Helm Bay, on the mainland, one was shot and another seen September 16.

***Passerella iliaca townsendi* (Audubon).**

Townsend Fox Sparrow.

Of the splendid series of thirty-two skins of this species obtained, fifteen are from Admiralty Island (Nos. 485-499), eight are from Chichagof Island (Nos. 457-460, 520-523), six from Baranof Island (Nos. 440, 501-505), two from Glacier Bay (Nos. 510, 511), and one from Helm Bay (No. 450). After a close scrutiny I am unable to discern any variation accompanying difference in locality. The two from Glacier Bay happen to be full-grown juvenals. These might be expected to depart slightly towards *meruloides* of the Alaskan coast farther northwest: but as far as I can see they are identical with two juvenals from Chichagof Island. The individual variation in the series is remarkably little; the extreme of darkness is but a trifle more sooty than the opposite extreme, which is a deep vandyke brown with a hint of a chocolate tinge. I compared two of the specimens from Admiralty Island showing average characters with the skin in the United States National Museum considered to be the type of *townsendi*. The latter is a winter bird from the Columbia River. The former I found to be somewhat more sooty than this type, therefore showing some of the character ascribed to *fuliginosa*. (See Ridgway, Bds. N. & Mid. Am., Part I, 1901, pages 392-394.)

The Townsend fox sparrow proved to be widely distributed throughout the region explored, occurring commonly, as land birds go, in this sort of country. At Windfall Harbor, Admiralty Island, it was plentiful April 17 to May 19. Dixon secured a nest and four slightly incubated eggs there May 3, together

with the female parent. The nest had been found one week previously by watching the bird carrying feathers. It was located eight feet above the ground, resting among some drooping spruce boughs that overhung a pool of water near the beach. It is a bulky structure, 120 mm. high by 160 mm. across, the walls being very thick. The inner cavity is 70 mm. across by 50 deep. The main part of the nest is a matted mass of dead twigs, leaves, moss, and weathered grasses, and the lining is of finely frayed-out grasses mixed with duck feathers. The eggs resemble closely a common type of song sparrow's eggs. They are a pale Nile blue of a very distinct tone, blotched, spotted, and scrawled mainly at the large ends with vandyke brown, underlaid more profusely and evenly over the whole surface with finer irregular shell-markings of vinaceous. They measure: 23.2×17 , 22.8×16.1 , 22.9×16.4 , 21.2×17 .

A pair of fox sparrows were shot at 2000 feet altitude on a mountain side near Hasselborg Lake, and several were seen along Hasselborg River. At Hawk Inlet they were fairly common, August 1 to 9.

On Baranof Island Stephens records it as rather common June 11 to 20 at Red Bluff Bay, particularly about midway up the mountain side. They were also found at Rodman Bay and Bear Bay, in August.

On Chichagof Island, at Hooniah, Dixon reports the species as "very abundant up on the mountain near timber-line where full-fledged young and old birds building were seen on June 25." It was noted again at Port Frederick the last week in July; and at Idaho Inlet July 20 to 25. At Glacier Bay, June 27 to July 20, Stephens records it as "abundant on one of the outer Beardslee Islands." And at Helm Bay the same collector took a bird-of-the-year September 15.

***Hirundo erythrogaster palmeri* Grinnell.**

Western Barn Swallow.

On Admiralty Island a few barn swallows were seen in June at Mole Harbor, about the three lakes inland from that place, and at Killisnoo. Stephens records them as rather common at

Red Bluff Bay, Baranof Island, June 11 to 20; and at Rodman Bay, August 12 to 20, he "saw several around the old sawmill, where there were two old nests attached to a beam in the mill." According to Dixon, a number of barn swallows were seen circling over the meadow at Port Frederick, Chichagof Island, the last week in July. And at Glacier Bay, near the camp at Coppermine Cove, "about fifty pairs were nesting on a cliff. The young were nearly half-grown by July 15."

The four adult males secured, three from Glacier Bay (Nos. 352-354) and one from Admiralty Island (No. 345), all have the broad, deep chestnut forehead patch, and the more cinnamon-rufous posterior lower surface, which distinguish western and particularly Alaskan barn swallows from the Atlantic coast birds. The west coast race is clearly a valid one.

***Iridoprocne bicolor* (Vieillot). Tree Swallow.**

At Windfall Harbor, Admiralty Island, several were seen about the head of the harbor, May 8, according to Dixon, and about fifty were seen the last of May at the lakes near Mole Harbor. Stephens noted a few at Red Bluff Bay, Baranof Island, June 11 to 20. On Chichagof Island, tree swallows were numerous, mostly young-of-the-year, at Idaho Inlet, July 20 to 25; and at Port Frederick a number were seen circling over the meadow, July 25 to August 1.

Two specimens were preserved, an adult from Admiralty (No. 340), and a juvenal from Chichagof Island (No. 289). These are identical with breeding birds from southern California.

***Helminthophila celata lutescens* (Ridgway). Lutescent Warbler.**

At Windfall Harbor, Admiralty Island, the first specimen was discovered by Littlejohn May 1. Thereafter a number were noted by Stephens and Miss Alexander. Six examples were secured, May 1 to 16 (Nos. 333-338). These are all adult males and appear to me indistinguishable from breeding *lutescens* from California.

The species was noted at but one other place: Port Frederick, Chichagof Island, where Dixon saw one the last of July.

Dendroica coronata hooveri McGregor.

Alaska Myrtle Warbler.

This species was found only at Windfall Harbor, Admiralty Island, where two specimens, an adult male (No. 308) and an adult female (No. 309) were taken by Stephens and Littlejohn, respectively. These two examples show the following measurements:

	Wing	Tail
Male	75	66
Female	71	61

A color character of this form was pointed out by Bishop (N. Am. Fauna, No. 19, 1900, page 90) and holds in the six Alaskan males I have at hand, as compared with eastern birds; that is, the black on the chest is distributed more narrowly on each feather so as to give a streaked rather than a clouded effect. The larger size also is diagnostic. This subspecies was based on migrants and winter birds taken in California. (See McGregor, Bull. Cooper Orn. Club, I, 1899, pages 32, 33.)

Dendroica townsendi (Townsend). Townsend Warbler.

At Windfall Harbor, Admiralty Island, several Townsend warblers were seen during a storm on May 13, and an adult male (No. 300) was secured by Littlejohn. At Red Bluff Bay, Baranof Island, in June, Stephens saw a male at close range, but had no "aux" at the time. A full-plumaged male (No. 328) was shot by Hasselborg at Glacier Bay, July 9. It was acting as though a nest were nearby.

Wilsonia pusilla pileolata (Pallas). Pileolated Warbler.

This warbler became moderately common at Windfall Harbor, Admiralty Island, early in May. Four adult males (Nos. 341-344) were obtained there by Stephens and Littlejohn, May 8 to 13. At Coppermine Cove, Glacier Bay, Dixon found the species common in the alders July 11, and secured an adult female (No. 351). These five skins are typically *pileolata*, showing all the characters separating that form from both *pusilla* and *chryscola*, as carefully pointed out by Ridgway (Bds. N. & Mid. Am. II, 1902, pp. 712-714).

A nest of the Alaska pileolated warbler was found by Stephens on the 7th of June near Hasselborg Lake, Admiralty Island. It was in the thick moss growing among the roots of an uprooted tree in a creek bottom. The nest was about five feet from the ground and occupied a niche in the mass of moss which overhung and hid it. The nest consists externally of moss, weathered leaves, and bark strips; internally of deer hair. The cup-shaped inner cavity is 46 mm. across and 30 mm. deep. The set consists of five eggs in which incubation had scarcely commenced. These are pure white, finely dotted, chiefly in a ring around the large ends, with brick red and heliotrope purple. They measure: 16×13 , 16.5×12.9 , 16.2×13 , 16.4×12.6 , 16.3×13 .

Anthus rubescens (Tunstall). American Pipit.

Pipits were found early in May in small flocks, evidently in migration, at Windfall Harbor, Admiralty Island, where they frequented the beach among the melting ice cakes. A pair (Nos. 369, 370) were taken there May 4 and 8. The male has the lower surface strongly tinged with cinnamon, but no more so than in some nuptial-plumaged males from elsewhere.

The species evidently breeds in the Sitkan District but only in the Arctic Zone, above timber-line, along with the ptarmigan and leucostictes. A pipit was seen on the summit of a mountain, 2300 feet altitude, near Hasselborg Lake, May 31. Another was noted at the same elevation on a mountain near Red Bluff Bay, Baranof Island, in June, and in August Stephens saw several on the top of a mountain at Rodman Bay, the same island. Dixon shot an adult male (No. 360) at Glacier Bay, July 10.

Cinclus mexicanus unicolor Bonaparte.

North American Dipper.

The single skin (No. 310) brought home by the party was secured by Miss Alexander at Windfall Harbor, Admiralty Island, April 22. It is fully adult, and I can appreciate no differences in color between it and dippers from California, but in size it is slightly larger. The wing measures 92 mm., though this dimension is exceeded, according to Ridgway (Bds. N. & Mid. Am., Part III, 1904, p. 679), in the case of Rocky Mountain

birds. Dixon records seeing birds of this species flying up and down Hasselborg River, June 12. Stephens saw one at the mouth of the creek opposite camp at Idaho Inlet in the latter part of July. And at Port Frederick, Chichagof Island, the last week in July, one stayed around the mouth of the creek there, where, as Dixon thought, it was feeding on salmon eggs.

Nannus hiemalis pacificus (Baird). Western Winter Wren.

The ten skins of this species brought home by the expedition, five from Admiralty Island (Nos. 361-365), two from Baranof Island (Nos. 316, 317), one from Chichagof Island (No. 290), and two from Thomas Bay (Nos. 274, 275), are typical of *pacificus* as occurring on Puget Sound and the northwest coast of California.

In the vicinity of Windfall and Mole harbors, April 17 to June 10, winter wrens were met with, but not commonly. At Hawk Inlet, the third of August, one was caught in a mouse-trap. A juvenal was taken at Port Frederick, July 28, and others seen. Stephens saw two at Rodman Bay, between August 12 and 20. The same collector records it as rare at Glacier Bay, where but two were seen. At Helm Bay several were seen September 10 to 17.

A nest of the western winter wren was found by Stephens at Mole Harbor, Admiralty Island, May 19. It was located 2½ feet above the ground, and was embedded in a large mass of moss which surrounded a branch of a dead and fallen hemlock. There were six eggs in which incubation had scarcely commenced. The nest itself was a very unpretentious affair; in addition to the moss surrounding it there were only a few twigs, though the lining was more profuse, of grouse feathers and fur of some sort.

Certhia americana montana Ridgway.

Rocky Mountain Creeper.

The single example (No. 355) from Glacier Bay, is an adult male, taken by Stephens July 4, and is somewhat worn. Because of the broadness of the dorsal white streaking and general paleness, I refer it to *montana*, though it is small for that form. It is certainly not *occidentalis*, with skins of which from Sitka

as well as the coast of northern California, I have made comparison.

One other individual was seen at the same time the above was secured, and the two were the only creepers found anywhere in the region explored.

Sitta canadensis Linnaeus. Red-breasted Nuthatch.

A single specimen of this bird, an adult female (No. 346), was secured by Dixon at Windfall Harbor, Admiralty Island, April 23. As far as I can discern, this example is identical with birds in corresponding plumage from Connecticut. The under surface is just as pale as the average in birds from there and from California. The species was not common anywhere in the region explored, and was found at all in but three places. At Windfall Harbor Dixon found a pair prospecting for a nesting place in a dead spruce stump, May 4. At Hasselborg Lake a pair was seen that was thought to have a nest nearby. And at Port Frederick, Chichagof Island, the last of July, one individual was seen.

Penthestes rufescens rufescens (Townsend).

Chestnut-sided Chickadee.

On Admiralty Island Dixon states this chickadee to be "scattered all through the woods; we rarely went all day without seeing or hearing one." At Windfall Harbor a pair were building their nest May 15, and on May 10 Stephens saw a chickadee "carrying an insect in its mouth, as if to young." At Mole Harbor and the lakes in the vicinity the species was seen occasionally, as also at Killisnoo.

On Baranof Island, at Red Bluff Bay, June 11 to 20, it was not common. Several were seen, and on various occasions, at Port Frederick, Chichagof Island, the last week in July. On Glacier Bay Dixon saw a small flock July 16 at Coppermine Cove, and at Helm Bay Stephens saw one flock September 10.

The seven chestnut-sided chickadees secured by the expedition (Nos. 347-350, 315, 356, 273) are typical of the species. In fall plumage the back and sides are darker, more of a sooty burnt umber, than in the year-old summer plumage where they are hazel. The pileum, too, is darker—bistre instead of sepia.

Regulus satrapa olivaceus Baird.

Western Golden-crowned Kinglet.

This kinglet is a characteristic component of the Sitkan fauna, yet was nowhere found common. On Admiralty Island it was met with in small numbers at Mole Harbor and Windfall Harbor. At the latter place on May 9 a nest was secured by Littlejohn from a small, dense hemlock growing on the shore just above high-water mark. The nest was in a thick mass of foliage near the end of a branch about twelve feet above the ground. Its walls are composed of green moss and lichens closely felted together, and the lining is a copious collection of feathers from crossbills, jays, and grouse, mixed with deer-hair. Owing to its being somewhat flattened from tight packing, measurements taken now are of no value. This nest contained seven fresh eggs. These are plain white, profusely and finely dotted with clay color and vinaceous-buff, these markings condensing into a broad band or zone about the large ends of the eggs, in one case, midway between the two poles. The eggs measure: 14×11 , 14.8×11 , 14.2×11.1 , 14.5×11.4 , 14×11 , 14.1×11 , 14.5×11 .

The golden-crowned kinglet was also found at Red Bluff Bay, Baranof Island, June 11 to 20, but it could only be considered rare there. At Glacier Bay a very few were noted on both shores, and specimens were taken June 30 and July 4.

The six specimens secured (Nos. 306, 307, 312, 313, 326, 327) are all typical of *olivaceus*.

Regulus calendula grinnelli Palmer. Sitka Kinglet.

This, the northwest coast race of the ruby-crowned kinglet, was found to be sparsely scattered through the woods on Admiralty Island, in the neighborhood of both Windfall and Mole harbors. Two males were taken at the former place by Stephens April 19 and 27 (Nos. 298, 299). On Chichagof Island the species was noted as rare by Dixon at Hooniah, June 21 to 27, and at Port Frederick, July 25 to August 1.

At Glacier Bay, June 27 to July 20, it was apparently more common than anywhere else: Miss Alexander obtained three

males (Nos. 321-323) June 29 and July 1; Stephens and Dixon secured a male and a female, respectively, July 8 and 14 (Nos. 324, 325).

The five specimens from Glacier Bay are fully as typical of the race as the two from Admiralty Island. I have compared the series with my two co-types from Sitka, and find them identical in every respect.

***Hylocichla ustulata ustulata* (Nuttall).**

Russet-backed Thrush.

Stephens and Littlejohn secured four adult specimens of this thrush at Red Bluff Bay, Baranof Island, June 13 to 19 (Nos. 387-390), and at Coppermine Cove, Glacier Bay, Dixon took one adult July 17 (No. 279), remarking in his notes that the "species was fairly common, but unlike the hermit thrushes, the russet-backs get up in the tree tops to sing."

The five skins show no peculiarities when compared with a series of *ustulata* from farther south along the Pacific Coast. They approach not at all the race "*almac*" (= *swainsonii*).

***Hylocichla guttata nana* (Audubon).** Dwarf Hermit Thrush.

At Windfall Harbor, Admiralty Island, Stephens and Dixon record that several hermit thrushes were caught in mouse-traps set for shrews. Both there and at Mole Harbor this bird could not, however, be considered common. Seven specimens were secured April 25 to June 1 (Nos. 417-423). At Hawk Inlet the species was noted, August 1 to 9. On Baranof Island, at Red Bluff Bay, two were taken June 17 and 18 (Nos. 431, 432); and at Bear Bay a juvenal was secured August 23 (No. 433). Several were seen at Hooniah, Chichagof Island, June 21 to 27. And at Idaho Inlet, according to Stephens, "a pair had a nest near camp that contained four young ready to fly, July 22. The nest was built in a niche in a perpendicular moss-grown bank about four feet above the bottom." Five skins were obtained on Chichagof (Nos. 395-399).

On both shores of Glacier Bay, June 27 to July 20, the species was rather common, and several young birds were trapped. Eight

skins were procured (Nos. 280, 441-447). On July 7, Littlejohn found a nest containing four fresh eggs. "The nest was situated in a crotch formed by a small limb and the naked body of a ten-inch hemlock and was six and one-half feet above the ground. It was found by seeing the female fly from it, and was seemingly but a stray bunch of moss in which a cavity had been made by the bird." The eggs are plain Nile blue in color, ovate in shape, and measure: 24×16 , 24×15.6 , 24×16.3 , 22.7×16 .

Planesticus migratorius caurinus, new subspecies.

Northwest Robin.

TYPES.—Male adult; No. 140, U. C. M. V. Z.; Windfall Harbor, Admiralty Island, Alaska; April 27, 1907; collected by C. Littlejohn. Female juvenal; No. 160, U. C. M. V. Z.; Port Frederick, Chichagof Island, Alaska; July 27, 1907; collected by Frank Stephens.

CHARACTERS.—Full-plumaged male resembles *Planesticus migratorius migratorius* of corresponding plumage in the matter of size and darkness of coloration, the latter being excessive, but lacks the extended white patch on inner web of outer tail feathers; resembles *Planesticus migratorius propinquus* in the extremely narrow white tippings of the outer tail feathers, but coloration much darker and size smaller. In other words, this new form shares some characters of both, but presents in addition an extreme darkness of coloration seldom or never found in even *migratorius*. Young very much darker than in either *migratorius* or *propinquus*.

DESCRIPTION OF TYPE.—Adult male (No. 140): head all around black, interrupted by slaty tippings to the feathers posteriorly, so that there is dorsally and laterally a mergence into the color of the back. Eyelids white, except on loreal side. Whole dorsal surface uniform dark mouse-gray with a tinge of sepia. Wings and tail blackish, edged with color of back. Outer pair of tail feathers with a terminal bar of white, mostly on inner web, at most 3 mm. wide. Proximal to this is an indistinct grayish interval merging into the blackish of the basal portion of the feathers in question. Extreme chin pure white. Throat

streaked black on a white ground. Some hazel in malar region. Whole lower surface from behind throat to anal region, including sides and under wing-coverts, clear deep brown of a shade between hazel and chestnut. Anal region abruptly white and crissum mainly white, the fuscous bases showing through, giving a clouded effect. Wing, 130; tail, 97; culmen, 19.2; tarsus, 32.

Juvenal female (No. 160): heavily black-spotted dorsally on a sepia ground; on top of head the spots coalesce into an almost solid sooty cap which extends down over sides of head; wings and tail blackish, sepia-edged, none of the tail feathers with a trace of white tipping. Scapulars showing shaft-lines of tawny-white, with wedge-shaped tawny markings on lesser wing coverts. Chest and anterior belly heavily spotted with black, sharply contrasted anteriorly against a tawny ochraceous ground, this shading posteriorly into a deep tawny, almost hazel in the abdominal region. Anal region and crissum mottled dusky and whitish; throat dull white, sparsely flecked with black.

REMARKS.—The series of fifteen skins consists of nine from Admiralty Island (Nos. 139, 140, 261-267), three from Chichagof Island (Nos. 158-160), one from Baranof Island (No. 148), and two from Glacier Bay (Nos. 240, 251). The adult males are quite uniform in depth of coloration, the main point of variation being the extent to which the lower surface posteriorly is scaled with white. It is probable that the oldest or most vigorous males are freest from white scalings. Two of the specimens (Nos. 139, 140) are practically solid color from throat to anal region, with no white interruptions. Two males (Nos. 261, 265) have not a trace of white tipplings at the ends of the retrices. Two males (Nos. 139, 148) have broader white tipplings on inner webs of outer retrices than in the type, but not nearly so much so as in examples of *migratorius* from northern Alaska (Kowak River). The female from Glacier Bay (No. 251, July 8) shows a curious mixed pattern: the left-hand two outer retrices are shortest and have broad white tipplings, including both webs, and about as extensive as in average eastern females; but on the right-hand side the outermost reatrix is narrowly tipped with white about like the average of *caurinus*, and the feathers are of normal length. This specimen might be reasonably considered a hybrid.

showing characters of the two parentages asymmetrically, as in the case of certain hybrid flickers. The locality, Glacier Bay, is almost at the north extremity of the Sitkan District, the home of *caurinus*, and pretty close to the known range of true *migratorius*, so that hybridization is wholly possible.

The three adult females of *caurinus* are much paler colored than the males, and closely resemble breeding females of *migratorius*.

Robins were not uncommon in portions of the region explored. At Windfall Harbor, Admiralty Island, according to Dixon, "a flock of about a dozen stayed around the mouth of the creek," April 17 to May 19. At Mole Harbor, May 19 to June 10, one was shot and two others seen by Stephens. On Baranof Island, one was shot and others seen at Red Bluff Bay June 11 to 20, and at Rodman Bay one was seen the middle of August.

On Chichagof Island they were common on the mountain side above timber-line near Hooniah. A brood of young were found there June 23. At Idaho Inlet, July 20 to 25, several were noted feeding on salmon berries. And again at Port Frederick, the last week in July robins were common. At Glacier Bay an adult and young were secured July 8.

***Ixoreus naevius naevius* (Gmelin). Varied Thrush.**

On Admiralty Island this bird was fairly common at Windfall Harbor, April 17 to May 19. Stephens saw a female carrying nest material on April 23. At Mole Harbor it was rather common, May 19 to June 10; and at the chain of lakes near there, during the same interval, Dixon several times saw birds carrying food to their young. The same collector saw one at Hawk Inlet, August 5. Eight specimens, all adults, were taken on Admiralty Island (Nos. 424-430, 461).

At Red Bluff Bay, Baranof Island, Littlejohn and Stephens secured six skins June 14 to 16 (Nos. 434-439). At Rodman Bay the species was detected August 12 to 20.

At Hooniah, Chichagof Island, Dixon noted several as seen and two taken June 24 (Nos. 400, 451). One was a full-fledged juvenal caught in a rat trap. At Glacier Bay, Dixon states that old nests were abundant all through the woods at Coppermine

Cove, July 10-20; but by this time most of the birds had scattered. On July 16 a nest was found containing four newly hatched young. At Helm Bay, Stephens took two varied thrushes in full fall plumage (Nos. 448, 449), September 13, and saw others.

In spite of assertions to the contrary (Ridgway, Bds. N. & Mid. Am., Part IV, 1907, page 132) I still believe that there are two races of the varied thrush. The present material from the Sitkan District appears to me to emphasize the distinctness of a humid-coastal form from that of northern Alaska. In the males of *nacvius* the colors are deep-toned, the back especially being very dark, nearly or quite slate-black. Of the race I called *meruloides* (*Auk*, XVIII, April, 1901, pages 142-145) I have at hand no new material; so I prefer not to re-discuss the matter until I have a still better basis.

THE MAMMALS.

BY EDMUND HELLER.

The present paper is based on the mammals obtained by the Alexander Expedition in southeastern Alaska during the summer of 1907. The bulk of the material described in this paper was collected by Messrs. Frank Stephens, Joseph Dixon and Chase Littlejohn, who accompanied Miss Alexander. Most of Miss Alexander's time was devoted to the collecting of the larger species, chiefly the Ursidae, which have been turned over to Dr. C. Hart Merriam for identification and description.

The collection, excluding the bears, comprises some four hundred and sixty specimens in which twenty-one species are represented. Special attention was given to Admiralty Island, which heads the list of islands with two hundred and fifteen specimens, comprising eleven species. Considerably less time was given to Baranof Island where but sixty-four specimens, representing seven species, were obtained. The Chichagof Island material consists of thirty-one specimens covering four species. On the adjacent mainland at Glacier Bay one hundred and fourteen specimens were obtained, in which lot but six species are included. Helm Bay on the Cleveland Peninsula, somewhat farther to the south, contributed twenty-five specimens and six species. Thomas Bay is represented by eight specimens and four species, and Etolin Island by two species, each represented by single specimens.

The mammals known to inhabit the islands of southeastern Alaska are to a large degree widespread forms throughout the coast islands and the adjacent coast. This uniformity in distribution is apparently due to the narrowness of the dividing channels and to the carrying agency of the large ice masses recently so prevalent in the region. The great depth of the channels which separates many of the islands from their neighbors gives them the marks of considerable age. This age factor alone would

lead us to expect at least a slight peculiarity in the faunae of the various islands. From the geologic evidence now available it is certain that the islands of the Alexander Archipelago have been isolated since early Miocene time. Some small areas have been subject to depression and uplift since the isolation took place, but no extensive submergence has occurred. The whole region has been subject to a recent glacial epoch at which time much of the present topography was chiseled. A differentiation to a slight degree has taken place in some of the mammals on several of the islands, but in most cases it is so slight that it does not deserve recognition by a name. The species of limited distribution arrange themselves in two sets on opposite sides of Chatham Strait which forms the water barrier between Admiralty Island and the two closely associated islands of Baranof and Chichagof. This is doubtless one of the oldest channels in the archipelago, its depth being one hundred fathoms greater than any of the others.

On Admiralty Island we find four species: *Castor c. phaeus*, *Peromyscus hylaeus*, *Microtus admiraltiae*, *Mustela a. (actuosa?)*, which are not known to cross Chatham Strait. On Baranof and Chichagof islands we meet with *Peromyscus sitkensis* and with a very different form of *Microtus*, namely, *sitkensis*. The importance of Chatham Strait as a barrier is still further shown by the greater similarity of the fauna of Admiralty and the islands south of it, which also lie east of the strait or its extension.

The mammal fauna of the three islands under consideration was derived chiefly from the coast and islands to the southeast. But a single form, *Microtus sitkensis*, has been received from the north and this form has already undergone some change. *Microtus admiraltiae*, *Putorius c. alascensis* and *Sorex o. glacialis* have doubtless been received from the Yukon Basin by way of the passes leading from the northeast.

Generalizations based on the material at hand, however, cannot be considered conclusive, as the region is as yet only partially worked. This is well shown by the lack of complete duplication in the species taken by various collectors at the same localities throughout the region.

Four new forms, *Castor canadensis phaeus*, *Microtus admiraltiae* and *Lutreola vison nesolestes*, from Admiralty Island, and *Marmota vigilis* from Glacier Bay, have been detected in the material and are herewith described.

The writer wishes to express his obligation to Dr. C. Hart Merriam, chief of the Biological Survey, for the privileges extended him with the collections under his charge and for his friendly interest in the work. To the staff of the Biological Survey he is indebted for much aid of various kinds in his comparisons with the extensive series in the Survey collection. He is particularly under obligations to Mr. W. H. Osgood for much assistance and many favors.

Odocoileus columbianus sitkensis Merriam. Sitka Deer.

Two young females from Baranof Island are in the collection.

Deer were found fairly common on Admiralty, Baranof and Chichagof islands. Admiralty and Chichagof mark their extreme northern range on the coast islands. They reach on the mainland about the same latitude. Their northward extension is apparently checked by the severity of the climate, the deer at these latitudes succumbing to the cold in large numbers during severe winters.

On Admiralty Island Stephens reports them as common at Mole and Windfall harbors. At Hawk Inlet a doe with two fawns was seen by Hasselborg. Dixon has the following notes on the deer about Alexander, Hasselborg and Beaver lakes:

“Deer were quite common about the lakes. We saw many carcasses of deer that had died during the previous winter, which had been an exceptionally hard one on deer as the snow came early and stayed late. Most of the dead deer that we saw were bucks. The greater mortality among bucks is due to the lean condition in which they are left after the rutting season. They become fat in July, and about the first of August their horns are out of the velvet, at which time they begin fighting. Then the rutting season comes on and they keep chasing about, getting poorer and poorer all the time. When winter comes it finds them comparatively weak, very different from the sleek, fat condition of August. The does drop their fawns in May, as a

rule, but if the season is backward, not until June. After they have weaned their young they begin to get fat. Thus while the bucks are chasing about and getting poorer the does are putting on fat and getting ready for the winter. Sometimes the bucks fight as late as Christmas and when the hard spring months come they are so weak that they are only able to crawl off somewhere to die. A reliable hunter reported seeing in one day's walk the carcasses of about fifteen deer that had died from starvation and exposure during the winter."

Stephens records them as fairly abundant on Baranof Island at Red Bluff and Rodman bays and at Peril Strait. At Hooniah and at Idaho Inlet, Chichagof Island, Dixon found them scarce. Three were seen on the mountain tops near Port Frederick the first of August, at which time their horns were still in the velvet.

Sciurus hudsonius petulans Osgood. Glacier Red Squirrel.

The series of sixteen from Glacier Bay agrees well with topotypes in the Biological Survey collection.

Stephens gives the following notes on those observed at Glacier Bay:

"Common; notes are a grasshopper-like 'churr,' similar to those of the chickaree living in the Sierra Nevada Mountains of California. But few nests were seen in the spruces, but piles of scales from the spruce cones were plentiful. These were usually gathered about the bases of the larger trees and may have been produced by the destruction of the cones from those trees only. Many holes led through these piles of cones, which were probably entrances to the burrow. From these entrances many trails led away through the moss." Dixon reports them rare on the west shore of the bay.

Marmota vigilis, new species. Glacier Marmot.

TYPE from west shore of Glacier Bay, Alaska; adult male, No. 418, Univ. Cal. Mus. Vert. Zool.; collected by Joseph Dixon, July 14, 1907; orig. No. 69.

CHARACTERS.—Coloration variable, normally blackish, grizzled by an admixture of long white hairs everywhere except on occiput, which is black. Region of shoulders and rump uniform

in coloration with the back; tail like the back and without conspicuously darker terminal band or a dark median stripe inferiorly. Skull with enlarged audital bullae, the surfaces of which rise to the level of the raised borders of the basioccipital processes. Walls of infraorbital foramen very heavy, the basal wall ending in a blunt process.

COLORATION.—Snout anteriorly grayish white, with a small blackish area a short distance posterior to snout; grayness of snout giving way in the interorbital region to the black occipital area which extends to the ears; ears and sides of head blackish, slightly grizzled; nape, shoulders and back blackish, interspersed with long white hairs; rump posteriorly with a faint trace of brownish; tail blackish with light brownish tips, the basal portion walnut brown. Sides of body grizzled like the back; fore and hind limbs like the back. Underparts grayish.

The series of seven skins from Glacier Bay is extremely variable in coloration. They are all in various conditions from old faded pelage to new, but their diverse coloration is not due to this condition. These skins range from the grayish type which is sprinkled with white hairs to a specimen which is almost uniform black with the exception of the hoary snout and interorbital region and a few grayish hairs about the sides and along the neck and patches on the chin, throat and midline of the belly. None of these skins make a close approach to the coloration of *caligata*. They lack any indication of the tricolored dorsal effect of black occiput, hoary nape and shoulders, and fulvous or tawny rump. The series of *caligata* from Prince William Sound, the Kenai Peninsula and Yakutat are quite uniform in coloration in all pelages. Further differences as compared with *caligata* are the blackish tails with yellowish tipped hairs, these parts in *caligata* being fulvous with black-tipped hairs and a distinct black terminal band. In winter pelage *caligata* shows a much heavier black wash which obscures to some extent the tricolor dorsal pattern.

SKULL OF TYPE.—Similar in size and proportions to that of *caligata*. The chief differences are the larger, more rounded audital bullae and a shallowness of the basioccipital trough due to the lower processes of the basioccipital. The lower wall of

the infraorbital foramen is very heavy and ends bluntly in a truncated knob. Nasals end very slightly posteriorly to premaxillaries.

MEASUREMENTS.—Type: length, 680; tail vertebrae, 210; foot, 102. Average of three other adults: length, 680; tail, 204; foot, 97. Skull (type): occipito-nasal length, 98.3; Hensel, 83.5; zygomatic width, 62; length of nasals, 38.5; width of nasals, 17; length of upper molar series, 23; diastema, 25. Average of three other skulls: occipito-nasal length, 98; Hensel, 82; zygomatic width, 63; length of nasals, 40; width of nasals, 17; length of lower molar series, 22; diastema, 25.

Dixon found the glacier marmot abundant on the west shore of Glacier Bay near an abandoned copper mine. His notes for this locality are: "Marmots were seen daily on the grass-covered hill tops or about the mossy boulders near the beach. They were not particularly shy and two were secured with a shotgun. The young at this time (July 10-20) were about half grown." About Bartlett Cove, Stephens saw only a few tracks.

***Sciuropterus alpinus zaphaeus* Osgood.**

Osgood Flying Squirrel.

The four topotypes in the collection from Helm Bay are in summer pelage which is slightly lighter than the winter pelage of the type and topotypes in the Biological Survey collection:

***Castor canadensis phaeus*, new subspecies.**

Admiralty Beaver.

TYPE from Pleasant Bay, Admiralty Island, Alaska; adult male, No. 209, Univ. Cal. Mus. Vert. Zool.; collected by A. Haselborg, May 16, 1907; orig. No. 27.

CHARACTERS.—Coloration above, dark seal brown, very much darker than *leucodontus* or *pacificus*.

COLORATION.—The long hair of the upperparts is very dark, almost black, with a slight chestnut iridescence to the tips of the hairs, the individual hairs appearing decidedly blackish. Anteriorly the blackness gives way to a deep russet on the shoulders which lightens farther on the head to a chestnut-brown;

cheeks somewhat lighter than the crown. Posteriorly the dark dorsum merges into a dark vandyke-brown on the rump and base of the tail. Under fur of upperparts very dark seal-brown, or blackish, becoming seal-brown on the head and lower sides. The long coat of the underparts is seal-brown, becoming slightly reddish at the base of the tail and about the gular region and chin. Under fur of underparts seal-brown, darkening gradually on the sides to the darker coat of the upperparts. Ears black.

SKULL.—Nasals long and narrow, projecting considerably beyond premaxillary sutures, much more so than in Vancouver Island specimens. Lambdoidal crest rounded; sagittal crest diverging a little posteriorly to frontal sutures.

Specimens of *pacificus* in the Biological Survey collection are of the usual chestnut coloration, being very different from these dark Admiralty Island skins. The blackness of this form is due to a very considerable extent to the much darker under fur upon which the coloration of the thin coat of long hair has little effect. Specimens from Prince of Wales Island in the Biological Survey collection show much less difference in coloration and may be considered as intermediate with *pacificus*, although the lightest ones are considerably darker than any of the latter examined. The lightest skin from Admiralty Island is a rich dark bay and can be matched in depth by the darkest skin in the Prince of Wales series. A better color character, however, than the depth of the general body coloration seems to be the coloration of the rump and base of the tail. This area is much richer vandyke brown in all the Admiralty specimens, and serves to distinguish them at once from the lighter rumped specimens from Prince of Wales Island. There is doubtless a gradual change in the intensity of the coloration in beavers along the Pacific Coast from the chestnut coloration of the Washington form to the very dark form of southeastern Alaska. Two skins of *leucodontus* Gray, from Vancouver Island have been examined in the Provincial Museum at Victoria. These are light chestnut brown and similar to the coloration of the skins of *pacificus* examined.

The skull differences exhibited by American beavers are apparently slight. The large series of skulls in the Biological

Survey collection from Vancouver Island, British Columbia, Washington, Oregon, and California, show only trivial differences upon comparison with the material from southeastern Alaska. Skulls from Washington and California exceed in size and massiveness the largest from southeastern Alaska. The two adult skulls from Admiralty Island have a very small interorbital width, considerably less than a third of the mastoid width. Six specimens are in the collection, all of which are males, three of them adult. Four of these were secured in the central part of the island, at Hasselborg Lake, and one each from Mole Harbor and Pleasant Bay.

MEASUREMENTS.—Type: total length, 1030; tail vertebrae, 485; hind foot, 175; length of scaled part of tail, 147; width of scaled part of tail, 132. Average of three adults: total length, 1035; tail vertebrae, 430; hind foot, 177; length of scaled part of tail, 262; width of scaled part of tail, 124. Skull (type): Hensel, 115.5; zygomatic breadth, 22.5; mastoid width, 72; interorbital width, 22.5; length of nasals, 50.5; width of nasals, 23. The only other adult skull has the following dimensions: Hensel, 117; zygomatic breadth, 97; mastoid width, 74; interorbital width, 21; length of nasals, 52; width of nasals, 22.5.

Dixon has the following notes on the beavers observed about the lakes in the interior of Admiralty Island:

“We were very pleasantly surprised to find beavers on Admiralty Island, as we had been told that there were none on any of the islands between Sitka and Juneau. The lakes with their irregular shore line and quiet little bays were the natural home of the beavers and they had lived there in peace and seclusion for many years. At intervals of four or five years, the Indians who owned the region by tribal inheritance were accustomed to visit the lakes in the early spring and trap for beavers. But the Indian methods of trapping were crude and they quarreled among themselves so they did not catch many beavers. Aside from this we saw only one thing that would lead us to think that the beavers were ever bothered. This was a beaver house that had been torn open by a bear.

“At the time of our visit many of the younger beavers had never seen a man and regarded the canoe with shy curiosity;



Beaver Dams at North End of Hasselborg Lake.

but some of the old ones knew what a canoe was and upon catching sight of one they would bring their tails down upon the water with a pop like the explosion of a fire-cracker, and then hastily disappear in the water. We rarely saw a beaver on the land, as they carry on most of their work at night. About six o'clock in the evening the beavers would begin to come out, but they would be back again to their dams or houses by about seven in the morning.

“We found that the mode of life of the beavers divided them into two classes, bank beavers and house beavers. All of the bank beavers that we killed were males and I am inclined to believe that they were bachelors, who had gone off to live in holes in the banks instead of building houses and raising families. The houses were usually in some secluded corner of a beaver pond in which the water had been backed up by the dams that they had built until it suited them. One dam that we saw was at least one hundred and fifty yards long, and between four and five feet high. (Plate 26.) It was very irregular in shape as it curved about so as to keep the crest on the same level. The dam was six or eight feet wide at the base and tapered to about one foot at the top. Some of the saplings used were six or eight feet long and from two to three inches in diameter, but most of the sticks were smaller and shorter. After the sticks had been worked in and wedged together the beavers had dumped in a lot of mud and soil.

“They carry the mud between their forepaws and the body just as *Thomomys* or similar rodents do. Their dams were not curved against the stream in the majority of cases, although we did see some cases where the arch was used to good advantage. It seemed to me that the beavers showed their greatest engineering skill not in felling trees and constructing dams but in the way they dug ditches and canals, forming highways for traffic, and in the way they had of distributing the water so that there would be just a little water running over the dams all along. If the water had not been distributed and had run over in just two or three places it would have washed the dam out very soon.

“The houses were not like the pictures and drawings that we sometimes see. They did not look like an old-fashioned brick

oven built out-of-doors and plastered over. All that one can see from the outside is a big pile of sticks and poles about ten or twelve feet in diameter at the base and from three to five feet high. The beavers always have the entrance under water so it is hard to see them leave or enter their houses. Some of the houses looked as though some one had taken a shovel and thrown a lot of mud and rocks on them, but none were what I would call plastered. The number of beavers in one house seemed to vary from two to four.

“The main food supply of the beavers was spruce bark. They preferred willow, but that grew only in a few favored localities. If no willow or spruce was to be had they would feed on crab-apple or huckleberry. We saw where considerable alder had been cut, but I am satisfied that they used this in building their dams, as it was easy to cut, grew nearby and lasted pretty well in the water. Only once did I see where they had nibbled the bark off of an alder stick; so they certainly could not have been fond of it.

“We spent considerable time sneaking around in the canoe studying the habits of the beavers and trying to get some photographs of them in their home life. We succeeded in getting up to within twenty feet of one in the canoe one evening. He grew suspicious, however, and turned back toward the nest. In shifting the camera I made a slight movement and the beaver ‘popped’ his tail and disappeared like a flash. At another time a beaver was seen swimming across the lake. Two of the party got into the canoe and followed him cautiously while the third member kept an eye on the beaver with the field glasses. The beaver swam along the shore until he came to an old log that was partially submerged but stuck out of the water about fifteen feet from the shore. Here he crawled out on the log and then hunched himself up, took a small spruce stick in his fore paws and started to nibble the bark off of it. The men in the canoe were not more than fifty feet away and watched the performance with a great deal of interest. The beaver kept twirling the stick over and over in his paws as he chewed the bark off and the way he was sitting up made him look like a little old man eating a roasting-ear.”

At Mole Harbor Stephens reported beavers as recently exterminated in the meadows four miles south of the harbor.

At Hooniah, Chichagof Island, Hasselborg found some old dilapidated dams which were evidently quite ancient. Dixon states in his notes that the beaver is undoubtedly exterminated on Chichagof. The beaver on Chichagof was doubtless the same form as on Admiralty, although it is not improbable that this form should show slight differences considering the significance of Chatham Strait as a faunal barrier between these two islands.

Peromyscus sitkensis Merriam. Sitka White-footed Mouse.

A series of seventeen specimens are in the collection which were secured at Red Bluff and Rodman bays, and Peril Strait, Baranof Island. These agree minutely with the topotype series in the Biological Survey collection. Stephens reports this species rare at Red Bluff Bay and Peril Strait, but fairly common at Rodman Bay.

The Chichagof material consists of fourteen specimens, chiefly from Hooniah. Single specimens were taken at Fresh-water Bay, Idaho Inlet and Port Frederick. This series averages somewhat smaller in all its measurements than the Baranof material, in which respect it approaches *macrorhinus*. This apparent intergradation is difficult to account for, as typical *sitkensis* holds an intermediate geographical position.

At Hooniah this species was found fairly abundant by Dixon in the abandoned houses, to which retreats it seemed to be confined.

Peromyscus hylaeus Osgood. Admiralty White-footed Mouse.

This species was found only on Admiralty Island where it occurred in great abundance in the littoral zone to which it is chiefly confined. A series of one hundred and seven specimens are in the collection. These agree with the topotype series from Prince of Wales Island.

At Windfall Harbor ninety-two specimens were secured. Stephens and Dixon found them here in great abundance, confined, however, to the alder thickets near the beach. Dixon found them common at Hawk Inlet in abandoned houses. At Mole Harbor Stephens found them fairly numerous.

Peromyscus macrorhinus Rhoads. Rhoads White-footed Mouse.

Stephens secured eight specimens at Helm Bay and one at Etolin Island during September. These agree well with the topotype series in size but are slightly lighter in color than the August material in the Biological Survey collection.

Microtus admiraltiae, new species. Admiralty Vole.

TYPE from Windfall Harbor, Admiralty Island, Alaska; adult female, No. 118, Univ. Cal. Mus. Vert. Zool.; collected by Joseph Dixon, May 4, 1907; orig. No. 25.

CHARACTERS.—Upper incisors long and straight, their are forming a wide angle; coloration of upperparts grizzled brownish.

COLORATION.—Upperparts grizzled grayish brown, the brown predominating; sides somewhat paler and grayer but changing rather abruptly to the light grayish wash of the underparts. Feet grayish. Tail well haired, sharply bicolor, dusky brown above, whitish below.

SKULL.—Skull remarkably wide with wide-spreading zygomatic arches; interorbital region without any prominent angles, rounded; upper incisors long and straight, very little decurved, their are forming a wide angle; brain case large, flattened above.

MEASUREMENTS.—Type: total length, 158; tail vertebrae, 48; hind foot, 21. Average of five adults: total length, 156; tail vertebrae, 45; hind foot, 21. Skull (type): Hensel, 24.2; zygomatic breadth, 15.2; mastoid width, 11.7; length of diastema, 10.4. Average of five adults: Hensel, 23.9; zygomatic breadth, 15.1; mastoid width, 11.8; length of diastema, 10.3.

The straight, projecting incisors at once distinguish this form from *drummondii* and its allies of the adjacent mainland. The diastema measured from the anterior border of the alveolus of the first upper molar to the outside border of the upper incisor averages a millimeter greater in this form than in *drummondii*. The Admiralty series, compared with skulls of *drummondii* from Bennett, Alaska, the only locality from which this form is known in the immediate region, shows the skull to be

much larger and proportionately wider zygomatically with a much greater diastema and less decurved upper incisors.

