

THE ORIGIN AND DISTRIBUTION OF THE CHEST-
NUT-BACKED CHICKADEE.

BY JOSEPH GRINNELL.

THE Chestnut-backed Chickadee (*Parus rufescens*) is a boreal species of peculiarly limited distribution. It is almost exclusively confined to the humid Pacific Coast region of North America, within which it is the most abundant, and in many places the only, member of the genus *Parus* present. We find it characteristically at home within the densest coniferous forests, or along their edges, where there is much shade and an even temperature.

The range of the Chestnut-backed Chickadee is nearly two thousand miles long north and south, extending from a little north of Sitka, Alaska, to some forty miles below Monterey, California. (See Map I.) But its width is very narrow, only within the confines of Oregon and Washington exceeding one hundred miles and elsewhere usually much less, save for one or two isolated interior colonies to be mentioned later.

The influences determining this queer-shaped distribution area may be safely assumed to be atmospheric humidity, with associated floral conditions. For this habitat coincides quite accurately with the narrow coastal belt of excessive cloudy weather and rainfall.

The specific character distinguishing *Parus rufescens* from all other American chickadees is the color of the back, which is an intense rusty brown approaching chestnut. It is of common note that the most evident effects of similar climatic conditions on other animals is a corresponding intensification of browns, especially dorsally. We may therefore consider the Chestnut-backed Chickadee, as indicated by its chief specific character, to be a product exclusively of the peculiar isohumic area to which we find it confined.

Parus rufescens, from Sitka to Monterey, has a chestnut-colored back. And from Sitka to Point Arena, between which we find the extremest humidity, another conspicuous character is uniform,—the color of the sides, which are also deep rusty brown. But from Point Arena south to San Francisco Bay (Marin District), these

lateral brown areas suddenly weaken to pale rusty; while from San Francisco south past Monterey (Santa Cruz District), adult birds have the sides pure smoke gray without a trace of rusty. (See Map II.)

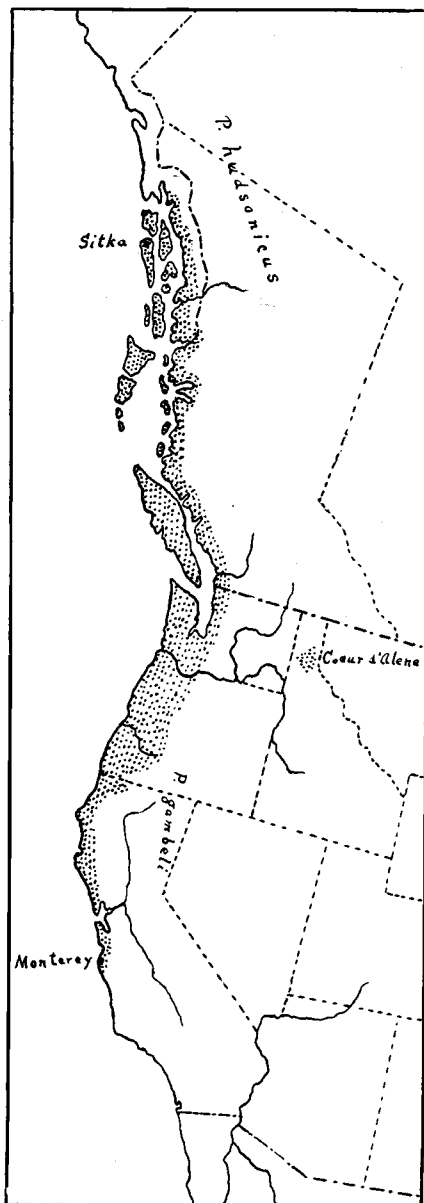
The species thus presents geographic variation within itself, and three distinguishable forms have been named, respectively, the Chestnut-sided Chickadee (*Parus rufescens rufescens*), the Marin Chickadee (*Parus rufescens neglectus*), and the Santa Cruz Chickadee (*Parus rufescens barlowi*). But all three subspecies are unmistakably the Chestnut-backed Chickadee (*Parus rufescens*). (For detailed descriptions, distribution and synonymy see beyond.)

This southward paling of the lateral feather tracts seems to be parallel to the relative decrease in the humidity of the regions occupied. But still, even the Santa Cruz District with its gray-sided *barlowi* has very much greater rainfall and cloudiness than regions immediately to the southward and interiorly. The too abrupt aridification with accompanying sudden floral changes apparently forms the present barrier to further distribution in these directions.

