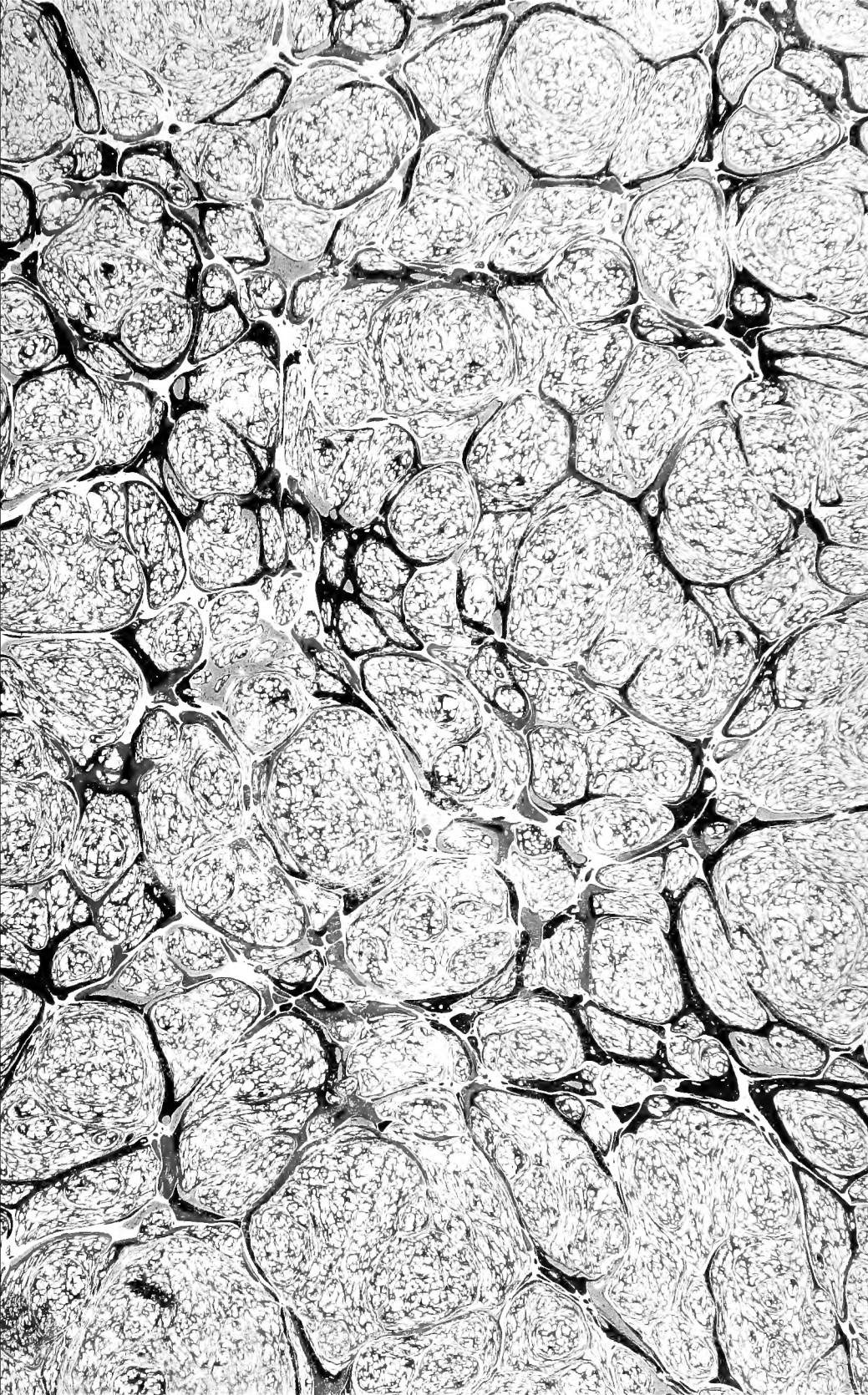

CORNELL
LAB *of* ORNITHOLOGY

LIBRARY

at Sapsucker Woods

Illustration of Bank Swallow by Louis Agassiz Fuertes

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY
Vol. 7, No. 10, pp. 319-436, pls. 7-12 February 14, 1912

FIELD NOTES ON AMPHIBIANS, REPTILES AND BIRDS OF NORTHERN HUMBOLDT COUNTY, NEVADA

WITH A DISCUSSION OF SOME OF THE FAUNAL FEATURES OF THE REGION

BY
WALTER P. TAYLOR

UNIVERSITY OF CALIFORNIA PRESS
BERKELEY

UNIVERSITY OF CALIFORNIA PUBLICATIONS

Note.—The University of California Publications are offered in exchange for the publications of learned societies and institutions, universities and libraries. Complete lists of all the publications of the University will be sent upon request. For sample copies, lists of publications or other information, address the Manager of the University Press, Berkeley, California, U. S. A. All matter sent in exchange should be addressed to The Exchange Department, University Library, Berkeley, California, U. S. A.

OTTO HARRASSOWITZ, LEIPZIG.

Agent for the series in American Archaeology and Ethnology, Classical Philology, Education, Modern Philology, Philosophy, Psychology, History.

R. FRIEDLAENDER & SOHN, BERLIN.

Agent for the series in American Archaeology and Ethnology, Botany, Geology, Mathematics, Pathology, Physiology, Zoology, and Memoirs.

ZOOLOGY.—W. E. Ritter and C. A. Kofoid, Editors. Price per volume $3.50. Commencing with Volume II, this series contains Contributions from the Laboratory of the Marine Biological Association of San Diego.

Cited as Univ. Calif. Publ. Zool.

Volume 1, 1902-1905, 317 pages, with 28 plates $3.50

Volume 2 (Contributions from the Laboratory of the Marine Biological Association of San Diego), 1904-1906, xvii + 382 pages, with 19 plates $3.50

Volume 3, 1906-1907, 383 pages, with 23 plates $3.50

A list of titles in volumes 1-3 will be sent on request.

Vol. 4. 1. The Ascidians Collected by the United States Fisheries Bureau steamer *Albatross* on the Coast of California during the Summer of 1904, by William Emerson Ritter. Pp. 1-52, plates 1-3. October, 1907..... .50

2. (XVIII)* Behavior of the Starfish *Asterias forreri* de Loriol, by H. S. Jennings. Pp. 53-185, 19 text figures. November, 1907..... 1.00

3. (XIX) The Early Life-History of *Dolichoglossus pusillus* Ritter, by B. M. Davis. Pp. 187-226, plates 4-8. March, 1908..... .50

4. Notes on two Amphipods of the Genus Corophium from the Pacific Coast, by J. Chester Bradley. Pp. 227-252, plates 9-13. April, 1908. .30

5. (XX) The Incrusting Chilostomatous Bryozoa of the Western Coast of North America, by Alice Robertson. Pp. 253-344, plates 14-24, May, 1908 ..... 1.00

6. (XXI) On Exuviation, Autotomy, and Regeneration in Ceratium, by Charles Atwood Kofoid. Pp. 345-386, with text figures.

7. (XXII) Notes on some Obscure Species of Ceratium, by Charles Atwood Kofoid. Pp. 387-393.

Nos. 6 and 7 in one cover. April, 1908..... .50

Index, pp. 395-400.

Vol. 5. (Contributions from the Museum of Vertebrate Zoology.)

1. The Biota of the San Bernardino Mountains, by Joseph Grinnell. Pp. 1-170, plates 1-24. December, 1908 ..... 2.00

2. Birds and Mammals of the 1907 Alexander Expedition to Southeastern Alaska. Pp. 171-264, pls. 25-26, figs. 1-4. February, 1909 ..... .75

3. Three New Song Sparrows from California, by Joseph Grinnell. Pp. 265-269. April 9, 1909 ..... .05

4. A New Harvest Mouse from Petaluma, California, by Joseph Dixon. Pp. 271-273. August 14, 1909 ..... .05

5. A New Cowbird of the Genus *Molothrus*, with a note on the Probable Genetic Relationships of the North American Forms, by Joseph Grinnell. Pp. 275-281, 1 text figure. December, 1909..... .05

---

*Roman numbers indicate sequence of the Contributions from the Laboratory of the Marine Biological Association of San Diego.

UNIVERSITY OF CALIFORNIA PUBLICATIONS
IN
ZOOLOGY

Vol. 7, No. 10, pp. 319-436, plates 7-12 February 14, 1912

FIELD NOTES ON AMPHIBIANS, REPTILES AND BIRDS OF NORTHERN HUMBOLDT COUNTY, NEVADA,

WITH A DISCUSSION OF SOME OF THE FAUNAL FEATURES OF THE REGION

BY

WALTER P. TAYLOR

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

CONTENTS

INTRODUCTION

In order to progress toward the ultimate solution of the problems in the field of biology, it is essential that increasingly accurate and comprehensive observations of living forms, both in a state of nature and under experimental conditions, be carried

forward and recorded. The biological explorations made in the Pine Forest Mountain region were prosecuted with this principle in mind; and in the present paper detailed facts of possible faunal and distributional significance have been emphasized.

At the present time it is coming to be realized that there are other characters distinguishing species than those brought forward through morphological researches, as, for example, those belonging to the domains of physiology and psychology. These characters, being less accessible and sometimes less tangible, offer more obstacles to precise definition than those others dealing with structure. Nevertheless, traits, habits, manners of performing particular acts, preferences of one kind and another, seem in most cases to be as definite and as constant characteristics of species as the shape and size of bill and feet, or coloration of fur and configuration of skull. An attempt has in this paper been made to place the emphasis upon such non-morphological characters, here mainly psychological. That the facts as recorded are in some cases fragmentary and unrelated to others indicates strongly the general desirability of putting on record such data as are available, to the end that later investigators in this field may at least benefit by that little which is at present known.

This paper represents the completion of the report on the vertebrates of the Pine Forest Mountain region, the first major installment of which appeared as the "Mammals of the Alexander Nevada Expedition of 1909" (Taylor, 1911).

While Mr. Richardson and the writer were carrying on field work in the Pine Forest Mountain region, Miss Alexander and Miss Kellogg were members of a palaeontological expedition working in the same general neighborhood (see Taylor, 1911, p. 205). They incidentally collected specimens of vertebrates and made field notes. The results of their work as well as of our own have been incorporated into the present paper.

The writer must acknowledge indebtedness to the following persons: to Professor Charles A. Kofoid, of the Department of Zoology of the University of California, for generous criticism; to Mr. Joseph Grinnell, Director of the Museum of Vertebrate Zoology of the University of California, for general direction and advice in connection with the paper; to Professor Harvey M.

Hall, of the Department of Botany of the University of California, for identification of plants submitted to him; and to Mr. Harold C. Bryant, Fellow in Zoology on the foundation established by the California Fish and Game Commission, for provisional identification of certain species of reptiles.

ITINERARY

Mr. Charles H. Richardson, Jr., and the writer left Berkeley on May 10, 1909, arriving at Winnemucca, Nevada, on the following morning. From there we journeyed by stage to Quinn River Crossing (Mason's Crossing), seventy-five miles to the northwest. One night en route was spent at Amos (Cane Springs Station), and one at Tregaskis Well. The morning of May 14 found us at our first collecting ground.

Camp was established one mile from the buildings of the Quinn River Ranch on Wheeler Creek, tributary to the river (see map, plate 7). Practically three weeks (May 15 to June 8) were spent at this locality. Twelve miles in a northwesterly direction from Quinn River Crossing is found Big Creek Ranch, the second collecting station. This ranch is located at the base of the Pine Forest Mountains. It constituted the first camp of the "biological cross-section" series (see map, plate 7). By establishing collecting localities from one side of the mountains to the other, 1000 feet apart as regards altitude, we hoped to obtain precise data on the range of species, life zones, and comparative distribution of forms on the two sides of the mountains. Big Creek Ranch was the base camp for all further operations, which had to be conducted by means of pack animals. We remained in this locality two weeks (June 8 to 23).

The next camp was at the head of Big Creek (8000 feet), where the time from June 23 to July 6 was spent. This became the secondary, or mountain base of supplies. The following camps were then established as parts of the cross-section plan: Big Creek (6000 feet), July 6 to 8; Big Creek (7000 feet), July 8 to 10; Duffer Peak Meadow (8400 feet), July 10 to 12; Alder Creek (7000 feet), July 12 to 14; Alder Creek Ranch (5000 feet), July 16 to 18; Head of Big Creek (8000 feet), July 19 to 29. The gaps in the series were thus filled, and the east-west

cross-section completed. It will, of course, have been noted that the cross-section is not an ideal one. To make it so an equal amount of time should have been spent at each locality. Practical difficulties, however, made this impossible. Furthermore, seasonal change, even within the short space of time covered in the cross-section series of camps, affects the distribution of certain forms, particularly birds, and so ideally these localities should all have been worked at the same time.

On July 29 we departed for Leonard Creek, making camp at 6500 feet altitude, and remaining until August 10. On this date we returned to Big Creek Ranch, and prepared our outfit for transit back to the University. Practically three months were occupied in actual collecting.

DESCRIPTIONS OF LOCALITIES

(Refer to map, plate 7)

The following localities were visited either by members of the palaeontological party or by our expedition.

Willow Point, Amos (Cane Springs Station), Sod House Point, and Tregaskis Well (fourteen miles south of Quinn River Crossing) are successive stage stations between Winnemucca and Quinn River Crossing. Chimney Creek is a stream flowing westward out of the Santa Rosa Mountains east of Amos.

Virgin Valley is located northwest of the Pine Forest Mountains over a low range of hills (see map). Thousand Creek flows northeast out of Virgin Valley. It is situated some twelve miles north and a little west of Alder Creek Ranch. Soldier Meadows is located on an arm of the Black Rock Desert, and is forty miles due south of Virgin Valley. Little High Rock Cañon is west and a little south of Soldier Meadows, being just over the Humboldt County line in Washoe County.

Mason's Crossing or *Quinn River Crossing* (altitude 4100 feet).—This locality is situated in the midst of the open desert on the Quinn River. The stream is in this region strongly alkaline and follows a winding course in a general westerly direction, soon turning toward the southwest and flowing into a sink on the Black Rock Desert.

Toward the east appears a series of low, desert hills, which

culminate to the north in Split and Trident peaks. The Pine Forest Mountains, which constitute the highest range in this part of Nevada, are seen to the west. Upon the south appear the Jackson Mountains.

The flat expanse of the open desert extends away in all directions, interrupted in the near vicinity of the Crossing only by two lava buttes which rise up to the northward. One can easily realize that this great extent of regular desert was once the floor of an arm of the great Pleistocene Lake Lahontan.

Tributary to the Quinn River at this locality is Wheeler Creek, which rises in the hills to the northeastward and flows as far as the river for a part of the year. The smaller stream is largely utilized for the irrigation of the Quinn River Ranch, owned by Miller & Lux.

The soil in the vicinity is made up of very fine particles, which fly in clouds in response to the slightest breeze. Ordinarily several miniature sand-pillars or whirls may be seen in the distance. Beneath the surface the soil is exceedingly hard, this fact perhaps accounting for the comparative rarity there of burrowing mammals.

A few willows (*Salix fluviatilis exigua*) along the river were the only trees in the vicinity. Mr. F. M. Payne, of the Miller & Lux Company, said that introduced trees do not thrive.

The commonest shrub on the desert was *Artemisia tridentata.* This plant grew more luxuriantly and to a greater size in the general neighborhood of some creek or stream than elsewhere. On the more arid waste places it was replaced locally by *Artemisia spinescens, Grayia spinosa,* and *Sarcobatus vermiculatus.* On less arid portions of the desert such plants as *Tetradymia spinosa, Chrysothamnus nauseosus,* and *Mentzelia albicaulis* were associated with the true sagebrush (*Artemisia tridentata*).

Along the river, vegetation was very sparse. At intervals there were thickets of willow and wild rose (*Rosa blanda*) but the growth was nowhere luxuriant. Other species occurring along the stream were *Poa buckleyana, Ribes aureum, Radicula sinuata, Vicia americana, Artemisia ludoviciana,* and *Taraxacum officinale.*

A large proportion of the species of animals and plants found

at Quinn River Crossing are typically Sonoran in distribution, many of them being found elsewhere not lower than Upper Sonoran. On the other hand, while a number of the animal species abundant at this locality (e.g., *Oreoscoptes montanus, Dendroica aestiva brewsteri, Eutamias pictus, Perognathus parvus olivaceus, Thamnophis vagrans*) occur also in Transition, no species in other localities characteristic of, or limited to, that zone, with the possible exception of *Otocoris alpestris merrilli* and *Sceloporus graciosus,* were found at Quinn River Crossing. The conclusion seems justified, therefore, that the Quinn River Valley in this vicinity is Upper Sonoran.

Pine Forest Mountains (4350–9400 feet; Biological Cross-section Camps nos. 1 to 8).—If one stands upon a high point and looks out over the lower slopes of the range he is impressed immediately with the excessively arid appearance of the mountains as a whole (see pl. 8, figs. 1 and 2). No trees are to be seen anywhere at the lower altitudes, except for the very narrow and often broken lines along streams. The lower ridges, lying baked and bare, are observed to be unprotected except by a very meager growth of sagebrush or associated xerophytes. In the higher parts of the mountains, the scene is somewhat more varied (see pl. 10, fig. 1). A few quaking-aspen groves are noted on the more humid of the meadows, and brush-like patches of the same species of tree are apparent on certain favorable steep slopes. Furthermore, a tract of limited proportions, confined almost entirely to the western slope of the mountains, is seen to be occupied by small limber pines, *Pinus flexilis* (?) (see pl. 11, fig. 1). It is unfortunate that the identification of the pine is based on foliage only, no cones being at hand. Geographic and zonal considerations indicate that it is *Pinus flexilis,* although its identity can not be considered to be certainly established. Scattering groups of mountain mahogany are observed on certain of the western ridges (see pl. 10, fig. 2).

The topography of the higher parts of the mountains seems to indicate the former presence of glaciers. Several hanging valleys were observed, and in three localities, namely at the head of Leonard Creek, in the vicinity of Alder Creek Lake, and at the head of Big Creek, there are land forms resembling cirques.

Each one of the three little lakes appears to have been formed through the damming up of cañons by morainal material. The best examples of moraines in the mountains are found at the head of Alder Creek. The peculiar shape of Alder Creek Lake (see pl. 10, fig. 2) and the intersection of it by long mounds are with very little doubt to be accounted for in this way. A number of facetted rocks were picked up at Alder Creek Ranch. Certain ridges in the mountains resemble the "sheep-back" type.

There are several extensive meadows, always grass-covered and usually traversed by at least one creek, in the higher parts of the mountains (see pl. 12, fig. 1). Usually there is a limited area of springy ground, surrounded by thickets and grown over with rank grass. Along the creeks or on the borders of the meadow quaking aspens and a few willows may be found. On the mountain slopes rising up from it extensive chinquapin thickets and locally individual limber pines are often noted. Snow banks persist until late in the summer on the highest meadows (see pl. 9, fig. 1), and *Iris missouriensis* and *Veratrum californicum* are common plants on the moister ones (see pl. 11, fig. 2).

Big Creek Ranch (4350 feet; Biological Cross-section Camp no. 1; see pl. 8, fig. 1).—This station is located three-fourths of a mile from the mouth of Big Creek Cañon, and ten or twelve miles in a northwesterly direction from Quinn River Crossing.

The ranch is on a broad alluvial fan. During the summer season all the water of Big Creek is used for purposes of irrigation.

The Pine Forest Mountains rise up immediately to the west, appearing as a series of foothills resembling badlands. Their very sparse covering of xerophilous plants is at once noticeable.

The vegetation of the flat in the neighborhood of the ranch was more scattering even than at Quinn River Crossing, being made up largely of *Chrysothamnus* and *Grayia,* with some *Artemisia tridentata.* About the ranch buildings was a windbreak of poplars. These trees, together with the willows and alders along the stream, were the only ones in the vicinity. The quaking aspens (*Populus tremuloides*) followed the creek down to within a half-mile of the ranch.

As the mountains were approached, a pronounced difference in the fauna, especially as regards reptiles, was observed. The number of species of the latter, as well as the number of individuals, increased markedly. *Cnemidophorus tigris, Crotaphytus collaris baileyi,* and *Uta stansburiana* were recorded for the first time. *Crotaphytus wislizenii, Sceloporus biseriatus,* and *Phrynosoma platyrhinos* became abundant, whereas previously but few specimens had been collected. Of the mammals, *Neotoma nevadensis, Lepus californicus wallawalla,* and *Perodipus microps levipes* were found in somewhat increased numbers. This locality was the only one at which *Onychomys brevicaudus* was secured. As regards birds, Say phoebes, western wood pewees, black-throated sparrows, and western robins were more in evidence.

These facts probably do not indicate difference in temperature so much as they do that there is something present, whether a more suitable dwelling-place or better food supply or something else, which proves especially attractive or favorable to the species in question. For example, the presence of rock piles in which they may nest conveniently accounts, at least partly, for the increase in numbers of wood rats.

One factor which doubtless affects distribution is the nature of the ground (see C. H. Merriam, 1892, p. 46). As Big Creek Ranch is approached the flour-like, hard soil characteristic of Quinn River Crossing is replaced by a more sandy, slightly coarser material. The more favorable conditions in this respect may account somewhat for the difference in number and abundance of certain species of mammals and reptiles at the two localities.

Zonally Big Creek Ranch is inseparable from Quinn River Crossing, except that it apparently possesses a facies representative of a higher division of Upper Sonoran. Nearly all of the species taken at Big Creek Ranch occur elsewhere in Upper Sonoran, and several are not found above that zone.

Transitional elements were, however, noted at Big Creek Ranch, which were lacking at Quinn River Crossing; for example, among plants, *Populus tremuloides, Castilleia parvifolia, Alnus tenuifolia,* and *Achillaea millefolium lanulosa;* among mammals, *Erethizon epixanthum* and *Microtus mordax;* and among birds

Vireosylva gilva swainsoni. So, keeping in mind the fact that temperature may not be the only or even the principal limiting factor in certain individual cases (of the species cited), still the conclusion is justifiable, that Big Creek Ranch belongs to higher Upper Sonoran than Quinn River Crossing, and may properly be included in the area of admixture of Transition and Sonoran forms, as shown in the accompanying map.

The Big Creek Camps (4500–8000 feet; Biological Cross-section Camps nos. 2 to 4; see pl. 8, fig. 2).—From its mouth to a point about a mile into the mountains Big Creek Cañon is narrow and fairly steep-sided. Then it begins to widen, until at the forks, about two miles distant from the mouth, a broad series of rolling flats comes to view. If the creek is followed still farther, the cañon once more becomes constricted.

In the biographic accounts of certain species reference has been made to the "Dugout Camp," which marks a mining claim. This is located at 5000 feet altitude on Big Creek about halfway between the mouth of the cañon and the forks.

The range in the region of the Dugout Camp and for some distance east and west is made up of steep-sided foothills resembling badlands. This series of hills continues for nearly the entire north and south extent of the Pine Forest Mountains. Then at the forks the rolling flats come into view. These are continuous on the south with the even more extensive Leonard Creek flats. From two to four miles farther west the main ridge of the mountains, culminating in Duffer Peak (9400 feet), is seen.

Biological Cross-section Camp no. 2 (6000 feet; see pl. 8, fig. 2).—This camp was situated on Big Creek about a half-mile above the forks. *Artemisia tridentata* was the prevailing plant all over the flats and ridges. The trees along the stream, named in the order of their abundance, were quaking aspens, willows, and alders. The flowering plant most in evidence in the open was *Lupinus laxiflorus.* This camp may perhaps more properly be said to represent lower Transition than high Upper Sonoran. The green-tailed towhee was common, and *Citellus oregonus* was secured on nearby ridges. The presence of *Chondestes gram-*

macus strigatus indicates, however, that it is at best only low Transition.

Biological Cross-section Camp no. 3 (7000 feet).—This camp was made on a small meadow separated from the main stream of Big Creek by a rocky ledge. The meadow was undoubtedly Transition, as *Thomomys fuscus fisheri* was trapped upon it, and *Iris missouriensis* was fairly common on nearby slopes. *Zonotrichia leucophrys leucophrys* was probably nesting in brush in the vicinity.

Very high Transition, with a touch of Boreal, was represented on a limited area on a north-facing slope on the south side of Big Creek at this altitude. There were several springs in this area, and the verdure grew as luxuriantly as at any locality in the mountains, the thickets being made up of quaking aspens and many water-loving species of plants. In this cool, protected situation both *Hylocichla ustulata swainsoni* and *Zonotrichia leucophrys leucophrys* were noted.

Biological Cross-section Camp no. 4 (8000 feet; see pl. 9, figs. 1 and 2).—This camp at the head of Big Creek, at which more time was spent than at any other established, was located at an altitude of approximately 8000 feet, near the source of the southernmost of the main feeder streams. Geologically speaking, the glade in which camp was situated was apparently a hanging valley.

As might be anticipated, the flowering season was found to be later at this altitude than at the lower camps. Vegetation was comparatively abundant. Quaking aspens grew to a height of thirty feet along the creek. Associated with them in the sheltered cañon was the limber pine, which occurred also quite abundantly on the north-facing slope on the south side of the cañon, and less commonly on the south-facing slope on the opposite side. Such plants as the following, referable to Transition zone and higher, were found at this locality: *Aquilegia truncata, Ribes cereum, Achillaea millefolium lanulosa, Aphyllon fasciculatum, Pentstemon confertus caeruleo-purpureus, Arnica chamissonis, Iris missouriensis, Aconitum columbianum, Elymus pubiflorus, Sisymbrium canescens, Allium validum, Ceanothus velutinus, Castanopsis* (species not known), and *Veratrum californicum.* Of the

plants found the following indicate that zonally the locality is high Transition with a Boreal infusion: *Ribes cereum, Aconitum columbianum, Pinus flexilis, Allium validum, Aquilegia truncata* and *Veratrum californicum. Hylocichla ustulata swainsoni, Zonotrichia leucophrys leucophrys, Microtus mordax, Zapus princeps oregonus,* and *Sorex palustris navigator* also were taken.