In color *admiraltiac* is decidedly grayer than topotypes of *drummondi*. British Columbia specimens are even darker than typical *drummondi*. Bennett and Yukon specimens are closer to this gray coloration than any others, but they can usually be distinguished by their browner tints. April specimens from Windfall Harbor, still in the winter coat, do not differ much from August pelages from Hawk Inlet.

A series of fifty-three specimens are in the collection from Windfall and Mole harbors and Hawk Inlet. This large series shows remarkably little variation in either proportions or coloration.

At Windfall Harbor both Stephens and Dixon found them abundant in the tall beach grass a little above high tide level. In this zone of grass their nests were found placed six to eight inches above the ground. Dixon reports them common in the grass about the mouths of creeks. At Hawk Inlet, Stephens found them abundantly in the grass about the harbor. At the lakes, Dixon found them common above timber-line in the heather. There their burrows were often found exposed where the bears had torn up the runways in an endeavor to secure the voles.

***Microtus sitkensis* Merriam. Sitka Vole.**

The collection contains fourteen specimens from Baranof Island and five from Chichagof Island. The series from Baranof agrees well with the type and single topotype in the Biological Survey collection. The type and topotype both have abnormal first lower molars, the closed triangles of which have a formula of 5-4 and 4-5 respectively. In the series of thirteen adults from Baranof twelve of them are found to have a formula of 4-4 for these teeth, the single exception having the loops 5-4 like the type. The Chichagof material with one exception has the formula 4-4 for the first lower molars. The series from this island averages larger with heavier skulls and longer hind feet; but the material is too scanty to determine the value of these slight differences.

Stephens' notes from Rodman Bay, Baranof Island, are: "Common in grass patches along the beach in a few places. They had the habit of burrowing and carrying earth out to the entrance of the burrows, which were in light loamy soil. They covered some traps with earth freshly brought out. I have noticed this burrowing habit elsewhere only at Idaho Inlet, Chichagof Island." At Peril Strait Stephens found them at one place only and there difficult to secure. Dixon has the following to say about the habits of this species at Idaho Inlet, Chichagof Island: "Meadow mice were abundant in the salt marsh meadows, where they cut trails two or three inches wide along the bottoms of little gutters. I watched one throw up a mound of dirt about a foot across and four inches high. The mouse would start a hole and then turn around and push the dirt out just as a gopher does. This was the first time that I had ever seen meadow mice burrow in the ground to such an extent and I never saw them throw up 'mole hills' before."

At Hooniah two were taken by Dixon above timber-line, at which locality no runways were observed below 2300 feet altitude. In the vicinity of Port Frederick the species was found by Dixon abundant in a meadow five miles north of camp.

***Microtus yakutatensis* Merriam. Yakutat Vole.**

This species was secured in abundance on both shores of Glacier Bay. A series of thirty are in the collection. These although not differing in color from *sitkensis* have the small foot of *yakutatensis* with the typical form of which they doubtless intergrade in color somewhere along the coast north of Glacier Bay. In coloration this series is readily distinguishable from the much grayer *yakutatensis*. No reliable skull differences, however, were detected between the island and the mainland material. The first lower molar has normally four closed triangles, but variations to five on one first lower molar or the other are not rare.

On the west shore at Coppermine Cove, Dixon found them common in patches of strawberry plants near the beach but none were found in the elevated interior country. About Bartlett Cove Stephens found them common in grassy situations on

the mainland and on the small islands near the shore. Judging from the notes of the collectors this species is without the mound-building habits of the closely allied *sitkensis*.

Microtus macrurus Merriam. Long-tailed Vole.

Four specimens were secured at Windfall Harbor, Admiralty Island, and one at Thomas Bay on the mainland. This is a wide-ranging form and covers most of the coast and islands of southeastern Alaska. It has not, however, been secured on Baranof Island.

Evotomys dawsoni Merriam. Dawson Red-backed Mouse.

A series of fourteen are in the collection from Glacier Bay. These agree well with *dawsoni* in coloration, but their skulls average slightly larger than topotypes. The majority of the specimens were secured by Stephens in alder thickets at Bartlett Cove. A single additional specimen was taken by Dixon at Coppermine Cove.

Evotomys wrangeli Bailey. Wrangell Red-backed Mouse.

Two immature specimens were taken at Helm Bay, but as these show neither adult coloration or skull characters their reference to this form is somewhat doubtful.

Erethizon epixanthus nigrescens Allen. Dusky Porcupine.

An adult specimen is in the collection from Thomas Bay. This skin which is very dark agrees well in coloration with Allen's description and shows decided differences on comparison with skins from Prince William Sound, Alaska. The skull, however, is not distinguishable from a large series from the Kenai Peninsula except in the coloration of the incisors which are buffy yellow instead of ochraceous rufous.

Lutreola vison nesolestes, new subspecies. Island Mink.

TYPE from Windfall Harbor, Admiralty Island, Alaska; adult male, No. 201, Univ. Cal. Mus. Vert. Zool.; collected by Annie M. Alexander; April 28th, 1907; orig. No. 14.

CHARACTERS.—Size large; coloration of upperparts vandyke brown; upper molars enlarged, the last molar proportionately much greater than in any other described form.

COLORATION.—General color of long hairs on upperparts vandyke brown, becoming lighter on cheeks and sides, and deepening on tail to dark seal brown, the tip quite blackish. Limbs above dark like the dorsal region. Underparts walnut brown. The scrotum and the tail terminally very dark seal brown; tip of chin, an irregular spot on the throat, a wide stripe on the chest, a small area at the insertion of the arm, and an irregular abdominal and inguinal patch, creamy white. Under fur everywhere slightly less reddish than mars brown. Ears lighter brown than dorsal region.

SKULL.—Skull large and heavy, nearly the size of that of *ingens*, with wide spreading zygomatic arches; audital bullae short; teeth very large, greatly crowded, the last upper molar greatly enlarged; palate narrow.

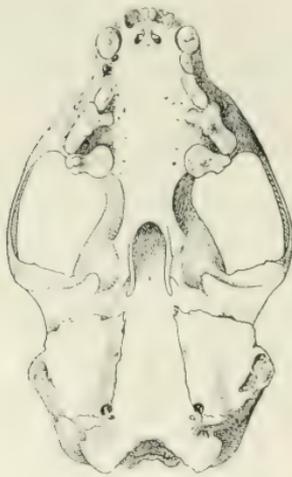


Fig. 3.—*Lutreola vison nesolestes*, new subspecies. Type, No. 201, ♂ ad.; Admiralty Island, Alaska. $\times 1$. L. Nash, *del.*

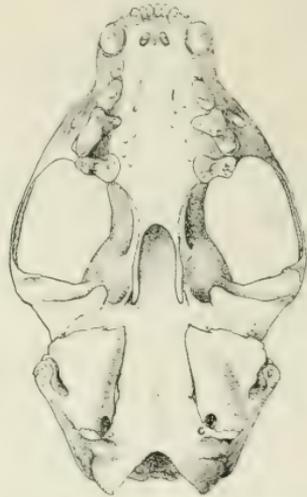


Fig. 4.—*Lutreola vison energumenos* (Bangs). No. 3265, ♂ ad.; Klamath Co., Oregon. $\times 1$. L. Nash, *del.*

The distinctive characters of this form are chiefly in the last upper molar, which is greatly enlarged. The only form with which this needs comparison is *energumenos*. The difference in size between the upper molars of these two races is so great that it can be readily determined by measurement. (See figures 3 and 4.) Measurements taken of this tooth in the largest skulls available give almost a millimeter difference in both diameters in the two forms. *Ingens* and *energumenos* have the upper molars of about the same actual size, which makes them relatively much less in the large-skulled *ingens* and throws this northern race farther from *nesolestes*. All the cheek teeth are large and crowded in *nesolestes*, but the upper carnassial is no longer actually than in *ingens*.

Specimens from Prince of Wales, Kupreanof and Baranof islands show the enlarged last upper molars of the Admiralty specimens with which they also agree in size and coloration. Skulls from Revillagigedo and Vancouver islands and the Cleveland Peninsula have somewhat smaller molars. These apparently represent forms intermediate with *energumenos*. This mink in its typical form will doubtless be found to be confined to the Alexander Archipelago.

MEASUREMENTS.—Type: total length, 615; tail vertebrae, 182; hind foot, 80. Average of three adult males: total length, 604; tail vertebrae, 177; hind foot, 79. Skull (type): occipitonasal length, 65; zygomatic breadth, 43; breadth at postorbital processes, 19; mastoid width, 36; greatest diameter of upper molar, 7.4; width of upper molar, 5.2.

***Putorius cicognani* Bonaparte.** Bonaparte Weasel.

A female from Helm Bay is in the collection. This specimen agrees minutely in coloration and skull characters with specimens of *cicognani* of the same age in the Biological Survey collection.

***Putorius cicognani alascensis* Merriam.** Alaska Weasel.

The collection contains five specimens from Saook Bay, Baranof Island, covering dates from September to November. This small series ranges from the light brownish pelage of early

fall to the white of winter. The skulls agree well in characters with the topotype series. These specimens, however, are not comparable as to coloration as they represent different pelages than the topotypes.

Two somewhat immature specimens were secured at Hawk Inlet, Admiralty Island. These agree fairly well in coloration and skull characters with specimens of *haidarum* but as there is no *alascensis* material comparable to these in age I have hesitated about assigning them to *haidarum* on account of their geographic position. The material representing both *haidarum* and *alascensis* in the Biological Survey collection is not extensive enough to determine the relation these two forms bear to each other.

***Lutra canadensis periclyzomae* Elliot.** Sea-girt Otter.

The material in the collection consists of two adult male specimens, one taken at Saook Bay, Baranof Island, and the other at Windfall Harbor, Admiralty Island. After working over a large series of skulls from the Pacific Coast to determine the status of this form, the only reliable character was found to be the extreme flatness of the audital bullae. This character is dominant in the skulls of all the otters of the whole coast and coast islands of British Columbia north at least to Prince William Sound, Alaska. Skulls of this form in the Biological Survey collection from the Queen Charlotte, Vancouver, Prince of Wales and Montague islands have been examined. Skulls from Washington, California and from the Yukon Basin have the larger bullae of *pacifica* and *canadensis* respectively. The largest skulls in the collection are from Prince of Wales Island, where this form doubtless reaches its maximum size. Besides several very large adult skulls from this island there is in the collection an immature one which exceeds all others in size and massiveness.

***Sorex personatus streator* Merriam.** Streator Shrew.

A series of fifty-six are in the collection from Baranof, Chichagof and Admiralty islands and from Glacier, Thomas and Helm bays of the mainland. This widespread form was secured

abundantly everywhere except on Admiralty where only a single specimen was collected. It was the only shrew taken on Baranof and Chichagof islands.

This series is fairly uniform in coloration. The size variation is considerable, some of the larger specimens approaching *glacialis* in external size. The skull variation due to age is enormous. Young adults with unworn teeth have large skulls with high, inflated brain cases, which surpass greatly in all dimensions those of old adults with worn teeth. Unfortunately the topotype series of *streatori* consists chiefly of old adults with their dental characters worn away largely. The old skulls in the present series agree well with these in size and dental characters. There is, however, a color difference between these two series, one which practically parallels that found between *glacialis* and *longicauda*. Compared with typical *streatori* in the same pelage our series is more grayish brown above with very little yellowish or brownish wash to the grayish underparts. Wrangell and Revillagigedo islands are represented in the Biological Survey collection by series taken in September which are scarcely distinguishable in coloration from Yakutat material.

***Sorex obscurus glacialis* Merriam. Glacier Shrew.**

A good series is in the collection from Admiralty Island. These were secured at Mole and Windfall harbors and at Hawk Inlet, and Hasselborg Lake. They are also known to occur on Chichagof Island.

A series of twenty-three topotypes was secured at Glacier Bay. *Glacialis* was based on two specimens, a type and topotype from Point Gustavus, Glacier Bay. The large series now available seems to confirm the color differences. They differ from both *alascensis* and *longicauda* in their more grayish brown upperparts and the less extensive brownish wash on the underparts. There are, however, no very evident skull characters or differences in body measurements between these series. In coloration they approach very closely specimens of *obscurus* from Bennett, Alaska, to which form they are apparently most closely allied.

Myotis lucifugus alascensis Miller. Alaska Brown Bat.

Ten specimens are in the collection from Red Bluff Bay, Baranof Island, and two from Mole Harbor, Admiralty Island. These two latter specimens are in worn pelage and are therefore somewhat darker than the others. They are very similar in coloration and condition of pelage to the specimens in the Biological Survey collection labeled *alascensis*. The series from Baranof Island is very little darker than typical *lucifugus*. A much larger number of skins and alcoholics is apparently necessary for the definition of this subspecies.

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April 9, 1909

THREE NEW SONG SPARROWS FROM
CALIFORNIA

BY

JOSEPH GRINNELL

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THREE NEW SONG SPARROWS FROM
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BY

JOSEPH GRINNELL.

(Contribution from the Museum of Vertebrate Zoology of the University of California.)

During the past year the Museum of Vertebrate Zoology has acquired through the efforts of Annie M. Alexander and Louise Kellogg a large amount of material representative of the avian genus *Melospiza*. My attention has long been attracted towards this wonderfully "plastic" group of birds, and the availability of so much new material from the Pacific Coast would seem to warrant a monographic revision of the western song sparrows. This work I have now undertaken, to be concluded and published at some future time when results shall seem to have reached a sufficiently important stage. Meanwhile it seems desirable to characterize briefly the following three new forms, so that they may become known to other ornithologists and their status tested from other points of view. No less than seventeen distinct races, forms, small species or subspecies, as phylogenetic groups of such rank are variously called, are now represented in the Museum's collection of song sparrows from California alone.

Melospiza melodia maxillaris, new subspecies.

Suisun Song Sparrow.

TYPE.—Male adult (age determined by examination of skull); no. 5476, Univ. Calif. Mus. Vert. Zool.; tule marsh west of Suisun, Solano County, California; January 1, 1909; collected by L. Kellogg.

CHARACTERS.—Resembles *Melospiza melodia gouldii* closely in coloration and *M.m. heermanni* in general size; differs from *M.m. samuelis* (topotypes from salt marshes near Petaluma, Sonoma County) in having the browns more extended and of a deeper tone (bay rather than hazel) and in much greater size and, especially, bulkier bill; differs from *M.m. gouldii* (type) in much greater size throughout; and from *M.m. heermanni* (type and topotypes from Tejon Valley, Kern County) in that the base of the maxilla is more swollen, the black streakings everywhere broader, and the general tone of coloration darker. The type of *M.m. maxillaris* measures: wing, 63.7 mm.; tail, 62; tarsus, 21.8; culmen, 12.9; bill from nostril, 9.8; depth of bill, 7.6.

RANGE.—Permanently resident on the extensive marshes at the confluence of the Sacramento and San Joaquin rivers; up these streams for an unknown distance; west to Benicia on the north side of the straits of Carquinez and to Port Costa on the south side, but not to the westward of these straits.

REMARKS.—Through the courtesy of the authorities at the National Museum, Washington, D. C., I have at hand the type of *Melospiza melodia heermanni* (no. 6227, U. S. Nat. Mus.). Baird's description of his *Melospiza heermanni* (Pac. R. R. Rep. IX, 1858, p. 478) applies to this specimen so closely as to leave no doubt that the name should attach to the form which it represents, even if a type had not been designated. This form is an inhabitant of the mountain valleys at the southern rim of the great San Joaquin Valley, where it is apparently resident. I secured breeding topotypes at old Fort Tejon in July, 1904. These, in shape of bill and all other characters, are typical of *M.m. heermanni*; allowance must of course be made for the effects of wear in judging of color comparisons. Baird's type is plainly an unworn, early winter specimen of the song sparrow resident in the region, and not a migrant or winter visitant from the floor of the San Joaquin Valley 3000 feet lower in altitude, as some ornithologists have assumed. Baird says that the bill of his *M. heermanni* is "broader, more convex, and bulging laterally at the base"—this in comparison with the narrow-billed "*Zonotrichia guttata*" (= *Melospiza melodia morphna* Oberholser?). The same remark would apply in a comparison of *M.m. maxil-*

laris with *M.m. heermanni*. The huge, lateral bulbosities of the maxilla alone render *M.m. maxillaris* a unique race among the song sparrows so far described. It is proper here to state that the recognition of a form (*heermanni*) from the Tejon region does not invalidate the *M.m. cooperi* from the San Diego district. In fact, to the best of my knowledge, there are so far no pure synonyms in the nomenclature of California song sparrows.

Melospiza melodia gouldii Baird, (revived name) new subspecies. Marin Song Sparrow.

TYPE.—Sex not recorded, but with scarcely any doubt female; no. 8053, U. S. Nat. Mus.; "California"; "J. Gould."

CHARACTERS.—Resembles *Melospiza melodia maxillaris* most closely in coloration, but size very much less; like *M.m. samuelis* (topotypes from salt marshes near Petaluma) and *M.m. cleonensis* (topotypes from Westport, Mendocino County) in size, but decidedly browner than the former, and with much broader black-streaking than in the latter; differs from *M.m. santaecrucis* (type and topotypes from Palo Alto, Santa Clara County) in smaller bill and darker coloration. Measurements of type of *M.m. gouldii* (probably ♀): wing, 55.9 mm.; tail, 56; tarsus, 18.8; culmen, 10.7; bill from nostril, 8.2; depth of bill (estimated), 6.1. Measurements of selected male (no. 7230, Univ. Calif. Mus. Vert. Zool.; Point Reyes, 5 miles west of Inverness, Marin County; March 1, 1909; W. P. Taylor): wing, 62.4; tail, 63.8; tarsus, 20.8; culmen, 10.9; bill from nostril, 8.3; depth of bill, 6.4.

RANGE.—Permanently resident on fresh-water streams and upland marshes of Marin and Sonoma counties; the form is most typically represented in the vicinity of Point Reyes, less so along the stream courses emptying into San Francisco Bay, where its range meets that of *M.m. samuelis* at the edges of the salt marshes. While song sparrows probably occur on suitable ground almost continuously up the California coast to the northward, we have as yet no material showing intergradation with *M.m. cleonensis*.

REMARKS.—Baird's description of his *Melospiza gouldii* was based solely upon the type. This specimen I have been privileged to examine by the officials of the National Museum. It is

in but slightly worn winter plumage, and although no more precise locality than "California" appears on the label, I have no hesitancy in placing it as here indicated. The chief character pointed out by Baird (Pac. R. R. Rep. IX, 1858, p. 479) was its small size; it does not differ appreciably in size, nor in color, from female specimens at hand from Point Reyes and Nicasio, Marin County. It finds no duplicate among our series of song sparrows from elsewhere. Dr. C. W. Richmond, of the Division of Birds, National Museum, writes me that the type of *M.m. gouldii* was received (catalogued February 27, 1858) from John Gould, who was in the early days in the habit of obtaining specimens in exchange from the London Zoological Society's collection. The specimens in this collection had, in turn, been obtained from a variety of sources, but so far there is nothing by which to determine the collector or locality of capture of this song sparrow. The present disposition of the name *gouldii* has already been given by me (Pac. Coast Avifauna, no. 3, 1902, p. 55), but without characterization. This was done in consequence of information given me by W. K. Fisher, who at my request compared specimens I sent him with the type in Washington. The fact of my now having the type at hand leads happily to a confirmation of this determination.

***Melospiza melodia saltonis*, new subspecies.**

Salton Sink Song Sparrow.

TYPE.—Male adult; no. 599, Univ. Calif. Mus. Vert. Zool.; margin of Salton Sea, one mile southeast of Mecca, Colorado Desert, California; March 13, 1908; collected by C. H. Richardson, Jr.

CHARACTERS.—Resembles *Melospiza melodia fallax* Baird, but very much paler throughout, the "ground-color" being white ventrally and ashy dorsally, with streakings of pale hazel; superciliary stripe wholly white; general size much less than in either *M.m. fallax* or *M.m. montana*. Measurements of type of *M.m. saltonis*: wing, 58.8 mm.; tail, 67.2; tarsus, 20.7; culmen, 10.5; bill from nostril, 8.4; depth of bill, 6.5. The type of *M.m. fallax* measures: wing, 69.2; tail, 77.8; tarsus, 19.8; culmen, 9.9; bill from nostril, 8.1; (depth of bill not determinable).

RANGE.—Permanently resident in suitable localities around Salton Sea, and along the lower Colorado River, at least at Yuma, The Needles, and Fort Mohave. (I have not at present the material to warrant discussing the status of the breeding song sparrows of central Arizona.)

REMARKS.—The type of Baird's *Melospiza fallax* (no. 10281, U. S. Nat. Mus.) has been forwarded to me by the authorities at the National Museum. This proves to represent, not the Colorado Desert form, as I had been previously led to believe, but a migratory song sparrow, probably breeding in some part of the elevated Great Basin tract to the northward. *M.m. fallax* is much nearer to *M.m. montana* than to *M.m. saltonis*, as shown by its ashy coloration, larger size and, especially, proportions. I have seen no breeding examples of *M.m. fallax* as here restricted, all specimens at hand being winter birds undoubtedly out of their breeding range, as was also the type, from "Pueblo Cr., N. M." (= Arizona). I have typical examples of *M.m. fallax* from Victorville, on the Mohave Desert (December), and Clipper Gap, Placer County, California (collected by E. Adams in February). Baird's description of *Melospiza fallax* (Pac. R. R. Rep. IX, 1858, p. 481) without question applies to the type; it was drawn up in comparison with *Melospiza melodia*. Even though Henshaw's subsequent action in restricting the name *fallax* to the breeding song sparrow of Arizona (Auk I, July, 1884, p. 224) seems open to question, there is good ground for recognizing the *M.m. montana* of Henshaw as well as the *M.m. fallax* of Baird.

The song sparrow problem is still far from worked out; and the practice of "lumping" forms only retards a more satisfactory solution.

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IN
ZOOLOGY

Vol. 5, No. 4, pp. 271-273

August 14, 1909

A NEW HARVEST MOUSE FROM
PETALUMA, CALIFORNIA

BY

JOSEPH DIXON



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August 14, 1909

A NEW HARVEST MOUSE FROM
PETALUMA, CALIFORNIA

BY
JOSEPH DIXON.

(A contribution from the Museum of Vertebrate Zoology of the University of California)

Two years of intermittent collecting on the salt marshes of San Francisco and San Pablo bays have furnished two new forms of harvest mice. The first species was described as *Reithrodontomys raviventris* (Dixon, Proc. Biol. Soc. Wash., XXI, Oct. 20, 1908, pp. 197-198) from the southern salt marshes of San Francisco Bay. A series of twenty-four skins collected in the salt marshes of San Pablo Bay three miles south of Petaluma, California, prove to be quite distinct from either *R. raviventris* or *R. longicauda*. This new form seems to share certain characters of both *R. longicauda* and *R. raviventris* to a slight degree; but the combination of characters is such that it remains distinct from either of them and I therefore propose it as new, to be known as:

Reithrodontomys halicoetes new species.

Type.—Male adult; no. 7146, Univ. Calif. Mus. Vert. Zool.; three miles south of Petaluma, Sonoma County, California; original number 179; collected by Joseph Dixon; March 28, 1908.

Habitat.—This mouse seems to be restricted to the salt marsh, its range being coextensive with that of the "pickle grass" (*Salicornia*). Diligent search and trapping failed to reveal its presence outside the *Salicornia* and no specimens of *R. longicauda* could be caught in the *Salicornia*. The harvest mice used the runways of *Microtus* extensively.

Color.—The pelage on the dorsal surface of the new mouse consists of two different sorts of hair. The most numerous are soft hairs, blackish slate at the base and broadly tipped with tawny ochraceous; sometimes there is a narrow terminal band of black. The long, coarse black hairs sprinkled over the dorsal surface are the other kind, and give a general dark hue to that part of the body. The hairs on the underparts are slate-colored at the base and tipped with white. The chin is white. There is a decided black spot on each side of the nose at the base of the whiskers, and a black ring encircles the eye. The ears are very dark as are also the hind feet. The fulvous spot at the anterior base of the ear is very noticeable, and the tail is long, rather bi-colored, and well covered with hair.

In an immature specimen (no. 7148, Univ. Calif. Mus. Vert. Zool.), the ochraceous band on the hair is much restricted, giving a more slaty tone to the entire dorsal and lateral surfaces.

Measurements.—A series of twenty-four, thirteen males and eleven females, collected in the salt marsh at Petaluma, March 28-29 and December 22-30, 1908, average: length, 151.3 (130-168); tail, 77.5 (60-88); hind foot, 17.5 (17-19); average ratio of tail to total length, 51.2 per cent. Skull measurements of type: basal length, 17.3; nasals, 7.8; zygomatic breadth, 11.4; alveolar length of upper molar series, 3. A female (no. 7147, Univ. Calif. Mus. Vert. Zool.) measures: basal length, 17.5; nasals, 7.6; zygomatic breadth, 11.3; upper molar series, 3.

Food.—On March 28 several stomachs of these mice contained tender tips of a species of rush that was just coming up over the marsh at that time.

Remarks.—The material from the vicinity of Petaluma seems to show that there are two forms of *Reithrodontomys* to be found there: a light-colored, small, fine-haired, upland form (*R. longicauda*) and a larger, darker, thick-furred form which is restricted to the salt marsh. Their ranges seem to be distinct and as far as I was able to learn, do not overlap.

Mr. W. H. Osgood, formerly of the Biological Survey, states in a letter: "Typical *longicauda* is undoubtedly an upland species much paler in color than the salt marsh forms. Of the specimens originally listed by Baird only one skull is now to be

found in the National Museum. This is scarcely identifiable more than generically, so that the name rests on Baird's description; and this seems to apply wholly to the light-colored upland mouse."

For this reason most of my comparison has been with typical specimens of *R. longicauda* taken as near Petaluma as possible. *R. halicoetes* may be distinguished from *R. longicauda* by its larger size, darker color, denser fur and particularly by the much darker ears and hind feet which are especially noticeable during life. The black spot on the sides of the nose and the black ring around the eye are also darker than in *R. longicauda*. *R. halicoetes* may be told from *R. raviventris* by its larger size, white underparts and bi-colored tail which is relatively much longer.

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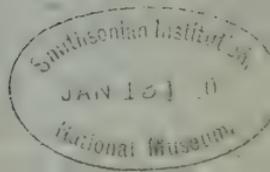
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December 31, 1909

A NEW COWBIRD OF THE GENUS
MOLOTHRUS
WITH A NOTE ON THE PROBABLE GENETIC
RELATIONSHIPS OF THE NORTH
AMERICAN FORMS

BY
JOSEPH GRINNELL

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A NEW COWBIRD OF THE GENUS

MOLOTHRUS

WITH A NOTE ON THE PROBABLE GENETIC
RELATIONSHIPS OF THE NORTH
AMERICAN FORMS

BY

JOSEPH GRINNELL

(Contribution from the Museum of Vertebrate Zoology of the University of California)

The recurring suggestion that cowbirds are of recent arrival in the west, having newly invaded the domain from the east as a consequence of its settlement by man, is not borne out by a study of the case. It is possible, even probable, that this bird, as with many others, is increasing in abundance with the cultivation of the arid regions, and that it is in consequence to be observed at many points where formerly not met with. But that the cowbird affords an example of a species which is rapidly extending its range across the wide area westward from the Rockies is negated by the available data.

In the first place, the earliest naturalists to collect birds in quantity ascertained the presence of this species even as far west as Nevada (Ridgway, Orn. 40th Parallel, 1877, 501: upper Humboldt Valley and Truckee Reservation) and California (Baird, Pac. R. R. Rep. IX, 1858, 525: Sacramento Valley and Fort Yuma).

In the second place, as is to be shown in the present paper, the cowbirds of the Great Basin are subspecifically distinct from those of the eastern United States; and, furthermore, their closest relationship is with the subspecies occupying the region from Arizona and southeastern California southward through Mexico "to Oaxaca, Colima, and Jalisco" (*vide* Ridgway, Bds. N. & Mid. Am. II, 1902, 210). It is from this latter form that the Great Basin race was probably derived; and not from the form east of the Rocky Mountain plateau.

The present study of the question was stimulated by a series of twelve adult cowbirds recently come to hand from a single small area in northern Nevada, this being the result of intensive field work carried on during the summer of 1909 by Walter P. Taylor and Charles H. Richardson, Jr., under the direction of Miss Annie M. Alexander. This series, together with the rest of the extensive collections obtained during the 1909 expedition to Nevada, has been donated by Miss Alexander to the Museum of Vertebrate Zoology.

It is here assumed that the various published records of the "cowbird" from the Great Basin region of the western United States were based upon individuals of the same subspecific characters as exhibited by the specimens at hand. It seems that extremely few cowbirds have been preserved previously from the region, and none of them are available to me. At any rate twelve specimens from one locality are preferable, for purposes of specific characterization, to twelve specimens from as many widely separated localities, even if in the same general area.

***Molothrus ater artemisiae*, new subspecies.**

Nevada Cowbird.

TYPE.—Male adult; no. 8825, Univ. Calif. Mus. Vert. Zool.; Quinn River Crossing, Humboldt County, Nevada; May 31, 1909; C. H. Richardson, Jr.

CHARACTERS.—Similar to *Molothrus ater ater* (Boddaert) of the eastern United States, but somewhat larger, with proportionally longer and more slender bill; similar to *M. a. obscurus*

(Gmelin), of the Lower Sonoran zone in Arizona and south-eastern California, but much larger.¹

RANGE.—Upper Sonoran and Transition zones of the Great Basin region of the western United States. This is practically coincident with the range of the sage-brush (*Artemisia tridentata*).

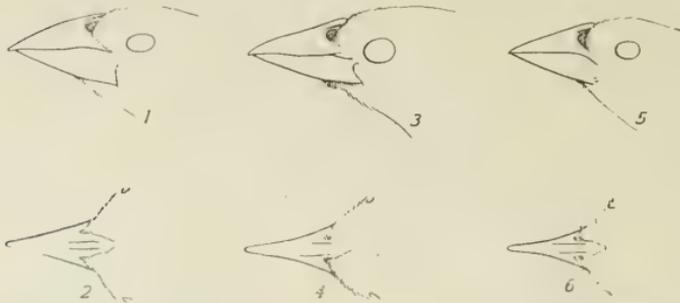
REMARKS.—The differences between the three forms of cowbirds under consideration lie chiefly in their relative sizes and proportions. Between the males I can detect no color differences of importance. The brown of the head appears no paler in the western forms, *artemisiac* and *obscurus*, than in the eastern form, *ater*. The steely reflections of the body plumage vary slightly from deep bluish to bronzy; but as far as I am able to judge, these are purely individual qualities.

The single female of *artemisiac* (no. 8824) from Humboldt County, Nevada, is distinctly paler than eight adult females of *ater* from the eastern United States. It is of a drab color throughout, very much paler and more clay color on the throat, whereas the eastern birds are slaty hair brown, with less abruptly contrasted grayish throat. These color differences are very similar to those exhibited between *obscurus* (of which seven female specimens are at hand) and *ater*. In other words, the female of *artemisiac* is like that of *obscurus* in color.

The characters by which the three cowbirds are best distinguished may be comprehended by an examination of the three tables of measurements of male birds presented herewith. The relative sizes and proportions in the females of the three sub-

¹ As to the nomenclatural treatment of the three forms here distinguished, I am reluctantly following recent precedent. The genus *Molothrus* contains only these three, and one other somewhat more divergent form, *Molothrus atronitens* (Cabanis), from northern South America. I have no evidence whatever that the three forms, *ater*, *artemisiac*, and *obscurus*, intergrade continuously and geographically between each other. In other words their distinctness is specific on any criterion excepting those of relatively close similarity in gross appearance, and individual overlapping in separate characters. Certainly the trinomial or subspecific form of name as used here indicates no different order of genetic entity from that existing, say, between the three "species" of flickers, or the three meadowlarks, occupying the same relative areas. This is merely a protest against the very evident tendency among ornithologists nowadays to "reduce" all congeneric forms in plastic groups to subspecific status. Indeed it might even be urged with reason that trinomials have outlived their usefulness, and that a pure binomial system, as consistently followed by Sharpe in his "Hand-List of Birds," is adequate and decidedly less cumbersome.

species are apparently the same as in the case of the males, but the material at hand is insufficient. It will be noted in the case of the males that *artemisiae* is decidedly the largest in general size, *obscurus* the smallest, while *ater* is intermediate, nearest *artemisiae*. But *obscurus* is much more nearly uniformly smaller than *artemisiae*, than uniformly smaller than *ater*. Its range of variation in ratios of measurements in the six particulars of the tables is five per cent. with *artemisiae* as compared



Figs. 1, 2. *Molothrus ater ater*, ♂ ad.; no. 4767, coll. H. S. Swarth; Chicago, Ill.; October 18, 1904.

Figs. 3, 4. *Molothrus ater artemisiae*, ♂ ad.; type, no. 8825, Univ. Calif. Mus. Vert. Zool.; Quinn River Crossing, Humboldt County, Nevada; May 31, 1909; C. H. Richardson, Jr.

Figs. 5, 6. *Molothrus ater obscurus*, ♂ ad.; no. 970, Univ. Calif. Mus. Vert. Zool.; Lano, Imperial County, California; April 21, 1908; J. Grinnell and C. H. Richardson, Jr. All figures are natural size.

to eleven per cent. with *ater*. The chief differential feature between *artemisiae* and *ater* is in the proportions of the beak, as shown in the accompanying drawings. *Ater* has a tumid bill, broad and high at base with conspicuously arched culmen. *Artemisiae* has a longer and relatively much slenderer bill, vertically shallow at base and laterally compressed, with the culmen in its greater portion straight or even slightly depressed. The beak of *obscurus* is practically a miniature of that of *artemisiae*. The average ratio of depth of bill at base to length of culmen is 56 per cent. in both *obscurus* and *artemisiae*, as contrasted with 62 per cent. in *ater*. The point which I wish to

emphasize is that *artemisiae* is in all particulars a uniformly large edition of *obscurus*, and not nearly as closely allied to *ater*, although nearer the latter in the matter of bulk. A survey of relevant cases among birds leads me to argue that as a rule mere uniform increase or decrease in size signifies less of phylogenetic separation than do changes in proportion of parts. In other words *artemisiae* has closer affinities with *obscurus* than with *ater*.

This being the interpretation of the facts in the present case, then *artemisiae* is a derivative from *obscurus* stock, from which, but more remotely, *ater* may have also been derived. The Y-shaped geographic divergence of *artemisiae* and *ater* from *obscurus* is exhibited in the present ranges of the three forms. The northern limit of the range of *obscurus* extends clear across the Mexican border of the United States, very close to the breeding range of *artemisiae* at the west, and very close to *ater*, in Texas, at the east.

Should it be found that the ranges of *artemisiae* and *ater* adjoin somewhere across the Rocky Mountains, and should series of specimens be forthcoming from various localities from the west to the east, and should these demonstrate the existence of intergradation in all characters continuously between *artemisiae* and *ater*, I believe there would still be little reason for considering *artemisiae* a subspecies derived from *ater* (and in process of invasion) or *vice versa*. The existence of such "intergrades," where eastern and western races have met, might with good reason be looked upon as the result of long-continued hybridization.

It would seem to me that the cowbirds afford a condition of affairs like that so clearly demonstrated by Stejneger with regard to the origination of the various forms of the hairy woodpecker in North America. (See *Auk* XXIII, July, 1906, pp. 265-270). Stejneger says of the hairy woodpeckers: "We may then assume that previous to the Glacial period there lived in North America a hairy woodpecker small of size. The advance of the glaciation pushed the woodpeckers southward and in combination with the transgression of the Gulf of Mexico effected a separation of the southern Alleghany region from the western portion of our continent which then as now formed the northern continuation of

Mexico. . . . I feel convinced of the correctness of the hypothesis that it was during this long period of separation that the two main forms, the western and the eastern, finally got established." The hairy woodpeckers, of both east and west, are represented by northern and southern forms, which it is argued are more recent in differentiation.

Unlike the woodpeckers in question, the cowbirds are doubtless austral in their origin. But this would not militate against the hypothesis of a similar course of divergence.

In conclusion: It seems improbable that the cowbirds of the Great Basin of the northwestern United States have recently invaded that area from across the Rocky Mountain region. On the contrary, the facts as above presented show that cowbirds were to be found in the west as soon as careful observations were made; and that the birds of the Great Basin belong to a distinct form from that occupying the United States east of the Mississippi. And finally it appears most probable that this Great Basin race is a direct offshoot of a stock-form now represented from the southern United States border southward, and not a descendant from the Atlantic form.

TABLE I.

Molothrus ater artemisiae.

No. ¹	Locality	Date	Wing	Tail ²	Tarsus	Culmen	Gonys	Depth of bill at base ³	Ratio % of depth of bill to culmen
8822	Humboldt Co., Nev.	May 27, 1909	110.3	72.7	28.3	17.7	10.8	10.5	59
8823	Humboldt Co., Nev.	May 28, 1909	112.7	76.0	27.1	18.2	10.9	10.0	55
8825	Humboldt Co., Nev.	May 31, 1909	112.9	72.6	27.9	18.2	11.7	10.1	55
8826	Humboldt Co., Nev.	May 31, 1909	112.6	73.3	27.7	17.5	10.8	9.7	55
8827	Humboldt Co., Nev.	June 1, 1909	111.1	72.7	26.5	18.1	11.0	9.9	55
8828	Humboldt Co., Nev.	June 3, 1909	112.4	72.3	27.7	18.0	10.6	10.8	60
8829	Humboldt Co., Nev.	June 3, 1909	112.2	74.0	28.7	18.8	11.4	10.1	54
8830	Humboldt Co., Nev.	June 5, 1909	115.5	76.2	28.9	19.6	11.3	10.7	55
8831	Humboldt Co., Nev.	June 11, 1909	117.2	79.0	28.2	18.3	10.7	10.4	57
8832	Humboldt Co., Nev.	June 11, 1909	117.0	79.5	27.9	18.9	11.5	10.3	54
8833	Humboldt Co., Nev.	June 11, 1909	115.0	75.8	26.4	17.6	10.9	10.7	61
Average of the eleven adult males			113.5	74.9	27.7	18.3	11.1	10.3	56

¹ Univ. Calif. Mus. Vert. Zool.

² The tail is measured from the point between the insertions of the median rectrices into the uropygium, to the tip of the longest rectrix in "closed" tail. All measurements are in millimeters.

³ The depth of bill is not a satisfactory measurement to secure because of the conical shape of the beak and because the mandible and maxilla may have dried either separated slightly or crowded closer together than normally; the errors in these regards would, however, seem to neutralize one another.

TABLE II.
Molothrus ater ater.

No.	Locality	Date	Wing	Tail	Tarsus	Culmen	Gonys	Depth of bill at base	Ratio % of depth of bill to culmen
..... ¹	Minneapolis, Minn.	May 5, 1887	105.5	68.3	26.5	17.3	10.1	11.2	65
4557 ²	Chicago, Ill.	July 2, 1904	113.3	76.2	26.8	18.9	11.0	11.1	59
4767 ¹	Chicago, Ill.	October 18, 1904	112.4	74.9	25.0	17.5	11.0	10.7	61
4836 ¹	Chicago, Ill.	April 9, 1905	110.7	72.4	26.4	16.6	10.3	11.2	67
4899 ³	Chicago, Ill.	April 9, 1905	110.8	70.2	26.7	17.0	10.6	10.5	62
..... ²	Chicago, Ill.	April 29, 1887	108.8	67.3	26.0	18.0	11.0	11.0	61
..... ²	Stark Co., Indiana	May 16, 1885	107.3	69.6	26.1	18.2	10.8	10.5	58
..... ²	Stark Co., Indiana	June 8, 1884	108.0	73.7	25.8	18.1	10.4	10.4	58
1246 ⁴	Wayne Co., Mich.	March 29, 1891	107.8	71.4	25.3	17.0	11.1	10.5	62
..... ¹	Jackson Co., Mich.	April 2, 1888	113.7	77.6	25.8	17.8	11.0	11.5	65
..... ⁴	Princeton, N. J.	April 3, 1894	107.5	69.8	25.7	17.2	11.0	11.0	64
868 ¹	Milford, Conn.	May 4, 1889	105.0	69.5	24.5	17.0	10.1	11.0	65
Average of the twelve males			109.2	71.7	25.9	17.5	10.7	10.9	62

¹ Univ. Calif. Mus. Vert. Zool.² Coll. G. Frean Morcom.³ Coll. H. S. Swarth.⁴ Coll. J. Grinnell.TABLE III.
Molothrus ater obscurus.

No.	Locality	Date	Wing	Tail	Tarsus	Culmen	Gonys	Depth of bill at base	Ratio % of depth of bill to culmen
969 ¹	Lano, Calif.	April 21, 1908	101.1	67.7	24.7	16.9	9.9	9.3	55
970 ¹	Lano, Calif.	April 21, 1908	100.4	69.6	23.6	16.0	9.4	9.4	59
971 ¹	Mecca, Calif.	April 18, 1908	98.9	69.2	24.0	16.0	9.6	9.0	56
973 ¹	Mecca, Calif.	April 27, 1908	102.4	69.0	24.2	17.1	10.0	8.7	51
3304 ²	Fort Yuma, Calif.	May 13, 1886	104.8	71.7	25.5	17.6	10.1	9.5	54
222 ³	Huachuca Mts., Ariz.	July 8, 1896	94.8	63.6	23.3	16.0	9.2	9.0	56
2746 ³	Huachuca Mts., Ariz.	May 7, 1902	102.0	72.8	23.4	16.1	9.4	9.0	56
2813 ³	Huachuca Mts., Ariz.	May 14, 1902	96.8	65.0	24.6	15.1	8.8	9.0	60
3866 ³	Huachuca Mts., Ariz.	May 4, 1903	100.5	68.2	25.0	16.7	9.5	9.3	56
3867 ²	Huachuca Mts., Ariz.	May 4, 1903	99.6	66.4	22.5	16.8	9.0	9.4	56
4019 ²	Tucson, Ariz.	June 3, 1903	101.1	69.0	24.0	17.0	10.0	9.2	54
Average of the eleven males			100.1	68.4	24.1	16.5	9.5	9.2	56
Ratio % of average of 11 males of <i>obscurus</i> to average of 11 males of <i>artemisiae</i>			88	91	87	90	86	89	
Ratio % of average of 11 males of <i>obscurus</i> to average of 12 males of <i>ater</i>			92	95	93	94	89	84	

¹ Univ. Calif. Mus. Vert. Zool.² Coll. G. Frean Morcom.³ Coll. H. S. Swarth.

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Vol. 5, Nos. 6 and 7, pp. 283-305, Pls. 27-29

February 12, 1910

TWO NEW RODENTS FROM NEVADA

BY
WALTER P. TAYLOR

A NORTHERN COAST FORM OF THE
CALIFORNIA GRAY FOX

BY
JOSEPH DIXON

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Vol. 5, No. 6, pp. 283-302, Pls. 27-29

February 12, 1910

TWO NEW RODENTS FROM NEVADA.

BY
WALTER P. TAYLOR.

(Contribution from the Museum of Vertebrate Zoology of the University of California.)

The discovery of these rodents is a further¹ result of work carried on in northern Humboldt County, Nevada, by a field party under the patronage of Miss Annie M. Alexander. Collecting was done in Virgin Valley and vicinity by Miss Alexander and Miss Louise Kellogg, and in the Pine Forest Mountains by Charles H. Richardson, Jr., and the writer.

Callospermophilus trepidus, new species.

Nevada Golden-mantled Ground Squirrel.

TYPE.—Male adult; no. 8240, Univ. Calif. Mus. Vert. Zool.; head of Big Creek (altitude 8000 feet), Pine Forest Mountains, Humboldt County, Nevada; June 27, 1909; W. P. Taylor and C. H. Richardson, Jr.; orig. no. 768.