The paling of the sides in the southern bird seems to be a secondary condition, as I hope to show further on by age comparisons. We can reasonably infer that *Parus rufescens rufescens* was the ancestral form from which *Parus rufescens neglectus* and then *Parus rufescens barlowi* successively arose through exodus distally from its point of differentiation further north, where the faunal conditions were doubtless then as now most effective.

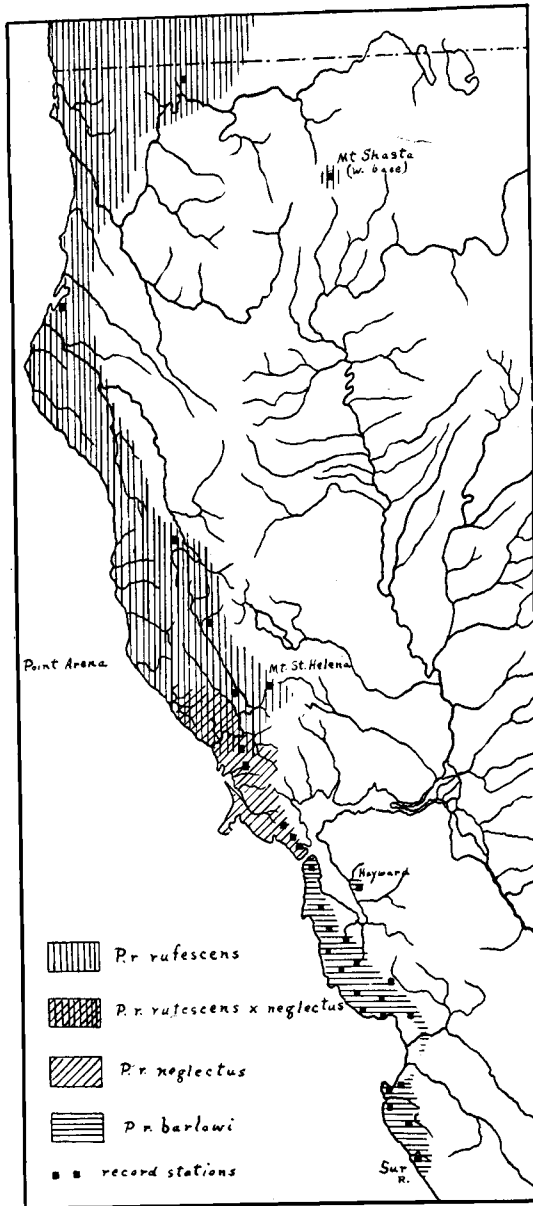
First, as to the origin of the species, *Parus rufescens*. Can we find a chickadee now occupying a faunal area which can be considered as nearer the common ancestral form than *rufescens* now is?

An affirmative answer seems plausible when we come to consider *Parus hudsonicus*, which occupies the interior of Alaska and British Columbia east to Labrador and Nova Scotia. This wide-ranging boreal species also affects coniferous forests, and according to my own experience possesses life habits quite similar to those of *Parus rufescens*; in fact to me indistinguishable. The latter differs from *Parus hudsonicus* in smaller size and particularly in shortness of tail. The color areas on the two species are coextensive, but the colors themselves are different in intensity. The top of the



MAP I.

(Dotted area = range of *Parus rufescens*.)



MAP II. RANGES IN CALIFORNIA OF THE RACES OF *PARUS RUFESCENS*.

head in *hudsonicus* is broccoli brown, while in *rufescens* it is dark hair brown. The back of *hudsonicus* is pale grayish olive brown, while in *rufescens* it is chestnut brown. The sides and flanks of *hudsonicus* are rather pale hazel brown, while in *rufescens* they are deep hazel brown—approaching chestnut. Otherwise the two species look practically alike.

These differences are just those we find so commonly in two conspecific representatives, one occupying an arid habitat, the other a comparatively more humid one. Indeed we can find exactly parallel cases in certain other bird races occupying the same two regions as the chickadees in question, but which as yet are not disconnected by intermediates, and in which the degree of difference is not so great. (For example, *Melospiza lincolni lincolni* and *Melospiza lincolni striata*, and *Regulus calendula calendula* and *Regulus calendula grinnelli*.) It is the same story, of intensification of browns and decrease in size under the conditions of a moist climate.