Certain warm slopes nearby should probably be regarded as low Transition, for while the Transition species *Prunus demissa* and *Amelanchier alnifolia* were present, so also was the cañon mouse (*Peromyscus crinitus*), an Upper Sonoran form.

Mammals were more numerous at this locality than at any other visited, but birds were rare. In one day during which I remained in camp and kept count of those noted, only sixteen individuals, made up of the following species, were seen: red-shafted flickers, 2; Clarke nutcrackers, 3; Cassin purple finch, green-tailed towhee, thick-billed fox sparrow, rock wren, Audubon warbler, and russet-backed thrush, 1 each; and western robins, 5.

The Duffer Peak Meadow (8400 feet; Biological Cross-section Camp no. 5; see pl. 11, fig. 2).—This station, the highest made by the party, was located on a rather broad, level meadow directly north of Duffer Peak, and in the most extensive belt of limber pines in the mountains. Snowbanks persisted here until late in the summer.

On the north side of the meadow was a tract of quaking aspens. The pine-covered face of the highest peak in the range rose up to the south. The dominant tree of the high pass to the east was the limber pine, associated there with stunted mountain mahogany. To the north, in the direction of Alder Creek Lake, lay one of the principal forested areas, which was interrupted to some extent by slopes of a more open character immediately north of the meadow, covered by chinquapin and quaking aspen. On the west were other meadows.

The Duffer Peak meadow itself was open and grassy, a small lake occupying its lowest portion. *Veratrum californicum* was perhaps the commonest plant on the meadow (see pl. 11, fig. 2).

The pines themselves persisted to the peak, as did also *Eutamias pictus* and *Peromyscus maniculatus sonoriensis.*

Among the species of birds secured at the locality, purple

finches, Audubon warblers, Clarke nutcrackers, white-crowned sparrows, and western red-tails were numbered. The following mammals were noted: *Odocoileus hemionus, Callospermophilus trepidus, Eutamias pictus, Peromyscus maniculatus sonoriensis, Microtus mordax, Zapus princeps oregonus, Canis lestes,* and *Myotis lucifugus longicrus.* The latter was a species of mammal noted at the Duffer Peak meadow only.

The limber pines and the presence of a number of species usually ranging into zones above Transition gave to the locality a distinctly Boreal complexion. As in the case of the head of Big Creek, the predominant Transition facies was somewhat diluted by the addition of certain Boreal elements. It seems appropriate, therefore, to regard the locality as Transition with a marked Boreal infusion.

Alder Creek Camps (5000–7000 feet; Biological Cross-section Camps nos. 6 to 8).—The mountains grade off to the west more gradually, locally at least, than they do to the east. As is the case with certain other desert ranges, as well as with the Warner, Sierra Nevada and other mountains of California, there is a line of faulting along the eastern side, which accounts for the greater steepness upon that slope.

The western slopes seem more rocky and are apparently made of harder material, as the cañon-sides are steeper. There are great masses of igneous rock. In the vicinity of Alder Creek Ranch especially, much scattered pumice stone was noted.

While in general the flora as regards species was the same as on the eastern side, it was noticeably more sparse, and the ridges and flats of the western slope had even more of an arid and baked appearance than those of the eastern.

Biological Cross-section Camp no. 6 (7000 feet).—In favorable situations along the stream, for the most part above this altitude, quaking aspens formed rather dense groves. As a rule, north-facing slopes, i.e., on the south side of the cañon, were covered with a scattering, sometimes with a dense, growth of these trees. Clumps of willows occurred along the stream, and on the arid, exposed ridges mountain mahoganies were fairly common.

The vicinity of Camp no. 6 must apparently be referred to

high Transition. A few limber pines occurred below the level of Alder Creek Lake (7800 feet), and occasionally the penetrating cries of *Nucifraga columbiana* sounded from the ridges. About the lake itself a number of Boreal and Transition forms, as *Aphyllon fasciculatum, Pentstemon confertus caeruleo-purpureus, Arnica chamissonis,* and *Pinus flexilis,* were present. White-crowned sparrows, olive-backed thrushes, Brewer sparrows, chipping sparrows and green-tailed towhees were common at Camp no. 6, as were also Oregon ground squirrels.

Biological Cross-section Camp no. 7 (6000 feet; see pl. 12, fig. 2).—As progress was made down the creek the flora grew more limited. In the neighborhood of this camp there was no thick vegetation away from the stream. That along the creek was made up of quaking aspens and willows, with occasional thick tangles of *Rosa* and other vines. Alders appeared for the first time on this stream not far below this altitude, and were found scatteringly down to Alder Creek Ranch.

Three species of mammals were taken here which make the locality an extremely interesting one from a zonal standpoint, namely, *Neotoma cinerea occidentalis, Zapus princeps oregonus,* and *Putorius cicognani.* The olive-backed thrush, western warbling vireo, and green-tailed towhee were also noted. The exposed ridges in the vicinity may be high Upper Sonoran, as *Sylvilagus nuttalli grangeri* was secured on one of them. On the other hand the Oregon ground squirrel ranges down below the large Alder Creek Meadow (6700 feet) even on exposed ridges. So, if the ridges are Sonoran at all they should be regarded as high Upper Sonoran. There is little doubt that along the stream Transition extends down to and beyond this point. This remarkable association of Boreal, Transition and Upper Sonoran forms, found at several points in the mountains, is strikingly illustrated by the fauna of this locality.

Biological Cross-section Camp no. 8 (5000 feet).—Willows, with a few alders and aspens, made up most of the line of vegetation along the creek in the vicinity of Alder Creek Ranch. Treeless stretches were fairly common. The *Artemisia* association of the open desert was more sparse and scattering here than at any other point visited.

One fact of distribution may be of particular interest, namely, the occurrence on Alder Creek not far above the ranch of a *Populus,* tentatively identified by Professor H. M. Hall of the University of California as *P. balsamifera.* The species was represented by a clump of four trees only. The tree is northern in distribution, the nearest locality from which it is reported by Sudworth (1908, p. 244) being northern Oregon and Idaho. May not a colony of these trees have been left here when the cooler environment of the Glacial period retreated?

Zonally Alder Creek Ranch (Camp no. 8) is referable to Upper Sonoran. *Ammospermophilus leucurus, Neotoma nevadensis, Phrynosoma platyrhinos, Tyrannus verticalis,* and *Icterus bullocki* were all recorded here. That it is high Upper Sonoran is shown by the fact that the green-tailed towhee occurs in the neighborhood. The apparent absence from Alder Creek Ranch of *Citellus mollis,* so abundant on the other side of the mountain, and the scarcity on the Alder Creek side of *Centrocercus urophasianus,* common on the Big Creek side, and so very numerous on the Leonard Creek flats, attracted our attention. Possibly these facts are accounted for, the first on the theory that Alder Creek Ranch is higher in Upper Sonoran zone than is the Quinn River Crossing district, and the second on the observed fact that the sage-brush was very much more sparse on the Alder Creek slopes than on Big or Leonard creeks.

Leonard Creek (6000 feet).—The flats and mesas drained by Leonard Creek are by far the most extensive in the mountains. The main ridge rises up to the west of the Leonard Creek basin, furnishing several tributary streams, while toward the east appear the Pine Forest foothills culminating in Sentinel Peak (6800 feet), and presenting a very arid and barren appearance indeed.

Except where interrupted by patches of dry meadow the flats were covered with sagebrush, which was locally very luxuriant. These dry meadows were apparently slightly more favorably situated as regards moisture conditions than the rest of the flats; the most conspicuous members of their flora were grasses and *Iris missouriensis.*

Willows were the dominant trees along the stream. A few

alders were observed near the Leonard Creek Ranch. A short distance above our camp, which was located at 6500 feet altitude, patches of chinquapin were in evidence, and on certain nearby ridges, at altitudes not much greater than that at which our camp was located, mountain mahogany trees were found.

It is rather difficult to decide whether the Leonard Creek flats should be regarded as Transition or Upper Sonoran. Elements of both were present. *Neotoma cinerea occidentalis* was taken in a rocky outcrop at 6500 feet altitude. *Perognathus parvus olivaceus* was quite common, and *Microtus mordax, Odocoileus hemionus,* and *Citellus oregonus* were recorded. On the other hand, *Reithrodontomys megalotis deserti* was fairly abundant and cottontails and jackrabbits ranged commonly over the flats. Among bird species noted, *Spizella breweri, Oreoscoptes montanus,* and *Centrocercus urophasianus* were present in greatest numbers. White-crowned sparrows, green-tailed towhees, sage sparrows, and vesper sparrows were all noted. One difficulty is apparent in attempting to use species of birds as zone indicators at this time of year (August 1 to 8), namely that many species were no longer nesting and were migrating locally. This probably accounts for the presence at this locality of the white-crowned and sage sparrows, both of which were in all likelihood out of their breeding zone.

It may be said that in all probability the Leonard Creek flats (altitude 6000 to 7000 feet) should be regarded as an area of overlapping Transition and Upper Sonoran, with the emphasis placed on the Transition. This zone certainly follows the stream down nearly to Leonard Creek Ranch. The assemblage of forms more typically Upper Sonoran at the ranch itself is sufficiently predominant to warrant its reference to that zone.

THE LIFE ZONES OF THE PINE FOREST MOUNTAIN REGION

(See map, plate 7)

The region here considered is doubtless fairly typical of the Great Basin in northern Nevada, so that general conclusions as regards life zones, with due regard for local modifying factors, may be widely applicable to the northern Great Basin region.

The following species were doubtless breeding at Quinn River Crossing and Big Creek Ranch. In many cases proof of sexual activity was obtained. The chief evidence from this list would indicate that these localities are both Upper Sonoran.

Species Probably Breeding at Quinn River Crossing or Big Creek Ranch, and Known to Breed in Upper Sonoran Elsewhere

(ranging above in some cases)

Birds

Tyrannus tyrannus
Aphelocoma woodhousei
Molothrus ater artemisiae
Xanthocephalus xanthocephalus
Agelaius phoeniceus (subsp. indet.)
Pœcetes gramineus confinis
Passerculus sandwichensis nevadensis
Chondestes grammacus strigatus
Spizella breweri
Amphispiza nevadensis nevadensis
Melospiza melodia montana
Pipilo maculatus curtatus
Passerina amoena
Vireosylva gilva swainsoni
Dendroica aestiva brewsteri
Geothlypis trichas occidentalis
Icteria virens longicauda
Oreoscoptes montanus
Psaltriparus plumbeus

Mammals

Citellus mollis
Eutamias pictus
Onychomys brevicaudus
Peromyscus crinitus
Neotoma nevadensis
Thomomys nevadensis
Dipodomys merriami nevadensis
Perognathus parvus olivaceus
Perognathus nevadensis
Sylvilagus nuttalli grangeri
Lepus californicus wallawalla
Taxidea taxus

Reptiles

Crotaphytus collaris baileyi

The following species are known to breed commonly in Lower Sonoran elsewhere, and occurred at the lower stations visited by the expedition. Definite proof of the breeding of some of them was obtained.

Species Known to Breed in Lower Sonoran Elsewhere and Probably Breeding in Northern Nevada

Birds

Tyrannus verticalis
Icterus bullocki
Carpodacus mexicanus frontalis
Amphispiza bilineata deserticola

Mammals

Ammospermophilus leucurus
Reithrodontomys megalotis deserti
Antrozous pallidus pallidus

Reptiles

Uta stansburiana
Sceloporus biseriatus
Crotaphytus wislizenii
Phrynosoma platyrhinos
Cnemidophorus tigris

SPECIES APPARENTLY NOT RANGING ABOVE UPPER SONORAN IN THE NORTHERN NEVADA REGION

Birds

Carpodacus mexicanus frontalis
Chondestes grammacus strigatus
Amphispiza bilineata deserticola
Amphispiza nevadensis nevadensis

Mammals

Citellus mollis
Ammospermophilus leucurus
Onychomys brevicaudus
Peromyscus crinitus (possibly ranging into lower Transition)
Reithrodontomys megalotis deserti (possibly ranging into lower Transition)
Neotoma nevadensis
Thomomys nevadensis
Perodipus microps levipes
Dipodomys merriami nevadensis
Perognathus nevadensis
Sylvilagus nuttalli grangeri
Lepus californicus wallawalla (perhaps ranging into lower Transition)
Antrozous pallidus pallidus

Reptiles

Crotaphytus collaris baileyi
Crotaphytus wislizenii
Uta stansburiana
Sceloporus biseriatus
Phrynosoma platyrhinos
Cnemidophorus tigris
Bascanion taeniatum
Pituophis catenifer deserticola
Crotalus, species uncertain

The following species were present and were probably breeding in the mountains (Transition). In certain cases definite proof of sexual activity was obtained.

SPECIES KNOWN TO BREED ELSEWHERE IN TRANSITION OR ABOVE

Birds

Oreortyx picta plumifera
Selasphorus platycercus
Empidonax wrighti
Carpodacus cassini
Spinus pinus
Zonotrichia leucophrys leucophrys
Junco hyemalis thurberi
Passerella iliaca schistacea
Oreospiza chlorura
Tachycineta thalassina lepida
Vermivora celata orestera
Dendroica auduboni auduboni
Oporornis tolmiei
Cinclus mexicanus unicolor
Penthestes gambeli gambeli
Hylocichla ustulata swainsoni
Sialia currucoides

Mammals

Odocoileus hemionus
Citellus oregonus
Callospermophilus (various species)
Microtus mordax
Microtus (Lagurus) (various species)
Zapus princeps oregonus
Erethizon epixanthum
Putorius cicognani
Putorius arizonensis (possibly breeds below Transition)
Sorex palustris navigator
Myotis lucifugus longicrus

Reptiles

Sceloporus graciosus

Species Apparently Breeding both in Upper Sonoran and Transition in the Northern Nevada Region

Birds

Zenaidura macroura carolinensis
Myiochanes richardsoni richardsoni
Spizella passerina arizonae
Spizella breweri
Melospiza melodia montana
Pipilo maculatus curtatus (occurred only in area of zonal overlapping)
Passerina amoena
Dendroica aestiva brewsteri
Oreoscoptes montanus
Planesticus migratorius propinquus

Mammals

Eutamias pictus
Peromyscus maniculatus sonoriensis
Perognathus parvus olivaceus
Erethizon epixanthum
Canis lestes

Reptiles

Sceloporus graciosus
Thamnophis vagrans

Species Apparently Limited to Pure Transition in the Northern Nevada Region

Birds

Oreortyx picta plumifera
Selasphorus platycercus
Oreospiza chlorura (possibly ranging into Upper Sonoran)
Cinclus mexicanus unicolor

Mammals

Citellus oregonus
Microtus intermedius

Nearly all the forms following proved to be breeding in the Pine Forest Mountains.

Species Known to Breed Elsewhere in Canadian

Birds

Carpodacus cassini
Spinus pinus
Zonotrichia leucophrys leucophrys
Junco hyemalis thurberi
Passerella iliaca schistacea
Vermivora celata orestera
Dendroica auduboni auduboni
Oporornis tolmiei
Penthestes gambeli gambeli
Hylocichla ustulata swainsoni
Planesticus migratorius propinquus
Sialia currucoides

Mammals

Odocoileus hemionus
Marmota flaviventer
Callospermophilus (various species)
Peromyscus maniculatus sonoriensis
Microtus mordax
Erethizon epixanthum
Canis lestes
Putorius cicognani
Putorius arizonensis
Sorex palustris navigator
Myotis lucifugus longicrus

SPECIES IN OTHER REGIONS APPARENTLY MOST COMMON IN CANADIAN OR ABOVE DURING THE PERIOD OF REPRODUCTION

(Found locally in the Transition of the Pine Forest Mountains)

Birds

Nucifraga columbiana
Spinus pinus
Zonotrichia leucophrys leucophrys
Hylocichla ustulata swainsoni

Mammals

Marmota flaviventer
Microtus mordax (in some regions occurs in Transition also)
Putorius cicognani
Putorius arizonensis (may be more common in Transition)
Sorex palustris navigator

The following birds occur commonly during the breeding season above Canadian, and breed in the Pine Forest Mountains.

SPECIES KNOWN TO BREED IN HUDSONIAN IN OTHER REGIONS

Hylocichla ustulata swainsoni
Nucifraga columbiana
Zonotrichia leucophrys leucophrys

The small collection of plants leads to much the same conclusions that the faunal lists indicate. Only those species are here listed which have been used by other authors as life zone indicators.

PLANTS OCCURRING ELSEWHERE IN UPPER SONORAN AND FOUND AT QUINN RIVER CROSSING AND BIG CREEK RANCH (UPPER SONORAN)

Artemisia tridentata
Artemisia spinescens
Sarcobatus vermiculatus
Tetradymia spinosa
Grayia spinosa

PLANTS OCCURRING ELSEWHERE IN TRANSITION AND FOUND AT QUINN RIVER CROSSING AND BIG CREEK RANCH (UPPER SONORAN)

Poa buckleyana
Vicia americana
Chrysothamnus viscidiflorus tortifolius
Populus tremuloides (mouth of cañon)
Castilleia parvifolia (foothills)
Artemisia tridentata
Alnus tenuifolia (along stream at Big Creek Ranch)
Achillaea millefolium lanulosa (along stream at Big Creek Ranch)

PLANTS OCCURRING ELSEWHERE IN THE SONORAN ZONES AND FOUND IN THE PINE FOREST MOUNTAINS

Cercocarpus ledifolius (found on certain ridges from 7000 to 8800 feet)
Artemisia tridentata (found from 4100 to 9400 feet altitude)

Plants Ordinarily Occurring in Transition and Found in the Pine Forest Mountains

(Cool, shaded situations in meadows or along streams, except as noted, from 7500 to 8600 feet altitude)

Prunus demissa (found on favorably exposed slopes at 8000 feet)
Aquilegia truncata
Ribes cereum (ordinarily occurring elsewhere in upper Transition and above)
Achillaea millefolium lanulosa
Aphyllon fasciculatum
Pentstemon confertus caeruleo-purpureus
Cercocarpus ledifolius (on dry, exposed ridges 7000 to 8800 feet)
Iris missouriensis (in meadows and on dry, open hillsides)
Amelanchier alnifolia (found on favorably exposed slopes at 8000 feet)
Arnica chamissonis
Aconitum columbianum
Sisymbrium canescens
Hypericum formosum
Artemisia tridentata (found from 4100 to 9400 feet altitude)
Ceanothus velutinus (on favorable slopes)
Veratrum californicum (ordinarily occurring elsewhere in upper Transition and above)

Plants Ordinarily Occurring in Canadian or Hudsonian and Found in the Pine Forest Mountains

(8000 feet and above)

Aquilegia truncata
Ribes cereum
Arnica chamissonis
Iris missouriensis (from 7000 feet up)
Aconitum columbianum
Sisymbrium canescens
Pinus flexilis
Allium validum
Ceanothus velutinus
Veratrum californicum (in meadows 7000 feet in altitude and above)

DISCUSSION OF LIFE ZONES

The life zones represented in the region are Upper Sonoran and Transition, with a touch of Boreal (see map, pl. 7).

The desert proper, comprising in this region the broad flats of the Quinn River Valley and the neighboring deserts, is Upper Sonoran. On favorable slopes tongues of this zone invade the mountains to an altitude of 8000 feet at least, as is indicated by the presence at that elevation of *Reithrodontomys megalotis deserti* and *Peromyscus crinitus.*

The zone of widest extent in the mountains is the Transition. The most conspicuous element of its flora on exposed flats and treeless ridges was *Artemisia tridentata.* The most abundant

Transition tree was *Populus tremuloides*. The occurrence of this species and of *Alnus tenuifolia* along creeks to 4500 feet altitude, and even in the case of *Alnus* below that, indicates the downward extension of Transition. Certain species of mammals, ordinarily characteristic of that zone, were found at comparatively low altitudes. *Callospermophilus trepidus* and *Microtus mordax* were both found near Big Creek Ranch, the former on a nearby foothill ridge at 5000 feet, and the latter along the creek at the ranch proper. *Neotoma cinerea occidentalis* was secured at 6500 feet altitude on both Alder and Leonard creeks, and *Zapus princeps oregonus* at 6000 feet on Alder Creek.

In an earlier paper (Taylor, 1911, p. 226 and elsewhere in the same paper) the presence of a zone above Transition was rather questioned. A careful analysis of the vertebrate fauna and of the flora leaves no doubt that while there is locally present a Boreal assemblage of forms, still there is no definite tract of pure Boreal. The species which are found elsewhere above Transition and which are present in the Pine Forest Mountains cannot be referred as a whole to either the Canadian or the Hudsonian subdivision of the Boreal, as an inspection of the foregoing lists will show. Such species have been grouped together, and where they occur there is said to be a *Boreal infusion*. These areas are very limited in extent. In general the pine-covered areas, together with certain shaded cool strips along the streams in the higher parts of the mountains, may be regarded as tracts of such Boreal infusion into a predominating Transition assemblage of species.

The small extent of the Pine Forest Mountains and their comparative lack of elevation above the level of the plateau (see C. H. Merriam, 1890, p. 27) are obstacles to the plotting of their life zones. These factors decrease their humidity and give this element, as compared with temperature, a disproportionate influence in determining the presence of particular species, and the absence of others (see C. H. Merriam, 1890, p. 26, footnote). This being the case, the life-zone concept here becomes difficult of application, since boundaries of zones cannot be drawn with the precision possible in many other regions.

CHECK-LISTS OF SPECIES RECORDED BY THE NEVADA EXPEDITION

For list of mammals see Taylor (1911, p. 208).

Amphibians

Reptiles

Birds

GENERAL OBSERVATIONS ON THE SPECIES

THE AMPHIBIANS

Hyla regilla Baird and Girard

Pacific Tree Frog

Distribution.—A number of specimens of this remarkable little tree frog (see Test, 1899, p. 477) were secured in the mountains. With the exception of one, which was found at an altitude of 6000 feet on Alder Creek, our series of six individuals was

taken either in or near a small lake (altitude 8400 feet) near Duffer Peak.

The present record is the first known to the writer from northern Nevada. The area in which the Pacific tree frog occurs in greatest numbers is the Pacific Slope west of the Sierra Nevada (Test, 1899, p. 480). The Government Death Valley Expedition (Stejneger, 1893, p. 222) recorded it in some numbers from southern Nevada, and Test (1899, p. 490) in listing the specimens in the National Museum mentions one example from Ogden, Utah. This author comments on the distribution of the species and calls attention to the fact that it is semi-isolated in the southern Great Basin mountain ranges; and further, that the manner of its spreading from place to place has not been explained satisfactorily. He suggests (p. 481) that the present distribution of *Hyla regilla* may be accounted for through the great inland lakes formerly existing in Panamint and Death valleys, the species following the borders of the lakes and up the streams flowing into them, and being left stranded where now found. A similar suggestion may be offered for the presence of the tree frog on the semi-isolated Pine Forest Mountains. The waters of the irregular and extensive Pleistocene Lake Lahontan bathed the lowermost slopes both of the Pine Forest Mountains and of the Sierra Nevada, thus furnishing a continuous water-front across all the territory intermediate between portions of the range of *Hyla regilla* which are now discontinuous (namely, the Sierra Nevada and Pine Forest Mountains).

Habits.—The individual taken on Alder Creek was caught in a mouse trap set ten feet from the stream. Although they probably never get very far from water, they evidently wander about to a certain extent. Tadpoles and young tree frogs in various stages of development were noted July 31 in the lake on Duffer Peak Meadow.

Bufo boreas Baird and Girard

Mountain Toad

Distribution.—The twelve examples of the mountain toad secured were all taken in the higher parts of the mountains as follows: Duffer Peak Meadow (8400 feet), 5; head of Alder

Creek (7800 feet), 1; head of Leonard Creek (8500 feet), 4; and head of Big Creek (8000 feet), 2. The species was fairly common in suitable environments at altitudes of 8000 feet or over.

This toad may be found to approach or be referable to *Bufo boreas nelsoni* (Stejneger, 1893, p. 220), the type locality of which is Oasis Valley, Nevada. In the Pine Forest Range the species is completely isolated geographically and so might be expected to exhibit variation from typical *boreas*.

Habits.—These little toads were not infrequently noted on mountain meadows. Two individuals, probably a pair, were found in an iris patch on a meadow at the head of Leonard Creek. Two others were taken in short meadow grass between some rocks at the margin of the same meadow. Near Duffer Peak an individual was secured on the shore of a small lake, and on a nearby meadow one was observed hopping along on the dry ground among some green leafy plants a yard distant from a spring. One was found near a high mountain lake in a steer hoof-print which was filled with water, another being secured in the lake itself.

Bufo lentiginosus woodhousei Girard

Rocky Mountain Toad

Distribution.—Taken at three points touched by the expedition: Quinn River Crossing (4100 feet), 13 specimens; Big Creek Ranch (4350 feet), 9; and Leonard Creek (4300 feet), 1. As would be implied by these figures, *Bufo lentiginosus woodhousei* was the common toad of the flat, but did not range into the mountains even along the streams. A single individual was observed near the stream at Alder Creek Ranch.

I have seen no record of the species from northern Nevada. Dr. C. Hart Merriam has recorded it (in Stejneger, 1893, p. 221) from several localities in the southern part of the state.

Habits.—Toads were numerous along the streams at Big Creek Ranch. Five were caught in one day. One strove to escape by swimming to the bottom of the stream and remaining there quietly for several minutes. As a rule, however, when the toads are pursued, they leave the water and try to escape by rapid

hopping. Upon being captured they often object with monosyllabic croaks, and if held in the hand never fail to emit a quantity of fluid from the cloaca.

In every case in which the toads are killed by the use of chloroform it is found that the poisonous white secretion is exuded from the glands of the skin, and stands out all over the animal in the form of small drops.

Toads were caught in tall grass and soft mud near Wheeler Creek (Quinn River Crossing), in a ditch at Leonard Creek Ranch, and both in and near the stream at Big Creek Ranch. None were seen more than fifteen feet from running water.

On June 9 a pair were observed copulating in the stream at Big Creek. Tadpoles, supposedly of this species, were observed in large numbers at Quinn River Crossing on May 24, and were seen also at Leonard Creek Ranch on August 7.

