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A REVIEW OF THE HOUSE FINCHES OF THE SUBGENUS BURRICA

WITH THREE ILLUSTRATIONS

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It has been assumed generally by zoologists that the genus *Carpodacus* originated somewhere on the mainland of Asia. As long ago as 1898 Bianchi recognized twenty-five species of this genus, six belonging to the Nearctic and nineteen to the Palaearctic Region, while all but one (*C. erythrinus*) were claimed to be inhabitants of alpine districts. Because of differentiation into so many more full species in Asiatic countries than in North America, authors have believed the genus existed in Asia for a longer period of time. Not conceding that this is sufficient evidence, the author, after a long study of approximately fifteen hundred specimens, covering all the North American species and races, has nevertheless come to the conclusion that the present distribution can be explained best on the basis of an Asiatic origin. If this is true, it seems necessary to grant further that the ancestral forms came from the north in preglacial times and that the acquisition of new territory probably took place from north to south at fairly high elevations. The Mexican plateau may have been occupied during this period and the occupation of the deserts to the west, the islands off the coast of the Californias, the lowlands on both sides of Mexico and the Sierra del Sur of southern Mexico may have been forced by depressed temperatures during the glacial periods. Finally, we may assume that the characters of the populations which stayed and adjusted themselves to the climatic conditions at these lower levels have had a longer time to be moulded by the new meteorological forces that they encountered than the populations which may have shuttled up and down the Mexican plateau in periodic efforts to reoccupy their older habitats. This may account for the greater differentiation between the southern races of house finches (subgenus *Burrica*) than between those of the cooler regions to the north, which regions may not have been reoccupied for a very long period of time. Even today a gradual occupation of new territory in the northern United States and southern Canada is in progress.

Much of the above belongs to the field of speculation. This paper is concerned with the study of factual data for the purpose of determining the present distribution of this elusive subgenus and its trends in differentiation, and it will touch upon the foregoing theories only in so far as they may be of help in understanding the distribution.

In spite of the enormous number of specimens I have directly compared, it is impossible satisfactorily to determine the breeding ranges of certain races. There still are large areas, many of them in the United States, as in eastern Utah, from which few specimens seem to be available. To supply these satisfactorily at least another five hundred individuals would be required. Therefore, no claim to have attained finality in these studies is made. They merely break the ground for future research workers to cultivate more efficiently. I have noted on the distribution maps (figs. 35, 36), with black dots or circles, every locality from which specimens have been examined, the circles indicating intergrading areas. The absence of dots from large portions of the

maps proves how much collecting must be done to obtain a complete picture. It should be recognized, however, that there are certain very definite gaps in the range of *Burrica,* notably one in southern Sinaloa, and others in northwestern Oregon and western Washington, which are not occupied. That the latter may be occupied in the future is possibly indicated by the appearance of a group of breeding birds on the southeastern end of Vancouver Island. The House Finches are definitely "on the march!" It has been only in the past few years that they have begun to occupy two portions of Canada, and only a few decades ago they do not seem to have been in the Denver region of Colorado (Figgins, 1930, pp. 1-2). The recent occupation of certain islands of the Hawaiian group is probably due to man, but there are some reasons to believe that the presence of *Carpodacus mexicanus mexicanus* on the southeastern end of the Mexican plateau may be due to a geologically recent annexation of a former habitat.

The affinities of the forms of *Burrica* and the crescendo or decrescendo of their characters from one race to another seem to lie along north-south axes, except for the races of the peculiar Sierra del Sur of Mexico. It is true that considerable evidence exists of east-west or west-east developments in other regions, but the developments which have operated along longitudinal lines seem to have been more powerful than those along latitudinal lines, or at least the characters, as they appear to progress from one race to an adjoining race, increase or decrease along north-south axes to maximum or minimum expression, while the evidences of alterations along east-west axes are blurred. However complex these fluctuations may have been in the past, two of the characters of *Burrica* have been sufficiently susceptible to meteorological pressures to become definitely moulded when populations have pushed into new areas, and a third character has been strongly directed so that when it has started on a course toward maximum or minimum expression it has generally continued on to a greater extreme, even when it has entered an adjoining area of slightly different meteorological pressures. The first two are ground color of posterior underparts, hereafter to be called merely "ground color," and streaking, while the third is size. A fourth character, "red" coloration, is as likely to develop to maximum expansion over the body in one extreme type of climate as it is in another of just the opposite extreme; but these alterations progress along a north-south axis, except in the Sierra del Sur.

There seem to be three kinds of characters: (a) susceptible ones definitely correlated with climatic areas, such as streaking and ground color; (b) moderately susceptible ones, definitely directed toward certain extreme expressions, which may not reach their maxima or minima within the climatic area which directed them (size belongs here and so may coloration of the rumps of females); (c) those which seem to have little or no relation to climatic areas, such as extent of red coloration and the sharply defined red U on the pileum in males.

Taking into account the less important as well as the important characters, we find the subgenus *Burrica* divided today into four main groups, which for the discussion of trends, may be called, (1) the desert, (2) the coastal, (3) the plateau, and (4) the Sierra del Sur, hereafter to be called the "sur group" (see fig. 37). The first three have approximately north-south axes, the fourth an east-west one. When discussing these groups I shall have occasion frequently to refer to rainfall areas. Whenever I use the term "five inch rainfall area" it will mean the area, in which the mean annual rainfall ranges from zero to five inches, whereas the term "ten inch rainfall area" will cover a range from five to ten inches, and so on.

The desert group occupies the great longitudinal arid belt of the continent, west of the Rocky Mountains and the Sierra Madre of Mexico, where the mean annual

rainfall is generally less than ten inches. But, it extends into fifteen inch rainfall areas, sometimes in modified form, notably in the hot coastal plains of northern Sinaloa. This group includes three races, *Carpodacus mexicanus solitudinis* of southeastern Oregon and Nevada, and *C. m. ruberrimus* and *C. m. rhodopnus* of Mexico. As a group these races occupy the continuous stretch of five and ten inch rainfall areas from eastern Oregon and southwestern Idaho south through Nevada, western Utah, southeastern California, western Arizona, and the arid coastal plains of Sonora, to the northern half of Sinaloa and to the interrupted coastal plains and most of the southern half of eastern Lower California. The group also seems to occupy the ten inch rainfall area along the Yakima Valley of southern Washington. The birds reported (no specimens collected) from the Okanogan Valley of northeastern Washington and southern British Columbia probably belong with this group, just as do those from the ten inch rainfall area of the San Joaquin Valley of central California, which, although they are intergrades with *C. m. grinnelli* of northwestern California, seem closer to the white-bellied northern section of the desert group. Reference to the distribution maps (figs. 35, 36) will show that the desert group separates the plateau group on the east from the coastal group on the west.

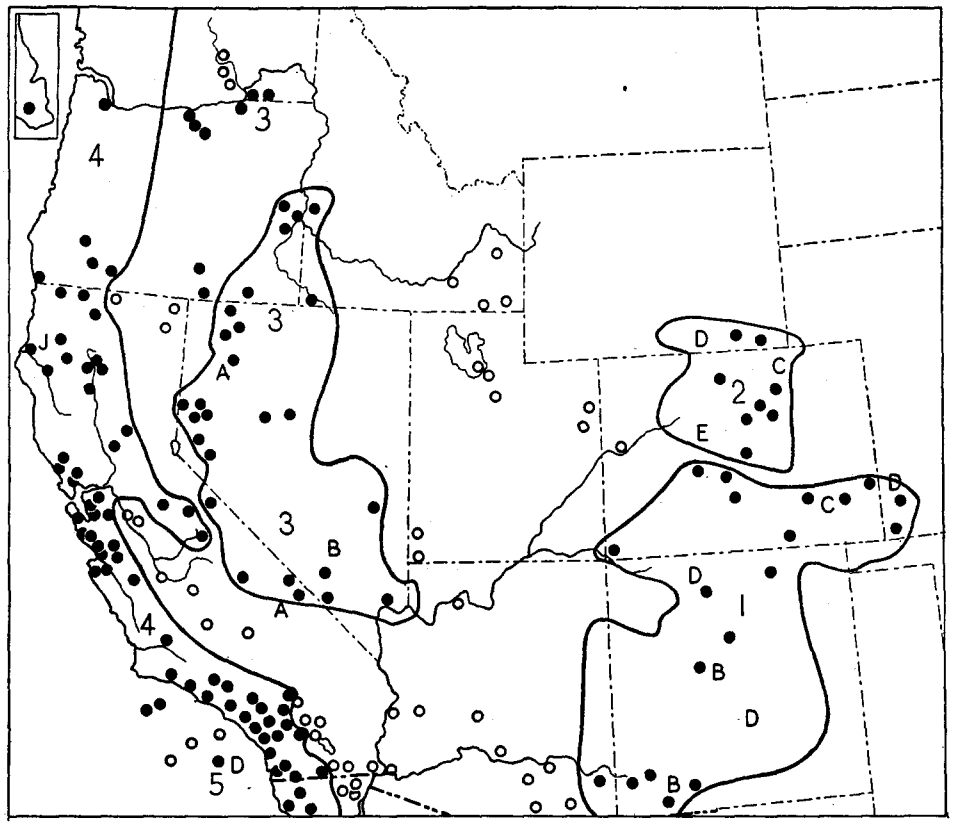

Fig. 35. Distribution of House Finches. Each dot marks a locality from which specimens have been examined; circles indicate intergrades. 1=*C. m. frontalis*; 2=*C. m. smithi*; 3=*C. m. solitudinis*; 4=*C. m. grinnelli*; 5=*C. m. clementis*. A, annual rainfall 0-5 inches; B, 5-10; C, 10-15; D, 15-20; E, 20-30; J, over 80. Black lines enclose areas where characters of races are best developed.

The characters of the desert group, which differentiate it from all the other groups consist of: (1) narrowest and least conspicuous streaking of under parts throughout the entire range of the group; (2) whitest ground color; (3) smallest size, and (4) most intense coloration of yellow or red on rump of females; (5) most extensive red coloration. It is significant that all four of the important characters and one of the less important reach either a maximum or a minimum for the subgenus in this group.

It should be noted that some ten inch rainfall areas occur in the Rocky Mountain states, and a very considerable one in eastern Utah. Few specimens are available from this last region. So susceptible are ground color and streaking, that specimens from small scattered ten inch rainfall areas in Colorado and New Mexico show these two characters to be modified in the direction of the desert group, whereas other less susceptible characters, such as extensiveness of red and size, remain the same as in the typical race of the region. From this I think it reasonable to conclude, particularly when it is shown later that ground color is much darker in heavier rainfall areas, that ground color and streaking in the subgenus *Burrica* are definitely correlated with climatic areas.