DIAGNOSTIC CHARACTERS.²—Larger than *Callospermophilus chrysodeirus chrysodeirus* (see table of measurements) except as regards hind foot; paler: under-parts lighter, nearly white; hair on feet lighter, almost pure white; lacking the wash of light

¹ This is the second paper based primarily on the results of the 1909 Alexander Expedition to Nevada. (See Univ. Calif. Publ. Zool., V, pp. 275-281.)

² Such general color terms as "fulvous" have been avoided; Ridgway's *Nomenclature of Colors* has been used as the basis for color names.

clay color on throat and on sides of neck which is characteristic of *chrysoceirus*; shoulders and upper surface of head slightly more ochraceous clay; lateral white stripe tending to be broader and somewhat lighter; ventral surface of tail varying from ochraceous to tawny ochraceous instead of chestnut; inner lateral dark stripe tending to be narrower than the outer (reverse true in *chrysoceirus*). Skulls present no obvious differential characters.

DESCRIPTIVE REMARKS.—A majority of the specimens used in comparison have already assumed the post-breeding pelage. Our series of adults from the Pine Forest Mountains was collected from June 16 to July 31. There are also at hand a number of well-prepared skins of *Callospermophilus chrysoceirus chrysoceirus* taken by A. S. Bunnell July 12 to August 2 on Mount Shasta.

The type specimen of *trepidus* is in the post-breeding pelage and is fairly representative of the males of our series. It presents the following characters: Cheeks and shoulders ochraceous clay, lightest on the cheeks, darkest on the shoulders, where the tint approaches tawny ochraceous. Forehead and nose hazel, sprinkled with black hairs. Eyelids white. Hairs at the bases of ears and along their anterior edges light ochraceous, melting insensibly into white toward the posterior part of the pinna. Hairs on the inside of the ears light ochraceous for the basal two-thirds, having their ends black or very dark brown. The three lateral stripes broad; average width (measured from the skin): white stripe, 7 mm.; inner black stripe, 8; outer black stripe, 10. Ends of both dark stripes obscured. Light stripe traceable for some distance in front of and behind the ends of the black stripes. Outer black stripe extending about 10 mm. farther back than the inner one. White stripe running directly into the ochraceous clay of the shoulders, the white hairs of the stripe being gradually replaced by light ochraceous hairs and finally by darker ochraceous hairs until in the shoulder area it is merely indicated. The white of the stripe modified by an extremely faint wash of yellow on the tips of the hairs. Region between the two inner lateral dark stripes grizzled (ochraceous, white, and black). There are more black hairs anteriorly, the

hazel brown coming into prominence on the nose. This grizzled area narrowest just back of the ears, posteriorly becoming broader and extending over the rump and upper surface of the thighs, also on to the dorsal surface of the tail for a quarter of the distance to the end. Ends of hairs of under-parts (throat, pectoral region, and abdomen) practically pure white, their plumbeous proximal portions showing through to some extent. Sides (just below the outermost black stripe) white with a faint suggestion of brown.

The color of the sides grading anteriorly into the ochraceous clay of the shoulders, ventrally into the white of the under-parts and posteriorly into the grizzled black, white, and ochraceous of the rump. Fore legs dorsally light ochraceous, becoming white on the fingers, and ventrally pure white. Hind legs dorsally like back, except that there is a slightly more hazel tinge. There are two kinds of hairs on the upper surface of the hind legs, one a long stiff type, gray basally, black in its middle portion and white for three or four millimeters distally, the other a short soft type, its inner half plumbeous, its outer half hazel. Feet white with a suggestion of very light ochraceous. Lower surface of thighs pure white, the hairs of this region lacking the plumbeous bases. Ventral surface of tail anteriorly ochraceous, becoming gradually more tawny ochraceous toward the end. Lateral black stripe of tail (viewed ventrally) three to six millimeters broad. Dorsally (distal three-fourths) the tail is black, sprinkled with a few light ochraceous hairs. Tail edged with soiled white; in other specimens this edging approaches ochraceous. The tail presents the second lateral black stripe (concealed), although this stripe is far less extensive than in *lateralis*.

An adult male *chrysoeirus* from Mt. Shasta, taken July 28, 1904 (no. 3302), is at hand and may be profitably examined with the above description in mind. It is slightly lighter ochraceous about the head and shoulders, and has not so many black hairs on the nose. Eyelids not so prominently white. Ears varying from hazel on the anterior edge to tawny ochraceous posteriorly. Hairs on inside brown (ochraceous to hazel) with no black endings. The three lateral stripes broad. Average

width (measured from skin): white stripe, 5 mm.; inner black stripe, 8; outer black stripe, 7. White of light stripe slightly less pure than that of *trepidus*. Back similar in color to the specimen previously described. Others of the series of *chryso-deirus* manifest a distinct tendency for this region to be darker. Grizzled area not encroaching to any extent upon the upper surface of the tail. Underparts, except throat and sides of neck, soiled white. The dilution of the white is due partly to the bases of the hairs being plumbeous for a greater distance than in *trepidus* and partly to a faint wash of ochraceous. A definitely ochraceous area is present in the posterior abdominal region along the median line. Throat and sides of neck light ochraceous. Sides slightly darker, there being a somewhat more definite suggestion of brown. Fore legs dorsally ochraceous, lighter on toes, ventrally light ochraceous; no white. Hind legs dorsally like back but with an ochraceous instead of a hazel tinge. Lower surface of thighs soiled white. The hairs have their bases plumbeous, and their distal portions very light ochraceous. This color is intensified about the heel. Feet darker ochraceous than in *trepidus*. Ventral surface of tail dark hazel close to the body, becoming chestnut distally. Tail dorsally similar to *trepidus*, but the few light hairs are ochraceous rather than light ochraceous. Tail edged with tawny ochraceous.

A number of our adult specimens of *trepidus* (nos. 8232, 8249, and 8258) are in process of molt. As remarked by Allen (Bull. Am. Mus. Nat. Hist., III, no. 1, June, 1890, p. 49), "the new coat with its bright tints appears as patches interspersed with the old." The nose seems to be one starting place for the molt, the middle of the back another.

Sexual variation in color is obvious, the males being instantly recognizable through the brighter color of the shoulders and the clearer definition of the stripes. In two of the females (nos. 8227 and 8249) the lateral dark stripes are seal brown instead of black.

A series of 29 juvenals shows that the young of *trepidus* are very similar in color to the adults. Their pelage is of course softer and more silky. A number are in the process of molt into the bright first winter pelage. In these specimens there

EXTERNAL MEASUREMENTS OF *Callospermophilus trepidus*.³

All from Pine Forest Mountains, Humboldt County, Nevada.

Museum Number	Sex and Age	Total Length	Tail Vertebrae	Hind Foot	Ratios	
					Tail Vert. to Total Length	Hind Foot to Total Length
8258	♂ ad.	.....	.....	42	.....	.....
8244	♂ ad.	288	104	40	36.1	13.9
8231	♂ ad.	266	99	42	37.2	15.8
8240	♂ ad.	268	90	44	33.6	16.4 <i>type</i>
8243	♀ ad.	255	95	39	37.2	15.3
8246	♀ ad.	268	99	40	36.9	14.9
8227	♀ ad.	283	107	40	37.8	14.1
8232	♀ ad.	252	101	40	40.1	15.9
8241	♀ ad.	280	105	40	37.5	14.3
8249	♀ ad.	.....	.....	40	.....	.....
Averages of ♂♂		274.0	97.6	42.0	35.6	15.3
Averages of ♀♀		267.6	101.4	39.8	37.9	14.9
Averages of all adults		270.0	100.0	40.7	37.0	15.0

EXTERNAL MEASUREMENTS OF *Callospermophilus chrysodeirus chrysodeirus*.

All from Mount Shasta, Siskiyou County, California.

Museum Number	Sex and Age	Total Length	Tail Vertebrae	Hind Foot	Ratios	
					Tail Vert. to Total Length	Hind Foot to Total Length
3298	♂ ad.	235	.....	40	.....	17.0
3305	♂ ad.	266	91	42	34.2	15.8
3301	♂ ad.	265	90	38	33.9	14.3
3302	♂ ad.	260	88	41	33.8	15.7
3299	♂ ad.	264	89	42	33.7	15.9
3303	♀ ad.	256	82	42	32.0	16.4
3307	♀ ad.	254	82	42	32.3	16.5
3300	♀ ad.	265	82	44	31.0	16.6
3304	♀ ad.	265	80	42	30.2	15.8
3306	♀ ad.	260	82	42	31.5	16.1
Averages of ♂♂		258	89.5	40.6	33.9	15.7
Averages of ♀♀		260	81.6	42.4	31.4	16.2
Averages of all adults		259	85.1	41.5	32.5	16.0

³ Note in *Callospermophilus trepidus* as compared with *Callospermophilus chrysodeirus chrysodeirus* the larger size and greater ratio of the length of tail vertebrae to total length.

is no patchy appearance, except in one (no. 8259), the molt appearing to proceed regularly commencing at the nose.

The form *trepidus* is distinguished by certain leading characters from any previously described similar species known to the writer. From *wortmani* (Allen, Bull. Am. Mus. Nat. Hist., VII, November 8, 1895, p. 335, type locality Kinney Ranch, Bitter Creek, Wyoming) it is differentiated by the presence dorsally of the broad inner lateral black stripe; from *lateralis* (Say, Long's Exped. Rocky Mountains, II, 1823, p. 46, type locality "Near the Source of the Arkansas River, Colorado") by the much broader inner lateral black stripe (dorsal); from *cinerascens* (Merriam, N. Am. Fauna, no. 4, Oct., 1890, p. 20, type locality Helena, Montana) by a number of color differences and much smaller size; from *castanurus* (Merriam, *l. c.*, p. 19, type locality Park City, Wahsateh Mountains, Utah, altitude 7000 feet) by the ochraceous instead of chestnut color of the under surface of the tail; and from *chrysodeirus* (Merriam, *l. c.*, p. 19, type locality Fort Klamath, Oregon), by the differences above outlined.

In the original description of *wortmani* (*l. c.*) Allen makes the assertion that the new form (*i. e.*, *wortmani*) combines in a singular manner the characters of the two "couplets" into which Merriam a few years since (N. Am. Fauna, no. 4, Oct., 1890, p. 18) separated the *lateralis* group. This statement may seemingly be even more appropriately applied to *trepidus*. In cranial characters it much resembles the *castanurus* group, but certain external characters point strongly in the direction of the *lateralis* group. For example it has the inner lateral black stripe on the back narrower than the outer, and possesses a distinct second lateral black band (concealed) on the tail. It should perhaps be noted in passing that specimens of *chrysodeirus* in the Museum have the bases of the lateral tail hairs plumbeous or black. One individual (no. 3301) possesses the second lateral band (concealed) somewhat as in *lateralis*.

DISTRIBUTION.—Specimens of the Nevada golden-mantled ground squirrel were collected as follows: Big Creek Ranch, 16; Big Creek, 10; Leonard Creek, 2; Duffer Peak, 4; Alder

Creek, 4; Virgin Valley, 1; these localities are in northern Humboldt County, Nevada, and vary in altitude from 5000 to 9000 feet. All but the last mentioned are in the Pine Forest Mountains.

Callospermophilus trepidus is one of the most common mammals in the mountains. Ranging from a few hundred feet above the desert to the highest point of the mountains, it obviously has an extensive Life Zone habitat, being found at least from high Upper Sonoran through Transition and Canadian into Hudsonian.

So far as known *trepidus* is isolated on this range of mountains and neighboring spurs. Segregation at some time in the past as a consequence of some environmental change was probably one factor in the evolution of the species.

During the period when local glaciation took place in the northern Cordilleran region, the life-zones must of necessity have been driven to lower levels. At the close of the glacial period the zones probably returned to their former positions. As this return process took place, some of the animal species now found in this region must have extended their range higher and higher, and may be assumed to have become gradually accustomed to life in their new habitats. This adaptation would presuppose the appearance of new characters. Certain ones of these species through this adaptation to a different environment may have lost all intercourse with others of their own kind. This would allow free play to isolation as a factor in evolution, and any new characters, whether arising through natural selection, mutation or any other cause would tend to be perpetuated.

***Neotoma nevadensis*, new species. Nevada Wood Rat.**

TYPE.—Adult female; no. 8282, Univ. Calif. Mus. Vert. Zool.; Virgin Valley, Humboldt Co., Nevada, altitude 4800 ft.; May 17, 1909; collected by Annie M. Alexander; original number 23.

DIAGNOSTIC CHARACTERS.—Similar in general appearance to *Neotoma desertorum* in comparable pelage, but averaging darker dorsally; upper surface of tail black; measurements averaging less. Skull smaller; incisors narrower and shorter; molars

brown; rostrum longer; mandible less massive; interparietal differently shaped; bullae more swollen; dorsal and ventral anterior roots of zygomatic arch narrower.

The ranges of *nevadensis* and *desertorum* as known at present are separated by a wide stretch of territory. Taking this fact into consideration, and noting also that *nevadensis* inhabits a different life-zone and possesses a large number of important differential cranial characters, the conclusion that it should be accorded full specific rank seems amply justified.

MEASUREMENTS OF TYPE.—(External measurements taken in the flesh): total length, 260 mm.; tail vertebrae, 115; hind-foot, 30. (See table of comparative measurements.)

DESCRIPTIVE REMARKS.—Geographical considerations lead to the comparison of *Neotoma nevadensis* with *Neotoma desertorum* (Merriam, Proc. Biol. Soc. Wash., IX, July 2, 1894, p. 125), the type locality of which is Furnace Creek, Death Valley, Inyo County, California. Upon lining up series of the two animals in comparable pelage, one is immediately impressed with the average darker color of the Nevada specimens. The back of *nevadensis* is slate-gray washed with seal brown. *Desertorum*, on the other hand, has the back varying from light isabella color to pinkish buff.

In respect to color of breast and belly, our examples of the new species are more or less clearly distinguishable from *desertorum*. In three of the Nevada specimens (nos. 8281, 8282, and 7888) the chest and inguinal region are white. In all of the others, however, there is a suggestion of ochraceous buff, which in two specimens (nos. 8283, 8287) amounts to a definite suffusion. The color is deepest on the breast in front of the fore legs. As shown by our series from the Mohave Desert (Antelope Valley, Victorville, etc.), *desertorum* has the underparts pure white in a majority of cases, although some specimens (no. 6089 in particular) present a buffy wash on the belly. Two of the individuals (nos. 5995, 6089) have the breast in front of the fore legs definitely buffy.

Neotoma nevadensis presents a characteristic black dorsal tail surface, there being some variation in the intensity of the color. One male specimen (no. 8280) has the dorsal surface of the tail

light brownish, or light fawn color, as in *desertorum* from the Mohave Desert. But on the whole the Nevada skins are markedly different in this respect. Of twenty adults of the Mohave Desert species, mostly males, only one (no. 6087) approaches the Nevada series in color of tail dorsally. As a matter of fact, the color in this specimen is not the charcoal black of *nevadensis*, but seal brown.

Differences between the two species are quite as evident in the juvenals as in the adults. Three young specimens of *nevadensis* (nos. 7886, 7885, 7889) taken in June and July and four of *desertorum* (nos. 5386, 5287, 5343, 5385) taken in June are at hand. Two selected individuals (nos. 7886 and 5385) are of about the same age, and are typical of the two series of juvenals. As exemplified by these two specimens, *nevadensis* is darker than *desertorum*. The back of the former is slate black with a few buffy hairs showing through. The latter has the dorsal surface hair brown. The face and forehead of *nevadensis* are dark gray with merely a suggestion of buffy, while *desertorum* has these parts almost wholly buffy. *Nevadensis* has merely a suggestion of buff on the flanks and rump, while *desertorum* has the color intensified. All of the young specimens of the former present a buffy tinge on the white-tipped hairs of the ventral surface, while a number of examples of the young of the latter have the underparts pure white. There is great variation in both species in this respect. In the juvenals of *nevadensis* the region behind the ears is noticeably buffy, whereas in *desertorum*, although it is almost identical in tone, this marking is not evident, since its color is much the same as that of the upper parts in general. In respect to coloration of the tail, the differences between the young of the two species are analogous to those between the adults.

The table of comparative external measurements shows that the new form is uniformly smaller than *desertorum*, except that the average of the hind foot for the females of *nevadensis* is slightly greater than that for the females of *desertorum*. In other respects the difference in size is quite marked. The longer tail of *desertorum* makes the ratio of the hind foot to the total length greater in *nevadensis* than in *desertorum*, while of course

the ratio of the tail vertebrae to the total length is greater in *desertorum*, due to the same cause.

Another form whose range may be supposed to be contiguous is *Neotoma lepida* (Thomas, Ann. Mag. Nat. Hist., 6th series, XII, Sept., 1893, p. 235). The type locality of this species is Williams Spring, just south of Champlin Mts., Juab County, Utah. Although no specimens of this form are at hand, a study of the original description seems to show that *nevadensis* is distinct.

The ears of *lepida* are described as being large, their minute hairs whitish. In the Nevada wood rat these hairs are gray or brown. In some of the specimens there is a tendency for the hairs on the inner side of the pinna to be light gray, tipped with black. Those on the outside are very dark brown, almost black.

Quoting from Thomas' description of *lepida* (*l. c.*): "Tail very thickly haired, so much so as to be intermediate between that of the round-tailed and the bushy-tailed species, the scales entirely hidden by the hairs; its color mixed brownish fawn above, white below." The tails of our examples of *nevadensis* are rather thinly haired, the scales being hidden by the hairs in two of our specimens only (nos. 8281, 7888). Nor can our specimens be said to be intermediate between the round-tailed and the bushy-tailed species. Other slight differences appear to exist, showing that *lepida* must be a different form.

CRANIAL CHARACTERS.—The skulls of *nevadensis* average smaller than those of *desertorum*, and are differently shaped. (See table of cranial measurements.) The frontal profile is not flattened on the same plane. By placing the skull on a horizontal flat surface with the basiscranial face downward, and setting the edge of a ruler on the flat part of the frontal, the plane of flattening is shown to be tipped a little downward anteriorly. In *desertorum* the plane is nearly horizontal, or tipped slightly downward posteriorly. Thus the highest part of the skull when in this position is formed by the temporal region instead of the frontal bones. Both this difference and the other distinctive cranial characters may be more readily apprehended by the inspection of the appended plates.

The upper incisors are not only narrower and shorter but

are relatively thicker antero-posteriorly. A tendency toward sharper curvature seems to exist also. The lower incisors are smaller both as regards length and breadth. The molars are subject to great individual variation in shape in both species. They are, with individual exceptions, brown in *nevadensis*, black in *desertorum*.

The rostrum in *nevadensis* is relatively longer and more narrow than in *desertorum*. On the other hand, the tongues of the premaxillaries extending back of the nasals are relatively broader in *nevadensis*.

The hamular processes of the pterygoid bones are straighter in the Nevada wood rat, and although the skulls of *desertorum* are larger, the hamulars in the latter are closer together.

Every skull of *nevadensis* at hand has the bay in the dorsal contour of the foramen magnum emphasized. In *desertorum* it is less prominent, and in one specimen (no. 6967) no trace of it is observable.

The presphenoid bar separating the spheno-palatine vacuities is wider in all our specimens of *nevadensis* than in *desertorum* except in one skull (no. 8280) in which it is so narrow as to approach *desertorum*.

The mandible is less massive. The coronoid process is sharper and the outline of the cut-out portion, or bay, on the posterior surface is a more even curve than that of *desertorum*, in which the curve is interrupted ventrally by a sudden straightening. It has already been remarked that the anterior roots of the zygomatic arch are more narrow than in *desertorum*. The same should be said of the posterior root. These differences are among the best of the cranial diagnostic characters.

Several interesting facts come to light upon examination of the table of cranial measurements. It is evident that the skulls of the Nevada animal average smaller in almost every particular. The fact that *nevadensis*, that is, the smaller-skulled animal, presents the longer tooth-row is a seeming exception to this relation of averages. The interparietal is of different shape in the two species, being wider in *nevadensis*. The height of the cranium at the auditory bullae is greater in *nevadensis*, indicating that the bullae are more swollen in that form.

COMPARATIVE MEASUREMENTS OF
Neotoma nevadensis and *Neotoma desertorum*.

Neotoma nevadensis, all from North Humboldt County, Nevada.

Mus. No.	Sex	Locality	Length	Tail Vertebrae	Hind Foot	Ratios to Length	
						Tail Vertebrae	Hind Foot
7888	♂	Alder Creek, Pine Forest Mts.	276	119	33	43.1	11.96
8280	♂	Virgin Valley	.....	.....	30	.....	.....
8281	♂	Virgin Valley	.....	118	30	.....	.....
8283	♂	Virgin Valley	216	112	29	51.8	13.42
8284	♂	Virgin Valley	267	116	29	43.5	10.86
8286	♂	Virgin Valley	250	95	30	38.0	12.00
8287	♂	Virgin Valley	267	110	30	41.2	11.23
8288	♂	Virgin Valley	235	90	30	38.3	12.76
7887	♀	Big Cr. Ranch, Pine F'st Mts.	281	120	32	42.7	11.38
8282	♀	Virgin Valley	260	115	30	44.2	11.54
8285	♀	Virgin Valley	267	122	31	45.6	11.61
Average of 8 males			251.83	108.5	30.12	42.65	12.03
Average of 3 females			269.33	119.0	31.00	44.16	11.51
Average of all adults			257.66	111.7	30.30	43.15	11.86

Neotoma desertorum, all from the Mohave Desert, California.

Mus. No.	Sex	Locality	Length	Tail Vertebrae	Hind Foot	Ratios to Length	
						Tail Vertebrae	Hind Foot
5370	♂	Fairmont, Antelope Valley	292	123	27	42.0	9.24
5374	♂	Victorville, S. B. Co.	302	140	32	46.2	10.59
5373	♂	Fairmont, Antelope Valley	281	126	31	44.4	11.00
5372	♂	Fairmont, Antelope Valley	306	130	32	42.2	10.45
5371	♂	Fairmont, Antelope Valley	329	152	32	46.2	9.72
6089	♂	Victorville, S. B. Co.	278	126	31	45.3	11.15
6091	♂	Victorville, S. B. Co.	295	136	32	46.1	10.85
6075	♂	Victorville, S. B. Co.	281	124	31	44.1	11.04
6077	♂	Victorville, S. B. Co.	313	135	32	43.1	10.21
6087	♂	Victorville, S. B. Co.	284	127	29	44.7	10.21
6078	♂	Victorville, S. B. Co.	300	142	30	47.3	10.00
6007	♂	Victorville, S. B. Co.	304	137	33	45.1	10.85
5995	♂	Victorville, S. B. Co.	283	129	30.5	45.6	10.77
6006	♂	Victorville, S. B. Co.	300	135	31	45.0	10.34
6088	♂	Victorville, S. B. Co.	290	131	32	45.2	11.02
6225	♂	Cushenbury Springs	260	116	30	44.6	11.54
5384	♀	Fairmont, Antelope Valley	296	134	32	45.2	10.82
6086	♀	Victorville, S. B. Co.	283	135	30	47.7	10.60
6084	♀	Victorville, S. B. Co.	302	145	31.5	48.0	10.33
6080	♀	Victorville, S. B. Co.	301	137	30	45.5	9.97
Average 16 males			293.62	131.8	30.90	44.81	10.56
Average 4 females			295.50	137.7	30.87	46.60	10.43
Average of all adults			294.00	133.0	30.95	45.17	10.53

Taylor.—Two New Rodents from Nevada.

1910]

CRANIAL MEASUREMENTS.
Neotoma merriamensis.

Museum Number	Sex	Length	Basilar Length	Zygo- matic Width	Inter- orbital Constrict- ion	Interparietal	Nasals	Diastema	Post- palatal Tooth Row	Masi- lary Granium	Height of Pre- Granium Basion	Height of Greatest Post- Granium Basion	Zygo- matic Width	Squa- rate Width	Height of Greatest Basion	Ratios to Greatest Length	
																Zygo- matic Width	Height of Greatest Basion
8282 (Type)	♀	35.5	20.3	19.2	5.1	4.5 × 11.2	13.7	9.6	13.6	8.3	13.0	18.2	11.0	16.2	54.1	45.6	36.6
8285	♀	35.9	20.6	19.9	4.7	4.7 × 11.7	14.2	9.9	14.2	8.4	13.1	18.1	10.5	16.1	55.4	44.9	36.5
8283	♂	36.7	21.4	19.8	4.9	4.2 × 11.2	14.0	9.8	14.6	8.2	13.2	18.9	11.0	16.6	54.0	45.2	36.0
8281	♂	4.6	.....	16.6	11.2	.....	8.0	.....	20.2	.....	.....	.....	.....	.....
8280	♂	38.8	23.8	20.5	5.2	5.1 × 11.7	15.1	11.0	15.7	7.9	13.8	19.9	11.7	16.9	53.8	43.5	37.6
8287	♂	37.8	22.6	20.2	4.9	5.5 × 11.4	13.9	10.2	15.2	8.4	13.6	19.1	11.1	16.9	53.7	44.7	36.0
Average ♀♀		35.70	20.45	19.55	4.90	4.60 × 11.45	13.95	9.75	13.90	8.35	13.05	18.15	10.75	16.15	54.75	45.25	36.55
Average ♂♂		37.76	22.60	20.42	4.90	4.93 × 11.43	14.30	10.60	15.16	8.12	13.53	19.52	11.26	16.80	53.50	44.46	35.86
Average adults		36.94	21.74	20.13	4.90	4.80 × 11.44	14.58	10.31	14.66	8.20	13.34	19.06	11.06	16.54	54.00	44.78	36.14

<i>Neotoma desertorum.</i>																	
5384	♀	38.5	23.0	20.7	4.5	4.5 × 10.4	15.3	11.2	15.4	7.5	13.1	19.6	11.1	17.8	53.8	46.2	34.0
5383	♀	39.3	22.9	20.3	4.9	4.6 × 9.6	15.3	11.6	15.3	7.1	13.1	19.8	11.5	17.1	51.6	43.5	33.3
6968	♂	40.4	25.7	22.0	5.0	5.4 × 12.6	16.1	11.8	17.0	7.9	13.2	20.5	11.9	.....	54.4	.....	32.7
5370	♂	38.7	23.6	20.9	5.0	5.5 × 12.2	14.6	11.6	15.4	7.7	13.5	20.2	11.5	17.4	54.1	44.9	34.9
6967	♂	40.2	25.0	21.4	5.2	6.2 × 8.6	15.0	11.4	16.3	8.2	.....	20.7	11.9	.....	53.2	.....	.....
5374	♂	38.7	23.5	21.4	4.9	4.4 × 11.4	15.8	11.1	15.8	8.2	13.2	19.8	11.1	17.6	53.3	45.5	34.1
Average ♀♀		38.90	22.95	20.50	4.70	4.52 × 10.00	15.30	11.45	15.35	7.30	13.10	19.70	11.30	17.45	52.70	44.85	33.65
Average ♂♂		39.50	24.45	21.42	5.02	5.37 × 11.20	15.37	11.47	16.12	8.00	13.30	20.30	11.60	17.50	53.25	45.20	33.90
Average adults		39.43	23.95	21.11	4.91	5.10 × 10.80	15.35	11.46	15.86	7.76	13.22	20.10	11.50	17.47	53.73	45.02	33.80

The ratio of the zygomatic width to the greatest length is seen to be practically the same in the two forms, that of the squamosal width to the greatest length being slightly larger in *desertorum*. A constant difference between the two is shown by the ratio of the height of the cranium at the auditory bullae to the greatest length. In *nevadensis* this ratio is two to three per cent. greater than in *desertorum*.

The table shows individual and sexual variation. Skulls of the females average smaller than those of the males except as regards two measurements. In *nevadensis* the interorbital constriction averages the same in males and females, being, in *desertorum*, less in the females than in the males. The maxillary tooth-row is in *nevadensis* longer in females than in males; but the reverse is true of *desertorum*. That sexual variation in the two species is not exactly parallel is shown also by the fact that whereas in *nevadensis* the ratios of the zygomatic width, squamosal width and height of cranium at bullae to the greatest length are respectively greater in the females than in the males, in *desertorum* the opposite is the case.

DISTRIBUTION.—The Nevada wood rat was collected at the following localities: Virgin Valley, 9 specimens; Quinn River Crossing, 1 specimen; Mouth of Big Creek, Pine Forest Mountains, 3 specimens; and Mouth of Alder Creek, Pine Forest Mountains, 2 specimens. Thus the range of the animal as observed by our party is the Upper Sonoran of the high arid plateau and lower slopes of the foothills of the Pine Forest Mountains, northern Humboldt County, Nevada.

PLATE 27.

Dorsal view of skulls of *Neotoma desertorum* from the Mohave Desert (series at left) and *Neotoma nevadensis* (series at right). Enlarged to $1\frac{1}{4}$ natural size. Note in *nevadensis* the smaller size, the broader and shorter premaxillaries, the less widely spreading zygomatic arches, and the narrower dorsal anterior roots of the same.

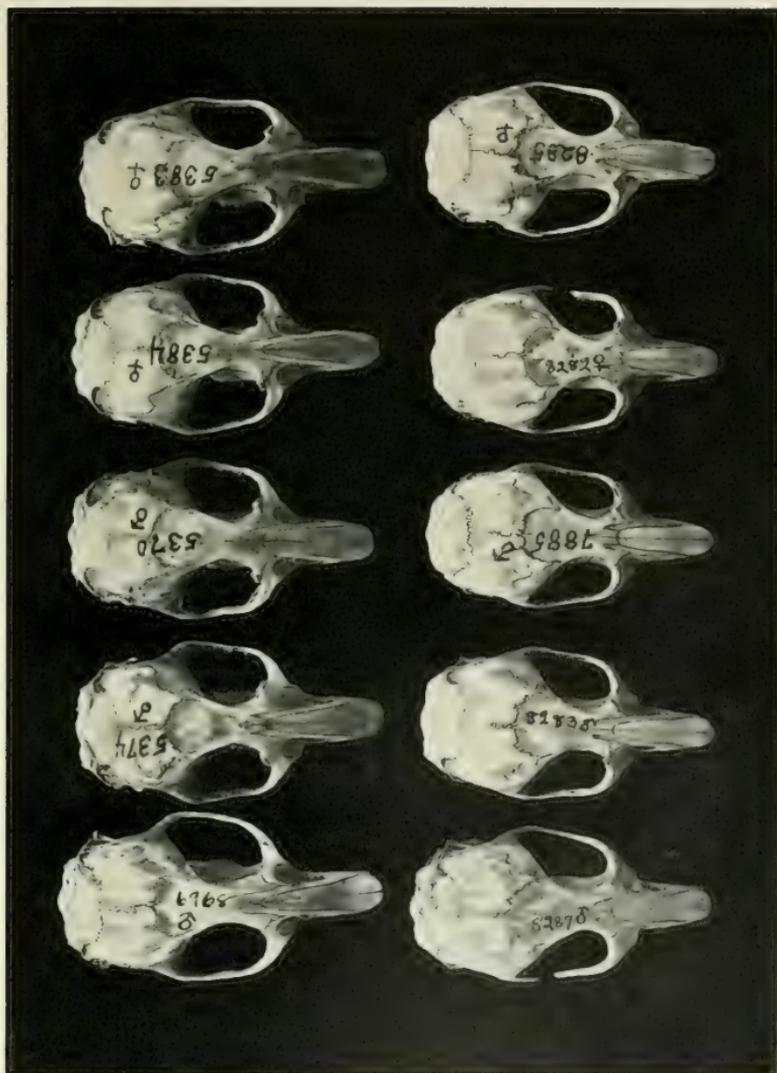


PLATE 28.

Ventral view of skulls of *Neotoma desertorum* from the Mohave Desert (series at left) and *Neotoma nevadensis* (series at right). Enlarged to $\frac{3}{7}$ natural size. Note in *nevadensis* the relatively longer and narrower rostrum, the shorter incisive foramina, the broader presphenoid bar, and the narrower posterior root of the zygomatic arch.

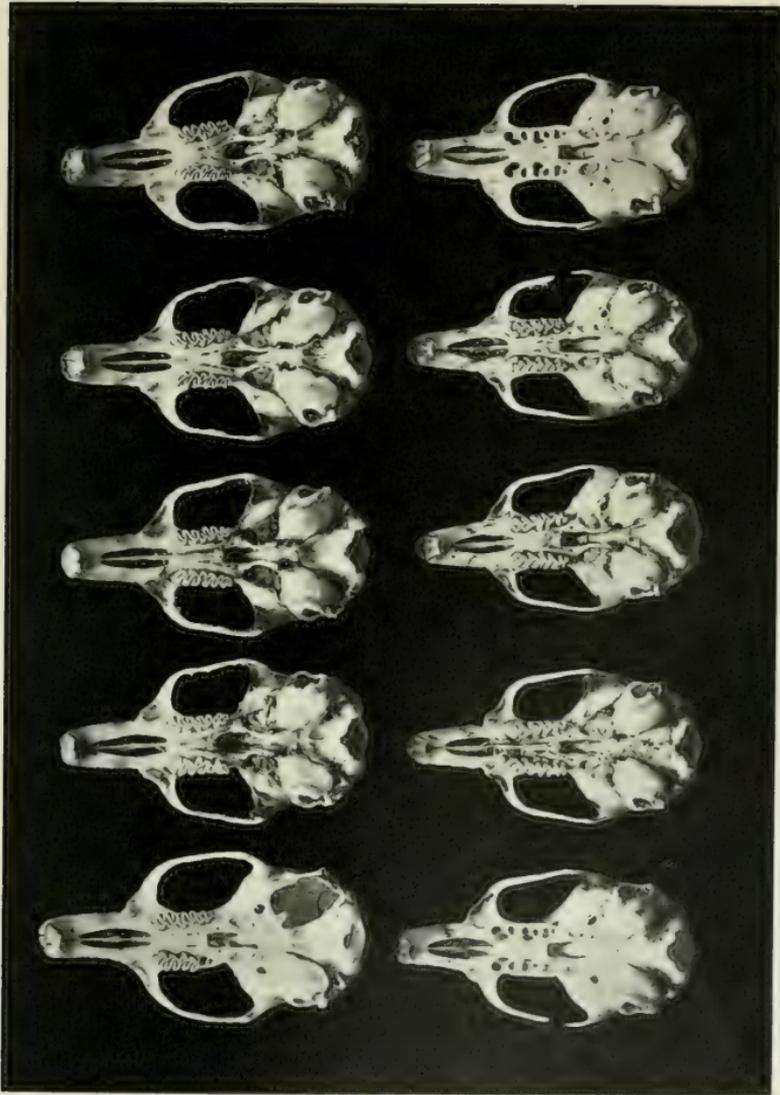
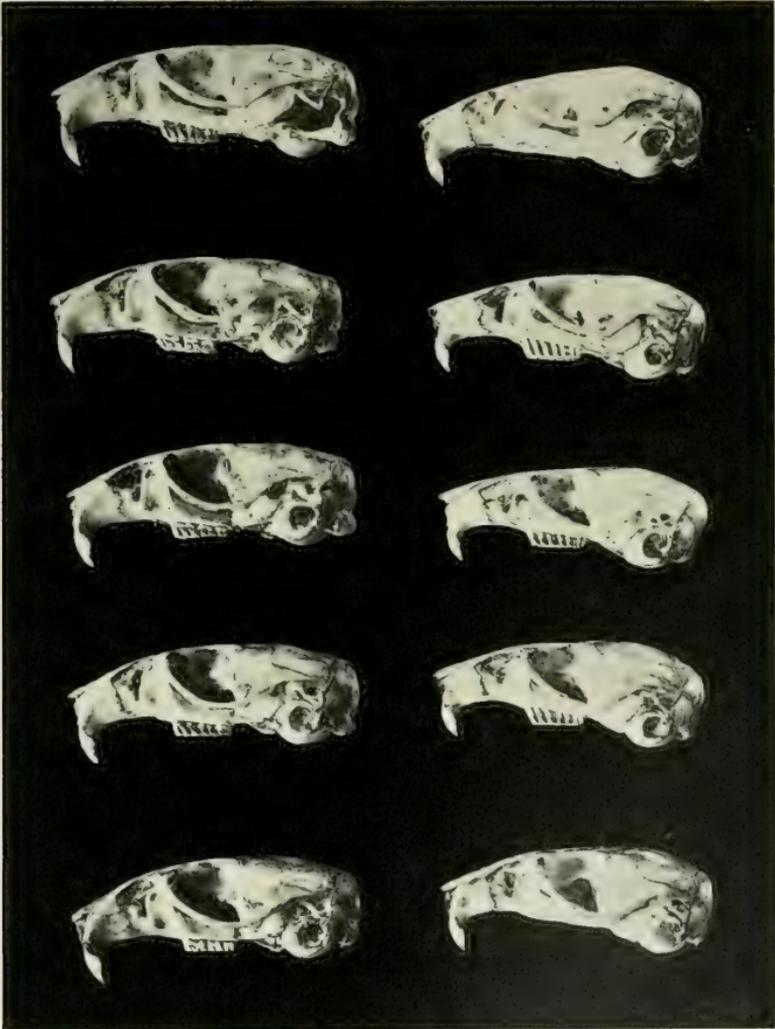


PLATE 29.

Lateral view of skulls of *Neotoma desertorum* from the Mohave Desert (series at left) and *Neotoma nevadensis* (series at right). Enlarged to 1½ natural size. Note in *nevadensis* the smaller, differently shaped skull, the narrower anterior roots of the zygomatic arches, and the shorter, more curved incisors.



UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 5, No. 7, pp. 303-305

February 12, 1910

A NORTHERN COAST FORM OF THE
CALIFORNIA GRAY FOX.

BY

JOSEPH DIXON.

(Contribution from the Museum of Vertebrate Zoology of the University of California.)

A recent examination of the forty skins and skulls of the gray fox from California, in the collection of the Museum of Vertebrate Zoology of the University of California, has convinced me that the animal inhabiting the humid coast belt of California is sufficiently different from either *Urocyon californicus californicus* Mearns or *Urocyon californicus townsendi* Merriam to be readily distinguished from either of these two forms. I therefore propose it as new, to be known as:

***Urocyon californicus sequoiensis*, new subspecies.**

TYPE.—Female adult; no. 8978, Univ. Calif. Mus. Vert. Zool.; Lagunitas, Marin County, California; collected by Joseph Dixon; January 1, 1910; original number 455.

GEOGRAPHIC DISTRIBUTION.—Humid coast belt of California. The northernmost specimens which I have examined are from Lakeport, Lake County, California; the southern range of this form appears to be Monterey Bay, south of which it intergrades with *californicus*.

CHARACTERS.—The fulvous areas more intense in color than in *townsendi* and much more intense and extensive than in *californicus*; measurements of skull and entire body less than in *townsendi*, greater than in *californicus*.

COMPARATIVE MEASUREMENTS.

Urocyon c. californicus.

Museum Number Sex	Locality	BODY					SKULL				
		Length	Tail	Hind Foot	Basilar ¹ Length	Zygomatic Breadth	Greatest Width of Brain Case	Nasals ²	Upper ³ Diameter ⁴ of Tooth Row	Bulbous	
2925 ♀	San Jacinto Mts., Riverside Co. (topotype)	1002	435	140	112.5	62.8	44.5	37.5	60.8	15.2	
2926 ♀	San Jacinto Mts., Riverside Co. (topotype)	970	380	120	112.5	65.7	45.6	35.0	57.8	14.6	
8827 ♀	Escondido, San Diego Co.	908	394	125	95.4	63.0	43.7	36.0	57.9	14.4	
8828 ♀	Escondido, San Diego Co.	870	368	121	96.5	61.0	45.7	34.0	57.7	15.5	
	Average of 4 females	937	394	125	104.2	63.1	44.8	35.6	58.5	14.9	

Urocyon c. sequoiensis.

8978 ♀	Lagunitas, Marin Co. (type)	890	320	127	106.0	65.1	45.6	35.0	57.8	14.6
3619 ♀	Portola, San Mateo Co.	945	378	130	110.5	66.7	43.8	36.7	60.0	15.7
3617 ♀	Palo Alto, Santa Clara Co.	994	380	135	114.7	69.5	45.3	37.2	62.7	16.4
	Average of 3 females	943	359	130	110.4	67.1	44.9	36.3	60.1	15.5

Urocyon c. californicus.

3681 ♂	Pasadena, Los Angeles Co.	921	394	131	109.3	66.9	45.2	38.2	61.4	15.0
3250 ♂	Witch Creek, San Diego Co.	900	380	126	107.0	63.2	45.0	35.7	58.0	14.0
4540 ♂	Bluff Lake, San Bernardino Co.	968	393	130	110.3	64.8	45.0	34.5	60.3	15.5
	Average of 3 males	929	389	129	108.8	64.9	45.0	36.1	59.9	14.8

Urocyon c. sequoiensis.

4097 ♂	Portola, San Mateo Co.	1005	407	140	113.5	68.4	46.0	38.6	60.8	16.0
3618 ♂	Portola, San Mateo Co.	992	378	138	112.3	71.1	47.0	38.3	60.8	16.0
8894 ♂	Pescadero, San Mateo Co.	965	400	127	114.7	68.8	46.0	38.8	63.6	16.0
	Average of 3 males	987	395	135	113.5	69.4	46.3	38.5	61.7	16.0

Urocyon c. tobiasi.

3289 ♂	Baird, Shasta Co. (topotype)	1080	444	146	120.9	72.0	47.6	44.0	63.4	17.2
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¹ Anterior notch of foramen magnum, to most anterior part of premaxilla.² Base, to anterior end of inner edge.³ Last molar to incisors, inclusive.⁴ Measured at right angles to main axis of skull.

COLOR.—The chief color differences between the new form and *californicus* is that in the former the rufous at the base of ears, down sides of neck, on belly, and on ventral surfaces of feet is more intense and extensive than in *californicus*. The hairs between the pads of the feet and on the dorsal surface of the feet are likewise darker than in *californicus*. In the many specimens of the latter examined the black stripe down the fore leg is the exception; in *sequoiensis* it is the rule. A summer topotype of *townsendi* has the rufous tints paler than summer specimens of *sequoiensis* from the Santa Cruz Mountains. Some of the shades of the type of *sequoiensis* could not be exactly matched in Ridgway's Nomenclature of Colors, 1885, which is as closely as practicable the basis used in the following color description.

Posterior base of ears, dark cinnamon rufous; anterior margin of tip of ear, orange buff; sides of neck, cinnamon rufous; lower part of neck crossed by a broad band of the same shade; a black stripe is present on the front of the fore leg; ventral surface of feet dark cinnamon rufous; dorsal surface of feet infused with a strong salmon tint; white on chin and belly much restricted by encroachment of cinnamon rufous; ventral surface of tail, orange buff.

REMARKS.—*Urocyon c. californicus* Mearns (*Proc. U. S. Nat. Mus.*, XX, 1897, p. 459) was described from the San Jacinto Mountains in southern California; we find an average increase in the intensity and extent of the fulvous areas in animals occurring northward from there along the coast. There is also a gradual increase in size which reaches its climax in *Urocyon c. townsendi* Merriam (*N. Am. Fauna*, no. 16, 1899, p. 103), from Baird, Shasta County. But the latter, being an inland form, is paler than the animal of the redwood belt, which is of intermediate size. The tendency of the color of birds and animals to be intensified in this faunal area is well known. The facts that the most deeply colored gray foxes are from the coast belt north of San Francisco Bay, and that the new form therefore seems to be there differentiated in extremest degree, find many parallels in other genera of vertebrate animals; for instance, *Eutamias*, *Peromyscus*, *Chamaca*, *Penthestes*, and *Thryomanes*.

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Vol. 5, Nos. 8, 9, and 10, pp. 307-320, Pl. 30

February 21, 1910

TWO HERETOFORE UNNAMED WRENS
OF THE GENUS THRYOMANES

BY
JOSEPH GRINNELL

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GREAT BASIN

BY
JOSEPH GRINNELL

A SECOND RECORD OF THE SPOTTED
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TWO HERETOFORE UNNAMED WRENS
OF THE GENUS *THRYOMANES*.