Scaphiopus hammondi Baird

Western Spadefoot

Distribution.—Three specimens taken, two at Quinn River Crossing (4100 feet), and one at Big Creek Ranch (4350 feet).

The species has previously been recorded from scattered localities in the Great Basin; for example, Olancha and Owens Lake, California; Salt Lake City, Utah; Fort Walla Walla, Washington; and Pyramid Lake, Nevada. Consequently its discovery in the northern part of the state was to be expected.

Habits.—Without doubt the spadefoot would have eluded our utmost vigilance had we not been at work during its breeding season.

The first specimen (no. 1568) was taken on May 30. It was slowly walking and hopping over damp ground near thick swamp grass. On June 4 a second *Scaphiopus* (no. 1567) was secured. Attention was attracted to it by a rustling sound as it moved through a tussock of wild hay in a meadow. The last specimen (no. 1566) was caught June 21 in a mouse trap set in grass beneath willows near a stream at Big Creek Ranch.

A large number of young Salientia which were assumed to belong to this species were collected on June 7 in the shallow water of a marshy meadow at Quinn River Crossing. They were

in various stages of development, and the resemblance of the oldest to *Scaphiopus,* together with the probability that the spadefoot was breeding there and at that time, makes a strong circumstantial case for their being referable to it.

THE REPTILES

Crotaphytus collaris baileyi Stejneger

Bailey Lizard

Distribution.—The eleven specimens of this form were all taken near Big Creek Ranch, at altitudes ranging from 4800 feet to 5400 feet.

The species is reported from a number of localities in Nevada and the northern Great Basin (see Van Denburgh, 1897, p. 56). The present furnishes the first definite record for northern Nevada. The localized range of the species in this locality indicates that its distribution over the Great Basin is discontinuous.

Habits.—We looked in vain for this lizard on the open desert and on certain of the lower slopes of the mountains. All but one were secured on top of a steep-sided, rocky ridge (altitude 5000 feet) near Big Creek Ranch. The exception was collected in Big Creek Cañon just below the Dugout Camp (4800 feet) and at the base of the steep-sided ridge just mentioned.

One was apparently resting in a groove on one of the stones. We saw none on very large boulders. *Crotaphytus c. baileyi* does not seem to be as adept at clinging to rocks in any position as is *Sceloporus biseriatus.* The movements of *Crotaphytus c. baileyi* resemble those of *C. wislizenii.*

Some of the individuals taken were probably paired; at any rate, their being secured close together might so indicate.

The Bailey lizard is a nimble animal, jumping short distances from rock to rock. Frequently individuals allowed of very close approach, remaining perfectly quiet (see Ruthven, 1907, p. 513), but at other times they retreated with great rapidity.

The example taken in Big Creek Cañon was just shedding its epidermis, fragments of the old skin being still adherent.

Crotaphytus wislizenii Baird and Girard

Leopard Lizard

Distribution.—Recorded from the following localities: Amos

(4400 feet), 4; Quinn River Crossing (4100 feet), 10; Big Creek Ranch and vicinity (4350 feet), 31; Alder Creek (5000 feet), 1; Leonard Creek (4700 to 5000 feet), 6; Thousand Creek Flat (5000 feet), 4.

One of the commonest of the reptiles of the desert. As will have been observed, we did not discover it at such great altitudes as are recorded by C. Hart Merriam (in Stejneger, 1893, pp. 167–168). In our experience, *C. wislizenii* does not ordinarily range so high as *Cnemidophorus tigris,* which we found at an altitude of 5000 feet on certain ridges near Big Creek Ranch. On these ridges *wislizenii* was replaced by *baileyi.* This is a seeming deviation from the range relations of the two species of *Crotaphytus* given by Ruthven (1907, p. 518), according to whom the distribution of *Crotaphytus wislizenii* corresponds closely to that of *C. c. baileyi.* Locally in the Pine Forest Mountain region, as has been shown, the ranges of the two did not overlap, *baileyi* being practically limited to a single rocky ridge, and *wislizenii* to the desert flat and a short distance up certain cañons. Ruthven did not find the leopard lizard in Upper Sonoran, whereas all our localities belong to that life zone.

Leopard lizards were found in washes and on lesser ridges of the open desert, under various species of desert plants. As was the case with other species of reptiles, *Crotaphytus wislizenii* was much more common at Big Creek Ranch, that is, along the eastern foothills of the mountains, than at any other locality visited.

Habits.—We found these lizards comparatively easy to noose. When really surprised they exhibit tremendous speed, never stopping until they reach come convenient bush, into the shelter of which they crawl and remain quiet. One individual, on being pursued, escaped by running into a burrow.

One shot in the top of a low thorny bush on the mesa near Quinn River Crossing contained the partly digested remains of a *Sceloporus graciosus.*

When handled the animals make a hissing sound and vigorously attempt to bite. One uttered a low moaning sound. While at rest they keep the head raised from the ground and watch the intruder, but when in motion lower it. One was seen running

into a bush after a cicada, which it apparently failed to secure. Next it crawled slowly along, occasionally protruding its tongue. When a fly buzzed about the bush and alighted on the ground some two and a half feet away it raised its head and started a little as if it recognized the sound. Then it crawled slowly up toward the fly and as the insect left the ground the lizard jumped four inches into the air after it. In executing this leap all four feet necessarily left the ground. Once the lizard crouched down on a gray sage-leaf background with which the color of its body blended perfectly.

Numbers of the females exhibited the red coloration characteristic of some examples during the breeding season. The first specimen showing this character was secured June 8, between Quinn River Crossing and Big Creek Ranch.

Uta stansburiana Baird and Girard

Brown-shouldered Lizard

Distribution.—Collected in greater numbers at Virgin Valley than at any other locality visited. Specimens were secured as follows: Virgin Valley (5000 feet), 12; Big Creek Ranch (4350 to 5000 feet), 10; Alder Creek Ranch (5000 feet), 2; Quinn River Crossing (4100 feet), 1. Seen at Amos (4400 feet).

The type locality of the brown-shouldered lizard is the "Valley of the Great Salt Lake, Utah." It has been recorded from localities north and east of the Pine Forest Mountains, but I can find no record of its occurrence in the Mount Shasta and Warner Mountain regions of California, which lie to the westward. No specimens of *Uta* were obtained by the Warner Mountain Expedition of the Museum of Vertebrate Zoology in 1910. Possibly the species does not range far west of the Pine Forest Mountains.

As is the case with many of our reptiles, *Uta stansburiana* was very much more common along the mountains than on the open desert.

Habits.—*Uta stansburiana* is characteristically a ground-loving species, as noted by Van Denburgh (1897, p. 58), though occasional individuals were noted either on boulders or in rocky

situations. They are active and extremely shy. When once startled *Uta* generally keeps running until it has reached a hiding place, unlike certain other lizards, as *Sceloporus* or *Crotaphytus,* which nearly always stop after running some distance, apparently to see whether or not the intruder is still at hand.

On June 20 a female containing three eggs with heavy shells was secured.

Sceloporus graciosus Baird and Girard

Mountain Lizard

Distribution.—The widespread occurrence of this lizard is best indicated by the following list of localities and specimens: Winnemucca (4300 feet), 1; Virgin Valley (5000 feet), 2; Quinn River Crossing (4100 feet), 23; Alder Creek Cañon (6000 feet), 3; mouth Alder Creek (5000 feet), 1; Big Creek Ranch (4350 feet), 3; Big Creek Cañon (4800 to 6000 feet), 6; Leonard Creek (5000 to 6500 feet), 3. The species was observed also at Amos and at Leonard Creek Ranch.

We found the mountain lizard in Upper Sonoran and Lower Transition zones together with those species of birds and mammals which C. H. Merriam (in Stejneger, 1893, p. 184) mentions as being characteristically associated with it.

The different habitats (in northern Nevada) of the two species of *Sceloporus* taken by us may be understood from the following table:

Sceloporus graciosus	*Sceloporus biseriatus*
1. Typically ground-loving.	1. Typically rock-loving.
2. Numerous on flats of open desert.	2. None found on flats of open desert.
3. None found on rocks of lower slopes of foothills. Rarer as mountains were approached.	3. Found abundantly on rocks of lower slopes of foothills. More numerous as mountains were approached.
4. A few found on the broad arid mountain valleys of Big and Leonard creeks at 6500 feet altitude, so more typically a mountain-dwelling species.	4. Not taken above 5000 feet altitude, so not so typically a mountain-dwelling species.

It should be remarked that while *S. biseriatus* was not taken

on the flats of the open desert, three specimens were secured on a rocky butte north of Quinn River Crossing.

The above table shows *S. graciosus* to possess the wider altitudinal range, *S. biseriatus* being, for the most part, confined to a narrow strip along the lower slopes of the foothills.

At Quinn River Crossing several specimens of *S. graciosus* were taken in mouse traps.

Those stretches of desert seem to be preferred where sagebrush (*Artemisia tridentata*) grows very thickly, although mountain lizards are occasionally to be found on more open sandy washes.

Habits.—They were rather commonly observed climbing about among the branches of the sage. When pursued they often attempted to escape in this way. Ordinarily, when surprised, they moved with great rapidity to the shelter of a bush, on the ground under which they remained motionless, until the collector came into the near vicinity. Then they retreated into the thicker brush or disappeared into some convenient burrow. Although in the open the lizards were very shy, when they were in the shelter of the brush one could approach them closely.

Two females containing eggs were taken at Quinn River Crossing May 21, one at Big Creek Ranch June 18, and another at 4800 feet on Big Creek June 25.

Crotaphytus wislizenii is doubtless one of their chief enemies. One of the leopard lizards taken contained the partly digested remains of a *Sceloporus graciosus.*

Sceloporus biseriatus Hallowell

Rock Lizard

Distribution.—Quite common at Big Creek Ranch, but rare at Quinn River Crossing. To enumerate stations at which specimens were collected: Quinn River Crossing (4100 feet), 3; Virgin Valley (5000 feet), 2; Limestones (near Dike colony, south of Big Creek Ranch), Pine Forest Mountains, 1; Big Creek Ranch (4350 feet), 38.

Van Denburgh (1897, p. 83) calls attention to the fact that

this lizard is common in Idaho, and observes that it probably occurs the whole length of the Great Basin.

The relative abundance of rock lizards at Big Creek Ranch is easily accounted for by the presence of rocky ridges. The buttes at Quinn River Crossing upon which three specimens were captured rise up only slightly above the level of the plain. At Big Creek Ranch a *Sceloporus* of this species was caught in a mouse trap set in one of the ranch buildings. We found rock lizards invading the mountains to a height of a little more than 5000 feet. They apparently do not range so high in northern as in southern Nevada (see Stejneger, 1893, p. 184).

Habits.—The vast majority of the individuals observed were seen on rocks and boulders at an average altitude of about 4600 feet. Rock lizards at times apparently take advantage of rocks upon which excrement of birds is found. The fecal matter attracts flies and gnats which may serve as food to the lizards.

A great many of the specimens captured had lost parts of their tails and presented caudal stubs in various stages of regeneration.

Several females secured June 11 contained developing eggs.

The coloration of these lizards blended remarkably with that of the rocks upon which they were found, and made them exceedingly hard to discern except when they were in motion.

Phrynosoma platyrhinos Girard

Desert Horned Lizard

Distribution.—Most of the specimens taken were secured in the vicinity of Big Creek Ranch, that is, about the foothills of the Pine Forest Mountains, and on the nearby desert. Twenty-five specimens were preserved at this locality. Others were taken as follows: Quinn River Crossing, 3; Leonard Creek, 4; Thousand Creek Basin, 5; Amos, 1; Alder Creek, 1.

As is shown by the large proportion of horned lizards from Big Creek Ranch, the species was more numerous near the foothills than away from them on the open desert. They ranged fairly commonly to 5000 feet altitude, both in the cañon and on ridges of the foothills.

Our records are the first for the northern part of Nevada known to me. Van Denburgh (1897, p. 99) states that *platyrhinos* crosses Nevada and ranges into Utah, and lists a series of localities in the southern part of the state, Pyramid Lake being the most northerly one mentioned. It is said to inhabit Idaho, also, so one would expect to find it in northern Nevada.

Habits.—Sand was adherent to the back of one horned lizard secured, as if it had recently been covered. Another individual was found in a hole with only its head protruding. All appearances lead to the conclusion that the animal had made the hole, or had at least remodeled it, for earth had recently been thrown out and tracks of the horned lizard were seen in the entrance. The animals were found on sandy, on loamy, and on sun-baked hard soil. One horned lizard, upon being picked up, opened its mouth and made a hissing sound.

Of three individuals taken July 3 on Big Creek, two were shedding their epidermis.

A pair of horned lizards were observed copulating on June 10. On June 14 a female containing ten eggs was taken.

Cnemidophorus tigris Baird and Girard

Desert Whip-tailed Lizard

Distribution.—The thirty-six specimens of this lizard in the collection of the expedition came from the vicinity of Big Creek Ranch (4350 feet). We looked in vain for the species on the open desert in the vicinity of Quinn River Crossing. Evidently a strip of land immediately adjoining the foothills is either the only place inhabited by it, or at least is much preferred. It is rather peculiar that whip-tailed lizards were not recorded from Alder Creek Ranch on the west side of the mountains. A number of facts of distribution, of which this is one, show that Alder Creek Ranch differs environmentally to an appreciable degree from Big Creek Ranch.

The latter locality is Upper Sonoran zone (see C. Hart Merriam, in Stejneger, 1893, p. 199), in some respects approaching Lower Transition.

The most northerly part of Nevada from which I have found

this lizard recorded is the vicinity of Reno. It ranges (Van Denburgh, 1897, p. 136) into southern Idaho and western Utah, however, so would be expected to occur generally in the northern part of the Great Basin.

Habits.—The desert whip-tailed lizard was found alike on the sides of dry washes and on the open flat desert in the vicinity of the foothills. It ranged in small numbers to an altitude of 5000 feet on the low ridges, and a short distance up Big Creek Cañon. A single specimen was taken in the vicinity of the forks of Big Creek (5700 feet).

If surprised, *Cnemidophorus* runs with great speed, holding its long tail erect in air something in the manner of *Callisaurus ventralis*. When at ease it progresses more slowly, dragging itself along on its belly and waddling from side to side. This has been described (J. and H. W. Grinnell, 1907, p. 35) as being a peculiar slinking, hesitating gait. They run a short distance very swiftly, then creep along in a jerky fashion, bobbing the head up and down. When at some distance from the intruder they remain motionless, eyeing him.

Sometimes as many as twenty individuals were seen in the course of a morning's hunt.

Their long narrow bodies and extremely agile movements combine to make noosing them (see J. and H. W. Grinnell, 1907, p. 7) almost an impossibility.

They were seen in copulation on June 10, and *pairs* were commonly seen after this date. On June 21 one was seen pursuing another, but whether this was for purposes of play or was an exhibition of sexual instinct is not known.

Bascanion taeniatum (Hallowell)

Striped Racer

Distribution.—Four specimens of this widely distributed form (see Stejneger, 1893, p. 210) secured, localities being as follows: Quinn River Crossing (4100 feet), 2 (taken on the open desert several miles from any mountains); Big Creek (5000 feet), 1; and Leonard Creek (4700 feet), 1.

The species has been recorded from Antelope Springs and

Carson City, Nevada, from Bliss and the Snake River in Idaho, and from Shasta, Inyo, and Kern counties in California. The present are definite records from a point near the center of the range implied by these localities.

Habits.—While these snakes do not move as rapidly as the red racers, they are by no means sluggish.

Both of those captured at Quinn River Crossing attempted to escape by climbing through a large sagebush. When secured they fought vigorously, coiling themselves about the limbs of the bushes and resisting capture to the utmost.

The specimens taken on Big and Leonard creeks were both seen as they were crossing the mountain road. The one on Big Creek, after traveling rapidly off the roadway, observing that it was not pursued, stopped momentarily under a sagebush. On Leonard Creek the racer was taken on a hot dry mesa, a hundred yards or more from the nearest water.

Pituophis catenifer deserticola Stejneger

Desert Gopher Snake

A fragment of a gopher snake was picked up on May 11 near the Western Pacific tracks at Winnemucca. Two perfect specimens were later secured, both in Big Creek Cañon, one at an altitude of 5400 feet, and the other at 6000 feet.

The gopher snake doubtless occurs generally in small numbers over the deserts of northern Nevada and to some extent on the broad flats in the mountains.

The first specimen was taken in sagebrush on the ground not far from the creek near the Dugout Camp, Big Creek Cañon.

Thamnophis vagrans (Baird & Girard)

Wandering Garter Snake

Distribution.—The commonest snake in the region, both on the desert and in the mountains. Specimens were recorded as follows: Quinn River Crossing (4100 feet), 5; Alder Creek Lake (7800 feet), 3; Duffer Peak Meadow (8400 feet), 1; Leonard Creek Ranch (4300 feet), 1; Leonard Creek Flat (6000 feet),

1; Virgin Valley (5000 feet), 1; Thousand Creek Flat (5000 feet), 1.

Habits.—Garter snakes were fairly common in the grassy marshes along the Quinn River. When pursued they moved with a fair degree of rapidity and generally took refuge in the water of some irrigating ditch, or in a pool of the main river itself. Upon being roughly handled the snakes would often disgorge a number of pollywogs.

When picked up they do not ordinarily attempt to bite, but have a fairly effective protection in their habit of giving off "a strong and offensive odor if handled" (Ditmars, 1907, p. 236) and of voiding excrement.

A female garter snake, secured July 31 on the Duffer Peak Meadow, altitude 8400 feet, contained eggs near the hatching point. Probably the young are born earlier on the open desert than at this altitude. At this date there were still patches of snow in the woods.

One morning early in July as we were walking through the sagebrush at the head of Big Creek (altitude 8000 feet) our attention was attracted by the excited "chips" of a pair of white-crowned sparrows (*Zonotrichia leucophrys leucophrys*). The cause for this excitement proved to be a garter snake which was crawling over their nest. Evidently it was after the young birds, but it did not appear to have captured any, as they were by this time old enough to escape.

Crotalus (species indet.)

Rattlesnake

Distribution.—Ten rattlers were secured, being distributed by locality as follows: Quinn River Crossing (4100 feet), 1; Big Creek Ranch (4350 feet), 1; Big Creek Cañon (5000 feet), 1; Granite Creek (4300 feet), 1; Leonard Creek Ranch (4300 feet), 2; Virgin Valley (5000 feet), 4.

Although *Crotalus lucifer* (Stejneger, 1893, p. 448) has been recorded from Pyramid Lake, the Truckee River, and from various localities farther east in Nevada, as well as from Utah, Idaho, and Oregon, I can by no means be sure that our examples are referable to it. They differ markedly from specimens of

lucifer in the Museum collection from the San Jacinto and San Bernardino mountains of southern California, and the task of finally determining their status must be reserved for some specialist of the future.

Habits.—Shortly after we started from Quinn River Crossing, June 8, our attention was attracted by the buzz of a rattlesnake beside the road. It resisted capture to the utmost, fighting desperately. In this respect it was different from several others secured later, which were very sluggish and could only with difficulty be induced to rattle.

While we were encamped at Big Creek Ranch a small rattler was brought in from Granite Creek, six miles north of Big Creek. On July 20 a *Crotalus* was killed in the garden at the Dugout Camp, 5000 feet altitude, in Big Creek Cañon.

A pair of snakes were taken at Leonard Creek Ranch. The two were lying very close together in some tall weeds, and had probably been copulating, as the male had one hemipenis protruded. These snakes rattled little and were particularly sluggish of movement.

The scarcity of rattlesnakes was to us surprising. Residents of the region testified to their greater abundance in former years.

THE BIRDS

Larus delawarensis Ord.

Ring-billed Gull

The only species of gull observed. On the first day of June an individual was noted fleeing down the Quinn River before the attacks of a belligerent avocet. No specimens were preserved.

Hydrochelidon nigra surinamensis (Gmelin)

Black Tern

Two black terns were observed on May 19 at Quinn River Crossing flying erratically and excitedly back and forth over the marsh. Possibly the species was breeding in this locality. No specimens were preserved.

Anas platyrhynchos Linnaeus

Mallard

Small companies of mallards were twice seen the last of May at Quinn River Crossing, and an individual was noted June 15 at Big Creek Ranch. One specimen (no. 9190) was secured.

Nettion carolinense (Gmelin)

Green-winged Teal

A male green-winged teal was shot on the Quinn River June 3. The next day a female of the same species was flushed from a nest, which was located in a depression on moist ground, and surrounded by the tall grasses of the marsh. The nest was composed of willow twigs and grass stems so loosely felted together that the structure could not be picked up intact. The cavity measured 127 mm. (5 inches) in diameter and 70 mm. (2¾ inches) deep. Four eggs were found in the nest, and one other on the ground at a distance of seven inches from it, probably having been carried there by the flushing bird. Strangely enough, no down feathers were noted anywhere in the vicinity.

Two specimens of green-wing teal (nos. 9104, 9105) were preserved.

Querquedula cyanoptera (Vieillot)

Cinnamon Teal

A single bird (no. 9106) was shot on a pool of the Quinn River on June 4.

Dafila acuta (Linnaeus)

Pintail

One pintail was noted flying over a marsh near Quinn River on May 31. The next day a flock of three was observed. No specimens were obtained.

Nycticorax nycticorax naevius (Boddaert)

Black-crowned Night Heron

One flushed from a bend in the Humboldt River near Winnemucca on May 11. No specimens were preserved.

Porzana carolina (Linnaeus)

Sora Rail

On May 22 one was flushed from a nest near Quinn River and flew heavily away to another part of the marsh. Built in an open bunch of marsh grass, the nest touched the water so that the bottom of it was damp. Marsh grass was its principal structural constituent, some of the stems being still green. The fragments incorporated into the lining were smaller than those in the main body of the nest. The whole structure was securely interwoven among grass-stalks which partly supported it. It was overshadowed and effectively concealed by a frail canopy of broken-down stems. The diameter of the cavity was 89 mm. ($3\frac{1}{2}$ inches), its depth 30 mm. ($1\frac{3}{16}$ inches). Ten eggs lay close together in it.

Fulica americana Gmelin

American Coot

On May 12 a single one was seen wading in the shallow water of the Humboldt River near Winnemucca. No specimens of this species were secured.

Lobipes lobatus (Linnaeus)

Northern Phalarope

A large flock was observed in a lagoon near Quinn River Crossing on May 19. The birds were resting on the surface of the water like ducks, and were surprisingly tame and unsuspicious. Upon the approach of the collector they drew closer together, forming a dense flock. At the discharge of the gun the birds flushed, uttering sandpiper-like notes as they flew. Several were wounded and others gathered around and alighted near them.

Four individuals were seen ten days later (May 29) wading about in a shallow lagoon, apparently looking for food.

So far as known to the writer there are no records of the northern phalarope for the vast extent of the Great Basin, the nearest on the east being from Colorado, and on the west from California. Furthermore, May 19 and 29 are exceptionally late

dates of occurrence of this migratory species anywhere at the latitude of Quinn River Crossing.

Four individuals (nos. 9107–9110) were preserved.

Steganopus tricolor Vieillot

Wilson Phalarope

Noted at Quinn River Crossing and Hot Springs, Thousand Creek Valley. The first individuals were observed on May 20, when eight were seen circling over a marshy meadow near the Quinn River. They were giving utterance to a peculiar nuptial (?) call-note, which may be transcribed as "oit! oit! oit!" possessing a nasal quality difficult to imitate, but somewhat resembling the croak of a toad (*Bufo lentiginosus*) during the breeding season. At the instant of utterance of the note the bird which is calling raises its head somewhat, pauses momentarily in its flight, and its throat bulges slightly. The females, which of course are in this species much the larger and more brilliantly colored of the two sexes, evidently uttered most of the call-notes. From this time on Wilson phalaropes were seen daily on the marshes along the river, it being a common occurrence to flush several individuals from some shallow still-water lagoon.

From observation of their actions we were led to believe that they were nesting some time before we had other evidence on the subject. One bird when flushed feigned lameness, and the phalaropes usually circled about the collector in small companies of two or three, seemingly excited over his presence.

On May 31 a male was flushed from a nest in the marsh. The bird flew a short distance and then seemed to fall wounded into the grass. Upon following it, the same decoying pretense was repeated several times. The nest contained two eggs, so was left on the suspicion that the set was not complete. By June 2 another egg had been laid. There had been little attempt at construction of the nest, which was located on a small island of moist ground and surrounded by short marsh grass. Careful examination showed that the dead grass stems had been collected in some way, either by scraping them up or fetching them in. The eggs rested in a slight depression in the accumulated material at a height of 19 mm. (¾ inch) above the ground. The size

of the open space in the marsh grass occupied by the nest was 57 mm. (2¼ inches) by 76 mm. (3 inches). The whole structure was damp.

At Thousand Creek a phalarope was observed carrying a worm in its beak. At the same location, on another occasion, the birds followed and swooped at persons crossing the meadows. It is altogether likely that they were breeding in this locality as well as at Quinn River Crossing. In all, twelve individuals were secured (nos. 9111–9119, 9303–9305).

Recurvirostra americana Gmelin

Avocet

Distribution.—Seen at Quinn River Crossing, Virgin Valley, and along Thousand Creek.

Habits.—The birds were undoubtedly nesting along the Quinn River. Whenever the hunter invaded the precincts of the moist wild-hay meadows two to seven avocets appeared and betrayed the greatest excitement. They circled about him, uttering wild cries somewhat resembling "clai! clai! clai!" and voiding excrement at intervals.

The same "bobbing" or "bowing" trait observable in so many waders was very evident in the avocets. One was noted sitting on the water of a lagoon tributary to the Quinn River. The bird in a truly ludicrous manner jerked its head up and down, abruptly thrusting it under water at intervals.

Difficulty of approach varied with the individual. Some birds were exceedingly shy, while others were not so much so.

Avocets evidently share with most other birds a dislike of owls. Three were seen pursuing a *Speotyto* over a wild-hay meadow.

