

A SYSTEMATIC REVIEW OF THE MOUNTAIN CHICKADEE

By WILLIAM H. BEHLE

Chickadees of the species *Parus gambeli* have a range restricted to western North America where they occupy mountainous country from the Rocky Mountains west to the Cascade-Sierra Nevada cordillera and the interior coast ranges of California and south through the mountains of southern California to the Sierra San Pedro Mártir and Sierra Juárez of northern Lower California. Mountain Chickadees are essentially resident birds showing no pronounced migratory movements although some individuals move to lower elevations in fall and winter, and occasionally vagrants wander out of their breeding range. The habitat of the species is in general coniferous forest, where it breeds from the lowest altitudinal levels of this ecologic type up to timber line.

Being widely distributed over a diversified geographic area and thus being subject to varying environmental influences, the species is composed of several populations of subspecific rank. However, the distinctness and geographic limits of some of these races have been in doubt. It has been the purpose of this study to analyze variation in the principal external characters of the species, determine more precisely the ranges of the races, inquire as to the degree of differentiation and the relationships of the subspecies, and thus to extend our knowledge of the evolution of the species.

For the loan of comparative material which has made this study possible I am indebted to A. M. Bailey, Denver Museum of Natural History; the late A. J. van Rossem, and Thomas R. Howell, Donald R. Dickey Collection, University of California at Los Angeles; Robert T. Orr, California Academy of Sciences; Alden H. Miller, Museum of Vertebrate Zoology; and John W. Aldrich and Herbert Friedmann, United States National Museum. The figures were prepared for publication by my colleague, W. W. Newby, to whom I express my appreciation. Acknowledgement also is made of aid in revision of manuscript and statistics by Robert K. Selander.

METHODS

Linear measurements were taken in millimeters as follows: chord of the wing; tail from point of insertion between the middle rectrices to the tip of the longest rectrix; length of bill from anterior edge of nostril to tip of the maxilla; depth of bill from anterior edge of nostril to lower edge of mandible in same transverse plane; and width of bill at base. In the course of the study the measuring of tarsal length and length of middle toe was discontinued because of generally unsatisfactory and insignificant results.

Statistical analyses of the measurable characters are presented for each race in tabular form and comparisons are made graphically between the several races following the method described by Dice and Leraas (1936) as modified by Pitelka (1951) and Davis (1951). The samples for each race do not include intergrades but do include both breeding and winter birds taken within the range of the subspecies, since they are resident. Only the measurements of postjuvinal specimens were used. Where the wing and tail feathers were badly worn they were not measured. Juveniles can be distinguished by their loose, fluffy feathers and abbreviated bills. In those few instances where immature birds (as determined by skull condition) in first fall plumage were available, their average measurements did not vary from those of adults, nor did they differ from adults in plumage characters.

In studying geographic variation in color characters, individual variation, seasonal effect of wear, and "foxing" of museum specimens had to be weighed before geographic variation could be appraised. Post-mortem browning does occur and the changes are

most noticeable on the rectrices and remiges. Old specimens have lost the blue-gray tone that characterizes fresh specimens. While members of the family Paridae are prone to foxing to a greater degree than in many other families, I do not believe that Mountain Chickadees undergo such extreme post-mortem color change as Davis (1951:6) found in Brown Towhees. Some difficulties were presented where only old material of some populations was available and so had to be compared with new material of others. These cases are noted in the text. Capitalized color designations follow Ridgway (1912).

REVIEW OF PREVIOUS WORK

The species was first described as *Parus montanus* by Gambel (1843:259), based on a specimen taken about a day's journey west of Santa Fe, New Mexico. The name *Parus montanus* was shown by Ridgway (in A.O.U. Committee, 1886:335) to be pre-occupied, and the name *Parus gambeli* was substituted. When Ridgway (1904:408) prepared the account for the Birds of North and Middle America no subspecies were known, although his measurements suggested that geographic variation did exist in the characters measured. The species was called *Penthestes gambeli* at that time. A few years later the race *baileyae* was described from southern California by Grinnell (1908:29). Grinnell (1918) later undertook a systematic revision of the species and at that time described two additional races, *inyoensis* from the desert mountains of eastern California and *abbreviatus* from northern California. The range of *inyoensis* was later found by Linsdale (1936:87) to extend throughout the Great Basin. The range of *abbreviatus* was extended by Oberholser (1919) to include Oregon, Washington, and central Idaho, and thence north to central western Alberta and northern British Columbia. However, van Rossem (1928) changed this concept of distribution when he described the subspecies *grinnelli*, with a range extending from east-central Oregon, eastern Washington and northern Idaho north through British Columbia. In the meantime Grinnell and Swarth (1926:163) described *atratus* from the Sierra San Pedro Mártir of Lower California.

A detailed picture of the distribution of the several races occurring in California was presented by Grinnell and Miller (1944:300-303). In the present review I have had essentially the same material that Grinnell and Miller so carefully worked over. As a result little information is added for the California region and it is corroborative of their findings. My major contribution has been to work out the picture of geographic variation in the populations farther east. In the course of this study the race *wasatchensis* was described (Behle, 1950), with a range covering central and southern Idaho, southwestern Wyoming and all of Utah except the mountains of the extreme eastern and western margins of the state.

GEOGRAPHICALLY VARIABLE CHARACTERS

Color of dorsum.—This is one of the most variable characters of the species and in some cases serves as the principal basis for distinction between races. It is correlated to some extent with flank and side coloration. A well-marked north-south cline exists in this character in populations from the Cascade-Sierra Nevada southward through the mountains of southern California to the Sierra San Pedro Mártir of northern Lower California. The cline is toward increasing pigmentation or darker coloration to the south. Those examples representing the race *abbreviatus* are light gray. Those from the mountains of southern California representing *baileyae* are slightly darker, while those from the San Pedro Mártir called *atratus* are still darker, representing the extreme of dark gray coloration.

In addition there is a west-east cline which extends from the gray color of the *atratus-baileyae-abbreviatus* group to a light buff or tan color of *inyoensis* of the Great Basin, through a darker gray-green form, *wasatchensis*, which occurs just east of the Great Basin, to the brown of *gambeli* of the Rocky Mountain region. A slightly different transition from the gray coloration of coastal birds to the brown of Rocky Mountain birds is seen through eastern Washington and northern Idaho, where the race *grinnelli* represents a transitional stage.

Color of sides and flanks.—Accompanying the grayish dorsum of the coastal trio of races, *abbreviatus-baileyae-atratus*, the color of the sides and flanks is likewise gray and the same cline toward darker coloration to the south is manifest. In *abbreviatus* the flanks are tan-gray. In *baileyae* they are darker and dirty appearing but still tan-gray, while in *atratus* the flanks are still darker, more of a brown-gray. In the Rocky Mountain region (*gambeli* and *grinnelli*) the flanks are differently colored from the dorsum, being pinkish buff or cinnamonaceous. Between these two areas a transition occurs so that the flanks of chickadees from the Great Basin and Utah mountains (*inyoensis* and *wasatchensis*) are buffy. In northwestern Nevada, however, the gray color of *abbreviatus* prevails. Farther north across eastern and central Washington a more erratic transition occurs. Some individuals with cinnamon colored flanks occur as far west as the east side of the Cascades. The blending of coastal gray and Rocky Mountain cinnamon is best seen in Okanogan County, Washington.

Amount of white on head.—The prominence of the superciliary stripe and its extent posteriorly, together with the amount of white in the frontal stripe of the head, are subject to great individual variation and also to some geographic variation. In the race *atratus* of northern Lower California the white is greatly reduced, being narrower and not extending so far posteriorly. This was brought out in the statement of Grinnell and Swarth (1926:163-164) made while comparing *atratus* and the neighboring race *baileyae*: "The white on the head of *atratus* is not only less in area occupied, but it is shallower; and birds in breeding plumage, when it is [further] reduced or effaced by wear, come to bear a curious resemblance about the head to *Penthestes* [= *Parus*] *atricapillus*." The amount of white seems to be fairly constant in the races *baileyae*, *abbreviatus*, *grinnelli*, *gambeli* and *wasatchensis*. The race *inyoensis* has the greatest amount of white, especially in examples from central northern Nevada.

Length of wing.—The races do not vary greatly in this character, as shown in figure 1. The greatest difference in wing length between races exists between *gambeli* and *grinnelli*.

Tail length.—In contrast to the wing, the tail length shows considerable variation between populations. The longest tail is found in *wasatchensis* of the Utah region. The race *gambeli* of the Rocky Mountains is next longest with *inyoensis* of the Great Basin a close third. The races of the coastal Sierra Nevada-Cascade Cordillera, *abbreviatus*, *baileyae* and *atratus*, are shorter tailed. Thus there is a west-east cline toward longer tails in the interior Rocky Mountain region. There is also a suggestion of a southward cline in the three coastal populations toward a longer tail, but differences in means are not statistically significant. The form *grinnelli* of the northern Idaho region is somewhat intermediate geographically between the Rocky Mountain and coastal races, but in tail length it is closer to the latter. Both sexes show the same differences between populations in tail length. It should be noted that whereas my tail measurement was the usual one from the point of insertion between the middle rectrices to the tip of the longest rectrix, Grinnell (1918:508) in his revision measured the tail from the base of the uropygium to the tip of the longest pair of rectrices. Hence the two sets of data are not directly comparable.