As to the greater relative decrease in length of tail in *rufescens*, it may be suggested that it is an observed rule among the Paridæ (and in some other birds of similar habits, though not without exception) that those species which habitually forage highest above the ground in the foliage of tall trees possess the relatively shortest tails, while conversely those which haunt low thick trees or underbrush exhibit the greatest caudal development. (For example, *Psaltriparus* and *Chamæa*.) These conditions doubtless bear some definite relation to mode of flight. The shorter the flights the slower they are, and therefore the greater must be the tail surface distally in furnishing sufficient opposition to the air to direct or arrest flight. At any rate, *rufescens* haunts much higher and more open trees than *hudsonicus*.

It seems to me reasonable to suppose that *Parus hudsonicus* approaches closely the common ancestral form. Its wide range, which, if we take the Old World *Parus cinctus* of such close resemblance as conspecific, is almost holarctic, favors this idea. At some early period there may have been no representative of *Parus* in the Northwest Coast belt. By a process of invasion of individuals of the hypothetical stock form (which we may call *Parus pre-hudsonicus*) from the adjacent region, and their subsequent

gradual response to the new set of environmental factors, a geographical race became differentiated which might have then been properly called *Parus pre-hudsonicus rufescens*.

Unfortunately this process, which I believe to be constantly going on among all animals, is so slow that its actual operation under natural conditions has so far defied direct observation and measurement during a man's lifetime. But it seems quite logical to consider the natural process identical with that under 'artificial' conditions, where the rate is readily perceptible.

We seem warranted in considering all observed living forms, including 'species,' and completely isolated (insular) as well as intergrading 'races' as just a momentary glimpse, so to speak, of a tree-like branchwork slowly rising through time, some of the limbs ramifying freely and rapidly, others growing slenderly without offshoots, but all advancing continually, though changing in outward appearance at different rates; only we at our brief glance can see but a horizontal section, that is, only the set of *tips* of this otherwise ancestral tree.

Accepting this standpoint as the most reasonable hypothesis yet presented, and moreover not at variance with our facts, I feel justified in judging of the methods of ramification and progress through time from observation of the existing set of 'tips' (= species and subspecies). Among these, from the nature of the case, we should be able to recognize various stages in the process of species formation, and from these judiciously selected steps demonstrate the completed stairway which leads up from the very incipiency of differentiation (as impossible of ultimate detection by us as the vanishing point) to the complete separation of two distinct species. The steps are of course really infinite in number, like the points in a geometrical line; the transition proceeds gradually without a break.

In tracing the hypothetical lines of development of the chickadees, I do not feel guilty of bold speculation; for I am only attempting to express in a selected case what is to me clearly evidenced from a survey of bird races in general.

As has already been asserted, *Parus rufescens* doubtless arose as a geographical race of *Parus pre-hudsonicus*. It is now called a 'species' because intermediates have dropped out; in other

words, the divarication is now wholly complete and there are two separate twigs. The area of intermediate faunal conditions between the humid coast belt and the arid interior region of British Columbia and Alaska is very narrow, consisting, in places personally traversed by me, of but a few miles over a mountain ridge. This very narrowness of the area of faunal mergence probably accounts for the lack of intermediates at the present day between *hudsonicus* and *rufescens*.

[The center of distribution of any animal is where the greatest rate of increase is. The greatest rate of reproduction is presumably where the species finds itself best adapted to its environment; and this is also where the death rate is least, unless an enemy rapidly multiplies so as to become a serious check. In a wide-ranging species, or one that is rapidly spreading over a region of varying climatic and associated conditions, sub-centers of distribution will arise at points which prove to be more favorable, in point of food supply and minimum of enemies, than intervening areas. From each of these new centers of distribution there will be a yearly radiating flow of individuals into the adjacent country, so as to escape intra-competition at any one point.]

Such centers of distribution will obviously, as time goes on, harbor only locally pure-bred individuals, for foreign individuals will not stem the tide of population from season to season slowly emigrating. This will amount to operative isolation and allow of the time necessary for the impress, by local factors of environment, of incipient characters, which, through cumulative inheritance as the element of time further increases, become to us perceptible and characterize this set of individuals as a geographical race or 'subspecies.'

Let us suppose that descendants from the interior *Parus pre-hudsonicus* from season to season pushed their way further and further into the primæval coast belt until the latter supported a vigorous colony. The coastal humidity was very likely at that time but slightly greater than that of the interior, having gradually increased through slow shifting of ocean currents or other causes, so that the faunal boundary was not so abrupt and did not then as now constitute a formidable barrier to invasion.