Two specimens (nos. 9103, 9318) were preserved.

Actitis macularius (Linnaeus)

Spotted Sandpiper

On May 11 one was noted on the Humboldt River near Winnemucca. Later at Quinn River Crossing single birds and flocks of as many as four individuals were frequently noted on the

banks of the stream. They were very tame, and would usually allow of a near approach before flushing.

A single specimen was taken at Thousand Creek flats.

Ridgway's observation (1877, p. 610) that the spotted sandpiper is probably, next to the killdeer, the most numerous wader in the Great Basin region is not borne out by our later experience. In the vicinity of Quinn River Crossing the Wilson phalarope must be accorded this distinction.

Specimens preserved, three (nos. 9080, 9081, 9302).

Oxyechus vociferus (Linnaeus)

Killdeer

Distribution.—Occurred generally in the neighborhood of streams and ponds. The highest point at which it was noted was the meadow on Big Creek (7000 feet). It was noted in Virgin Valley and on Table Mountain as well as in the Quinn River region.

Habits.—The birds are found not only on the marshes and on contiguous moist ground, but often also on high and dry ground somewhere in the neighborhood of streams.

A male juvenal (no. 9102) was secured at Camp no. 3, on the meadow on Big Creek (7000 feet). The specimen exhibits the juvenal plumage. There is little doubt that the species breeds in the region.

Oreortyx picta plumifera (Gould)

Plumed Quail

One of the rare birds of the mountains, occurring only above 5000 feet altitude. A female was flushed in the sagebrush of a cañon near Big Creek Ranch. A male was seen not far below the head of Big Creek (8000 feet), and a single individual was heard at 6000 feet altitude on Alder Creek. A large family, including about a dozen juvenals, was surprised July 20, on the meadow on Big Creek (7000 feet), where they had probably been drinking at a spring. The chicks were highly adept at hiding. No specimens secured.

Centrocercus urophasianus (Bonaparte)

Sage Hen

Distribution.—Observed commonly the last of June and thereafter in the mountains above 6000 feet. Most numerous on the broad flats of Leonard Creek. They were characteristic of Transition zone.

Habits.—In general habits sage hens much resemble the California quail. They allow of one's near approach before giving the slightest warning of their presence, making up for this a little later, however, through a series of explosive sounds made by the sudden rapid beating of many wings as the birds rise in flight. Occasionally individuals (these were frequently observed to be young birds) do not fly up with the others, but wait until a little later, giving the hunter a second series of momentary surprises. Often, too, the sage hens that flush last take a different direction from that followed by the main flock.

The manner of flight is characteristic. First there is the stentorian "whirr," and the birds fly away with wings rapidly beating and the body swaying from side to side. At intervals this is alternated with a sailing movement, performed by holding the wings extended and motionless. The latter seems to be the favorite manner of alighting, for they always sail just previous to coming to rest.

Usually the birds void some fecal matter shortly after leaving the ground, and as they fly utter a chuckling or clucking fowl-like note.

One individual was flushed and flew a short distance up a hillside, alighting on the bare ground. The observer, upon looking away for a moment and then attempting to make out the resting bird, was absolutely unable to do so. Later the sage hen was again frightened from the place where it had perched. There is little doubt that the colors exhibited by *Centrocercus* are effectively protective.

The crops and gizzards of three birds contained sagebrush leaves, insects, grass seeds, and grass stems.

One flock was observed on the ground near a stream. The sage hens were sitting close together and dusting their feathers

in a typical chicken-like manner. Although the birds were in plain view they merely remained quiet, holding their heads erect in a listening attitude. Two or three of them walked in a stately manner for a distance of a few feet, but it was some time before the flock took wing.

The birds were very numerous on the Leonard Creek flats, where the broad expanse of country covered by sagebrush, with streams intersecting it at intervals, furnished the necessary food and shelter for thousands.

Numerous small piles of sage hen droppings were noted in the higher parts of the mountains. The pieces of fecal matter are about an inch long and a quarter of an inch in diameter. They are light cream in color and pleasantly fragrant.

By June 23 the young were out and fully feathered (juvenal plumage). Up to this date, although we had been maintaining a sharp lookout for this big game bird, none was seen. It must be that they are extremely quiet and cautious during the brooding period. The largest flocks flushed, which were made up in many cases of about thirty individuals, were seen during the last days of July and the first week in August. At this time adults and young birds were traveling in company.

Zenaidura macroura carolinensis (Linnaeus)

Mourning Dove

Distribution.—Occurred commonly at almost every point touched by the expedition, being numerous in flocks May 11 at Winnemucca, along the Humboldt River; abundant in an alfalfa field at Amos; and observed daily at Quinn River Crossing.

Habits.—At the latter locality mourning doves were observed in flocks of from three to seven individuals. They were first heard on May 25, being in full voice by June 1. Two weeks later at Big Creek Ranch they were observed singly or in companies of two or three individuals.

As is usually the case, they were most commonly flushed along streams or near springs. One dove was observed perching on a dead pine branch at the head of Big Creek (8000 feet). A single individual was noted at the Duffer Peak Meadow (8400 feet).

Three nests were found, two at Big Creek Ranch, June 20, and the other at an altitude of 6500 feet on a sidehill in Big Creek Cañon, June 26. The first nest contained one fresh egg, the second was in process of construction, and the third held two eggs.

Cathartes aura septentrionalis Wied

Turkey Vulture

Observed at rather long intervals flying about over the open desert or in the vicinity of the foothills. A badger carcass attracted several of the scavengers to the neighborhood of the camp on Leonard Creek (6500 feet). No specimens taken.

Circus hudsonius (Linnaeus)

Marsh Hawk

An immature female specimen (no. 9314) was shot July 21 at Soldier Meadows Ranch.

Accipiter velox (Wilson)

Sharp-shinned Hawk

A few noted in the lower parts of the mountains, usually along some stream.

On Leonard Creek August 5 a fully feathered juvenal and an adult were seen in a grove of aspens. From time to time the young one uttered an exceedingly plaintive jay-like begging note, which the parent answered. No examples of the species were preserved.

Buteo borealis calurus Cassin

Western Red-tail

Noted only in the mountains, for the most part in their higher portions.

Two red-tails were observed flying about in the vicinity of some cliffs at an altitude of 6000 feet on Alder Creek.

A nest, probably one that had belonged to this pair, was found fifteen feet above the ground on a cliff near the stream. It rested on a shelf formed by a large outcropping of granite,

and had apparently been used this year (1909), as the white excrement both on the nest and on the sticks and rocks under it was comparatively recent. The structure was inaccessible to a climber without the aid of a rope. It was a very large mass, built of coarse sticks and twigs. Some of these had fallen and formed a little heap under the nest.

The limited pine-covered area of the highest ridges of the mountains was *Buteo's* favorite hunting ground. Four individuals were seen in the immediate vicinity of the wild crags of Duffer Peak.

Red-tails were twice seen with prey held in their talons, and on one of these occasions (see account of *Callospermophilus,* Taylor, 1911, p. 221) I was able to determine what the quarry was. The great strength of this hawk is instanced by its ability to break through the tough skull of *Callospermophilus trepidus.*

No specimens of the species were preserved.

Aquila chrysaëtos (Linnaeus)

Golden Eagle

Seen only in the higher parts of the mountains. One was observed near the summit of Duffer Peak on July 29 in the neighborhood of a company of western red-tails. The latter appeared to be somewhat afraid in its presence and to take care that it did not approach too closely.

No examples of the species were obtained.

Falco mexicanus Schlegel

Prairie Falcon

Observed at Quinn River Crossing, Big Creek Ranch, Big Creek Cañon at 7000 feet altitude, and Thousand Creek. On June 27 a nest was found in the latter locality. Two prairie falcons were seen flying in front of cliffs near a mud lake, and from their actions it was judged that they must have a nest with young nearby. Search revealed it on a rocky ledge, which proved inaccessible without a rope. The noise of young birds could be clearly heard. As approach was made to the nest the parents attacked the collector, flying at his head in a very

threatening manner. The nest was more closely investigated on the following day, when one adult bird only was seen in the vicinity, and the juvenals had apparently forsaken the nest.

Two examples of the species (nos. 9315 and 9316) were preserved.

Falco sparverius phalaena (Lesson)

Desert Sparrow Hawk

Distribution.—Occurred in small numbers almost everywhere along our route, its zonal range being Upper Sonoran to the highest Transition.

Habits.—Sparrow hawks were noted in the mountains, perching like lonely sentinels on limber pines, quaking aspens and convenient boulders. Two fully fledged juvenals were noted on July 17 in a grove of aspens near Alder Creek Ranch. On July 19 a family of adults and juvenals was observed flying about the cliffs of Little High Rock Cañon, Washoe County.

Four examples of the species (nos. 9083–9086) were preserved.

Asio wilsonianus (Lesson)

Long-eared Owl

A solitary owl of this species was noted at 7:30 p.m. on the evening of August 1, on the Duffer Peak Meadow. He was maintaining a lookout from a horizontal branch of a dead limber pine; and was calling at intervals with notes which sounded dismal and lugubrious. His stomach proved to be empty. This individual (no. 9189) was the only one observed.

Bubo virginianus pallescens Stone (?)

Western Horned Owl

A horned owl, presumably of this species was heard "whooing" about midnight on July 9. At this time we were encamped at an altitude of 7000 feet on Big Creek. The sound seemed to come from the rocks of a nearby butte. A second individual was flushed from an aspen on Alder Creek at 6000 feet altitude. On taking wing it was pursued some distance by a western warbling vireo. It disappeared in a grove of aspens up the

cañon a short distance, was flushed again and flew down the cañon far out of gunshot.

Oberholser (1904, p. 191) has recorded a specimen of *Bubo v. occidentalis* from Austin, Nevada. The American Ornithologists' Union Committee (1910, p. 175) has referred *occidentalis* to *pallescens,* the range of which is said to include all of the Great Basin region.

Speotyto cunicularia hypogaea (Bonaparte)

Burrowing Owl

Seen between Winnemucca and Amos, at Quinn River Crossing, and at Thousand Creek. On one occasion we saw one chased by three avocets, and on another by two western kingbirds. They were rather shy—seemingly they had good reason to be!

A nest was found at Thousand Creek in an abandoned badger hole. Seven young were seen near the mouth of the burrow. They came out just at sunset, and while they were disporting themselves the parents would sit on a nearby fence or sagebush and give the alarm if anything suspicious appeared. One of the youngsters, too, seemed to act in the capacity of sentinel, and was always the last one to re-enter the hole. By the middle of July the young owls had grown as large as the parents, and were able to fly fairly well. At no time were they observed very far from the nesting site.

Ceryle alcyon (Linnaeus)

Belted Kingfisher

A single individual was observed on a fence-post near the Humboldt River at Winnemucca.

Colaptes cafer collaris Vigors

Red-shafted Flicker

Distribution.—The flicker occurred commonly throughout the region, apparently being as much at home on the summit of Duffer Peak (9400 feet), as at Quinn River Crossing (4100 feet). Ridgway (1877, p. 555) found the species to prefer the deciduous trees of the lower valleys, but in our experience it was about

equally abundant in high and low localities, with the advantage if anything in favor of the higher ones. Its zonal range was Upper Sonoran to high Transition.

Habits.—The penetrating "yip! yip! yip! . . . . . ." call of *Colaptes* was frequently heard as early as 4:30 in the morning. Although they were occasionally noted on rocks, the pines and aspens were in the mountains the most favored perching places. The birds are of a rather curious temperament. I was able to attract one by making a squeaking sound with the lips. At Quinn River Crossing two birds were observed about an old hay stack. On May 17, upon the discharge of a shotgun in the near vicinity, a flicker burst from a hole in the side of this stack. Investigation showed the presence of a set of eight eggs rather advanced in incubation. There were practically no trees on the desert, and the flickers were evidently reduced to an extremity for nesting sites. The upper part of the stack overhung its base. About 1.52 meters (5 feet) from the ground was a hole 114 mm. (4½ inches) in diameter opening into a cavity 482 mm. (19 inches) deep. This cavity had been appropriated by the flickers. Ridgway (1877, p. 579) mentions the digging by the red-shafted flicker of holes in *cliffs* for nesting purposes. Evidently *Colaptes* is broadly resourceful!

A second nest was found more than a month later (June 24) at the head of Big Creek (8000 feet). The nesting cavity was in the decayed portion of a quaking aspen near the stream. The hole was 1.52 meters (5 feet) from the ground, and the cavity was 63 mm. (2½ inches) in diameter and 533 mm. (21 inches) deep. The nest contained six young birds a few days old and one egg within which was a chick that had been too weak to pip the shell. The young birds were resting on a bed of chips. The probabilities are that the flickers were nesting quite commonly in the wooded parts of the mountains. Individual birds were fairly numerous.

The presence of this species in a region in which no other woodpeckers occur is an indicator of its comparative hardihood and relatively superior adaptability.

Phalaenoptilus nuttalli nuttalli (Audubon)

Nuttall Poor-will

Distribution.—Observed on the open desert and in the mountains to an altitude of 7000 feet. Ridgway (1877, p. 567) found poor-wills ranging to 8000 feet. It was most numerous in the vicinity of Big Creek Ranch and Cañon. We found the species predominantly in Upper Sonoran zone.

Habits.—Poor-wills were flushed in the sagebrush in the vicinity of our lower stations, escaping by their characteristic erratic flight. Frequently a poor-will or a pair of them would appear in camp in the evening, perch with seeming stupidity for a few moments on the ground or on a convenient boulder sometimes within a few feet of the observer, and presently zig-zag away on an insect hunt.

Call-notes heard comprise the usual "poor-will! poor-will!" and a clucking call heard when the bird is flushed, which may be rendered by the syllables "quut! quut!"

Three specimens (nos. 9157–9159) were preserved.

Chordeiles virginianus hesperis Grinnell

Pacific Nighthawk

Distribution.—Occurred generally over the entire region. Most numerous along the foothills and upon the broad flats (6000 feet) of the mountains, its zonal distribution being chiefly Transition.

The American Ornithologists Union Check-list (1910, p. 199) does not include Nevada in the citation of the breeding range of *Chordeiles virginianus hesperis.* This record for northern Humboldt County thus constitutes a substantial extension of the breeding range as therein outlined.

Habits.—At Big Creek Ranch nighthawks were frequently seen flying overhead in broad daylight, sometimes even as late as ten or eleven o'clock A.M. They were observed in the evening flying about over the small lake on the Duffer Peak Meadow (8400 feet) capturing insects. At intervals they left the lake

and circled about through the pines, soon returning, however, and continuing their erratic flight over the water.

Seventeen individuals were seen circling over the broad Leonard Creek flats (6000 feet) in a manner resembling that of a gyrating flock of turkey vultures. As a rule the nighthawk moves its wings slowly. Its principal call-note, which may be rendered by the syllables "squee-awk!" is uttered immediately after it makes three short wing-beats. The process of "booming" is as follows. The nighthawk, being high in the air, sets its wings and dives rapidly earthward. When it reaches a point ten or fifteen feet from the ground it suddenly catches itself, the operation producing a most peculiar and indescribable buzzing or whistling sound, which constitutes the "boom." This note is in a measure analogous to the explosive sound made by the Anna hummer as it reaches the lowest point in its nuptial flight. After producing the boom the nighthawk remounts to something like its original height, repeating the maneuver only at irregular intervals.

Eggs were discovered June 25, on Thousand Creek.

Three specimens (nos. 9160, 9308, 9309) were secured.

Aëronautes melanoleucus (Baird)

White-throated Swift

Noted flying about the cliffs of Little High Rock Cañon. They were seen entering crevices, so may have been nesting. No specimens taken.

Selasphorus platycerus (Swainson)

Broad-tailed Hummingbird

Distribution.—Hummingbirds presumably of this species were noted as follows: at Big Creek Ranch, May 18 and 20; at intervals in the vicinity of the head of Big Creek; and at Leonard Creek Ranch, where they were buzzing in and out among the trees of the large poplar windbreaks.

Habits.—On July 1 a single specimen (no. 9082) was taken on a meadow at an altitude of 8000 feet. It was feeding about iris, which was blooming on the mountain meadows at this time.

When first seen it was executing a nuptial flight over a willow.

Later in the season the drying up of the iris and certain pentstemons on the exposed hillsides, together with the invasion of the region by bands of sheep, which caused an extensive spoliation of the flora, apparently drove the hummers to the neighborhood of the streams where flowers were more abundant.

Frequently the flight of the hummer becomes bullet-like in speed and directness, and it is truly surprising if not a little disconcerting to have the little fellow shoot past close to one's head.

One individual was seen chasing a rock wren. It pursued the wren persistently and belligerently, and at intervals appeared to strike it with its bill.

Our observations of the habits of this species accord in nearly every particular with those of Ridgway (1877, p. 561). Apparently the broad-tailed hummers make straight instead of undulating flights. It is confessedly difficult, however, to follow the course of such unusually rapid flyers, so perhaps a positive statement is not justified.

Selaphorus rufus (Gmelin) (?)

Rufus Hummingbird

A reddish hummingbird, presumably belonging to this species, was noted August 3 on Leonard Creek. It hovered for a moment near some willows by the stream about 6:20 o'clock in the evening, then was away like a flash. A week later an individual was seen buzzing about the alders at Big Creek Ranch. An immature specimen (no. 9301), not with certainty identifiable, was secured at Soldier Meadows, July 21.

Tyrannus tyrannus (Linnaeus)

Eastern Kingbird

An eastern kingbird was almost the first bird noted as we approached Big Creek Ranch, June 8. The bird was perching on a fence near an alfalfa field. The next day two more were seen, and one individual was taken. The other appeared to be a juvenal, but unfortunately it was not secured. The birds

were not shy. They were heard to utter but one call-note. It is probable that the birds had bred at Big Creek Ranch.

The point nearest to the Pine Forest Mountains mentioned by the American Ornithologists' Union (1910, p. 208) in its definition of the range of *Tyrannus tyrannus* is central Oregon on the north, and northern New Mexico on the southeast. Ridgway (1877, p. 532) noted this bird in the valley of the Truckee, western Nevada. This fact, together with our records, would seem to indicate that the Great Basin should be included in the range of the species.

Two specimens(nos. 8607, 8608) were secured.

Tyrannus verticalis Say

Western Kingbird

Distribution.—Typically a bird of the desert flat below 5000 feet altitude. Observed at Quinn River Crossing (4100 feet), Wheeler Creek (4300 feet), Big Creek Ranch (4350 feet), and Alder Creek Ranch (5000 feet), all the localities being in Upper Sonoran zone.

Habits.—The warlike nature of *Tyrannus verticalis* is indicated by the fact that five individuals were seen simultaneously fighting in air, and that one kingbird was observed giving vigorous pursuit to a Bullock oriole.

At Quinn River Crossing about May 20 two pairs were seen performing amorous antics, and shortly a nest was discovered in process of building on a fence rail near the river. By June 5 it was completed, and there were five eggs. It was saddled on the rail between two posts and built of strings and plant fibers. Long pieces of string and rags dangled from the nest. The site was on a hill-slope, there being no large trees nearby. The male (as was later proved) was bolder than his mate, who, instead of approaching very closely, hovered overhead during the examination of the nest. After the killing of the male another kingbird made its appearance, but was apparently driven away by the remaining bird.

Two kingbirds were seen on May 26 on Wheeler Creek, evidently mating. The species was quite commonly observed at Big Creek Ranch. A nest with five eggs was found at this locality

June 14. Attention was attracted to it by the agitation betrayed by the pair of birds when the collector appeared in the neighborhood. The nest was located twenty feet from the ground, and within two feet of the top of a willow. It was saddled on top of an abandoned oriole's nest. The cavity was 76 mm. (3 inches) across and 51 mm. (2 inches) deep. One of its outer edges had a frayed appearance. A third nest containing one young bird in the juvenal plumage barely able to fly was found July 17 at Alder Creek. This nest was twelve feet up in an alder, and was constructed very much like the others.

Sayornis sayus (Bonaparte)

Say Phoebe

Distribution.—Noted at nearly all the camps below 5000 feet altitude. Evidently the bird does not invade Transition.

Habits.—Very few Say phoebes were observed. One family noted at Big Creek Ranch was made up of the parents and three young ones. The adults were usually out foraging. A broad cross-beam in the open wagon-house was the favorite and almost constantly occupied perch of the juvenals. They sat close together to keep warm, the two of them on the outside facing in one direction, the one in the middle in the opposite direction. At intervals they uttered a plaintive call-note something like "peear! peear!" Ridgway (1877, p. 535) renders it "peer, peer." They had nearly completely acquired the juvenal plumage. One of the birds left his position on the beam for a few moments and made a short flight, capturing an insect.

Nuttallornis borealis (Swainson)

Olive-sided Flycatcher

One was seen on June 3 at Quinn River Crossing. Six days later a second bird was observed on a dead alder by the stream at Big Creek Ranch. No examples were secured.

Myiochanes richardsoni richardsoni (Swainson)

Western Wood Pewee

Distribution.—Seen in the following localities: Quinn River Crossing (4100 feet), Big Creek Ranch (4350 feet), and head of Big Creek (8000 feet).

Habits.—The western wood pewee was typically a bird of the flat, though it was not numerous anywhere. The birds were seen in varying situations, for example, on fences about the Quinn River Ranch, and in willows along the river itself. Ordinarily they were shy.

On June 29 an individual was observed at the head of Big Creek (8000 feet) proceeding gradually up the valley in which our camp was located. It stopped to rest for a few moments on almost every naked top twig of the quaking aspens. The birds were more in evidence along a fence near the tree-lined stream at Big Creek Ranch, than at any other locality visited.

That there is a vertical migration among the western wood pewees during the early summer seems quite probable. Such a movement seems to exist in the black-headed grosbeaks, Wright flycatchers, western lark sparrows, and white-crowned sparrows in this region. Our data upon this point is so limited, however, that no certain laws of movement may be formulated.

Empidonax trailli trailli (Audubon)

Traill Flycatcher

This flycatcher was one of the less common species, being found at Big Creek Ranch only.

The birds were noted only three times, being heard in a thicket along the creek below the ranch. In this region the stream flows rather slowly, and the vegetation surrounding it is of the river-bottom type, which these birds so commonly frequent in other parts of their range.

One specimen only (no. 8560) was taken.

Empidonax hammondi (Xantus)

Hammond Flycatcher

Our only record of the species is that of a specimen (no. 9251) taken in Virgin Valley on June 2.

Empidonax wrighti Baird

Wright Flycatcher

Distribution.—Noted at Quinn River Crossing (4100 feet), Big Creek Ranch (4350 feet), head of Big Creek (8000 feet),

Duffer Peak Meadow (8400 feet), Alder Creek Lake (7800 feet), Alder Creek (7000 feet), Virgin Valley (5000 feet), and Leonard Creek (7500 feet and above). Occurred everywhere in the higher portions of the mountains.

Habits.—As regards note, song, and habits this flycatcher seemed to be identical with the bird from the San Bernardino Mountains of southern California called *E. griseus* by Grinnell (1908, p. 78). During the latter part of May several of the birds were observed in the tall sagebrush along Wheeler Creek near Quinn River Crossing. The first one was seen at this locality May 22; the last June 2. Presumably there occurred a vertical migration about this time or soon thereafter, for none were observed during the last week of our stay at Quinn River Crossing, and only a few were noted at Big Creek Ranch (June 9 and 10), while higher in the mountains a few days later they were common.

One individual seen at Quinn River Crossing was killing a grasshopper by pounding it on a sagebush twig.

This flycatcher was observed in limber pines on hillsides and high ridges, in quaking aspens along streams, in the mountain mahogany on arid ridges and cañon slopes, and in brushy plants generally. The bird seemingly prefers bare twigs to those fully leafed out, being very often seen perching on exposed branches. When heard calling from a dense thicket of quaking aspens, for instance, it is generally found to be, not in the thickest part of the foliage, but on a naked twig rather low down in the tangle.

The evident excitement of a bird seen on June 29 above Alder Creek Lake doubtless indicated the presence of a nest nearby. This individual persisted in remaining in a very circumscribed locality.

The flycatchers seem by nature curious, and seek to determine the source of a strange sound. Frequently a "squeaking" sound made with the lips would attract one to within a few feet of the observer. As soon as the bird discovered the source of the peculiar note it usually retired in great haste. Ridgway (1877, p. 542) says this flycatcher is confiding and unsuspicious, but in our experience it was shy.

Two nests were discovered, the first on July 1 at the head of Big Creek in an aspen thicket. The nest was built against a large limb, being supported by two smaller branches and fastened with sheep's wool. It was three and a half feet above the ground, its cavity being 53 mm. ($2\frac{1}{10}$ inches) in diameter and 38 mm. ($1\frac{1}{2}$ inches) deep. The nest contained four eggs in so late a stage of incubation that their preservation was impossible. The second (found July 9 on Big Creek, altitude 7000 feet) was in process of construction. The body of the nest was being built up of thin strips of quaking aspen bark, and its fastenings to the limb were of spider-web. It was about half completed; no lining had as yet been put in. The nest was four feet above the ground. The female was carrying on the building process. She came three times during a few minutes, and, while sitting on the nest, added material with her beak, all the while uttering a series of "ker-wit" call-notes, and occasionally notes of different inflection. The male bird was shyer and more quiet. He was not observed aiding in the work of construction.

Otocoris alpestris merrilli Dwight

Dusky Horned Lark

Distribution.—Occurred at nearly all the lower stations visited, following up the broad Leonard Creek flats to 7000 feet. Its habitat thus falls within Upper Sonoran and Transition.

It is perhaps significant to note that certain of our observations with reference to the distribution of this bird do not accord with those of Ridgway (1877, p. 499). In our experience, instead of being omnipresent, equally abundantly in all localities, the horned larks exhibit a very marked preference for the vicinity of the fields and dry meadows, as along Quinn River. The birds were frequently encountered, however, on the most inhospitable deserts, although they were more numerous in pleasanter surroundings. We did not observe them at a greater altitude than 7000 feet, although Ridgway noted them as high as 11,000 feet.