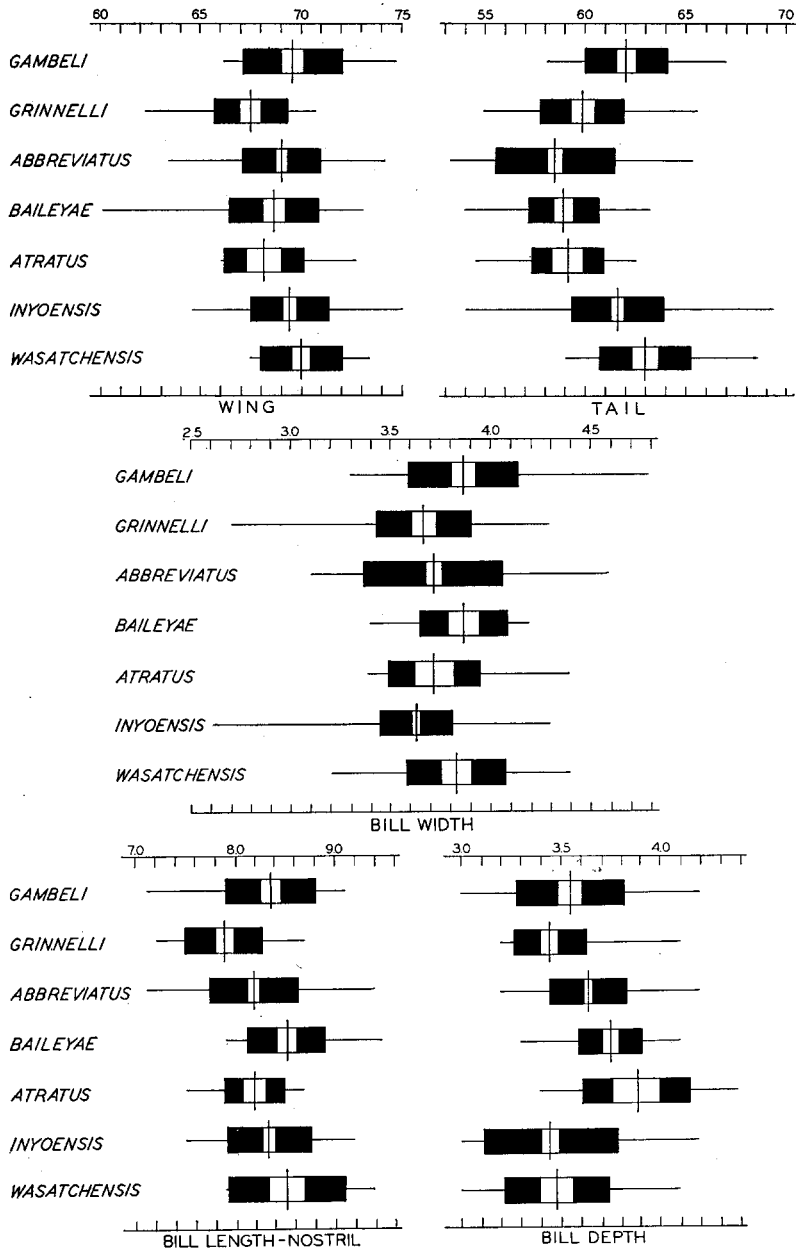


Fig. 1. Individual and geographic variation in several mensural characters of races of *Parus gambeli* based on adult males. Limits of variation shown by lengths of horizontal lines; means marked by vertical lines; dark rectangles represent standard deviation; light parts of rectangles, twice the standard error of the mean. Where the light areas do not overlap, differences in mean are statistically significant.

Wing-tail ratio.—Since tail length is more variable than wing length, the races differ in relative length of wing and tail. Comparison of the figures obtained by dividing the average wing length by the average tail length for each race is a better indication, perhaps, of differences between the various populations of chickadees in wing and tail lengths than that revealed by comparing absolute lengths of these characters. Wing-tail ratios for males of races are as follows: *gambeli*, 1.11; *grinnelli*, 1.12; *abbreviatus*, 1.18; *baileyae*, 1.16; *atratus*, 1.15; *inyoensis*, 1.12; *wasatchensis*, 1.10. While *grinnelli* is smaller than *gambeli*, the wing-tail ratio is essentially the same. With their short tails the coastal group of races, *abbreviatus*, *baileyae*, and *atratus*, show the largest wing-tail ratios in the order mentioned. Of special concern is the difference between *grinnelli* and *abbreviatus*. These two races have been considered by some writers to be indistinguishable, yet in wing-tail ratio there is a considerable difference. The interior races *inyoensis* and *wasatchensis* have proportions closer to *gambeli* and *grinnelli* than to the coastal group. The race *wasatchensis* has the smallest ratio of wing to tail. In this population the tail most nearly approaches the wing in length.

Bill length.—The bill of the race *grinnelli* is the shortest. Long-billed populations are *gambeli*, *baileyae* and *wasatchensis*. Intermediate are *abbreviatus* and *inyoensis*.

Depth of bill.—The Rocky Mountain and Great Basin races, namely *gambeli*, *grinnelli*, *wasatchensis* and *inyoensis*, are about the same in bill depth; the coastal races have deeper bills. Bill depth in the race *abbreviatus* is less than in *baileyae* and *atratus*. The latter has the deepest bill of all races. Thus in the three far western races there is a southward cline toward increasing bill depth at the base.

Bill width.—The bills of *gambeli*, *baileyae*, and *wasatchensis* are wider than those of the other races.

Bill types.—On the basis of the three bill dimensions of length, depth, and width it seems that the race *grinnelli* has the smallest bill all around; it is short, narrow, and shallow at the base. The bill of *atratus* is short but deep and of moderate width. That of *baileyae* is longer, deeper, and wider than its neighbor *abbreviatus*, although the two are generally similar in appearance. The races *inyoensis* and *wasatchensis* likewise are similar but are unlike the previous mentioned races in that they are longer and slenderer. The bill of *gambeli* differs decidedly from the last two and is more like that of *grinnelli* except it is larger and longer. Although racial differences in bill dimensions are slight, they are apparent in the averages. Yet Grinnell was partly right when he said (1918: 508) "neither depth of bill nor culmen is a practical index to degree of slenderness of bill. No ordinary measurement will suffice to indicate the facts . . . perceived by the eye."

Combining the measurable differences and visual impressions, it seems that three types of bill are represented in the species. In the Rocky Mountain area proper the bill is relatively short, stubby, thick at the base, and blunt; the northern population (*grinnelli*) is smaller, being shorter and thinner at the base. A second bill type occurs in the interior mountain region of Utah, Nevada, and eastern California, where the bill is long, slender, and tapers to a point. The more eastern population *wasatchensis* has a slightly longer and wider bill at the base than *inyoensis*. The third type is seen in the three races closest to the Pacific coast, namely *atratus*, *baileyae* and *abbreviatus*, where the bill is generally more massive, especially at the base, and, although variable among the three races as to length, it is quite unlike the long, tapering *inyoensis*-type bill. The bill of *atratus* resembles the remote *gambeli* far more than it does that of the intervening races *inyoensis* and *wasatchensis*.

Weight.—Samples of weight data among the various races are so inadequate that little can be judged of geographic variation in body weight. The indications are, however, that the races do not differ in average body weight. Large samples are available

for *abbreviatus* and *inyoensis*. Their average weights are very close, yet *abbreviatus* has a shorter tail. The small sample of *grinnelli*, which race shows shorter measurements in wing, tail, and bill than the other races, indicates no significant difference in average weight. Slight sexual difference in weight is suggested, which is probably correlated with slight difference in size; females average smaller.

Degree of variability of characters.—Comparing the coefficients of variation for the characters measured (fig. 2), the wing is the least variable, followed by the tail, length

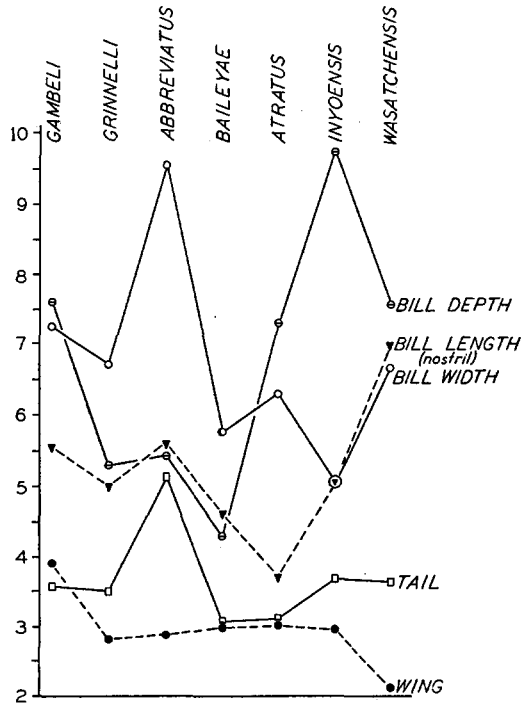


Fig. 2. Comparison of coefficients of variation of five mensural characters of adult males in the seven races of *Parus gambeli*.

of bill (from nostril), bill width, and bill depth. Wing and tail are considerably more conservative than the bill dimensions. In juncos (Miller, 1941:365), jays of the genus *Aphelocoma* (Pitelka, 1951:358), and Brown Towhees (Davis, 1951:92), the wing also is the least variable mensural character. Towhees and jays are similar in having the bill length more variable than bill depth. These are large-billed forms. Mountain chickadees are like juncos in having the bill depth more variable than bill length. The latter two are small-billed types.

Parus gambeli gambeli Ridgway

Parus montanus (not of Baldenstein) Gambel (1843:259).

Parus gambeli Ridgway (in A.O.U. Check-list, 1886:335); new name for *Parus montanus* Gambel.

Type locality.—About one day's journey west of Santa Fe, New Mexico.

Racial characters and comparisons.—This race is distinguished by the possession of a brown dorsum, cinnamonaceous or pinkish buff flanks and sides, and a relatively short, stubby bill. As compared with neighboring races, it differs from *wasatchensis* in having a browner dorsum, shorter, stubbier bill, and the tail length averages slightly shorter. It has the same bill type as *grinnelli* but the