Faunal conditions are without doubt undergoing constant alter-

ation. Endemic animals must adaptively respond or else be exterminated or restricted to the places where faunal change is slowest. The possibility at once presents itself of *Parus pre-hudsonicus* having been already native of the coast before the latter became faunally distinct from the interior. But in either case the original populating of the region must have been through invasion from elsewhere, as effected by shifting climatic conditions.

At any rate a center of distribution must have arisen in the new region of different faunal conditions. Just as quick as the new colony began to reproduce fast enough to furnish a return flow of individuals the immigration of individuals bearing the inherited stock characters from the parent region would be checked. This would mean that the new colony would become a new center of differentiation because of the isolation thus afforded. (As to what brings about the acquisition or change of innate characters, whether by natural selection or some other more direct cause, we need not here try to discuss.)

As the dissemination of individuals to prevent congestion of population will be continually away from the centers of distribution, it follows that the characters newly acquired at the centers where the rate of differentiation is greatest will be constantly carried away from those centers. If the region of intermediate faunal conditions were narrow, as in the present case, individuals bearing the inherited characters impressed by their separate areas of differentiation would from generation to generation invade toward each other until intermediates would be swamped, or there might be an unfit strip left between where neither would flourish. This might be bridged over by hybrids for a while. But the specific characters becoming strengthened by time would make hybridization less and less likely to take place, and there would result the two distinct species as we now know them.

In the case of *Parus rufescens* and *Parus hudsonicus* there seems to be now a narrow hiatus between the two. At least I can find no record of the two species having been found in the same locality. The narrowness of the region of intermediate faunal conditions may therefore be considered as the reason why we do not find connecting links between *hudsonicus* and *rufescens* at the present time. For the amount of difference between these two chicka

dees does not strike me as any greater than, for instance, between *Melospiza cinerea montana* and *Melospiza cinerea rufina*, between which there is continuous distribution and free interosculation. [But we cannot expect any two species of birds or other animals to present the same degrees of differentiation in the same length of time or under the same conditions, much less under different conditions. For in no two animals is the physical organization in all respects exactly the same.]

In a given aggregation of individuals constituting a new colony a certain amount of time is necessary for the set of environmental factors to become operative in bringing about new inheritable characters to a degree perceptible to us. Then the inherited effects of invasion and crossbreeding from season to season from the adjacent parent center of differentiation will be evidenced less and less, as time elapses, as the distance from this center increases. The offspring of successively further removed unions will, of course, inherit to a less and less degree the distinctive characters of the ancestral stock on one side and more and more of the incipient ones on the other.

If, now, the distance is great enough to permit of the time required for adaptive manifestations to become innate, then we would find new characters making their appearance distally nearest the new center of differentiation. If the distance were too short we would not find new characters showing themselves because they would be constantly crowded down by the influx of the old. The time factor may therefore be reduced by the intervention of an impassable barrier. As an instance we find three (and there are probably two other) insular forms of the Song Sparrow within a limited distance among the Santa Barbara Islands, while through the same distance on the adjacent mainland there is but one. Or in the case of continuous distribution the time element may be comparatively lessened by the great distance between the range limits, and it may be still further decreased as these limits lie in faunal areas of more emphatically different nature. The Horned Larks as well as Song Sparrows furnish us several good examples of the latter two rules.

It is *isolation*, either by barriers or by sufficient distance to more than counterbalance inheritance from the opposite type, that seems

to me to be the absolutely essential condition for the differentiation of two species, at least in birds.

A strong argument in support of this conviction is that we never find two 'subspecies' breeding in the same faunal area, and no two closely similar species, except as can be plainly accounted for by the invasion of one of them from a separate center of differentiation in an adjacent faunal area. An appropriate instance in illustration of the latter is the occurrence together in the Siskiyou Mountains of northern California of the brown *Parus rufescens* of the wet coastal fauna and the gray *Parus gambeli* of the arid Sierran fauna. (See Anderson & Grinnell, Proc. Ac. Nat. Sc. Phila., 1903, p. 13.) The Siskiyou Mountains occupy a line of mergence between the two faunæ, and the two respectively representative chickadees have evidently extended their ranges toward each other until now over this one small area they occupy common ground. Several parallel cases could be cited; their significance seems obvious.