The coastal group is found on the Pacific coast and in certain areas farther inland, west of the southern Cascades and the Sierra Nevadas, in rainfall areas of fifteen inches or more or where the average number of days of dense fog amounts to over thirty days a year, as on certain islands of the Pacific. The characters are best expressed in rainfall areas of thirty inches or more. The group is the only one in the United States which has a race in the sixty to eighty inch rainfall area, and this race attains its extreme expression of characters there. The occurrences at Forrest Grove, Washington, and Victoria, B. C., may mean that this race is extending its range in this heavy rainfall area. This group includes *C. m. grinnelli* of southwestern Oregon and northwestern California, as well as a race (*clementis*) and three species (*mcgregori, amplus,* and *mutans*) on islands of the Pacific Ocean. The group ranges from southwestern Oregon south throughout California, except in the five and ten inch rainfall areas, and occurs in the San Pedro Mártir Mountains of Lower California; also on the Santa Barbara Islands, Los Coronados, San Benito, Cedros, Guadalupe and Hawaiian islands. Near Point Concepcion the group forks, the western division crossing to the Santa Barbara Islands and developing certain characters of the group from island to island in a more or less regular progression to Guadalupe Island. The mainland fork proceeds south on the mainland, west of the San Joaquin Valley, to the San Pedro Mártir Mountains, keeping in rainfall areas of ten inches or more, becoming somewhat paler in ground color and less conspicuous in streaking. The insular series of races becomes darker and more conspicuously streaked, and larger in size of bill.

There is no single character, which distinguishes this assemblage as a group from the other three, but the bill attains the maximum in size in *amplus* of Guadalupe Island, and the progression of red coloration is markedly different from that in both the desert and the plateau groups. The red extends posteriorly to the center of the breast in southwestern Oregon, maintains this extension as far as the San Francisco Bay region and then decreases on the islands, reaching almost the minimum for the subgenus in *amplus* (see fig. 37). In the mainland fork it changes little. Exactly the opposite progression occurs in both the desert and plateau groups.

Two other possible distinguishing characters are ones which are not generally considered characters, first, the presence of orange and yellow feathers in males, and second, the essential absence of the female costume in first winter plumage for males, hereafter for conciseness only to be called the "eclipse plumage." In using "eclipse

plumage" it is realized that this term has been confined to use in the Anatidae and connotes there something quite different. The orange and yellow types are much more common in the coastal group (18.4 per cent of the total specimens as compared with 3.3 per cent for the desert and plateau groups and 7.8 per cent for the Sierra del Sur group). The eclipse plumage occurs in 1.2 per cent of the coastal group as compared with 7.4 per cent in the desert and plateau groups. I am familiar with the conclusions reached by Mr. and Mrs. Michener (1931), whose indefatigability and research spirit cannot be praised too highly. Their banded birds were individuals of the coastal group and add to the evidence for the occurrence of a considerable percentage of orange and yellow plumage in this group. It should be pointed out that the Micheners do not claim that all first year males of the mainland show yellow or orange in the plumage, nor even that a majority do so. Island conditions seem to develop this tendency to the maximum, so that 73 per cent of males from San Clemente and 100 per cent of those from the Hawaiian Islands show some abnormal coloration.

The progression of the four important characters in the coastal group differs remarkably from that in the desert group, much *more so* than it does from either of the other two groups (see fig. 37). In fact, the trends in the coastal group, particularly the insular fork, are actually closer to those of the sur group of extreme southern Mexico than to any other. The characters in the mainland fork, as would be anticipated, generally approach those of birds of the intergrading areas of the southern Colorado Desert, but the trends from north to south are very different from those of this desert group.

The forms of the plateau group range from southern Wyoming south along the Rocky Mountains through New Mexico and western Texas, and thence east of the Sierra Madre of Mexico. They spread out fan-shape over the entire Mexican plateau as far as Tamaulipas, southern San Luis Potosi, Guanajuato, Michoacan and Jalisco, and probably to the Rio Balsas. Here the group suddenly ends near the boundaries of the sur group. A fork of this group extends its range into extreme eastern Arizona. In the United States and northern Mexico, the group is found in the ten to twenty inch rainfall regions, chiefly above fifteen inches, whereas in central Mexico *Carpodacus mexicanus centralis* is found in the twenty to thirty inch area of Guanajuato, and two races occur in the forty to sixty inch area along the higher parts of the Sierra Madre range of Sinaloa and south to lower elevations in Nayarit and Jalisco.

This group contains *smithi, frontalis, nigrescens, potosinus, centralis, coccineus* and the mountain birds of Sinaloa.

Only one character distinguishes this group from all the other three, but three characters differ decidedly from those in the desert group and one, extent of red, from those of the sur group. Size reaches its maximum for *Burrica* in *centralis* of this group; in fact the birds of all races in the group are large. In addition, the number of young males in eclipse plumage attains its maximum percentage for the subgenus in the northern range of the group, 26.8 for *smithi* and *frontalis*, as compared with 9.9 for *C. mexicanus mexicanus* and the birds of Guerrero and 12.4 for *solitudinis*.

The sur group is a peculiar one without definite trends, which occupies twenty to sixty inch rainfall areas and extends chiefly along the great west-east mountain range that lies south of the Mexican plateau and is separated from it by two tropical river systems, the Rio Balsas and Rio Tonto, as well as by the great volcanic province, which crosses the whole southern end of the Mexican plateau from west to east. This group also extends across these barriers up on to the southeastern portion of the Mexican plateau through Mexico and Morelos to Hidalgo and through Puebla into the sixty inch rainfall area of Veracruz.

That this group is very distinct from the other three seems clearly indicated, for the development of critical characters from north to south in the desert and plateau groups, which reaches a climax in Sinaloa and Guanajuato, respectively, is not con-

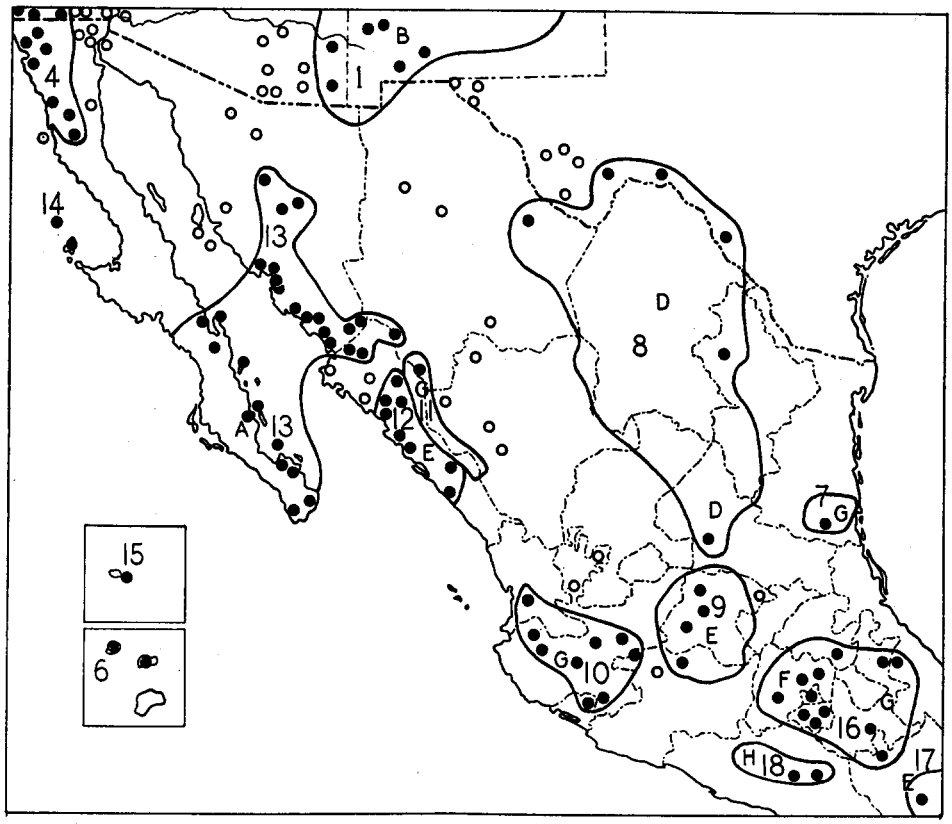

Fig. 36. Distribution of House Finches (symbols as in fig. 35): 1=*C. m. frontalis*; 4=*C. m. grinnelli*; 6=*C. mutans*; 7=*C. m. nigrescens*; 8=*C. m. potosinus*; 9=*C. m. centralis*; 10=*C. m. coccineus*; 11=*C. m. altitudinis*; 12=*C. m. rhodopnus*; 13=*C. m. ruberrimus*; 14=*C. mcgregori*; 15=*C. amplus*; 16=*C. m. mexicanus*; 17=*C. m. roseipectus*; 18=*C. m. griscomi*. A, annual rainfall 0-5 inches; B, 5-10; C, 10-15; D, 15-20; E, 20-30; F, 30-40; G, 40-60; H, 60-80.

tinued on into the sur group. A sudden and complete change occurs. For example, the extent of red in the desert group reaches its maximum and suddenly ends at the unoccupied area in southern Sinaloa, whereas in the plateau group, the progression stops with the extensively red *centralis* of Guanajuato. Then, only a hundred and fifty miles to the southeast we find the least extensively red race of the entire subgenus, *C. m. mexicanus* of the Sierra del Sur. So far no positive intergrades between the sur group and the others have been found. To a less degree a similar change is noted in size. This decreases to the smallest race in Sinaloa, but south of the "gap" a very large race suddenly appears. Contrariwise, to the east, size increases from Colorado to the largest race, *centralis* of Guanajuato, and then diminishes sharply in *C. m. mexicanus* of Hidalgo, declining to a moderate-sized bird in Guerrero.

These and other peculiarities, lure one to speculate that the house finch populations were driven off the Plateau by the decreasing temperatures of the ice ages, and held in Oaxaca and Guerrero, isolated from the main stream of *Burrica* for a long period of time and that their inclination to return during the warmer periods of the ice ages was checked by some unknown cause. It does no harm to point out that geologists (Schuchert, 1935, pp. 55, 41, 130) claim that unparalleled volcanic outbursts flamed along the volcanic province during the Pleistocene. Possibly *C. m. mexicanus* has too recently crept back on to the plateau to intergrade with the plateau group, which may have re-established itself from the east or west and developed its present characters at a much earlier date.

Two of the characters of the sur group, most highly developed in the birds of Guerrero, are remarkably different from those of all the other groups and are approached only by races geographically far distant. The first is the sharply defined red U on the forehead of males, the uprights of the U continuing as superciliary streaks on each side of the crown. In all other races of *Burrica,* even when the crown is not definitely incarnidined, the red of the superciliary areas merges gradually into the crown. The second character is the minimum extent of red, the color being reduced to a sharply defined throat patch and to the U of the forehead. A third character reaches its maximum in this group: ground color increases to Cinnamon Buff and Clay Color. (Names of colors in this paper, when capitalized, are taken from Ridgway, 1912.)