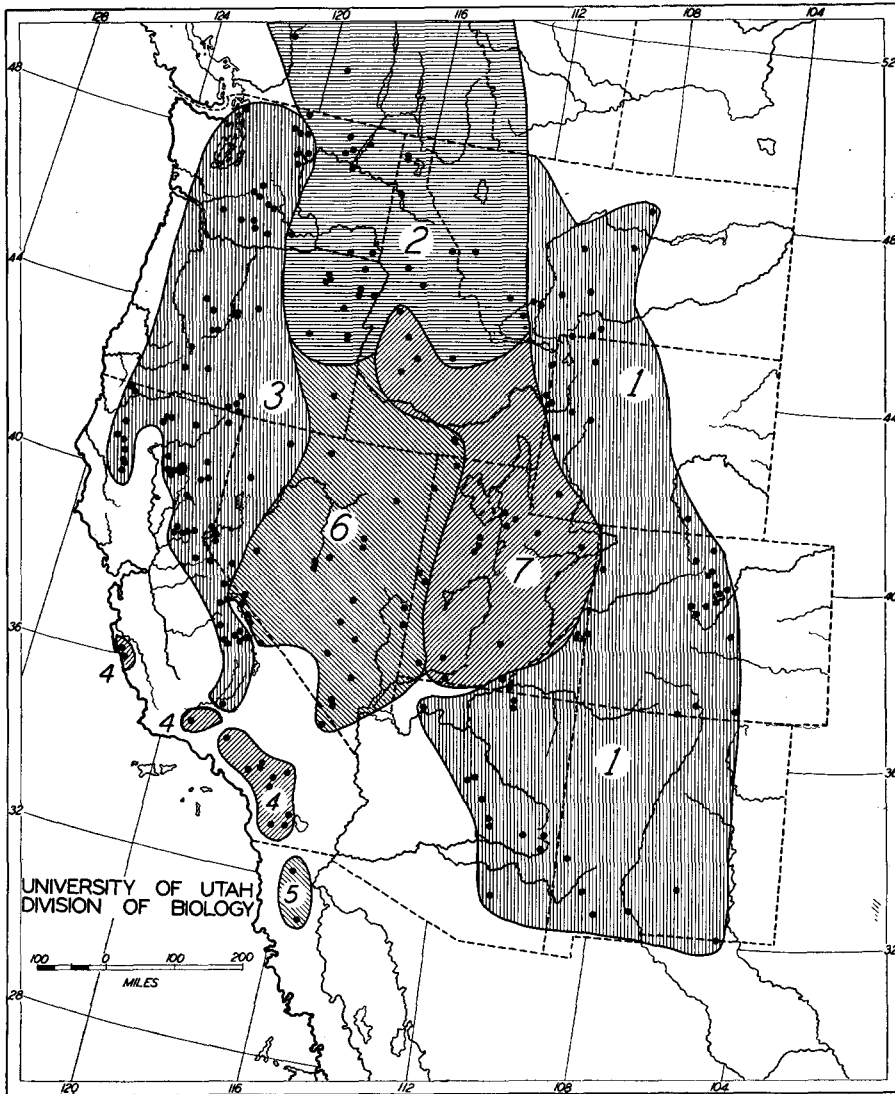


Fig. 3. The ranges of the races of *Parus gambeli* broadly outlined. Actual areas of occurrence within the ranges are discontinuous because these chickadees frequent only the coniferous forest in mountainous areas. 1, *gambeli*; 2, *grinnelli*; 3, *abbreviatus*; 4, *baileyae*; 5, *atratus*; 6, *inyoensis*; 7, *wasatchensis*.

bill averages slightly longer, wider, and deeper. *Gambeli* has a longer average wing and tail length than *grinnelli*. The principal difference from *grinnelli*, however, is the browner dorsum of *gambeli*.

Geographic distribution.—Rocky Mountain region from Montana (except the extreme western portion) south through Wyoming (except possibly the extreme southwestern portion) and Colorado to southern Arizona, New Mexico, and central western Texas (Davis Mountains). Occasionally members wander outside their breeding range as indicated by a specimen from Smith Morehouse Creek, Weber River, Summit County, Utah, taken on October 11 within the breeding range of *wasatchensis*.

Specimen localities.—MONTANA: *Gallatin County*: Madison River, 2 (Sept.); near Hillsdale, 2 (Aug.); Jefferson River, 1 (Sept.); Mystic Lake, 1 (Sept.). *Sweetgrass County*: near head Big Tim-

ber Creek, Crazy Mountains, 1 (June). *Park County*: 2 mi. NE Cooke, 8500 feet, 1 (July). *Judith Basin County*: Dry Woolf Cr., Little Belt Mts., 20 mi. SW Stanford, 1 (Aug.). *Carbon County*: 2 mi. E Shriver, 6500 feet, 1 (July). *Phillips County*: Zortman, 2 (July). *Fergus County*: Hilger, 1 (Aug.). IDAHO: *Fremont County*: 17 mi. E, 4 mi. N Ashton, 1 (Aug.). WYOMING: Yellowstone National Park: Mammoth Hot Springs, 3 (Oct., Nov.); *Teton County*: Above Fish Creek, 7200 feet, Teton Pass, 2 (Sept.); 2 mi. SW Victor [Idaho], 1 (July); *Lincoln County*: Head Dry Cr., 9200 feet, Salt River Mts., 1 (Aug.); *Sublette County*: "Near" Green River Lakes, 8000-8300 feet, 3 (Aug., Sept.); *Carbon County*: 25 mi. E, 10 mi. S Saratoga, 9800 feet, 4 (Sept.). *Albany County*: 7 mi. W, 4 mi. N Centennial, 11,000 feet, 1 (Sept.); Headquarters Park, 10,200 feet, Medicine Bow Mountains, 1 (June). UTAH: *Summit County*: Smith Morehouse Creek, Weber River, 1 (Oct.); *Grand County*: 15 mi. SE Moab, La Sal Mountains, 1 (April); *San Juan County*: Wilson Creek, La Sal Mountains, 1 (Oct.); 5 mi. NE La Sal P. O., 8000 feet, 2 (April); Navajo Mountain, 10,000 feet, 2 (June). *Kane County*: Kaiparowits Plateau, 2 (Aug.). COLORADO: *Jackson County*: Buffalo Park, 1 (Feb.). *Larimer County*: Medicine Bow Range, 2 (Aug.). *Grand County*: Granby, 4 (Oct., Nov.). *Rio Blanco County*: Rangeley, 1 (Oct.). *Boulder County*: Boulder, 3 (Feb., April); Longs Peak, 1 (July). *Adams County*: Henderson, 1 (Oct.). *Jefferson County*: Golden, 2 (Mar., Oct.); Morrison, 4 (Mar., Feb.); Arvada, 2 (May, Feb.); Turkey Creek, 1 (Oct.); Dome Rock, 1 (Oct.). *Eagle County*: Red Cliff, 1 (Dec.). *Denver County*: Clear Creek, Denver, 1 (Jan.). *Lake County*: Leadville, 2 (Mar.). *Park County*: Hall Valley, 2 (June, July). *El Paso County*: Manitou, 1 (Jan.). *Montrose County*: La Sal Mountains, 1 (May). *Montezuma County*: Ute Peak, 8500 feet, 1 (June). *Conejos County*: Sanford, 1 (Feb.); Osier, 10,000 feet, 1 (July). *Las Animas County*: Trinidad, 7 (Mar., Oct., Nov.). ARIZONA: *Mohave County*: Nixon Spring, 6250 feet, Mt. Trumbull, 1 (May). *Cocconino County*: West side Agassiz Peak, 10,000 feet, 9 mi. NW Flagstaff, 1 (July); Deadman's Flat, 6400 feet, NE San Francisco Mountain, 9 (Sept.); Sawmill Springs, 7300 feet, 8 mi. SE Mormon Lake, 1 (July). *Navajo County*: Keet Siel Canyon, 7000 feet, 1 (Jan.); 8 mi. S White River, 6100 feet, 1 (April). Skeleton Mesa, 8000 feet, 20 mi. NW Kayenta, 1 (June). *Pima County*: Santa Catalina Mountains, 5 (Sept., Oct.). *Gila County*: Head of Workman Creek, Sierra Ancha, 1 (June); Aztec Peak, 6500 feet, Sierra Ancha, 1 (June). *Greenlee County*: Hannagan Meadow, 9500 feet, 2 (July). *Apache County*: Big Lake, 20 mi. S Springerville, 2 (June). NEW MEXICO: *Catron County*: Reserve, 12 (Oct.). *Grant County*: Pinos Altos, 1 (May). *Luna County*: Mimbres River, 2 (Mar.). *Dona Ana County*: Radium Springs [= Fort Selden], Rio Grande River, 2 (Mar.). *Otero County*: Cloudcroft, 1 (April). TEXAS: *Culbertson County*: McKittrick Canyon, 8 mi. NE Guadalupe Peak, 5300 feet, 4 (Mar.).

Table 1

Measurements of *Parus gambeli gambeli*

Dimension	Sex	Number of specimens	Range	Mean with standard error	Standard deviation	Coefficient of variation
Wing	♂	73	66.0-74.7	69.57±0.29	2.50	3.59
	♀	43	64.5-75.6	67.41±0.36	2.40	3.57
Tail	♂	73	58.1-67.0	62.13±0.25	2.21	3.56
	♀	43	56.6-67.5	60.72±0.37	2.45	4.04
Bill from nostril	♂	69	7.1- 9.1	8.35±0.05	0.46	5.56
	♀	43	7.6- 9.5	8.18±0.06	0.43	5.35
Depth of bill	♂	59	3.0- 4.2	3.55±0.03	0.27	7.64
	♀	38	3.0- 4.2	3.45±0.04	0.27	7.83
Bill width	♂	70	3.3- 4.8	3.87±0.03	0.28	7.28
	♀	43	3.2- 4.8	3.76±0.04	0.32	8.61
Weight (grams)	♂	17	10.5-13.5	11.87±0.18	0.74	6.27
	♀	4	10.0-12.2	10.78±0.33	0.82	7.62

Geographic variation and intergradation.—Although *gambeli* occupies the whole Rocky Mountain region, it shows fair uniformity of color characters throughout its range. No constant color differences were detected between specimens at hand from Texas, Arizona, and New Mexico and the Colorado-Wyoming-Montana area. However, intergradation occurs where the range of *gambeli* impinges upon that of the races *wasatchensis* and *grinnelli*. Fresh fall specimens from the San Francisco Mountains of northern Arizona and a few worn examples from Mount Trumbull, Navajo

Mountains, and the Kaiparowits Plateau, all of which localities are near the Utah-Arizona border, are intermediate between *wasatchensis* and *gambeli* but closer to the latter. Incidentally, van Rossem (1928:105) assumed that birds from the San Francisco Mountains were typical of *gambeli*. To me they seem to be intergrades. Examples from the La Sal Mountains of southeastern Utah, almost on the Colorado border, also are intergrades and again closer to *gambeli*. Presumably intergradation between these two races continues to the north, but there is no material to demonstrate this except that from near the northeastern part of the range of *wasatchensis*. Specimens from near Green River Lakes, Sublette County, near Teton Pass, Teton County, and the Head of Dry Creek, Salt River Mountains, Lincoln County, all in western Wyoming, and others from 17 miles east and 4 miles north of Ashton in nearby Idaho show the attenuated bill of *wasatchensis*; but their coloration is closer to *gambeli*, under which they have been listed.

Apparently the ranges of *gambeli* and *grinnelli* come together in southwestern Montana. Whereas examples from Gallatin, Sweetgrass and Park counties are closest to *gambeli*, those from the Dillon area and the Ruby Mountains are closest to *grinnelli*. A specimen from Dry Wolf Creek, Little Belt Mountain, 20 miles southwest of Stanford, also is intermediate but closer to *gambeli*.

Parus gambeli grinnelli (van Rossem)

Penthestes gambeli grinnelli van Rossem (1928:104).

Type locality.—Priest Lake, 2450 feet, Bonner County, Idaho.

Racial characters and comparisons.—Distinctive characters of this race are a short, stubby bill, short wing and tail, and grayish-green, less brownish dorsum. As compared with *gambeli* it has the same bill type and wing-tail ratio but is smaller throughout. It differs in addition in being darker (gray-green, less brown) on the dorsum and having lighter flanks and sides. In describing *grinnelli*, van Rossem (1928:104) commented that in relative darkness of tone, *grinnelli* bears much the same relation to *gambeli* as *baileyae* does to *abbreviatus*. *Grinnelli* is distinguished from *abbreviatus* by shorter wing length and proportionately longer tail as well as darker, greener, less grayish dorsum. From *wasatchensis*, *grinnelli* differs in markedly shorter, stubbier bill and darker, gray-green coloration. There is greater variation in flank color in *grinnelli* than in other races.