We come now to consider the origin of the races of *Parus rufescens*. In a species of recent arrival into a new region (by invasion from a neighboring faunal area), as it adapts itself better and better to its new surroundings, granted the absence of closely related or sharply competing forms, its numbers will rapidly increase. This means that there will be increased competition within the species itself, on account of limited food supply. The alternative results are either starvation for less vigorous individuals during recurring seasons of unusual food scarcity, or dissemination over a larger area. In a way the first might be considered as beneficial in the long run, as doubtless leading to the elimination of the weaker; such a process evidently does take place to a greater or less degree all the time, and is important for the betterment of the race. But as a matter of observation Nature first resorts to all sorts of devices to ensure the spreading of individuals over all inhabitable regions; in other words, the extremest intra-competition does not ensue until after further dissemination is impossible. In birds we find a trait evidently developed on purpose to bring about scattering of individuals. This is the autumnal 'mad impulse' which occurs just after the complete annual moult, when both birds-of-the-year and adults are in the

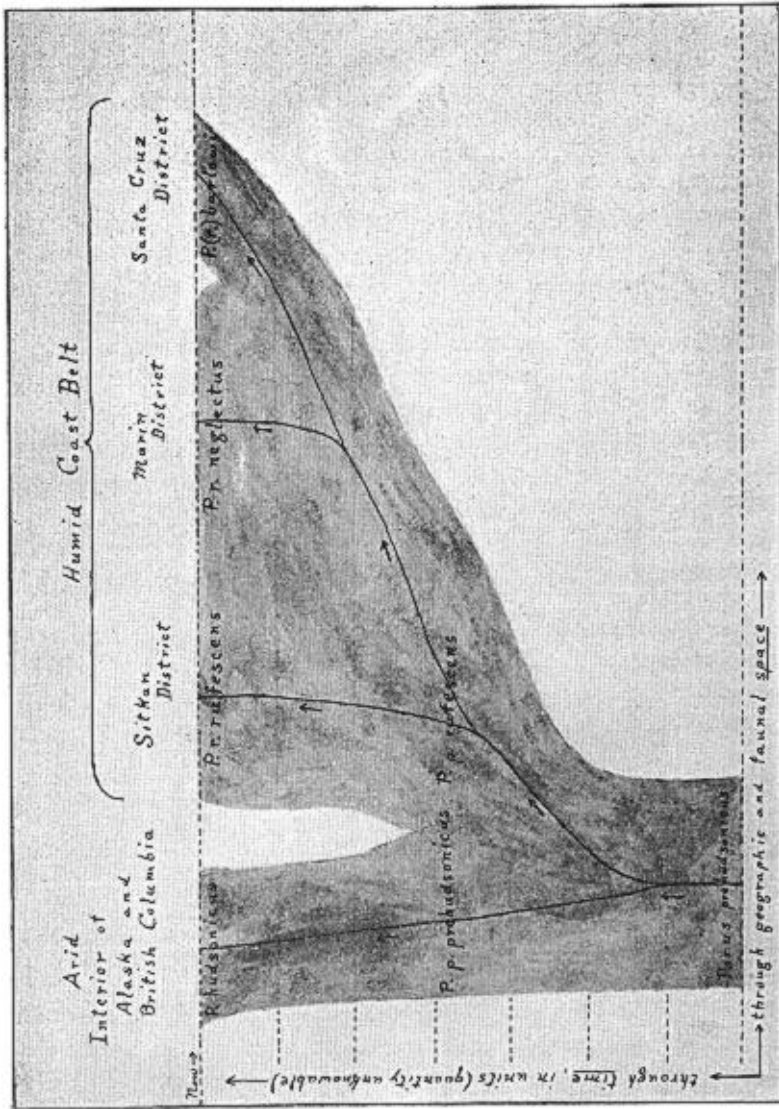
best physical condition, and just before the stress of winter food shortage. Even in the most sedentary of birds, in which no other trace of a migratory instinct is discernible, this fall season of unrest is plainly in evidence. I may suggest not unreasonably that autumnal migration may have had its origin in such a trait as this, the return movement in the spring becoming a necessary sequence. (See Loomis, Proc. Cal. Acad. Sc., 3rd Series, Zoölogy, II, Dec., 1900, 352.) It is a matter of abundant observation that autumn is the season when we find the most unlooked-for stragglers far out of their normal range, and when sober, stay-at-home birds, like *Pipilo crissalis* and the chickadees, wander far from the native haunts where they so closely confine themselves the rest of the year. It is also the experience of collectors that the greatest number of these stragglers are birds-of-the-year, which thus, obeying the 'mad impulse,' are led away from their birthplace into new country, where they may take up their permanent abode, and be less likely to compete with their parents or others of their kind. Then, too, crossbreeding of distantly related individuals is more likely. The records of the Santa Cruz Chickadee outside of its regular breeding range are all of August to October dates (Haywards, Gilroy, San Jose, etc.).