BY

JOSEPH GRINNELL.

(Contribution from the Museum of Vertebrate Zoology of the University of California.)

Thryomanes bewicki marinensis, new subspecies.

Nicasio Wren.

TYPE.—Male adult; no. 7243, Univ. Calif. Mus. Vert. Zool.; Nicasio, Marin County, California; February 21, 1909; Annie M. Alexander.

DIAGNOSTIC CHARACTERS.—Similar to *T. b. spilurus* (Vigors), of the Santa Cruz faunal area south and east of San Francisco Bay, in size, but dorsal coloration brighter brown, of a vandyke tone, and flanks and light intervals on crissum strongly washed with vandyke brown. Similar to *T. b. calophonus* Oberholser, of western Washington and Oregon, but dorsal coloration brighter brown, of a less sooty tone, and size decidedly less.

MEASUREMENTS OF TYPE.—Wing 51.4; tail, 50.8; culmen, 14.1; bill from nostril, 11.2; depth of bill at base, 2.9; tarsus, 18.5; anteroposterior diameter of tarsus one-third its length below tibio-tarsal joint, 1.6; hind toe with claw, 13.4; middle toe with claw, 15.2.

RANGE.—The humid coast belt north of the Golden Gate and San Francisco Bay, in Marin and Sonoma counties. (I have never seen any specimens of *Thryomanes* from the more northern

coastal region of California. If the species is represented at all in the Humboldt Bay district, it would seem likely to resemble *calophonus* most nearly.)

***Thryomanes bewicki catalinae*, new subspecies.**

Catalina Island Wren.

TYPE.—Male adult; no. 3277, coll. J. Grinnell; Avalon, Santa Catalina Island, California; December 24, 1897; J. Grinnell.

DIAGNOSTIC CHARACTERS.—Closely similar in color and general size to *T. b. charienturus* Oberholser, of the adjacent mainland, but averaging darker dorsally (more sepia and not so umber brown), and with heavier bill and conspicuously and constantly larger feet (longer toes and heavier tarsus); differs from *T. b. leucophrys* (Anthony), of San Clemente Island, in decidedly darker, less ashy coloration, and in much more heavily barred under tail-coverts; differs from *T. b. nesophilus* Oberholser, of Santa Cruz Island, in duller, less rufescent, coloration, grayer flanks, longer bill and generally larger size.

MEASUREMENTS OF TYPE.—Wing, 54.0; tail, 53.7; culmen, 15.7; bill from nostril, 11.7; depth of bill at base, 3.3; tarsus, 21.3; anteroposterior diameter of tarsus one-third its length below tibio-tarsal joint, 1.8; hind toe with claw, 14.0; middle toe with claw, 16.2.

RANGE.—Santa Catalina Island, southern California; common, permanently resident.

GENERAL REMARKS.—The wrens of this group have been dealt with in more or less detail by Oberholser (*Proc. U. S. National Museum*, XXI, November, 1898, pp. 421-450) and by Ridgway (*Birds N. and Mid. Am.*, III, 1904, pp. 548-569). Both of these authors refer to peculiarities in birds from Santa Catalina Island and Marin County. But evidently the material at their command was not sufficient for the establishment of the distinctiveness of the forms to their satisfaction.

With the naming of the above two new forms I am able clearly to distinguish the following eight geographic races within the limits of the state of California, occupying as many separate areas of differentiation.

Thryomanes bewicki eremophilus Oberholser. Range: The desert ranges southeast of the southern Sierra Nevada, occurring on the more southern deserts in winter.

Thryomanes bewicki charienturus Oberholser. Range: The San Diegan district, northwest at least to the vicinity of Mt. Pinos and Santa Barbara.

Thryomanes bewicki catalinae Grinnell. Range: Santa Catalina Island.

Thryomanes bewicki leucophrys (Anthony). Range: San Clemente Island.

Thryomanes bewicki nesophilus Oberholser. Range: Santa Cruz and Santa Rosa islands.

Thryomanes bewicki drymoecus Oberholser. Range: The great San Joaquin-Sacramento basin, north to Yreka and west through the Coast Ranges to the coast in the region of San Luis Obispo County; southward on to the Mohave Desert in winter. The wrens of the mountains about the southern end of the San Joaquin Valley are of as yet uncertain status; at any rate, they are not typical of any of the described races.

Thryomanes bewicki spilurus (Vigors). Range: The Santa Cruz Faunal area, that is, from San Francisco Bay south into Monterey County, and east around the south arm of the Bay at least to Berkeley.

Thryomanes bewicki marinensis Grinnell. Range: The humid region immediately north of San Francisco Bay, in Marin and Sonoma counties.

THE SAVANNAH SPARROW OF THE
GREAT BASIN.

BY

JOSEPH GRINNELL.

(Contribution from the Museum of Vertebrate Zoology of the University of California.)

The Savannah sparrows of western North America have caused considerable trouble to systematic ornithologists because of the large amount of variation exhibited and because of the consequent difficulties experienced in attempting to segregate subspecies. This has been due in a measure to the fact that the great majority of specimens in museums are winter birds. A winter series from California often consists of birds from at least two distant and widely separated breeding areas, mingled together so that the existing subspecific distinctions are obscured through the overlapping of characters in a small proportion of examples as a result of individual variation.

Series of summer specimens from breeding areas are now becoming available for study, and these show that there are really two or more distinct forms where but one was recognized before. This condition of affairs was clearly anticipated by Brewster, who says (Birds of the Cape Region of Lower California, Bull. Mus. Comp. Zool., XLI, 1902, p. 137): "*A. s. alaudinus*, like some of the other forms of the group to which it belongs, might not inaptly be termed a composite subspecies. In

¹This is the third paper based primarily on the results of the 1909 Alexander Expedition to Nevada. (See Univ. Calif. Publ. Zool., V, pp. 275-281 and 283-302.)

other words, it includes several well-marked but unnamed races which differ quite as much from one another and from the typical bird as does the latter from its nearest named and recognized allies.”

The winter Savannah sparrows of southern California evidently consist of representatives from at least two areas of speciation. By far the most prevalent of these, occurring on the Pacific slope from San Diego northward, belong to the form summering throughout the vast interior of northwestern North America, from Bering Sea and Kotzebue Sound to the Mackenzie region. To this form I would restrict the name *alaudinus* of Bonaparte. Another form wintering in southern California, mostly on the desert side of the mountains, is the one that breeds in the arid Great Basin region of the United States. This form I believe should be distinguished by name. Since none of the several synonyms in the genus appear to me, after a careful inspection of the literature, to be available, it may be called:

***Passerculus sandwichensis nevadensis*, new subspecies.**

Nevada Savannah Sparrow.

TYPE.—Male juvenal; no. 9280, Univ. Calif. Mus. Vert. Zool.; Soldier Meadows, Humboldt County, Nevada; July 21, 1909; Louise Kellogg; orig. no. 293.

My reason for selecting a juvenal for the type of a new bird lies in the fact that the subspecific characters are just as pronounced among the juvenals of the forms compared as among the adults. This seems to point towards an innateness of differential characters not in accord with the idea that *nevadensis* and other pale races of birds inhabiting arid regions are “bleached out.” According to this notion the “bleaching” process becomes more and more apparent in the life of the individual with successive molts. The juvenal plumage is practically the first plumage (the real first, or natal plumage, being extremely scant and evanescent).

The fact that the differential characters manifested in this fresh juvenal plumage are no less marked than in the plumages acquired later in the life of the individual would appear to

refute the notion entertained by certain ornithologists that *subsequent* molts lead normally into conditions of coloration more *emphatically* specific. Further, the fact that old birds are no more extreme in their differential characters than juvenals may be interpreted as showing that there is no "direct action" of the environment upon the individual, at least as affecting its coloration, during the portion of its life-time beyond the period of juvenal feather growth. Since the results of experimental biology indicate that the earliest, prenatal, stages are impressionable to a great degree by external influences (as of light, temperature, and pressure), the whole problem of the germinal versus the somatic nature of such characters as those here considered demands further investigation.

CHARACTERS.—Resembles *Passerculus sandwichensis alaudinus* Bonaparte, but much paler throughout in all plumages: white replacing buff, black streaks thus more conspicuously contrasted, there being a minimum amount of hazel marginings; size slightly less. From *P. s. savanna* (Wilson), the new form differs in coloration in the same ways as above but in greater degree; the bill is proportionally much smaller, though the wing length is nearly the same. From the other described forms of the Savannah sparrow, *nevadensis* is still more divergent.

DESCRIPTIONS.—*Juvenal plumage*. (based on type of *P. s. nevadensis*): throat, post-pectoral region and crissum pure white; flanks narrowly black-streaked on a white ground; pectoral region sharply black-streaked on a very pale cream-buff ground; sides of head and neck flecked with black on a pale cream-buff ground; superciliary and median crown stripes whitish, the former minutely flecked with blackish; lateral crown stripes, to hind neck, broadly black streaked on a ground of pale clay color; feathers of dorsum with broad coal-black central areas margined with whitish; tipplings of wing coverts and edgings of inner wing quills broadly whitish; edgings of wings otherwise, scapulars and tail, clay color.

A specimen of *P. s. alaudinus* (no. 3622, Grinnell coll.; Cape Blossom, Kotzebue Sound, Alaska; July 26, 1898) in parallel plumage is conspicuously browner than the above: whole lower surface pervaded with buffy, and pectoral region, sides of head

and whole dorsal region strongly suffused with raw sienna; the broad edgings of scapulars, wings and tail strongly hazel; there is no pure white anywhere.

First winter plumage (based on male; no. 10453, Univ. Calif. Mus. Vert. Zool.; Little Truckee River, Sierra County, California, near Nevada line; August 15, 1909; Louise Kellogg): lower surface clear white, except for faint tinge of cream-buff on flanks and pectoral region, these being in addition sharply streaked with blackish; general effect of dorsal surface including wings and tail black-streaked, with edgings of clay color and whitish; superciliary and malar stripes pale clay color; outer web of outermost rectrix chiefly white, and its tip and inner margin the same. Wing, 65.3 mm.; tail, 49.5; tarsus, 20.7; hind toe with claw, 15.0; culmen, 10.4; gonys, 6.7; depth of bill at base, 5.6.

A selected specimen of *P. s. alaudinus* (male no. 1504, Univ. Calif. Mus. Vert. Zool.; head of Port Nell Juan, Prince William Sound region, Alaska; August 19, 1908; Annie M. Alexander) in parallel plumage is decidedly brown-and-black in its general tone as compared with the white-and-black of *nevadensis*. This is due to the buffy suffusion of the ground color everywhere beneath except on the belly, to the absence of whitish markings above, these being replaced by clay color, and to the relatively great amount of deep hazel. The latter color is disposed on each feather (in the dorsum, lateral crown stripes, upper tail coverts, wing coverts and inner wing quills) as lengthwise bands along each side of the black shaft area, separating the latter from the outermost edgings of clay color. This hazel also characterizes the streakings beneath, so that the amount of actual black is much reduced, or to express it in another way, replaced by hazel. The contrast and sharp definition to the markings found in *nevadensis* are thus lacking in *alaudinus*. Wing, 72.5; tail, 50.9; tarsus, 21.0; culmen, 9.9; gonys, 6.9; depth of bill at base, 5.1.

Adult breeding plumage (based on male; no. 8784, Univ. Calif. Mus. Vert. Zool.; Quinn River Crossing, Humboldt County, Nevada; May 29, 1909; W. P. Taylor): whole lower surface pure white, with narrow blackish streaking on sides of

throat, pectoral region, and flanks; sides and top of head with whitish ground, upon which the black streaking is sharply defined; anterior part of superciliary stripe pale canary yellow; whole back, wings and tail with feathers centrally fuscous or dull blackish and with conspicuous edgings of either whitish or pale clay color or both; outer web and tip of outermost rectrix white, and next three inner rectrices outwardly margined and tipped with white but successively more narrowly. This feature is possessed by 19 out of the 21 breeding examples of *nevadensis*, at hand. Wing, 71.5; tail, 48.8; tarsus, 19.7; hind toe and claw, 14.3; culmen, 10.0; gonys, 6.7; depth of bill at base, 5.7.

A selected specimen of *P. s. alaudinus* (male; no. 4599, Univ. Calif. Mus. Vert. Zool.; Forty-mile, Yukon Territory, Canada; May 7, 1898; C. L. Hall) in parallel plumage is very much browner, owing to the presence of extensive pale hazel, margining the black shaft streaks both above and below; the flanks, pectoral region and sides of head have the ground color white distinctly tinged with pale buff; and the whole upper surface has the outer feather edgings of clay color instead of whitish; the superciliary stripe is strongly yellowish; the outermost tail feathers are not conspicuously edged with white. Wing, 72.5; tail, 52.8; tarsus, 20.6; hind toe with claw, 16.0; culmen, 10.7; gonys, 7.1; depth of bill at base, 5.5.

To summarize from the above descriptions: *Passerculus sandwichensis nevadensis* differs from its presumably nearest relatives in its extremely pale coloration. This paleness is not due to a less amount of black-streaking, but to a replacement of buff and clay color by white or whitish and to a restriction, and dilution to clay color, of the hazel areas on each feather. The appearance of white edges on the rectrices is a remarkable feature, showing an incipency of the condition among certain terrestrial birds where the outer rectrix on either side is chiefly white, as in *Pooecetes*.

RANGE.—I have handled breeding specimens of *P. s. nevadensis* only from Humboldt and Washoe counties, Nevada. But I believe that it is the same form which breeds in suitable localities throughout the Great Basin. Winter or spring specimens unequivocally of this form are at hand only from Mecca on the

Colorado Desert (March and April), and Los Angeles County. In large suites of winter Savannah sparrows from throughout California, west of the Sierras and south to San Diego, the large majority are clearly referable to *alaudinus* as here restricted. There yet remain, however, a certain proportion of specimens not satisfactorily understood; and these may be representatives from breeding areas of intermediate situation to the northward from the Great Basin and therefore producing individuals of intermediate characters. But this is purely speculative. It is of importance to remark that out of nearly seventy-five Savannah sparrows examined from Alaska and Yukon Territory, not one shows the aggregate characters of *nevadensis*.

SYNONYMY.—My action in giving a new name to the palest of the Savannah sparrows will probably be criticized on the ground that *alaudinus* has been currently used to denote the "pale western Savannah sparrows." But this name has also currently included both the Alaska and the Great Basin birds, which I have just demonstrated to belong to distinct forms. Bonaparte's *Passerculus alaudinus* (Compte Rendu XXXVII, December, 1853, p. 918) was described from "California." I have not seen the type specimen, and do not even know whether or not it is in existence. But other species mentioned in the same paper are stated to have come from either San Diego or Bodega; and since the swarms of Savannah sparrows visiting the coast region of California belong to the Alaskan form, I would restrict the name *alaudinus* to that subspecies. Of the several other synonyms in the genus, I find none that appear to me usable for the newly described form.

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 5, No. 10, pp. 317-320, Pl. 30

February 21, 1910

A SECOND RECORD OF THE SPOTTED
BAT (*EUDERMA MACULATUM*) FOR
CALIFORNIA.

BY
JOSEPH GRINNELL.

(Contribution from the Museum of Vertebrate Zoology of the University of California.)

On the evening of April 24, 1908, I was invited by Mr. G. W. Urie, station-agent at Mecca, Riverside County, California, to come to his house to see his collection of birds, insects, and other curios. Among these I was surprised to see a specimen of *Euderma maculatum*. This Mr. Urie kindly consented to part with, and it is now no. 1196 of the mammal department in the Museum of Vertebrate Zoology. The specimen had been secured the previous fall (1907), on or close to October 1. It was dead when found, lying in a puddle, the overflow from the big railway water tank at Mecca. The bat was skinned out by Mr. Urie, stuffed with cotton, and dried with wings outstretched, in which condition it still is. Only the anterior part of the skull was preserved and this was left in the skin of the head. It has not been removed. It is the dorsal surface of the bat just as originally prepared that is shown in the accompanying photographic plate (pl. 30).

The coloration and all other characters, as far as shown by this specimen, are precisely as described of the type by Dr. J. A. Allen. (See Bull. Am. Mus. Nat. Hist., III, February, 1891, pp. 195-198.)

The type and for thirteen years the only known specimen of *Euderma maculatum*, now in the American Museum of Natural History, was taken near Piru, Ventura County,¹ California, where it was "caught on a fence," in March, 1890.

A second instance came to the notice of mammalogists through the record by G. S. Miller, Jr. (Proc. Biol. Soc. Wash., XVI, November, 1903, pp. 165-166) of a specimen "found dead in the Biological Laboratory of the New Mexico College of Agriculture and Mechanic Arts, at Mesilla Park, New Mexico, in September, 1903." This specimen, the skull of which is figured by Mr. Miller ("Families and Genera of Bats," 1907, p. 226), is now in the United States National Museum (no. 122,545).

According to F. Stephens (Calif. Mammals, 1906, p. 264), a third specimen has been recently captured at Yuma, Arizona.

The specimen now recorded thus affords the fourth record station for the species. Two of these are in California, one in Arizona, and one in New Mexico.

The coloration of this animal, suggesting the "death's-head" pattern displayed upon the thorax in certain moths, is, as far as I am able to learn, unique among bats. Some adaptive function is suggested by the recurrence of this pattern among distantly related groups of animals. Conspicuously contrasted black and white markings appear to be prevalent among crepuscular birds, as nighthawks and poor-wills, and have been thought to be directive in meaning. As indicated by the above data, the habits of *Euderma maculatum* remain wholly unknown.

¹ Dr. C. Hart Merriam (N. Am. Fauna, no. 13, 1897, p. 49) gives his belief that the type was taken at the mouth of Castae Creek, in the Santa Clara Valley, Los Angeles County; this is eight miles from Piru, in the same valley.

PLATE 30.

Dorsal surface of the spotted bat (*Euderma maculatum*), showing the peculiar color pattern and shape of ears and wings. Two-thirds natural size.



PLATE I

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WITH DESCRIPTIONS OF THE LOCALITIES
VISITED AND NOTES ON THE FLORA OF
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BY
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WITH A NOTE ON THE AVIFAUNAL RELATION-
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BY
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MAMMALS OF THE 1908 ALEXANDER
ALASKA EXPEDITION,
WITH DESCRIPTIONS OF THE LOCALITIES VISITED
AND NOTES ON THE FLORA OF THE PRINCE
WILLIAM SOUND REGION

BY
EDMUND HELLER.

(Contribution from the Museum of Vertebrate Zoology of the University of California.)

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INTRODUCTION.

During the summer of 1908 Miss Annie M. Alexander explored the Prince William Sound region, Alaska, accompanied by Miss Louise Kellogg, Joseph Dixon, Allen Hasselborg, and the writer.

The Sound with its many islands offered an attractive field which had scarcely been explored. The Harriman Expedition of 1899 visited the region, but stopped only at a few points on the mainland for short intervals; unfortunately the results of this work still remain largely unpublished. Miss Alexander's

party devoted their efforts to the collecting of the bird and mammal fauna of the region, particular attention being given to the larger islands in the Sound. Camps were established successively on fourteen of the islands from which collecting operations were carried on. Besides these island localities five widely separated points on the mainland were used as collecting stations.

The birds secured totaled 500 specimens, in which 84 species were represented. The species of mammals were much less numerous, only 18 being included in the collection of 665 specimens. As in the cases of her other Alaskan expeditions,¹ all of the material gathered has been donated by Miss Alexander to the University of California Museum of Vertebrate Zoology. The birds are reported upon by Joseph Grinnell in a separate paper to follow.

For transportation about the Sound a ten-ton yawl-rigged boat was taken along and launched at Cordova on the arrival there of the party on June 3. This vessel carried, besides the members of the party, the collecting and camping outfit. The method of work consisted in establishing camps at each locality where collecting was to be done, the boat being in use for but short intervals as a means of transportation from place to place.

ITINERARY.

On May 27 we departed from Seattle on one of the Alaskan steamers going via the inside passage. At Yakutat we expected to find Allen Hasselborg, the fifth member of the party, but were disappointed on arriving there the first of June to learn that his dogged determination to collect brown bears had kept him in the mountains. He had secured at this time one adult female brown bear with two young. The cubs were captured alive and were at the time of our arrival under the charge of a missionary at Yakutat village. Arrangements for shipping them to the zoological garden at Golden Gate Park, San Francisco, were made with the officers of the steamer. These young

¹ Field work in Alaska has been prosecuted as follows: In 1906 on the Kenai Peninsula; in 1907 in the Sitkan district; in 1908 in the Prince William Sound region; and in 1909 in the Sitkan district.

bears reached the Park in safety. They are now of very large size, and apparently well content in their restricted quarters.

Upon our arrival at Cordova we at once entered upon the routine of collecting while our yawl was being rigged and loaded. The town of Cordova is situated in a narrow valley between Eyak Lake and the shores of Cordova Inlet, amid the stumps of a spruce and hemlock forest which had until recently occupied the site. This narrow valley is walled in by steep, rugged hills, the summits and upper heights of which were heavily mantled by snowfields. From the floor of the valley the spruce and hemlock forests extend up the mountain sides to an elevation of about 1000 feet. At this season the snow lay well down into the forests and in places along the stream beds even down to the beach. The alders were still leafless but adorned by a profusion of catkins.

On the 7th of June we left Cordova in our boat for the head of the inlet some fifteen miles distant. During our stay we had had each day a few hours of drizzle and a total lack of wind. We therefore cast off from the wharf with the beginning of the ebb tide regardless of the absence of breezes. Four hours' ride with the tide took us down past the timbered slopes of Orca and some little distance up the bay, where we anchored and awaited the turn of the tide. The head of the bay consists of extensive tide-flats through which the Cordova River has cut numerous serpentine channels. Through one of these channels we poled our way with the assistance of the flooding tide. About 10 P.M. we were as far inland as the assistance of the tide would allow.

The next morning at low tide we beheld from the deck a mile or two of bared mud-flat between us and the waters of the bay. Above us the broad, level floor of the valley extended until lost among the snowy ranges which walled it in precipitously. We pitched camp on a small, cleared flat at the base of a towering cliff on the south side of the valley near the cabin of Mr. A. B. Cooper. During our stay Mr. Cooper kindly gave us the assistance of his knowledge of the region and made occasional extensive excursions afield with some of the members of the party.

On June 15 after a week's work about Cordova Bay we departed for Hawkins Island. Late in the afternoon of the 16th we arrived at the north entrance of Canoe Passage and made an anchorage behind the protecting arm of a long gravel spit on the west side of the passage. Finding this place unfavorable for a camp, we sailed across the Passage on the following morning and established a camp on a small sand-spit on the east shore.

Our stay at Hawkins Island was brought to a close on June 24 by our departure for Hinchinbrook Island. We got away at noon on the ebb tide, which shot us out of the narrow passage at the speed of a millrace. A light wind picked us up after we got clear of the reefs guarding the entrance. As we sailed along the shore of the western section of Hawkins Island, a good view of the checker-board effect due to the interchange of the forest and tundra areas of the island was obtained. Late in the afternoon we entered a bay at the northeast point of Hinchinbrook and cast anchor. Here we were welcomed by a swarm of gnats and mosquitoes with an intensity very much beyond that displayed by these insects at previous camps. After a few hours of inspection we located camp on a sand-spit at the mouth of a large creek. As this bay had been left unchristened by the Coast Survey we bestowed on it the name of Northeast Bay, in order to fix a definite locality to the specimens collected here. (See map, plate 32.)

The morning of July 4 found us under way headed for Zaikof Bay, Montague Island, where we made camp on a small sand-spit on the south shore at the head of the bay. Both shores of Zaikof Bay were heavily forested, both of the capes being low, flat extensions covered by trees.

At noon on the 12th we broke camp for Green Island, some twenty miles west. A light breeze took us out to the mouth of the bay and westward as far as Montague Point, where we were left in a calm among the kelp beds. Near the head of the bay on the north shore low bluffs occur, the formation being vertically bedded strata of graywacke and slate, the softer layers of which have been eroded, leaving picturesque columns or bold buttresses projecting out into the water. At Montague Point

we anchored for the night. The following day we skirted the shore to a point opposite Green Island, but conditions prevented further progress, so we spent the night at Stockdale Harbor. The next morning a favorable breeze took us over to Green Island, where we made camp in a small cove near the northeast point of the island. The island had recently been used as a fox farm and most of its vertebrate life had been greatly reduced by the depredations made by the foxes.

After spending two days on Green Island we proceeded to Latouche, where, on July 15, we established a camp on the beach.

On July 22 we left Latouche, Montague Island again being our destination. Zaikof Bay had not yielded any bears, so another attempt was made at Hanning Bay, near the southern end of the island. We dropped anchor at the head of the bay, near the delta of the creek which enters it near its southern extremity. At the mouth of this stream we pitched our camp on a wide gravel spit which was overgrown by a heavy growth of salmonberry bushes, large umbellifers and rye-grass. After securing two brown bears at this point, we felt justified in leaving the island, and on August 1 we were again under way. We arrived at Hoodoo Island on August 2, touching at the bay west of the north point of Elrington Island. A camp was hastily made on a knoll at the north end of the bay. From this station short trips were made to Elrington Island and the southern shore of the bay.

On August 4 the party, with the exception of the writer, returned to Latouche Island. The writer remained a few days on one of the small islands at the north of the bay. From this place collecting operations were conducted on Elrington and the adjacent shores of Hoodoo Island. On the 9th the party, less one of its members, Miss Kellogg, who had taken passage on a south-bound steamer, set sail for Port Nell Juan. After beating out of the channel we were favored by a squally breeze, which assisted us to skirt the south coast of Knight Island as far as Drier Bay. Here we anchored at dark in a little cove. On awakening in the morning we were greatly surprised to see sharp reefs sticking up close to us on all sides, which we had escaped on entering the cove in the dark.

Two days later we entered Port Nell Juan and made a day's stop on the south shore a few miles from the entrance. The tides were so strong that two days were required to reach the head of the inlet. The gray-green glacier water of the inlet gave no indication of the water's depth and when we attempted to anchor close inshore our twelve-fathom rope was found insufficient. This inlet is deep up to the very head, where it suddenly shallows close in to the tide-flats. A small gravel bar at the base of a cliff on the north shore furnished us with a scanty camp ground. A week was spent at this camp. On August 21 we began the voyage down the inlet, reaching Grafton Island on the evening of the 22nd. A few hours were spent on the island collecting.

Early the next morning we were on our way to Drier Bay, Knight Island. We arrived at the mouth at noon, and by sundown we were anchored near the head at the mouth of a small stream. Camp was pitched on the gravel bar at the mouth of this creek.

On August 29 we sailed out of Drier Bay for Chenega Island. The party was now reduced to two, Miss Alexander and Dixon having departed a few days previously for California, via Valdez. Chenega was reached late in the afternoon and an anchorage made at the north end in a small bay.

At noon on September 1 we set sail for the small group of islands north of Knight Island. Disc Island, or rather the passage between this island and Eleanor, was reached on September 3. Here we anchored in a nook on the Disc Island side. Collecting operations were carried on, both on Disc Island and on Eleanor, from this anchorage.

On the 6th we set out for Naked Island, making an anchorage on the south shore at the head of a small cove. Two days were spent here and then we proceeded to Storey Island, where a day was spent on the abandoned fox farm. On the 9th we reached Ellamar. The 12th found us making our way up Valdez Inlet. On the morning of the second day we worked our way through the Narrows and made camp in Shoop Bay on the west side of the inlet, a few miles above the Narrows.

On September 17 we left Shoop Bay heading toward Valdez.

A light breeze and a flooding tide aided us for a few miles, but a calm overtook us and we had to anchor close inshore. While lying here a fierce squall suddenly struck our boat with such force that we were drifted ashore, although both anchors were out. This storm subsided as suddenly as it had come. It was two days before the tide became sufficiently high to float the boat. The wharf at Valdez was reached on September 21 and a few days afterward our outfit was shipped south. Hasselborg departed for the Yakutat region to continue his search for Yakutat brown bears, and the writer returned to Berkeley.

Upon arriving at Valdez, August 28, Miss Alexander made a hasty trip to Thompson's Pass, where she spent a few days collecting birds and mammals before leaving for California.

DESCRIPTIONS OF LOCALITIES.

Prince William Sound and its contained archipelago is situated on the southern coast of the Alaskan mainland and at the head of the Gulf of Alaska. It lies between longitudes 145° and 149° , and latitudes 60° and 61° . The region therefore occupies, roughly speaking, 10,000 square miles. This area is set off topographically from the rest of Alaska by the lofty land mass of the adjacent interior. This elevated tract surrounding the immediate borders of the Sound sharply defines the area under consideration, rather more so than in the case of any other coastal area of Alaska of similar extent.

HEAD OF CORDOVA BAY.

The bay, which is about four miles wide at its head, terminates squarely at the extensive tide-flats which have been built up by the Cordova River. The ridges forming the walls of the bay rise precipitously from the water, and this abruptness is continued inland in the form of confining walls to the long valley. The floor of the valley is generally level, the bordering mountains rising abruptly to heights of 2000 to 3000 feet. These ranges are sharply cut and chiseled into many small peaks, producing a saw-tooth topography. The rock formation consists chiefly of shallow, alternating beds of sandstone and slate which

are much contorted, their position being mostly vertical or nearly so. Timber-line reaches an altitude of 1000 to 1500 feet on the south wall of the valley, but on the north wall it ascends as high as 2000 on some of the lateral ridges.

The Sitka spruce, mountain hemlock, and western hemlock are the prevailing forest trees, all three occurring from tide water to timber-line. The meadows at the mouth of the river which are subject to flooding by spring tides are covered by a heavy growth of carex, which gives way to rye-grass on the gravel beaches contiguous to the mud-flats. At the upper edges of the meadows thickets of willow occur, extending inland along the streams where these thickets become mixed with alders. The cottonwoods occupy the drier soil beyond the willows, and spruce of small size growing in dense masses has taken possession of the greater part of the valley. Scattered about through these forests are considerable areas of swamp, supporting bright green patches of grass growing in a foot or two of water. These swamps are normally covered by a thin coating of oil and are known locally as vegetable oil swamps. The streams flowing from these pools are charged with considerable iron oxide which is deposited on all the vegetation in contact with the streams. This substance occasionally stains the plumage of some of the water birds frequenting the region.

CANOE PASSAGE, HAWKINS ISLAND.

Hawkins Island is rectangular in outline, with a narrow passage through the middle which separates it into two nearly equal masses. This passage is so shallow that it is only navigable for canoes at high tide. The surface of the island slopes gently from the few central low dome-shaped mountains to the coast. The rocky cliffs along the coast show the same characteristics as those observed at Cordova Bay. The strata along the coast consist of alternating beds of sandstone and slate, usually with a sharp dip, or nearly vertical in position. Permanent snow-beds do not occur on the island, the highest peak being but 2000 feet and scarcely reaching above timber-line. The highest mountain, altitude 1800 feet, on the west section of the island was ascended. Here timber-line extended nearly to the summit

on favorable slopes, but on the north exposure it appeared to reach only 1200 feet. The great bulk of the island is forested, the eastern section uniformly by hemlock and spruce. The northern slopes in the vicinity of Canoe Passage are about equally divided between forest and open tundra areas. This variegated nature of the vegetation continues westward along the whole northern slope of the western section. The southern exposures of the island appear to be uniformly forested.

HINCHINBROOK ISLAND.

The larger part of Hinchinbrook Island consists of two parallel mountain ranges. These have a northeast trend, the highest peaks attaining an elevation of some 2300 feet. Permanent snowbanks cover the peaks and extend down the northern slopes well into the creek valleys. The rock formation of the ridges is a hard yellowish quartzite or sandstone. The coast formation consists of the usual layers of interlarded slate and sandstone, much folded and contorted. The eastern and northern sides of the island are low and forested. Open tundra is less extensive than on Hawkins Island. The country about Northeast Bay is low and rolling, with the stream margins well forested and the ridges chiefly open tundra. Small lakes are numerous.

GREEN ISLAND.

Green Island is low and rolling, the island consisting, in its northern part at least, of a series of ridges. The rock formation is largely black sandstone, slate, and conglomerate which have been thrown into sharp folds. The tops of these folds have been worn away, leaving the harder layers of the vertically placed strata in the shape of ridges. The valleys between these ridges are quite narrow, dammed where they enter the sea by heavy gravel beaches which have backed up the small streams. From the ponds thus formed the water escapes by seepage through the coarse structure of the dams. The island is well forested by rather small trees, interspersed among which are many small meadows which make the country easily accessible. The island is apparently sinking rapidly along this north shore,

as evidenced by the many old stumps to be seen in place on the beach below high-tide level.

LATOUCHE ISLAND.

Latouche Island is an elongated land mass with a northeast and southwest trend. It is obviously the summit of a sunken mountain range which parallels those ranges whose summits form the islands of the Sound generally. The central portion of the island is little broken, being chiefly a plateau of which the highest point reaches 2300 feet. The southeastern coast is very precipitous, the cliffs extending unbroken throughout its length. On the northwestern side the slope is more gentle, with considerable areas of level land about the shallow bays. The rock formation is similar to that of the other islands described, with the bedding largely vertical or oblique. There are no permanent snow fields of any considerable extent. Timber extends to the summit of the island wherever there is sufficient soil, but is much dwarfed at the higher altitudes. The lower slopes of the island are well forested with mountain hemlock, the tundra area being of small extent. The flats and stream margins support considerable Sitka spruce, and the littoral strip, western hemlock.

MONTAGUE ISLAND.

This, the largest and highest of the islands and the only one possessing any peculiar species, is more isolated than any other. It is the weather island, and in conjunction with Hinchinbrook it protects the whole Sound. The mountain range which forms the bulk of this island is a saw-tooth ridge rising abruptly from the sea to an altitude of 2000 to 2500 feet. This range, which has the prevalent northeast and southwest trend, gives the island its elongated shape. The northern and southern portions and much of the southern slopes of Montague are well forested by mountain hemlock and Sitka spruce. On the northwest slopes the forest does not extend much above 1000 feet, often only to 500 feet. The higher slopes are covered by permanent snow beds, this being the condition on the northern exposures above 1500 feet.

Zaikof Bay is a deep indentation at the north end of the island. The sides of the bay are formed by low, comparatively level, heavily forested capes. Much of the rock formation is black sandstone, chiefly in vertical beds where it is exposed along the coast. On the higher parts of the island the rock formation is apparently grayish sandstone which is horizontally bedded. The forest about the bay is quite uniform and the tundra areas are of small extent, covered chiefly by deer cabbage and having a much more verdant appearance than those of Hawkins and Hinchinbrook islands.

About Stockdale Harbor the rock formation is very much contorted and broken, the strata often changing from vertical to horizontal within a few rods. A rapid sinking is taking place about the margin of the bay, where many stumps are to be seen below high-tide level.

Hanning Bay is a large, semicircular bay backed by a similarly shaped basin. The northern and southern points of the bay are formed by high ridges enclosing a shallow valley. The timbered area is confined to the coast and the flats about the mouths of the stream, the greater part of the country being open tundra. A considerable part of the shore line below high-tide level is dotted with the stumps of spruce which have recently been killed by the sinking of the beaches. The western hemlock is absent from this region, apparently due to the severity of the climate on the north exposure.

HOODOO ISLAND.

Hoodoo Island is very similar in vegetation and rock formation to Latouche. The island is chiefly a low ridge, the highest points attaining a height of some 1700 feet, but without permanent snow fields. The forest growing about the bay in which we made camp is heavy and made up chiefly of large spruce. The undergrowth in these forests is dense. The western skunk cabbage grows in large patches and attains an immense size, the leaves of some reaching a length of five feet. The devil's-club flourishes equally well and attains a height of ten feet. The open tundra is of the usual type, covered chiefly by beds of deer cabbage and swamp carex.

Elrington Island is very similar to Hoodoo in rock formation and forest conditions. It is of about the same height, length, and trend as Hoodoo but is much narrower and consequently its sides are very much more precipitous.

PORT NELL JUAN.

Port Nell Juan is one of the longest and crookedest inlets in the Sound. It pierces a glacial region, one of rugged topography. The numerous angles of the inlet are made by the sharp angles of the mountain ranges. The beds of the ravines which separate these ridges are occupied by glaciers. Most of these enter the inlet and give off at their mouths small icebergs. Timber-line does not extend up the slopes more than 1000 feet except at the north on southern exposures. The greater part of the inlet presents an arctic appearance, and its ranges harbor great snow fields which supply the glaciers found in all the ravines and cañons of the region. At the head of the Port is a wide, flat valley which divides into two arms a few miles inland. Two large streams enter the bay here. In appearance this region resembles Cordova Bay. The wide border of mud-flats is succeeded by a considerable exposure of grassy meadow in which a few large ponds occur. This meadow is fringed by a growth of willow which gives way in a few rods to groves of cottonwoods. These in turn are held in check by heavy forests of spruce throughout the greater part of the valley, covering all the drier and higher portions. Tongues of willow, alder, and cottonwood trees extend up the stream margins. The gray-green water of the Port, which holds much glacial silt in suspension, is apparently injurious to marine life. This lack of marine forms may account for the corresponding lack of sea-birds.

GRAFTON ISLAND.

Grafton Island is a small, low island lying a few miles south of Port Nell Juan and very close to Point Newell. It is separated from the mainland by a narrow, shallow channel. The greatest diameter of the whole mass is only about half a mile. It is uniformly forested with rather small trees of Sitka spruce and mountain and western hemlock. Near the lee shore several

abandoned houses were found. These were at one time the quarters of a fox rancher who stocked the island with black foxes. About the houses where the forest had been cleared grew a heavy growth of salmonberry bushes, devil's-club, currants, western skunk cabbage, and other shrubby plants.

KNIGHT ISLAND.

Knight Island is the most rugged and deeply indented island in the Sound. It is apparently the extreme crest of a sunken mountain range. The rock formation is more uniform and the strata are much heavier than usual in the Sound. The rocks are chiefly graywacke and blackish sandstone. Permanent beds of snow occur as low as 1000 feet on the northern slopes, but they are usually small in extent. The southern exposures and the southern and northern ends of the island are well timbered. The region about Drier Bay, however, is very thinly forested, the trees being confined to a narrow margin along the shore line. Most of this forest is *Tsuga mertensiana*. Alder thickets cover extensive areas about the hillsides bordering the bay. Above timber-line the rocks and soil are closely carpeted by the small heather, *Harrimanella*. This plant is also conspicuous as a covering for the boulders scattered through the forest.

CHENEGA ISLAND.

The central portion of Chenega Island is formed by a rounded, gently sloping ridge which attains a height of about 1600 feet near the southern end of the island. The topography lacks the ruggedness so prevalent in the Sound. The rock formation is chiefly a blackish sandstone which is much less contorted than the strata of Knight Island. The island is very uniformly forested from sea-level to the summits of the highest ridges. No permanent snow fields occur, nor is there any apparent timber-line to be seen on the southern and eastern slopes. Open tundra was seen only near the southeastern point of the island. The mountain hemlock is the predominating tree. Forests of Sitka spruce occur on the more level parts of the island and on the slopes near the sea. Scattered everywhere along

the coast are western hemlock of small size. Large areas on the mountain sides where deforestation had taken place are occupied by a luxuriant alder growth. The undergrowth in the forest is made up largely of *Vaccinium ovalifolium*, *Rubus spectabilis*, and *Menziesia ferruginca*.

DISC ISLAND.

Disc Island owes its name to its narrow disc-like shape. It is a long, high ridge of almost uniform altitude throughout the four miles of its length. The summit of this ridge is about 700 feet in altitude and bare of forest growth above 500 feet. Below this altitude the island is fairly well forested by small mountain hemlock and Sitka spruce. The majority of these trees show conspicuous dead tops which give the forests a peculiar appearance not seen on the islands previously visited. Scattered through this forest are small patches of open tundra supporting the normal growth of deer cabbage, heathers, gale and sedges.

ELEANOR ISLAND.

Eleanor Island is an irregular mass several times the area of its southern neighbor, Disc Island. Its rock formation is similar, being chiefly graywacke. Its ridges attain about the same altitude but are forested practically to their summits. The forests, however, are heavier and with less dead standing timber.

NAKED ISLAND.

Naked Island is a very irregular mass lying a few miles northeast of Eleanor. It is a part of the same sunken ridge to which the two islets last described and also Knight Island belong. The rock formation is largely composed of slaty sandstones and schists. Notwithstanding the prevalence of vertical bedding, the hills which form the central mass of the island are low, gently sloping masses with broad, rounded summits. The forests of Naked Island are similar in composition and luxuriance to those of Disc Island.

ELLAMAR.

The vegetation about Ellamar has much the appearance of that about Canoe Passage, Hawkins Island. The proportion of tundra and forest is about the same. On the flat country near the coast Sitka spruce predominates, but on the hillsides this tree is replaced by mountain hemlock which ascends the steep mountain sides to approximately 1200 feet. Above this the arctic alpine shrubs occur. Permanent snow fields are found farther inland where the ridges attain altitudes of more than 2000 feet. Many of the higher ridges about Ellamar are bare of vegetation on their summits.

VALDEZ NARROWS.

This indentation is walled in by steep mountains. Only a few spruce and mountain hemlock occur about the bay, a few hardy individuals which have found a foothold near the beach on level land. The cottonwood has pushed down the inlet to this point where the trees occur solitarily on hillsides among alder thickets, very unusual situations for these riparian trees. The hillsides are uniformly covered by a heavy growth of alders. These thickets hold the ground everywhere up to 1000 feet or more. Above the alder zone the normal arctic alpine plants occur in a narrow zone below the bared or snow-covered summits. Shoop Bay is formed by a lateral cleft in the north wall of Valdez Inlet a short distance above the Narrows. The bay has been scooped out by a glacier which has since retreated a mile or so inland but continues to give off small bergs when the waters of the bay reach it at high tide.

GENERAL ACCOUNTS OF THE MAMMALS, WITH
DESCRIPTION OF A NEW EVOTOMYS.

The small number of species of mammals occurring in the drainage basin of Prince William Sound is due apparently to its unfavorable climatic conditions. The heavy precipitation which prevails in the region has made it unfit for a large number of species found in close proximity, but inhabiting districts where

the precipitation is but a third as much or less. This marked antipathy to the Sound is well shown by the failure of almost all the species of large game-mammals of the Kenai Peninsula to occur even sporadically in this region. These species are confined to the comparatively dry interior and west slopes of the Peninsula and range only as far east as the summit of the western divide.

The scanty mammalian fauna which occurs is very uniformly distributed on the mainland and those islands separated from it by shallow channels. On the more isolated central islands several of these species are lacking, and, moreover, this group, comprising Montague, Green, Knight, Disc, Eleanor, Naked, and their adjacent islets, agree in a measure in their mammalian fauna. According to the soundings given on recent maps, this group of islands is separated from the mainland and other islands by depths of 100 fathoms or more and from each other by channels of less than 90 fathoms in depth. Its islands all lack *Eutamias dawsoni* (except on Knight Island) and *Sorex personatus streator*, both of which are generally distributed on the other islands and on the mainland. Montague Island, the largest and most isolated of the group, is the only island of the Sound which shows any appreciable amount of faunal individuality. The *Microtus* (*M. clymocetes*) of this island is a well-marked form.

It is remarkable in view of the great abundance of *Erethizon* everywhere on the mainland that this mammal has not made its way to any of the islands. Apparently it is a very recent arrival in the region. Other comparatively recent immigrants are: *Sciurus hudsonicus petulans*, *Synaptomys dalli*, *Eutamias dawsoni*, and *Sorex personatus streator*.