Geographic distribution.—Extreme western Alberta (Smoky River, Henry House, *vide* Hellmayr, 1934:75) and northern British Columbia west of the Rocky Mountains (Doch-da-on Creek on the Upper Stikine River) south through eastern Washington, northern Idaho, and extreme western Montana to northeastern Oregon and central Idaho. Vagrants may occur outside the breeding range, although two supposed records had best be discounted. Van Rossem (1928:104) referred a specimen from Tacoma, Pierce County, Washington, taken on December 21, and one from Hope, British Columbia, to this race as wanderers west of the Cascades. However, the Tacoma specimen seems to me to be an example of *abbreviatus* which has become darker through adventitious coloration, and according to Brooks and Swarth (1925:117) the Hope record is based on a manuscript reference.

Specimen localities.—BRITISH COLUMBIA: Atlin, 1 (June); Mountain at 3000 feet, above Doch-da-on Creek, Stikine River, 3 (July); Nine-mile Mountain, 4000 feet, northeast Hazelton, 1 (July); 8 mi. N Clearwater P. O., 1 (June); Okanagan Landing, 2 (Sept.); Okanagan, 5 (Feb.); Spences Bridge, 1 (Mar.). WASHINGTON: *Okanogan County*: Aeneas, 8 (Feb.); Republic, 4 (Nov.); Bauerman Ridge, 6 (Sept.). *Benton County*: Prosser, 2 (Oct.). *Asotin County*: Anatone, 1 (June). *Columbia County*: 1 mi. W Stayawhile Spring, 5300 feet, 1 (July). *Yakima County*: Toppenish Ridge, 3400 feet, 10 mi. SW Fort Simeol, Yakima Indian Reservation, 1 (Sept.). *Stevens County*: Marcus, 1 (Sept.); *Whatcom County*: Bellingham, 1 (Nov.). *Spokane County*: Fort Spokane, 1 (Sept.). *Ferry County*: Curlew Lake, 5 (Nov.). OREGON: *Umatilla County*: Meacham, 1 (July). *Union County*: Kamela, 1 (June). *Wallowa County*: Wallowa Lake, 4000 feet, 1 (April). *Baker County*: 11 mi. E Unity, 1 (Dec.); Anthony, 1 (Oct.); North Pine Creek, 3000 feet, 1 (June). *Malheur County*: Willow Creek, Ironside, 1 (Dec.). IDAHO: *Kootenai County*: Coeur d'Alene, 7 (Apr., Sept., Feb.). *Bonner County*: Coolin, 1 (Sept.); Priest Lake, 1 (Aug.); Lost Creek, 6500 feet, 1 (Sept.); Hunt Creek, 3200 feet, 3 (July). *Elmore County*: Horseheaven Creek, 6000 feet, 2 (Dec.); Hunter Creek, 6000 feet, 1 (Dec.); North Fork Boise River, 6000 feet, 1 (Dec.). *Idaho County*: 4 mi. SW Selway Falls, 5500 feet, 1 (Sept.); Beaver Ridge, 8½ mi. SE Lola Pass, 7000 feet, 1 (July); Castle Creek R.S., South Fork Clearwater River, 1800 feet, 1 (July). *Latah County*: Bald Mountain, 2 (Sept.). *Custer County*: Dickey, 2 (June). *Adams County*: Summit Smith Mountain, 7500 feet, 1 (July). MONTANA: *Missoula*

County: Lolo Creek, 6½ mi. W Lolo, 3470 feet, 2 (May). *Beaverhead County*: Birch Creek, 18 mi. NW Dillon, 7100 feet, 1 (July). *Madison County*: 12 mi. SW Alder, Ruby Mountains, 1 (Aug.).

Dickinson (1953:170) in reporting on the McCabe collection from the Fraser River drainage area of British Columbia lists specimens under *grinnelli* from the following localities: Anahim Lake, Birch Island, Chezacut, Clearwater, Hotnarko River, Indianpoint Lake, Lytton, 100 Mile House, Quesnel, Redstone, Watson Lake.

Geographic variation and intergradation.—The presumed center of differentiation, or at least the area from which typical specimens come, covers northern Idaho and adjacent areas in extreme eastern Washington, southeastern British Columbia, and northwestern Montana. Fringing this center are areas of intergradation with surrounding races. That between *grinnelli* and *gambeli* in southwestern Montana has been noted in the account of *gambeli*. There is an area of intergradation between *grinnelli* and *wasatchensis* in central Idaho (see account of *wasatchensis*). Either *wasatchensis* or *inyoensis* is involved along with *abbreviatus* in a confusing area of blending in the Blue Mountain region of Wallowa, Baker, and Grand counties in northeastern Oregon and extreme southeastern Washington. I have referred these heterogeneous specimens to *grinnelli* because their dorsal coloration is darker than that of the other races mentioned and, therefore, most like *grinnelli*. However, the specimens are for the most part worn and frayed. The bills are variable; some are small and stubby as in *grinnelli* but most are long and tapering as in *inyoensis* and *wasatchensis*. Flank color is more like *abbreviatus*.

Specimens showing this mixture of characters are as follows: OREGON: *Wallowa County*: 16 mi. S, 3 mi. E Lostine, 5500 feet, 9 (July); 25 miles north Enterprise at Sled Springs, 4600 feet, 3 (April). *Grant County*: north fork Malheur River, 21 mi. SE Prairie City, 5000 feet, 9 (July); Summit Creek, 6700 feet, 7 mi. E Austin, 2 juveniles (July). *Union County*: Grande Ronde Lake, 7100 feet, 1 (July). WASHINGTON: *Columbia County*: Blue Mountains, 5000 feet, 21 mi. SE Dayton, 2 (June).

When Gabrielson and Jewett (1940:434) extended the range of *grinnelli* into southeastern Oregon they assigned their birds from the Steens Mountains and Rome to *grinnelli*. These birds may also represent this intermediate population although I have assigned a fall specimen from Rome to *inyoensis*.

Table 2
Measurements of *Parus gambeli grinnelli*

Dimension	Sex	Number of specimens	Range	Mean with standard error	Standard deviation	Coefficient of variation
Wing	♂	47	62.2-70.7	67.40±0.27	1.86	2.75
	♀	25	60.4-69.9	64.95±0.45	2.25	3.46
Tail	♂	47	54.4-65.2	59.85±0.30	2.12	3.54
	♀	25	53.9-60.9	57.64±0.33	1.67	2.89
Bill from nostril	♂	47	7.2- 8.7	7.88±0.05	0.39	5.01
	♀	25	7.0- 8.5	7.80±0.08	0.40	5.21
Depth of bill	♂	39	3.2- 4.1	3.45±0.02	0.18	5.33
	♀	21	2.8- 4.0	3.50±0.07	0.32	9.21
Bill width	♂	46	2.7- 4.3	3.67±0.03	0.24	6.74
	♀	25	3.2- 4.3	3.60±0.05	0.25	6.94
Weight (grams)	♂	9	9.0-13.0	11.48±0.44	1.32	11.60
	♀	4	10.7-12.0	11.25±0.30	0.61	5.45

Although Gabrielson and Jewett (*loc. cit.*) refer to *grinnelli* as a somewhat poorly differentiated form, they state that they had fairly typical specimens of that race from Wallowa, Baker, Grant, and Crook counties, Oregon. According to the present writer's concept, specimens from Wallowa and Baker counties would be atypical since they are intergrades closest to *grinnelli*, while those from Grant and Crook counties also are intergrades, those from Crook County at least being closer to *abbreviatus*. When van Rossem (1928:104) described *grinnelli*, he noted this intergradational area between *grinnelli* and *abbreviatus* in east-central Oregon. He referred an atypical specimen from Anthony, Baker County, to *grinnelli* but three from Prineville, Crook County, to *abbreviatus*, with which disposition I agree.

The broad belt of intergradation between *abbreviatus* and *grinnelli* extends north into Washington through Chelan and Okanogan counties. I have somewhat arbitrarily placed specimens from longitude 120° and westward with *abbreviatus* and have listed the intermediate specimens in that

racial account. However, five September specimens in that intermediate zone from Bauerman Ridge, located east of Cathedral Peak near the Canadian boundary in northwestern Okanogan County, have cinnamon flanks and seem closer to *grinnelli*. Perhaps it was this broad zone of intergradation that prompted Jewett, Taylor, Shaw, and Aldrich (1953:479) to comment: "Although birds from northern Idaho and northern Oregon and northward are minutely smaller and darker than *abbreviatus* of northern California, southern Oregon, and western Nevada, there is far too great an overlapping to identify satisfactorily a large percentage of individuals. Therefore, the northern race, *grinnelli*, appears not to be recognizable."

***Parus gambeli abbreviatus* (Grinnell)**

Penthestes gambeli abbreviatus Grinnell (1918:510).

Type locality.—Horse Creek, near [= 7 miles northeast of] Seiad P.O., [on south slope of] Siskiyou Mountains, Siskiyou County, California.

Racial characters and comparisons.—Gray coloration, intermediate-sized bill and short tail characterize this race. As compared with surrounding races, *abbreviatus* is closest to *baileyae*, having prevailing gray coloration, heavy bill, and similar proportions of wing and tail, but it differs in being lighter and having a smaller bill both as to length and size at the base. *Abbreviatus* differs from *grinnelli* in having a grayer, less greenish dorsum; the tail is relatively shorter and the bill is larger and longer. It is distinguished from *inyoensis* by its grayer and darker dorsal coloration, shorter and heavier bill, and relatively shorter tail. Grinnell (1918:510) indicated that the tone of color of the sides, flanks, and back of *abbreviatus* is, in fresh plumage, the same as in *inyoensis*, namely Cartridge Buff, though not quite so pale. It seems to me that the whole appearance of *abbreviatus* is generally grayer. Only in some extreme individuals or in birds from intergrading regions does the buff color of the flank occur which shows an approach to *inyoensis*.

Geographic distribution.—Interior mountain ranges of central Washington, west through the Cascades and south through central and southwestern Oregon to northwestern Nevada and eastern California (exclusive of Inyo district) as far south as the Piute Mountains, Kern County. In the coast ranges of northwestern California the species occurs in the Siskiyou and Trinity mountains and southward in the higher parts of the inner coast ranges to Mount Sanhedrin, Mendocino County, and Snow Mountain, Colusa County. The species only occurs in the humid coast belt as a straggler (*vide* Grinnell and Miller (1944:300)).