Thus, as above indicated, by the occupancy of new territory the number of individuals which can be supported will correspondingly grow. Hence a vigorous colony will spread out along lines of least resistance, being hindered by slight faunal changes, but completely checked only by topographic or abrupt climatic barriers. *Parus hudsonicus* and its near relative *Parus rufescens* are boreal species, the former inhabiting the Hudsonian Zone and the latter a certain portion of the Canadian. It seems reasonable to suppose that *rufescens* differentiated in the northern part of the humid coast belt, which has been called the Sitkan District. This is a faunal subdivision of the Canadian Zone, and its northern part approximates more closely Hudsonian conditions than southerly. Granting that the early center of differentiation and distribution of *Parus pre-hudsonicus rufescens* was in the northern part of the Sitkan District, then the route of emigration would be confined to the narrow southward extension of that faunal area. The habitat of *Parus rufescens* thus gradually acquired the long north and south

linear appearance as shown at this day. But when the pioneer invaders at the south reached the vicinity of Point Arena, they met with somewhat changed temperature and consequent floral conditions, but not so abrupt as to constitute a permanent barrier. Doubtless the progress of invasion was retarded until adaptive modifications evolved, which correlatively allowed of further invasion, until the abrupt limits of the Santa Cruz District were reached.

San Francisco Bay and the Golden Gate seem to now form a pretty effectual barrier between *neglectus* on the north and *barlowi* on the south. At least, among the large number of skins examined by me with this point in view, I can find none from one side that can be confidently determined as being identical with the race on the other. Neither chickadee has been found east of the bay, nor anywhere nearly so far from the coast belt, except for one record of a specimen taken in the fall at Haywards. This has been reëxamined and proved to be *barlowi*, as was to be expected from its contiguity. However, the Golden Gate is so narrow that an occasional crossing may take place. This was more probable formerly, when the redwood timber grew up to the Gate on both sides. Heermann in 1853 recorded the species from "San Francisco." But now, I think, the bird is unknown for several miles on either side of the Gate. Doubtless this barrier accounts in part for the origin of the distinct form *barlowi* within so short a distance.

As to the distance to which a species may invade, we can surmise that, topography permitting, theoretically there is no limit so long as adaptive modifications continually take place. The geographic variation in *Melospiza* may be called to attention as an extreme illustration. But practically, in the case of *Parus rufescens barlowi*, much further invasion is improbable, because in adjoining areas are already firmly established members of the same family (*Baeolophus*, *Psaltriparus*, *Chamaea*) thoroughly adapted to prevailing food conditions. No one of these could probably be successfully competed against by a foreigner. [Every animal tends to increase at a geometric ratio, and is checked only by limit of food supply. It is only by adaptations to different sorts of food, or modes of food getting, that more than one species can occupy the same



MAP III. ROUTES OF DISSEMINATION AND DIFFERENTIATION OF THE *PARUS RUFESCENS* GROUP OF CHICKADEES.

locality. Two species of approximately the same food habits are not likely to remain long evenly balanced in numbers in the same region. One will crowd out the other; the one longest exposed to local conditions, and hence best fitted, though ever so slightly, will survive, to the exclusion of any less favored would-be invader. However, should some new contingency arise, placing the native species at a disadvantage, such as the introduction of new plants, then there might be a fair chance for a neighboring species to gain a foothold, even ultimately crowding out the native form. For example, several pairs of the Santa Cruz Chickadee have taken up their permanent abode in the coniferous portion of the Arboretum at Stanford University, while the Plain Titmouse prevails in the live oaks of the surrounding valley.

In accordance with the above outlined theories of distribution it is easy to account for isolated breeding colonies, such as that of *Parus rufescens rufescens* in northern Idaho (Fort Sherman and Cœur d'Alene Mountains). Fall stragglers, wandering unusually far and finding themselves suddenly amid familiar conditions, would tarry there to breed, and with the continuance of a favorable state of affairs, and with no serious competition, might soon result in a well-established colony, itself a center of distribution. The record of *rufescens* from Mt. Shasta (July 14) seems to have been based on a lone straggler, for the species has not been found there since. (For references and localities see beyond.)