Habits.—The mode of flight is quite characteristic. The wings are vibrated rapidly a number of times in alternation with short periods of soaring.

After May 12 the birds were in pairs, and singing persistently and cheerily. On June 4 an individual was observed pursuing another, possibly mating. A large flock of some twenty-five or thirty individuals, including both adults and young birds, was encountered at the mouth of Alder Creek, July 17, and on August 4 another flock of about the same size was observed near the broad divide (7000 feet altitude) between Leonard and Big creeks. Flocking had evidently commenced by the middle of July.

Pica pica hudsonia (Sabine)

American Magpie

Distribution.—During the early summer magpies occurred in small numbers at nearly all the stations below 6000 feet. Later they were found along streams in the mountains to a height of 8500 feet.

The birds were breeding just on the line between Upper Sonoran and Transition, evidently invading the latter zone in their daily wanderings.

Habits.—From the point of view of the hunter, to approach the bird was practically impossible if a shotgun was exhibited. Its sagacity was the most notable trait of the magpie. One morning as I was setting a mouse-trap by a willow thicket, I was startled to hear a vigorous chattering. In the thicket a few feet from me was a magpie, the personification of surprise. The bird did not linger, but speedily made off, chattering until out of hearing.

While for the most part the magpies were confined to the immediate neighborhood of streams, individual birds were seen on the arid sage-slopes of the mountains or on the sage-covered desert. In no case, however, were they observed far distant from a visible supply of water. As is commonly the case with other species, the magpies were represented at the higher altitudes and at points farthest from their natural habitat by young birds.

Two nesting colonies were found, one in the mouth of Chimney Creek near Amos and the other in the foothills of the Pine Forest Mountains near Big Creek Ranch. There were five nests in the first colony, which was discovered May 13. One was

located ten feet up in a willow thicket. It was built of large coarse sticks and lined with fine dry rootlets, mud having been freely used in cementing the structure together. Above the nest proper was a roof-like arch, of sticks. This made the nest very conspicuous. The top of the nest proper was not horizontal, but slanted toward the south. There was considerable fecal matter about and on it, and it consequently had a very disagreeable odor. The nest cavity was 203 mm. (8 inches) in diameter, and contained six eggs. A second nest was built in an elder (*Sambucus glauca*). Its height above the ground was the same as that of the one just described. This nest was built in every way like the first except that the dome over it was constructed of thorny rosebush twigs, which formed a rather open cover. This nest had no definite opening, there being several possible entrances on the south. Contained in it were three young birds, with juvenal feathers just appearing, and three eggs. Another juvenal was found dead on the edge of the nest. The second colony of magpies had all built in quaking aspens. These nests had been occupied earlier in the season (they were found June 15). Companies of adults and juvenals were several times heard in their vicinity. The preferred height for nests was eight to fifteen feet above the ground. The adults and young were traveling about in company during the latter part of June and the first of July. Frequently from thickets along a stream two unlike series of harsh "squawks," evidently indicative of the progress of feeding operations, would be heard, the squawks being referable to parent and young one respectively.

Aphelocoma woodhousei (Baird)

Woodhouse Jay

One was flushed from a willow-thicket near Quinn River. This (no. 9093) was the only jay seen. Hoffman (1881, p. 234) found this species rather common in Nevada.

Corvus corax sinuatus Wagler

Western Raven

Noted only at Quinn River Crossing and Big Creek Ranch. Individuals were several times seen and heard about the former

locality, our attention often being attracted to them through their persecution by red-winged blackbirds. No specimens taken.

Nucifraga columbiana (Wilson)

Clarke Nutcracker

Distribution.—Observed commonly above 7000 feet in the mountains. They were closely confined to the pine-covered area, and were consequently more numerous on the western than on the eastern slopes. The nutcracker was a characteristic inhabitant of that part of the Transition which is designated (see pl. 7) as possessing a Boreal infusion.

Habits.—The birds were first noted at the head of Big Creek. Small companies of three or four individuals appeared, and perching on boulders and dead pines on the mountain sides, they proceeded to call back and forth to one another. As regards degree of shyness there was much individual variation.

Several birds were dissected and their stomachs found to contain insect remains, principally a large species of ant common in logs at high altitudes. Sometimes a mixture of insect remains and pine-nuts was discovered. Individuals were frequently observed pounding pine-cones to extract the seeds. Others were noted prying and tearing strips of bark from dead pines, evidently searching for insects.

By making a "squeaking" sound with the lips I attracted one individual to within ten feet of me. As long as I remained quiet he remained near at hand. For several minutes he watched me intently, making little nervous movements from time to time. Presently he uttered several loud jay-like notes, and went to work at stripping off bark.

These birds were the noisiest of all the species in the higher parts of the mountains. They could be heard calling at almost any time of day. Toward the last of July the young were out of the nest and seemed to be accompanying their elders.

A parent was twice observed feeding a juvenal by the process of regurgitation. The juvenal begged by flapping its wings in a linnet-like manner, and uttering a loud squawking. When the parent inserted its bill into that of the young bird the cries of the latter became increasingly violent. At intervals the adult

took short rests, turning her back to the young bird for a few moments. Three or four feedings to the visit were administered. Bare horizontal branches of the limber pine were selected as the scene of the process. The pumping motion of the adult during the regurgitation did not seem to be as vigorous as that of the linnet. The throats of the parent and juvenal were found to be full of hulled pine-nuts. Once I observed a young one persistently pursuing a parent, apparently attempting to coerce the latter into feeding it.

Dolichonyx oryzivorus (Linnaeus)

Bobolink

A single individual in full song observed June 3 at Quinn River Crossing. The bobolink is said in the American Ornithologists' Union Check-list (1910, p. 231) to breed in northeastern Nevada. The single individual secured by us (no. 8834) had the enlarged testes significant of breeding activity.

Molothrus ater artemisiae Grinnell

Nevada Cowbird

Distribution.—Three individuals were seen on the out-buildings of the Sod House Ranch. The yards of the Quinn River Ranch and the willows of Big Creek Ranch were the only other localities at which the cowbird was observed (see Grinnell, 1909, p. 275).

Habits.—Cowbirds were frequently seen flying rapidly up or down the course of Wheeler Creek, near the Quinn River Ranch. Solitary individuals were sometimes observed flying over this course, but usually the birds were in two's and three's. Frequently they gave voice to their peculiar shrill "screep," uttered with an ascending inflection; another of their call-notes may be described as a "cluck, cluck" made in the throat and executed simultaneously with an opening of the mandibles. From their actions during the last of May it seemed evident that mating was taking place.

At times the birds were extremely tame. One morning, while I was walking from the Quinn River Ranch towards camp, two

of the birds were seen on a fence near the road. The male left the vicinity, but the female allowed of my approach to within eight feet.

The cowbirds seemed to offend the sensibilities of the Brewer blackbirds in some way, as the latter were not infrequently observed giving vigorous chase to males or females of the former. The greater proportion observed were males.

On June 15 a single cowbird's egg was found in a song sparrow's nest, together with two eggs of the rightful owner.

Twelve specimens (nos. 8822–8833) were preserved.

Xanthocephalus xanthocephalus (Bonaparte)

Yellow-headed Blackbird

Distribution.—Observed at Tregaskis Well and Quinn River Crossing only.

Habits.—While we were stopping over between stages at the Well, a yellow-head flew in and perched on a haystack near the barns. The locality is in the middle of a very wide expanse of extremely arid desert, and it seemed strange to encounter here such a denizen of the tules.

Two individuals were seen in company with a flock of redwings at Quinn River Crossing on May 20. A nesting colony was discovered two days later in the extensive wild-hay fields along the river, which are covered with a thin sheet of water in the spring and early summer, but which are left high and dry later in the season. During May and June various species of water-birds take advantage of these intermittent marshes. Willows, wild hay, many small species of water-loving plants, and a very few tules make up their flora. A few pairs of yellow-headed blackbirds were nesting in the solitary tule patch discovered here.

Two nests were found May 22, one 152 mm. (6 inches) above the water, the other almost touching its surface. They were made entirely of dry strips of tule, being lined with very fine shreds of the same material. The nests were fastened in such a way that they could easily be slipped up and off the reeds. The first contained one egg; the second three. The cavity of the latter measured 76 mm. (3 inches) across and 72 mm. (2⅝

inches) deep. A third was found on May 31 three feet above the water in the same clump of tules. It was about the same size, contained two eggs, and was made and fastened in the same way as were the others.

On June 1 the birds were heard in full song.

Although it is not rare, *Xanthocephalus xanthocephalus* cannot be said to be a common species in the region, probably because the type of environment to which it is suited is so restricted.

Agelaius phoeniceus (subspecies indet.)

Red-wing

Distribution.—Common in almost every locality which was at all suitable for their habitation. Specific localities at which they were noted: Winnemucca (4300 feet); Quinn River Crossing (4100 feet); Big Creek Ranch (4350 feet); Alder Creek (5000 to 7000 feet); Virgin Valley (4700 feet); and Little High Rock Cañon (5000 feet).

This bird is considered by Mr. Grinnell to be nearest *Agelaius p. sonoriensis,* though it is said not to be that form.

Habits.—On more than one occasion was the belligerent disposition of this blackbird in evidence. Flocks of four to eight individuals were frequently seen pursuing some distressed raven; they swooped at the fleeing bird with every appearance of intent to do bodily harm, but I was not able to observe that they did actually strike the fugitive. Individuals do not seem to be particularly timid about attacking a raven, even when no other red-wings are about. Magpies come in for a share of abuse. Apparently the red-wings do not confine their attacks to birds of their own size or larger, for one was observed driving a Savannah sparrow from a grass stem. Upon the flight of the sparrow, the blackbird settled down on the vacated perch.

The male apparently guards the female and nest very carefully. If the female flies up from the grass he often follows her with tail and wings widely spread, singing most persistently. If another male intrudes he is immediately attacked and ejected. The males are much more in evidence than the females.

Both this species and *Euphagus cyanocephalus* showed very

ragged plumage the last of May and the first of June. Some of the individuals preserved had the crowns of their heads almost naked.

At Quinn River Crossing the red-wings were found in a slightly different habitat from that occupied by the Brewer blackbirds. In general they (the red-wings) were more restricted to the open meadows, alfalfa fields, and low willow thickets along the river than were the Brewers, which had a much wider distribution, being found about the ranch buildings, in thick tangles of willow and wild rose along the river, and on the nearby sagebrush flats. The habitats overlapped, however, to a great degree. Red-wings were commonly seen along creeks and in the sagebrush in Virgin Valley.

Our work was carried on during the nesting season. The first nest, discovered May 22, contained four fresh eggs, and was located in a bunch of marsh grass in the middle of an arm of a meadow near Quinn River. The water was 127 mm. (5 inches) deep, the nest being woven among the grass stems 13 mm. (½ inch) above the surface. Although the bottom of the nest was damp, the inside was perfectly dry. It was constructed exteriorly of marsh grass, being lined with finer material of the same sort. Its inside diameter was 76 mm. (3 inches), depth 63 mm. (2½ inches). On May 24 three more nests were found in situations practically similar. All contained sets of four eggs. The eggs of the one taken proved to be fresh. The nests were located at a height of 101 to 152 mm. (4 to 6 inches) above the surface of the water, and were constructed practically as the one described.

A nest containing small young was found a week later. It was built 304 mm. (12 inches) above the surface of the water in a grass tuft. Unlike those thus far considered, it was made of dry reeds entirely, graduated from coarse to fine as the lining was approached. On June 4 a nest was discovered containing three eggs and two small young. This was the only case in which a set of five was recorded. Of a half dozen other nests of the species found, no deviations of significance from the observations above recorded were noted. In some instances the nests were supported by reeds instead of being placed in grass

tufts, and in individual cases horse-dung had been freely incorporated into the structure.

While investigation of the nest was going on the parents were always much agitated and kept up a continual series of objections in the form of nervous circular flights and excited call-notes.

Four juvenal red-wings were noted flying up Alder Creek, at an altitude of 7000 feet, which was the highest point at which *Agelaius* was observed.

Sturnella neglecta Audubon

Western Meadowlark

Distribution.—Occurred generally along the route of the expedition in suitable situations, being recorded at nearly all the stations of lesser altitude.

The meadowlark was most numerous on the ranches, in the alfalfa and wild-hay meadows, but ranged rather commonly to a height of 7000 feet in the mountains, and individually to a still greater altitude. One was observed on June 29, flying about from boulder to boulder, giving its call-note, at 8500 feet altitude. Ridgway (1877, p. 506) recorded it to an altitude of 7000 feet.

Habits.—At Quinn River Crossing the song of the meadowlark was the one most in evidence. Especially in the early morning the beautiful notes rang out over the meadows in the neighborhood of the ranches and on the sagebrush-covered ridges of the foothills.

One meadowlark was seen in the morning at Quinn River Crossing giving vigorous chase to another individual of its own species. After having ejected the interloper he returned to his particular section of alfalfa field.

Two nests were found at Quinn River Crossing. The first was discovered May 26 in an alfalfa field northeast of the ranch. The nest was in a depression in the grass, and was composed of straw, and lined with grasses. The bird flushed from this nest as the collector came into the vicinity, feigning an injury after having retreated to a distance of several yards. A second nest was discovered on May 31 in the marsh near the Quinn River. The bird flew out almost from under the feet of the

hunter, disappearing from view across the river. This nest rested in a slight depression on some moist ground, and was surrounded by marsh grasses. It was nearly spherical in shape, being built entirely of straw, and having a light covering arranged over it in such a way that the opening was on one side. It was especially well concealed and one could hardly see how the parent bird got into and out of the nest, as immediately in front of the opening were some dry willow branches. The opening into the nest was 76 mm. (3 inches) in diameter, and the nest cavity 127 mm. (5 inches) from front to back. Each nest contained five fresh eggs.

Meadowlarks were present in small numbers on the Leonard Creek flats, altitude 6000 feet, but were characterized by extreme shyness, retreating hastily into sagebrush thickets when surprised.

A juvenal barely able to fly was noted in Big Creek Cañon between the Dugout Camp and Big Creek Ranch on June 22.

Icterus bullocki (Swainson)

Bullock Oriole

Distribution.—Observed fairly commonly at lower stations, for example, Winnemucca, Quinn River Crossing, Virgin Valley, Little High Rock Cañon, and Leonard Creek Ranch. The highest record stations were Big Creek (6000 feet), Leonard Creek (6500 feet), and Duffer Peak Meadow (8400 feet), while the lowest was Quinn River Crossing (4100 feet).

Habits.—Orioles were by no means confined to the willows, but were often seen in the sagebrush, though never at any great distance from some stream. Nests were seen May 11 in the poplars at Winnemucca. The males were at that time in full song. Nests, but no birds, were observed at Amos. Orioles were nesting in the willows at the mouth of Wheeler Creek and probably at Quinn River Crossing also.

Detailed observations of breeding habits were made at Big Creek Ranch, where the orioles were more numerous than at any other locality on our itinerary. One nest, which may be regarded as fairly typical, was located fifteen feet up in a willow.

It contained five fresh eggs, and was well built, being a firmly woven felt work of horse-hair, willow-cotton, and plant fibers. The nest was 104 mm. (4⅛ inches) by 60 mm. (2⅜ inches) across the opening. Average inside diameter was 136 mm. (5⅜ inches). The parents scolded vociferously at my intrusion. They were exceedingly cautious, however, and took care to keep out of firing reach. Orioles were several times seen chasing Brewer blackbirds from the vicinity of their nests. Families made up of both young birds and adults were noted at Alder Creek Ranch on June 17.

Euphagus cyanocephalus (Wagler)

Brewer Blackbird

Distribution.—Noted at every collecting station visited by the party, the species occurring from Quinn River Crossing (4100 feet), to Duffer Peak Meadow (8400 feet).

Habits.—A colony of thirty Brewer blackbirds was seen in the willows on a meadow at the head of Leonard Creek (9000 feet). Large flocks were observed on the Duffer Peak Meadow (8400 feet) also. Small companies were frequently noted apparently crossing the mountains. They did not fly continuously for any great distance, but rested at intervals on convenient boulders or quaking aspens.

Two individuals were seen at Quinn River Crossing giving chase to a cowbird, but on the whole the Brewers seem to be not nearly so pugnacious as their red-winged cousins.

On May 13 at Amos individuals were observed mating. Six days later, at Quinn River Crossing, Brewer blackbirds were found nesting in the willow and bramble thickets along the stream. Whenever a nesting site was approached the birds always set up a vociferous chattering. The nests were situated at a greater distance (2½ to 6 feet) from the ground than those of the red-wing. We found very few blackbirds, however, nesting in trees, whereas Ridgway (1877, p. 510) observed several nests twelve to fifteen feet above the ground, in piñons and junipers.

On June 10 a colony was found at Big Creek Ranch. Six nests were discovered in a sagebrush area 50 by 150 feet in size.

Several others were noted in willow thickets farther down the creek. The six nests examined contained eggs as follows: 5, 6, 2, 3, 6, and 5 (probably the sets of two and three were incomplete). In one set collected there was a notable difference in degree of development of the eggs, one being fresh and the others in various stages of incubation, possibly indicating that more than one day elapses between the successive depositions, and that incubation commences as soon as the first egg is laid. One of the sets collected June 10 was in a late stage of incubation. The nests were fairly close together, and some were built almost over the stream while others were built 150 feet away from it. They were not well concealed. The blackbirds congregated in a flock of a dozen or more and scolded continuously while we were in the vicinity.

Carpodacus cassini Baird

Cassin Purple Finch

Distribution.—Occurred rather commonly above 7000 feet altitude in the mountains.

Habits.—Two individuals were observed feeding in the foliage of a quaking aspen at 7500 feet altitude. Especially cold mornings seemed to drive the birds to slightly lower altitudes. Purple finches were in full song at the head of Big Creek June 24. They continued singing until about the last of July, when they became very quiet and correspondingly inconspicuous. Our observations with regard to the singing powers of the young males in the dull plumage of the first winter accord with those of Ridgway (1877, p. 457), who asserts that they sing almost if not quite as vigorously and sweetly as those in the adult livery. On several occasions purple finches were heard singing while in flight.

A nest was found June 26 in a *Pinus flexilis* near the head of Big Creek. The tree itself was surrounded by a grove of quaking aspens. The nest was located five feet from the trunk of the pine on the slender twigs of a branch thirty feet above the ground. Sticks and greenish yellow lichens had been used in its construction. The lining consisted of shreds of bark and sheep's wool. The structure was rather frail and loosely built. The depth of the cavity was 30 mm. ($1\frac{3}{16}$ inches), its diameter

79 mm. (3⅛ inches). When it was first noted one parent was seen on the nest, but when a close examination of the site was made neither bird was seen. There were five young in the nest.

Young birds out of the nest were noted as early as the middle of July. Upon their appearance purple finches were very much in evidence on the highest ridges in the mountains (altitudes of 9000 feet and above). The juvenals kept up a continuous vociferous clatter. A bird would fly from one tree to another and then the other members of the family would follow. Feeding of the young was by regurgitation. It was very easy to approach the females and juvenals, but the brilliantly colored males were more cautious.

Carpodacus mexicanus frontalis (Say)

Linnet

Distribution.—Noted at all the lower stations touched by the expedition. It invaded Big Creek Cañon to an altitude of 6000 feet. Localities where it was observed may be enumerated as follows: Winnemucca, Quinn River Crossing, Big Creek Ranch, Alder Creek Ranch, Leonard Creek Ranch, and Virgin Valley. All of these are in Upper Sonoran life zone.

Habits.—Linnets were common at the localities listed. In habits they seem to vary somewhat from those of southern California. Their songs particularly appear to have a slightly different inflection. It may be that the different environmental setting has some acoustic influence on the effect of the song, but I do not believe the difference is entirely accounted for in this way.

They were perhaps more abundant at Big Creek Ranch than at any other place visited. Individuals were often heard on the sage-covered hill slopes. It is probable that they scattered out over the foothills to feed.

Birds were seen in copulation June 14. Young linnets were seen July 17 at Alder Creek Ranch.

The birds were shy at all times, and nine specimens only (nos. 8670–8676, 9284, and 9285) were secured.

It is of interest to note that *Passer domesticus* was not found at any locality away from the railroad. As is well known, where

the English sparrow is common the linnet comes to be almost displaced.

Astragalinus psaltria hesperophilus Oberholser

Green-backed Goldfinch

Notably rare. On June 9 one was heard near Big Creek Ranch. The clear call-note of a second individual was heard the next afternoon, as the bird was flying overhead. Finally one (no. 8606) was secured in the willow thicket below the ranch.

Spinus pinus (Wilson)

Pine Siskin

Distribution.—Heard at Quinn River Crossing, Big Creek Ranch, in the higher parts of the mountains, and in Virgin Valley.

Habits.—The shyness of the species in this region is indicated by the fact that although several individuals were heard, no specimens were secured by our immediate party, and only one (no. 9280) by the palaeontological division in Virgin Valley. The usual thing was to note them flying high overhead, their presence being indicated merely by their clear-voiced call-note. On June 2 one individual was observed at 6 a.m. flying westward. Later in the day a pair was seen and shortly afterward an individual bird flying in the same direction.

At Big Creek Ranch and in the mountains siskins were noted perching on willows along the stream and in the brush on the hillsides.

Several individuals were observed feeding in a warbler-like manner, picking insects from the foliage of a limber pine.

Pœcetes gramineus confinis Baird

Western Vesper Sparrow

Distribution.—Noted at Big Creek Ranch and locally on the sagebrush flats of the mountains rarely above 7000 feet altitude; zonally in Upper Sonoran and Lower Transition.

Habits.—Vesper sparrows were not abundant. They were unusually shy and difficult of approach, as they flew over long

distances before making the characteristic flirt downward into the sage and to the ground. As the birds dropped to the ground they dodged either to the right or to the left behind a sagebrush. Sometimes they remained motionless after alighting, but usually they ran along for some distance. In either case they were generally highly successful in eluding pursuit. When followed persistently the flights became longer.

One female secured July 9 had a bare breast, indicating that she was brooding. This, together with the taking of a juvenal bird on July 28, gives a clue to the time of nesting. The young bird was noted in company with a sage thrasher and several Brewer sparrows in a sagebrush flat at the head of Big Creek (8500 feet).

By the first week in August the post-natal aggregation had begun to be apparent, and flocks of from three to seven birds were seen.

Five examples of the species (nos. 4677–4680) were preserved.

Passerculus sandwichensis alaudinus Bonaparte

Western Savannah Sparrow

Three specimens (nos. 8780, 9277, 9278) were obtained. These birds, which were evidently migrating, were taken at Quinn River Crossing and Virgin Valley, May 14, 15, and 22, respectively.

Passerculus sandwichensis nevadensis Grinnell

Nevada Savannah Sparrow

Distribution.—Noted at three localities only: Quinn River Crossing, Big Creek Ranch, and Leonard Creek flats. These stations are in Upper Sonoran zone.

Habits.—This species was a very common one in the grassy marshes, in the wild-hay meadows and in the willows along the Quinn River, and also in the alfalfa fields of Big Creek Ranch.

At long intervals the birds ventured out from the grass of the meadows into nearby sagebrush. A single juvenal was secured at an altitude of 6500 feet on Leonard Creek. It had evidently followed up the stream. The only meadows in the vicinity were

particularly unattractive, being very dry by this time (August 3). The adults did not venture away from the ranches.

The striking similarity between the habits of *Passerculus* and those of *Melospiza* was very evident. This extended to appearance, movements, song, and habitat. There was one marked difference between the two, however, in the latter regard. While the song sparrows were confined almost exclusively to the willows along the Quinn River, the Savannah was found alike in this situation and in the grass of the marsh.

A single nest was found, May 24. The female was flushed from it and flew heavily away, feigning injury. The structure was located in a slight depression on a low hummock in the marsh, being completely surrounded by mud and water. The grass about it was sparse. The nest had been built between a large clod of earth and a piece of cowdung, and was composed of coarse pieces of wild hay and marsh grass, and lined with fine grasses and threads of horsehair. Dimensions of the cavity were: diameter 54 mm. (2⅛ inches), depth 42 mm. (1⅝ inches). It contained five eggs, the incubation of which was just begun. Both parents remained near while the nest was being examined.

Twenty-five specimens of this new form (see Grinnell, 1910, p. 311) were obtained.

Chondestes grammacus strigatus Swainson

Western Lark Sparrow

Distribution.—Generally distributed over the desert from Winnemucca to Alder Creek Ranch. It was not noted above 7000 feet altitude. Its habitat is apparently exclusively within the Upper Sonoran life zone.

Habits.—Lark sparrows were in full song from the last of May well into June. One bird was observed on an alder on Big Creek with two grasshoppers in its mouth. Parents with young in juvenal plumage were observed on the sage flats of Big Creek Cañon the first week in July. There is little doubt that the species was nesting in the region.

It may be that the birds move from the flats to the foothills for nesting purposes, for while they were commonly observed at Quinn River Crossing before May 22, after that date they be-

came less abundant. A few days later they were found to be common at Big Creek Ranch and in the cañons and on the lower ridges nearby.

Zonotrichia leucophrys leucophrys (J. R. Forster)

White-crowned Sparrow

Distribution.—Occurred quite generally. Noted at Winnemucca on May 11; seen near the stage road between Tregaskis Well and Quinn River on May 15; rarely observed at the latter locality; one heard singing in a low, dry cañon at the mouth of Wheeler Creek, several miles to the eastward. After May 26 none were seen at the lower altitudes. The birds retreated about this time to the highest parts of the mountains to breed. Here they were often seen in the sagebrush, in willow tangles over springs, in the low chinquapin patches, and in gnarled quaking-aspen thickets.

Habits.—The birds were in full song and probably nesting commonly June 23 to August 4. The first nest (with young birds which had already assumed juvenal plumage) was found on July 3 near the head of Big Creek. (See account of garter snake, p. 354). The nest was located a foot and a half above the ground in a sagebush. It was securely fastened, and fairly well concealed. The cavity was approximately 88 mm. (3½ inches) across, and 63 mm. (2½ inches) deep. The nest was a substantial structure built of dry grass stems, light sage twigs, sage bark, and dry blades of grass. A pair of white-crowns seen July 13 on Alder Creek appeared to be very much agitated, and probably had a nest somewhere in the near vicinity. It seemed characteristic of the birds to display the extremest solicitude for the welfare of the young.