When Grinnell (1918:510) described the race *abbreviatus*, he included in its range the higher mountains of central and northern California and northwestern Nevada. He presumed that it extended into southern Oregon. Oberholser (1919:424) restated the range on the basis of material in the Biological Survey collection to include in addition, Oregon, Washington, central Idaho, southwestern Alberta, and British Columbia. Swarth (1922:297, 1924:368, 1926:142) initially assigned his specimens from British Columbia to the race *abbreviatus*, but with van Rossem's description of *grinnelli* (1928:104) it developed that the birds of British Columbia belonged to the latter race. If *abbreviatus* occurs in British Columbia at all, it is probably confined to the extreme southwestern corner.

Specimen localities.—WASHINGTON: *Pierce County*: east slope Mt. Rainier, 1 (Aug.). *Yakima County*: Pine Grass Ridge, near Signal Peak, 4000 feet, 1 (July); Klickitat Meadows, 2 (Sept.); Reynolds Creek, Cowichee, 3000 feet, 2 (May); near Potato Hill, 4500 feet, 15 mi. N Goldendale, Yakima Indian Reservation, 1 (Aug.); head of Hindos Creek, 6500 feet, Mt. Aix, 1 (Sept.); 3 mi. NE at Goose Prairie, 5000 feet, Bumping Lake, 2 (Aug.); Foundation Ridge, Ahtanum, 4000 feet, 1 (May); Mt. Adams, 2 (Oct.). *Skamania County*: Mt. St. Helens, 2 (June), 1 (Sept.). OREGON: *Wheeler County*: 11 mi. W, 7 mi. S Mitchell, 4850 feet, 8 (June). *Tillamook County*: Happy Camp, Netarts, 1 (Dec.). *Crook County*: 6 mi. E, 3 mi. N Wildcat Mountain, 4700 feet, 1 (June); Ochoco R.S., 1 (June). *Deschutes County*: West Silver Creek, 4650 feet, 10 mi. SW Silverlake, 1 (Sept.); 7 mi. NW Sisters, 3300 feet, 1 (June); 4 mi. N, 9 mi. W Sisters, 4000 feet, 5 (June); 1 mi. SE Paulina Lake, 4 (June); 3 mi. W Paulina Lake, 5700 feet, 3 (June); Tumalo Creek, 11-15 mi. W Bend, 6 (June); Swampy Lakes, 13 mi. W and 3 mi. S Bend, 4 (June). *Douglas County*: 5 mi. S Mt. Thielson, 2 (June). *Lake County*: Drews Creek, 1 (June); Barley Camp, Warner Mountain, 17 mi. SW Adel, 1 (June); north base Crook Peak, Warner Mountains, 1 (June); Lakeview, 1 (Oct.); 2 mi. E Lakeview, 5200 feet, 1 (May). *Klamath County*: Fort Klamath, 1 (Nov.), 1 (Sept.), 1 (Dec.). NEVADA: *Humboldt County*: near Alder Creek Lake, Pine Forest Mountains, 2 (July); west side Pine Forest

Mountains, 2 (July). *Washoe County*: Galena Creek, 7000-7500 feet, 8 (May), 3 (Oct.); 6 mi. N Incline, 9500 feet, 2 (May); $\frac{1}{4}$ mi. SE Incline, 6300 feet, 1 (April); east side Granite Mountain, 1 (Oct.). *Churchill County*: 4 mi. SW Fallon, 4000 feet, 3 (Mar.), 1 (Oct.). *Lyon County*: West Walker River, 4900 feet, 1 (Mar.). *Mineral County*: 2 mi. SW Pine Grove, 2 (June). CALIFORNIA: *Humboldt County*: Horse Mountain, 4700 feet, 2 (June); Brannan Mountain, 3500 feet, 2 (Sept.); South Fork Mountain, 5700 feet, nr. Blake Lookout, 2 (June-July). *Siskiyou County*: Seiad Val. P. O., Horse Creek, Siskiyou Mountains, 10 (Nov. to Feb.); Kangaroo Creek, 2 (Aug.); Jackson Lake, 5900 feet, 5 (June); South Fork Salmon River, 5000 feet, 1 (July); T. H. Benton Estate, Butte Creek, 8 (Aug.); Grass Lake, 5000 feet, 2 (May); Mt. Shasta, 1 (July). *Trinity County*: Head Grizzly Creek, 6000 feet, 3 (July); 8 mi. NE Hyampom, 2900 feet, 2 (Sept.); 2 mi. E Hayfork, 2400 feet, 1 (June); Red Mt., 5300 feet, 14 mi. S Hayfork, 1 (Sept.), White Rock Ranger Station, 4800 feet, and 4 mi. E, 4 (May); Miller's Spring, 5000 feet, South Fork Mountain, 2 (June); The Racetrack, 5500 feet, South Fork Mountain, 2 (June); 4 mi. N, 1 mi. W Norse Butte, 5000 feet, South Fork Mountain, 2 (Aug.); Reilley's Ranch, 3000 feet, South Fork Mountain, 9 (Mar., Apr., May); South Fork Mountain, 4 mi. N Mad River Rock, 4200 feet, 1 (Jan.); Divide, 12 mi. N North Yolla Bolly Mountain, 4400 feet, 4 (May); 1 mi. SW North Yolla Bolly Mountain, 1 (Aug.). *Modoc County*: 8 mi. N, 13 mi. W Canby, 4700 feet, 1 (May); Sugar Hill, 5500 feet, 4 (May); Parker Creek, 5500 feet, Warner Mts., 10 (June-July); Shield's Creek, 5000 feet, 1 (June). *Lassen County*: 4 mi. SW McDonald Peak, 5300 feet, 1 (Oct.); 5 mi. N Fredonyer Peak, 1 (Oct.); 4 mi. W, 2 mi. N Susanville, 5000 feet, 3 (June); 8 mi. NE Susanville, 4800 feet, 1 (Jan.). *Shasta County*: Harrison Gulch, 2600 feet, 1 (Feb.); Manzanita Lake, 6000 feet, 3 (June). *Tehama County*: 11 mi. E Payne's Creek Post Office, 3500 feet, 1 (Dec.); Payne Creek, 600 feet, 2 (Dec.); Mineral, 4900 feet, 2 (May, Dec.); Lyman's, 3300 feet, 4 mi. NW Lyonsville, 1 (June). *Butte County*: Stanwood, 1 (June). *Plumas County*: Willow Lake, 5600 feet, 1 (July); Meadow Valley, 1 (June). *Nevada County*: 1 mi. W Nevada City, 1 (Oct.); Grass Valley, 2 (Oct.); Boca Spring, 6000 feet, 2 (May); Sage Hen Creek, 6500 feet, 3 (Nov.). *Placer County*: Tahoe Valley, 2 (Sept.); Cisco, 13 (June, Sept., Oct.); Blue Canyon, 5000 feet, 10 (Oct.); Dutch Flat, 3400 feet, 1 (Aug.). *El Dorado County*: Kyburz Station, 1 (Aug.); Slippery Ford [= Kyburz Station] 1 (June). *Alpine County*: 4 mi. W Lookout Peak, 7900 feet, 1 (Sept.); $\frac{3}{4}$ mi. S Woodford, 5500 feet, 1 (May). *Mariposa County*: Merced Grove Big Trees, 1 (June); Gentry's, 5800 feet, Big Oak Flat Road, Yosemite Park, 1 (Oct.); Cascades, Coulterville Road, Yosemite Park, 4500 feet, 1 (Nov.); Dudley, 3000 feet, 2 (July); Yosemite Valley, 4000 feet, 1 (Dec.); Eagle Peak Trail, 6800 feet, 1 (Dec.); Yosemite Falls Trail, 4000 feet, 2 (Dec.); Porcupine Flat, 8100 feet, 2 (June); 1 mi. E Merced Lake, 7500 feet, Yosemite Park, 1 (Aug.); East Fork, Indian Canyon, 7300 feet, 1 (June). *Mono County*: 7500 feet, on William's Butte, 1 (Sept.); Warren Fork of Leevining Creek, 9200 feet, 1 (Sept.); Sweetwater Canyon, 7900 feet, Sweetwater Mts., 2 (June); 7300 feet, nr. Convict Creek, Long Valley, 1 (July). *Fresno County*: Shaver R.S., 5300 feet, 2 (July); Bullfrog Lake, 10,600 feet, 6 (Sept.). *Tulare County*: near Twin Lakes, 2 (Aug.); Redwood Mt., 6500 feet, 10 mi. E Badger, 1 (June); Piute Mt., 9300 feet, 30 mi. S Bishop, 1 (July); Little Onion Valley, Sierra Nevada, 7500 feet, 1 (May); Onion Valley, 8500 feet, Kearsarge Pass, 1 (June); Whitney Creek, 11,000 feet, Sierra Nevada, 3 (Aug.); Silliman Crest, Sequoia Park, 1 (June); Whitney Meadow, 9800 feet, Sierra Nevada, 5 (Aug.); Little Lake, Kern Canyon, 2 (July); Quaking Aspen Meadow, 7500 feet, 1 (July); near Olancho Peak, Sierra Nevada, 10,000 feet, 1 (Aug.); Trout Creek and 4 mi. N Trout Creek, 7500 feet, 5 (July); Cannell Meadow, 7500 feet, 1 (July); Song Meadow, 7700 feet, 1 (July); Taylor Meadow, 7000 feet, 3 (July). *Kern County*: Kiavah Mt., 7000 feet, near Walker Pass, 1 (June); French Gulch and Meadow, 7500 feet, Piute Mts., 2 (Oct.). *Inyo County*: Cottonwood Lakes, 11,000 feet, Sierra Nevada, 6 (Aug.-Sept.); $2\frac{1}{2}$ mi. S and 6 to $8\frac{1}{2}$ mi. W Big Pine, 9000 feet, 7 (June); Independence, 3900 feet, 1 (May); Onion Valley, 9000 feet, $7\frac{1}{2}$ mi. W 2 mi. S Independence, 3 (June); east side Independence Peak, 8500 feet, 3 (May); 6 mi. W $3\frac{1}{4}$ mi. S Lone Pine, 6300 feet, 1 (May); Lone Pine Creek, 8200 feet, $9\frac{1}{2}$ mi. W, $1\frac{1}{4}$ mi. S Lone Pine, 2 (May); Lone Pine Creek, 9500 feet, $2\frac{1}{2}$ mi. E Mt. Whitney, 1 (May); 4 mi. S, 4 mi. W Olancho, 6500 feet, 1 (May); $1\frac{3}{4}$ mi. N, 1 mi. W Round Mt., 8600 feet, 1 (May).