As has become a generally accepted idea, the young plumages of birds, if different at all from those of the adults, present a generalized type of coloration; or, to express it in another way, the young more nearly resemble recent ancestral conditions. The familiar examples of the spotted, thrush-like plumage of the young robin and the streaked, sparrow-like plumage of young towhees and juncos are cases in point. Accepting this phylogenetic significance of ontogeny, we find the chickadees giving some interesting illustrations.

Although the adult of *barlowi* has the sides pure smoke-gray, the juvenal plumage possesses pale rusty sides. This points towards a rusty sided ancestor like *neglectus*. This also agrees perfectly with the distributional evidence of origin. The adult of *neglectus* has pale rusty sides; the young also has rusty sides, but

somewhat darker than in the corresponding age of *barlowi*, and moreover is more nearly like the juvenal plumage of *rufescens*. But the sides in adult *rufescens* are deep brown, almost chestnut, while the young has much paler, merely dark rusty sides. And what is most significant is that the young of *rufescens* and *hudsonicus* are much nearer alike than are the adults, the former having only very slightly darker rusty on the flanks. The young of *hudsonicus* in respect to intensity of browns almost exactly equal the adults of the same species, showing that the present coloration is of very long standing, and offering further evidence that *hudsonicus* is nearest the common stock form of all the chickadees under consideration. Juvenal characters, resembling ancestral conditions, lag behind the newer acquired adult characters.

To repeat: The young of *barlowi* has the sides paler rusty than *neglectus*, *neglectus* slightly paler than *rufescens*, but *rufescens* has the sides slightly more rusty than *hudsonicus*, a sequence which accords well with the present theories of origin. (See Map III.)

MEASUREMENTS (IN INCHES AND MILLIMETERS) OF THE RACES OF
Parus rufescens.

<i>Parus rufescens rufescens.</i>			<i>Parus rufescens neglectus.</i>			<i>Parus rufescens barlowi.</i>		
	Wing.	Tail.		Wing.	Tail.		Wing.	Tail.
21 ♂♂	max. 2.50 (63)	2.33 (59)	6 ♂♂	2.38 (60)	2.21 (56)	25 ♂♂	2.50 (63)	2.36 (59)
	av. 2.42 (61)	2.18 (56)		av. 2.35 (59)	2.17 (55)		av. 2.42 (61)	2.26 (57)
	min. 2.38 (60)	2.08 (53)		min. 2.30 (58)	2.07 (53)		min. 2.32 (59)	2.19 (56)
11 ♀♀	max. 2.41 (61)	2.21 (56)	5 ♀♀	max. 2.28 (58)	2.16 (55)	10 ♀♀	max. 2.45 (62)	2.24 (57)
	av. 2.28 (58)	2.10 (53)		av. 2.24 (57)	2.12 (54)		av. 2.30 (58)	2.13 (54)
	min. 2.15 (55)	2.03 (52)		min. 2.21 (56)	2.08 (53)		min. 2.22 (56)	2.05 (52)

COMPARATIVE COLORATION¹ OF THE RACES OF *Parus rufescens*.