The sur group includes three forms, *C. mexicanus mexicanus, C. m. roseipectus,* and the undescribed bird of Guerrero.

If we refer to the chart of increase and decrease of characters (fig. 37), we will find the four characters, which we consider the most important in *Burrica,* represented graphically to show how different is the progression of characters in adjoining groups. The coastal, desert and plateau groups run lengthwise of the page to indicate their north-south axes, whereas the sur group is shown horizontally to indicate an east-west axis south of the others. The same character in each group is represented by the same kind of column. The varying widths of the columns show the average relation of that character to maximum or minimum expression, a width of 8 mm. indicating in every case the maximum expression reached in the subgenus, and a point, the minimum. An attempt has been made to place the name of a state as nearly as possible immediately opposite the point of correct widths of the columns. Only males at about the same stage of wear in the nuptial plumage were used for this chart.

As an illustration, the average wing length of the largest race is 82.1 mm. for *centralis* of Guanajuato at the southern end of the plateau group. The wing length for the smallest race, *rhodopnus* of Sinaloa, at the southern end of the desert group is 71.2 mm., a difference of nearly 11.0 mm. The average wing length of the most northern race of the plateau group, *smithi,* is 78.1 mm., or exactly 4 mm. less than the average wing length of the largest race. Four millimeters is 36.1 per cent of the difference between the wing length of the longest and the shortest race. Accordingly we make the width at the top of the column for size of the plateau group 6.9 mm. Now turning to the races at the southern end of each group, we find that *amplus* of Guadalupe Island in the coastal group has a greater wing length than the race at the top of the column of the same group by 24.5 per cent of the above-mentioned range of 11.0 mm., and we therefore increase the width of the column at the bottom opposite this race by that percentage of 8 mm. On the contrary, wing length in the desert group grows smaller as we proceed south and reaches the extreme minimum for *Burrica*; so, the size column of this group reduces to a point. Employing the same method for the

size column of the plateau group, we find size increasing toward the south to *centralis* of Guanajuato, where the extreme maximum for *Burrica* is attained; the width of this column at the bottom is shown as 8 mm.

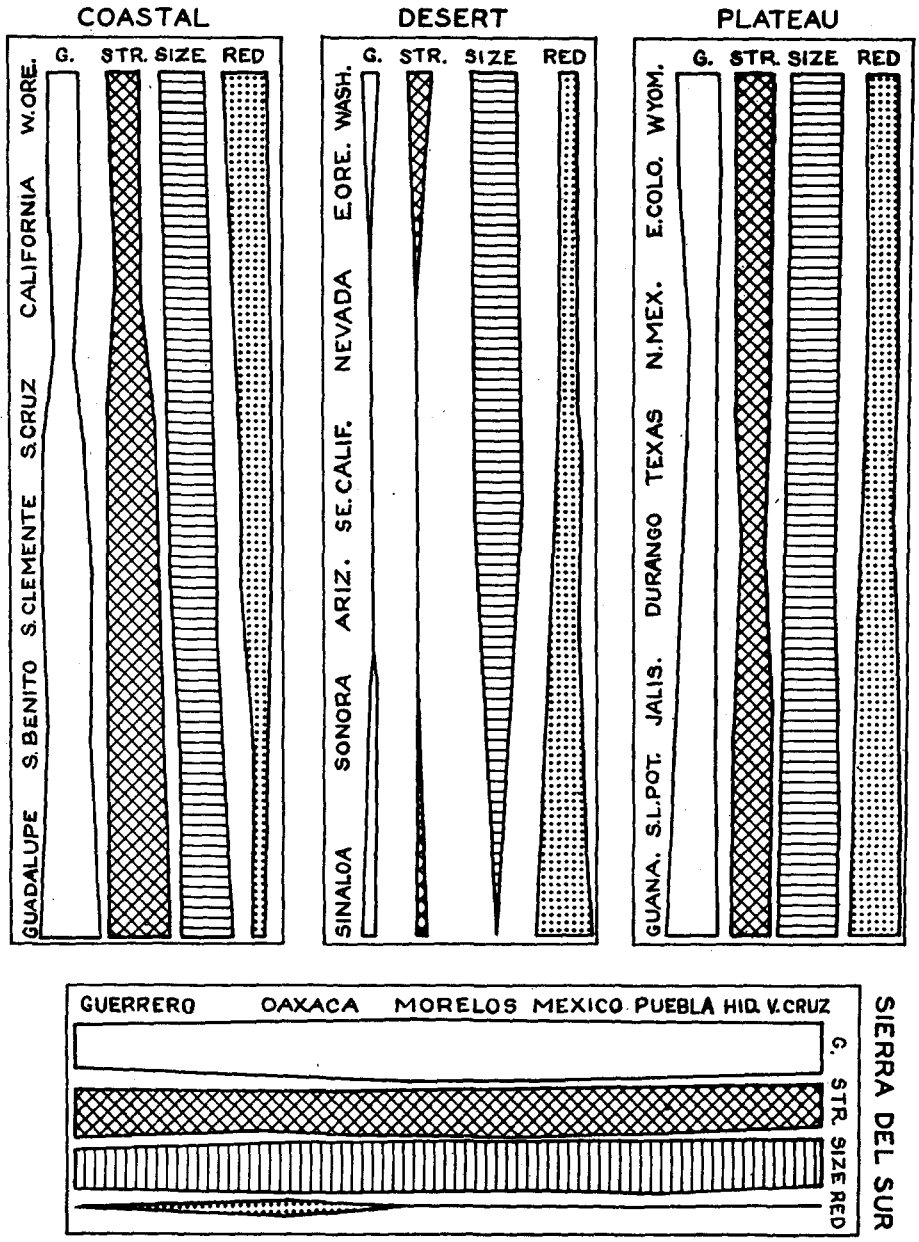

Fig. 37. Chart showing increase and decrease of characters in races and species of House Finches. G.=ground color of posterior under parts; Str.=streaking; size=wing length; Red=degree of extension of "red" coloration on under surface. Widths of columns indicate relative intensity of characters. For further explanation see text, p. 183.

A quick glance at the three upright columns for size reveals instantly that whereas size, as represented by wing length alone, increases to, or nearly to, maximum in both the coastal and plateau groups as we proceed south, it does just the opposite in the group geographically between them, the desert group.

It may be of some significance that of the twenty-four maxima and minima occurring in the columns of the three vertical groups, most of them are found in terminal races of the groups. This would seem to indicate that a progressive movement, once initiated in any character, proceeds on to either a maximum or minimum until the terminal race of the group is reached, where it, like the group, stops. This seems particularly clear in the desert group, where the two southern branches, forking to extend on either side of the Gulf of California, reach clearly defined and unquestionable terminal races in *ruberrimus,* which ceases at the southern tip of the peninsula, and in *rhodopnus* which stops just as abruptly in central Sinaloa, where the gap in the range of the entire species is reached near the Tropic of Cancer. With *rhodopnus* the extreme minimum for size and the extreme maximum for extent of red of the entire subgenus are reached. Furthermore, a fourth maximum in a character, not represented by a column, is attained, that is, brightest coloration on rump of females.

Four maxima and minima which do not occur in terminal races are ground color and streaking in the desert and plateau groups. It is just in these two characters that we would expect exceptions, for these seem to be the only two that are definitely correlated with climatic areas. Therefore, they should reach their minima where the climatic factors (mean annual rainfall, mean annual maximum temperature and daytime cloudiness) reach their minimum extremes. These extremes for the North American continent are attained in the desert region, near the head of the Gulf of California (Brooks, 1936), and it is exactly there that we find the minima reached by the two characters mentioned.

I should preclude here a possible misinterpretation of a statement which appears in an earlier paper on house finches (Moore, 1936, p. 205). Although the streaking of *rhodopnus* is less than in *ruberrimus,* I find by lifting up each feather of the lower abdomen that the more extensive red has so completely covered up the streaks that it has eclipsed them. So completely blurred is the streaking that it is difficult to get an exact comparison. I am now convinced that *rhodopnus* and *ruberrimus* of Sonora, which both inhabit a heavier rainfall area than the region at the head of the Gulf, are not less streaked than in the intergrades of the latter region, and probably are slightly more streaked.

In the plateau group the minima for meteorological factors occur from New Mexico to Durango, and it is in this section at the middle of the columns, that we find ground color and streaking reaching the minima for this group. The picture of what happens in the sur group is very incomplete because of the lack of specimens from Oaxaca. Not having seen recently the only specimens in existence of *roseipectus,* those in the British Museum, I am unable to show the widths of the columns accurately, so it is futile to discuss the changes from one race to another in this group.

It admittedly is impossible to obtain exact percentages for widths of columns in the chart to represent ground color, streaking and extent of red. Nevertheless, approximate accuracy can be reached, sufficient to show the changes that occur. A great amount of time was taken in making these as accurate as possible. The enormous series assembled made it possible to select for comparison a sufficient number of males of the same stage of wear in almost every form. In only two of the eighteen forms were insufficient numbers obtained, but even in these, quite a few were found which gave

some idea of the comparative relation. As an example, let us take the most difficult character to measure mathematically, ground color of the posterior under parts. The portion of the body chosen for determination of color value was a horizontal band across the center of the abdomen, including the sides. This area on each specimen was compared carefully with the tables in Ridgway's color standards and the exact color value taken. When the value for the sides differed from that of the abdomen, the values were averaged. Then the values for all the males were averaged and were found to deviate but slightly, although the differences between sides and center of abdomen were subject to some variation. Dependent on the increment of gray on Ridgway's color plates and the relative depth of tone, all the color values were given consecutive numbers in a scale, so that only a small amount of possible error is involved in the averaging process. The color values matched the following plates of Ridgway, only one value being added, namely "Ivory White". This value represents a very small increment of yellow which occurs in certain forms of the coastal group and in birds of the southwest portion of the Mexican plateau. The values are surprisingly numerous and are given here in the reverse order, starting with plate LIII of Ridgway: White, Ivory White, Pallid Mouse Gray, Pale Mouse Gray, Mouse Gray, Pale Smoke Gray, Drab Gray, Pale Drab Gray, Light Drab, Drab, Pale Olive Buff, Tilleul Buff, Vinaceous-Buff, Pale Vinaceous Fawn, Cartridge Buff, Ivory Yellow, Pale Pinkish Buff, Pinkish Buff, Cinnamon Buff, Clay Color, Pale Pinkish Cinnamon, Light Pinkish Cinnamon, Pinkish Cinnamon, Cinnamon, Pale Cinnamon Pink, Light Vinaceous Cinnamon. Classifying these values in order of depth of tone and letting "White" be represented by a point in each open column and Clay Color by 8 mm. of width, a sufficiently accurate picture is obtained to give a very fair idea of the changes which occur in ground color.