Geographic variation and intergradation.—In Washington and Oregon, *abbreviatus* occurs in typical form in the Cascade Mountains. In the interior mountains to the east a zone of contact occurs with *grinnelli*, as noted in the account of that race. On the basis of the aggregate of characters, I regard

the following atypical specimens from this intergrading area in Washington as closer to *abbreviatus*: *Whatcom County*: Barron and 5 mi. W Barron, 2 (Aug.). *Okanogan County*: Lost River, 1 (June); Mazama, 2 (April); Twisp, 1 (April). *Chelan County*: Lucerne, 1 (July); Entiat River, 20 mi. from mouth, 1 (July); Tyee Peak, 5000 feet, 1 (July). The following intergrades from Oregon are also closer to *abbreviatus*: *Crook County*: Maury Mountains, 1 (June); 4 mi. SW Prineville, 3300 feet, 1 (June); 7 mi. W Prineville, 1 (July).

In the Sierra Nevada of California *abbreviatus* also occurs in typical form as far south as Mount Whitney, where the population starts to intergrade with *baileyae*. Chickadees from as far south as the Piute Mountains, Kern County, are, however, still referable to *abbreviatus*.

Table 3

Measurements of *Parus gambeli abbreviatus*

Dimension	Sex	Number of specimens	Range	Mean with standard error	Standard deviation	Coefficient of variation
Wing	♂	220	63.3-74.2	69.06±0.12	1.96	2.84
	♀	88	62.2-70.7	65.97±0.20	1.88	2.85
Tail	♂	221	53.2-65.4	58.51±0.20	3.03	5.18
	♀	86	52.0-61.9	55.85±0.27	2.54	4.55
Bill from nostril	♂	218	7.1- 9.4	8.18±0.03	0.45	5.61
	♀	85	7.2- 9.1	8.07±0.04	0.41	5.16
Depth of bill	♂	204	3.2- 4.2	3.64±0.01	0.19	5.46
	♀	79	3.1- 4.5	3.58±0.29	0.26	7.32
Bill width	♂	219	3.1- 4.6	3.72±0.02	0.35	9.59
	♀	84	3.0- 4.2	3.67±0.02	0.25	6.91
Weight (grams)	♂	113	10.0-14.3	11.68±0.07	0.78	6.71
	♀	48	9.4-14.5	11.13±0.16	1.11	9.97

Intergradation with *inoensis* occurs in the Mono Lake area of central eastern California. This is discussed in the account of the latter race. Another possible area of contact between *inoensis* and *abbreviatus* is in northeastern California, where some fall examples from eastern Lassen County have flanks that are buff rather than gray, which is an *inoensis* character. Four January specimens from near Susanville are darker than most other examples of *abbreviatus*. These specimens may be vagrants or it may be that this area is one of great variability in the population. Specimens from the Pine Forest Mountains, Humboldt County, Nevada, to the east are referable to *abbreviatus*. A specimen from Minidoka, in central southern Idaho, taken March 25, 1915, is either a vagrant of *abbreviatus* well east of its range or an extreme variant of *grinnelli* that resembles *abbreviatus*.

Parus gambeli baileyae Grinnell

Parus gambeli baileyae Grinnell (1908:29).

Type locality.—Mount Wilson, 5500 feet, San Gabriel Mountains, near Pasadena, Los Angeles County, California.

Racial characters and comparisons.—Characterized by a distinctly plumbeous color on the sides, flanks, and dorsum, heavy bill, especially at the base, and a short tail, the tail being nearly as short as in *abbreviatus*. The color of the dorsum is close to Deep Grayish Olive or Mouse Gray. The flank color is Smoke Gray. This race can be distinguished from *abbreviatus* by its darker, more plumbeous appearance and longer, larger, and heavier bill; the bill is especially thick at the base. As compared with *inoensis*, *baileyae* is considerably darker and more plumbeous, has a shorter tail, and the bill is larger and heavier. It differs from *atratus* in lighter coloration and more extensive white on the head.

Geographic distribution.—*Baileyae* has a discontinuous distribution in the higher mountains of southern California from the Santa Lucia Mountains of Monterey County and the Tehachapi Mountains of Kern County south through the San Gabriel, Santa Ana, San Bernardino, Little San Bernardino, San Jacinto, and Santa Rosa mountains to the Cuyamaca and Laguna mountains in San Diego County. Altitudinal range for nesting birds is from 3000 to 10,600 feet. In winter chickadees of this race are known to occur in the lower valleys at the bases of the mountains, having been recorded from Pasadena and in the desert along the Mohave River at Victorville.

Specimen localities.—CALIFORNIA: *Monterey County*: Santa Lucia Pk., 1 (May); Nacimiento

River, 2000 feet, Santa Lucia Mts., 1 (Aug.). *Ventura County*: Mt. Pinos, 8500 feet, 2 (July). *Los Angeles County*: Pasadena, 3 (Sept.-Oct.); Arroyo Seco Canyon, 1 (Dec.); Mt. Wilson, San Gabriel Mts., 17 (May, Oct., Nov., Dec., Feb.); Buckhorn Canyon, San Gabriel Mts., 2 (July); Old Mt. Wilson Trail, 4000 feet, San Gabriel Mts. near Pasadena, 4 (Mar.-Nov.). *San Bernardino County*: Hog Canyon, Yucaipa, 1 (Jan.); Cajon Canyon, 1 (Dec.); S side Bear Lake, 1 (June); Fawnskin Meadows, Bear Lake, 1 (June); Saragossa Springs, 7500 feet, San Bernardino Mts., 1 (Aug.); Bluff Lake, 7500 feet, San Bernardino Mts., 1 (July); Seven Oaks, 5100 feet, San Bernardino Mts., 1 (July); Fish Creek, 6500 feet, San Bernardino Mts., 1 (July); Dry Lake, 9000 feet, San Bernardino Mts., 1 (June); San Bernardino Mts., 5 (May, June); Santa Ana River, 5500 feet, San Bernardino Mts., 3 (July, Aug.); South Fork Santa Ana River, 7500 feet, 2 (Aug.); San Gordonio Peak, 10,000 feet, San Bernardino Mts., 3 (June, July); Victorville, Mohave River, 2 (Dec.). *Riverside County*: Schain's Ranch, San Jacinto Mts., 4 (June); Fuller's Mill, San Jacinto Mts., 2 (June); Trail between Fuller's Mill and Idyllwild, San Jacinto Mts., 1 (July); Canyon east of Round Valley, 8500 feet, and Round Valley, 9000 feet, San Jacinto Mts., 2 (July); Strawberry Valley, 6000 feet, San Jacinto Mts., 2 (July); Thomas Mt., 6800 feet, San Jacinto Mts., 1 (Aug.); Garnet Queen Mine, 6000 feet, Santa Rosa Mts., 5 (June, July); Santa Rosa Peak, 7500 feet, Santa Rosa Mts., 3 (June); Stubby Spring and 2 mi. N 4500-4750 feet, Little San Bernardino Mts., 8 (Sept., Dec.); Split Rock Tank, 4100 feet, Little San Bernardino Mts., 3 (Oct.); Lower Covington Flat, 5600 feet, 2 (Aug.). *San Diego County*: Julian, 1 (July); Cuyamaca Mts., 6 (Aug., Sept.); Morris Ranch, 5500 feet, Laguna Mts., 2 (Jan.).

Table 4

Measurements of *Parus gambeli baileyae*

Dimension	Sex	Number of specimens	Range	Mean with standard error	Standard deviation	Coefficient of variation
Wing	♂	58	60.0-73.0	68.7 ±0.29	2.28	3.00
	♀	37	63.4-68.7	66.08±0.20	1.22	1.84
Tail	♂	56	54.0-63.3	58.93±0.24	1.90	3.06
	♀	36	54.0-60.3	56.62±0.26	1.57	2.78
Bill from nostril	♂	56	7.9- 9.5	8.51±0.05	0.39	4.65
	♀	33	6.3- 9.2	8.30±0.09	0.52	6.34
Depth of bill	♂	54	3.3- 4.1	3.75±0.02	0.16	4.34
	♀	33	3.0- 4.0	3.58±0.03	0.21	6.00
Bill width	♂	55	3.4- 4.2	3.87±0.04	0.22	5.78
	♀	33	3.2- 4.2	3.74±0.04	0.24	6.54
Weight (grams)	♂	1	12.1			
	♀	2	10.7-11.2			

Geographic variation and intergradation.—While the distribution of this race is discontinuous, there appear to be no significant differences among the populations from different mountain ranges. The only intergradation with a contiguous race occurs in the southern Sierra Nevada where *baileyae* merges with *abbreviatus*. Concerning this Grinnell (1918:512) remarked "Abundant material at hand from that portion of the Sierra Nevada immediately south of Mount Whitney shows complete transition from *Penthestes gambeli baileyae* to *P. g. abbreviatus*; in fact, many of the specimens can only be placed arbitrarily in one category or the other." As noted in the account of *abbreviatus*, Piute Mountains marks the intermediate point in this transition, specimens from south of that point being judged closest to *baileyae*.

Parus gambeli atratus (Grinnell and Swarth)

Penthestes gambeli atratus Grinnell and Swarth (1926:163).

Type locality.—La Grulla, 7200 feet, Sierra San Pedro Mártir, Lower California, México.

Racial characters and comparisons.—The race *atratus* is distinguished by its dark, slaty coloration and reduced amount of white in the superciliary and frontal region. The slate color is most apparent on the rectrices and remiges, especially in birds in fresh fall plumage. The dorsal coloration is Dark Olive and the flank is Light Grayish Olive. Since this form occurs at the southernmost part of the range of the species, it is close geographically only to the race *baileyae*, from which it differs in darker coloration, reduced white in the head region, and slightly longer average tail length.

Geographic distribution.—Sierra San Pedro Mártir and the Sierra Juárez of northern Lower California. In winter these chickadees drop down to lower levels (see Grinnell, 1928:223).

Specimen localities.—LOWER CALIFORNIA: Vallecitos, 8500 feet, San Pedro Mártir Mts., 8 (May, June); Concepción, 6000 feet, San Pedro Mártir Mts., 1 (Nov.); La Grulla, 7200 feet, San Pedro Mártir Mts., 14 (May, Oct.); Laguna Hanson, 5200 feet, Sierra Juárez, 14 (Oct.); Los Pozos, 4200 feet, Sierra Juárez, 1 (Nov.); El Valle de la Trinidad, 2500 feet, 2 (Nov., Dec.).