It is now quite impossible to determine what species of mammals occurred on the islands that have been used as fox farms for any considerable time. Storey Island, which first fell a victim to the foxes and has been farmed longer than any other, is now without trace of any terrestrial species of rodents or insectivores. The only island now used as a fox farm is Perry. The manager of this farm, who is a trustworthy observer, assured me that his foxes had long since exterminated

the voles from the island and that a few years ago he had noted the complete disappearance of the shrews also. Some trapping was done on two other islands used as fox farms, one situated at the entrance to Drier Bay and another near the east coast of Hoodoo Island; but both of these were found to be without any evidence of the presence of small mammals, although islets near them were inhabited by the representative species of the region. Green Island, which has until very recently been used for fox farming, has lost all its indigenous mammals except *Sorex obscurus alascensis*, and this species is much reduced in numbers. The absence of *Sorex* on Naked and Storey islands is difficult to account for except on the basis of fox depredations.

Seventeen species of mammals were secured within the drainage area of the Sound. Specimens of all the forms known to occur on the islands were secured; but we were less fortunate in capturing the mainland species. The mainland forms known to occur but not secured by us were: *Oreamnos*, *Fiber*, *Castor*, *Lepus*, *Lynx*, *Vulpes*, *Gulo*, *Mustela*, and *Ursus dalli*. *Oreamnos* is found occasionally about Cordova Inlet, Valdez Inlet, and Eaglek Bay, but not on the Kenai Peninsula. *Fiber* is said to occur sparingly in Lowe River near Valdez. *Castor* was formerly found in the meadows at the head of Cordova Inlet where the remains of dams are still to be seen. *Lepus* occurs during favorable seasons in numbers near Valdez and about the head of Cordova Inlet. *Vulpes*, *Gulo*, and *Lynx* occur sparingly except during seasons when *Lepus* is abundant, and then these carnivores also become numerous. *Mustela americana* is widely distributed but is seldom taken.

***Sciurus hudsonicus petulans* Osgood.** Glacier Red Squirrel.

The two specimens secured are referable to this form. An adult male from the head of Port Nell Juan is considerably larger than any in the series from Glacier Bay, the feet being especially large. The dimensions of this specimen (no. 910) are: length 370 mm., tail 145, hind foot 54; skull: Hensel 38.5, zygomatic breadth 28.5, length of nasals 15.5, width of nasals 7.5. Another specimen secured at Thompson's Pass, near Valdez, is somewhat smaller and nearer the average of *petulans*.

The only place in the Sound where red squirrels were found was Port Nell Juan. Here they were observed only by Hasselborg, who secured one and saw two others. A prospector who had spent several years in the vicinity of the Port knew of but a single colony and this one had recently become very much reduced in numbers. About the heads of the passes leading into the interior from Valdez they are said to be more common. These localities represent their extension from the Copper River drainage. Red squirrels are not known to occur on any of the islands of the Sound.

Citellus plesius ablusus Osgood. Nushagak Ground Squirrel.

Three specimens, one from Valdez Narrows and two from Thompson's Pass. Two of these have the coloration of *plesius*. The other specimen has a grizzled tail like *ablusus*. The skulls have the small flat bullae of *ablusus*, but in size they approach *plesius*. The nasals, however, are short as in *ablusus*. The form is thus intermediate, perhaps nearest *ablusus*.

Marmota caligata (Eschscholtz). Hoary Marmot.

Secured at Cordova Bay and Valdez Narrows and on Hinchinbrook and Montague islands. Nine specimens are in the collection from these localities. The species occurs everywhere on the mainland along the shores of the Sound. It is also found on the higher islands where a definite timber-line occurs, but is much less abundant in these localities than on the adjacent mainland. A few were seen on Hinchinbrook Island, where a single specimen was obtained. On Montague Island they were observed at both Zaikof and Hanning bays, living in burrows at the edge of timber-line. They were very timid and whistled much less frequently than those observed on the mainland. Unless very much frightened they remained silent, their whistling note not being used as a warning to their neighbors but rather as an indication of sudden fright. A very few were seen on Knight Island. Hawkins, the only other large island, apparently lacked them. They were found at Cordova Bay from the cliffs along the coast to timber-line, but at other localities they were noted only at timber-line or above.

A specimen taken September 14 at Valdez Narrows is in the thick winter pelage. This one is heavily lined dorsally with black, the gray of the nape and the fulvous rump being much less conspicuous than in worn summer pelage. A few days after this specimen was secured snow fell heavily on the region above timber-line, causing the species to go into hibernation.

***Evotomys dawsoni orca* Merriam.** Orca Red-backed Mouse.

Represented by 59 specimens, covering four island and five mainland localities. Of these specimens, 27 are fully adult, the remainder being immature. The island material agrees fairly well with the Cordova series, but the few adults in it are in worn pelage. *Evotomys* is confined to the forest, and is much rarer on the islands than elsewhere. The specimens secured on Knight Island have considerably darker colored underparts, but only one fully adult specimen was taken. Localities represented by specimens: Cordova 12; head of Cordova Bay 7; Hoodoo Island 7; Latouche Island 3; Knight Island 8; Chenega Island 6; Port Nell Juan 13; Ellamar 1; Valdez Narrows 3.

***Evotomys dawsoni insularis*, new subspecies.**

Island Red-backed Mouse.

TYPE.—Male adult; no. 557, Univ. Calif. Mus. Vert. Zool.; Canoe Passage, Hawkins Island, Prince William Sound, Alaska; June 20, 1908; collected by E. Heller; orig. no. 79.

CHARACTERS.—Similar in size and proportions to *Evotomys dawsoni orca* Merriam (Proc. Wash. Acad. Sci., II, March, 1900, p. 24), but dorsal coloration much brighter rufous; tail dorsally similar to the back in coloration; coloration of underparts much lighter, grayish without any yellowish suffusion. The skull has conspicuously larger audital bullae than *orca* and is wider zygomatically.

COLORATION.—Above ferruginous-rufous from snout to base of tail; sides yellowish to level of ears; belly and feet light grayish without any yellowish suffusion; a concealed whitish spot at base of ear; tail bicolor, above reddish like the back, below tawny brownish.

SKULL.—Compared with skulls of *orca* from Cordova the series from Hawkins Island is somewhat wider zygomatically, which is due to the more spreading zygomatic arches, the two series averaging the same in length. Nasals slightly larger and somewhat longer. The two series of skulls differ most in the size of the auditory bullae. These are conspicuously larger in the Hawkins series, their size difference being due chiefly to greater inflation and depth of the bullae.

MEASUREMENTS.—Type: length 143 mm.; tail vertebrae 32; hind foot 19.5. Average of six adults from Canoe Passage, Hawkins Island: length 145; tail vertebrae 32; hind foot 19.5. Skull (type): Hensel 22; zygomatic width 14.6; length of nasals 7; diastema 8.8; alveolar length of upper molar series 5. Average of six skulls from Canoe Passage, Hawkins Island: Hensel 22; zygomatic width 14.4; length of nasals 7; diastema 7.7; alveolar length of upper molar series 5.

The material in the collection representing this new form consists of a series of ten adults from Canoe Passage, Hawkins Island, and five adults from Northeast Bay, Hinchinbrook Island.

The small series from Hinchinbrook Island agrees well in coloration and skull characters with the Hawkins Island material. The whole series is very uniform in coloration and easily distinguishable from the darker, dusky-tailed *orca*, which is a widespread form elsewhere in the Sound region.

***Microtus kadiacensis* Merriam. Kadiak Vole.**

This is the most widespread species about the Sound. The series of 150 specimens represents twelve localities, as follows: Hawkins Island 14; Hinchinbrook Island 38; Chenega Island 19; Grafton Island 5; Knight Island 7; Disc Island 7; Eleanor Island 4; Naked Island 9; Port Nell Juan 37; Valdez Narrows 3; Thompson's Pass 3; Cordova Bay 7.

In size this series agrees better with *Microtus kadiacensis* than with *M. yakutatensis*. There is, however, considerable local variation shown in some of the island material. Those specimens from Grafton Island are much darker, with darker wash over the underparts as in *elymoces*, but they are much smaller than the latter species. The Naked Island series has shorter

incisive foramina and slightly darker colors than the mainland specimens. Chenega and Knight Island material also is somewhat darker than mainland specimens. The specimens from Cordova Bay and Valdez are smaller and grayer than the large series from Port Nell Juan.

At Canoe Passage, Hawkins Island, voles were uncommon and confined to the narrow strips of rye-grass along the beach and on sand-spits. At Northeast Bay, Hinchinbrook Island, the species was more abundant, but confined to the rye-grass areas, as on Hawkins Island. Runways were also found to be plentiful about timber-line at 1200 feet in patches of carex, but no specimens were secured at these altitudes. The habits of the *Microtus* on Knight Island approached more nearly those of *M. elymocetes*. About Drier Bay on this island they were found at the margin of the forest and in the patches of deer cabbage on the side hills and tundras from sea-level to the limit of vegetation. The cut food material in the runways was chiefly carex, with some stems of purple iris and hellebore.

About the south shore of Chenega Island voles were found numerous in the patches of rye-grass near the beach. From these centers of abundance they invaded the edges of the forest and tundra, but were nowhere found so common as in the rye-grass. They were not rare about streams in the patches of carex and in the meadows above the timbered areas about the summits of the highest peaks. At these altitudes they formed the chief food of the rough-legged hawks which frequented the high open meadows. In the denser grass patches their runways and burrows formed a complex reticulation on the surface.

Small piles of the stems of rye-grass and iris cut into inch lengths were found about the runways. In places, little heaps of grass roots cut into short lengths were found exposed where the rain had washed the soil away from the burrows. These had evidently been stored in underground chambers for future use.

These voles were very abundant on Grafton Island where they lived chiefly in the forest similarly to *elymocetes* of Montague Island. On Disc and Eleanor islands they inhabited the small open patches of tundra scattered through the forest, but were somewhat less abundant than on Knight Island.

On Naked Island *Microtus kadiacensis* was found abundantly in some of the small meadows and on sparsely wooded hillsides. Runways in the rye-grass of the littoral zone were rather rare; in fact abandoned runways were nowhere common. On many of the hillsides, amid *Menziesia* bushes and patches of *Veratrum*, many small holes were found where the voles had dug among the rootstocks of the grass which had been cut into lengths and carried away and stored in the chambers of their burrows.

About the head of Port Nell Juan a large series of *Microtus* was secured. They occurred chiefly near the beach in recently formed meadows about the edges of lagoons. These situations were very wet tundra supporting chiefly *carex*, *iris*, *gale*, dwarf willows, and a host of herbaceous plants. The cuttings found in the runways were chiefly rye-grass, *carex*, and *iris*.

***Microtus elymocetes* Osgood. Montague Vole.**

This large vole was found to be abundant on Montague Island at Zaikof and Hanning bays, at Montague and Graveyard Points, and on the numerous small islets in Stockdale Harbor—in fact wherever we touched the island. This species is especially common in the woods, living in holes beneath logs and the roots of conifers. The wide, deep runways are to be seen everywhere from the littoral zone to the upper limit of vegetation. There is perhaps not a square rod of ground on Montague Island and its adjacent islets that is without runways of this rodent.

At Zaikof Bay runways were most abundant on the edges of the forest in beds of deer cabbage, the burrows being placed beneath tree trunks and logs. In these situations at various places in the runways considerable quantities of the petioles of deer cabbage were found, cut into lengths an inch or two long and placed in irregular little heaps. In a few places the gnawed remains of skunk cabbage leaves were found in the runways. A few small mountain hemlocks were seen with the bark removed a few inches above the ground, evidently the work of this rodent during winters of heavy snowfall.

In the vicinity of Hanning Bay, *elymocetes* was found very abundant in the fields of rye-grass near camp. Great numbers

were taken in traps set along their numerous runways. Here their food consisted chiefly of the wild rye. Their runways were much less common in the woods.

A series of thirty specimens are in the collection. The largest exceeds considerably any of the material described by Osgood (Proc. Biol. Soc. Wash., XIX, May 1, 1906, p. 71). The largest specimen, an adult female, measures: length 225 mm.; tail 49; hind foot 24. The average of the four largest specimens is: length 215; tail 47; hind foot 24. The largest skull is that of an adult male which measures: Hensel 29; zygomatic breadth 19.3; length of nasals 9; length of maxillary tooth row 7.5.

This species is easily distinguishable from any other member of the genus inhabiting the region by its larger size and much darker coloration, the buffy wash on the underparts being much heavier than in allied forms.

Synaptomys dalli Merriam. Dall Lemming Mouse.

Three specimens from Cordova, five from the Head of Port Nell Juan and one from Northeast Bay, Hinchinbrook Island. The specimens from these three localities agree very well in skull characters, coloration and proportions. They agree minutely in skull characters with the original description of *dalli* (Merriam, Proc. Biol. Soc. Wash., X, March, 1896, p. 62).

Special efforts were made to secure a series of *Synaptomys*, but they are of such rare occurrence in the Sound that only a few were taken. At Cordova their runways were found at the margin of Eyak Lake amid a tangle of rye-grass, stumps and salmonberry bushes. At this locality they were not associated with *Microtus kadiacensis*. A single specimen was secured on a small island in Northeast Bay, Hinchinbrook Island, in a *Microtus* runway at the edge of the forest. More specimens were secured at the head of Port Nell Juan than elsewhere. Here they were secured in *Microtus* runways in the open tundras in very swampy situations near the beach.

Erethizon epixanthum myops Merriam. Alaska Poreupine.

Six specimens, three from Port Nell Juan and three from Cordova Bay. Four of these are fully adult and in coloration are quite yellowish, the dark hairs having little effect on the general coloration.

None of the skulls in this series is large in comparison with the largest in the series of fifty from the Kenai Peninsula. The skull of a female from Port Nell Juan, however, is much older than any other examined, but it is rather undersized. This skull (no. 988) has lost all traces of sutures except the nasals, and has the crowns of the molars worn down until the enamel indentations have disappeared. It measures: Hensel 86 mm.; zygomatic width 70. The individual variation in size, independent of age or sex, shown by this large series of fifty skulls is immense. The variation in the relative size of the audital bulla is especially great.

The trees most used for food were the Sitka spruce and the mountain hemlock. At Cordova Bay and at Port Nell Juan large patches of the bark near the base of these conifers had been removed by these rodents. Most of the work was done at the base and on one side only, a tree very seldom being found girdled. Occasional patches of gnawing at the base of large limbs where the animal could obtain convenient support while working were observed at considerable distances above the foot of the tree. This sort of poreupine "sign" was especially noticeable at the shore line and often on the horizontal limbs of trees projecting over the water.

One evening a poreupine was found at Cordova Bay feeding well out on one of these limbs projecting above the water. The limb was chopped off and fell with the poreupine into the salt water of the bay. The poreupine on rising to the surface after his plunge struck out vigorously for the shore. This means of escape was cut off several times by the vigorous use of an oar, and the poreupine eventually was hauled aboard the boat ensnared in the coils of the painter. He proved himself to be a vigorous swimmer, the great buoyancy of his quills floating him well out of the water.

In view of the littoral habitat of this animal and its non-insular distribution, we are justified in considering it a very recent immigrant into the Alaskan region.

***Canis pambasileus* Elliot.** Alaska Timber Wolf.

The skull of a large black specimen was secured from a trapper at Cordova Bay. This man, who was also a fur dealer, reported black wolves to be as abundant as the normally colored individuals. The same proportion between the melanistic and the normal coloration apparently holds good at Yakutat and no doubt also at the intermediate localities along the coast. Tracks were observed on the river bars at Cordova Bay and at the head of Port Nell Juan.

***Lutreola vison melampeplus* (Elliot).** Kenai Mink.

A single one secured on Disc Island in a trap set in one of the runways. Another was seen by Miss Kellogg on Hinchinbrook Island, where tracks were also observed about the mouths of creeks. Well-marked mink trails were found on Knight, Disc, and Eleanor islands. These mink trails, sunk two or three inches below the surface of the moss and heather which forms a dense mat over the ground, skirted the beach at a distance of ten yards or less.

***Putorius alascensis* Merriam.** Alaska Weasel.

A single specimen, an adult female, shot by Miss Kellogg on Hinchinbrook Island. This was taken at timber-line at 1200 feet altitude in a dense thicket of prostrate mountain hemlock. One other individual was observed on a small islet in Port Nell Juan running about the rocks at the water's edge. Numbers are trapped on the mainland during the winter. Weasels appear to be found only on the mainland and the islands lying close to the shore, being absent from the isolated central ones.

***Lutra canadensis* (Schreber).** Land Otter.

Four specimens secured on Montague Island, two by Miss Alexander at Port Chalmers and two by Dixon at Hanning Bay. This is the most widespread species of carnivore in the Sound.

Otter trails and other "sign" were found on every island visited and at every point where we touched on the mainland. The well-marked trails occur everywhere and extend through forest and over open tundras and meadows. Usually the trails run from one small lake to another, following water courses as closely as possible. Beach trails skirting the shore line are seldom constructed on the islands.

***Ursus dalli* Merriam (?).** Yakutat Brown Bear.

Two were shot by Hasselborg on Montague Island. The first secured was a young adult female about four years old from Hanning Bay. The other was an old male shot at Macleod Bay. In addition to these two the tracks of an old female and two large cubs were seen at both Hanning and Macleod bays. These two bays and the intervening country apparently held only these five bears during our stay of ten days in the vicinity. From the bear "sign" it was apparent that they had recently come into the region, apparently for the purpose of feeding on the salmon which were just beginning to run.

When we entered Hanning Bay on July 24 only three or four dog salmon were seen in the creeks; but after a few days a dozen or more were always to be seen in the spawning beds at the mouth of the creek. A week later a few humpbacked salmon were seen, and these were becoming more numerous when we left on the first of August. As these salmon, owing to the shallow stream, spawn practically at tide-water, the bears at this season spend their time near the beach. The stomach contents of the bears shot was chiefly deer cabbage and salmon.

Besides the croppings of deer cabbage, patches of swamp carex were found beaten down by bears and also many places where the roots of skunk cabbage had been grubbed up and eaten. A well-marked bear trail was found running parallel with the beach about twenty-five yards back from the water. This was seen along the whole coast and apparently was the main highway of the bears between the various bays and their streams. No "sign," old or new, was seen at timber-line or about the heads of the creeks.

At Zaikof Bay tracks of but one small bear were seen in a journey of five miles along the shore line. It is evident that there are very few bears on Montague Island, and the small extent of vegetation and the limited number of salmon in the streams would account for their scarcity.

Tracks and other evidence of brown bears were seen on Hinchinbrook Island and at Port Nell Juan; but bears from these localities are probably different from the Montague Island form. Hawkins Island is traversed by many old well-worn trails, but only one recent track was found there. Apparently this island at one time supported more bear than any other, but it has recently been depopulated.

The above determination for the Montague bear is merely tentative, awaiting Dr. C. Hart Merriam's monograph on the brown bear group.

***Ursus americanus* Pallas. Black Bear.**

One old female was secured by Hasselborg at the mouth of Port Nell Juan. This brute was affected by some tooth disease which had caused the decay or loss of most of the molars. Black bear "sign" was found abundantly about Cordova Inlet and less abundantly at the head of Port Nell Juan. Black bear were reported by a trustworthy fur dealer as occurring on Hawkins Island until within a very recent date. No black bear "sign" was noted there however.

***Sorex personatus streator* Merriam. Alaska Masked Shrew.**

A series of 99 specimens secured at eleven localities, five on the mainland and six representing islands. This shrew was found associated with *Sorex obscurus alascensis* at all the island localities where secured except Chenega and Grafton islands; at both of these localities *streator* alone occurred, but not commonly.

The habits of these two species are apparently identical. They were both found most abundantly about the grass flats inhabited by *Microtus*, and were usually taken in traps set on the runways of this rodent. On islands where no voles occurred shrews were secured in the forest beneath logs and about rock

ledges on the ill-defined runways of *Evolomys*. Everywhere they were found to be quite active during the day, except during midday in clear weather.

The large series of *S. p. stricatori* is remarkably uniform in coloration, proportions and skull characters, and is practically indistinguishable from a large series from southeastern Alaska.

Localities: Cordova 16; Cordova Bay 6; Ellamar 4; Valdez Narrows 6; Port Nell Juan 8; Hawkins Island 6; Hinehinbrook Island 11; Latouche Island 14; Hoodoo Island 13; Elrington Island 8; Chenega Island 5; Grafton Island 2.

Sorex obscurus alascensis Merriam. Alaska Dusky Shrew.

This is the most generally distributed species of mammal in the region and the only species of shrew found on the more isolated Montague, Green, Knight, Disc, and Eleanor islands. The series of ninety-two specimens in the collection was secured at seventeen localities. This series is fairly uniform. Some local variation is apparent, as on Montague Island where the species is somewhat more robust with a very slight increase in foot and tail measurements. No skull differences have been detected in the series from the various islands.

Localities: Port Nell Juan (entrance) 2; Ellamar 1; Valdez Narrows 10; Thompson's Pass 1; Cordova Bay 2; Hawkins Island 4; Hinehinbrook Island 8; Montague Island (Zaikof Bay) 3; Montague Island (Hanning Bay) 17; Green Island 3; Latouche Island 4; Hoodoo Island 4; Elrington Island 3; Knight Island (Herring Bay) 3; Knight Island (Drier Bay) 16; Disc Island 6; Eleanor Island 5.

Myotis lucifugus (LeConte). Little Brown Bat.

One specimen secured, an adult male, at Port Nell Juan. This is an alcoholic specimen and agrees well with *lucifugus* in ear characters and body measurements. Several others were seen about the Port, but they appeared so late in the evening that it was not possible to see distinctly enough to shoot them. One was also noted on Hoodoo Island. Wherever found they were very local and invariably solitary. If once located they could be found at the same spot each evening, flitting about catching insects.

PARTIAL LIST OF PLANTS, CHIEFLY SHRUBS AND
TREES.

(Unless otherwise stated, the determinations of plants are by Mr. T. S. Brandegee. The specimens on which this list is based are on file at the Herbarium of the University of California. The interpolated numbers are the collector's field numbers accompanying the specimens.)

Hylocomium. Moss.

Two species of this genus, *H. splendens* (no. 53) and *H. lorcum* (no. 42) form the great bulk of the moss which thickly covers the floor of the forest and the trunks and lower branches of the trees. (Determined by Professor W. A. Setchell.)

Blechnum spicant (L.) Wither. Deer Fern.

A common species in the coniferous forests throughout the region. (No. 52.)

Athyrium filix femina (L.) Roth. Fern.

An abundant species in the forest and on recent landslips. In the latter situations it occurs in heavy masses, attaining a height of four feet. It is apparently one of the first plants to take possession of these deforested areas. (No. 30.)

Equisetum pratense Ehrh. (?) Thicket Horsetail.

Occurs rather sparingly about the edges of the forest and along streams. (No. 27.)

Chamaecyparis nootkatensis (Lamb) Spach. Yellow Cedar.

Near the northeast point of Hinchinbrook Island a considerable forest of this tree flourishes close to the shore at a low altitude. It was not noted elsewhere, although reported from Hawkins and Glacier islands. This tree seems to be of very sporadic occurrence throughout its whole Alaskan range. The specimens collected have flatter foliage, resembling *Thuja plicata* in this respect. It is probable that these forests, which are widely isolated, represent a form of this species. (No. 4; determined by Professor H. M. Hall.)

Tsuga heterophylla (Raf.) Sarg. Western Hemlock.

The western hemlock here reaches its northern limit but retains remarkable uniformity in distribution. It is confined

chiefly to the immediate vicinity of the coast, attaining timber-line in only a few localities. About the rocky shores of the fiords it grows to the very edge of the water, its graceful branches often sweeping the surface at high tide. Much of the beauty and charm of this tree is due to its smaller proportions at this latitude. (No. 15.)

Tsuga mertensiana (Bong.) Carr. Mountain Hemlock.

Almost as numerous individually as the spruce. A mountain species primarily, it here reaches the coast and becomes of universal distribution on the hillsides from timber-line to sea-level. At the upper limit of coniferous forests it becomes a prostrate, shrub-like growth, often covering extensive areas. About the swampy margins of tundras it flourishes unhampered by other forest growth, apparently being better suited to such wet conditions than any other conifer of the region. The wetter portions of these swamps, however, are not adapted for this hardy species and the few trees that have attempted an invasion stand dwarfed near their margins. (Nos. 22, 46.)

Picea sitchensis (Bong.) Traut. & Mayer. Sitka Spruce.

The most abundant, wide-spread and largest tree of the region. Occurs practically everywhere where forests occur, from sea-level to timber-line. At the upper limit of forest growth it becomes a prostrate shrub and vies successfully with the mountain hemlock. Forests of pure growth occur throughout the floors of the larger valleys and stream deltas, but elsewhere it occurs mixed with the two hemlocks of the region. (No. 14.)

Elymus mollis Trin. Rye-grass.

Confined to the marine littoral. On all the heavy gravel beaches and spits of recent origin this grass forms a dense growth. As these gravel formations are of small extent and widely isolated, this grass is correspondingly of limited distribution. (No. 3.)

Carex, sp. Saw-grass.

The deltas of creeks and their margins were covered by a heavy growth of this sedge wherever there were fresh-water influences. Most of the territory occupied by this species was flooded daily by back water during high tide. (No. 12.)

Lysichiton camtschatcense (L.) Schott. Western Skunk Cabbage.

About bogs and stream margins in the forest this plant occurs abundantly. In many localities it attains a large size, the leaves measuring 3 to 5 feet in length. (No. 35.)

Veratrum viride Ait. Green Hellebore.

Occurs in the same situations as the skunk cabbage, but much less generally distributed. (No. 59.)

Iris setosa Pall. Iris.

One of the littoral plants, usually found associated with rye-grass, yarrow, etc., on gravelly deposits near the mouths of streams. (No. 21.)

Salix, spp.

At least three species of willow occur in the region. An arborescent form was found growing along the margins of large streams in company with *Populus* at Cordova Bay, Port Nell Juan, Hinchinbrook, and Montague islands. A shrubby species a few feet in height grew in masses about the margins of swamps and stream deltas at Cordova Bay and Port Nell Juan. A third form, a foot to eighteen inches in height, occurred on the margins of ponds at Port Nell Juan associated with *Myrica gale*.

Populus trichocarpa T. & G. Black Cottonwood.

Poplars were found growing at the mouths of large streams and fringing forests at Cordova Bay, Port Nell Juan, and Valdez Inlet. About Valdez Inlet this tree occurs also on side-hills with alders and scattered spruce. (No. 58; determined by Professor H. M. Hall.)

Myrica gale L. Sweet Gale.

One of the most characteristic tundra shrubs. It occurs throughout the whole region, usually forming thickets about the edges of ponds and as a scattered growth in the tundra generally. (Nos. 8, 48.)

Alnus sitchensis (Regel) Sargent. (*A. alnobetula* var. *B. fruticosa* (Rupr.) Winkl.) Shrubby Alder.

One of the most abundant tree-like growths. It occurs along all stream courses, usually throughout their whole length. It is the first tree to take possession of the deforested areas on hill-sides. About timber-line heavy thickets of alder form a char-

acteristic feature. (No. 43; determined by Professor H. M. Hall.)

Arcnaria peploides var. *major* Hook. (*Ammodenia peploides major* Piper.) Beach Sandwort.

The gravelly beaches were covered with mats of this weed wherever the rye-grass had failed to take possession. (No. 38.)

Aconitum delphinifolium DC. Monkshood.

Gathered at the head of Port Nell Juan. (No. 50.)

Aquilegia formosa Fisch.

The columbine occurs in the littoral belt. Specimens are from Hanning Bay, Montague Island. (No. 24.)

Sedum roseum Scop. Stonecrop.

Found chiefly on Montague Island above timber-line, growing on rock ledges or steep hillsides.

Ribes bracteosum Dougl. Stink Currant.

Flourishes best on snow-slides or land-slides where it often covers large areas as a pure growth. In these places it is associated with the shrubby alder, usually forming a dense mat about the edges of the alder patches. Together with the salmonberry, it is one of the first shrubs to appear on denuded side-hills. This species follows the alder everywhere, accompanying it along all water courses. It is, however, more generally distributed and occupies considerable areas in the coniferous forests. (No. 16.)

Ribes triste Pall. Currant.

Found growing in the littoral zone. (No. 20.)

Geum calthifolium Smith.

Collected on Hawkins Island. (No. 9.)

Geum macrophyllum Willd.

Perhaps of general distribution, but the only preserved specimens are from Montague Island. (No. 40.)

Spiraea pectinata T. & G.

A common alpine species on Montague Island. (No. 34.)

Arunceus sylvester Kostel. Goatsbeard.

Observed scattered along the bluffs about Hanning and Macleod bays, Montague Island, and along streams in the forest at Port Nell Juan. (No. 51.)

Rubus spectabilis Pursh. Salmonberry.

The most abundant shrub of the region. Flourishes best on snow-slides where the stiff, scantily leaved stalks hold absolute possession of large areas. Extensive patches occur in the littoral zone on gravelly flats and wherever the forest has been removed. This omnipresent shrub borders all water courses and also forms a scattered growth throughout the forests. Above timber-line it flourishes, being one of the hardiest pioneers and following closely the snow-slides to the limit of vegetation. Large areas of it in these altitudes remain buried beneath the snow most of the year, often receiving less than two months of freedom annually. Very seldom do these plants have an opportunity of maturing fruit in such short intervals. It is not unusual to find these snow-slide thickets late in summer in blossom or just leafing out, at a time when the more favorably located bushes of the lower altitudes are bearing mature fruit. (Nos. 23, 44.)

Rubus pedatus Smith.

Of common occurrence in the forest where it forms a delicate traecery on the moss. (No. 61.)

Rubus arcticus L.

Found growing in the littoral zone about Cordova Bay, on Montague Island and at Port Nell Juan. (No. 37.)

Pyrus sitchensis (Roem.) Piper. Mountain Ash.

Occurs scatteringly along the edges of the forest, tundras and streams everywhere. Occasionally individuals were observed on land slips amid the alders and stink currants. Nowhere was this shrub found in masses or clusters, but only as solitary individuals. (No. 45.)

Pyrus diversifolia Bong. Crab Apple.

Practically identical in habits and occurrence with the last. It was, however, somewhat more generally distributed. (No. 7.)

Lathyrus maritimus Bigel.

Specimens of this plant, which is characteristic of the littoral zone and is partial to salt-water influence, were gathered on the beach of Hanning Bay, Montague Island. (No. 41.)

Lupinus nootkatensis Donn. Lupine.

Lupines of this species are a characteristic element of the flora above timber-line. Specimens were collected on Montague Island. (No. 31.)

Viola. Violet.

Two species of this genus were collected on Hawkins Island; namely, *V. glabella* Nutt. (no. 11), and *V. langsdorfi* Fisch. (no. 10).

Epilobium latifolium L. Broad-leaf Willow-herb.

The handsome and showy flower-clusters of this plant were in full bloom in August at the head of Port Nell Juan. (No. 55.)

Echinopanax horridum (Smith) D. & P. Devil's-club.

Chiefly a forest and riparian species, with alpine tendencies. It is found associated on snow-slides with alders, salmonberry bushes and stink currants. In dense forests its immense, lobed, horizontally placed leaves made a pleasing contrast with the darker green of these depths. (No. 56.)

Heracleum lanatum Michx. Cow Parsnip.

The cow parsnip endures the influence of salt water but does not grow so near the beach as *Elymus*, *Lathyrus*, and *Senecio*. Collected at Hanning Bay, Montague Island. (No. 19.)

Coelopleurum gmelini DC.

The notes under *Heracleum lanatum* apply here as well. (No. 18.)

Cornus canadensis L. Bunchberry.

Generally distributed in the forest. Clusters of these diminutive plants were often found growing on decayed stumps and logs. (No. 26.)

Cornus succica L. Northern Dwarf Bunchberry.

Like the last in habits and occurrence. (No. 26a.)

Phyllodoce glanduliflora (Hook.) Cav. Heather.

Rather widely scattered above timber-line and about the edges of tundras. (No. 33.)

Harrimanella stelleriana (DC.) Cov. *Cassiope stelleriana* DC. Alaska Heather.

Above timber-line this species covers large areas, occurring particularly abundantly on rock masses. At Drier Bay, Knight Island, this heather covered large alpine areas as a pure growth, and invaded the forests, covering densely the large boulders among which the trees stood. (No. 47.)

Menziesia ferruginca Smith. Menziesia.

A characteristic shrub in scattered forests and at the margins

of the denser coniferous growths. About the forest openings it is usually associated with *Rubus spectabilis* and *Vaccinium ovalifolium*. (No. 5.)

Cladothamnus pyrolaciflorus Bong.

Clusters of this shrub were found growing about the margins of tundras and on low ridges. Nowhere, however, was it found in any considerable quantity. During the latter part of July in the vicinity of Hanning Bay, Montague Island, the bushes were covered with blossoms. (No. 2.)

Vaccinium ovalifolium Smith. Common Huckleberry.

One of the most abundant and widely spread shrubs of the region. It is an important component of the forest undergrowth, in some localities occupying the available ground exclusively. At timber-line it is associated with the salmonberry. About the snow-slides it grows in considerable beds, taking possession of denuded areas and fighting the snow for existence in the same manner as the salmonberry. About these inhospitable slopes it is found late in the season just budding and flowering at a time when the bushes at lower altitudes are ripening their fruit. (No. 13.)

Vaccinium uliginosum L. Bog Huckleberry.

A characteristic tundra shrub, in which situations it occurs sparingly but uniformly distributed. (No. 6.)

Nephrophyllidium crista-galli (Menz.) Gilg. Deer Cabbage.

The open, boggy hillsides of the region are clothed with a profusion of deer cabbage. Usually it occurs in masses to the exclusion of other hillside plants. Above timber-line it is much more sparingly distributed. (No. 1.)

Sambucus racemosa L. Elder.

Found sparingly distributed in the littoral zone associated with *Rubus spectabilis*, and again above timber-line on steep hillsides with *Ribes* and *Alnus*. Nowhere did this species occur in clumps, or form any considerable proportion of the flora. (No. 39.)

Viburnum pauciflorum Pyl. High-bush Cranberry.

The occurrence of this shrub is also very irregular and scattered. A few were found along the open margins of streams and about the edges of the tundra. (No. 54, foliage only.)

Valeriana sitchensis Bong. Valerian.

The herbaceous vegetation above timber-line is composed in part of this species. Collected on Montague Island. (No. 28.)

Arnica chamissonis Less.

Collected at the head of Port Nell Juan. (No. 49.)

Senecio pseudoarnica Less. Beach Senecio.

This large, heavy-leaved composite is a characteristic growth of the marine littoral. On the beaches it is associated with *Elymus*, *Lathyrus*, *Aquilegia*, *Arenaria*, and *Rubus spectabilis*. (No. 57.)

DISCUSSION OF DISTRIBUTION.

Two divisions of the Boreal Region are represented in the Prince William Sound district, the Hudsonian Zone and the Arctic-Alpine Zone.²

All the area covered by coniferous forests is comprised in the Hudsonian Zone, that is, all the country below timber-line. In the Sound region there is little uniformity in the altitude to which forests extend. This is chiefly due to the effects of slope exposure and the direction of the prevailing winds. On southern exposures and on low islands, free from the chilling effects of large masses of perpetual snow, timber-line may extend to an elevation of 2000 feet or more. On north exposures this line often drops to 500 or 1000 feet, and at the heads of some of the inlets as low as sea-level.

The two conifers which are uniformly present at timber-line are *Tsuga mertensiana* and *Picea sitchensis*. With these a few individuals of *Tsuga heterophylla* struggle to the limit of tree growth in some localities. With this forest occur either scattered through it or as a fringing growth on its margins the following shrubs: *Alnus sitchensis*, *Ribes bracteosum*, *Aruncus sylvester*, *Rubus spectabilis*, *Pyrus sitchensis*, *Pyrus diversifolia*, *Echinopanax horridum*, *Menziesia ferruginea*, *Cladothamnus pyrolaeiflorus*, *Vaccinium ovalifolium*, *Sambucus racemosa*, and *Viburnum pauciflorum*.

² For description of similar conditions, as prevailing in the Cook Inlet region of Alaska, see Osgood, North American Fauna No. 21, 1901, p. 59.

The only characteristically Hudsonian tree of general distribution is *Tsuga mertensiana*. *Chamaecyparis nootkatensis*, which is also a Hudsonian tree, is of sporadic occurrence in the region and on that account of little zonal significance. No typically Hudsonian shrubs, with the exception of *Vaccinium uliginosum*, were observed in the region, those occurring being widespread Boreal forms, together with a few stragglers from the Arctic-Alpine Zone.

The proportion of shrubs and perennial plants which occur from this region south through the Canadian Zone to the coast of Washington is large, nearly 90 per cent. One conifer, *Picea sitchensis*, accompanies these wide-spread species. This large proportion of boreal forest species occurring at the limit of tree growth makes the definition of a Hudsonian Zone very difficult. Since so many trees and shrubs extend through the whole Boreal region below the Arctic-Alpine Zone, the combination of the Canadian and Hudsonian zones into a Boreal forest gives us a term of more distributional significance and allows us to ignore the Hudsonian in districts where it is ill-defined.

The following species of trees and shrubs occur along the coast from Prince William Sound south at least to the coast of Washington:

<i>Tsuga heterophylla</i>	<i>Pyrus diversifolia</i>
<i>Picea sitchensis</i>	<i>Pyrus sitchensis</i>
<i>Myrica gale</i>	<i>Echinopanax horridum</i>
<i>Alnus sitchensis</i>	<i>Cornus canadensis</i>
<i>Ribes bracteosum</i>	<i>Menziesia ferruginca</i>
<i>Aruncus sylvester</i>	<i>Vaccinium ovalifolium</i>
<i>Rubus spectabilis</i>	<i>Sambucus racemosa</i>

The occurrence of this association of plants along this immense length of coast is in my opinion due rather to humidity than to temperature conditions. The rainfall in this coast strip, which is the heaviest in extra-tropical America, averages nearly the same throughout its whole length. On the coast of Washington it ranges from 80 to 130 inches. This is about the range of the rainfall at the few stations in Prince William Sound where records have been kept, and it is also close to that of the rainfall of the intermediate stations on the coast. The differences in temperature existing between the southern and the northern

portions of this coast strip are greater than those shown by the records of rainfall, but nevertheless surprisingly small, averaging only about 10° lower at Prince William Sound than on the coast of Washington. This small difference in temperature is remarkable in view of the great difference in latitude of these localities.

The great bulk of the animal life is confined to the forest area of the Hudsonian Zone. The mammals characteristic of this area are: *Sciurus hudsonicus petulans*, *Eutamias dawsoni orca* and *E. dawsoni insularis*, *Erethizon epixanthum myops*, *Mustela americana*, *Ursus americanus*, and *Myotis lucifugus*. Other species which occur chiefly in the forest are: *Microtus clymocetes*, *Putorius alascensis* and two species of *Sorex*. A large majority of the birds are confined to this area. The mammals confined to the littoral and riparian areas are *Microtus kadiacensis*, *Synaptomys dalli*, *Lutreola vison melampeplus*, *Lutra canadensis*, and *Ursus dalli*. *Sorex personatus streatori* and *S. obscurus alascensis* are abundant in this area. The most characteristic bird is the song sparrow which is not found away from the beach patches of Elymus. The northwest crow and Alaska bald eagle are also strictly littoral species.

The Arctic-Alpine Zone includes all the country above timber-line. The vegetation of this area consists chiefly of perennial herbs and small shrubs. These hardy plants form a narrow zone between timber-line and the lower limits of perpetual snow. The characteristic shrubs found in the region are the heathers, *Phyllodoce* and *Harrimanella*. *Alnus sitchensis*, *Ribes bracteosum*, *Vaccinium ovalifolium*, and *Rubus spectabilis* are the principal species which invade this zone from the forest area below. The characteristic herbaceous plants of the region above timber-line are *Spiraea pectinata*, *Lupinus nootkatensis*, *Sedum roseum*, *Valeriana sitchensis*, and a yellow-flowered *Castilleja*.

The mammals characteristic of the Arctic-Alpine are *Oreamnos*, *Marmota caligata*, and *Citellus plesius abusus*. Occasionally *Microtus* invades this zone; but except on Montague Island this genus occurs here sparingly.

The characteristic birds are rock ptarmigan, Hepburn leucosticte, and pipit. The rough-legged hawk seems to be confined to this zone, at least using it as its chief hunting-ground.

The evident floral areas of the region are four: the forest, tundra, littoral, and alpine. These divisions, with the exception of the alpine, are based chiefly on soil conditions. The tundra occupies wet swampy ground that the forest cannot invade, the complete saturation being fatal to tree growth. This is well shown by the stunted hemlocks and spruces growing on the edges of these tundras, where they have been dwarfed by the unfavorable conditions. The forest occupies the drier ground excepting a narrow littoral strip subject to periodical submergence and areas of very recent formation. These littoral formations are of a gravelly construction and are, except for short periods, the driest areas to be found in the region. The Alpine Zone includes the area above timber-line which, owing to its low temperature, cannot support conifers. The tundra, forest, and littoral associations are all parts of the Hudsonian. The forest and the alpine associations have already been characterized sufficiently.

The tundra occurs as islands in the forest area and consists chiefly of a heavy covering of mosses and shrubs which hold much moisture. The characteristic shrubs of this area are *Vaccinium uliginosum* and *Myrica gale*. A dwarf *Salix* is also quite characteristic. The heathers, *Phyllodoce* and *Harrimanella*, are usually an important part of the tundra association. About the edges of these bogs a scattering border of such shrubs as *Cladothamnus*, *Viburnum*, *Pyrus sitchensis*, *Vaccinium ovalifolium*, and *Menziesia* are usually to be found; but they are not invaders, not even to the extent of *Tsuga* or *Picea*.

The littoral zone is characterized by species which are partial to salt-water influences, namely: *Elymus mollis*, *Senecio pseudoarctica*, *Lathyrus maritimus*, and *Arenaria peploides*. Associated with these, but of less maritime habits, are two large umbellifers, *Heracleum* and *Coelopleurum*, and the shrubs *Sambucus racemosa*, *Ribes triste*, *Rubus spectabilis*, a shrubby *Salix*, and *Alnus sitchensis*. With these species are usually associated a host of herbaceous plants characteristic of these gravelly areas. In a region so mountainous and arctic as Prince William Sound, land slips occur frequently. These produce many changes in the definition of plant associations. The littoral changes due to the

tides are of minor extent but of some floral importance. These denuded and newly made areas exhibit plant succession in all its stages. The succession taking place on hillsides is somewhat different from that occurring on sand-spits and along streams.

The usual succession taking place on land slides in forest areas consists first of a growth of ferns (*Athyrium*) and a few herbs. Later *Rubus spectabilis*, *Ribes bracteosum*, and *Vaccinium ovalifolium* invade the slide, and these in turn are replaced by *Alnus sitchensis*. This large shrub or tree holds the ground for years until replaced by the slow immigration of conifers. The riparian succession consists of more species and stages. This succession usually runs from a beginning of *Epilobium* and *Lupinus* through *Salix* and *Alnus*, then *Populus*, and finally *Picea*. Varying conditions of soil and moisture change this succession somewhat, the conditions sometimes being unfavorable to some of the stages.

The affinities of the flora of the Prince William Sound district are clearly with the coast region to the southeast through which most of the species range still farther southward. Only a small percentage of the plants range northward or extend to the adjacent Asiatic coast. The few species of mammals which reach the region have apparently a southeastern derivation, although their affinities are rather with northern forms. *Ursus dalli* and the forms of *Microtus* appear to be of Asiatic derivation.



Hunting grounds at Northeast Bay, Hinchinbrook Island, June 28, 1908. This is typical of the country prevalent in the Prince William Sound region. (See pp. 324 and 329.)

BIRDS OF THE 1908 ALEXANDER ALASKA EXPEDITION

WITH A NOTE ON THE AVIFAUNAL RELATIONSHIPS
OF THE PRINCE WILLIAM SOUND DISTRICT

BY

JOSEPH GRINNELL.

(Contribution from the Museum of Vertebrate Zoology of the University of California.)

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INTRODUCTION.