The author has found it extremely important in this subgenus to compare only birds of the same amount of wear. This is due to the fact that all of the forms acquire their nuptial plumage by the gradual wearing off of the fine margins of the winter plumage. It has been repeatedly pointed out, particularly by the Micheners (1931), that the bright coloration of male house finches changes from month to month and even from year to year in some individuals, creating a series of traps for an unsuspecting systematist. Every conceivable effort has been made to discount specimens of unusual coloration. For most practical purposes it has been found sufficient to group the birds as follows: (1) September-October, early winter plumages, (2) January-February, late winter plumages, (3) late April-May and early June, worn nuptial plumages, (4) July-August, very worn nuptial plumages before molt.

Although the author would have preferred to publish lists of localities of all the specimens examined in connection with this study, this would have lengthened the paper excessively and would have repeated data already presented in descriptions of recently named races. Every locality is shown on the distribution maps (figs. 35, 36).

My grateful acknowledgements are made to the directors of many museums and institutions and to individuals for their cooperation and generous loan of material, including many valuable types (the courtesies of certain individuals are acknowledged in the text and these names are not repeated here): Herbert Friedmann and the United States National Museum, James L. Peters and the Museum of Comparative Zoology, John T. Zimmer and the American Museum of Natural History, George E. Hudson and the Charles R. Conner Museum, Miss Martha R. Flahaut and the Washington State Museum, George Willett and the Los Angeles Museum, C. D. Bunker and the University of Kansas, J. Van Tyne and the University of Michigan, F. Kermode and

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Subgenus **Burrica** Ridgway

Burrica Ridgway, Man. N. Amer. Birds, 1887, p. 390. Type, by original designation, *Fringilla mexicana* Müller.

Subgeneric characters.—As compared with the subgenus *Carpodacus, Burrica* differs in having tail much less emarginate; wing relatively shorter, the difference between wing and tail slightly less than length of tarsus in southern races; adult males with wing feathers margined with pale grayish, rather than pinkish; streaks on upper parts of both sexes less conspicuous, except in *Carpodacus mexicanus centralis* of Guanajuato. Normally, young males molt directly from the juvenal plumage into that of the adult male, exactly contrary to the procedure in the subgenus *Carpodacus,* but about four per cent, chiefly in the plateau and desert groups, maintain the female plumage throughout the first year.

Ridgway's key (1901, p. 124) makes a differentiation under division "aa," which is no longer admissible; he states that the "tail" is "shorter than wing by much *less* (italics mine) than length of tarsus." These studies prove that in northern races of *Carpodacus mexicanus,* the difference between the tail and wing is considerably *more* than the length of the tarsus, but that in the group ranging from Hidalgo to Guerrero, and in the races of the arid coastal plains of southern Sonora, Sinaloa and southern Lower California, Ridgway's statement holds true, the difference being equal to, or slightly less, than the length of the tarsus.

Carpodacus mexicanus

Specific characters.—Differs from *C. amplus* and *C. mcgregori* in having bill considerably smaller; bill shorter, and shallower at its deepest point. Differs from *mutans* in coloration of brightly colored parts.

Ridgway (1901, pp. 141-142) gave measurements for *mcgregori* and *amplus,* indicating that they possessed longer wings and tails than any race of *mexicanus.* He did not have a long series from Guanajuato, and he grouped those he had under the too inclusive name, *rhodocolpus.* Measurements of our much larger series of thirty-three fresh specimens from Guanajuato show that *centralis* has the longest wing and tail of all the forms of house finches, whereas *amplus* and *mcgregori* possess the largest bills (see table of measurements). Accordingly, we are reduced to a single character, that of size of bill, in differentiating the species *C. mexicanus* from these two island birds. Nevertheless, in view of the appearance on Cedros Island of sharply differentiated individuals of both *mcgregori* and *mexicanus,* which live together in the same habitat, and, taking into consideration the isolation of *amplus* on Guadalupe Island, it is not wise at present to reduce *amplus* and *mcgregori* to races of *mexicanus.*

The problem of *C. mutans* of the Hawaiian Islands is still more perplexing. This form almost certainly arose following the introduction of some race of *mexicanus*. It was described (Grinnell, 1912, pp. 24-25) on the basis of one character, the yellow-orange type of coloration in males. There are, however, other discernible differences, and another character may be developing. All of the six adult males in the collection of the Museum of Vertebrate Zoology have the tenth (outer) primary the longest, except for the left wing of one male. Contrasted with this, all except three out of 476 specimens of *mexicanus, amplus* and *mcgregori,* which I have examined for this character show either the ninth or eighth primary the longest, and the tenth rarely equal to the others. A reference to the table on p. 203 will show that the measurements of *mutans* are close to those of the central California bird. With reference to the relation of length of tarsus to the difference between length of wing and tail, the Hawaiian individuals are also closest to central California birds. Obviously a large series is needed to determine the status of this form.

The relationship of the birds ranging from Hidalgo to Guerrero, now known as *C. mexicanus mexicanus,* with the races to the west and north, which are separated by only a few miles of zoologically unexplored mainland in eastern Michoacan, Queretaro and northern Guerrero, is the most puzzling of all. When Sharpe (1888, p. 421) described *"Carpodacus frontalis,"* he considered it to be specifically distinct from *C. mexicanus;* he said, *"C. mexicanus* perhaps merges into *C. frontalis;* but I have seen no sign of this in the series of specimens examined." In the large series which has been assembled by me no specimen has come under observation which would indicate intergradation. An individual from Temascaltepec in worn nuptial plumage, unlike a typical *C. m. mexicanus* from the same place, has vestiges of Carmine on its breast, indicating that it might have been more extensively red in winter plumage. Otherwise, it is a typical *mexicanus,* with the sharply defined U outlining the pileum and with brown back with no reddish tinge. In spite of this slight "approach," it is vastly different from three nearly typical *C. m. centralis* males from Lago de Ciutzeo, only one hundred miles to the northwest which have entirely reddish brown upper parts and the red extending below to the abdomen. No two races of the entire species are so widely separated in characters and so closely juxtaposed geographically as these two. In one hundred miles there is a far greater change than in the two thousand miles from Canada to Guanajuato. This is not the way the species behaves in other parts of its range. For example, the birds of Lower California and those of Sonora, though entirely out of contact and separated by the Gulf of California, are in my judgement identical. In spite of the relatively great difference between *C. m. mexicanus* and *C. m. centralis,* our lack of specimens from Queretaro, and eastern and southern Michoacan makes it unwise to upset the present concept of conspecific relationship.

Carpodacus mexicanus frontalis Say

Pueblo House Finch

Fringilla frontalis Say, *in* Long, Exped. Rocky Mountains, vol. II, 1823, p. 40 (note). Arkansas River, near the mountains=near Pueblo, Colorado; type lost.

Carpodacus obscurus McCall, Proc. Acad. Nat. Sci. Phila., vol. V, 1851, p. 220. Santa Fe, New Mexico; type in Acad. Nat. Sci. Phila.; female, or male without red.

[*Carpodacus mexicanus*] *sayi* Figgins, Proc. Colorado Mus. Nat. Hist., vol. IX, no. 1, April 22, 1930, p. 3. No type selected.

Subspecific characters.—A medium sized bird with wing averaging about 20 mm. longer than the tail, the average difference exceeding that of the tarsus by less than 2 mm.; eighth or ninth primary generally longest; in winter plumage (description is taken from a recently molted September bird in winter plumage from Rocky Ford, Otero County, Colorado, on the Arkansas River, fifty miles east

of the type locality; no specimen from Pueblo seems to be available), ground color of upper parts of adult male Light Drab to Hair Brown, blotched or spotted, but never conspicuously streaked with Deep Brownish Vinaceous even on forehead and crown; rump brighter, each feather margined with gray; vinaceous color of forehead and superciliary region not sharply defined; chin, throat and jugulum Light Russet-Vinaceous to Russet-Vinaceous, the color extending to middle of breast; ground color of posterior under parts Tilleul-Buff to Pinkish Buff on sides, marked by medium wide streaks approximating Hair Brown. In adult males in worn nuptial plumage vinaceous worn away on upper parts, completely on the back as a rule, but rump, forehead and a marginal line on each side of crown becomes brightened by wear to Carmine; vinaceous of under parts worn away almost completely from breast, and brightened by wear to Carmine or Nopal Red; ground color of posterior under parts brightened by wear to a color varying from Pallid Mouse Gray to Tilleul-Buff, sometimes to Pale Pinkish Cinnamon. Adult females in winter plumage Light Drab to Drab above, obscurely blotched with darker, the rump seldom colored with bright yellow or red, generally faintly buffy, not nearly so much so as in juveniles; ground color of under parts varying from Drab Gray to Pallid Mouse Gray, but in worn nuptial plumage to Tilleul-Buff or Ivory Yellow; in winter plumage streaks on under parts medium wide, becoming narrower and sharper in nuptial plumage.

Range.—Upper and Lower Austral zones from western Kansas, northwestern corner of Cimarron County, Oklahoma, Colorado south of Arkansas River, and western Colorado west of the Divide, south through New Mexico to eastern Arizona, and to western Texas.

Specimens examined.—The localities of all specimens are shown either by circles or black dots on the distribution maps (figs. 35, 36). This method of representation will be used for each form in this paper. The names of the localities will be kept permanently with the manuscript for the use of future revisers. Colorado, 23 ♂ ♂, 11 ♀ ♀; Kansas, 4 ♂ ♂, 5 ♀ ♀; New Mexico, 15 ♂ ♂, 3 ♀ ♀ (includes types of *C. obscurus* McCall and *C. familiaris* McCall); Arizona, 2 ♂ ♂. Intergrades with *potosinus*: Texas, El Paso and Brewster counties, 17 ♂ ♂. Intergrade with *coccineus*: Chihuahua, Carmen, 1 ♂. Migrant *frontalis*: Chihuahua, 2 ♂ ♂. Intergrades with *ruberrimus*: Arizona, 39 ♂ ♂, 25 ♀ ♀, 2 jv.; Sonora, 15 ♂ ♂, 1 ♀. Migrant intergrades: Sonora, 6 ♂ ♂, 2(?).

The type specimen, now lost, came from the "Arkansas River near the mountains," which the A. O. U. Check-list gives as "near Pueblo, Colorado." Among the specimens examined, some (Coal Creek, Cañon City) were taken about twenty-eight miles to the west of Pueblo, one (Rocky Ford) fifty miles to the east and others about the same distance to the south. It seems fairly certain, although I have not been able to obtain specimens from Pueblo, that, if the house finch occurs there, it is the same as the above-mentioned birds, which in worn nuptial plumage have more extensive and brighter red on the under parts, paler ground color on the posterior under parts and narrower streaking than *smithi* from Arapahoe County, Colorado.