One of the most attractive of *Zonotrichia's* habits is that of singing in the twilight. The advent of the season of rest seems to put the birds into the best possible spirits. Perhaps a song is heard close at hand in the thicket. Presently it is answered by another which sounds cheerily from another part of the tangle. As it grows darker there comes a chorus of soft twitterings until finally all is enveloped in the stillness of the desert night.

Spizella passerina arizonae Coues

Western Chipping Sparrow

Distribution.—Observed to 9000 feet altitude; most commonly seen in the mountain mahogany on the west slope of the mountains (6000 to 7000 feet). This accords practically with Ridgway's statement of the habitat of the chipping sparrow as observed by him in the Great Basin (1877, p. 479).

Habits.—The bird's presence in our neighborhood was proclaimed by the trilled call-note which we heard from time to time and which proved very difficult to locate, especially in the sagebrush country. The birds were seen in the limber pines near the summit, in the quaking aspens on the ridges, in the mountain mahogany and in the sagebrush.

A nest was found July 13 on the shore of Alder Creek Lake (7800 feet). The nest contained two young birds and two pipped eggs, and was built near the shore of the lake four feet above the ground. The nest rested on slender twigs on an outer limb on the south side of the bush, being fairly well concealed by upright twigs. Materials used in construction were small sticks and dried grass, the lining being of rootlets and cowhair. The dimensions of the cavity were: diameter 57 mm. (2¼ inches), depth 28 mm. (1⅛ inches).

Seven specimens (nos. 8702–8708) were preserved.

Spizella breweri Cassin

Brewer Sparrow

Distribution.—Practically coincident with that of the sagebrush; apparently limited little by altitude. Observed from 4100 to 9000 feet, and from Winnemucca to Virgin Valley. The great vertical range of this species in a particular sort of environment, regardless even of whether the environment is continuous or not, is another exemplification of the principle adduced by Ridgway (1877, p. 378), and discussed as regards the hummingbird, the flicker, and the Harris woodpecker.

Habits.—*Spizella breweri* was by far the most abundant of the bird species encountered in the region. This accords with

the experience of Ridgway (1877, p. 480), who records it as one of the commonest birds of the open wastes. Throughout the sagebrush country, individuals, pairs, and later, flocks, of Brewer sparrows were observed. Even at high altitudes in the mountains (below 9000 feet, however), as has already been implied, the only seeming requisite for the occurrence of the birds was the presence of *Artemisia.* The thicker the sage the more in evidence was *Spizella breweri.* This is, in our experience, in contrast to a degree with the relation existing between the *sage* sparrow and the sagebrush. The latter bird inhabits the open sage-covered deserts, where vegetation is sparse, although there is apparently variation in this respect in different parts of its range (see the account, p. 397, and Ridgway, 1877, p. 476).

During the latter part of May and the first of June *Spizella breweri* was a most enthusiastic songster, and was heard earlier than 3 o'clock in the morning and later than 8 in the evening. Nor had the tuneful spirit entirely left the bird even by August 10, though its singing was certainly not so much in evidence at that date as earlier in the season.

The birds made rather nervous movements, often flying irregularly into the air to a height of fifteen feet or more and then shooting straight down and coming to rest in a sagebush. Certain variations in flight were observed. For instance, at times a manner of movement resembling that of a vesper sparrow was noted, the Brewer flying in a zigzag manner towards a bush at some distance and sinking to the ground behind it, repeating the operation on being flushed again.

Nests were found by our party at Quinn River Crossing, and at Thousand Creek flats. One found June 4 near a meadow of the Quinn River Ranch contained three eggs and may be regarded as fairly typical. It was well built of light dead twigs, being lined with fine materials, including plant fibers and horsehair. The nest was 685 mm. (27 inches) above the ground, the cavity 50 mm. (2 inches) in diameter and 40 mm. ($1\frac{9}{16}$ inches) deep. Three main branches of the *Artemisia* bush in which the nest was found helped to support it. Another nest (found May 28) was placed on a small branch of sage and supported on the sides by upright twigs which formed a canopy over it. Struc-

turally it was essentially similar to the one just described. Dimensions of cavity were: diameter 55 mm. ($2\frac{3}{16}$ inches), depth 37 mm. ($1\frac{7}{16}$ inches). A nest found on June 2 contained four eggs and was built of weed stems, bits of dry grass, and lined with weed seed, cowhair, and a bit of rabbit fur. Four other nests found varied in height above the ground all the way from 304 to 608 mm. (12 to 24 inches). Of seven nests examined, four contained sets of four, the others sets of three eggs. The first nest was noted May 28 at Quinn River Crossing, the last June 11 on the flats at Thousand Creek.

As a rule the nests were found by the flushing of the sitting bird. Frequently the parent remained close at hand during the investigation of the nest, often with the feathers of the top of the head elevated and the wings drooping, at intervals uttering a weak "chip." On other occasions the bird would fly heavily away, keeping close to the ground. Once at least the disturbed parent disappeared from view entirely and did not utter a note.

About the middle of July the appearance of the scores of young ones became noticeable, and *Spizella breweri* was more than ever in evidence. In certain sage-covered meadows about the head of Big Creek there were hundreds, if not thousands, of the birds. On the broad Leonard and Big Creek flats August 4 they were observed in vast numbers, a large proportion of those seen and collected at this time being birds of the year.

Several flocks were observed in willows along a creek, twit tering together in a most amicable fashion. This peculiarity reminds one of the intermediate and white-crowned sparrows, which, especially in the evening twilight, may be heard singing in a similar manner.

Junco oreganus thurberi Anthony

Sierra Junco

A full-fledged juvenal female Sierra junco was flushed from a small pine in a cañon near the Duffer Peak meadow (8400 feet). It was rather shy and flew into a tall dead pine. The only note it uttered was the low "check! check!" call-note.

A second juvenal was noted taking a bath on the edge of a small lake on the same meadow.

These two individuals were the only representatives of the genus *Junco* seen. As the flight feathers are fully formed in the specimen just mentioned there is, of course, a possibility that the young birds were able to traverse the deserts between the Warner Mountains of California, where the species is common, and the Pine Forest Mountains of Nevada. The distance is approximately eighty-five miles and there are several low desert ranges, reaching a height of 6000 or 7000 feet, interrupting the continuity of the plain between, with intervening flats or hollows which average about 4800 feet altitude. It seems probable that full-grown young birds could have made the trip, and to regard this as a breeding record would seem to be unjustified.

Amphispiza bilineata deserticola Ridgway
Desert Sparrow

Distribution.—Less common than the sage and Brewer sparrows, but still not rare. Noted at Quinn River Crossing, Big Creek Ranch, Alder Creek Ranch, and Virgin Valley. None were observed above 5000 feet. Northern Nevada is, in all probability, about the northern limit of the range of the species.

The birds were more numerous along the foothills in the vicinity of Big Creek Ranch than at any other locality. A single bird was noted in the low brush on a flat-topped and very arid ridge near Alder Creek Ranch.

Habits.—This bird, which was found only in the sagebrush association, resembles the sage and Brewer sparrows in habits. Its *Thryomanes*-like song could be heard at intervals, and as the bird perched on the topmost twig of a bush its black throat rendered it conspicuous for a considerable distance.

Individuals were often difficult of approach, as they would run along the ground until out of firing range, taking advantage of the cover afforded by the sagebrush, and flying twenty or thirty yards ahead when hard pressed.

From the general similarity of the habits of the desert and sage sparrows, it might be expected that competition between them, at least of a subtle sort, would be rather severe. Apparently the interests of individuals conflict in more evident ways, as a desert sparrow was on at least one occasion seen fighting with a sage sparrow.

The song is imperfectly represented by the following syllables, "queet! queet! toodle-oodle-oodle-oodle!" with a rising inflection on the "queets." In a variation of the song a note is apparent resembling somewhat a call of the western lark sparrow.

Two nests were found, the first one containing three eggs, on July 29 in Virgin Valley. After the sitting bird was flushed, it was noted that both parents were present in the vicinity. The bird which had been frightened from the nest was very persistent in returning thereto, but finally left and did not come back.

The second nest was found on a ridge (5000 feet) near Big Creek Ranch. Low "chips" were heard which were finally traced to a desert sparrow which had its beak full of insects and was perching on a rock. Presently the nest was found in a low sagebush by the boulder. The structure was very frail and contained three young in natal down. Dried grass stems and light sage bark constituted the building materials, while a small amount of cowhair and some other fine substance which I was unable to identify made up the lining. The cavity was 44 mm. (1¾ inches) in diameter and 25 mm. (1 inch) deep. Both parents were noted in the vicinity.

Amphispiza nevadensis nevadensis (Ridgway)

Nevada Sage Sparrow

Distribution.—Noted commonly on the broad flats of the desert from Winnemucca to Quinn River Crossing, in much the same habitat as that in which the Brewer sparrow was found. The sage sparrow, however, was not found above an altitude of 6000 feet in the mountains, while *Spizella breweri* ranged to considerably greater elevations along tongues of sagebrush. Ridgway (1877, p. 476) records the species as generally being the most abundant bird in the moister valleys of the Great Basin where the growth is most thrifty. At no locality visited by us did the sage sparrow approach the Brewer sparrow in point of numbers.

Birds of every species were less common in the vicinity of Alder Creek Ranch than at any other point visited, not even excepting the head of Big Creek. No sage sparrows were observed on the western side of the mountains, though the proba-

bilities are that they occur generally over the northern Great Basin. They were noted July 18 at Little High Rock Cañon, Washoe County.

Habits.—One is immediately impressed with the similarity in habits between *Amphispiza nevadensis* and *Spizella breweri.* Both were paired and nesting at the same time, both could often be heard singing simultaneously, both were strict dwellers in the sagebrush association, as noted by Ridgway (1877), and both had similar modes of flight. As regards the latter point, it may be said that the flights of the sage sparrow are longer and more direct than those of the Brewer.

The sage sparrows are lovers of the sparse vegetation of the open desert. Very often their cheery song was the only sound to be heard in such localities. This observation also is somewhat contrary to Ridgway's notes (1877, p. 476), which state the bird's preference for the thicker sage. Although for the most part the birds were paired, individuals and occasionally three or four together in a flock were several times seen. They are very difficult birds to follow, as they take advantage of every sagebush, and usually fly low and run along on the ground. Each time they are flushed they follow a new course, so that one cannot be sure even of their general direction.

They frequently remain quietly on one prominent twig of an *Artemisia* bush, singing at short intervals. One was observed singing as usual, with no noticeable variation in the quality of its song, even though three insects were held in its beak.

Seven nests of this species were found, the first at Winnemucca on May 11, the last June 16 at Big Creek Ranch. Nests were also found at Amos and Quinn River Crossing.

Of the seven nests three contained three eggs each, and the remainder four eggs each. Young in natal down were contained in nests found May 26 and 29 respectively at Quinn River Crossing, and on June 2 at the same locality a nest containing eggs in an advanced stage of incubation was found. The nest found May 26 was in a depression on the ground under a sagebush. The others ranged in height above the ground from 152 to 456 mm. (6 to 18 inches). The finding of the nests so commonly in bushes above the ground is contrary to the experience of Ridg-

way (1877, pp. 477–478) in this regard, who states that the nests are usually on the ground. The structures were variously supported, as a rule being built into the body of the bush so that the foundation was firm, although in some cases the attachment was not so secure. Materials worked into the several nests included dry sage twigs and sticks; in the linings, wool, dried grass, weed stalks, weed seeds, cowhair, and rabbit fur.

In general, discovery of the nest was through the flushing of the sitting bird. Most frequently the bird dropped to the ground and disappeared by running to a distance. One parent hopped along on the ground not far away while the examination of the nest was going on and completely encircled the site. The birds usually made no audible objection, but in one case the parent bird remained fairly close at hand and gave voice to a "pit, pit."

Toward the last of July young in juvenal plumage appeared, one being obtained on the Big Creek flats. All the birds seen above an altitude of 4500 feet were juvenals.

Melospiza melodia montana Henshaw

Montana Song Sparrow

Distribution.—Heard in the willows along the Humboldt River at Winnemucca on May 11. Occurred quite commonly at Quinn River Crossing. Individuals were noted along Big Creek to the altitude of the Dugout Camp, 5000 feet. Observed at Virgin Valley and Soldier Meadows.

Habits.—Song sparrows were very shy, remaining in the willows over the water or on the opposite bank of the river (at Quinn River Crossing), or retreating into very dense thickets (at Big Creek Ranch). Sometimes, however, *Melospiza* approached the field naturalist very closely and looked him over.

They had apparently mated by May 21. Nests were found at Quinn River Crossing, Big Creek Ranch, and Virgin Valley. The first, containing one fresh egg, was noted May 31 at the first mentioned locality. It was 203 mm. (8 inches) above the ground in grass growing up between small willow branches, and was composed of dried marsh grass and weed stalks, and lined with fine grasses and horsehair. The diameter of the cavity was 57 mm. (2¼ inches) and its depth 47 mm. ($1\frac{13}{16}$ inches).

On June 2 a nest was discovered in a clump of willows near Virgin Creek. It was close to the ground and contained three young birds. Both parents were noted in the vicinity. On June 15 a third nest was found at Big Creek Ranch. This one was noteworthy for the fact that it contained a cowbird's egg besides two fresh eggs of its rightful owner. The eggs were cold and the nest had probably been deserted. It was located 253 mm. (10 inches) above the ground in a willow-clump. Stalks of some species of grass growing at the base of the willow were woven into the nest. The cavity was 54 mm. (2⅛ inches) in diameter by 49 mm. (1$^{15}/_{16}$ inches) deep.

Juvenals were observed on May 29 and thereafter. A female with bare breast and an egg in the oviduct was collected on June 11.

Passerella iliaca schistacea Baird

Slate-colored Fox Sparrow

Distribution.—A solitary specimen taken at Quinn River Crossing on May 18. Rather commonly observed in the early summer at Big Creek Ranch, and one of the more numerous birds of the higher parts of the mountains. Their habitat was typically Transition life zone.

Habits.—The birds were noted to 9000 feet altitude, one being heard singing from a perch on a quaking aspen above a snow-bank. The species was perhaps more common on the west slope of the main ridge of the mountains around and above Alder Creek Lake and southward from there toward Duffer Peak than at any other locality visited. The rocky slopes, covered with chinquapin and quaking-aspen thickets, with a sparse intersprinkling of mountain mahogany and limber pine, seemed to be particularly well liked by the fox sparrows.

When a squeaking sound was made with the lips any *Passerella* that happened to be within hearing emerged from his thicket and, "chipping" excitedly, looked the intruder over.

It is one of the most tuneful of all the birds of the Great Basin and, furthermore, its song is one of the most beautiful. One fox sparrow was observed singing from an aspen tree in which, at the same time, a couple of black-headed grosbeaks were also singing.

Vegetation about springs on the mountain meadows was almost sure to shelter several individuals of this species in company very often with white-crowned sparrows and Macgillivray warblers.

Fox sparrows feed principally on insects and their larvae which they find in the leaf-mold under willow and aspen thickets. One individual was watched as it worked for its noon meal in the loose matter at the base of a clump of willows. It scratched in a towhee-like manner, using both feet at the same time. It would dig for several seconds in one place, often without reward. The amount of endeavor and labor that had to be bestowed on the task was impressive.

On June 26 a fox sparrow was observed whose vitality was so low that it could scarcely hop along or scratch in the leaves. Upon being closely examined it was found to be in a very emaciated condition and probably diseased.

The birds were in full song from May 18 to the last of June. The willow tract below Big Creek Ranch was a favorite place of habitation, and the actions of individuals observed during the second and third weeks in June would indicate that they were nesting there, but no nests were discovered. Most of the males had testes enlarged. A female with a bare and calloused breast was secured on June 12, which would indicate that the eggs had been laid by that date. Six days later another female which had evidently been sitting or brooding was noted in Big Creek Cañon at an altitude of 4800 feet. Birds were observed in about the same places day after day, which may have indicated nests in the vicinity. Juvenals were first observed about the middle of July. Thereafter they were common.

Pipilo maculatus curtatus Grinnell

Nevada Towhee

A very few individuals of this species (see Grinnell, 1911, p. 309) were noted along Big Creek above the ranch below 5600 feet. One was heard singing June 16 on the swaying tip of a willow. Its song did not sound exactly like that of *P. m. megalonyx* of southern California. Ridgway (1877, p. 493) has very clearly described the pose and movements of the singing bird.

A second towhee was heard June 22 in the sage near the mouth of the cañon. Five days later two individuals were heard in the willows at an altitude of 5600 feet. Both were uttering their trilled "tschschschschsch!" call-note. The testes of a male specimen secured were enlarged, indicating sexual activity.

No reason for the restricted distribution of the towhee is apparent, since other cañons visited would seem to present environmental conditions almost identical as regards exposure, altitude, stream, foliage, and food supply.

Three examples (nos. 9151–9153) were secured.

Oreospiza chlorura (Audubon)

Green-tailed Towhee

Distribution.—Occurred rather commonly in the mountains between 4350 and 9000 feet altitude. Most numerous on open hillsides from 5000 to 7000 feet, decreasing in numbers above or below the tract between these altitudes. It was found characteristically in the Transition, though individuals invaded Upper Sonoran.

Habits.—The great majority of green-tailed towhees were noted in sagebrush. On the higher slopes they dwelt to a slight extent in chinquapin and quaking-aspen thickets. Frequently individuals were observed with beaks full of insects. The birds were in full song during the last week in June and the first two weeks in July. While singing they ordinarily perched on the topmost twig of some convenient sagebush, or on the upper pinnacle of some large boulder. Their song is much like that of the fox sparrow, although it is not so round and full-voiced. It seemed to me to be much more like that of the fox sparrow than that of the vesper or lark sparrows. Ridgway (1877, p. 497) speaks of its close resemblance to that of the vesper in style, tone, and modulation, and to the song of the lark sparrow in its quality of continuity.

One of the call-notes resembles the "mew" of a cat to a considerable extent. By making a squeaking sound with the lips, I induced one towhee to answer me several times with this feline call. Unusual sounds, such as that just mentioned, usually

attracted the bird into the open. A second note is a low "chip" or "chick," uttered when the bird is excited over something. The birds make use of it to very good purpose, moving about continually and thus giving it something of the so-called ventriloquial quality of the call-notes of the long-tailed chat.

Two modes of retreat were observed. At times when flushed the towhee will fly for some distance, then sink down into or behind a bush, repeating the operation before a person can get very close to it. Escape is also made by running along on the ground with long green tail high in the air, and finally disappearing into a suitable thicket.

Although we were able to accumulate abundant circumstantial evidence upon the nesting of the towhee, no nests were actually discovered. On June 23 a bird was flushed as if from a nest, but if there was one we failed to find it. The agitated deportment of a pair of towhees on June 27, on a meadow on Big Creek, probably indicated their nesting in the vicinity. The first day of July, as I was working through some brush just above a high meadow, a green-tail came running out toward me from a chinquapin thicket. She ran along on the ground dragging her wings as if hurt, heightening the effect of the pretended deception by uttering a shrill note of pain. She limped and ran off to a distance of ten feet. The cause of her solicitude was found to be a youngster in newly acquired juvenal plumage. From this time on immatures were commonly observed.

On July 13 a young towhee was found dead on the waters of Alder Creek Lake.

Zamelodia melanocephala (Swainson)

Black-headed Grosbeak

Noted at Quinn River Crossing, Big Creek Ranch, Big Creek Cañon, Duffer Peak, and Alder Creek. Although they were fairly common at the stations on the desert, very few grosbeaks were seen in the mountains. Found chiefly in Upper Sonoran, although individuals ranged into Transition.

Grosbeaks were observed along Quinn River and Wheeler Creek. They were frequently seen at Big Creek Ranch, being observed along the stream and in the willow thickets. By June

1 the species was in full song. In Big Creek Cañon a grosbeak and fox sparrow were heard singing simultaneously in the same tree.

The first individual was seen at the head of Big Creek (8000 feet) on July 1. Ridgway (1877, p. 488) did not find the species ranging to this altitude. A couple of days later one was heard singing in an aspen, and after this a few grosbeaks were ordinarily to be found in the higher parts of the mountains. Probably a partial vertical migration took place about this time, as the weather was becoming much warmer.

A youngster begging for food was seen at Big Creek Ranch on July 27.

Passerina amoena (Say)

Lazuli Bunting

Occurred generally along the route followed by the expedition, from Quinn River Crossing to Alder and Leonard Creek ranches, and to a height of 8000 feet in the mountains. Found characteristically in Upper Sonoran and lower Transition zones.

The lazuli bunting was a bird of the mountain stream association of plants, being observed in quaking aspens, wild rose and gooseberry thickets, willows, and in alders.

In certain localities they became very numerous. On July 7, at an altitude of 6000 feet on Big Creek, twenty or more individuals were observed. In general the buntings were most common from 5000 to 7000 feet altitude.

At Quinn River Crossing lazuli buntings were observed both in the sagebrush of the desert and in the willows along the river. In no case were they seen far from streams. After June 1 the birds were in full song. One brightly plumaged male observed was shyer and more secretive than its more modestly clothed mate, which is, in my experience, contrary to all precedent. Upon my appearance the male dodged back into a thicket, though the female remained in plain view.

Males were commonly observed along streams, perching for a few moments on some topmost swaying willow branch. After voicing a roundelay of song, a flight would be made down stream for some distance, and the vocal performance would be repeated. Sometimes they sing while flying through the air.

The birds were shy at all times.

On July 17 two flocks of young birds were noted. The parents seemed very solicitous for the welfare of their offspring.

Passer domesticus (Linnaeus)

English Sparrow

A few noted May 11 about houses in Winnemucca. No specimens were collected.

Piranga ludoviciana (Wilson)

Western Tanager

Occurred rather sparingly along our route. Those observed were very shy. The first individual was seen between Amos and Tregaskis Well, where it was frightened from the sagebrush. They were noted at nearly all the camps, though in very limited numbers. The birds may have been breeding in Transition.

Specimens taken, four (nos. 9154–9156, 9231).

Petrochelidon lunifrons lunifrons (Say)

Cliff Swallow

Distribution.—Observed at localities below 5000 feet altitude in the Upper Sonoran zone.

Habits.—It was the usual thing to see cliff swallows circling about the eaves of ranch buildings. They were more abundant at Quinn River Crossing than at any other point visited. On May 16 about 50 were seen flying about over our camp. The birds seldom alight on any sort of perch except in their nests, but individuals were twice observed resting upon the ground. They remained for no more than thirty seconds. Four individuals were noted at the mouth of Wheeler Creek, several miles from Quinn River Ranch.

The last of May the birds commenced building nests at the Crossing, for the most part on the east sides of the barns. Some were nesting in low cliffs not far from the river. At Big Creek Ranch the season seemed to be somewhat later, and the birds were seen gathering mud the middle of June. On June 21 the foundation of a nest had been built on the south side of the

barn at that place. Here they entered the open carriage house, and had built nests on the cross-beams of the same, the nests being placed in a way which is rather unusual for cliff swallows, namely, on the upper surface of the beams.

Cliff swallows were nesting in numbers in the sides of Virgin Creek gorge through the wall of Virgin Valley.

Hirundo erythrogastra Boddaert

American Barn Swallow

Distribution.—Observed at Tregaskis Well, Quinn River Crossing, Big Creek Ranch, and Alder Creek Ranch.

Habits.—Barn swallows were not so common as the cliff swallows, but small numbers were ordinarily to be seen flying about the ranch houses. Ridgway (1877, p. 441) remarks their lesser numbers as compared with the cliff swallows, and notes that they inhabit similar situations.

They seem very solicitous for the welfare of their mates. If anything happens to one, the other circles about in an agitated manner and does not leave the vicinity for some time.

In our experience these birds alight more often than do the cliff swallows. The latter are very seldom seen at rest, except at the openings of their nests, but the barn swallows are often observed perching on fence wires.

The swallows have several call-notes; one is a kind of whistle, another a continuous twittering. When one approaches the nesting sites the birds fly about very excitedly, giving voice to a note which may be transcribed as a "tweet! tweet! tweet!" somewhat resembling the note of the spotted sandpiper.

On May 31 barn swallows were found nesting at Quinn River Crossing both on Mr. Payne's residence and under a bridge. At Big Creek Ranch June 14 three were observed possibly going through copulatory antics. Two individuals would come together in air from time to time and fall about a foot before separating or recovering themselves. Toward the last of July, at Big Creek Ranch, young birds were out and imperiously demanding food, uttering a note somewhat resembling a call-note of the Audubon warbler.

Iridoprocne bicolor (Vieillot)

Tree Swallow

A single example (no. 9183) obtained at Quinn River Crossing on May 20.

Tachycineta thalassina lepida Mearns

Northern Violet-green Swallow

A few of these interesting birds were seen at Quinn River Crossing on May 28. No more were observed until a month later, when four or five individuals were noted flying about the higher parts of the mountains. Observed in Virgin Valley flying about over a pool of water, catching insects. From the observed facts, first, of their remaining all through the summer, and second, of their deportment of themselves in pairs, we were led to believe that they were breeding at the greater altitudes.

Three specimens were secured (nos. 9179, 9180, 9298), at Quinn River Crossing (4100 feet), Duffer Peak (8500 feet), and Virgin Valley (5000 feet), respectively.

Stelgidopteryx serripennis (Audubon)

Rough-winged Swallow

Six individuals were seen June 2 at Quinn River Crossing (4100 feet) flying about over the mesa near Wheeler Creek. On July 17 two were observed perching on a bush on Alder Creek, a short distance above the ranch (5000 feet). Two individuals were noted flying about a field at Leonard Creek Ranch (5000 feet) on August 7.

Two specimens (nos. 9181, 9182) were taken.