In 1908, Miss Annie M. Alexander organized a third expedition for the purpose of making collections of the vertebrates of Alaska. The territory selected for exploration was the Prince William Sound region. This lies at the head of the Gulf of Alaska, between longitudes 145° and 149°, and latitudes 60° and

61°. The Sound contains an isolated archipelago, of the fauna of which but little was previously known. Moreover the Hudsonian Zone is here of relatively large area and continued to the east and west by very narrow coastal extensions, being thus so isolated as to promise interesting problems in distribution and speciation. This has proved to be true especially of the birds of the Expedition.

The party consisted of Joseph Dixon, Edmund Heller, Allen E. Hasselborg, Miss Louise Kellogg, and Miss Annie M. Alexander. Cordova was reached on June 3, 1908, and the last member of the party left Valdez September 22. Between these dates as many of the islands of the Sound, and mainland points, were visited as time permitted. (See map, plate 32.) The following is the itinerary of the Expedition:

Cordova Bay, June 3 to 7.	Hanning Bay, Montague Island, July 23 to Aug. 1.
Head of Cordova Bay, June 8 to 15.	Hoodoo Island, Aug. 3 to 4.
Canoe Passage, Hawkins Island, June 17 to 24.	Latouche Island, Aug. 5 to 9.
Northeast Bay, Hinehinbrook Isl- and, June 25 to July 3.	Port Nell Juan, Aug. 11 to 22.
Zaikof Bay, Montague Island, July 5 to 10.	Drier Bay, Knight Island, Aug. 24 to 27.
Graveyard Point, Montague Island, July 12.	Chenega Island, Aug. 29 to Sept. 1.
Stockdale Harbor, Montague Isl- and, July 13.	Knight Island, Sept. 1 to 3.
Green Island, July 14 to 15.	Disc Island, Sept. 3 to 5.
Latouche, Latouche Island, July 16 to 21.	Naked Island, Sept. 6 to 8.
	Storey Island, Sept. 8 to 9.
	Ellamar, Sept. 9 to 12.
	Valdez Narrows, Sept. 12 to 21.

Not all members of the party remained until the last date. Miss Kellogg left Latouche for home on August 2. Mr. Dixon and Miss Alexander went by launch to Valdez on August 27. Dixon left there for home on the 28th; but Miss Alexander remained in the vicinity of Valdez until September 5, making a trip up the Eagle Government Trail to the Copper River divide. After August 27 Messrs. Heller and Hasselborg constituted the party left with the sail boat which was used throughout the season. The season's work in the Prince William Sound region was brought to a close September 22.

The ornithological material obtained by the 1908 Expedition

consists of the field note-books of each of the party, 500 bird skins and ten sets of eggs, part of these with nests. All of this material, together with the mammals, has been donated by Miss Alexander to the University of California Museum of Vertebrate Zoology, and upon it the following report on the birds is based. Specimens of 84 out of the 89 species listed are represented in the collections. A detailed physiographic account of the region has been given by Edmund Heller in connection with his report upon the mammals of the Expedition. (See Univ. Calif. Publ. Zool., 5, no. 11, pp. 327-335.)

The terms employed in color descriptions conform to Ridgway's "Nomenclature of Colors," 1886 edition. Measurements are in millimeters unless otherwise specified. The accompanying photographs were taken by Miss Alexander.

CHECK-LIST OF THE SPECIES OBSERVED.

- | | |
|--|--|
| 1. <i>Colymbus holboellii</i> (Reinh.) | 26. <i>Histrionicus histrionicus</i>
(Linn.) |
| 2. <i>Colymbus auritus</i> Linn. | 27. <i>Oidemia perspicillata</i> (Linn.) |
| 3. <i>Gavia immer</i> (Brünn.) | 28. <i>Oidemia deglandi</i> Bonap. |
| 4. <i>Gavia pacifica</i> (Lawr.) | 29. <i>Branta canadensis occidentalis</i>
(Baird) |
| 5. <i>Gavia stellata</i> (Pont.) | 30. <i>Ardea herodias fannini</i> Chapm. |
| 6. <i>Lunda cirrhata</i> (Pall.) | 31. <i>Grus canadensis</i> (Linn.) |
| 7. <i>Fratercula corniculata</i> (Naum.) | 32. <i>Phalaropus fulicarius</i> (Linn.) |
| 8. <i>Phalaris psittacula</i> (Pall.) | 33. <i>Lobipes lobatus</i> (Linn.) |
| 9. <i>Synthliboramphus antiquus</i>
(Gmel.) | 34. <i>Gallinago delicata</i> (Ord) |
| 10. <i>Brachyramphus marmoratus</i>
(Gmel.) | 35. <i>Pisobia aurita</i> (Lath.) |
| 11. <i>Brachyramphus brevirostris</i>
(Vig.) | 36. <i>Pisobia minutilla</i> (Vieill.) |
| 12. <i>Cephus columba</i> Pall. | 37. <i>Ereunetes mauri</i> Cab. |
| 13. <i>Uria troile californica</i> (Bryant) | 38. <i>Totanus melanoleucus</i> (Gmel.) |
| 14. <i>Stercorarius parasiticus</i> (Linn.) | 39. <i>Totanus flavipes</i> (Gmel.) |
| 15. <i>Rissa tridactyla pollicaris</i>
Ridgw. | 40. <i>Helodromas solitarius cinnamomeus</i> (Brewst.) |
| 16. <i>Larus glaucescens</i> Naum. | 41. <i>Heteractitis incanus</i> (Gmel.) |
| 17. <i>Larus brachyrhynchus</i> Rich. | 42. <i>Actitis macularia</i> (Linn.) |
| 18. <i>Sterna paradisaea</i> Brünn. | 43. <i>Aegialitis semipalmata</i>
(Bonap.) |
| 19. <i>Oceanodroma furcata</i> (Gmel.) | 44. <i>Arenaria melanocephala</i> (Vig.) |
| 20. <i>Phalacrocorax pelagicus</i> Pall. | 45. <i>Haematopus bachmani</i> Aud. |
| 21. <i>Mergus americanus</i> Cass. | 46. <i>Canachites canadensis atratus</i>
n. ssp. |
| 22. <i>Anas platyrhynchos</i> Linn. | 47. <i>Lagopus rupestris kelloggae</i>
n. ssp. |
| 23. <i>Mareca americana</i> (Gmel.) | 48. <i>Circus hudsonius</i> (Linn.) |
| 24. <i>Nettion carolinensis</i> (Gmel.) | |
| 25. <i>Harelda hymalis</i> (Linn.) | |

49. *Accipiter velox* (Wils.)
 50. *Archibuteo lagopus sancti-johannis* (Gmel.)
 51. *Haliaeetus leucocephalus alascanus* Towns.
 52. *Falco columbarius* Linn.
 53. *Bubo virginianus lagophonus* (Oberh.)
 54. *Ceryle alcyon caurina*, n. ssp.
 55. *Dryobates pubescens glacialis* n. ssp.
 56. *Selasphorus rufus* (Gmel.)
 57. *Empidonax trailli alnorum* Brewst.
 58. *Pica pica hudsonia* (Sab.)
 59. *Cyanocitta stelleri stelleri* (Gmel.)
 60. *Corvus corax principalis* Ridgw.
 61. *Corvus brachyrhynchos caurinus* Baird
 62. *Pinicola enucleator flammula* Hom.
 63. *Loxia leucoptera* Gmel.
 64. *Leucosticte tephrocotis littoralis* Baird
 65. *Acanthis linaria linaria* (Linn.)
 66. *Calcarius lapponicus alascensis* Ridgw.
 67. *Passerculus sandwichensis alaudinus* Bonap.
 68. *Zonotrichia coronata* (Pall.)
 69. *Junco hyemalis hyemalis* (Linn.)
 70. *Melospiza melodia kenaiensis* Ridgw.
 71. *Melospiza lincolni gracilis* (Kittl.)
 72. *Passerella iliaca sinuosa* n. ssp.
 73. *Hirundo erythrogaster palmeri* Grinn.
 74. *Tachycineta thalassina lepida* Mearns
 75. *Vermivora celata lutescens* (Ridgw.)
 76. *Dendroica aestiva rubiginosa* (Pall.)
 77. *Dendroica coronata hooveri* McGreg.
 78. *Dendroica townsendi* (Townsend.)
 79. *Wilsonia pusilla pileolata* (Pall.)
 80. *Anthus rubescens* (Tunst.)
 81. *Cinclus mexicanus unicolor* Bonap.
 82. *Nannus hiemalis pacificus* (Baird)
 83. *Certhia americana montana* Ridgw.
 84. *Penthestes atricapillus turneri* (Ridgw.)
 85. *Penthestes rufescens vivax* n. ssp.
 86. *Regulus satrapa olivaceus* Baird
 87. *Regulus calendula grinnelli* Palmer
 88. *Hyllocichla guttata guttata* (Pall.)
 89. *Ixoreus naevius meruloides* (Swains.)

GENERAL ACCOUNTS: DISTRIBUTION, BIOLOGICAL
 NOTES, VARIATION.

Colymbus holboelli (Reinhardt). Holboell Grebe.

Not noted until September 1 and subsequently, when observed by Heller sparingly about Chenega and Storey islands, and at Ellamar and Valdez Narrows. An immature specimen (no. 1109) was secured at Ellamar, September 9.

Colymbus auritus Linnaeus. Horned Grebe.

Heller saw a few at Valdez Narrows in September, and obtained an immature specimen (no. 1110), September 18. The

stomach of this bird contained nothing but some grebe feathers, probably swallowed during preening.

Gavia immer (Brünnich). Common Loon.

Heller saw two flying over at short range at Northeast Bay, Hinchinbrook Island, the last of June. Two more seen at Green Island the middle of July.

Gavia pacifica (Lawrence). Pacific Loon.

An immature female (no. 1116) shot by Heller in Valdez Narrows, September 18.

Gavia stellata (Pontoppidan). Red-throated Loon.

Common, and thought to be breeding, about the head of Cordova Bay. Two adult specimens taken there June 9 and 10 (nos. 1117, 1118) have the entire lower surface, where it is normally snowy white, of a bright ferruginous tinge. This color is intensest on the exposed portions of the feathers, suggesting adventitious origin. Dr. M. Vaygouny, of the Department of Chemistry of the University of California, determined by analysis that the discoloration is due to the presence of ferric oxide (Fe_2O_3), probably deposited from the water of the marshes in the immediate locality. As the red-throated loon molts in the spring, the discoloration must have been acquired since about April 1; and furthermore, the species probably does not arrive from the south until that date at earliest. Therefore the deposit had been surprisingly rapid. The iron oxide in the water is said to result from bacterial action, and precipitation is liable to occur freely on organic substances of certain textures. Evidently the loon's feathers are especially favorable. The same deposit was noted to a less extent on certain other birds of the same locality, as hereinafter noted.

The red-throated loon was seen elsewhere but once, by Heller, at Green Island.

Lunda cirrhata (Pallas). Tufted Puffin.

Not uncommon around Montague Island, where it was believed to be nesting at Stockdale Harbor. Noted also near

Hinchinbrook Island, at Green Island, off Knight and Latouche islands, and near the mouth of Port Nell Juan.

Fratercula corniculata (Naumann). Horned Puffin.

Seen in numbers near Zaikof Bay, Montague Island, and around Green Island, where an adult female (no. 1124) was secured on July 15; several small flocks seen at Drier Bay, Knight Island, the first part of September; also a few at Chenega Island.

Phaleris psittacula (Pallas). Paroquet Auklet.

Dixon secured a pair of adults (nos. 1176, 1177) at Green Island July 13 from a flock of six or eight on the water near the beach. At a distance they had much the appearance of murrelets. Six seen off Knight Island August 27.

Synthliboramphus antiquus (Gmelin). Ancient Murrelet.

At the entrance of Port Nell Juan, August 11, Dixon saw a single individual of this species, the only one noted in the region.

Brachyramphus marmoratus (Gmelin). Marbled Murrelet.

A common bird in the Prince William Sound region, occurring in pairs and small flocks in the open sea-channels. At the head of Cordova Bay a dozen or so were observed; one shot, disgorged fishes three inches in length. In the waters around Hinchinbrook, Montague, Knight, Chenega, and Disc islands, the murrelets were noted as a regular feature of the pelagic avifauna. The species occurred also well up into Port Nell Juan and through Valdez Narrows.

At Montague, Dixon records rowing within ten yards of a marbled murrelet that appeared to have a school of small fish completely at its mercy. The fishes were in a mass about as large as a bushel basket near the surface of the water. The bird kept diving down, back and across, with the result that the fishes acted as though thoroughly frightened; at least they made no attempt to scatter or to seek safety in the depths.

Five adult murrelets were secured (nos. 1163-1167) of dates from June 8 to August 13, all in summer plumage.

Brachyramphus brevirostris (Vigors). Kittlitz Murrelet.

But one, an adult female (no. 1168), taken by Miss Alexander at the mouth of Port Nell Juan, August 11.

Cepphus columba Pallas. Pigeon Guillemot.

The single specimen preserved (no. 1127, adult male, Stockdale Harbor, Montague Island, July 13), as well as other Alaskan examples of this species at hand, is decidedly blacker than specimens from the coast of California. There appear to be also differences in proportions; but the inadequacy of the available material does not warrant conclusions as to their constancy.

The pigeon guillemot was common along rough sea-coasts, and was undoubtedly breeding at several points. At Stockdale Harbor a nesting place was situated up under the dangling roots of a tree that stood on the verge of the cliff. The bird was seen flying anxiously about the site, with a long yellow marine worm hanging from her bill. With a sudden swoop upwards she alighted and disappeared among the tree roots. This is an exceptional sort of nesting site.

The species was further noted around Hawkins, Hinchinbrook, Green, Latouche, and Knight islands, and at the mouth of Port Nell Juan.

Uria troile californica (Bryant). California Murre.

A single specimen (female adult, no. 1114) secured by Heller at Drier Bay, Knight Island, September 3, is darker colored and has a greater wing-length than examples from the Farallone Islands, California. But with the scanty material at hand I am not certain but that such differences are included in individual variation. Two other murrelets were seen by Heller off Knight Island, September 1 and 2. Common near Ellamar, September 9; and a few at Valdez Narrows, September 12 to 21.

Stercorarius parasiticus (Linnaeus). Parasitic Jaeger.

An adult in the dark phase of plumage was secured by Miss Alexander near Canoe Passage, Hawkins Island, June 23 (no.

1126). This and an accompanying individual were flying about a park-like meadow, where they may have been nesting. Heller noted one, September 9, at Ellamar.

Rissa tridactyla pollicaris Ridgway. Pacific Kittiwake.

Kittiwakes were first met with August 22 in the mouth of Port Nell Juan; an adult was secured (no. 1158). Thereafter the species was commonly observed. Heller records it from Knight, Chenega, Naked, and Storey islands, and at Ellamar; in Valdez Narrows it was abundant as late as September 21.

Larus glaucescens Naumann. Glaucous-winged Gull.

The commonest gull of the region, occurring about sandspits, and at the mouths of streams, as well as along the outer reefs; common at Cordova, doubtless nesting near by, for eggs were brought in by the natives, June 3 to 7. At the head of Cordova Bay many were observed on the mud flats at the mouth of the river. Around Hawkins, Hinchinbrook, Montague, Green, and Latouche islands the species was always more or less in evidence, and Heller found it conspicuously abundant at Chenega, Disc, and Naked islands, and at Ellamar and through Valdez Narrows, up to September 21. Many were seen by him at the mouths of creeks at Drier Bay, Knight Island, and at Port Nell Juan feeding on spawn of the humpbacked salmon.

On August 3 at Hoodoo Island, where an adult specimen (no. 1123) was taken, Dixon records some interesting observations. Salmon were running up the creek. The dog salmon had about all spawned and the humpbacks were coming in and taking their places. The glaucous-winged gulls would wait around on the sand-bar until a salmon started to go up a shallow place. Then one of the birds would jab at the salmon's eye, driving the struggling fish on shore, where the rest of the gulls helped to devour it. The bird shot had its mouth and throat full of salmon eggs. These must have been picked up as they floated over the riffles, for no freshly killed female salmon were seen. There were at least one hundred gulls gathered at this creek, and living on salmon and salmon eggs.

Larus brachyrhynchus Richardson. Short-billed Gull.

Not so numerous in the region as the glaucous-winged gull; a few seen along rocky beaches at Cordova Bay; a number nesting at Hawkins, Hinchinbrook, and Montague islands. Observed along salmon creeks on Hoodoo Island, and at the head of Port Nell Juan. Four specimens preserved: two adults (nos. 1159, 1160), one full grown young-of-the-year, August 16 (no. 1162), and a downy young one (no. 1161) caught by Miss Kellogg at Cedar Bay, Hawkins Island, June 23. This and another young one were discovered swimming near shore through the conspicuous demonstrations of their parents as the place was approached.

In the same locality a set of three eggs was found June 17. The nest was on the ground in the grass on a sand-spit. The eggs measure: 59×41.8 , 58.7×40.4 , 57.4×41.6 . The three are alike in coloration: the ground-color is olive-buff with a broccoli brown tinge; the spots are well defined, irregularly roundish, ranging from a diameter of 4 mm. down to mere points; the color of markings varies from bistre through Prout brown and fawn color to drab gray and ecru drab. At Zaikof Bay, Montague Island, July 5, two sets of three eggs each were found on a sand-spit; but incubation was so far advanced that the shells could not be preserved intact.

The short-billed gull has been reported as nesting in trees, but the above instances show that, in this region at least, even where trees are abundant and stand close to the water, the nests are located on the ground.

Sterna paradisaea Brünnich. Arctic Tern.

First seen August 9, when a flock was observed feeding about some reefs off Knight Island; August 12 an adult male in full breeding plumage (no. 1128) was secured in Port Nell Juan; common at the mouth of this port August 22.

Oceanodroma furcata (Gmelin). Forked-tailed Petrel.

In Valdez Narrows a few of these petrels came around Heller's boat near the beach every evening, picking up refuse from the water; adult male (no. 1398) taken September 18.

Phalacrocorax pelagicus Pallas. Pelagic Cormorant.

Noted singly or in pairs at Hawkins, Montague, Green, Latouche, Knight, Chenega, Naked, Disc, and Storey islands, mouth of Port Nell Juan, Ellamar and Valdez Narrows. Of three skins (nos. 1106-1108) taken by Heller at Valdez Narrows September 13 and 18, one is a brown-plumaged immature, and the other two are probably also birds-of-the-year though not so brown. No white flank patches and no white plumes are present; the feathers about the head and neck are steely, with fuscous tips dulling the blackness.

Mergus americanus Cassin. American Merganser.

At Cordova Bay and Hinehinbrook Island flocks of three to thirty often seen. At the latter place an old bird with a brood of small young was discovered on an inland pond near the beach. At Hawkins Island Miss Kellogg secured a downy young (no. 1148) June 21, from a brood on the open sea but not far from shore. A flock was seen at Stockdale Harbor, Montague Island; and a female with eight young, and other individuals of the species, at the head of Port Nell Juan.

Anas platyrhynchos Linnaeus. Mallard.

A few noted at the head of Cordova Bay, where there was good evidence of their breeding, four seen at the head of Port Nell Juan, and three in Valdez Narrows near the glacier.

Mareca americana (Gmelin). Baldpate.

Heller saw one in a mixed flock of ducks at the head of Port Nell Juan.

Nettion carolinensis (Gmelin). Green-winged Teal.

A few seen by Heller in Port Nell Juan and at Disc Island. Several flocks noted in Valdez Narrows. At Eleanor Island, September 5, an adult male (no. 1115) in fall plumage was secured.

Harelda hyemalis (Linnaeus). Old-squaw.

Noted only in Cordova Bay, where several flocks of female or immature birds were seen near the mouth of the river. A specimen (no. 1122), saved by Miss Alexander, June 15, is in worn, dilapidated plumage, suggesting that the birds remaining in Prince William Sound through the summer are of impaired vitality or non-breeders.

Histrionicus histrionicus (Linnaeus). Harlequin Duck.

Seen throughout the summer in many of the bays and channels of the Sound, where it doubtless regularly breeds. At Cordova Bay a flock of about twenty frequented a tide flat. Several similar flocks were noted around Hawkins and Hinchinbrook islands. On the latter a nest was found July 1 about a mile up a creek flowing into Northeast Bay. This nest, as described by Dixon, was placed in the grass that grew out from the roots of an upturned tree. There were two eggs; but a later visit to the site showed it to have been devastated in the meantime by some animal. Near the same place a partial albino male was seen several times; it was mated to a normally plumaged female. Rather large flocks were encountered around Montague Island, where, in a lagoon at Hanning Bay, a female with six young was reported by Heller. Observed also at Green Island, Port Nell Juan, and Valdez Narrows. A single specimen was preserved (no. 1121, male adult), from the head of Cordova Bay.

Oidemia perspicillata (Linnaeus). Surf Scoter.

Observed in flocks at several of the bays. Although seen in each month of summer, no positive evidence was forthcoming as to its breeding in the region. Noted at Cordova Bay, Hawkins, and Hinchinbrook islands, and at Valdez Narrows, where Heller secured a full-plumaged adult male (no. 1112), September 19. Its stomach contained small mussels.

Oidemia deglandi Bonaparte. White-winged Scoter.

Flocks seen at intervals throughout the summer in many of the bays and channels. Abundant at Hawkins Island; less so at Hinchinbrook, Naked, and Storey islands, at the mouth of Port Nell Juan and near Ellamar. At Valdez Narrows, September 19, Heller secured a full plumaged adult male (no. 1113). Its stomach contained fragments of clam shells.

Branta canadensis occidentalis (Baird). White-cheeked Goose.

Only this one species of goose was seen in the Prince William Sound region. At the head of Cordova Bay there were a few individuals, as also at Graveyard Point, Montague Island; and at Chenega Island. Flocks of from five to eight were noted at Hinchinbrook Island. On Hawkins Island there were many pairs, and some flocks of three to six each. Two geese shot by Heller were easily approached without stalking. Dixon found a nest with six eggs June 18 on this island, near Canoe Passage. It was located at the head of a tide slough at the edge of the woods. The nest was made up of moss and down and was placed in the open near the base of a hemlock. The eggs would have hatched in two or three days.

On June 22, Dixon records as follows: "In crossing some marshy flats we came upon six geese, five of which flew noisily away; but the sixth came gabbling toward us. We soon saw that her unusual tameness was due to her anxiety in regard to six or eight newly hatched goslings that scrambled from under our feet and disappeared with a splash into a nearby pond. I walked up to within twenty-five feet of the mother as she came with her head down in the usual manner of an irate goose. She followed us for some distance when we left."

On June 21, also on Hawkins Island, Miss Kellogg flushed an old goose from a nest in the tall grass near the beach. There were five newly hatched young. One of these, taken as a specimen (no. 1131), is identical in coloration with a downy young one from the Sitkan district.

The four adults taken measure as follows:

No.	Sex	Locality and Date	Wing	Tail	Tarsus	Culmen	Bill from Nostril	No. Tail Feathers
1130	♂	Hawkins Id., June 18	457	165	83.8	48.0	25.4	18
1132	♀	Hawkins Id., no date; head only	.....	.....	.....	45.3	24.0	.
1133	♂	Head of Cor- dova Bay, June 10	437	156	83.6	47.9	23.1	14
1129	♀	Hawkins Id., June 18	396	148	69.6	41.1	21.1	16

Two adult males from Admiralty Island (Sitkan District) previously referred by me to *occidentalis* (Univ. Calif. Publ. Zool., V, p. 199), have 18 tail-feathers each. Neither the Prince William Sound nor the Sitkan examples have any trace of "white collar around lower neck," this being emphasized by Coues and Ridgway as a character of *occidentalis*. Also, the white cheek patches are completely confluent across the throat, though in one example there are median extensions of black mottling along the midthroat which nearly meet.

The Prince William Sound geese are still darker, even, than the Sitkan district birds, with abruptly white belly and crissum. They thus differ from *canadensis* and *hutchinsi*, and resemble *minima*. But they lack entirely the white collar of the latter. It will be noted from the accompanying table of measurements that the Prince William Sound birds are decidedly smaller than the Sitkan district examples, the former being in this respect intermediate between the type of *occidentalis* and *minima*, but nearer the latter. Taking both coloration and size into account, the systematic status of these birds is decidedly unsatisfactory. I am using the name *occidentalis* for them only as a makeshift. A revision of the geese of the *canadensis* group, based upon extensive material, is much needed.

Ardea herodias fannini Chapman. Northwestern Blue Heron.

Miss Alexander obtained an adult male of the northwestern blue heron at Canoe Passage, Hawkins Island, June 22 (no. 1119), which is characterized by extremely dark coloration, practically identical with that of adults from the Sitkan district.

It measures: wing, 493; tarsus, 160; culmen, 124. Four other individuals were seen by Miss Alexander on Hawkins Island, three by Heller flying across Cordova Bay; one at Zaikof Bay, Montague Island; and one at Chenega Island. The species is thus quite uncommon in this, the northwesternmost extreme of its range.

Grus canadensis (Linnaeus). Little Brown Crane.

Dixon secured an adult at the head of Cordova Bay, June 12 (no. 1125). As it was shot through the body with a rifle the sex was indeterminable. Measurement before skinning showed a total length of 885 millimeters and a spread of 1700. The dry skin measures: wing, 446; tarsus, 178; culmen, 97. Heller saw a flock of fifteen flying along the beach at Hawkins Island, the only other record of the species.

Phalaropus fulicarius (Linnaeus). Red Phalarope.

One shot by Dixon at Northeast Bay, Hinchinbrook Island, July 1, from a sandy beach in the lee of a small island during a storm. It is an adult female (no. 1405), in worn summer plumage, but with some new white feathers, in sheaths, just appearing on the lower parts. Its occurrence in this region at this date was evidently abnormal.

Lobipes lobatus (Linnaeus). Northern Phalarope.

Seven adult specimens (nos. 1201-1207) obtained at the head of Cordova Bay, June 11 to 14. This was the only point where the species was found breeding; and here, on the tidal marshes, they were fairly common. Three have the lower surface of the body rusty-stained, as in the case of the loons from the same place before described. Two sets of four eggs each were found. In one set the eggs were overcast with the deposit of iron oxide, which also discolored the grass of the nest and the surroundings. Otherwise the five eggs preserved have markings of the normal color and pattern.

Not again met with until the fall migrations were well under way. Off Hanning Bay, Montague Island, July 22, several

hundred were seen feeding in flocks along tide rips where a full-grown bird-of-the-year (no. 1208) was secured August 2; a large flock off Latouche Island August 1; abundant along Port Nell Juan August 21; still abundant at Knight Island, September 1 to 3, and Valdez Narrows September 12 to 21.

Gallinago delicata (Ord). Wilson Snipe.

Heller saw two Wilson snipe at Valdez Narrows September 18, and secured one (no. 1196).

Pisobia aurita (Latham). Sharp-tailed Sandpiper.

But two examples of this Asiatic species were seen and both secured (nos. 1330, 1331, females) by Heller at Valdez Narrows September 18. To make sure of the identification, I sent no. 1330 to Mr. H. C. Oberholser, who confirmed the determination as above. This species so closely resembles the pectoral sandpiper that it may be easily confused with the latter; but the abruptly defined, bright chestnut crown-patch boldly black-streaked, and the ruddy brown suffusion across the chest and along the sides, minutely flecked with dusky, provide distinguishing characters for *P. aurita*. The specimens I judge to be in first winter plumage, that is, full juvenal carried over.

This species has been previously recorded from the mainland of Alaska only on the shores of Bering Sea. The present is apparently the easternmost record for Alaska.

Pisobia minutilla (Vieillot). Least Sandpiper.

A single female in worn adult plumage from Green Island, July 15 (no. 1397), was the only individual observed at the time. Several noted at Hanning Bay, Montague Island, July 30. At the head of Port Nell Juan the species had become common by the middle of August.

Ereunetes mauri Cabanis. Western Sandpiper.

Two specimens obtained: no. 1376 (a female in worn adult plumage, with many fresh winter feathers coming in), by Miss Kellogg at Northeast Bay, Hinchinbrook Island, July 4; and no. 1395 (a male in complete juvenal plumage) by Dixon, July

28, at Hanning Bay, Montague Island. Several others seen in the latter locality.

Totanus melanoleucus (Gmelin). Greater Yellow-legs.

Several pairs seen at Hanning Bay, Montague Island, the last of July, and two secured: an adult female (no. 1200), in adult summer plumage (a few winter feathers coming in), July 24, by Miss Alexander; and a male in full juvenal plumage (no. 1199), July 28, by Dixon. It would of course be unsafe to conclude from the above facts that the species had bred anywhere in the immediate region.

Totanus flavipes (Gmelin). Lesser Yellow-legs.

A full-grown juvenal (no. 1198) taken by Miss Alexander, July 24, at Hanning Bay, Montague Island, and one seen by Heller at a pond near the mouth of a river at the head of Port Nell Juan.

Helodromas solitarius cinnamomeus (Brewster).

Western Solitary Sandpiper.

A female (no. 1197) in full juvenal (or first winter plumage) taken by Miss Alexander at the edge of a small pond at an altitude of several hundred feet at Hanning Bay, Montague Island, July 30. This specimen is extremely dark in both dorsal ground-color, and in the spotting of cinnamon; in fact it is darker than any other example available for comparison. The peculiar white marbling on the inner web of the first primary towards its base is present, but is not so extensive as in some other specimens of *cinnamomeus*.

Heteractitis incanus (Gmelin). Wandering Tattler.

Five adults (nos. 1189-1193) secured July 7 to 28 at Hanning and Zaikof bays, Montague Island, are all in full breeding plumage. On July 28 Dixon secured a half-grown juvenal male (no. 1194) near Hanning Bay. The wing and tail quills of this bird are only partly grown, and plenty of grayish-mottled natal down adheres to the tibiae, throat, sides of head, hind neck and

forehead. The down of the head is leaden gray, whitish tipped. The juvenal plumage just being acquired is not different from the plumage of the full-grown fall immatures common in collections. The taking of this young specimen establishes another known breeding station for the species (see Osgood, *Auk*, XXIV, 1907, p. 340), although the actual eggs and nest remain to be discovered. Another juvenal, though full-grown (no. 1195) was secured by Miss Alexander at an elevation of 2450 feet, at Thompson's Pass, on the Eagle Government Trail, August 31. This was a considerable distance from the exposed rocky reefs of the ocean shore, with which physiographic features the wandering tattler is ordinarily closely associated.

Dixon records the following in regard to an adult tattler secured on Montague Island July 23, near Hanning Bay: "I found the bird in a park on the mountain side at an altitude of 400 feet. As soon as I appeared on a ridge several hundred yards from him, he flew up into a tree and began to 'tattle.' As I came nearer he flew out to meet me, scolding as he came. He flew around above me and then went back and lit on the very tip of a tree where he bobbed up and down."

The species was also seen at the mouth of Port Nell Juan, at Disc and Storey islands, and at Valdez Narrows.

***Actitis macularia* (Linnaeus). Spotted Sandpiper.**

At the head of Cordova Bay, June 10 to 15, this sandpiper was found to be common and breeding. Three adult males were secured (nos. 1209, 1210, 1212); and two sets of eggs were taken on the marshes, June 14 and 15. A nest was found also on a gravel bar in a creek delta on Hinchinbrook Island. An adult male (no. 1211) was taken at Hanning Bay, Montague Island, July 27, and two others were seen on the 24th. Two two-thirds grown juvenals (nos. 1214, 1215), with natal down still adhering to head, neck, tail, and tibiae, were taken August 16, at the head of Port Nell Juan. These were part of a family of five adults and young. Two other specimens (nos. 1213, 1216) were taken in the same locality August 14 and 16. Eight were noted by Dixon along the beach here in one day.

Aegialitis semipalmata (Bonaparte). Semipalmated Plover.

An adult-plumaged male (no. 1224) secured at the head of Cordova Bay, June 13; and four specimens (nos. 1225-1228) taken at Hanning Bay, Montague Island, July 24 to 31. Two of the latter are adults and two are full-grown juvenals. All were doubtless migrants.

Arenaria melanocephala (Vigors). Black Turnstone.

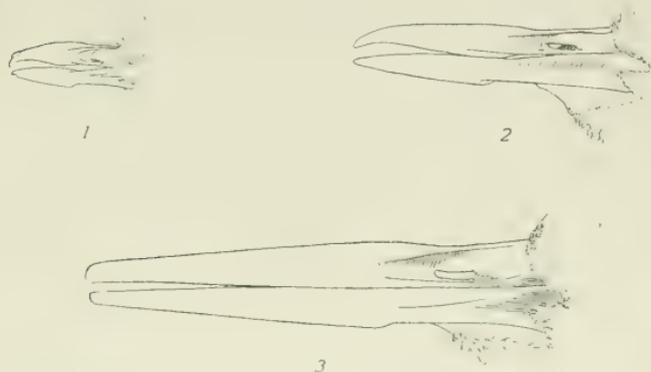
Most numerous at Hanning Bay, Montague Island, where four adult specimens were taken July 25 and 28 (nos. 1219-1221, 1223). On August 1, Dixon noted a flock of about thirty on an outlying, kelp-covered rock, and comments on how astonishingly well they blended with the rocks. At thirty yards they could not be seen till they moved. Turnstones were also seen on reefs at Knight Island, August 10, and in Port Nell Juan, August 22.

At Latouche Island Miss Alexander secured a full-grown juvenal female (no. 1222) on August 8. This specimen has the head, neck and chest solid, dull, blackish brown; feathers blackish-centered, lighter edged, but with no white flecking as in adults. Back, scapulars, and wing-coverts same, but feathers faintly margined with dull white. Whole tone of dark parts in juvenal much paler than in adult, sepia rather than sooty seal brown. The plumage of the dorsum presents a distinct metallic gloss of olive, not so evident in adult.

Haematopus bachmani Audubon. Black Oystercatcher.

Common at Cedar Bay, Hawkins Island, where four adult specimens (nos. 1149, 1150, 1154, 1155) were secured, June 17 to 21. On July 18 Miss Kellogg obtained a brood of three downy young (nos. 1151-1153). These were discovered from a distance following along the pebbly beach in the wake of one of their parents. The small size of these young leads to the belief that they could not have been more than a day old. A conspicuous calcareous nodule is borne on the culmen, one millimeter short of its tip, and the bills are notably curved, almost hooked. (See fig. 1.) The natal plumage is below dull grayish, lightest on

the belly, and blackening on the fore-neck; the down above is black at the base, becoming dull light ochraceous at the tips; the thighs and crissum are mottled with whitish; the effect is darkest on the hind neck, and thence two solid black stripes extend down the middle of the back; the light mottlings are rustiest on the wings, flanks, and rump. In general, there is a curious pepper-and-salt effect. The down is abundant and covers the entire skin, traces of apteria showing only on the sides of the hind neck in front of the wings.



Figs. 1, 2, 3.—*Haematopus bachmani*, showing changes in outline of mandibles with growth; $\times 1$. Fig. 1, no. 1151, natal; fig. 2, no. 1157, half-grown juvenile; fig. 3, no. 1155, adult male.

At Northeast Bay, Hinchinbrook Island, Dixon found an oystercatcher's nest, June 25. It was merely a bed of pebbles at the side of a stick of drift-wood on the end of a sand-spit. There was a single egg on the point of hatching. This may have been the last of the set, the other precocial young having probably already left the site and hidden among the stones. The old bird showed great solicitude, and kept crouching, pretending to hide behind rocks, or sneaking along with drooping tail and bowed head.

The species was common at the mouth of Port Nell Juan and at Drier Bay, Knight Island. It was noted on Montague Island at both Zaikof and Hanning bays. At the former point, July 5, Dixon observed two half-grown young running about on the

beach; but as soon as the old birds, which were always watching, saw any one approaching, a warning note was uttered at which the young ones promptly squatted among the rocks wherever they happened to be, even if in the edge of the water. They remained perfectly quiet and blended so nicely with their surroundings that it was difficult to locate them, even when they had been previously seen from a distance. The old birds attacked and put to rout any gulls or ravens that approached the vicinity.

The two young were secured (nos. 1156, 1157), and although not more than half-grown, the juvenal plumage had largely supplanted the natal. The down had been worn off the top of the head, auriculars, back, outer surface of wings, and sides of breast, leaving the juvenal feathers exposed. The latter plumage is like that of the adult except that the feathers of the dorsum and sides are tipped with narrow cinnamon-rufous bars, just proximal to which on each feather is a blackish bar. The calcareous nodule, on the tip of the upper mandible in the younger specimens, has disappeared, and the whole bill has assumed more nearly the shape of that of the adult, the tomia and outlines being more nearly straight. (See figs. 2-3.)

***Canachites canadensis atratus*, new subspecies.**

Valdez Spruce Grouse.

TYPES.—♂ adult; no. 1181, Univ. Calif. Mus. Vert. Zool.; Cedar Bay, Hawkins Island, Prince William Sound, Alaska; June 22, 1908; collected by E. Heller. ♀ adult; no. 1179, Univ. Calif. Mus. Vert. Zool.; Canoe Passage, Hawkins Island, Prince William Sound, Alaska; June 18, 1908; collected by A. M. Alexander.

CHARACTERS.—Resembles *Canachites canadensis osgoodi* of the interior of Alaska (Yukon and Kowak valleys), but general tone of coloration darker: white markings less in extent; black areas more extended; and grays less ashy, more olivaceous.

An analysis of the "general tone of coloration," in comparison with Yukon Valley examples of *C. c. osgoodi*, shows the following characters of the new form, enumerated in detail.

Male.—The light barring on top of head and hind neck more olivaceous than ashy; the white spots on lores, immediately in front of eye and behind eye, greatly reduced, only a trace of the latter being discernible; the scapulars and outer surface of closed wing with black markings better defined and light areas browner; the Δ -shaped white terminal markings of the longest scapular feathers and "tertials," not nearly so large, there being mere indications in some cases (I here take into account the effect of wear which certainly does remove a portion of the ends of the feathers everywhere, as is shown in those grouse taken in summer); light barring on lower back and rump, much less gray, more olivaceous; upper tail coverts with black predominating over the gray and brown mottlings, the reverse being the case in *osgoodi* (the central portions of the feathers in *atratus* are solid black); tarsal feathering decidedly darker, more nearly sepia than broccoli brown; sides with white wedges much narrower and shorter, light markings more olivaceous.

Female.—Light barring on top of head, hind neck, back, scapulars, rump and tail decidedly more ochraceous, and less ashy; black areas, especially as showing on outer surface of closed wing, more extensive on each corresponding feather, and white wedges more restricted; tawny barrings more ochraceous on throat, breast and sides; and black barrings everywhere below broader, and solid clear across each feather instead of being nearly or quite divided by the opposite encroachment of the light bars along the feather rhachis; tarsal feathering sepia instead of broccoli brown.

DISTRIBUTION.—The ten adult specimens and one downy young (these being the only examples at hand representative of the new form) are all from the Prince William Sound region: five from Hawkins Island (nos. 1179-1183), three from Hinchinbrook Island (nos. 1178, 1184, 1185), one from Hoodoo Island (no. 1186), one from Knight Island (no. 1188), and one from the western mainland near the head of Port Nell Juan (no. 1187). The indications are that this form is generally distributed in the humid coast belt from the eastern side of the Kenai Peninsula southwestwardly at least as far as Hawkins Island, and probably beyond.

REMARKS.—In the above description comparison is made with *Canachites* from the Yukon Valley (8 examples from Forty-mile, Nulato, and Russian Mission), and from the Kowak Valley (21 examples). The characters adduced are the result of careful scrutiny and represent average conditions as I can best judge of them. In nearly all of the characters there is sufficient range in individual variation to bring about overlapping, but not to the same degree in all characters at once; so that there is no example of *atratus* which cannot be distinguished from any one of *osgoodi*. One character, the blackness of the upper tail coverts in the male, is absolutely constant in the five males of *atratus*, and is without duplicate in any one of the 16 males of *osgoodi*.

A comparison with *C. c. canace* (from Michigan) shows the female of the latter to have far more extensive and deep-toned ochraceous markings, with the black barrings, especially below, narrower and interrupted on each feather, so that a spotty effect results rather than a complete barring. The male of *canace* is quite similar to that of *atratus*, though minor differences are apparent. For instance the browns are everywhere deeper toned in *canace*, and the black areas on corresponding individual feathers of the lower surface are less extensive.

As regards *C. c. canadensis*, I have no material of the race for comparison. Bishop, in describing *C. c. osgoodi* (Auk XVII, April, 1900, pp. 114, 115), states that "two adult females of *labradorius* [= *canadensis*]¹ from Mr. Bangs's collection are far closer to *canadensis* [= *canace*]¹ than to *osgoodi*. *Osgoodi* in spring has the buff of the entire plumage much paler, and the gray tips of the upper parts, especially the rump and tail-coverts, paler gray, and not the bluish gray of *labradorius*. In worn breeding plumage the difference between the two forms is far more striking, *osgoodi* having the white tips below broader, the buff markings far paler throughout, and replacing the buff bars of the abdomen, cervix and rump with grayish white." It is obvious from this, that the characters of *atratus* do not duplicate those of *canadensis* [= "*labradorius*"], although *atratus* is less gray than *osgoodi*.

¹ Interpolations mine, to indicate accordance with latest usage.

It is pertinent here to remark that the Kowak Valley series of spruce grouse averages grayer (bluer) in both sexes than examples from the Yukon Valley. The former are therefore most extremely divergent from the dark southern coast form here described.

The only young grouse obtained (no. 1178, from Northeast Bay, Hinchinbrook Island, June 27, collected by E. Heller) is in natal down and I judge to be rustier, more fulvous, in tone of coloration than the downy young of *osgoodi* described by Bishop (l. c., p. 115).

Spruce grouse were not abundant in the Prince William Sound region, but appeared to be generally distributed. Two shot on Hawkins Island were both in heavy timber near the beach. Their crops were filled with the fresh green leaf-buds of spruce. On Hinchinbrook Island a male was shot on the mountain side near timber-line. The example secured by Heller on Hoodoo Island was flushed from a rank growth of salmon-berry bushes; its crop contained berries, some fern fronds, and a few seed pods of the devils-club. Grouse sign was noted on Chenega Island; and, as previously noted, skins were secured at Knight Island and at the head of Port Nell Juan.

***Lagopus rupestris kelloggae*, new subspecies.**

Montague Rock Ptarmigan.

TYPE.—♂ adult; no. 1169, Univ. Calif. Mus. Vert. Zool.; mountain, 1600 feet altitude, at Zaikof Bay, Montague Island, Prince William Sound, Alaska; July 7, 1908; collected by J. Dixon.

CHARACTERS.—Similar to *Lagopus rupestris rupestris*, of the interior of Alaska (mountains near Eagle), in comparable stage of plumage, but coloration darker: black markings more extended; brownish shades deeper toned; white tippings reduced and suffused with ochraceous; top of head nearly solid black.

REMARKS.—Five ptarmigan were obtained by the expedition. All are adult males in partially acquired summer plumage. The type, and only example secured on Montague Island, is furthest along with the pre-aestival molt. Two specimens were obtained

on Hinchinbrook Island, this being the next island northeast of Montague. These are: No. 1173, collected by L. Kellogg on a mountain at about 1200 feet elevation, near Northeast Bay, June 30; and no. 1172, collected by E. Heller, June 29, at the same place. The two remaining specimens were secured on Hawkins Island still farther to the northeast, and nearest the mainland. These are: Nos. 1170 and 1171, collected by J. Dixon, June 22, at about 1700 feet, on a mountain near Canoe Passage. Of these five rock ptarmigan, no. 1171 is least typical, and if all were as slightly different from *rupestris* of the interior of Alaska as this specimen, I should not deem separation advisable.

It is to be noted that this least typical example is from the island nearest the mainland. The type specimen is from the most distant and isolated island, and in it the characters of *kelloggæ* are expressed in extremest degree.