As foreseen by Figgins (1930) *Fringilla frontalis* Say is a composite. One of its components, the bird of northeast Colorado, he described as *C. m. smithi* (p. 3). He then proposed *sayi* as a substitute for *frontalis* Say. Stone (1930, p. 590) correctly stated that this proposal was based on a misunderstanding of an earlier statement by Oberholser (1899, p. 186), and reduced *sayi* to the synonomy of *frontalis*. However, Figgins was correct in the matter of recognizing *Fringilla frontalis* Say as a composite of more than two races. As a matter of fact, it was a composite of four races: (1) *C. m. smithi* mentioned above, (2) the bird of Colorado, south of the Arkansas River and west of the Divide, Kansas, Oklahoma, New Mexico and extreme eastern Arizona, to which the name *Fringilla frontalis* Say properly applies, (3) the paler *solitudinis* of the Great Basin, and (4) the darker, more extensively red, *grinnelli* on the west coast.

When Figgins proposed *sayi*, he did not mention a type. It is true Figgins had in mind two specimens, one from Montezuma County and one from Grandby, Grand County, Colorado. Neither of these two has "type" marked on the labels and Mr. Alfred M. Bailey writes me that he cannot find a specimen so marked in the collection of the Colorado Museum of Natural History. This name represents a composite of two races, since the bird from Grandby, although slightly intermediate in character, is in my

judgment closer to *smithi*. To avoid possible confusion, I restrict the application of this name *sayi* to the bird of "Montezuma County," Colorado, and designate this county as the type locality. No nomenclatural significance can be attached to *Carpodacus californicus* Coues (1865, p. 164), since it merely misidentifies *"Carpodacus frontalis"* for *Carpodacus purpureus californicus*, and is not coupled with any pertinent information.

Individuals in winter plumage from Hamilton and Morton counties, Kansas, are difficult to determine in the absence of birds in nuptial plumage, but I place them with *frontalis*. I have not seen specimens from Cimarron County, Oklahoma (Tate, 1925, p. 176), but presume they belong to this race. The male from Four Corners, Montezuma County, mentioned above, has sharper streaking and brighter coloration and in my judgement is definitely *frontalis*. An adult male taken in June from Grand Junction is the same.

Most of the specimens from northern Sonora south to Kino Bay seem to be intergrades between *frontalis* and *ruberrimus*. Eight of these intergrades have been taken as migrants in southern Sonora.

Four years ago the author noted a number of non-juvenal specimens of this race in female plumage that were marked males. As the large series began to amass, an increasing number was detected, until curiosity impelled him to list every case with collector's name, locality, plumage, date and collateral information. The total number now is fifty. None of these shows any trace of the buffiness on the rump or elsewhere that is characteristic of the juvenal plumage. About half of them were taken in the fall and winter months between October 1 and March 15. Eighteen specimens come from the range of *frontalis*, Colorado to Arizona, whereas there are eight from Nevada and seven from Lower California (*ruberrimus*). Out of an enormous number of specimens from California, only one male has female plumage, and only three have been taken from the entire coastal group out of approximately 350 specimens. These fifty specimens have been sexed by twenty-three different collectors, several of them very careful field men, who realized the problem involved. Analysis indicates a certain amount of segregation, largely in the northern portions of the plateau and desert groups. Sixty-four per cent of the aberrant individuals come from this region, ranging from Colorado to Arizona, Nevada and southeastern Oregon, in which regions only thirty-three per cent of our total number of specimens were collected. Van Rossem (1936. pp. 52-53) called attention to a similar occurrence among the birds of southeastern Nevada, but seemed to assume that this aberrant molting behavior might be confined to that region. This deviation from the normal molting procedure of the subgenus *Burrica* is normal in the purple finches of the subgenus *Carpodacus*, and indicates that what has seemed a vital difference between the subgenera is bridged over by these individuals. Furthermore, it may be recalled that the ratio of difference in wing and tail length to tarsal length which generally is characteristic of *Burrica* proves not to hold true for the *northern* races. It is tempting, but at present unwise, to jump to the conclusion, that these data give a clue to the orginal source of the subgenus *Burrica*. Nevertheless, it does etch a question mark on the dark clouds of the past, which may point to a subject worthy of further research.

Carpodacus mexicanus smithi Figgins
Dusky House Finch

Carpodacus mexicanus smithi Figgins, Proc. Colo. Mus. Nat. Hist., vol. IX, no. 1, April 22, 1930, p. 3. Near Aurora, Arapahoe County, Colorado; type in Colo. Mus. Nat. Hist.

Subspecific characters.—Darkest of the races of *Carpodacus mexicanus* in the United States; nearest to *Carpodacus mexicanus frontalis*, but differs in having ground color of posterior under parts

darker, Pale Mouse Gray to Mouse Gray, instead of Pallid Mouse Gray to Pale Pinkish Buff; streaking of under parts wider; red coloration averaging darker, at least in worn nuptial plumage.

Range.—East slope of Continental Divide in Colorado, north of Arkansas River Valley; extends north into southern Wyoming.

Specimens examined.—Wyoming, 1 ♂, 2 ♀ ♀, 1 jv.; Colorado, 64 ♂ ♂, 28 ♀ ♀. Migrants: southern Colorado, 1 ♂; Texas, El Paso County, 5 ♂ ♂.

Thanks to the courtesy of Mr. J. D. Figgins and Mr. Alfred M. Bailey, I was given the opportunity of holding a large series of *smithi* in my possession for a long period of time, while I was endeavoring to assemble specimens of *frontalis*. This has made it possible, after various interruptions, to reconsider the question of the validity of the race. As indicated under the discussion of *frontalis*, I am now convinced that *smithi* should be recognized. A number of specimens have been submitted to me by other persons, including Mr. Edward R. Warren of Colorado Springs and Mr. John W. Scott of the University of Wyoming, specimens which are obviously not soiled by coal dust and have not been "washed," and these substantiate the major characters given by the describer. It is known that house finches of the valleys of southern California wander high into the mountains after the breeding season. A similar movement may account for the appearance farther north of an occasional specimen of *frontalis* at higher altitudes. On the other hand, migrants of *smithi* appear in the range of *frontalis* and should be eliminated in comparisons by using only breeding birds. It is important in this connection that certain breeding birds of *C. m. potosinus* of San Luis Potosi, Mexico, are just as dark gray as the unsoiled gray individuals of *smithi* from Arapahoe County, Colorado. The rainfall of the habitat of *smithi* averages about ten inches more than that of *solitudinis*.

Mr. McCreary of the University of Wyoming informs me that house finches have occurred in southern Wyoming at Evanston, Kemmerer, Green River, Parco, Laramie, Cheyenne, Terrington, Ft. Laramie, Lusk, Wheatland, Midwest, Thermopolis and Big Horn Basin. He adds, "It is partially migratory, as some years it is not seen—in the winter. In the winter of 1937-38 large numbers stayed all winter." The Wyoming specimens fortunately are not soiled by soot and are referable to this race.

Carpodacus mexicanus solitudinis Moore
Desert House Finch

Carpodacus mexicanus solitudinis Moore, Proc. Biol. Soc. Wash., vol. 52, p. 107, June 24, 1939. Fallon, Nevada; type in coll. Robert T. Moore.

Subspecific characters.—A larger, much less extensively red bird than *ruberrimus*, with ground color slightly whiter (generally pure white); it is also a less extensively red bird than *frontalis* or *smithi*, with much less red above and much whiter ground color.

Range.—*Solitudinis* is most strongly differentiated in the extreme arid desert regions of Nevada where the mean annual rainfall is less than five inches, but the race extends into sections where the rainfall is from five to ten inches in Nevada, the extreme arid portions of Mono and northern Inyo counties, California, southeastern Oregon, southern Idaho, southeastern Washington from Wallula to Walla Walla, and to the Yakima Valley of Washington and the Okanogan Valley of Washington and British Columbia.

Specimens examined.—Washington, 5 ♂ ♂, 2 ♀ ♀; Oregon, 11 ♂ ♂, 8 ♀ ♀; Idaho, 2 ♂ ♂; Nevada, 35 ♂ ♂, 14 ♀ ♀ (including type). Doubtful intergrades, nearest *solitudinis*: Washington, 17 ♂ ♂, 15 ♀ ♀. Intergrades with *grinnelli*: 13 ♂ ♂, 1 ♀. Intergrades with *frontalis*: Utah, 17 ♂ ♂, 10 ♀ ♀; Arizona, Coconino and Mojave counties, 2 ♂ ♂. Intergrades with *grinnelli* of central and southern California: San Joaquin Valley, 4 ♂ ♂; Los Angeles County, 2 ♂ ♂, 1 ♀; SE. California, 5 ♂ ♂, 4 ♀ ♀. Intergrades with *ruberrimus*: extreme SE. California, 13 ♂ ♂, 5 ♀ ♀; W. Arizona, 1 ♂; NW. Sonora, 9 ♂ ♂; NE. Lower California, 7 ♂ ♂, 2 ♀ ♀.

I have remarked elsewhere that the paleness of this race is probably due to the extreme aridity and to other meteorological factors of the Great Basin region. By way of the ten and fifteen inch rainfall areas, *solitudinis* inosculates with other races to the east, south and west. A striking example is the penetration through the Mojave Desert into the ten inch area of the San Joaquin Valley, and into Modoc County of northeastern California.

Carpodacus mexicanus grinnelli Moore
Grinnell House Finch

Carpodacus mexicanus grinnelli Moore, Proc. Zool. Soc. Wash., vol. 52, p. 109, June 24, 1939. Scott River, 6 mi. NW Callahan, Siskiyou County, California; type in Mus. Vert. Zool.

Subspecific characters.—A medium sized bird like *frontalis* and *solitudinis;* it differs from both in being more extensively red both above and below in all plumages, with crown more solidly red, and from *solitudinis* in less whitish ground color and wider streaking. It differs from *frontalis* especially in more pinkish buff ground color, and in less whitish nuptial plumage.

Range.—Characters best developed in the forty to eighty inch rainfall areas (U. S. Dept. Agric., 1922, pp. 6-7) of the Transition Zone of southwestern Oregon and northern California; thence it extends throughout the Upper Sonoran Zone of California, except in northeastern California and the Mono Lake region, and also into portions of the Lower Sonoran Zone, south to the San Pedro Mártir Mountains and the northwestern coast of Lower California as far as latitude 28°; also occurs on Farallon Islands, northern members of Santa Barbara island group, Todos Santos and Cedros islands.