<i>Parus rufescens rufescens</i>	<i>Parus rufescens neglectus.</i>	<i>Parus rufescens barlowi.</i>
(♂ ad.; No. 5623, Coll. J. G.; Seiad Valley, Siskiyou Mountains, California; Dec. 12, 1901; collected by M. P. Anderson.) Top of head and hind neck dark seal brown; ocular stripe sooty. Mantle chestnut, inclining slightly toward hazel; rump the same. Sides of head and neck white, forming a wedge-shaped patch from bill to shoulder. Chin and throat dark seal brown. Sides and flanks chestnut, inclining slightly toward hazel. Wings and tail fuscous, pale-edged.	(♂ ad.; No. 5624, Coll. J. G.; San Geronimo, Marin County, California; Feb. 13, 1902; collected by J. & J. W. Mailliard.) Top of head and hind neck dark seal brown; ocular stripe sooty. Mantle chestnut, inclining toward hazel; rump slightly paler. Sides of head and neck white, forming a wedge-shaped patch from bill to shoulder. Chin and throat dark seal brown, very slightly paler. Sides and flanks pale hazel. Wings and tail fuscous, pale-edged.	(♂ ad.; No. 4425, Coll. J. G.; Stevens Creek Cañon, Santa Clara Co., California; Oct. 13, 1900; collected by J. Grinnell. [Type.]) Top of head and hind neck dark seal brown, very slightly paler; ocular stripe sooty. Mantle chestnut, inclining strongly toward hazel; rump paling to clay color. Sides of head and neck white, forming a wedge-shaped patch from bill to shoulder. Chin and throat dark seal brown, very slightly paler. Sides and flanks pure smoke gray. Wings and tail fuscous, pale-edged.
(♂ juv.; No. 1194, Coll. J. G.; Sitka, Alaska; June 26, 1896; collected by J. Grinnell.) Similar to adult, but: Top of head and hind neck dark hair brown. Mantle burnt umber; rump inclining toward hazel. Chin and throat dull seal brown. Sides and flanks dark hazel.	(♂ juv.; No. 5625, Coll. J. G.; San Geronimo, Marin Co., Cal.; June 30, 1903; J. & J. W. Mailliard.) Similar to adult, but: Top of head and hind neck dark hair brown. Mantle dull burnt umber; rump slightly paler. Chin and throat dull seal brown. Sides and flanks pale hazel.	(♂ juv.; No. 4684, Coll. J. G.; Palo Alto, Santa Clara Co., Cal.; May 11, 1901; collected by J. Grinnell.) Similar to adult, but: Top of head and hind neck dark hair brown. Mantle pale burnt umber, merging into pure hazel on the rump. Chin and throat dull seal brown. Sides and flanks very pale tawny.

¹ Color names taken from Ridgway's 'Nomenclature of Colors.'

LOCALITIES OF OCCURRENCE.

Parus rufescens rufescens.

Specimens examined.—Sitka, Alaska. British Columbia: Mt. Lehman; North Saavich, Vancouver Id. Fort Canby, Wash. Oregon: Cedar Mill, Washington Co.; Salem; Butteville; Upper Klamath Lake. California: Siskiyou Mts.; Eureka; Healdsburg; Mt. St. Helena.

Other stations (mostly from published records).—Alaska: Juneau; Portage Bay; Lituya Bay; Haines; Skaguay; Glacier. Queen Charlotte Ids., B. C. Washington: Seattle; Ft. Steilacoom; Ft. Vancouver; Gray's Harbor; Cape Disappointment; Stehekin Valley, Okanogan Co. Idaho: Cœur d'Alene Mts.; Ft. Sherman. Oregon: Wilbur; Yakima Bay; Dayton; Sheridan; Portland; Corvallis; Clatsop Co. California: Cahto, Mendocino Co.; west base Mt. Shasta.

Parus rufescens neglectus.

Specimens examined (all from California).—Marin County: San Geronimo; Nicasio; Fairfax. Sonoma County: Sebastopol (intermediate, toward *rufescens*); Cazadero (intermediate, toward *rufescens*).

Record station.—Ukiah, Mendocino Co.

Parus rufescens barlowi.

Specimens examined (all from California).—San Mateo County: San Mateo; King Mt.; Woodside; Pescadero Cr.; La Honda. Santa Clara County: Palo Alto; Stanford University; Stevens Creek Cañon; Gilroy. Alameda County: Haywards; Alvarado. Monterey County: Monterey; Pacific Grove; Carmel Bay.

Other stations (from published records).—San Francisco. Santa Cruz County: Boulder Creek; Santa Cruz; Saratoga; Watsonville. Little Sur River, Monterey Co.

SYNONYMY.

Parus rufescens rufescens.

Parus rufescens TOWNSEND, Journ. Ac. Nat. Sc. Phil. VII, 1837, 190 (orig. descr.; "Inhabits the forests of the Columbia river").—AUDUBON, Orn. Biog. IV, 1838, 371.—TOWNSEND, Journ. Ac. Nat. Sc. Phil. VIII, 1839, 152.—AUDUBON, Synopsis, 1839, 80.—NUTTALL, Man. Orn. I, 1840, 267, part (notes and habits).—AUDUBON, Bds. Am. 1841, 158, pl. 129.—CASSIN, Bds. Cal. & Tex., 1853, 18.—BAIRD, Pac. R. R. Rep. IX, 1858, 394, part (Ft. Vancouver; etc.).—COOPER & SUCKLEY, Pac. R. R. Rep. XII, 1860, Zool. Rep., 194 (Ft. Steilacoom).—"SCLATER, Cat. Am. Bds., 1861, 14, No. 86."—BAIRD, Rev. Am. Bds., Aug. 1864, 83, part.—BROWN,

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