Lagopus rupestris kelloggæ is a coarsely barred rock ptarmigan, having many of the dorsal feathers with solid black central areas. It is therefore distinctly different from *Lagopus dixonii*, and from *Lagopus nelsonii* and the other forms described from the Aleutian chain. The new subspecies is on the other hand closest to *Lagopus rupestris rupestris*, as described in relevant literature. I have made comparison with a beautifully prepared series of nine skins of the latter, in the collection of the United States Biological Survey, secured in August, 1903, by N. Hollister from mountains in the vicinity of Eagle (near where the upper Yukon River crosses the eastern boundary of Alaska). This series, all from one place, and all males in full aestival plumage, is invaluable as serving to show individual range in color characters. These rock ptarmigan from the interior of Alaska may of course not be typical of true *rupestris*, the type locality of which I presume to be the vicinity of Hudson Bay. But I believe I am safe in inferring from other cases among birds, that they are quite close to typical—at any rate that the characters of the Hudson Bay *rupestris* are not of a sort to invalidate the recognition of the Prince William Sound *kelloggæ* as a separate subspecies.

The new ptarmigan is given its name in honor of Miss Louise Kellogg, whose unflinching energy as a collector helped materially to make the 1908 Alaska Expedition a success.

No willow ptarmigan were to be found in the Prince William Sound region, and the rock ptarmigan were detected only on the higher mountain-tops of the larger islands. Dixon's notebook contains the following data relative to the nature of the habitat of this ptarmigan: The type specimen was secured by him on Montague Island at an altitude of 1600 feet on the southern slope of a spur of a mountain having an altitude of some 2500 feet. It was flushed at a distance of 150 yards from a rock-covered slope just at timber-line, flying along rapidly around the ridge and alighting upon a crag above the snow, from which it was secured.

About 100 feet lower, or 1500 feet altitude, another bird was flushed from a thicket of spruce trees that had been so flattened by the wind that one could walk upon them. This ptarmigan plunged headlong down the ridge with the wind, uttering a loud cackle. Both of these birds were in almost full summer plumage, as only the primaries showed white during flight.

The observations made by Dixon and Hasselborg on Hawkins Island on June 22 give an idea of the conditions surrounding this hardy bird in summer. In ascending the mountain, ptarmigan feathers and droppings were first noted in heather-covered areas free from snow, at an altitude of 1500 feet where the mountains are shrouded in dense banks of fog and are swept by icy winds. The jagged ridges above lay bare of snow on the southern slopes. In a snow-slide on the wind-swept, fog-girt, western slope Dixon came upon a patch of rocks covered with light gray moss. "When I was within twenty feet of this rockpile, a gray and white ptarmigan arose and stood looking at me in relief against the neighboring snow bank. I backed off as far as I could and still see the bird, scoring a successful shot. Hasselborg saw three more birds, and secured one from a distance of fifteen feet. I believe that all the ptarmigan we saw were males."

Aside from the three islands where specimens were taken, ptarmigan were seen nowhere else; but Heller records "sign" as being noted on a mountain on Disc Island, and also on Knight Island, where, Heller was informed, ptarmigan had been shot in winter.

Circus hudsonius (Linnaeus). Marsh Hawk.

Seen twice on meadows at the head of Port Nell Juan; one was shot there August 19 by Heller (no. 1141), who also records it as abundant on meadows at Valdez Narrows late in September; one (no. 1142) was secured there on the 18th. Both specimens are immature females (that is, full grown, in juvenal plumage), and are very deeply colored, the dark areas being sooty sepia, and the light ones deep tawny. The freshness of the plumage probably accounts largely for this intensity of coloration, as compared with faded winter birds from the United States.

Accipiter velox (Wilson). Sharp-shinned Hawk.

Four specimens obtained at the head of Port Nell Juan August 18 and 19 (nos. 1146, 1144, 1143, 1147). Dixon saw one repeatedly pursuing a magpie, but the latter escaped each time by taking to cover in the brush. A Steller jay was also the object of unsuccessful attack. At Drier Bay, Knight Island, Heller saw sharp-shinned hawks at different times, alternately, in pursuit of, or being chased by, northwestern crows. Miss Alexander shot one (no. 1145) at Wortman's on the Eagle Government Trail, near Valdez, September 3.

Archibuteo lagopus sancti-johannis (Gmelin).

Rough-legged Hawk.

Heller secured a full-grown, juvenal male (no. 1111) at 2000 feet altitude on Chenega Island, August 31. Its plumage is intermediate between the lightest and darkest "phases": base of tail, back and lower parts strongly marked with tawny; posterior lower parts heavily blotched with sooty sepia; head buffy white, streaked with sooty sepia. The stomach of this bird contained hair and bones of meadow-mice.

Large hawks, of uncertain species, were seen at Zaikof and Hanning bays, Montague Island.

***Haliaeetus leucocephalus alascanus* Townsend.**

Northern Bald Eagle.

One adult specimen of the bald eagle (no. 1134) and six young of various ages (nos. 1135-1139) were preserved, all from Hawkins and Hinchinbrook islands under dates ranging from June 26 to July 16. Also observed at Montague, Green, Knight, Chenega, Dise, and Naked islands, and at Port Nell Juan, Valdez Narrows, and Cordova. At most of these points nests were to be seen, and the birds themselves were conspicuous. This is, therefore, one of the characteristic components of the avifauna of the region. Dixon has elsewhere reported fully his observations on the habits of the northern bald eagle, including what was learned during the present Expedition. (See Condor, XI, November, 1909, p. 187.)

***Falco columbarius* Linnaeus. Pigeon Hawk.**

At the head of Port Nell Juan, August 16, a pigeon hawk (no. 1174) perched on the mast of the boat, from which it was shot. Several were seen by Heller at Chenega Island, where one (no. 1175) was taken August 31; two more were noted at Valdez Narrows late in September. Both specimens are females, apparently immature. Neither show the characters of *F. c. suckleyi*; and lack of material prevents my drawing comparison with birds from eastern North America. Their wing-lengths are, respectively, 210 and 215 mm.

It seems probable that this hawk is merely a migrant through the Prince William Sound region.

***Bubo virginianus lagophonus* (Oberholser).**

Ruddy Horned Owl.

Owls of any sort were rare in the region. An undetermined small species was reported from the head of Cordova Bay. At this place Dixon flushed a horned owl June 13. Heller heard a *Bubo* at the head of Port Nell Juan. The only owl secured was shot by Dixon at Canoe Passage, Hawkins Island, June 23

(no. 1140, female adult). H. C. Oberholser, of the U. S. Biological Survey, to whom it was sent, has pronounced it to be *B. v. lagophonus*.

***Ceryle alcyon caurina*, new subspecies.**

Northwestern Belted Kingfisher.

TYPE.—♂ adult; no. 1233, Univ. Calif. Mus. Vert. Zool.; Graveyard Point, Montague Island, Alaska; July 12, 1908; collected by E. Heller.



4



5

Fig. 4.—*Ceryle alcyon caurina*, type, adult male; outer surface of closed wing; $\times \frac{3}{8}$.

Fig. 5.—*Ceryle alcyon alcyon*, female adult, Grinnell coll. (orig. no. 947, N. Hollister), Delavan, Wisconsin; outer surface of closed wing, showing relative shortness of secondaries and coverts; $\times \frac{3}{8}$.

CHARACTERS.—Similar to the *Ceryle alcyon* of eastern and southern North America, but size throughout greater, especially measurements of flight-feathers.

RANGE.—Northwestern America, south along the Pacific Coast in winter. (There is no material at hand to show the status of the birds breeding in California.)

REMARKS.—That there is a western race of the belted kingfisher has long been known. In 1858 (Pac. R. R. Rep., IX, p. 158) Baird remarked that, "as a general rule, specimens from the Pacific Coast are appreciably larger than eastern ones, though

I have been unable to detect any difference of coloration. Mr. Bell, of New York, says that the difference in size between living birds of New York and California is very striking." In Baird, Brewer, and Ridgway's History of North American Birds (vol. II, 1874, p. 393) it is stated that "western specimens are appreciably larger, especially those from the northwest coast."

The accompanying tables of measurements show that the secondary wing quills are *proportionally* longer in the northwestern birds. This means that in addition to its greater expanse of wing and generally larger size, the wing of *caurina* is *broader*. In the closed wing this difference presents itself conspicuously in the interval between the end of the longest secondary and the tip of the longest primary. In the northwestern birds this interval averages (from the accompanying tables) only 27.3 mm., while in the eastern birds it averages 33.7 mm. This is in spite of the larger size of the former. The ratio to total wing length in the two cases is 17 and 22 per cent. respectively. To express it differently, the secondaries are to the primaries as 83 to 100 in the Alaskan birds, and as 78 to 100 in the eastern birds. (See figs. 4-5.)

Ceryle alcyon caurina.

Nó.	Sex	Locality	Wing	Tail	Culmen	Bill from Nostril	Depth of Bill	**
1230	♂ ad.	Hawkins Id.	160.5	92.8	57.0	45.0	14.2	131.3
1233	♂ ad.	Montague Id.	161.2	96.0	55.3	45.3	13.7	132.7
1229	♂ jv.*	Hinchinbrook Id.	144.3	80.0	49.6	38.0	12.5	128.0
1231	♀ jv.	Hoodoo Id.	167.0	97.4	56.1	43.7	14.5	137.0
1232	♀ ad.	Knight Id.	165.9	98.0	55.0	45.0	14.0	133.6

Ceryle alcyon alcyon.

Sex	Locality	Wing	Tail	Culmen	Bill from Nostril	Depth of Bill	**
♂	Illinois	146.5	80.0	47.4	38.7	12.8	122.7
♂	Michigan	155.8	84.1	54.5	46.8	14.0	121.0
♀	Wisconsin	152.5	82.3	56.8	47.5	14.2	118.0
♀	Illinois	151.2	83.5	49.7	41.0	12.7	120.4
♀	Florida	153.7	85.1	54.0	46.9	14.4	109.0

* Not fully grown.

** Bend of carpus to end of longest secondary, on closed wing.

Kingfishers were not abundant, seldom more than one or a pair being seen in a locality. Yet the large number of record stations attests their general distribution throughout the region. The species was observed at Cordova Bay, head of Port Nell Juan, and on the Eagle Government Trail near Valdez; and at Hawkins, Hinchinbrook, Montague, Green, Knight, Hoodoo, Chenega, and Elrington islands.

***Dryobates pubescens glacialis*, new subspecies.**

Valdez Downy Woodpecker.

TYPE.—Female; no. 1288, Univ. Calif. Mus. Vert. Zool; Valdez Narrows, Prince William Sound, Alaska; September 18, 1908; collected by E. Heller.



Fig. 6.—*Dryobates pubescens nelsoni*, adult male, no. 4649, Russian Mission, Yukon River, Alaska; under surface of tail; $\times 1$.

Fig. 7.—*Dryobates pubescens glacialis*, type; under surface of tail (three median rectrices not appearing), showing heavy bars; $\times 1$.

CHARACTERS.—Resembles *Dryobates pubescens nelsoni* of northern and interior Alaska in a general way, but differs from it in slightly smaller size, in having a decided smoky wash over the lower surface, in having the exposed lower surface of "closed" tail completely black-barred (see figs. 6-7), in having the flanks and lower tail coverts distinctly mottled with black, and in having the white-spotting of wings less in extent; resembles *D. p. gairdneri* in size, but smokiness of lower surface much less in intensity and not invading the white areas of head, and white-spotting of wings much greater in extent; resembles *D. p. medianus* closely, except for decided smokiness of lower surface, black-mottling of flanks and lower tail-coverts, and reduction of spotting on wings.

DISTRIBUTION.—The narrow humid coast region of southern and southeastern Alaska: Kadiak Id. (?); Kenai Peninsula; coast and islands of Prince William Sound; Sitka (?). The questioned localities are record stations for a downy woodpecker of presumably this form, but I have not personally examined specimens. See remarks below quoted.

REMARKS.—The *D. p. nelsoni* of the great Alaskan interior is a large, extremely white form, from which *D. p. glacialis* is distinguishable at a glance by the extension of dark areas and markings, notably the complete barring of the tail. Yet from the extreme dark form of *pubescens (gairdneri)*, *glacialis* is just as readily separable on the grounds outlined above. Intermediateness may be ascribed to the new form if one speaks roughly; but an examination shows an uneven sharing of characters.

That this is not the first time peculiarities have been noted in downy woodpeckers of the coast district of southern Alaska is shown by the following references. Oberholser, in discussing his newly named *Dryobates pubescens nelsoni* (Proc. U. S. Nat. Mus., XVIII, 1895, p. 549) says: "Three birds from Kadiak are smaller than all but one of the other Alaskan specimens, and have more black on the outer tail feathers." And again (l. c.): "Of the 15 specimens [of *D. p. nelsoni*] above mentioned, only one (no. 95275, U. S. N. M., from Kadiak) shows dark markings on the under tail-coverts equaling in amount those on average examples of *D. pubescens*." Chapman (Bull. Am. Mus. Nat. Hist., XVI, 1902, p. 239) says of the two specimens taken at Homer, Kenai Peninsula, although listed under the name *Dryobates pubescens nelsoni*, "indistinguishable from the average eastern specimens of '*Dryobates pubescens medianus*.'"

These latter two examples, from Homer, and another, from Moose Camp, also on the Kenai Peninsula, are through the courtesy of Mr. Chapman and the American Museum of Natural History now before me. Although labeled "*nelsoni*," they are certainly not that form. They are in fact intermediate towards *glacialis*, and much nearer the latter. They are smaller than *nelsoni* with slightly less amount of white and, in the two from Homer, with distinct smoky suffusion beneath.

Measurements of *D. p. glacialis*.

No.	Sex	Wing	Tail	Tarsus	Hind Toe with Claw	Culmen
1288**	♀	98.0	60.9	17.1	17.0	16.5
1287**	♂	93.3	58.7	15.5	16.8	16.4
76363*	♀	96.5	64.3	16.0	17.3	15.8
76364*	♀	95.6	62.7	16.6	19.0	14.4
90750*	♂	95.0	59.0	....	18.5	16.3

* Am. Mus. Nat. Hist.

** Univ. Calif. Mus. Vert. Zool.

Woodpeckers were uncommon in the Prince William Sound region. The only ones secured by the 1908 Expedition were the two constituting the main basis of the above description. Both were taken by Heller, no. 1288 (the type) in some alders on an islet at Valdez Narrows, September 18; and no. 1287 on Naked Island, September 7. Woodpeckers, probably of this species, were heard by the same collector, on Disc Island, Chenega Island, Knight Island, and Hawkins Island.

Selasphorus rufus (Gmelin). Rufous Hummingbird.

Although at practically the northern extreme of its range, the rufous hummingbird proved to be well represented in the Prince William Sound region. Those seen at the head of Cordova Bay were slightly above 61° N. latitude. Miss Alexander secured an adult male (no. 1262) at Cordova June 6; and an adult female (no. 1263) at Canoe Passage, Hawkins Island, June 20. These were the only specimens actually captured; but the species was observed many times also on Hinchinbrook and Montague islands. Near Zaikof Bay, on the latter island, Dixon records that a rufous hummer appeared at 1600 feet altitude over a waste of snow-slides, and buzzed up within a few feet of him. Heller notes that no hummingbirds were seen feeding around flowers. None were seen anywhere after the last week of July.

Empidonax trailli alnorum Brewster. Alder Flycatcher.

Detected but once, on June 10, when Dixon shot an adult male (no. 1248) in an alder thicket at the head of Cordova Bay. This specimen is very clearly *alnorum*. As compared with ex-

amples of *trailli* from California it has the whole back and sides of a decided green cast; flanks and crissum strongly washed with greenish yellow; bill smaller; wing longer.

Mr. Frank M. Chapman has recorded *Empidonax "trailli"* from the Kenai Peninsula (Bull. Am. Mus. Nat. Hist., 1902, p. 240). Through his courtesy I have examined the specimen (no. 76366, Am. Mus. Nat. Hist.) upon which his determination was based. As compared with our Cordova specimen, the Kenai bird is not so green, and might be considered intermediate between *alorum* and *trailli*; but it has just as light wing bars as the former, and the decidedly small bill of the former. I therefore would have no hesitancy in classifying it with *alorum* rather than with *trailli*.

Pica pica hudsonia (Sabine). Black-billed Magpie.

The five magpies secured (nos. 1234-1238) were all obtained on Montague Island, July 12, 23, and 30. They are all juvenals, and none of them full grown; at least the tails are not of full length. These specimens show a conspicuous amount of sooty and brownish suffusion on the scapulars and abdomen. In six out of seven juvenal magpies from Nevada and eastern Oregon, the same areas are conspicuously pure white. One, however, from Nevada, has as much dusky obscuration as in three of the Montague specimens, and more than in one of the Montague birds (no. 1237). The extreme dark Montague examples are so diverse from the ordinary white-bellied magpies that here would seem to be another good case of darkening under the effects of humid climate, as with the woodpeckers. But there is not enough material at hand to prove a satisfactory average. And, furthermore, I have examined no adults from the humid coast belt of Alaska. The amount of white on the primaries seems to be dependent wholly upon age. Magpies from any region, previous to the first (complete) annual molt, that is, until they are about 16 months old, have far less of this white than subsequently.

This conspicuous bird was met with nowhere else as commonly as on Montague Island. At McLeod Bay, at the southern end of that island, several appeared within twenty feet of the

men who were skinning a bear. But ordinarily they were shy. One was observed at the head of Port Nell Juan, August 16. Heller reports it from Knight Island, Storey Island, and Valdez Narrows, and Miss Alexander from Valdez, August 29, and along the Eagle Government Trail, August 30.

Cyanocitta stelleri stelleri (Gmelin). Steller Jay.

Thirteen specimens (nos. 1249 to 1261) were procured: six from Cordova Bay, two from Hawkins Island, one from Hinchinbrook Island, one from Montague Island, two from Knight Island, and one from Port Nell Juan. These appear to present no tangible points of variation among themselves, beyond what is ascribable to age; nor can I distinguish the series as a whole from a still larger series from the Sitkan district of southeastern Alaska. The specimen from Northeast Bay, Hinchinbrook Island (collected June 25 by A. M. Alexander) is a bob-tailed juvenile. In its otherwise sooty brown throat are ten pure white feathers, showing an individual tendency towards albinism.

The species was abundant and generally distributed throughout the region as shown by the following list of record stations: Hawkins, Hinchinbrook, Montague (at all points visited), Green, Latouche, Knight, Chenega, Hoodoo, Disc, Eleanor, Naked, and Storey islands, and at Port Nell Juan, Cordova, and Valdez Narrows. It was often judged to be the most abundant of the land birds.

Corvus corax principalis Ridgway. Northern Raven.

Ravens were characteristic of the Prince William Sound region, as elsewhere in the coastal regions of Alaska. The following record stations were established: Cordova Bay, Valdez Narrows, head of Port Nell Juan; and Hawkins, Hinchinbrook, Montague, Green, Latouche, Knight, Chenega, Disc, and Eleanor islands. At Zaikof Bay, Montague Island, several families were in evidence, and these were doubtless responsible for the fish-bones found scattered through the woods.

The single raven obtained on the expedition (no. 1120, juvenile male) was shot in this vicinity. It is apparently full-grown, and measures: wing, 395; tail, 245; culmen, 72. It

was secured July 7 at an altitude of 1600 feet on a mountain side, and according to the notes of the collector (Dixon) its stomach contained what appeared to be a mass of marmot dung; the bird's bill was coated with the same material.

Corvus brachyrhynchos caurinus Baird. Northwestern Crow.

In evidence at nearly every point visited. At Cordova Bay small flocks frequented the mouth of the river and adjacent beaches. They were particularly common at Hawkins Island. A colony located by Miss Alexander on a sand-spit were observed worrying a pair of eagles which persisted in remaining in their territory. "The crows had a way of swooping down upon a perching eagle, first one crow and then another, in a manner that must have been quite disconcerting. For the eagle would shrink at each onset, finally lose his balance, and fly to another perch." At Drier Bay, Knight Island, Heller notes that the crows were constantly picking quarrels with the gulls. The former were abundant here, and were feeding on small black mussels uncovered at low tide. A dozen or so were seen at Hanning Bay, Montague Island; and at Hinchinbrook Island, June 26, many young recently out of the nest were noted. Crows were abundant at the mouths of salmon streams in Port Nell Juan. And the species was further observed at Green, Latouche, and Storey islands, and in Valdez Narrows.

But two specimens were obtained, both by Dixon, June 19, at Canoe Passage, Hawkins Island. These show the following measurements:

No.	Sex	Wing	Tail	Tarsus	Culmen	Bill from Nostril
1217	♀	270	159	45.8	42.3	30.1
1218	♀	272	157	46.4	45.4	33.9

These individuals appear to be identical with birds from the Sitkan district.

Pinicola enucleator flammula Homeyer. Kadiak Pine Grosbeak.

Twelve specimens (nos. 1510-1521) were obtained from the mainland of Port Nell Juan, and from Montague, Latouche, Knight, and Chenega islands. These show uniformly the extreme of characters differentiating the race of the Sitkan dis-

trict (and, I assume, also that of Kadiak Island). They are distinctly different, in all the characters previously pointed out, from the *P. c. alascensis* of the interior of Alaska. They do not show any slight approach, even, to that form, as is the case with some other birds represented in the two regions.

A specimen in full juvenal plumage (no. 1515, ♂ juv., Latouche Island, August 7, A. M. Alexander) may be described as follows:

Upper parts deep smoke gray, the feathers everywhere tipped with a greenish tint of orange ochraceous; this is strongest on top of head and upper tail-coverts; wings and tail slate black; three outermost rectrices narrowly and outwardly margined with dull greenish, the rest similarly edged with gray; the primaries narrowly, the secondaries more broadly margined with pale drab gray; greater wing-coverts copiously tipped on outer webs with light hair brown; middle wing-coverts, tipped with wood brown; lesser wing-coverts like back; underparts drab-gray, the sides of head and throat region suffused with dull ochre yellow. Although the bird is apparently full-grown, wisps of natal down still adhere to some of the juvenal feathers of the flanks, rump, and scapulars. The entire body plumage has the loose, soft texture characterizing the young of other fringillines.

The crop of a grosbeak taken by Dixon July 19 at Latouche Island contained sprouting weed seeds. This bird was flushed from the ground. A family of adults and young met with near the same place August 5 were also feeding on the ground where they were gathering soft weed seeds. This shows that the species probably resorts regularly to other sources of food than the leaf-buds of trees. Besides the localities above mentioned, Hinchinbrook Island was found to harbor the pine grosbeak. On Montague Island the species ranged from sea-level up to timberline.

Loxia leucoptera Gmelin. White-winged Crossbill.

Four adult examples of this species obtained (nos. 1531-1534), two males and two females, taken by Heller June 22, at Cedar Bay, Hawkins Island. I am unable to find any characters to distinguish these from the white-winged crossbill of the

interior of Alaska. The amount of white on the wings appears to be the same, and the intensity of coloration in the former is equalled in selected individuals in the latter.

The white-winged crossbill was seen by various members of the party on Hawkins Island, in flocks of twenty to fifty. One flock was observed by Heller feeding on grubs in the hemlocks. On Hinchinbrook Island several noisy flocks came to notice, usually in the tops of spruces. One flock was seen by Miss Kellogg at Hanning Bay, Montague Island, July 27, this being the only other record station for the species.

***Leucosticte tephrocotis littoralis* Baird.** Hepburn Rosy Finch.

This species, so rarely met with in summer, was found only in the arctic zone on or near the summits of the highest mountains on Hinchinbrook and Montague islands. Miss Alexander and Miss Kellogg saw one on a bare mountain top on the former island, June 29, and Hasselborg shot one at 2000 feet altitude near the same place.

On July 7 Dixon and Hasselborg located a pair or more at about 2200 feet altitude on a mountain near Zaikof Bay, Montague Island. The birds stayed around the misty, wind-swept cliffs, where they were difficult to see, and more so to stalk. On July 9, on the same mountain, Hasselborg succeeded in obtaining his second specimen.

The following are the measurements of the two specimens secured:

				Wing	Tail	Culmen
1529	♀	Hinchinbrook Id.	June 29	101.0	67.8	12.2
1530	♀	Montague Id.	July 9	101.5	68.1	11.9

The one from Montague Island is deepest-toned of the two, in its body coloration, being quite as deeply colored as in examples at hand of *L. t. griseonucha*. It is, however, no darker than a specimen of *littoralis* at hand from Mount Baker, Washington, and the size is the same, that is, much less than that of *griseonucha*. In the Montague specimen the ashy color of the head not only invades the chin, but scattering ash-colored feathers appear well back on the fore chest.

Acanthis linaria linaria (Linnaeus). Common Redpoll.

Of the six redpolls obtained, two (nos. 1389, 1390) were secured by Hasselborg at about 1600 feet altitude on a mountain at Zaikof Bay, Montague Island, July 9; these are adult male and female, but the male has only a trace of the rosy red on the breast and rump. Two specimens (nos. 1391, 1392) were taken by Hasselborg at about 1000 feet altitude near the mouth of Port Nell Juan, August 11. Both are males, one in very bright plumage, the other like no. 1389, from Montague Island. The two remaining specimens (nos. 1393, 1394) are from a mountain at 2000 feet altitude on Knight Island, near Drier Bay, taken on August 25, also by Hasselborg. Both are full grown birds in complete juvenal plumage. These are identical with a juvenal at hand from the Yukon Valley. The adult examples, too, are apparently in no wise different, either in darkness of coloration or in any detail of measurements, from what I have been accustomed to call *Acanthis linaria linaria* from northern and interior Alaska. They certainly cannot be allocated with the "*A. l. holboellii*," at least as that form is described. In the redpolls of Prince William Sound we appear to have a species which has defied differentiation from the interior stock in spite of the extreme nature of coastal climatic influences. This may be due to relatively recent immigration from the interior, too recent to have resulted as yet in the development of characters sufficiently gross to be perceived.

Calcarius lapponicus alascensis Ridgway. Alaska Longspur.

On a mountain at about 2000 feet altitude on Knight Island, August 25, Hasselborg saw a flock of four birds, which at first sight were mistaken for pipits. One of these was shot, proving to be an Alaska longspur (no. 1388). Heller noted longspurs on a mountain on Disc Island, September 4. Miss Alexander secured a specimen (no. 1387) at about 2400 feet altitude, at Thompson's Pass, on the Eagle Government Trail, August 31. The above two examples are in complete first-winter plumage. I should infer that the Alaska longspur occurs in the Prince William Sound region only as a transient.

Passerculus sandwichensis alaudinus Bonaparte.

Western Savannah Sparrow.

Thirty-eight specimens secured (nos. 1472-1509). While the series includes many specimens taken in August and up to September 2, and might be expected to contain transients, I find not even one example referable to *P. s. sandwichensis*. All seem to me to belong to a single subspecies which after much comparing of specimens from various parts of North America, I am reluctantly placing under the name *alaudinus*, the breeding range of which includes the great Alaskan interior. The series includes twenty-five birds in worn breeding dress. These average very close to, if not identical with, the subspecies of interior and northern Alaska, generally conceded to be *alaudinus*. Yet among them are dark-streaked, brownish individuals which I cannot distinguish from selected examples from the Sitkan district, which I have elsewhere (Univ. Calif. Publ. Zool., V, p. 227) allocated under the name *Passerculus s. savanna*. I have elected to call these dark examples (from the Prince William Sound region) extremes of individual variation; for there is every intermediate degree of blending towards the opposite extreme which is pale. The possibility presents itself of these dark birds being stragglers of *savanna*; the evidence is poor, but as far as it goes, indicates otherwise.

Breeding Savannah sparrows, even taken in the same month, have obviously been subject to varying amounts of wear. And this further confuses the original variation in fresh plumages. I have been unable to find any clue by which to distinguish among breeding birds those which are only one year old (and hence have left-over portions of the juvenal and first winter plumages in combination with an unknown amount of body-plumage acquired at the first prenuptial molt) from truly adult birds, two years old or older. The problem is complex, and to distinguish races to a finer degree in this genus of sparrows as occupying Alaska does not now seem to me to be practicable.

Eleven of the Prince William Sound Savannah sparrows were taken in the last two weeks of August, and are in complete winter plumage. Unfortunately age was not determined by the

collectors from degree of ossification shown by the skull, so that lacking this criterion I am unable to distinguish first winter from subsequent winter plumages. Suffice it to remark that there is considerable range of variation regularly graded from a relatively grayish bird (as in no. 1503) to a dark brownish bird (as in no. 1492). The latter, a male taken August 30 on Chenega Island, has the back with black streaked feathers broadly margined with deep hazel and laterally margined with clay color; the breast, flanks, and the whole sides and top of head are strongly pervaded with clay color. In another example (no. 1507) the anterior part of the superciliary stripe is distinctly yellow, though in most of the birds this marking is faint. Since these extreme dark birds are in the minority and appear not to be peculiar to any particular locality, I cannot but consider them co-subspecific with the rest of the series from Prince William Sound, and to be accounted for as representing age, sex, and individual variants combined. Individual variation appears sometimes to be widest in intermediate regions. The characters of individuals occupying an intermediate region are more unstable. It is more remotely possible that these dark individuals may really be examples of *savanna*, that is, invaders from the Sitkan district.

Only two out of the series are in juvenal plumage: no. 1502, from Port Nell Juan, August 16; and no. 1509, from Thompson's Pass, September 2. The latter must have been hatched very late, as the juvenal plumage in *Passerculus* is of short duration. However, the change was imminent, as it shows many first winter feathers appearing in the wing-coverts, dorsum and flanks. Finally it should be remarked that most of the points visited, both insular and on the mainland, are represented in the series of thirty-eight specimens; and that I can see little evidence of variation in this material to indicate the existence of subsidiary differentiation centers.

The species was recorded from the following localities: Cordova, Hawkins, Hinchinbrook, Montague, Green, Hoodoo, Knight, Chenega, Disc, Eleanor, and Naked islands; head of Port Nell Juan; Valdez Narrows; and Thompson's Pass, on the Eagle Government Trail, being abundant at the last three points. The

species occurred from the meadows at sea-level up to the slopes in the arctic zone of the higher mountains.

A nest of the western Savannah sparrow was obtained by Dixon at Northeast Bay, Hinchinbrook Island, June 27. It was situated under a tuft of dead grass on an open meadow near tide-water, and consisted chiefly of fine dry yellow grasses. It held five eggs, the size and color of which appear to be normal for the species.

Zonotrichia coronata (Pallas). Golden-crowned Sparrow.

Not met with anywhere until the last of August, when Heller found it common in the alders at Knight Island, and later on Chenega, Disc, and Storey islands, and at Valdez Narrows, where it was abundant in brush everywhere.

Seven specimens were secured (nos. 1522-1528); three of them were taken by Heller at Drier Bay, Knight Island, August 28; one by Miss Alexander at Valdez August 28, and three at Wortman's on the Eagle Government Trail, September 2. All are in full first winter plumage. This bird might with good reason be considered as transient and not belonging strictly to the avifauna of Prince William Sound.

Junco hyemalis hyemalis (Linnaeus). Slate-colored Junco.

This, the only form of junco detected in the region, was found but sparingly. At the head of Cordova Bay, June 10, a pair was seen, and Dixon secured one (female, no. 1382). At the head of Port Nell Juan, August 16 and 17, Miss Alexander collected two specimens (nos. 1384, 1385). The first is an adult male just completing the annual molt; the other, an immature female in full first winter plumage, the dark parts of which are everywhere washed with walnut brown. At Drier Bay, Knight Island, August 28, Heller took a female in full winter plumage (no. 1383), and later saw the species on Disc Island, September 4. Finally Miss Alexander secured an immature female (no. 1386) August 28, at Valdez, where a flock of about twenty were seen in a door-yard.

Melospiza melodia kenaiensis Ridgway. Kenai Song Sparrow.

A series of forty-two song sparrows were obtained (nos. 1406-1447). These were taken as follows: Eight from Hawkins Island, six from Hinchinbrook Island, eleven from Montague Island, eleven from Green Island, four from Latouche Island, one from Knight Island, and one from the mouth of Port Nell Juan. Other localities where the species was seen, but no specimens taken, were Chenega, Hoodoo, Disc, Eleanor, Naked, and Storey islands, and Valdez Narrows. The series consists of twenty-eight adults in more or less worn summer plumage, twelve half-grown to full-grown juvenals, and two specimens in fresh fall plumage which I take to be birds-of-the-year. After careful scrutiny I am unable to detect any differences in the specimens from island to island. The water-ways between adjacent islands are probably too narrow (always less than seven miles) to prevent frequent crossing, and therefore mingling of strains, even in this sedentary and susceptible bird.

I have not had the opportunity to examine a satisfactory series of typical *kenaiensis* from Cook Inlet, having but two examples of the latter at hand (Coll. U. S. Nat. Museum, nos. 81380, 81385). The first is a summer adult female; the second a juvenal male. The former is less heavily streaked and not so slaty as corresponding birds of Prince William Sound; the latter is decidedly paler, not nearly so broadly and blackly streaked. Through the courtesies of the authorities of the National Museum I have at hand eleven specimens of *M. m. caurina* from the Yakutat Bay region. From these the Prince William Sound birds differ by much greater size (at least equaling *kenaiensis*) and a decidedly leaden, less brownish tone of coloration. The streaking is even more intense and sharply defined, not indistinct and blended, as in *kenaiensis* proper. The birds of Prince William Sound, therefore, are large song sparrows (♂, no. 1443: wing, 78.5; tail, 78.1; tarsus, 23.8; culmen, 13.7), with sharply dark-streaked lower parts, and upper parts distinctly streaked upon a ground color very dark-toned in the direction of leaden gray rather than any shade of brown. I should not hesitate to name this as a new subspecies, if more

material from Cook Inlet were available, so that I could be surer of the average characters of true *kenaicensis*. However, there is scarcely any doubt but that, even if divergent towards *caurina*, the form under consideration is closest in the aggregate of characters to *kenaicensis*. As compared with *M. m. sanaka* (specimens from Popof Islands, Sanak Islands, and Unalaska) and *M. m. insignis* (from Kadiak Island), the birds of Prince William Sound are widely different, being smaller, black-streaked, and much slatier in general tone of coloration.

Song sparrows, in the region explored, appear to be exclusively littoral in their distribution. They were not found inland along streams, as are the numerous allied races in the western United States, but kept close to the narrow border of beach-grass just above high-tide line. They seemed to prefer the grassy sand-spits and smaller outlying islands to the main shore.

Two nests with eggs were obtained (nos. 34, 35), and because of their novelty, deserve detailed description. The first was found by Dixon at Canoe Passage, Hawkins Island, on June 17. There were four eggs in which incubation was partial. The nest was located at the base of a clump of beach grass growing on a sand-spit. The nest in the condition in which it reached the Museum is externally 67 mm. high and 142 wide; the cavity is 32 mm. deep by 70 in diameter (Pl. 33). These dimensions are doubtless inaccurate, because of a now indeterminable amount of flattening incurred in packing. Measurements of birds' nests, to be of most value, should be taken from the nest *in situ*, before it is disturbed at all.

The bulk of the nest under consideration consists of coarse, dry, bent and broken, mildewed grass stalks. These are arranged concentrically, with little evidence of intertwining, so that if roughly handled the nest would readily fall to pieces. The inner lining is thin and of fine, round, yellow grass stems, the majority approaching a position parallel to the rim of the nest. Although many stems are also incorporated cross-wise, the interweaving is not a conspicuous feature. The inner wall of the nest has a slippery feeling because of the smoothness of the grass-stems and the ease with which they slide, one over

another; and it is extremely porous. Yet there is a moderate firmness about the whole structure.

The second nest was found by Miss Alexander at Northeast Bay, Hinchinbrook Island, July 3, and held five eggs. The nest was located in the inner edge of a fringe of beach grass growing around a sand-spit. In structure and materials this nest is similar to that first described.

The eggs of the Kenai song sparrow are colored as in common types of those of the Santa Cruz, San Diego, and eastern subspecies. Although a dark-colored bird, its eggs appear to be no more heavily blotched than those of its paler relatives. Their immense size, however, distinguishes them from those of all the southern races. The measurements of the two sets of *kenaiensis* are as follows: 23×16 , 21.7×15.8 , 21.9×16.1 , 21.7×16.1 , 23.6×17.7 , 23×17.3 , 23.3×17.4 , 22.6×17 , 23×17 . A typical egg of *Melospiza melodia cooperi* from Los Angeles County, California, is 19.8×15.7 .

***Melospiza lincolni gracilis* (Kittlitz).** Forbush Sparrow.

Miss Alexander discovered the Forbush sparrow at the head of Cordova Bay, June 10 to 13, where she secured five skins (nos. 1399-1403) and a nest with eggs. The birds were occupying the upper end of the tide flat, where they found cover in the low, stiff, willow-like brush that skirted the sloughs. The specimens obtained are characterized by the peculiar rusty tinge already described as discoloring the plumages of the phalaropes and loons living in the same locality. This adventitious tinge varies in intensity, and appears to be confined to the lower surface, the whiteness of which is thus obscured.

The species was found only once again, when Heller caught one in a mammal trap at Valdez Narrows, September 18 (no. 1404). This specimen is in fresh, clean, winter plumage. Apparently this sparrow does not occur on any of the islands of the Sound.

The six specimens are all slightly larger than the average *gracilis* from the Sitkan district, and thus show an approach toward *lincolni*. But they are broadly streaked, especially dorsally, and in other points of coloration agree very closely, if not precisely, with *gracilis*.

The nest found by Miss Alexander, June 10, was well concealed in a rather straggling clump of the stiff brush characterizing the local habitat of the species. It was located at the base of a low-lying branch that almost completely covered it. The nest (no. 39) presents a firm structure, externally 67 mm. deep, by 100 in width. This does not, however, probably include whatever peripheral loosely laid materials there may have been. The cup-shaped cavity is 38 mm. deep, by 53 wide. Externally the nest consists of layers of brown willow leaves of the previous season. Within this, and making up the rim, is a basket-work of rather coarse, weathered, grayish stems and blades of grass. Finally the nest-lining is of fine, round, yellowed grasses.

The nest contained four eggs, three of which are of a clouded type of coloration, and the remaining one of the distinctly spotted type. This diversity and disproportion in the eggs of one set is a common condition with song sparrows. In the predominating type the ground color is a pale Nile blue, over which is laid a crowded mass of more or less blurred markings of hazel, liver brown, clay color and vinaceous. These markings are agglomerated into an indistinct ring around the larger end. The odd type of coloration, represented in the single egg out of the four, looks much brighter than the other. This is due to the clear-cut markings, leaving more of the contrasting ground color displayed. The markings are relatively more sparse, except around the large end where they are concentrated in a distinct ring. The colors are the same as in the other type, except that a brighter shade of brown is apparent, approximating the liver brown of Ridgway's "Nomenclature of Colors."

The eggs are ovate in shape, and measure: 18.5×13.9 , 18×14 , 18.5×13.8 , 18.4×13.7 .

Passerella iliaca sinuosa, new subspecies.

Valdez Fox Sparrow.

TYPE.—♂ adult; no. 1593, Univ. Calif. Mus. Vert. Zool.; Drier Bay, Knight Island, Prince William Sound, Alaska; August 26, 1908; collected by J. Dixon.

COMPARATIVE CHARACTERS.—Perhaps nearest to *Passerella iliaca unalascensis*, but differs from that form in smaller and

especially slenderer bill, in larger or heavier spotting beneath and in a much slatier tone of coloration throughout; differs from *P. i. insularis* in the same ways but, except in spotting, to a greater degree, especially in coloration, because of the warm hazel brown tone of the Kadiak race; differs from *P. i. meruloides* (= *P. i. annectens* Ridgway) from the Yakutat Bay region in slatier, much less ruddy tone of coloration.

GENERAL DISCUSSION.—The type of the new form is in nearly complete, newly acquired plumage, and hence the coloration is innate, that is, unmodified by wear, fading or any other adventitious circumstance. The type may be described as follows: Whole pileum and dorsum dark sepia, closely approaching clove brown; sides of head and hind-neck pervaded with slate gray; rump and edgings of wings and tail, Prout brown; ground-color below pure white, with spotting of same color as dorsum; flanks and lower tail coverts broadly streaked with clove brown, the narrow light edgings of the crissum being faintly cream-buff. This is fairly representative of the thirteen other specimens in complete or nearly complete fall plumage. Worn breeding birds (♂, no. 1546, Hinchinbrook Island, June 30, is selected as an average example) differ from the former in somewhat paler coloration and restriction of individual spots, both evidently due to wear.

The same sort of differences between fresh fall and succeeding breeding plumage is evident in other races of *Passerella* of which relevant material is at hand. Birds-of-the-year, that is, those in first winter plumage, differ from adult winter birds in the rustier edgings of the secondaries and rectrices. All this has, of course, to be taken into account in discriminating closely similar subspecies as those of the fox sparrow, where color characters are used.

Juvenals of *P. i. sinuosa* differ from *meruloides* in corresponding plumage in duller, less ruddy shades throughout, and from *insularis* in sootier, less brightly hazel browns. These differences are just as great as those between adults in the two subspecies, and point towards an inherentness of these "small" color characters incompatible with the idea that they are evanescent and subject to loss or acquisition upon slight temporary provocation.

The Valdez fox sparrow proved to be the most abundant as well as the most widely distributed land bird of the region. It occurred chiefly in deciduous thickets, but individuals were noted everywhere, from the borders of the beach to timber-line. The characteristic song was to be heard during all kinds of weather and at all hours.

At Cordova but few were seen; and on Hawkins Island only one was noted. But on Hinchinbrook, Montague, and Latouche islands the species was superabundant, from the standpoint of bird population in this sort of a region. Other places where fox sparrows were more or less in evidence were: Green Island; Hoodoo, Knight, and Chenega islands; both head and mouth of Port Nell Juan; Disc, Eleanor, and Storey islands; at Valdez Narrows; and along the Eagle Government Trail near Valdez.

A series of seventy-one specimens (nos. 1535-1605) was obtained, as follows: One from Cordova, one from Hawkins Island, sixteen from Hinchinbrook Island, twenty-five from Montague Island, five from Green Island, fifteen from Latouche Island, two from Knight Island, three from Port Nell Juan, and three from Wortman's, on the Eagle Government Trail.

Throughout this series I can detect no geographical variation, although opposite sides of the Sound are represented, as well as the islands separated by the widest channels. The series is interlocally uniform in its average of subspecific characters. Thirteen of the specimens are in complete or nearly complete winter plumage, of dates from August 7 to September 2. These are of value as affording relevant material for comparison with early winter birds from the south. There is little doubt but that all of the fox sparrows of the region leave for the winter, and the present material indicates that this race, as with *meruloides* and *insularis*, winters abundantly in interior and southern California. Nine of the specimens are juvenals, ranging in date from July 12 to 28. The remaining forty-nine specimens are in breeding plumage.

A nest of the Valdez fox sparrow containing three eggs was obtained by Heller at Zaikof Bay, Montague Island, July 9. No record is at hand concerning its location, but the nest is of the sort to presuppose its resting on the ground. It is composed

externally of a mixture of green moss, skeletonized leaves and coarse grasses, while in strong contrast there is internally a thick lining of fine, round grass stems.

The three eggs are short-ovate in shape, measuring: 22.6×18.4 , 22.1×17.9 , 22.8×18.3 . The ground color is a very pale Nile blue, so overcast by the dark markings as to show clearly in but few places. The markings are not clear-cut but are for the most part much blurred masses of pigment. The sharpest and darkest marks are dots of chestnut. The coalescing nebulous areas vary from burnt sienna through liver brown to vinaceous.

***Hirundo erythrogaster palmeri* Grinnell.**

Alaska Barn Swallow.

Met with only in the vicinity of Cordova Bay. At least ten pairs were nesting on the buildings of the railroad company at Cordova, June 3 to 7. A single specimen (no. 1308) was taken there. A pair had their nest in the hallway of a cabin at the head of Cordova Bay, June 11. At this date nest-building was still under way.

***Tachycineta thalassina lepida* Mearns.**

Northern Violet-green Swallow.