Remarks on range.—In a previous paper (*loc. cit.*) I have stated my belief that *grinnelli* and *solitudinis* intergrade with each other in several sections of the ten and fifteen inch rainfall areas of California. The localities where intergrades have been taken are shown on the distribution maps (figs. 35, 36) by circles, whereas true *grinnelli* is represented by dots in the forty to eighty inch rainfall area of California and Oregon, and in the fifteen to forty inch area in southern and Lower California.

Specimens examined.—Vancouver Island, 2 nestlings; Washington, 1 ♀; Oregon, 6 ♂ ♂, 3 ♀ ♀; California, 158 ♂ ♂ (including type), 32 ♀ ♀; Lower California, 8 ♂ ♂, 1 ♀.

Remarks on nomenclature.—*Carpodacus purpureus* var. *californicus* of Brewster (1877, p. 37) is merely a misidentification without nomenclatural standing.

Pyrrhula inornata Vigors (1839, p. 20) must be considered. Sclater (*in* Sharpe, 1888, p. 139) stated that this type "has disappeared"; he judged it to be a *"Spermophila* or *Guiraca."* I follow Grinnell (1932, p. 303) in so far as he gives no consideration to Sharpe's suggestion. The descriptive phrase, *"subtus albescens,"* certainly rules out the last, and the large measurements the first. Ridgway's rather arbitrary placement of this citation in the synonymy of *Carpodacus mexicanus frontalis* Say, when two other species of the genus *Carpodacus* have an equal claim for consideration, calls for reëxamination. Certain data must be kept in mind: (1) The measurements, when reduced to the metric system, are, length of body, 120.61 mm., wing 76.18 mm., bill 12.70 mm., tail 57.13 mm., and tarsus 19.04 mm. (2) A phrase from the Latin description reads, *"subtus albescens, brunneo maculata."* (3) If the bird were a member of the genus *Carpodacus,* which is all that concerns us in this paper, it was a female. (4) It was taken between October 9 and March 18 (almost certainly before January 27), during which period the bird must have been in unworn winter plumage. (5) Since no race of *Carpodacus* of the large size and description given above could have been taken at Acapulco, San Blas or Mazatlan, the possible localities which members of the party on H. M. S. Blossom (Beechey, 1831) visited can be reduced to the city of Tepic, Monterey and San Francisco. The occurrence of the Cassin Purple Finch on the Tres Marias Islands (McLellan, 1926, p. 306) represented a vagrant and does not imply the probability that the species could have been taken at San Blas or Acapulco, where no form of *Carpodacus* has been recorded.

Admitting that descriptions were carelessly made a century ago, nevertheless, we are bound by this description, since the type has disappeared, and we certainly have no right to invent a different description to suit some preconceived idea of the identity of the type. The large size of the bill and the tarsus eliminates every race of *Carpodacus mexicanus,* except *amplus,* and the Blossom did not visit Guadalupe Island. Furthermore, *"subtus albescens"* does not describe the female of *amplus* at any time of the year, nor the female of any other *C. mexicanus,* least of all in the winter months. This phrase does describe the female either of the Cassin Purple Finch or of the California Purple Finch, even in winter plumage, and four of the five measurements fit the latter best; the fifth measurement,

that of the bill, if it was measured from the rictus, would also apply. Finally, the California Purple Finch does occur in the vicinity of San Francisco in the winter months. I therefore suggest the elimination of *Pyrrhula inornata* Vigors from the synonymy of *Carpodacus mexicanus* and its races, and leave it to some future reviewer to decide whether the Latin name of the California Purple Finch should be changed.

Although we are still in doubt as to the racial identification of the birds of northeastern Washington, the unbroken occurrence of white-bellied birds from eastern Oregon and Nevada through southeastern California to northeastern Lower California, indicates that the ranges of *grinnelli* and *frontalis* are separated, and that the area between is occupied by *solitudinis,* a bird which is far more different from either of them, than *grinnelli* is from *frontalis.* I have pointed out in the original description of *grinnelli* (*loc. cit.*) that Ridgway's failure to recognize this form was due to his unfamiliarity with the relatively great extent to which the red is gradually worn away from November to June. This wearing has been described by recent investigators (Grinnell, 1911, Michener and Michener, 1931, and Moore, 1936).

It is rather surprising that as we proceed south through California into Mexico we do not find the red extending farther on to the posterior under parts, as is the case with the birds both of the plateau and the desert groups. *Mcgregori* and *amplus* are much less extensively red than *grinnelli* of southwestern Oregon. The extensively red bird of eastern and southern Lower California, belongs to the desert group, as shown by its identity with the bird of Sonora.

Carpodacus mexicanus clementis Mearns
San Clemente House Finch

Carpodacus clementis Mearns, Auk, vol. XV, July, 1896, p. 258. San Clemente Island, California; type in U. S. Nat. Mus.

Subspecific characters.—Nearest to *C. m. grinnelli* of the mainland, but bill larger on the average; in adult males the ground color of posterior under parts and sides slightly more buffy and streaks slightly wider; adult females more Drab, rather than Drab-gray above; ground color of under parts decidedly more buffy; streaks Drab rather than Hair Brown and wide.

Range.—San Clemente Island, where its characters are expressed best. Birds of Catalina, Santa Barbara, San Nicolas, and Los Coronados islands are variously intermediate toward *grinnelli.*

Specimens examined.—Santa Catalina Island, 4 ♂ ♂, 1 ♀; San Clemente Island, 53 ♂ ♂, 17 ♀ ♀; Santa Barbara Island, 3 ♂ ♂, 1 im. ♂, 2 ♀ ♀; San Nicolas Island, 12 ad. ♂ ♂; Los Coronados Islands, 3 ♂ ♂, 1 ♀, 1 jv.

Clementis is certainly one of the weaker races of the *mexicanus* group, but the buffier coloration of the adult females, which does not seem to have been emphasized, is conspicuous in the large comparable series of worn March and April birds which I have inspected. In this character even Santa Cruz Island females (I have seen only four adult March birds), although grayer above and showing whiter ground color below, have wider and more Drab streaks on the anterior under parts than mainland birds, but they are slightly closer to *grinnelli* than to *clementis.* Only two comparable adult females from Santa Barbara Island have been inspected by me, and these two happen to be close to *grinnelli,* having the smaller bill as well as less Drab (grayer) coloration and finer streaking.

I cannot perceive that the red or yellow coloration of the adult males is more brilliant than in *grinnelli* when birds of the same stage of wear are compared. The best characters are discernible in the females. The extraordinarily large proportion of yellow and orange males should not be too much undervalued in view of the fact that this is an important character of another island form, *C. mutans,* where all nineteen males exam-

ined have this coloration. Granting that young birds are more apt to be yellow (Michener and Michener, 1931), the contrast between *clementis* and *grinnelli* is still extraordinary. Seventy-three per cent of 53 adult San Clemente males have some yellow or orange coloration, whereas only 16 per cent of 176 mainland birds have it.

The opinions of numerous authors (Mearns, 1898, Grinnell, 1915, Howell, 1917, Dawson, 1923, van Rossem, 1925 and Willett, 1933) should all be weighed in evaluating *clementis,* since each may have inspected a different series.

Carpodacus mutans Grinnell
Hawaiian House Finch

Carpodacus mutans Grinnell, Auk, vol. 29, January, 1912, p. 24. Haiku, Maui, Hawaiian Territory; type in Mus. Vert. Zool.

Specific characters.—Resembles in winter plumage *Carpodacus m. grinnelli* of California, but differs in having yellow or orange rather than crimson coloration; occiput brown, not colored; streaking of posterior under parts much more sharply outlined; ground color of posterior under parts more yellowish (Ivory Yellow instead of Tilleul-Buff).

Range.—Confined to the Hawaiian group, appearing at least on the islands of Oahu, Molokai, and Hawaii.

Specimens examined.—Hawaiian Islands: Oahu, 3 ♂ ♂; Molokai, 12 ♂ ♂, 6 ♀ ♀; Paloan, 2 ♂ ♂; Kauluwai, 1 ♂; Hawaii, Olaa, 1 ♂.

Phillips (1912) doubted the wisdom of employing the name *mutans,* and also seemed to question the validity of the species itself. It seems to me the only question of importance to the systematist is whether the birds, as they exist today, show the differences emphasized by Grinnell, regardless of what the characters may have been when they were first introduced. The two series which I have examined, namely, seven birds in the collection of the Museum of Vertebrate Zoology and eighteen in the Museum of Comparative Zoology, reveal the character claimed by Grinnell.

It seems to me that two other characters have been overlooked. In the males in the series in the Museum of Vertebrate Zoology, the outer primary is the longest, and the next ones (9, 8, 7 and 6) are shorter in regular order.

An interesting table was prepared by Grinnell (1911, p. 193), by which he attempts to correlate different types of abnormal coloration with climatic areas.

Carpodacus mexicanus nigrescens Griscom
Tamaulipas House Finch

Carpodacus mexicanus nigrescens Griscom, Amer. Mus. Novit., no. 293, p. 5, January 12, 1928. Miquihuana, Tamaulipas, Mexico; type in Amer. Mus. Nat. Hist.

Subspecific characters.—Griscom says, "Similar to *Carpodacus mexicanus potosinus* . . . , but adult male even darker throughout, the red areas slightly so, but upperparts, primaries and streaks below dark fuscous or blackish brown; adult female and young of both sexes also darker in some respects."

Range.—Known only from the type locality. Apparently only four specimens have been taken.

Specimens examined.—Tamaulipas, Miquihuana, 1 ♂ (type), 1 ♂, 1 ad. ♂, 1 jv. ♀.

The type shows clearly the characters given by Griscom. It is as dark on the wings, tail and upper parts, as the blacker individuals from the coal regions of central Colorado. From the examination of two males only, this would seem to be a very well marked race, the blackest of all the races of *mexicanus*. The under parts are dark red even in worn July plumage. At this time of year, when normally the red is brightest, in this race it is as dark as Carmine. It extends posteriorly only as far as the anterior line of the abdo-

men and does not appear on the under tail coverts. On the upper parts it shows in an obvious suffusion. The juvenile from Miquihuana approximates a female of *potosinus*. A male from the type locality with throat, forehead and rump yellow, taken July 5, has the wings, tails and streaking below much browner than in the type. The measurements are approximately those of the northern races of the United States, but as in all Mexican races, the wing is proportionately shorter in relation to the tail, so that the difference between them is only slightly greater than the length of the tarsus. The streaking on the under parts is broadly and sharply outlined. *Nigrescens* occurs in a forty to sixty inch rainfall area, which circumstance seems to have affected its coloration.

Carpodacus mexicanus potosinus Griscom
San Luis House Finch

Carpodacus mexicanus potosinus Griscom, Amer. Mus. Novit., no. 293, p. 5, January 12, 1928. San Luis Potosi, Mexico; type in Mus. Comp. Zool.