Table 5
Measurements of *Parus gambeli atratus*

Dimension	Sex	Number of specimens	Range	Mean with standard error	Standard deviation	Coefficient of variation
Wing	♂	21	66.1–72.6	68.24±0.45	2.08	3.05
	♀	20	63.0–68.7	66.52±0.65	2.94	4.27
Tail	♂	21	54.6–62.6	59.20±0.40	1.84	3.11
	♀	19	53.0–60.9	58.28±0.47	2.09	3.58
Bill from nostril	♂	20	7.5– 8.7	8.18±0.06	0.30	3.73
	♀	20	7.7– 9.0	8.38±0.08	0.37	4.41
Depth of bill	♂	20	3.4– 4.4	3.88±0.06	0.27	7.24
	♀	20	3.5– 4.5	3.76±0.05	0.24	6.38
Bill width	♂	20	3.4– 4.4	3.72±0.05	0.23	6.34
	♀	20	3.3– 4.3	3.76±0.06	0.26	7.18
Weight (grams)	♂	19	10.0–12.2	11.23±0.14	0.62	5.62
	♀	20	8.2–12.1	10.45±0.18	0.83	7.99

Geographic variation and intergradation.—The race *atratus* is isolated from its only neighboring race, *baileyae*, to the north but the hiatus is not appreciably greater than that between some of the populations in the discontinuous range of the wider-ranging, more northern race. Since *baileyae* is darker than *abbreviatus* and *atratus* is darker than *baileyae*, *atratus* occupies a terminal position in a north-south cline toward darker coloration. This is not peculiar to chickadees, for Grinnell and Swarth (1926:164) point out that many other geographically variable birds from this same region have their dark colors accentuated. This suggests that some environmental effect in the Sierra San Pedro Mártir makes for darker pigmentation. For a further discussion of this center of differentiation see Grinnell (1928:8).

Parus gambeli inyoensis (Grinnell)

Penthestes gambeli inyoensis Grinnell (1918:509).

Type locality.—Three miles east of Jackass Spring, 6200 feet, Panamint Mountains, Inyo County, California.

Racial characters and comparisons.—Characterized by light buffy coloration on the dorsum, sides, and flanks; this is the lightest of all the races and it possesses a long, narrow bill. The light color is most apparent in fresh fall plumage and is rapidly affected by wear and fading, so that birds come to be more ashy in worn plumage; yet this race is still lighter than other races at comparable stages of wear and fading. The flanks are Cartridge Buff with the dorsum slightly darker, more like Cream Buff. The race *inyoensis* can be distinguished from *baileyae* by its much paler, buffy, less plumbeous appearance, narrower bill, and longer tail. As compared with *abbreviatus* it is lighter, less plumbeous on the back with buffy rather than gray flanks, and it has a smaller, narrower bill and longer tail. *Inyoensis* shares the same bill type with *wasatchensis* and, as in that race, the flanks and sides are buffier than the back, but the appearance is generally lighter, more buffy, and less greenish. The average tail length is slightly shorter.

Geographic distribution.—Extreme southeastern Oregon, extreme southwestern Idaho, extreme western Utah, Nevada (except northwestern portion), higher mountains of eastern California east and southeast of the Sierra Nevada from the vicinity of the Mono Craters and the White Mountains in Mono County south along the Inyo Mountains to and including the Grapevine, Panamint, and Argus mountains in Inyo County, and Clark Mountain in eastern San Bernardino County.

Specimen localities.—CALIFORNIA: *Inyo County*: Havaupah Canyon, 7500 feet, Panamint Mts., 2

(May); 3 mi. E Jackass Spring, 6200 feet, Panamint Mts., 13 (Oct.); Roberts Ranch, 8300 feet, Wyman Creek, White Mts., 2 (Aug., Sept.); Silver Canyon, 8000 feet, 7 mi. E Laws, White Mts., 5 (July); White Mts., 2½ mi. SE of head of Black Canyon, 8000 feet, 2 (July); 5 mi. up Bishop Creek Canyon, 3 (Dec.); Mazourka Cañon, 8000–10,000 feet, 3 (May); E base Waucoba Mt., 7300 feet, 1 (June). *San Bernardino County*: N side Clark Mt., 7100–7300 feet, 3 (May). *Mono County*: Benton and vicinity, 5639 to 7500 feet, 16 (June, Sept.); Big Prospector Meadow, 10,300 feet, White Mts., 5 (July); Mono Mills, Mono Lake, 1 (June); 5 mi. E, 1 mi. S Mono Mills, 8300 feet, 4 (June); Pellisier Ranch, 5600 feet, 5 mi. N Benton, 1 (Sept.); McCloud Camp, Cottonwood Creek, White Mts., 3 (July, Aug.). NEVADA: *Douglas County*: Desert Creek, 6250 feet, Sweetwater Range, 1 (June). *Mineral County*: N base White Mts., [= Queens Canyon], 11¼ mi. NE Benton Sta., 7200 feet, 2 (Sept.). *Esmeralda County*: Pinchot Creek, 8200 feet, White Mts., 1 (June); 2½ mi. S Cave Spring, 8000 feet, 1 (June); Chiatovich Creek, 8200 feet, 1 (May). *Nye County*: N Slope Toquima Mt., 9000 feet, 1 (July); Quinn Canyon Mts., Burned Corral Canyon, 6800 feet, 1 (July); Mohawk R.S., 1 (June); Wisconsin Creek, and vicinity, 8600 feet, 9 (May); 2½ mi. E, 1 mi. S Grapevine Peak, 6700 feet, 8 (June); 5 mi. W White Rock Spring, 6950 feet, Belted Range, 1 (May). *Lander County*: Kingston Creek, 8000 feet, 2 (Sept.); 2 mi. E Carroll Summit, 6800 feet, 2 (Aug.); Birch Creek, 7000 feet, 13 (Aug., Sept.); Kingston R.S., 7500–8000 feet, 21 (June, Sept.); Mahogany Cañon, 7700 feet, 6 (June, Aug.). *Clark County*: N side Potosi Mts., 7000–8000 feet, 3 (June); Head of Clark Cañon at Sawmill Creek, 8600 feet, Charleston Mts., 1 (June); Lee Cañon, 9000 feet, Charleston Mts., 9 (July, Sept.); Sheep Mts., 6 (Sept.). *Lincoln County*: Springer Springs, 7000 feet, Mt. Irish, 3 (Sept.). *White Pine County*: White Pine Mts., 8700 feet, 3 mi. W Hamilton, 1 (Aug.); Lehman Creek, 7500–8000 feet, 10 (May, Sept.); Baker Creek, 7500–9500 feet, Snake Mts., 13 (Sept.); Willow Creek, 12 mi. S White Pine County Line, Ruby Mts., 2 (May, June); West side Ruby Lake, 3 mi. S White Pine County Line, 6700 feet, 4 (Oct.); E side Schelbourne Pass, 6800 feet, 1 (Sept.). *Elko County*: Bear Creek, 8000 feet, Jarbidge Mts., 19 (Sept.); 9 mi. NE Wells, 6000 feet, 9 (Sept.); W side Ruby Lake, 6 mi. N Elko County Line, 1 (Dec.). *Humboldt County*: Martin Creek, R.S., 7000 feet, Santa Rosa Mts., 20 (June, Sept.). UTAH: *Washington County*: 3–5 mi. E Pine Valley, 7200–8700 feet, Pine Valley Mts., 14 (June, Sept.). *Juab County*: S end Deep Creek Mts., 5500 feet, 11 mi. W Trout Creek, near Utah-Nevada border, 5 (May); Queen of Sheba Mine, 8000 feet, W side Deep Creek Mts., 27 (May, June, Sept.); 6 mi. E Indian Village, 8000 feet, Deep Creek Mts., 3 (July). *Boxelder County*: Pilot Mountain, 1 (July); George Creek, 7500 feet, Raft River Mts., 5 mi. S Yost, 9 (May); Clear Creek, 7500 feet, N slope Raft River Mts., 5 mi. SW Nafton, 5 (May); One Mile Canyon near Standrod, Raft River Mts., 6 (May, Aug., Sept.). IDAHO: *Cassia County*: Mt. Harrison, 10 mi. S Albion, 1 (June); Corner Canyon, 4 mi. N Elba, 1 (June). OREGON: *Malheur County*: Rome, Owyhee River, 2 (Oct.).

Geographic variation and intergradation.—Series from central northern Nevada (Santa Rosa, Ruby and Jarbidge mountains) have a lighter dorsal coloration than topotypical birds from the Panamint Mountains, Inyo County, California, and have more white on the head, suggesting that this geographical region is the center of differentiation for the race and that the type locality may be somewhat marginal. The bill, however, is slightly smaller in the northern Nevada birds.

The races *inyoensis* and *abbreviatus* doubtless blend in southern Oregon, but the area of merging is unknown. A single specimen from Rome, Owyhee River, Malheur County, Oregon, taken October 24 is very pale with buffy flanks, being similar to those from Bear Creek in the Jarbidge Mountains, Nevada, and thus it represents *inyoensis*. It was referred to *grinnelli* by Gabrielson and Jewett (1940:434). A December specimen taken not far distant at Ironside, Willow Creek, Malheur River, is darker and grayer on the back and flank, thus being referable to *abbreviatus*.

Specimens from northwestern Nevada (Pine Forest Mountains, Humboldt County) are closer to *abbreviatus* as Grinnell (1918:312) noted. He pointed out that the coloration of these birds approaches *inyoensis* but the tail averages nearly as short as in *abbreviatus*. The flanks are gray as in *abbreviatus*.

Another point of contact between *inyoensis* and *abbreviatus* is in the Mono Lake area. Grinnell (1918:512) comments that several examples from along the east flank of the Sierra Nevada in Inyo County insensibly bridge the interval between the two races. Some additional specimens demonstrating this are fall-taken examples from the Benton area, 7000 feet, Mono County, California, and from Bishop Creek Canyon, Inyo County, California. They are grayer and less buffy than *inyoensis* and

thus show intergradation with *abbreviatus*. In addition to these intermediate forms, one finds from this area of increased variability extremes resembling different races. For instance, an immature male from Pellisier Ranch, 5600 feet, 5 miles north of Benton, taken September 19, 1917, has the bill type of *inyoensis* but resembles *gambeli* in its rich, brown dorsum. This might be interpreted as an example of extreme foxing except that the flanks are cinnamonaceous as in *gambeli*. This blending of *inyoensis*

Table 6
Measurements of *Parus gambeli inyoensis*

Dimension	Sex	Number of specimens	Range	Mean with standard error	Standard deviation	Coefficient of variation
Wing	♂	188	64.5-75.0	69.41±0.17	2.04	2.93
	♀	121	62.3-70.5	66.47±0.17	1.91	2.87
Tail	♂	188	54.0-69.4	61.70±0.17	2.32	3.77
	♀	120	54.7-66.0	59.69±0.18	2.02	3.38
Bill from nostril	♂	182	7.5- 9.2	8.33±0.03	0.42	5.04
	♀	116	7.3- 9.3	8.28±0.03	0.41	4.97
Depth of bill	♂	165	3.0- 4.2	3.45±0.02	0.33	9.77
	♀	108	3.0- 4.0	3.44±0.02	0.21	6.20
Bill width	♂	180	2.6- 4.3	3.63±0.01	0.18	5.05
	♀	116	3.0- 4.2	3.60±0.01	0.16	4.68
Weight (grams)	♂	119	9.5-12.9	11.18±0.06	0.73	6.61
	♀	78	9.1-13.2	10.48±0.15	1.42	13.50

and *abbreviatus* apparently does not occur much farther north than the Mono Lake area, for examples from the Sierra Nevada north of this point are good *abbreviatus*. It probably does not extend very far to the south either, because there is a barrier between the two races in the nature of the abrupt east face of the Sierra Nevada and the Owens Valley at the base of these mountains.