Lanius ludovicianus excubitorides Swainson

White-rumped Shrike

Distribution.—Occurred rather commonly on the broad sage-brush flats and to an altitude of 6500 feet in the mountains. A single individual was noted on a sage-covered hillside at 8000 feet. Three individuals were observed in the low hills east of

the broad Leonard Creek flats, north of Sentinel Peak, and the same number were seen at Leonard Creek Ranch. The last mentioned birds were extremely shy.

The shrike did not range much above the Upper Sonoran zone.

Habits.—Shrikes had evidently mated by the middle of May, and their peculiar mechanical notes were not infrequently heard.

Two nests were found, May 18 and 26 respectively, both at Quinn River Crossing. The sites selected by the birds were conspicuous bushes relatively much larger and more prominent than the surrounding sagebrush. The nests themselves were firmly and symmetrically constructed. Both were very solidly supported by a number of live branches and built of coarse sticks. The thorny branches of the *Sarcobatus* bush had been used in the second. Fine dry bark, cowhair, horsehair, sage leaves, fine gray twigs, rabbit fur, and a bird's feather were materials which had been made use of for nest-lining purposes. The proportions of these varied, the rabbit fur being very small in amount, and the bird feather and horsehair being limited to a single specimen of each found in one nest. The first nest was 1.01 meters (40 inches) above the ground, the second .608 meter (24 inches). Nest-cavity dimensions in both cases were 88 mm. (3½ inches) across by 76 mm. (3 inches) deep.

Individuals were frequently seen near Big Creek Ranch on the lower ridges of the mountains, where they perched on sagebushes or boulders.

A family of adults and young was twice observed during the first half of July in the neighborhood of the Dugout Camp in Big Creek Cañon. On July 17 a family of four was met with near a haystack at Alder Creek Ranch.

Vireosylva gilva swainsoni (Baird)

Western Warbling Vireo

Distribution.—Noted in the mountains, where it was found in small numbers along the streams; at Big Creek Ranch (4350 feet, Big Creek Cañon (4400 to 8000 feet), Duffer Peak Meadow (8400 feet), Alder Creek (6000 to 7000 feet), and Leonard Creek (6500 feet). The birds were noted in the greatest numbers at

an altitude of 7000 feet on Big Creek.

Habits.—All that is necessary, as a rule, to attract the vireos is to remain motionless and make an unusual squeaking sound with the lips. One bird was observed with a large insect in its mouth. On July 15, at 6000 feet altitude on Alder Creek, a couple of young ones were heard teasing a parent for food, so there is very little doubt of the breeding of the species in this region.

Vermivora celata orestera Oberholser

Oberholser Lutescent Warbler

Distribution.—Observed at several localities in the higher portions of the mountains; head of Big Creek (8000 feet), Alder Creek (7000 feet), and Duffer Peak Meadow (8400 feet). Evidently the lutescent warbler was limited to Transition. It was nowhere seen in numbers.

Habits.—The large patches of low, tangled quaking aspens on the higher slopes of the mountains seemed to be the favorite habitat of the lutescent. In the course of the summer's work we *saw* very few indeed, but occasionally heard the characteristic trilled call-note. This song made itself most evident in the morning, but once, at least, it was noted in the early afternoon.

Ordinarily the birds are very shy and their movements difficult to follow. In the gnarled aspen thickets they kept well within the shelter of the tangle, or where the trees were higher they remained in their topmost leafy foliage. In either case they were hard to locate. Two individuals observed perched on dead limbs of limber pines. The bird at times exhibits an extreme nervousness of movement, while at others it remains quietly perched on a single twig for several minutes.

A number of juvenals were seen in company with some chickadees in a willow patch near Duffer Peak. The greater shyness of the warbler was immediately apparent.

Dendroica aestiva brewsteri Grinnell

California Yellow Warbler

Distribution.—Noted at practically all stations below 6500 feet altitude. A single juvenal was taken at the Duffer Peak

Meadow (8400 feet). Breeding in Upper Sonoran and possibly higher.

Habits.—Yellow warblers are not confined exclusively to the willow thickets, and although they do not venture far from water they often do make short excursions into the sagebrush.

The species has at least two call-notes. One is very close to the "chick" of the chipmunk, while the other, while it may be transcribed by the same syllable, is much weaker. One female uttered this second call-note and shortly afterward a male bird with wings and tail spread came dashing into the tree. He went away in a short time, but upon a second call returned.

On June 11 a bird was seen collecting willow cotton. The first nest was found on June 5 in a wild rose at Quinn River Crossing. Willow bark was the main constituent of the nest, the lining being of plant down, feathers and horsehair. A single willow catkin had also been worked into it. The cavity was 42 mm. ($1^{11}/_{16}$ inches) in diameter and 38 mm. ($1^{9}/_{16}$ inches) deep. The set of four eggs was complete.

Another nest was discovered on June 16 at Big Creek Ranch. It was located six feet above an irrigating ditch also in a wild-rose bush. The cavity was 44 mm. ($1^{3}/_{4}$ inches) in diameter and nearly 50 mm. (2 inches) deep. Three eggs, incubation about half completed, constituted the set.

Males were twice observed feeding their mates. The female followed the male bird and shook her wings, assuming a begging attitude which was quite linnet-like in character, while the male bird fed her two or three times. During this process the birds, or perhaps only the female, gave utterance to a decidedly chipmunk-like (*Eutamias pictus*) series of chatterings. Both these birds were fully adult. Perhaps the female does not take time to hunt food during the brooding period.

A nest in process of construction was noted the same day a few hundred feet farther down the thicket. It was saddled on a wild-rose crotch, three feet above the ground. Shreds of willow-bark were the most prominent building materials employed, these being fastened together with spider web.

Dendroica coronata hooveri McGregor

Alaska Myrtle Warbler

A single individual secured at Quinn River Crossing on May 21. It was flying about in the brush near the junction of Wheeler Creek and the river. The discovery of the species migrating at this late date is unusual.

Dendroica auduboni auduboni (J. K. Townsend)

Audubon Warbler

Distribution.—Noted at nearly every desert station visited. During June it retired to the pine woods of the mountains, for at that time, though we found it occurring commonly at higher localities, it was apparently absent from stations intermediate in altitude. This vertical migration was observed by Ridgway (1877, p. 434), who asserts that its migratory movements in this region are mainly, if not entirely of this character. The species was breeding in Transition.

Habits.—The song of the Audubon warbler was much in evidence during July. A brilliantly plumaged male, observed in a thicket of tall sagebrush continually uttered a note resembling "pick!" "pick!" The syllable differed markedly from the customary "tit" or "wit" of the species.

Another individual was observed singing from one of the uppermost twigs of a limber pine. Its head was tilted backward during the song. After the rendition it would feed in the foliage of the pine or fly a short distance to another tree, shortly repeating its song again.

Adults with juvenals were sparingly noted as early as July 10, and thereafter more commonly. By August they became abundant.

For discussion of a probable case of hybridization between *Dendroica auduboni auduboni* and *Dendroica coronata* see Taylor 1910b, p. 173.

Oporornis tolmiei (J. K. Townsend)

MacGillivray Warbler

Distribution.—Occurred quite generally in suitable situations. Noted from Upper Sonoran at 4100 feet altitude to Transition at 8500 feet. It was doubtless breeding in Transition.

Habits.—A squeaking sound made by the lips was often sufficient to coax *Oporornis* from his favorite foraging grounds, the willow thickets and chinquapin patches (*Castanopsis*). One could often trace an individual by attending closely to the little call-note "chick!" "chick!", the only difficulty being that frequently the intervals between its times of utterance became long drawn out. The song of the MacGillivray warbler resembles those of the yellow warbler and lazuli bunting, but is nearer that of the latter, though it has a lighter, airier quality. One individual was seen with a large worm in its mandibles.

On the morning of July 9 two pairs were observed in the rank undergrowth over some springs surrounded by a thick grove of quaking aspens at 7000 feet altitude on Big Creek. One pair became highly excited, the female especially. Both birds approached to within a few feet of the collector. Though these signs indicated a nest in the vicinity, none was discovered. A juvenal was secured on July 15.

Geothlypis trichas occidentalis Brewster

Western Yellowthroat

Not common anywhere. A few individuals were noted at Quinn River Crossing, Big Creek Ranch, and Virgin Valley. Zonally the species was found in Upper Sonoran.

While ordinarily the yellowthroat was exceedingly suspicious, one was sometimes able, by making a peculiar sound with the lips, to coax the bird from its hiding place into plain view.

Eleven examples of the species (nos. 8509–8518, and 9205) were preserved.

Icteria virens longicauda Lawrence

Long-tailed Chat

Heard at Quinn River Crossing, Big Creek Ranch, and at 6000 feet altitude in Big Creek Cañon. Not common.

The chat was shy and secretive at all times, being for the most part merely heard in the willow and alder thickets along the streams. One of its many notes may be transcribed as "tä-tä-tä-tä," repeated rapidly, somewhat resembling a note of the Arizona hooded oriole. Two individuals (nos. 9187, 9188) were preserved.

Wilsonia pusilla pileolata (Pallas)

Pileolated Warbler

One of the rarer species. Recorded from two localities only, Quinn River Crossing (along Wheeler Creek and at the Crossing) and Big Creek Ranch. Found in Upper Sonoran zone.

Two pileolated warblers were seen at the first-named place May 26. A few days later one was heard singing near Wheeler Creek early in the morning.

The birds were not in the least shy, and often came very close to the observer. Three specimens taken (nos. 8507, 8508, 9297).

Cinclus mexicanus unicolor Bonaparte

Northern Dipper

Rare, only six or eight birds being seen all season. One was observed in Alder Creek Lake (7800 feet), where it was dwelling under a waterfall which occurred in a stream connecting two parts of the lake. The dipper was found in Transition zone.

Water ouzel sign, in the shape of the characteristic white splotches of fecal matter on rocks in the stream, was observed on a meadow located at an altitude of 8000 feet on Big Creek.

Two juvenals (nos. 9149, 9150) were secured on Leonard Creek.

Oreoscoptes montanus (J. K. Townsend)

Sage Thrasher

Distribution.—One of the commonest and most widely distributed species of the region. Localities at which the birds were

noted include all but those above 8500 feet altitude. Found commonly in the sagebrush association of Upper Sonoran and Transition zones.

The ranges of *Oreoscoptes montanus* and *Artemisia tridentata* were practically coextensive. Where one thrives, there the other apparently has its center of abundance. Thus, though the sage thrasher was found in numbers on the desert about Quinn River Crossing, it was most abundant in the flats of Leonard Creek where the sagebrush was flourishing.

Habits.—The monotony of the desert quiet was often most happily interrupted by the singing of this "mockingbird" of the arid valley. The song is somewhat imitative, perhaps, as we seemed to be able to recognize notes similar to those of the meadowlark and of the black-headed grosbeak in it.

Sage thrashers were rather frequently seen on a series of sage-flats, ranging up to 8000 feet and above, near the head of Leonard Creek. To a considerable extent the birds resemble the true mockingbird (*Mimus polyglottos leucopterus*) as regards habits of movement and song. When running along on the ground the tail is held in much the same manner, and we noted that they preferred running along on the ground to flying. The pose while singing, and the manner of flight, also remind one of the mockingbird. The differences between *Oreoscoptes* and *Mimus* seem to have impressed Ridgway (1877, pp. 400, 401) to a greater degree than the resemblances. It is true that in its habits it clearly shows thrasher affinities, and this, together with the fact of its being sage-loving, makes sage thrasher by far the most appropriate vernacular name.

An individual of one pair which was observed on a high sage-flat in the mountains lifted its wings at intervals while singing, as Ridgway (1877, p. 400) has noted. These birds were seen at an altitude of 8500 feet in a narrow depression along the side of which was a snowbank. It seems remarkable that this bird, ordinarily associated with wide expanses of desert, should be found on a level with the summer snow in the mountains.

The birds were often observed perching on rocks, in localities where boulders furnished one of the principal features of the landscape.

To a certain extent the sage thrashers were interested in each other. When one of a company was shot, the others frequently gave utterance to various expressions of excitement.

According to our own observations and to those of Ridgway (1877, p. 401) the sage thrasher exhibits a very quiet disposition during the period of incubation. There possibly is sufficient variation in the time of nesting to account for the fact that some are singing while others are silent. At all events there are numerous individual exceptions to the general statement. Ridgway has added that the males become perfectly silent the last of April.

The birds were evidently breeding in some numbers at Quinn River Crossing during the latter part of May and the first of June. A half-dozen nests were found, of which descriptions are given below. The sitting bird's sudden bursting from the nest most often led to its discovery. Our observations on method of flight confirm those of Ridgway (1877, p. 400). One bird retreated in a vesper sparrow-like manner, flying low over the sagebrush and suddenly dropping down either into brush or onto the ground. Ordinarily if one is traversing sage-tracts several of the birds are to be seen perched upon exposed twigs.

The first nest, found May 17, was located in the middle of a sagebush, being supported mainly by the largest stem, and partly by four other branches. The second, found the same day, was similarly located. Both nests were very carefully built, but neither was especially well concealed. Measurements: the first, two feet above the ground 95 mm. (3¾ inches) across the cavity, and 57 mm. (2¼ inches) deep; the second, twenty-two inches from the surface, 95 mm. (3¾ inches) in diameter, and 50 mm. (2 inches) deep. Coarse sticks constituted the foundation work of both nests. The layer next within was of soft dry bark, the innermost lining being of cowhair. In both instances four eggs constituted the set. A somewhat deeper nest was found the next day, twenty-two inches above the ground, the nest cavity 76 mm. (3 inches) in diameter and 76 mm. (3 inches) deep. A slight movement of the twigs of the bush and a barely perceptible fluttering sound as the bird forsook the nest betrayed its presence. The fourth was discovered on June 6 near Quinn River

in a very thick thorny bush. Unlike the others it was very well concealed, and it was some moments after the bird flushed before the nest was discovered. It held two eggs, evidently not a full set. In every respect excepting degree of concealment this nest closely resembled the others noted. The last one found was observed between Quinn River Crossing and Big Creek Ranch, about two miles from the latter locality. The parent flushed from a low thorny bush. The nest was one foot above the ground and contained the usual set of four eggs.

One of the birds frightened from a nest proved to be a male, indicating that the male takes part in incubation.

Great numbers of juvenals were seen the first few days of August about the Leonard Creek flats. Growing in a small cañon draining into Big Creek there was noted a considerable tract of gooseberry brush. Hundreds of sage thrashers, in company with large numbers of Brewer sparrows, green-tailed towhees, and fox sparrows, were feeding on the berries.

Salpinctes obsoletus obsoletus (Say)

Common Rock Wren

By far the commonest of the Troglodytidae in the uplands. Zonally it ranges from upper Sonoran to high Transition (see Grinnell, 1908, p. 118).

Habits.—This was one of the most characteristic birds of the rocky portions of the mountain range. It was observed also on the buttes near Quinn River Crossing. While the rock-piles constituted the preferred habitat, a few birds were observed on limber pines in the higher mountains, and at Virgin Valley a single individual was observed on the desert near a marsh. On July 29 two rock wrens were seen in a series of jutting rocks on the highest point of Duffer Peak.

Their song much resembles that of the mockingbird, being one of peculiar sweetness and variety, although it is not powerful. When in full song their melody is continued through the middle of the day.

While resetting a mouse-trap at Big Creek Ranch near a pile of boulders I heard a ringing call-note and presently on a rock immediately above me a trim little fellow appeared not six feet

distant. After regarding me for a minute or two he flew across the cañon. Ordinarily the birds are easily approachable.

The rock wren evidently possesses something at least akin to personal courage. One was observed attacking a chipmunk which was sitting on a rock, swooping at it in the same way that a mockingbird assaults a cat.

After July 8 young were quite commonly seen. While we were putting out a line of traps on a meadow on Big Creek (7000 feet) a family including two juvenals with the adults was met with. The youngsters had not been long out of the nest, as their "juvenal" plumage was still incomplete. As we approached, the excitement of the parents knew no bounds, one of them, supposedly the female, venturing to within four feet of us, and calling solicitously. Even in her excitement she caught and ate some small insect, deftly wiping her bill afterwards on the rocks. This may signify that the capture of food is largely a reflex action. It should perhaps be noted that the presence of food in the mouth does not interfere with the quality of the song to any appreciable extent; one male was heard singing roundly with his beak full of insects. This seems to be the case also in certain other birds, as for instance, the song sparrow and Cassin purple finch. Three or four young birds in each family were in most cases the numbers seen.

Troglodytes aëdon parkmani Audubon

Western House Wren

Recorded only from stations located in Transition zone, between 6000 and 8000 feet in the mountains. Young were twice observed, indicating that the birds breed in the region. One wren was caught in a mouse-trap set ten feet from the stream. A large family, including adults and juvenals, was observed July 28 on a flat covered with thick sagebrush at an altitude of 6000 feet on Big Creek.

Telmatodytes palustris plesius (Oberholser)

Western Marsh Wren

Two wrens of this species observed on May 20 in a tangle of wild rose and scrub willow on the banks of Quinn River. One of these (no. 8482) was secured.

Sitta canadensis Linnaeus

Red-breasted Nuthatch

Occurred rather rarely in the region. The first was noted on a barbed wire fence near Quinn River Crossing on May 24. First it flew to a post, down which it worked in a typical nuthatch fashion. Then it flew to the sagebrush, and perched, sometimes with head up, sometimes with head down. It caught and ate some sort of insect, and was not shy. It certainly gave one a feeling of surprise to find this bird, which is ordinarily so characteristic of the coniferous forest of the Boreal zone, in the midst of an arid waste far from trees of any kind. Our notes on habits bear out those of Ridgway (1877, p. 416), who states that apparently this species makes more or less of a vertical migration. We found the bird in Upper Sonoran and Transition.

Two nuthatches were seen on Wheeler Creek, one bird in the sagebrush and the other in the willows along the stream. Two were seen at Big Creek Ranch, both in the trees near the creek. Three other individuals were observed in limber pines at higher points in the mountains. The last specimen taken (no. 8969), secured on July 4, had its plumage much abraded. One of the call-notes of the nuthatch may be rendered "whă! whă! whă!" Five specimens (nos. 8965–8969) were preserved.

Penthestes gambeli gambeli (Ridgway)

Mountain Chickadee

Work was carried on in the limber pine area of the higher portions of the mountains for some time before *Penthestes* was recorded. The first one noted was seen near the shores of Alder Creek Lake (7800 feet). The species was confined to that portion of the Transition having a Boreal infusion.

The numbers of such pinicoline birds as chickadees, nuthatches and juncos were far smaller than one would expect, even considering the extremely limited pine-covered area.

Most of the chickadees noted were heard July 11 to August 1 in the vicinity of Duffer Peak.

On July 30 and August 1, respectively, two broods of juvenal

chickadees were observed, nine in one, seven approximately in the other. They appeared either in the limber pines or in the quaking aspens, though they seemed to prefer the pines.

The song which may be rendered by the syllables "wheetle! tootle! tŭh!" "wheetle! tootle! tŭh!" was the one most frequently heard.

Psaltriparus plumbeus (Baird)

Lead-colored Bush-tit

Distribution.—Not common anywhere along the route. Two individuals were seen May 26 in the sagebrush at the mouth of the low wide Wheeler Creek Cañon. At Quinn River Crossing a small company was seen in the sagebrush on June 2. In the vicinity of Big Creek Ranch they were confined, apparently, to a rather restricted portion of the course of the stream, namely, from about 4400 feet to 5000 feet altitude, their range here being practically coextensive with that of the spurred towhee. Later in the season a few flocks of from six to twenty-five individuals each were observed higher in the mountains, e.g., fifteen were seen on the Duffer Peak Meadow (8400 feet), in a grove of quaking aspens. Zonally their distribution was lower Transition, perhaps invading Upper Sonoran at times.

Habits.—The solicitude and as a rule the unsuspicious nature of the bush-tits were very marked. If anything happened to one individual, the others remained in the vicinity, twittering and whistling to one another. A number of young birds were secured, the first being taken at Quinn River Crossing on June 2.

Some of the bush-tits noted were shy. Their call-notes seemed to differ slightly from those of *Psaltriparus minimus californicus.*

In the lower parts of the mountains they evinced a preference for the thickets along the streams, taking to the sage if pressed closely. Upon the higher mountain slopes the quaking aspens were preferred.

Regulus calendula calendula (Linnaeus)

Ruby-crowned Kinglet

Conspicuously absent from the mountains. On May 13 one was seen in a willow on Chimney Creek near Amos post-office.

Water from a recent dip in the stream was still clinging to its feathers. Another individual was heard several hundred yards up the creek. Two birds, evidently a pair, were seen May 18 at Quinn River Crossing in the sagebrush near the ranch. This species was evidently migrating, being found by us only in Upper Sonoran zone. Two female specimens (nos. 8662, 8663) were taken.

Hylocichla ustulata swainsoni (Tschudi)

Olive-backed Thrush

Distribution.—Noted along Big and Alder creeks between the altitudes of 5700 and 8500 feet. Its habitat falls within that part of Transition which has a Boreal infusion.

Habits.—The song of this bird, which was perhaps the most attractive esthetically of all the bird-music we heard, was first noted at the head of Big Creek. Regularly while we were encamped in the mountains it was noted early in the morning and in the evening until eight o'clock. The limber pines, quaking aspens, and various thickets along streams seemed to be favorite places of habitation. One locality in particular, situated at a height of 7000 feet on Big Creek, was preferred to other places. A thick growth of moisture-loving plants, such as nettles, and the dense shelter afforded by the extensive quaking-aspen groves, together with the presence of streams flowing from small springs on the nearby slopes, made ideal surroundings for this thrush.

Three young thrushes in newly acquired juvenal plumage were recorded on Alder Creek (7000 feet) on July 13.

Planesticus migratorius propinquus (Ridgway)

Western Robin

Distribution.—Secured generally throughout the region. One of the most numerous birds observed. In scarcely diminishing numbers it invaded the mountains to an altitude of 9000 feet. Below this it was very common. It inhabited every suitable stream and willow clump on the desert. Its zonal distribution was Upper Sonoran and Transition.

Habits.—One robin was seen scratching about like a fox sparrow in the leaves near a log. In the higher parts of the mountains robins perched as freely on rocks and boulders as on pines and aspens. The species exhibits marked adaptability and considerable independence of temperature limitations.

Nearly all our habit notes have to do with nidification, as practically every bird observed from May to August was caring for eggs or young, or was singing. Robins were nesting May 11 in the poplars along the streets of Winnemucca. Nests were noted in the sagebrush on Chimney Creek near Amos, and at every locality from the willows along the Quinn River (4100 feet) to the limber pines (9000 feet) of the Pine Forest Mountains. Nesting materials included dry straws of wild hay and straw peelings, sticks, grass, bark and leaves. In every case the nests were cemented together with mud. Dimensions of nest cavity varied about the following figures, namely, diameter 98 mm. (3⅞ inches), depth 71 mm. (2 13/16 inches). Nests were found on the ground and at various heights up to six feet above it, and were located in willow thickets, wild-rose bushes, sagebrush, quaking aspens, poplars (at Big Creek Ranch) and limber pines. The nests contained two to four eggs, with the exception of one found June 20, in which were two youngsters in natal down. Dates of finding of nests, significant in a general way, are May 11 to June 29. The parent birds always became much excited upon the examination of their homes, and remained close at hand, often coming up to within a few feet of the intruder. In every case but one, in which the bird betrayed its agitation by excited action merely, the birds gave utterance to many querulous call-notes.

The first juvenal was observed on June 14 at Big Creek Ranch. From then on young were very common.

Sialia currucoides (Bechstein)

Mountain Bluebird

Distribution.—Noted only above 6700 feet, in Transition.

Habits.—Small flocks of four or more birds were frequently observed perching motionless on convenient rocks on some hill-

slope. As the field naturalist approached, one individual would leave, and soon the impulse would communicate itself to its companions, when all would fly for some distance. In general the birds were rather shy.

Toward the last of July the birds were seen for the most part in companies of two or three, although an occasional lone individual was noted.

A female taken on July 25 had the bare breast indicative of brooding. Furthermore, when secured this individual had its beak full of insects, which it may have been carrying to young.

On July 13 a juvenal was found dead in Alder Creek Lake. A number of young were seen in the higher parts of the mountains between that time and August 8.

Transmitted June 8, 1911.

LITERATURE CITED

AMERICAN ORNITHOLOGISTS' UNION COMMITTEE, J. A. Allen, Chairman and Editor.

1910. Check-list of North American birds. Ed. 3, revised, (New York, American Ornithologists' Union), 430 pp., 2 maps.

DICKERSON, M. C.

1906. The frog book, North American toads and frogs with a study of the habits and life histories of those of the northeastern states. (New York, Doubleday, Page & Co.), xvii + 253, 16 + 96 pls., 35 figs. in text.

DITMARS, R. L.

1907. The reptile book, a comprehensive, popularised work on the structure and habits of the turtles, tortoises, crocodilians, lizards, and snakes which inhabit the United States and northern Mexico. (New York, Doubleday, Page & Co.), 472 pp., 136 pls.

GRINNELL, J.

1908. The biota of the San Bernardino mountains. Univ. Calif. Publ. Zool., 5, 1–170, 24 pls.

1909. A new cowbird of the genus *Molothrus*, with a note on the probable genetic relationships of the North American forms. Univ. Calif. Publ. Zool., 5, 275–281, 1 fig. in text.

1910. The Savannah sparrow of the Great Basin. Univ. Calif. Publ. Zool., 5, 311–316.

1911. Description of a new spotted towhee from the Great Basin. Univ. Calif. Publ. Zool., 7, 309–311.

GRINNELL, J. and H. W.

1907. Reptiles of Los Angeles County, California. Throop Inst. Bull., 35, Science Series no. 1, 64 pp., 23 figs. in text.

HALL, H. M.

1902. A botanical survey of San Jacinto Mountain. Univ. Calif. Publ. Bot., 1, 1–140, 14 pls.

HOFFMAN, W. J.

1881. Annotated list of the birds of Nevada. Bull. U. S. Geol. and Geog. Surv. of the Terr., 6, 203–256, [2] pls., map.

MERRIAM, C. H.