Subspecific characters.—Adult male in winter plumage not nearly so dark above or below as *Carpodacus m. nigrescens*, the red areas being approximately Carmine as compared with Oxblood red; wings and tail browner; most specimens with very little suffusion of red on crown, occiput and back; red on anterior under parts extends to about middle line of chest; streaking narrower; size slightly larger.

Range.—State of San Luis Potosi, Mexico, north through Nuevo Leon and at least eastern Coahuila to Kinney and Valverde counties, Texas, and to extreme northeastern Chihuahua.

Specimens examined.—San Luis Potosi, 11 ♂ ♂, 5 ♀ ♀; Nuevo Leon, 1 ♂; western Texas, 7 ♂ ♂, 11 ♀ ♀; northeastern Chihuahua, 1 ♂.

Potosinus is an excellent race, strongly differentiated from its neighbor to the south, *centralis* of Guanajuato, and even more so from its neighbor to the southeast, *C. mexicanus mexicanus* of Hidalgo. Specimens from Kinney County, Texas, are almost identical with *potosinus* from San Luis Potosi, differing only in slightly smaller dimensions. The same is true of the individual from Valverde County. A comparable series of males and females taken from February to April show the slightly buffy ground color of the posterior under parts of *potosinus*, which is white in *frontalis* intergrades taken in May from western Brewster County. From Valverde County west to El Paso County there is a large area in southwestern Texas from which the specimens are paler in ground color below and redder in the dark area than either *frontalis* or *potosinus*. They approach, slightly, *coccineus* of Jalisco. They may represent intergrades between *frontalis*, *potosinus* and the intermediates of San Feliz in southern Chihuahua. Unfortunately there are not sufficient specimens available to work out the distributions and I venture only to suggest that *potosinus* may extend as far west as Marathon in Brewster County. An individual from Presidio County is placed in *potosinus* provisionally.

No specimens are available from between Kinney County, Texas, and Cienaga de las Flores, twenty miles north of Monterrey, Nuevo Leon. At the latter locality George Miksch Sutton collected a single bird which seems definitely to be *potosinus*. I have seen no specimens from eastern Coahuila, but a male (January 11) from Chupadero, northeastern Chihuahua, is almost true *potosinus*. It would seem, then, that western Coahuila should be inhabited by *potosinus*.

Carpodacus mexicanus centralis Moore
Guanajuato House Finch

Carpodacus mexicanus centralis Moore, Condor, vol. 39, September, 1937, p. 204. Guanajuato, Mexico; type in U. S. Nat. Mus.

Subspecific characters.—Largest of all the forms of the subgenus *Burrica*, even exceeding *amplus* of Guadalupe Island in all measurements, except size of bill; males with great extension of Prussian

to Ocher Red on under parts, including, in early winter plumage, almost all the abdomen as well as under tail coverts. It is closest in this to the smallest of all races, *rhodopnus* of Sinaloa, but in the nuptial plumage it differs, the red being worn away on portions of the lower abdomen. In nuptial plumage the color below is Spectrum Red to Carmine as compared with Rose Red and the streaking on posterior under parts is more prominent.

The accession of a fresh series of thirty-three specimens, representing all plumages, makes possible a more detailed comparison than was made in the original description. Compared with *potosinus,* males in winter plumage are much more extensively red below; much darker above because of the heavy suffusion of red on all upper parts; streaking much less conspicuous, being hidden by the red suffusion, but not in nuptial plumage; ground color of posterior under parts more Pinkish-Buff, but in worn nuptial plumage Vinaceous-Buff to Tilleul-Buff. Females in fresh winter plumage in the fall, apparently *darker* above; streaking wider and more sharply outlined on under parts; ground color between Pinkish-Buff and Cinnamon-Buff on lower flanks; Tilleul-Buff on anterior under parts.

A rather unusual characteristic, brought out by the new series, is the rather definite streaking of the upper parts of both males and females in winter plumage. This is the only race which approaches the purple finches in this respect.

Range.—State of Guanajuato, Mexico, and northern Michoacan.

Specimens examined.—Guanajuato, 25 ♂ ♂, 11 ♀ ♀; northern Michoacan, 3 ♂ ♂, 1 ♀.

When one considers that *centralis, potosinus* and *C. mexicanus mexicanus* of Hidalgo occupy a triangle with the three corners not over 200 miles from each other, the distinctness of these forms seems extraordinary. This is particularly so in comparison with the three northern races of the United States which spread over a territory 1400 by 700 miles, and which have the same measurements and differ only to a moderate degree in coloration. *Mexicanus* is the least extensively red of all races and *centralis* is the most red, barring one, *rhodopnus*.

Nine individuals are at hand from Rancho Enmedio in the Sierra de la Media Luna, thirty-five miles from the boundary of the state of San Luis Potosi. Two of the males have the less restricted red and smaller size of *potosinus*; the other three males are closer to *centralis*. Three males from San Augustin at the southwest end of Lake Cuitzeo, Michoacan, although very slightly smaller, are almost typical *centralis*.

Carpodacus mexicanus coccineus Moore
Scarlet-breasted House Finch

Carpodacus mexicanus coccineus Moore, Proc. Zool. Soc. Wash., vol. 52, July, 1939, p. 128. "Mts. of Colima," Colima; type in U. S. Nat. Mus.

Subspecific characters.—In nuptial plumage resembles most closely *Carpodacus m. potosinus,* but differs in having red worn nuptial plumage Scarlet, as compared with Nopal Red; ground color of upper parts distinctly paler, Drab as compared with Benzo Brown, suffused with Scarlet instead of Scarlet Brown; ground color of posterior under parts whiter; size about same. Females, in worn nuptial plumage, seemingly with upper parts paler, more Drab as compared with Fuscous; ground color of under parts whiter.

Range.—Mountains of Colima, western Jalisco and Nayarit north to Tepic and Guadalajara, east through Jalisco at least to La Barca, possibly to Patzcuaro, Michoacan. The northern Jalisco (Bolanos and Colotlan) and southern Durango birds are intergrades with *centralis,* but are closer to *coccineus.*

Specimens examined.—Colima, 1 ♂ (type); Jalisco, 13 ♂ ♂, 5 ♀ ♀; Nayarit, 9 ♂ ♂, 4 ♀ ♀; Michoacan, 1 ♂. Intergrades with *potosinus*: Durango, 2 ♂ ♂, 3 ♀ ♀.

This bird is the most brilliantly scarlet race in nuptial plumage of any of the house finches. From the geographically closest bird to the east, namely *centralis* of Guanajuato, it is distinguished by its smaller size, brighter coloration, and much less extensively red under parts. It is closest to the geographically more distant bird to the northeast, *potosinus* of San Luis Potosi, but differs as described above.

Carpodacus mexicanus altitudinis new subspecies
Sierra Madre House Finch

Type.—Male adult, in annual molt, no. 18503, collection of Robert T. Moore; San Feliz, Chihuahua, Mexico, on Chihuahua-Sinaloa state line, due east of Tepetuco, Sinaloa, Mexico; altitude "about 7500 feet;" August 20, 1936; collected by Chester C. Lamb.

Subspecific characters.—Very small size, almost as small as *rhodopnus* of the coastal plains of Sinaloa, but differs in much less extensively red coloration below; streaks on posterior under parts exceedingly wide, whereas streaks almost absent in *rhodopnus*. Females much more widely streaked below and darker, the markings almost as dark brown as in *centralis*.

Differs markedly from *coccineus* to the south, in being much smaller (wing 72.8 compared with 79.3); red coloration darker, less Scarlet. In females and immature males streaking below much wider than in a September bird from Jalisco. To the north, two October specimens taken October 7 at Batopilas in the great arid canyon of southwestern Chihuahua are *Carpodacus m. ruberrimus,* being more finely and obscurely streaked below and somewhat less extensively red than *altitudinis*. The females from the same place differ in a very much narrower streaking below. To the east, the series from Durango shows much larger dimensions and lighter streaking.

Range.—Undoubtedly confined to a few favorable places at high altitudes (7500 feet) in the Sierra Madre which divides Sinaloa from Chihuahua and Durango. The northern and southern extensions along the range are unknown, but it does not reach as far south as Tepic, Nayarit.

The range of *altitudinis* seems to parallel that of other races that are restricted to the heavy rainfall areas of the western slopes of the Sierra Madre, such as *Otus asio vinaceous*. These forms are markedly different from their relatives of the more arid Mexican plateau to the east and of the arid coastal plains to the west.

Specimens examined.—Chihuahua, San Feliz, 4 ♂♂, 3 ♀♀, 2 im. ♀♀. Intergrades closer to *potosinus*: Durango, Papasquiaro, 1 jv. ♂, 1 jv. ♀; Durango City, 1 ♂, 2 ♀♀; Guanacevi, 1 ♂; Opito, 3 ad. ♂♂, 2 im. ♂♂, 1 ad. ♀, 1 im. ♀. Chihuahua, San Francisco Mines near Parral, 5 ad. ♂♂, 1 ♀.

This dark, heavily streaked race is apparently confined to the lower Transition Zone of the Sierra Madre. I have flown over the type locality twice and have camped within approximately fifteen miles of it in an air line on Mt. Mohinora, in May, 1937. As has been indicated in a previous article (Moore, 1937a, p. 95), there is no doubt that the entire area from San Feliz to Mt. Mohinora is one of heavy rainfall which probably approximates a mean annual total of forty to sixty inches. Nearby areas have been recently so mapped (Brooks, 1936, map 14). This contrasts with twenty-one inches at Tascate, 75 miles to the northeast, and with eighteen inches at Parral, 125 miles farther east in Chihuahua. To the west in southern Sonora, near Alamos, it is only fifteen inches. San Feliz is one of the highest points at which the house finch has been found nesting (see F. M. Bailey, 1928, p. 690).

It would be desirable to have adequate series taken at other periods of the year, but fortunately there is comparable material showing the same early winter plumage (late July to early October), for every race that adjoins *altitudinis*. *Altitudinis* is certainly not an intergrade, for males, females and immatures are less extensively red and are darker and more widely streaked below than are similar series of *rhodopnus* to the west, and than series of *coccineus*. The much larger birds of the semi-arid plateau of Durango to the east are intergrades with *centralis,* and are somewhat smaller in size and less extensively red.

The series from the San Francisco Mines in Chihuahua clearly has affinities with *potosinus,* being less extensively red and smaller than the Durango birds, but more extensively red and much larger than *altitudinis*. They are intermediates between *altitudinis* and *potosinus*.

Carpodacus mexicanus rhodopnus Moore
Sinaloa House Finch

Carpodacus mexicanus rhodopnus Moore, Condor, vol. 38, 1936, p. 203. El Molino, Sinaloa, Mexico; type in coll. Robert T. Moore.