Parus gambeli wasatchensis Behle

Parus gambeli wasatchensis Behle (1950:273).

Type locality.—Silver Lake Post Office (Brighton), 9000 feet, head of Big Cottonwood Canyon, Salt Lake County, Utah.

Racial characters and comparisons.—This population is distinguished by dorsal coloration that is intermediate between *inyoensis* and *gambeli*. *Wasatchensis* is closest to *inyoensis*, showing the same bill type and buffy flank color, but the dorsum is slightly darker, having a greener, less grayish-pink cast; and while the wing lengths are virtually the same, the tail of *wasatchensis* is slightly longer. *Wasatchensis* differs from *gambeli* in having a less brownish dorsum and a longer, more attenuated bill. From *grinnelli*, *wasatchensis* may be told by its longer, more tapering bill and lighter dorsum. The greenish cast to the dorsum of *wasatchensis* shows closer affinity to *grinnelli* than to *gambeli* with its brown cast.

Geographic distribution.—Mountains of central and southern Idaho and of Utah, except along extreme eastern and western margins of that state.

Specimen localities.—IDAHO: *Valley County*: 5 mi. E Warm Lake, 7000 feet, 1 (July); 5 mi. W Cape Horn, Sawtooth Range, 1 (July). *Adams County*: 3 mi. W Payette Lake, 5400 feet, 3 (July). WYOMING: *Uinta County*: Fort Bridger, 6700 feet, 1 (Sept.). UTAH: *Summit County*: Smith Morehouse Creek, Weber River, 1 (Oct.). *Duchesne County*: 4 mi. up Brown Duck Canyon, northwest Moon Lake, 9000 feet, Uinta Mountains, 2 (Sept.). *Uintah County*: head of Ashley Creek, 9500 feet, near Trout Creek Park, 20 mi. NW Vernal, 6 (Sept.). *Davis County*: Bountiful Peak Picnic Ground, 8500 feet, head of Farmington Canyon, 1 (Nov.). *Tooele County*: Stansbury Mountains, 16 (April, July, Aug., Oct., Nov.); Onaqui Mountain, 1 (Nov.); Sheep Rock Mountains, 3 (May, July); Cedar Mountains, 2 (Jan., Sept.). *Salt Lake County*: Silver Lake P. O. (Brighton), 8750 feet, head of Big Cottonwood Canyon, Wasatch Mountains, 23 (June, Aug., Sept.); Bell's Canyon, 7800 feet, 18 mi. SE Salt Lake City, 1 (Sept.). *Garfield County*: 1 mi. E Jacobs Reservoir, 10,500 feet, Aquarius Plateau, 10 (June); Boulder, 6200 feet, 1 (July); 5 mi. N Boulder, 7500 feet, SE Base Aquarius Plateau, 1 (June). *Kane County*: Duck Creek Ranger Station, 8600 feet, 22 mi. SE Cedar City, 12 (June);

Navajo Lake, 9500 feet, 3 (July); Red Canyon, 5700 feet, 6 mi. N Kanab, 4 (Dec.); Tinny Canyon, 5400 feet, 4 mi. NW Kanab, 3 (Sept., Dec.).

Table 7
Measurements of *Parus gambeli wasatchensis*

Dimension	Sex	Number of specimens	Range	Mean with standard error	Standard deviation	Coefficient of variation
Wing	♂	43	67.3-73.3	69.95±0.22	1.49	2.13
	♀	33	64.3-69.0	66.41±0.22	1.31	1.97
Tail	♂	42	59.0-68.7	63.18±0.35	2.31	3.66
	♀	33	58.0-65.8	60.54±0.30	1.72	2.85
Bill from nostril	♂	42	7.9- 9.4	8.51±0.09	0.59	7.01
	♀	33	7.3- 9.5	8.50±0.07	0.40	4.74
Depth of bill	♂	39	3.0- 4.1	3.48±0.04	0.26	7.61
	♀	32	3.2- 4.4	3.40±0.48	0.27	8.12
Bill width	♂	41	3.2- 4.4	3.83±0.04	0.25	6.69
	♀	33	3.1- 4.5	3.66±0.05	0.33	9.17
Weight (grams)	♂	14	10.3-12.6	11.56±0.17	0.67	5.82
	♀	8	9.3-12.0	10.51±0.33	0.95	9.08

Geographic variation and intergradation.—Typical examples of *wasatchensis* occur in the Wasatch and Uinta mountains of northern Utah and south throughout the mountains and high plateaus of the central part of the state. In surrounding areas this race intergrades with neighboring races. As noted in the account of *gambeli*, intergradation with that race occurs in northern Arizona and extreme southeastern Utah along the Colorado border as well as in northwestern Wyoming and extreme northeastern Idaho. Intergradation occurs with *grinnelli* in central Idaho. Specimens from 5 miles east of Warm Lake and 5 miles west of Cape Horn, Sawtooth Range, Valley County, and 3 miles west of Payette Lake, Adams County, are intergrades but are closest to *wasatchensis*. The race *grinnelli*, as previously noted, occurs in typical form in Kootenai and Bonner counties. To the west in Utah a cline exists across the eastern part of the Great Basin whereby *wasatchensis* and *inyoensis* blend from one isolated desert range to the next. This is similar to the gradual blending over a long gradient of *grinnelli* and *abbreviatus* in central Oregon and Washington and between *abbreviatus* and *baileyae* in the southern Sierra Nevada. Specimens from the Stansbury Mountains are somewhat arbitrarily considered closer to *wasatchensis* and those from the Deep Creek Mountains are closer to *inyoensis*. The series from the Pine Valley Mountains in southwestern Utah is referable to *inyoensis*. Specimens from the Raft River Mountains in northwestern Utah could be referred in either direction but I have placed them with *inyoensis* along with some taken in adjacent Cassia County, Idaho.

SUBSPECIATION IN *Parus gambeli*

Within the species at the present time seven geographic races are known, representing different degrees of differentiation. They may be placed in several groups. One group occurs in the Rocky Mountains and is represented by the races *gambeli* and *grinnelli*. Members of the "*gambeli* group" are distinguished by a short, stubby bill type, cinnamonaceous color of sides and flanks, long tails, and similar wing-tail ratio even though there are absolute size differences between the two races. In the interior Great Basin and adjacent areas a second group is represented by *inyoensis* and *wasatchensis*. This may be termed the "*inyoensis* group." The members have the same type of long, slender bill, pale buffy color of sides and flanks, and generally pale coloration throughout. The third stock, the "*abbreviatus* group," ranges through the Cascade-Sierra Nevada Cordillera and detached mountain masses of southern California and northern Lower California and is represented by the races *abbreviatus*, *baileyae*, and *atratus*. Characteristics of this group are a short tail, heavy and moderately long bill type, and prevailing gray coloration. These races differ among themselves primarily in the degree of darkness of gray coloration.

While the races and groups are based on external morphological characters, differences in behavior and ecology probably would be shown to occur if intensive field studies were made. In this connection it is interesting to note that Miller (1934:163) detected a difference in song between representatives of *wasatchensis* heard at Cedar Breaks National Monument, Utah, and chickadees of the Sierra Nevada region representing *abbreviatus* or *baileyae*. He states: "I noted repeatedly that the songs of this chickadee consist of two groups of notes separated by three or more half tones of pitch. In contrast to this type of song are those of the races *P. g. baileyae* and *abbreviatus* in which the greatest interval of pitch with rare exceptions is no larger than one whole tone."

The existence of several races of different degrees of differentiation poses questions of whether they have become differentiated in their present environments or have pushed in from other areas and whether they are in process of diverging or merging. Perhaps the well-marked races, *gambeli*, *abbreviatus*, *atratus*, and *inyoensis*, with their different environments, represent older, stabilized, even parental stocks that have developed *in situ* in the respective centers of the Rocky Mountains, Cascade-Sierra Cordillera, Sierra San Pedro Mártir, and Great Basin, whereas *baileyae*, *grinnelli* and *wasatchensis* are younger races that are more recently formed as intermediate populations resulting from introgression. Incidentally a conservative view would be to recognize by name only the well-marked races *gambeli*, *abbreviatus*, *atratus*, and *inyoensis*. This, however, would not reveal the true picture of variation and subspeciation. *Grinnelli* is situated between *gambeli* and *abbreviatus*. While its small size is distinctive and its bill type is that of *gambeli*, the gray-green dorsal coloration might have arisen from a blending of the brown of *gambeli* and the gray of *abbreviatus*. Variation in flank color is erratic, showing in many examples of *grinnelli* features of one or the other neighboring races. This suggests an origin by introgression. Opposed to this interpretation is the circumstance that the northern Idaho region is a differentiation center for different races of several other species of birds. *Wasatchensis* similarly is situated between *inyoensis* and *gambeli*. The dorsal color tone is intermediate between these races. The bill type, however, is clearly that of *inyoensis*. The range of *abbreviatus* covers a very large area, whereas that of *baileyae* is restricted; and, furthermore, chickadees of this latter race occur in isolated populations on separate mountain ranges. The race *baileyae* may have arisen from the blending of *abbreviatus* and a relict *atratus* stock or it simply may be an intermediate differentiate between the other two races along a step gradient. *Atratus* may not be a relict stock, for again the San Pedro Mártir region where it exists is a differentiation center. Geographic intergradation has been shown to be present between all neighboring races except *baileyae* and *atratus*, between which a geographic hiatus exists. Intergradation occurs between these two races by virtue of individual variation. Regardless of the mode of origin of the several races, the species *Parus gambeli* is a "plastic" species composed of several populations of subspecific rank. These represent at least two levels of differentiation.

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