1890. Results of a biological survey of the San Francisco Mountain region and desert of the Little Colorado, Arizona. U. S. Dept. Agric., Div. Ornith. and Mamm., N. Amer. Fauna, **3**, vii + 136, frontispiece, 13 pls., 5 maps.

1892. The geographic distribution of life in North America with special reference to the Mammalia. Proc. Biol. Soc. Wash., **7**, 1–64, map.

1899. Results of a biological survey of Mount Shasta, California. Dept. Agric., Div. Biol. Surv., N. Amer. Fauna, **16**, 180 pp., 5 pls., 46 figs. in text.

OBERHOLSER, H. C.

1904. A revision of the American great horned owls. Smithsonian Inst., U. S. Nation. Mus., Proc., **27**, 177–192.

RIDGWAY, R.

1877. Ornithology, *in* "Ornithology and Palaeontology," U. S. Geol. Expl. of the Fortieth Parallel, **4**, part 3, pp. 303–669.

RUTHVEN, A. G.

1907. A collection of reptiles and amphibians from southern New Mexico and Arizona. Bull. Amer. Mus. Nat. Hist., **23**, 483–603, 22 figs. in text.

STEJNEGER, L.

1893. Annotated list of the reptiles and batrachians collected by the Death Valley expedition in 1891, with descriptions of new species. Dept. Agric., Div. Biol. Surv., N. Amer. Fauna, **7**, 159–228.

1895. The poisonous snakes of North America. Smithsonian Inst., U. S. Nation. Mus., Report, **1893**, 337–487, 19 pls., 70 figs. in text.

SUDWORTH, G. B.

1908. Forest trees of the Pacific Slope. (Washington, Government Printing Office), Dept. Agric., Forest Serv., 441 pp., 2 pls., 207 figs. in text.

TAYLOR, W. P.

1910a. Two new rodents from Nevada. Univ. Calif. Publ. Zool., **5**, 283–302, pls. 27–29.

1910b. An apparent hybrid in the genus *Dendroica*. Univ. Calif. Publ. Zool., **7**, 173–177.

1911. Mammals of the Alexander Nevada Expedition of 1909. Univ. Calif. Publ. Zool., **7**, 205–307, 2 figs. in text.

TEST, F. C.

1899. A contribution to the knowledge of the varieties of the tree frog *Hyla regilla*. Smithsonian Inst., U. S. Nation. Mus., Proc., 21, 477–492, 39 pls.

VAN DENBURGH, J.

1897. The reptiles of the Pacific Coast and Great Basin. Occasional Papers of the Calif. Acad. Sci., 5, 236 pp., many unnumbered figs. in text.

EXPLANATION OF PLATES

PLATE 7

Map of the life zones of the Pine Forest Mountain region, taken from the Disaster Sheet of the United States Geological Survey Topographic Map of the United States. The dotted line beginning at Quinn River Crossing indicates the route followed by the expedition. Squares indicate base-camps (where most of the time was spent), triangles, collecting localities. The route followed by the palaeontological party is not indicated.

It should be understood that the life zones as plotted are to be regarded as approximately accurate along the route of the expedition only. At a distance from the line of actual work the zones are based on inference from altitudes, slope-exposure, and distant observation.

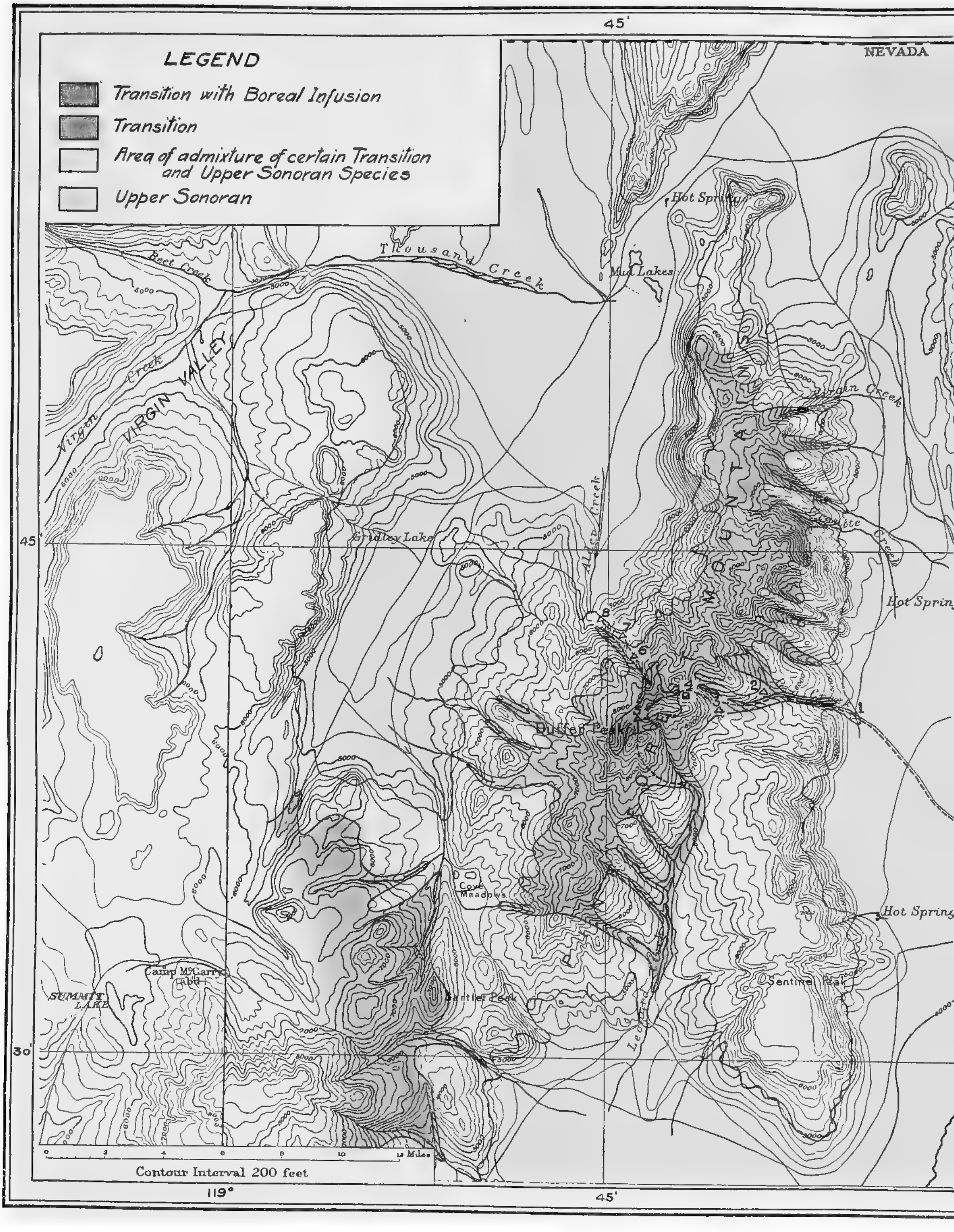
LEGEND
Transition with Boreal Infusion
Transition
Area of admixture of certain Transition and Upper Sonoran Species
Upper Sonoran
45'
NEVADA
Hot Springs
Mud Lakes
Thousand Creek
Beet Creek
Virgin Creek
VIRGIN VALLEY
Virgin Creek
Gridley Lake
Alder Creek
Granite Creek
Hot Springs
Duffer Peak
Cove Meadows
Camp McGarry (old)
SUMMIT LAKE
Bartlett Peak
Sentinel Peak
Hot Springs
Leonard Creek
Contour Interval 200 feet
119°
45'
30'

PLATE 8

Fig. 1. Big Creek Ranch (Camp no. 1, 4350 feet altitude) and neighboring desert, the Pine Forest Mountains in the background, Humboldt County, Nevada; June 22, 1909. The poplars about the ranch were introduced. The meandering course of Big Creek is marked by a line of willows and alders. Big Creek Cañon is noticed on the right. The brush in the foreground is principally *Chrysothamnus, Grayia,* and *Artemisia tridentata.* Mammals inhabiting this association include *Citellus mollis, Peromyscus maniculatus sonoriensis, Perodipus microps levipes, Eutamias pictus, Onychomys brevicaudus, Perognathus parvus olivaceus, Lepus californicus wallawalla, Sylvilagus nuttalli grangeri* and *Taxidea taxus.* The commonest reptiles are *Crotaphytus wislizenii, Cnemidophorus tigris, Sceloporus graciosus,* and *Uta stansburiana.*

Fig. 2. View up Big Creek from Camp no. 2 (see map, pl. 7), 6000 feet altitude, Pine Forest Mountains, Humboldt County, Nevada; July 7, 1909. The trees along the stream are aspens, alders and willows. *Artemisia tridentata* is the chief plant on the Big Creek flats. The dark patches on the high ridge are made up of *Populus tremuloides.* The sagebrush flats are areas of admixture of Transition and Upper Sonoran species, while the animals found along the stream were chiefly Transition in distribution. *Sceloporus graciosus, Perognathus parvus olivaceus,* and *Citellus oregonus* were fairly common in the vicinity of this camp.

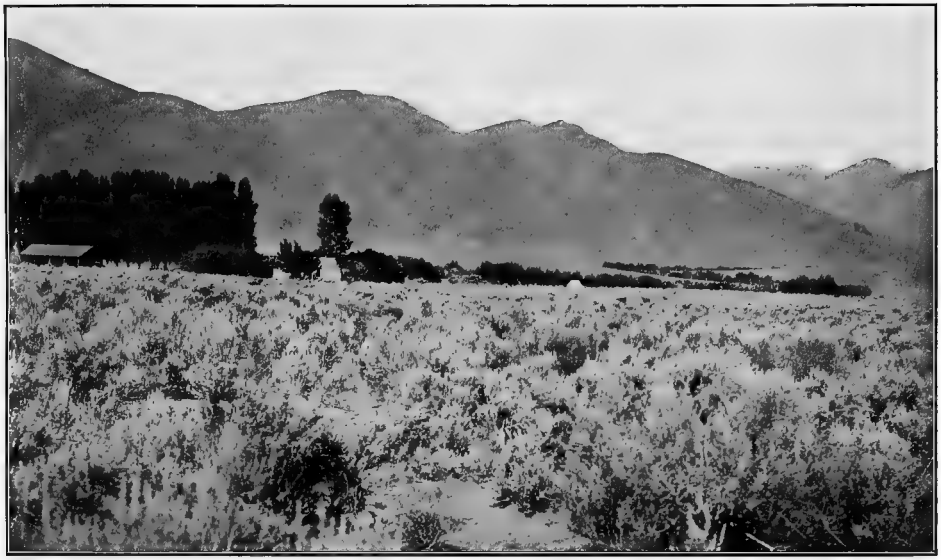

Fig. 1

Fig. 2

PLATE 9

Fig. 1. Basin at the head of Big Creek (Camp no. 4, 8000 feet altitude—the ridges attain a height of 9000 feet), Pine Forest Mountains, Humboldt County, Nevada; July 1, 1909. *Artemisia tridentata* is seen in the foreground. The conifers are *Pinus flexilis,* while the smaller trees and most of the brush-like patches are *Populus tremuloides.* The animals found here were for the most part Transition species, although the presence of *Nucifraga columbiana, Hylocichla ustulata swainsoni, Zonotrichia leucophrys leucophrys,* and *Sorex palustris navigator* indicates an infusion of Boreal elements.

Fig. 2. Tract of country at the head of Big Creek (near Camp no. 4, 8000 feet altitude), Pine Forest Mountains, Humboldt County, Nevada; July 29, 1909. The peculiar species of meadow mouse, *Microtus* (*Lagurus*) *intermedius,* was found in the *Artemisia tridentata* shown in the foreground, and was discovered nowhere else in the mountains. Immediately back of the sagebrush a line of *Populus tremuloides* appears, and then a few limber pines (*Pinus flexilis*). The brush-like vegetation in the background is dwarfed and gnarled *Populus tremuloides. Nucifraga columbiana* and *Colaptes cafer collaris* were frequently heard in the pines, and *Vermivora celata orestera* was noted in the aspens.

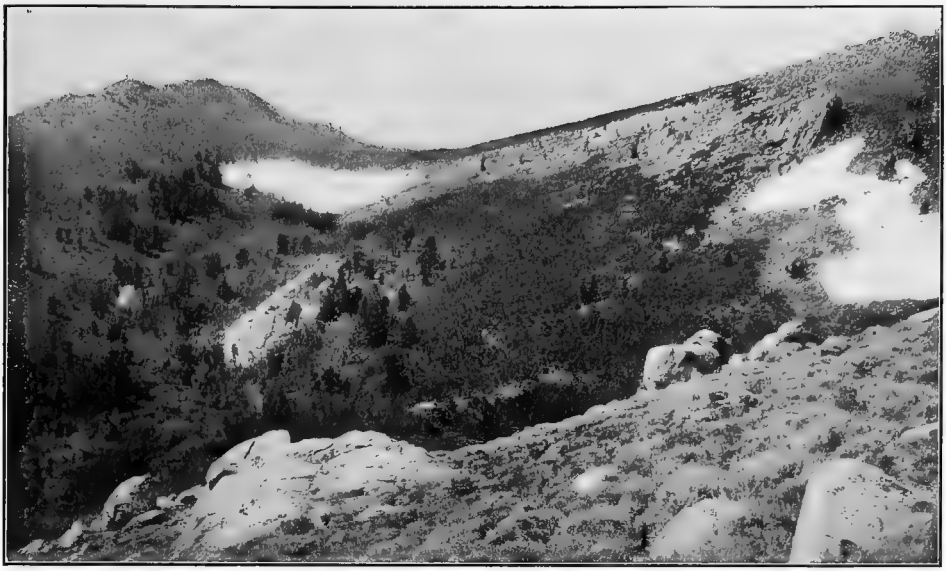

Fig. 1

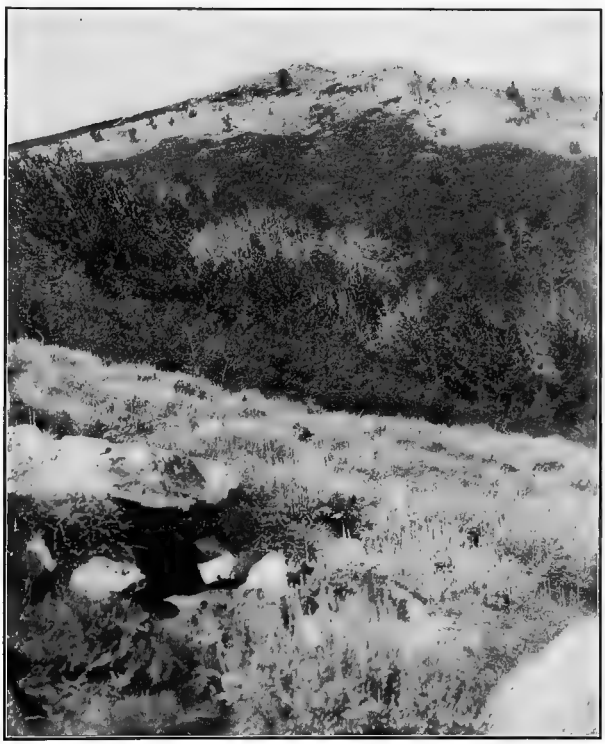

Fig. 2

PLATE 10

Fig. 1. Meadow at the head of Leonard Creek (8200 feet altitude), and a spur of Duffer Peak (9200 feet), Pine Forest Mountains, Humboldt County, Nevada; July 18, 1909. *Artemisia tridentata* appears in the foreground. The trees on the slopes of Duffer Peak are *Pinus flexilis. Oreoscoptes montanus, Spizella breweri, Centrocercus urophasianus* and *Sturnella neglecta* were noted in the sagebrush at this altitude. *Sialia currucoides* and *Colaptes cafer collaris* were observed in the limber pines on the slopes of Duffer Peak. Mammals most in evidence in the general neighborhood were *Citellus oregonus* and *Eutamias pictus.*

Fig. 2. Alder Creek Lake (7800 feet altitude), Pine Forest Mountains, Humboldt County, Nevada; July 26, 1909. The photograph shows the character of the upper ridges of the western slope of the Pine Forest Mountains, and indicates the glacial nature of the high country. Apparently this lake was formed through the damming of a cañon by a moraine. Other moraines are seen intersecting the lake.

The scattered character of the timber is noteworthy. The scrubby trees on the right-hand side of the lake are *Cercocarpus ledifolius,* the pines in the foreground being *Pinus flexilis. Empidonax wrighti* and *Penthestes gambeli gambeli* were common in the limber pines.

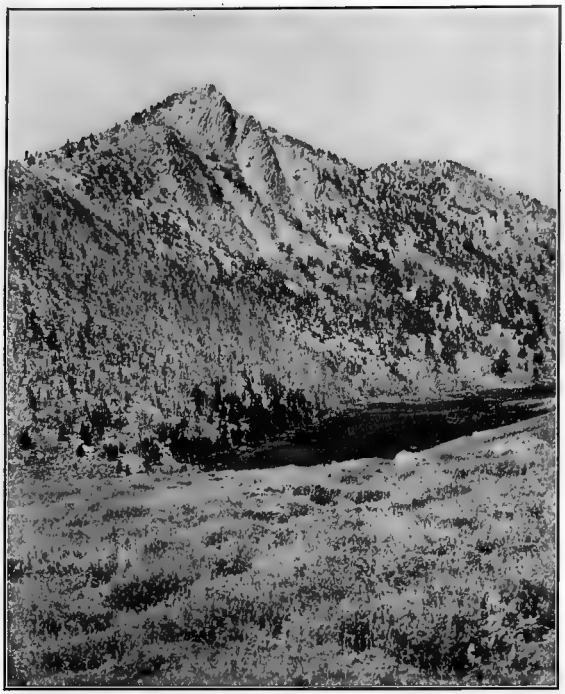

Fig. 1

Fig. 2

PLATE 11

Fig. 1. A typical stand of limber pines (*Pinus flexilis*), altitude 9000 feet, Pine Forest Mountains, Humboldt County, Nevada; July 1, 1909. The species of birds seen most commonly in this type of environment were *Carpodacus cassini, Colaptes cafer collaris, Empidonax wrighti,* and *Nucifraga columbiana.*

Fig. 2. *Veratrum californicum* on Duffer Peak Meadow (Camp no. 5; 8400 feet altitude), Pine Forest Mountains, Humboldt County, Nevada; July 11, 1909. The conifers at the left are *Pinus flexilis.* The brush-like vegetation in the background is made up of dwarfed *Populus tremuloides.* This was the collecting station having the greatest number of Boreal species. *Junco oreganus thurberi, Penthestes gambeli gambeli, Nucifraga columbiana, Zonotrichia leucophrys leucophrys, Microtus mordax, Zapus princeps oregonus* were all taken in the neighborhood.

Fig. 1

Fig. 2

PLATE 12

Fig. 1. View of a part of the largest meadow in the mountains; July 18, 1909. This is located at an altitude of 6500 feet on the western slope of the Pine Forest Mountains, Humboldt County, Nevada. Duffer Peak (9400 feet altitude), the highest point in the mountains, appears in the center background. The whitish brush on the slope in the foreground is *Artemisia tridentata.* The trees on the meadow, and the brush-like patches on the ridges and in the broad basin in the background are *Populus tremuloides. Citellus oregonus* was extremely numerous on this meadow. A coyote (*Canis lestes*) was seen here on the afternoon of July 18. *Cinclus mexicanus unicolor* was observed on Alder Creek both above and below this locality.

Fig. 2. Alder Creek (6000 feet altitude, near Camp no. 7), Pine Forest Mountains, Humboldt County, Nevada; July 15, 1909. The trees are, for the most part, *Populus tremuloides,* all the brush-like patches in the background as well as nearly all the trees along the stream being of this species. Associated with the aspens along the stream are a few willows. The hillsides are clothed with *Artemisia tridentata. Zapus princeps oregonus, Putorius cicognani,* and *Neotoma cinerea occidentalis* were taken at this locality. *Citellus oregonus* ranged down nearly to it, and *Sylvilagus auduboni grangeri* invaded the mountains along exposed ridges to a greater altitude than that of this camp. This is a fair illustration of an intermingling of lower and higher zonal elements. The locality is on the whole good Transition, at least along the stream.

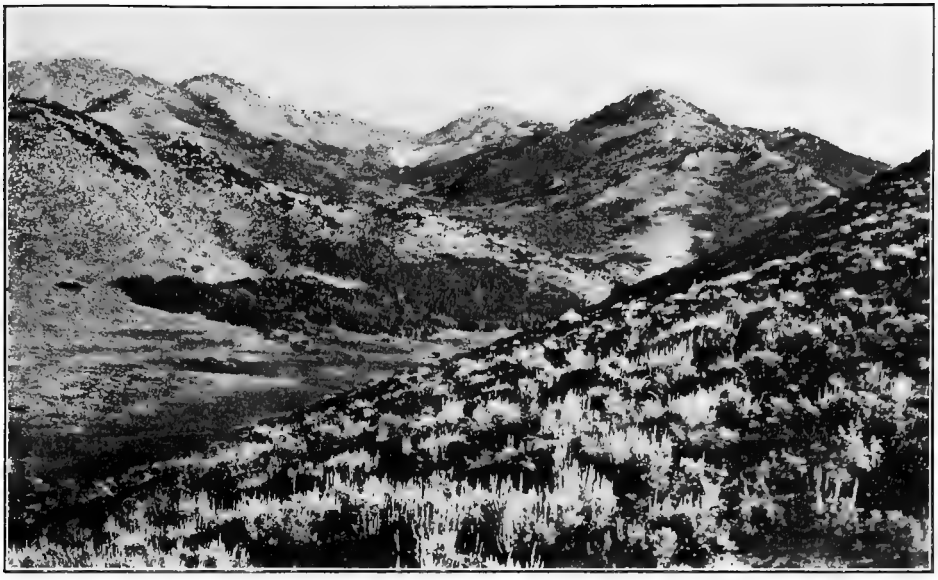

Fig. 1

Fig. 2

Vol. 7. (Contributions from the Museum of Vertebrate Zoology.)

1. Two New Owls from Arizona, with Description of the Juvenal Plumage of *Strix occidentalis occidentalis* (Xantus), by Harry S. Swarth. Pp. 1-8. May, 1910 ..... .10
2. Birds and Mammals of the 1909 Alexander Alaska Expedition, by Harry S. Swarth. Pp. 9-172; plates 1-6; 3 text-figures. January, 1911. 1.50
3. An Apparent Hybrid in the Genus *Dendroica*, by Walter P. Taylor. Pp. 173-177. February, 1911 ..... .05
4. The Linnet of the Hawaiian Islands: a Problem in Speciation, by Joseph Grinnell. Pp. 179-195. February, 1911 ..... .15
5. The Modesto Song Sparrow, by Joseph Grinnell. Pp. 197-199. February, 1911 ..... .05
6. Two New Species of Marmots from Northwestern America, by H. S. Swarth. Pp. 201-204. February, 1911 ..... .05
7. Mammals of the Alexander Nevada Expedition of 1909, by Walter P. Taylor. Pp. 205-307. June, 1911 ..... 1.00
8. Description of a New Spotted Towhee from the Great Basin, by J. Grinnell. Pp. 309-311. August, 1911 ..... .05
9. Description of a New Hairy Woodpecker from Southeastern Alaska, by H. S. Swarth. Pp. 313-318. October, 1911 ..... .05
10. Field Notes on Amphibians, Reptiles and Birds of Northern Humboldt County, Nevada, with a Discussion of Some of the Faunal Features of the Region, by Walter P. Taylor. Pp. 319-436, plates 7-12. February, 1912 ..... 1.00

Vol. 8. 1. The Vertical Distribution of *Eucalanus elongatus* in the San Diego Region during 1909, by Calvin O. Esterly. Pp. 1-7. May, 1911..... .10
2. New and Rare Fishes from Southern California, by Edwin Chapin Starks and William M. Mann. Pp. 9-19, 2 text-figures. July, 1911 .10
3. Classification and Vertical Distribution of the Chaetognatha of the San Diego Region, Including Redescriptions of Some Doubtful Species of the Group, by Ellis L. Michael. Pp. 21-186, pls. 1-8. December, 1911 1.75
4. Dinoflagellata of the San Diego Region, IV. The Genus *Gonyaulax*, with Notes on Its Skeletal Morphology and a Discussion of Its Generic and Specific Characters, by Charles Atwood Kofoid. Pp. 187-286, plates 9-17.
5. On the Skeletal Morphology of *Gonyaulax catenata* (Levander), by Charles Atwood Kofoid. Pp. 287-294, plate 18.
6. Dinoflagellata of the San Diego Region, V. On *Spiraulax*, a New Genus of the Peridinida, by Charles Atwood Kofoid. Pp. 295-300, plate 19. Nos. 4, 5, and 6 in one cover. September, 1911 ..... 1.50
7. Notes on Some Cephalopods in the Collection of the University of California, by S. S. Berry. Pp. 301-310, plates 20-21. September, 1911 .10
8. On a Self-closing Plankton Net for Horizontal Towing, by Charles Atwood Kofoid. Pp. 311-348, plates 22-25.
9. On an Improved Form of Self-closing Water-bucket for Plankton Investigations, by Charles Atwood Kofoid. Pp. 349-352. Nos. 8 and 9 in one cover. November 18, 1911 ..... .40

Vol. 9. 1. The Horned Lizards of California and Nevada of the Genera *Phrynosoma* and *Anota*, by Harold C. Bryant. Pp. 1-84, pls. 1-9. December, 1911 ..... .75
2. On a Lymphoid Structure Lying Over the Myelencephalon of *Lepisosteus*, by Asa C. Chandler. Pp. 85-104, plates 10-12. December, 1911 .25

Vol. 10. (Contributions from the Museum of Vertebrate Zoology.)

1. Report on a Collection of Birds and Mammals from Vancouver Island, by Harry S. Swarth. Pp. 1-124, plates 1-4 ..... 1.00
2. A New Cony from the Vicinity of Mount Whitney, by Joseph Grinnell. Pp. 125-129. January, 1912 ..... .05