Observed only at Cordova, where ten or twelve were seen June 3 to 7, and at the head of Cordova Bay. In the latter locality several were seen at the mouth of a canyon investigating cavities in the cliff, where they may have been nesting. They were supposed to be tree swallows until specimens were secured. A pair taken on June 13 (nos. 1277, 1278) do not differ in any perceptible degree from breeding birds from southern California. They are no larger, and one (the male) is actually shorter-winged than many Californian examples. We are accustomed to find the northernmost individuals of a migratory species, with longest wings. But here appears to be an exception. Although the southern subspecies of the violet-green swallow from Mexico (*thalassina*) and Lower California (*brachyptera*) are smallest, the larger northern form (*lepida*) shows no increase in size towards the northern confines of its habitat.

Vermivora celata lutescens (Ridgway). Lutescent Warbler.

This was conceded to be the commonest warbler of the region. It was found among alders at the head of Cordova Bay; on Hawkins Island; a few at the edges of the forest on Hinchinbrook Island; on Montague, Green, Hoodoo, and Knight islands; along Port Nell Juan, where young as well as old birds were observed August 14; and finally at Valdez, where noted by Miss Alexander August 28. Of the series taken (nos. 1313-1329), all are breeding adults, except one (no. 1325); this is a female in full juvenal plumage, from Green Island, July 14. It is notable because of its extreme grayness, as compared with young of *lutescens* from California, the latter being decidedly greenish though dingy. Among the sixteen adults are three which also stand out conspicuously as gray birds. These are: Nos. 1315 and 1318, both females, from head of Cordova Bay, June 11 and 9; and no. 1323, male, from Northeast Bay, Hinchinbrook Island, June 30. If I had only these four specimens, I would unhesitatingly refer the race from the Prince William Sound region to *Vermivora celata cclata*, though not typical. But the remaining thirteen skins of the series are *lutescens*, either precisely, or more nearly than anything else. My conclusion is that an infusion of *cclata* blood is apparent in the series; in other words that birds from the Alaskan interior, where typical *cclata* occurs exclusively (see Oberholser, *Auk* XXII, July, 1905, p. 242), have recently invaded the coast belt at this point, and interbred with *lutescens*. The descendants are variously intermediate, and are therefore in the category of hybrids, and not intergradients. If all the birds from any one locality were uniform in their characters, and the series from the various localities aligned themselves as steps from one extreme to the other, I would choose to call them intergradients. But this is not the case, as typical *lutescens* was taken at the same places (except on Green Island, where only the one juvenal was secured) as the *cclata*-like individuals.

Dendroica aestiva rubiginosa (Pallas).

Alaska Yellow Warbler.

A few seen about Cordova, June 3 to 7. At the head of Cordova Bay, June 14, Miss Alexander secured two male specimens (nos. 1264, 1265). These bear out closely the characters assigned to *rubiginosa*. The species was seen but once again, at the head of Port Nell Juan, the third week of August, when Heller saw two individuals in alder thickets.

Dendroica coronata hooveri McGregor. Alaska Myrtle Warbler.

Seen only at the head of Port Nell Juan, where three specimens were obtained August 18 and 19, all three in complete first winter plumage. The colors are exceptionally deep, the upper surface being of a very dark brown (near to sepia) with blackish shaft-streaks; and the under surface has the usually white areas strongly pervaded with cream color. I do not mean to imply, by stating these points, that the eastern *coronata* at this stage of plumage is not similarly distinguished, for I have no eastern August birds for comparison. But the greater size, alone, of these, as well as all other Alaskan examples examined, impels me to assert again the distinctness of *hooveri* as a geographical race of *D. coronata*. (See Univ. Calif. Publ. Zool., V, 1909, p. 235.)

The following are the measurements of the specimens from Prince William Sound:

No.	Age Sex	Date	Collector	Wing	Tail	Tarsus	Bill from Nostril
1266	♂ im.	Aug. 18	A. M. Alexander	77.3	62.2	18.4	7.0
1267	♂ im.	Aug. 19	A. M. Alexander	76.8	62.0	18.7	7.2
1268	♀ im.	Aug. 18	E. Heller	71.4	58.2	18.1	7.2

Dendroica townsendi (Townsend). Townsend Warbler.

One secured at Cordova June 7, and two more at the head of Cordova Bay, June 9. These are full-plumaged adult males (nos. 1289-1291), found by Miss Alexander in scattering small spruce trees bordering the flats, where they were actively fly-catching. They sang persistently, the brief song consisting of three triple notes given every few seconds. At the head of Port Nell Juan, August 13 to 18, eight specimens were taken

by Miss Alexander and Hasselborg (nos. 1292-1299). They were obtained from large mixed flocks of warblers, chickadees, and kinglets which were roving through the upper foliage of the cottonwoods. All eight examples are birds-of-the-year, in complete first winter plumage.

***Wilsonia pusilla pileolata* (Pallas).** Pileolated Warbler.

Well represented in the region as regards both numbers and distribution; observed not uncommonly in the alder thickets at the head of Cordova Bay, the middle of June; also in the latter half of the month on Hawkins and Hinchinbrook islands. At both Hanning Bay and Zaikof Bay, Montague Island, in July, and on Green and Latouche islands the species proved to be one of the commonest birds in the forest. At the head of Port Nell Juan, August 14, both old and young were noted. The species was seen at Drier Bay, Knight Island, August 26; and as late as the middle of September several were seen in alders at Valdez Narrows. At least one example was obtained at each of the above localities, resulting in a series of twelve specimens (nos. 1332-1343). These happen to be all in more or less worn breeding or post-breeding plumage, but are nevertheless unequivocally referable to the race *pileolata* as understood since Ridgway separated the California race, *W. p. chryscola*.

***Anthus rubescens* (Tunstall).** American Pipit.

A few noted at the edge of a marsh and on the sandbars at the head of Cordova Bay, and a pair taken there by Dixon, June 13 (nos. 1309, 1310); the female contained an egg with fully formed shell, so that the species doubtless breeds in the near vicinity. Several individuals were seen on a mountain near Canoe Passage, Hawkins Island, June 22. Miss Alexander saw some pipits on Hinchinbrook Island, June 29, where they were flying about a peak at about 1900 feet altitude, and behaving as though nests were close by. On Montague Island, July 30, the species was seen on the uplands near Hanning Bay; and near Zaikof Bay, July 7, on a mountain at 1600 feet altitude, Dixon found a nest containing three small young. The nest was close to a snowbank, and hidden from view under an overhanging

rock. Heller records pipits as seen on a mountain on Disc Island, September 4, and as abundant on the beach in Valdez Narrows, September 12 to 21. Miss Alexander saw many individuals at Thompson's Pass, on the Eagle Government Trail, August 31, and secured two (nos. 1311, 1312). These specimens are in complete first winter plumage, and are darker and more cinnamonaceous than winter birds of later date from California and the Atlantic States. This difference is possibly because the plumage is fresher, that is, not worn and faded. The two June breeding birds (from Cordova Bay) are distinctly less ashy than May examples from the upper Yukon, and the wings are slightly shorter. But the material at hand is too scanty to warrant any conclusions as to subspecific separateness.

Cinclus mexicanus unicolor Bonaparte.

North American Dipper.

Eight obtained (nos. 1279-1286), five of which are full-grown juvenals dating from June 27 to July 27. Both adults and young appear to me closely similar to corresponding stages from California, save that the latter average a trifle smaller. The species was found in suitable places both on the islands and mainland. At the head of Cordova Bay several were seen along streams and one taken by Heller, June 13; a partial albino was repeatedly seen there June 11. Three specimens were taken by Miss Kellogg at Northeast Bay, Hinchinbrook Island, June 27 and 28. Miss Kellogg secured three more specimens at Hanning Bay, Montague Island, July 26 and 27. Miss Alexander obtained one on Latouche Island July 19, and saw another near the mouth of Port Nell Juan, August 11. At Drier Bay, Knight Island, Heller saw two dippers the last of August.

Nannus hiemalis pacificus (Baird). Western Winter Wren.

Sparsely distributed through the region, and not common anywhere. Thirteen examples were secured (nos. 1344-1356), from Montague Island (both Zaikof and Hanning bays), Green Island, Hoodoo Island, and the mainland at the head of Port Nell Juan. The species was seen also on Disc Island. A full-grown young

one (no. 1355) was taken on Green Island July 15, and three full-grown young (nos. 1348-1350) at Hanning Bay, Montague Island, July 31. All the specimens are alike, considering age and abrasion, and I am unable to distinguish them from *N. h. pacificus* of the Sitkan and Puget Sound regions. Port Nell Juan is now the westernmost known station for the species. As far as I know the westernmost previous record station is Yakutat Bay, 275 miles to the eastward.

***Certhia americana montana* Ridgway.** Rocky Mountain Creeper.

Eight specimens secured, nos. 1269 to 1276, from the head of Cordova Bay and head of Port Nell Juan, on the mainland, and from Hinchinbrook, Montague, Knight, and Chenega islands. Although thus widely distributed throughout the region, the species is far from common, as only one or two individuals were noted which were not collected. Among the latter, two (nos. 1272, 1273) are full-grown juvenals, both taken on Knight Island, August 26. One (no. 1275), from Chenega Island, August 31, is in complete newly acquired winter plumage. The rest are breeding birds with more or less worn plumage. Keeping in account the stage of plumage, I find the creepers of Prince William Sound, both from the islands and the mainland, uniform and indistinguishable from the subspecies *montana* of the northern Rocky Mountain region.

***Penthestes atricapillus turneri* (Ridgway).** Yukon Chickadee.

Noted only on the mainland, where two specimens were taken by Miss Alexander at Valdez, August 29. A small flock was seen the next day on the Eagle Government Trail. The specimens (nos. 1306, 1307) appear to be birds-of-the-year, though in nearly full winter plumage. It is probable, considering the season, that the observed individuals of this chickadee were fall wanderers towards the coast from interior breeding grounds. At any rate, the Yukon chickadee is typically an Alaskan-interior species, the Valdez chestnut-sided chickadee replacing it on the coast.

***Penthestes rufescens vivax*, new subspecies.**

Valdez Chestnut-sided Chickadee.

TYPE.—♂ adult; no. 1368, Univ. Calif. Mus. Vert. Zool.; Latouche Island, Prince William Sound, Alaska; July 18, 1908; collected by A. M. Alexander.

CHARACTERS.—Like *Penthestes rufescens rufescens* in coloration, but larger, tail proportionately longer and bill bulkier.

DISTRIBUTION.—As far as known only the Prince William Sound region of Alaska; fifteen specimens at hand, from Hawkins, Hinchinbrook, Montague, Green, Latouche, and Knight islands, and head of Port Nell Juan.

REMARKS.—The accompanying tables of measurement show the actual size in certain respects of the specimens from Prince William Sound, and also of a like number of examples from the Sitkan district, the latter being that portion of the known habitat of the true *P. r. rufescens* nearest to that of the form here described as new. An interval of over 400 miles, from which I have found no records of this sort of chickadee, constitutes an apparent gap between the two.

List and measurements of 12 adult examples of *Penthestes rufescens vivax* from the Prince William Sound region, Alaska:

No.	Locality	Collector	Date 1908	Sex	Wing	Tail	Culmen	Bill from Nostril
1362	Hawkins Id.	A. M. Alexander	June 18	♂	62.3	57.2	9.2	7.2
1363	Hawkins Id.	A. M. Alexander	June 21	♂	62.4	58.8	9.6	7.7
1364	Hawkins Id.	A. M. Alexander	June 22	♂	65.0	59.5	9.2	7.1
1357	Hawkins Id.	L. Kellogg	June 23	♀	59.6	57.0	9.3	7.2
1358	Hinchin- brook Id.	L. Kellogg	June 25	♀	59.5	56.9	9.8	7.5
1365	Hinchin- brook Id.	A. M. Alexander	June 25	♂	65.0	59.8	9.0	7.4
1366	Hinchin- brook Id.	A. M. Alexander	July 1	♂	63.5	61.0	9.4	7.8
1369	Montague Id.	A. M. Alexander	July 23	♂(?)	59.7	57.8	9.2	7.4
1359	Montague Id.	J. Dixon	July 9	♂	63.4	57.5	9.6	7.9
1360	Green Id.	J. Dixon	July 14	♂	65.0	59.8	9.4	7.5
1368	Latouche Id.	A. M. Alexander	July 18	♂	65.9	61.1	9.7	7.9
1361	Latouche Id.	J. Dixon	July 20	♂	64.0	59.0	9.4	7.3
Average of the 10 males.....					63.4+	59.1+	9.3+	7.5+

Measurement of 10 adult males of *P. r. rufescens* from Sitkan district (Baranof and Admiralty islands):

No.	Locality	Collector	Date	Wing	Tail	Culmen	Bill from Nostril	
1197*	Baranof Id.	J. Grinnell	June 29, 1896	62.4	55.5	8.5	6.7	
1217*	Baranof Id.	J. Grinnell	July 1, 1896	61.6	54.9	8.5	7.0	
1479*	Baranof Id.	J. Grinnell	Aug. 17, 1896	61.1	55.0	8.1	6.9	
1160*	Baranof Id.	J. Grinnell	June 23, 1896	60.7	54.3	8.9	7.2	
1177*	Baranof Id.	J. Grinnell	June 24, 1896	60.7	54.6	8.4	7.3	
1110*	Baranof Id.	J. Grinnell	June 10, 1896	59.9	53.5	8.4	6.8	
1155*	Baranof Id.	J. Grinnell	June 22, 1896	59.3	54.0	8.3	7.2	
315	Baranof Id.	F. Stephens	June 16, 1907	60.3	52.6	8.5	7.3	
349	Admiralty Id.	F. Stephens	May 6, 1907	63.9	55.8	7.8	7.0	
248	Admiralty Id.	F. Stephens	May 3, 1907	61.6	55.3	8.0	6.8	
Average of the 10 males				..	61.1+	54.5+	8.3+	7.0+

* Grinnell coll.

The Sitkan examples are identical in size as well as in color, as far as I can see, with a series of chestnut-sided chickadees from Washington, Oregon, and northern California. From all these the Prince William Sound form differs not only in larger bill, but also in the gonys, which is more nearly straight, and



Fig. 8.—*Penthestes rufescens vivax*, type, adult male; lateral outlines of bill; $\times 2$.

Fig. 9.—*Penthestes rufescens rufescens*, adult male, no. 349, Admiralty Island, Sitkan district, Alaska; lateral outlines of bill; $\times 2$.

in the culmen, which is more curved. The bill thus presents a different lateral outline. (See figs. 8 and 9.) The generally larger size is shown in the tables of measurements given above.

Besides the above listed localities where specimens were taken, the species was also observed on Hoodoo, Chenega, Disc, Eleanor, Naked, and Storey islands. The collectors record it from each of the numerous localities as "several seen" to "very abundant." Nos. 1367, 1370, and 1371 are full-grown juvenals, from Green Island (July 14), Port Nell Juan (August 16), and Drier Bay,

Knight Island (August 24). The latter two show considerable advance in the post-juvenal molt.

It is probably safe to consider the Valdez chestnut-sided chickadee as one of the most characteristic as well as widely distributed land-birds of the Prince William Sound region.

***Regulus satrapa olivaceus* Baird.**

Western Golden-crowned Kinglet.

Represented in the collection by six specimens (nos. 1300-1305), from Hinchinbrook Island (June 26), Montague Island (July 30), Knight Island (August 24), Chenega Island (August 31), and head of Port Nell Juan (August 16). Miss Alexander saw the species, also, at Cordova, June 6. And Dixon noted a family of seven in a salmonberry thicket at Hanning Bay, Montague Island, July 31. Otherwise the golden-crowned kinglet was not found in apparently suitable localities. The specimens obtained present no perceptible peculiarities as compared with relevant material from the Sitkan district and California.

***Regulus calendula grinnelli* Palmer.** Sitka Kinglet.

At Cordova, June 3 to 7, this kinglet was noted by Dixon as fairly common in the young spruce growth. At Canoe Passage, Hawkins Island, Heller found a male in full song among the spruces near timber-line, June 20, and secured it (no. 1379). On Hinchinbrook Island the song was heard daily; at Northeast Bay, on that island, two adult males were secured by Miss Alexander on June 27 and 30 (nos. 1372, 1373), and another by Hasselborg on July 2 (no. 1377). At Zaikof Bay, Montague Island, Miss Kellogg secured an adult pair July 11 (nos. 1380, 1381). Two adult males were taken on Latouche Island, July 18 and 19, by Miss Alexander (nos. 1374, 1375) and another by Dixon, on the same island, July 20 (no. 1378). Several were seen at the head of Port Nell Juan August 14, and on the 18th Miss Alexander secured a specimen there (no. 1376). This is a bird-of-the-year, probably a female, in a late stage of the post-juvenal molt; the colors of the new feathers are very deep. The species was last seen August 26, at Drier Bay, Knight Island.

A careful comparison of the ten examples from Prince William Sound with an adequate series of *grinnelli* from the Sitkan district, shows no discernible differences. The smallness of general size, and darkness of coloration are just as extreme in the former as in the latter. I had an *a priori* notion that the former would at least be intermediate towards the *Regulus c. calendula* of interior and northern Alaska, because this subspecies has been recorded as the breeding form of the Cook Inlet region; but I find no intermediate individuals.

***Hylocichla guttata guttata* (Pallas).** Alaska Hermit Thrush.

Abundant in the Prince William Sound region both on the various islands and the mainland. At Cordova Bay Miss Alexander notes that the woods above the floor of the valley seemed to be deserted by all birds save the hermit thrush. At Hawkins Island they were seen everywhere from tide-water to timber-line; Dixon came upon one singing on the very summit of a mountain on that island, June 22. On Hinchinbrook Island, where the species was also abundant throughout the timber, Heller saw one far above timber-line, which refused to be frightened away from a small cliff where it may have had a nest. At Zaikof and Hanning bays, Montague Island, and at Green Island, hermit thrushes were common; several were noted along the beaches at low tide hunting for food among the rocks. Additional record stations were: Head and mouth of Port Nell Juan; Latouche, Elrington, Hoodoo, Chenega, Knight, Disc, Eleanor, and Naked islands; and Valdez Narrows. Heller noted a few at the latter point between September 12 and 21.

A series of twenty-four specimens was obtained (nos. 1448-1471). Three of these are juvenals (August 4, 14, and 15). Two are birds-of-the-year in newly acquired first winter plumage (August 14 and 26). The remainder of the series consists of breeding birds in more or less worn summer plumage. As compared with *H. g. nana* (as represented by a large series from the Sitkan district of southeastern Alaska), the thrushes of Prince William Sound are slightly larger and ashier, less of a bright brown. But this is only an average difference, for I can easily select individuals from the two series which are absolutely

identical. This is true with the breeding birds; but the two examples of *guttata* in fresh fall plumage are both distinct from any fall specimens I have seen of *nana*, in their peculiar dark slaty-brown tone, not the warm umber brown of the latter. It is probable that the thrushes of Prince William Sound are really intermediate between *guttata* (which finds its extreme of characters to the westward) and *nana*, I judge nearer to the former. My hesitancy in placing them with more certainty is due to lack of material from Kadiak Island, Cook Inlet, etc.

***Ixoreus naevius meruloides* (Swainson).**

Northern Varied Thrush.

Common in most of the localities visited; a forest species, with decided preference for the edges of the woods adjacent to open meadows. One was repeatedly seen at Green Island foraging among pebbles on the beach. On Hinchinbrook Island, noted up to timber-line.

The following is the list of points at which the species was observed: Cordova; head of Cordova Bay; Hawkins, Hinchinbrook, Montague, Green, Latouche, Hoodoo, Chenega, Knight, Dise, Eleanor, and Naked islands; Port Nell Juan; and Valdez Narrows.

The nine specimens secured (nos. 1239-1247) are all adults in breeding plumage. Although from such diverse localities as head of Cordova Bay, and Hawkins, Hinchinbrook, Montague, and Green islands the series is extremely uniform. The five females are indistinguishable from the same sex in the race of the Alaskan interior. They differ from females of *naevius* at hand from the Sitkan district, in the constantly ashy, less brown dorsum, especially the tail, and in the general paleness ventrally. The wing- and tail-length is also slightly greater. The four males show a rather intermediate condition in that they are slightly darker than northern Alaskan birds, but are not so dark as Sitkan examples. The series as a whole allocates itself with the subspecies *meruloides*, rather than with *naevius* as one would on climatic grounds suppose.

COMPOSITION OF THE PRINCE WILLIAM SOUND
AVIFAUNA; DISCUSSION OF ITS ORIGIN.

The animal and plant life of the Prince William Sound region clearly belongs to two life zones, the Hudsonian and Alpine-Aretic. The former is practically coincident with the timbered areas, which extend from sea-level to an altitude varying from 1,000 to 1,600 feet, and is confined to a relatively narrow tract bordering the sea shore and extending up the valleys. (See plate 34.) The Alpine-Aretic, or treeless, zone covers the tops of the mountains on the islands, and the interior land-mass which surrounds the Sound.

The birds of the region appear to be groupable zonally as follows:

1. Land-birds believed to breed in the Hudsonian zone of the Prince William Sound district:

<i>Canachites canadensis atratus</i>	<i>Melospiza melodia kenaiensis</i>
<i>Accipiter velox</i>	<i>Melospiza lincolni gracilis</i>
<i>Archibuteo lagopus sancti-johannis</i>	<i>Passerella iliaca sinuosa</i>
<i>Haliaeetus leucocephalus alascanus</i>	<i>Hirundo erythrogaster palmeri</i>
<i>Bubo virginianus lagophonus</i>	<i>Tachycineta thalassina lepida</i>
<i>Ceryle alcyon caurina</i>	<i>Vermivora celata lutescens</i>
<i>Dryobates pubescens glacialis</i>	<i>Dendroica aestiva rubiginosa</i>
<i>Selasphorus rufus</i>	<i>Dendroica townsendi</i>
<i>Empidonax trailli alnorum</i>	<i>Wilsonia pusilla pileolata</i>
<i>Pica pica hudsonia</i>	<i>Cinclus mexicanus unicolor</i>
<i>Cyanocitta stelleri stelleri</i>	<i>Nannus hiemalis pacificus</i>
<i>Corvus corax principalis</i>	<i>Certhia americana montana</i>
<i>Corvus brachyrhynchos caurinus</i>	<i>Penthestes rufescens vivax</i>
<i>Pinicola enucleator flammula</i>	<i>Regulus satrapa olivaceus</i>
<i>Loxia leucoptera</i>	<i>Regulus calendula grinnelli</i>
<i>Passerculus sandwichensis alaud-</i>	<i>Hylodichla guttata guttata</i>
<i>lous</i>	<i>Leoreus naevius meruloides</i>
<i>Junco hyemalis hyemalis</i>	

2. Land-birds believed to breed in the Alpine-Aretic zone of the Prince William Sound district:

<i>Lagopus rupestris kelloggae</i>	<i>Acanthis linaria linaria</i>
<i>Leucosticte tephrocotis littoralis</i>	<i>Anthus rubescens</i>

Osgood (N. A. Fauna no. 19, 1900, p. 16, foot-note) has called attention to the fact that the humid Pacific Coast belt of Alaska

is not uniform all the way from Dixon Entrance to Kadiak Island. The forested region south of Lynn Canal is largely dominated by the Canadian life zone, and to it should be restricted the term "Sitkan district." The forested coast belt from Lynn Canal and Cross Sound to the Alaska Peninsula is purely Hudsonian, but not to be considered a part of the Yukon faunal district as intimated by Osgood. It appears to be divisible into distinct faunal areas as follows: Yakutat Bay district, Prince William Sound district, Cook Inlet district, and Kadiak district. Too little work has been done in the Yakutat Bay district to warrant a discussion of its relationship further than to assert that, from what is known, it is more nearly like the Prince William Sound district than the Sitkan district. The former, as shown by the comparative lists of component species given beyond, although of the Hudsonian zone, is quite distinct from the Yukon district.

Absence of satisfactory data prevents a comparison of the avifauna of the Prince William Sound district with that of the Cook Inlet district or with that of the Yakutat Bay district. But enough is known of the Sitkan and Yukon faunas to warrant the following comparisons. It is almost superfluous for me to urge that the status here given to any species is of necessity tentative. Not until field work has been carried on throughout the year in representative localities, as by Nelson at St. Michaels, can we be certain of the seasonal and distributional status of each of the birds in the respective faunas.

The water-birds are of little service in characterizing the avifauna of Prince William Sound. With the exception of *Ardea herodias fannini* and *Branta canadensis occidentalis*, the species are either transients, or of wide distribution. The two exceptions are characteristic species of the Sitkan district, and do not occur in the interior of Alaska, nor much further to the westward along the Pacific Coast.

3. Prince William Sound birds which are believed to be merely transients from the Yukon district:

<i>Circus hudsonius</i>	<i>Zonotrichia coronata</i>
<i>Falco columbarius</i>	<i>Dendroica coronata hooveri</i>
<i>Catcaarius lapponicus alasensis</i>	<i>Penthestes atricapillus turneri</i>

4. Breeding land-birds of the Prince William Sound district which occur also quite generally throughout Alaska:

<i>Accipiter velox</i>	<i>Loxia leucoptera</i>
<i>Archibuteo lagopus sancti-johannis</i>	<i>Hirundo erythrogaster palmeri</i>
<i>Haliaeetus leucocephalus alascanus</i>	<i>Dendroica aestiva rubiginosa</i>
<i>Ceryle alcyon caurina</i>	<i>Anthus rubescens</i>
<i>Corvus corax principalis</i>	<i>Cinclus mexicanus unicolor</i>

5. Breeding land-birds occurring in the Prince William Sound and Yukon districts but not in the Sitkan district:

<i>Bubo virginianus lagophonus</i>	<i>Junco hyemalis hyemalis</i>
<i>Empidonax trailli alnorum</i>	<i>Tachycineta thalassina lepida</i>
<i>Pica pica hudsonia</i>	<i>Certhia americana montana</i>
<i>Acanthis linaria linaria</i>	<i>Ixoreus naevius meruloides</i>
<i>Passerculus sandwichensis alaudinus</i>	

6. Breeding land-birds occurring in the Prince William Sound and Sitkan districts but not in the Yukon district:

<i>Dryobates pubescens glacialis</i>	<i>Permyzora celata lutescens</i>
<i>Selasphorus rufus</i>	<i>Dendroica townsendi</i>
<i>Cyanocitta stelleri stelleri</i>	<i>Wilsonia pusilla pileolata</i>
<i>Corvus brachyrhynchos caurinus</i>	<i>Nannus hiemalis pacificus</i>
<i>Pinicola enucleator flammula</i>	<i>Regulus satrapa olivaceus</i>
<i>Leucosticte tephrocotis littoralis</i>	<i>Regulus calendula grinnelli</i>
<i>Melospiza lincolni gracilis</i>	

7. Breeding land-birds of the Prince William Sound district which do not occur in either the Yukon or Sitkan districts:

<i>Canachites canadensis atratus</i>	<i>Passercilla iliaca sinuosa</i>
<i>Lagopus rupestris kelloggae</i>	<i>Penthestes rufescens vivax</i>
<i>Melospiza melodia kenaiensis</i>	<i>Hylocichla guttata guttata</i>

8. Some land-birds of the Sitkan district not also found in the Prince William Sound district:

<i>Dendragapus obscurus fuliginosus</i>	<i>Empidonax difficilis</i>
<i>Lagopus lagopus alexandrae</i>	<i>Loxia curvirostra sitkensis</i>
<i>Buteo borealis alascensis</i>	<i>Spinus pinus pinus</i>
<i>Dryobates villosus harrisi</i>	<i>Junco hyemalis oregonus</i>
<i>Sphyrapicus ruber ruber</i>	<i>Hylocichla ustulata ustulata</i>
<i>Colaptes cafer saturator</i>	<i>Planesticus migratorius caurinus</i>

9. Some land-birds of the Yukon district not also found in the Prince William Sound district:

<i>Bonasa umbellus umbelloides</i>	<i>Spizella monticola ochracea</i>
<i>Lagopus lagopus lagopus</i>	<i>Zonotrichia leucophrys gambeli</i>
<i>Sturnia ulula caparoch</i>	<i>Lanius borealis inivictus</i>
<i>Dryobates villosus leucomelas</i>	<i>Dendroica striata</i>
<i>Picoides americanus americanus</i>	<i>Sciurus noveboracensis notabilis</i>
<i>Euphagus carolinus</i>	<i>Penthestes hudsonicus hudsonicus</i>
<i>Acanthis hornemanni exilipes</i>	<i>Hylocichla aliciae</i>

To review the faunal characteristics as indicated by the foregoing lists, the Prince William Sound district possesses thirteen breeding land-birds in common with the Sitkan district (list no. 6), and nine in common with the Yukon district (list no. 5). Besides these, there are ten species which occur throughout all three districts (list no. 4), and six which are not found in either the Yukon or Sitkan district (list no. 7). Of this last category, *Canachites canadensis atratus* is closely similar to *C. c. osgoodi* of the Yukon district; and as this bird has no analogue in the Sitkan district, it is clearly a recent derivative from the Yukon fauna. The same is evident of *Lagopus rupestris kelloggae*. On the other hand, *Penthestes rufescens vivax* is most nearly related to the *P. r. rufescens* of the Sitkan district, and has no near relative in the Yukon district. This subspecies may, therefore, be considered a contribution from the Sitkan fauna. However, as I have elsewhere suggested (Auk XXI, July, 1904, p. 368), *P. r. rufescens* was itself, though much more remotely, derived from *P. hudsonicus* of wide boreal range. *Melospiza melodia kenaiensis*, *Passerella iliaca sinuosa*, and *Hylocichla guttata guttata* are likewise most nearly allied to representatives in the Sitkan district; the same or near related forms extend also to the westward through the Cook Inlet region.

That there are not more endemic species of birds in the Prince William Sound region, and that the species which are peculiar are so slightly differentiated, appear to be due to its small area, and to the relative narrowness and ineffectiveness of the barriers which surround it. The barrier for the Hudsonian species is the arctic-zone divide which surrounds the Sound in the form of a semicircle, with only a long, narrow coastal connectant along the Kenai Peninsula to the westward, and another towards Yakutat Bay to the eastward. The only endemic arctic-zone species (*Lagopus rupestris kelloggae*) owes the opportunity for its differentiation to the isolation afforded by the mountains on the more remote islands of the Sound. (See p. 384.)

That the Prince William Sound region has not produced as divergent forms of birds as the other faunal areas of Alaska may be due also to its more recent service as a center of differentiation. We may assume that there were no land-birds at all in

the Prince William Sound region at some remote period. This is a reasonable assumption from the seesaw-like elevation and depression to which the Alaskan coast has been subject, and which is even now in operation. Then the present avifauna is composed of birds which have entered the region from elsewhere, these having been permitted to do so as the new region became inhabitable and as the intervening barriers allowed. An examination of the present ornis of the region shows that all the species represented may be traced to the two different sources already referred to, now geographically contiguous to the Prince William Sound region, namely, the Yukon and Sitkan districts. These two faunal areas had already become differentiation centers at least before the Prince William Sound region had become more than a meeting ground of invading species.

Migrants may pass regularly over a wide area; yet the evidence teaches us emphatically that migrants do not ordinarily stop in their semiannual movements and start breeding centers at any point where the conditions become attractive (as is often assumed). Birds, whether migratory or sedentary, invade a new territory only by gradual extension of their *breeding* areas from season to season, physiographic conditions permitting.

That there is apparently no geographic variation in the birds of the Sound from island to island or from island to mainland is possibly due either to (1) the narrowness of intervening waterways, so that they may be so frequently crossed as to swamp by inbreeding any developing centers of differentiation; (2) the relative uniformity of ecologic conditions throughout the region, so that the forces are lacking which would carry on rapid divergent speciation; or (3), the submergence of the region and resulting isolation of colonies, so recent as not to have allowed sufficient time for the differentiation of local forms with perceptible characters. It is entirely possible that all three of these factors have contributed to the condition of uniformity displayed throughout the region by such susceptible birds as *Melospiza* and *Passerella*.

In conclusion, it is safe to say that the Prince William Sound avifauna, although younger than the Sitkan and Yukon avifaunas, and of a lower rank, is nevertheless well marked. This

contention is based on the peculiar association of species which characterizes it, and upon the inclusion in it of several forms which appear to have differentiated within the region itself.

MELANISM IN THE ENDEMIC SPECIES.

A survey of the three faunas here discussed, to ascertain the general characters displayed by the respectively component species, shows that, in the birds of the Sitkan and Prince William Sound districts as compared with corresponding species of the Yukon fauna, there is an increase in the extent of black markings and a darkening of the shades of brown and green, and a reduction in the general size, and disproportionate shortening of the wings and tail. (See table on page 425.)

The melanism referred to includes the most conspicuous specific and sub-specific characters of the birds (and many other terrestrial animals) of the coastal region of southeastern Alaska notorious for its heavy rainfall. This correlation of heavy pigmentation with large precipitation, and *vice versa*, has been so generally observed and commented upon that the latter has often been advanced as a cause for the former. The correlation is an observed fact; but it is not yet acceptably explained, nor am I able to adduce any new evidence to solve the matter. A discussion of the present status of the problem may not prove out of place.

The "humid coast belt" of Alaska, as compared with the more arid interior, offers four obvious environmental conditions: (1) an extreme of precipitation—rainfall, heavy mists, fog; (2) a high relative humidity of the atmosphere when not actually saturated; (3) a very large percentage of cloudy days—that is, much shade; (4) impeded radiation and therefore a much more uniform temperature, free from the extremes of the arid region.

That the melanism in question is caused by precipitation directly (although this is often assumed) appears to be abundantly disproven by the occurrence of palely colored species in regions of great annual rainfall, as in the Sierra Nevada of California. Here the rain, averaging in places 70 inches per year, comes in brief, heavy storms interspersed with prolonged periods of clear weather. Furthermore, in the coastal region of

TABLE LISTING CORRESPONDING BIRDS OF THREE ALASKAN FAUNAS, TO SHOW RELATIVE CONDITIONS OF SIZE AND MELANISM.

YUKON DISTRICT.	PRINCE WILLIAM SOUND DISTRICT.	SITKAN DISTRICT.
<i>Icterus naevius meruloides</i> , large, pale.	<i>Icterus naevius meruloides</i> ¹ , large, pale.	<i>Icterus naevius naevius</i> , small, dark.
<i>Regulus calendula calendula</i> , large, pale.	<i>Regulus calendula grinnelli</i> , small, dark.	<i>Regulus calendula grinnelli</i> , small dark.
<i>Penthestes hudsonicus hudsonicus</i> , large, pale.	<i>Penthestes rufescens vivax</i> , large, dark.	<i>Penthestes rufescens rufescens</i> , small, dark.
<i>Certhia americana montana</i> , large, pale.	<i>Certhia americana montana</i> , large, pale.	<i>Certhia americana occidentalis</i> , small, dark.
<i>Fernivora celata celata</i> , large, pale.	<i>Fernivora celata lutescens</i> ¹ , small, dark.	<i>Fernivora celata lutescens</i> , small, dark.
<i>Passerella iliaca iliaca</i> , large, pale.	<i>Passerella iliaca sinuata</i> , smaller, slaty.	<i>Passerella iliaca townsendi</i> , small, ruddy.
<i>Melospiza lincolni lincolni</i> , large, pale.	<i>Melospiza lincolni gracilis</i> ¹ , small, dark.	<i>Melospiza lincolni gracilis</i> , small, dark.
<i>Junco hyemalis hyemalis</i> , large, slaty.	<i>Junco hyemalis hyemalis</i> , large, slaty.	<i>Junco hyemalis oregonus</i> , small, ruddy.
<i>Passerculus sandwichiensis alaudinus</i> , pale.	<i>Passerculus sandwichiensis alaudinus</i> ¹ , pale.	<i>Passerculus sandwichiensis saradani</i> , dark.
<i>Pipilo maculator alascensis</i> , large, pale.	<i>Pipilo maculator flammula</i> , small, dark.	<i>Pipilo maculator flammula</i> , small, dark.
<i>Hypocichla ustulata swainsoni</i> , large, slaty.	<i>Hypocichla guttata guttata</i> ¹ , large, pale.	<i>Hypocichla ustulata ustulata</i> , small, ruddy.
<i>Dryobates pubescens nelsoni</i> , large, pale.	<i>Dryobates pubescens glaciatis</i> , small, dark.	<i>Hypocichla guttata nana</i> , small, dark.
<i>Dryobates villosus leucomelas</i> , large, pale.	<i>Melospiza melodia leucotis</i> ¹ , large, slaty.	<i>Dryobates villosus harrisi</i> ¹ , small, dark.
<i>Cyanocitta stelleri</i> , large, pale.	<i>Cyanocitta stelleri</i> , large, slaty.	<i>Melospiza melodia rufina</i> , small, ruddy.
<i>Bubo virginianus lagophonus</i> ¹ , ruddy.	<i>Bubo virginianus lagophonus</i> , ruddy.	<i>Bubo virginianus saturatus</i> , blackish.
<i>Phainopepla nitens</i> , large, pale.		<i>Phainopepla nitens</i> , small, dark.

¹ Not typical.

central California, with an annual rainfall of but 25 inches, various deeply colored subspecies have differentiated. Here, however, there is a great preponderance of cloudy days. But it is clearly not a matter of actual precipitation.

Neither does the influence of a humid atmosphere appear to be a direct cause of normal melanism, the experiments of Beebe to the contrary notwithstanding. (See *Zoologica: Contributions of the New York Zool. Soc.* I, 1907, pp. 1-41.) For the newly hatched young and the young in newly acquired juvenal plumage show as great relative depth of coloring as the adults which have undergone many molts, and which have been for their lifetime bathed in the humid atmosphere. And furthermore, dark-colored birds, members of "humid" faunas, in instances known to me remain for several generations imperceptibly changed when artificially transplanted into a relatively more arid climate, or when they have naturally extended their range beyond the confines of the humid faunal area in which they were with little doubt originally differentiated.

As intimated in the second paragraph preceding, the correlation of dark-colored species of birds with areas of excessive cloudiness, irrespective of rainfall, is so general as to demand serious consideration. Although an apparent fact, its significance is far from clear. Exposure to intense light from a cloudless sky (as with the human species and certain other animals) induces an increased deposit of dermal pigment. But in many others, the tone of coloration of the surroundings, whether black lava or white sand, appears to be assumed, irrespective of the mean light intensity. It is held by some, and with good grounds if the matter is not pressed too far, that the tone of coloration of such birds as do not find it advantageous to be conspicuous, tends to harmonize exactly with the average or blended tone of the background, against which they "disappear" when motionless. This mean background varies in depth of tone directly with the percentage of cloudiness. This idea is upheld by the fact that the most typically dark-colored humid-belt birds are such as either regularly serve as prey or are predaceous; as the grouse, ptarmigan, fox and song sparrows, juncos, thrushes, owls and certain hawks. Crows, ravens,

swallows, hummingbirds, eagles, fish hawks, and some water-birds respond indifferently in this regard. Such "protective" coloration would have been acquired through gradual increments from individual variation, by the action of natural selection. But this theory is discountenanced by many on grounds it is not here necessary to discuss. That the light itself has no direct effect on the colors of birds at the time of pigment deposition in the forming feather is shown by the fact that the characteristic depth of coloring is acquired by young birds hatched and fledged within dark holes of trees, as woodpeckers and chickadees.

In well-known regions there is often much difference in climate from year to year, one year showing a much greater or lesser amount of cloudy weather than the next. There is nothing to show that relevant species of birds in the same region become darker during cloudy years. The characters are constant from year to year. The melanism is an inherited character, not modified during the life of the individual, except because of age by means of molt, and by such adventitious agencies as abrasion and bleaching.

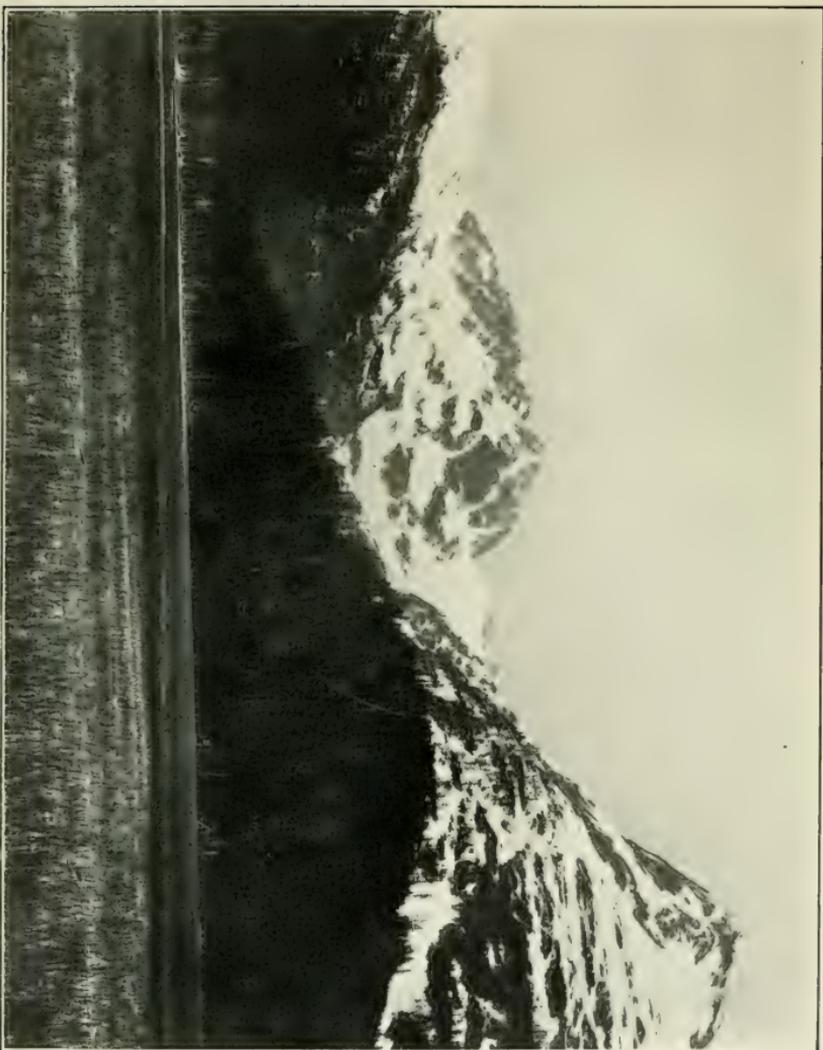
The effect of temperature on color in birds is not indicated by any evidence that I know of. The conspicuous difference in temperature affecting sedentary birds in the Yukon and Sitkan districts, respectively, consists in the great annual range of temperature in the former (57° C. in one known case) as compared with the latter (24°). This uniformity of temperature accompanies humidity everywhere, but I can not see in any case where it alone is accountable for any color characters.

The matter of size is a less conspicuous differential feature of the birds of the interior and coastal regions under consideration, than melanism. Yet in many plastic groups, the representatives in the Yukon district and to a slightly less extent those in the Prince William Sound district, are decidedly larger throughout. The woodpeckers, kinglets, thrushes, and certain finches exhibit this peculiarity. No satisfactory explanation is known to me. The relatively shorter, less pointed wings and shorter tails of the migratory coastal birds appear to be correlated with shorter semi-annual movements. Many of the

summer visitants to the Yukon district winter by the way of an interior route far south of the United States, even in South America; while corresponding species in the Sitkan district move south along the Pacific Coast and winter on the Pacific slope of Washington, Oregon, and California. This variation in the shape and area of the wing appears to be, therefore, more obviously adaptive than the melanism.



Nest of the Kenai Song Sparrow, in "beach grass," at Canoe Passage, Hawkins Island; June 17, 1908. (See p. 403.)

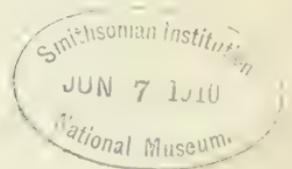


Head of Cordova Bay, June 15, 1908. The two life-zones of the region are here clearly in evidence: the tide-flat and timber belt, comprising the Hudsonian Zone; and the treeless area above timberline, the Alpine-Arctic Zone. (See p. 419.)

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