Subspecific characters.—Smallest, most extensively red and least streaked of all the races of *mexicanus;* entire under parts in winter plumage, and almost invariably in nuptial plumage, including under tail coverts as well as back, suffused with various hues of red. Differs from all preceding races in that the difference between wing and tail noticeably less, and tarsus relatively longer; difference in wing and tail less than the length of tarsus instead of more.

Range.—Approximately the central third of Sinaloa from the coast to an altitude of about 3000 feet and from El Molino and Palmar in the south near latitude 24° north approximately to the Sinaloa River.

Rhodopnus may be found sporadically as far south as Quelite near the Tropic of Cancer, as C. C. Lamb reports a sight record for that place. It is possible to define the range of *rhodopnus* more precisely than that of any other mainland race of *Burrica.* North and northwest of the range of true *rhodopnus* lies a strip of territory ranging north of the Sinaloa River, approximately fifty miles in length, in which intergrading forms with *ruberrimus* have been found, for example at Naranjo and Ahome in the extreme northwestern corner of the state. The birds of Yecorato, east of the Fuerte River, are definitely *ruberrimus,* having the posterior under parts in nuptial plumage largely white, or pinkish white. *Rhodopnus,* unlike *ruberrimus,* does not seem to be migrant.

Specimens examined.—Sinaloa: 28 ♂ ♂ (including type), 13 ♀ ♀. Intergrades with *ruberrimus,* 2 ♂ ♂, 3 ♀ ♀. Migrants from intergrading area to north: Palmar, 1 ♂, 1 ♀; Guamuchil, 1 ♂ (March 19); Culiacan, 2 ♂ ♂ (January 30, March 1); El Molino, 1 ♂ (February 10).

Since *rhodopnus* was described (Moore, 1936), more specimens have become available from all over Sinaloa, except for the puzzling gap in the distribution of the species that lies between a point south of Palmar and the southern boundary of the state. Of the twenty-eight adult males, ten are in nuptial and eighteen in winter plumage. All of these are completely red from chin to under tail coverts, including abdomen. The race is extremely well marked in nuptial plumage.

The most southern point at which we have taken a specimen is Palmar, about latitude 24°30′, in a gap in the mountains where the altitude is only about 800 feet. We have never taken it higher than at Rancho El Padre, 3000 feet, near latitude 26° which is the northern limit of the race. None of the five specimens from this locality shows any tendency to intergrade toward *altitudinis* of the high mountain area (7500 feet). The type locality of *altitudinis* is only thirty-eight miles east of El Padre.

Rhodopnus seems to represent the most southwesterly extension of a movement which may have had its origin in the depressed temperatures of the glacial period and which may have pushed the species down on to the Nevada-California deserts and the coastal plains of Sinaloa and Sonora. Throughout the vast arid belt occupied by the desert group, the ground color of the posterior under parts remains almost pure white, but the birds become smaller and more extensively red as we go south to approximately the latitude of Guaymas, where the mean annual rainfall increases to about ten inches. At Culiacan near the type locality of *rhodopnus* the rainfall rises to twenty-one inches, and the white ground color darkens to Pale Vinaceous-Fawn and the bird is now completely incarnadined. Although I believe that the extreme arid conditions of this belt affect the size and paleness of coloration of these races, the increasing extension of the red is due to some unknown cause. This is indicated by the fact that to the south in the mountains of Colima, the type locality of *coccineus,* where the annual rainfall is much greater, thirty to fifty inches, the birds are not nearly so extensively red as in *rhodopnus.*

In company with Arthur Barr and Chester Lamb, I found quite a colony of this race breeding at Reforma, Sinaloa, in May, 1938, under the thatched roofs of huts. A set of four eggs was taken.

Carpodacus frontalis ruberrimus Ridgway
San Lucas House Finch

Carpodacus frontalis ruberrimus Ridgway, Man. N. Amer. Birds, 1887, p. 391 (footnote). Cape San Lucas=La Paz, Lower California; type in U. S. Nat. Mus.

Carpodacus mexicanus sonoriensis Ridgway, Birds N. and Middle Amer., part 1, 1901, p. 135; no type designated.

Subspecific characters.—Differs from *C. m. rhodopnus* in nuptial plumage in less extensive red of under parts, the abdomen with little red coloration but often a suffusion on the flanks; streaks of abdomen obvious, instead of almost completely concealed; color of red on under parts brighter, Nopal Red instead of Carmine.

In winter plumage, *ruberrimus* is considerably brighter, when a series for each month of the year is compared. For example, January birds are much more rosy pink, whereas *rhodopnus* is Burnt Carmine to Wine Purple. The upper parts average less reddish and slightly paler brown. Adult females, from March to May, do not differ greatly, but *ruberrimus* has wider, somewhat less numerous, streaks on under parts.

Range.—Characters most extreme in Cape San Lucas region; ranges north along interrupted stretches of coastal plains of eastern Lower California at least to Mulegé, latitude 26° 54′; in central and western portions of southern half of Lower California, north to about latitude 28°; also from the Rio Fuerte, extreme northern Sinaloa, north on coastal plains about to Guaymas, Sonora, latitude 28°, east to a low altitude (about 2000 feet) in the foothills.

Birds of northeastern Lower California and northern Sonora are intergrades with *solitudinis*.

Specimens examined.—Lower California, 115 ♂ ♂, 48 ♀ ♀ (including type), plus large series in M. C. Z. and Brit. Mus. Also, nearly 100 specimens from west-central and southern Sonora, southwestern Chihuahua and extreme northern Sinaloa. Migrants in northern Sinaloa, 2 ♂ ♂.

In a former paper (Moore, 1936), on the basis of 95 specimens of *ruberrimus* from Sonora and Lower California, I agreed with the conclusion reached much earlier by Brewster (1902, p. 134) that both so-called *sonoriensis* and the birds of the Cape Region of Lower California are "referable to the same form (*ruberrimus*)." Since then I have had the opportunity to see a great many more specimens in the Smithsonian Institution, the British Museum and notably in the Museum of Comparative Zoology at Cambridge. These specimens are so numerous that I have not attempted to list them. Brewster called attention to the fact that the "birds of the two regions, as represented in my [his] collection, do not show (even by averages of measurements) the difference in respect to the length of the wings and tail which Mr. Ridgway has noted." He conceded that, " as a rule, my examples from the Cape Region are characterized by somewhat thicker or more swollen bills than are possessed by those which I have received from Guaymas and Alamos, Sonora. . . . " A much larger series now available makes even this character disappear; the height of the bill at the base is just about the same; the length of the exposed culmen may be one-third of a millimeter longer.

Regarding the criticism that Ridgway named no type of *sonoriensis*, Major Goldman, Dr. Friedmann and Dr. Oberholser all expressed to me the conviction that no. 164324, Biol. Survey Coll. *was* chosen by Ridgway as the type. It is so marked on the original tag in handwriting, which Major Goldman believes is Nelson's, and he adds that Nelson always regarded it as the type. Furthermore, Friedmann showed me the card in Richmond's copy of the "card catalogue," which definitely proves that this coworker with Ridgway, who specialized in research on types, described it in his handwriting as the "type." It still seems to me that the use of separate names for *ruberrimus* and the birds of southern Sonora would obscure an exceedingly interesting result of the directing power of similar climatic environments, rather than help to elucidate it. Therefore, I am reducing *sonoriensis* to the synonymy of *ruberrimus*.

In order to ascertain which group of birds on the east coast of the Gulf of California most closely resembles those of the Cape region of Lower California (type locality of

ruberrimus), I grouped together all the specimens from this latter region from Cape San Lucas, latitude 22°52′, to latitude 26°. These cover a section approximately comparable in size to the range of *rhodopnus* across the Gulf. One would expect these Cape region birds to show approximately the same average size. Instead, they are larger, having almost exactly the measurements of the birds occurring between Alamos and Guaymas, that is, from latitude 27° to latitude 29°. It may be more than a coincidence that the mean annual rainfall for the region between Hermosillo (175 mm.) and Guaymas (283 mm.) is much closer to that of La Paz (142 mm.), than to the very much greater rainfall in the Culiacan region of Sinaloa (542 mm.).

Ruberrimus, like *rhodopnus,* differs from the races farther north in having the tarsus longer than the difference between the wing and the tail.

Grinnell (1928, pp. 9-10) has stated that only three differentiates have come into Lower California and established themselves as "vagrants" via the water route from the mainland. It is probable that *Carpodacus* arrived by the northern route and like many other groups became differentiated in the Cape district. It is of interest to students of zoogeography to note that Schuchert (1935, map no. 14, series following p. 767) has shown that as late as the Lower and Middle Miocene the water surface of the Gulf of California was reduced almost one-half and the upper one-third was land.

Carpodacus mcgregori Anthony
San Benito House Finch

Carpodacus mcgregori Anthony, Auk, vol. XIV, April, 1897, p. 165. San Benito Island, Lower California; type in Carnegie Mus., Pittsburgh.

Specific characters.—Bill much larger than in *C. mexicanus*. Resembles most closely *C. m. clementis,* but in males in March at least, darker above; streakings below somewhat wider; red or yellow coloration somewhat less extensive; bill and tarsus larger; females in March seem to be much more widely streaked below and darker above. Differs even more in the same characters from *grinnelli,* having red much less extensive on under parts and seldom any on back. Almost all of the males I have seen are yellow or orange-yellow.

Range.—As a breeding bird, apparently confined to San Benito Island, but vagrants (Grinnell, 1928, p. 155) occur on Cedros Island.

Specimens examined.—Lower California, San Benito Island, 7 ♂ ♂, 6 ♀ ♀.

Remarks.—I find the length of wing and tail only very slightly larger than in *grinnelli* of northwestern California; *mcgregori* are somewhat larger than *grinnelli* from northwestern Lower California, the wing being 2 mm., and tail 1.9 mm., longer.

Carpodacus amplus Ridgway
Guadalupe House Finch

Carpodacus amplus Ridgway, Bull. U. S. Geol. and Geog. Surv. Terr., vol. II, April, 1876, p. 187. Guadalupe Island, Lower California; type in U. S. Nat. Mus.

Specific characters.—Resembles most closely *C. mcgregori,* but size larger, the bill especially; upper parts much darker brown without suffusion of red; under parts more widely streaked in males only.

Range.—Confined to Guadalupe Island, Lower California.

Specimens examined.—Guadalupe Island, 38 ♂ ♂, 1 im. ♂, 25 ♀ ♀.

Remarks.—It is interesting to note that although the wing and tail are longer than in the northern races, including *grinnelli* of California, the tarsus is also proportionately longer, so that the tarsus is almost exactly the same length as the difference between the wing and tail, whereas in California birds and other northern races, it is shorter.

Carpodacus mexicanus mexicanus Müller
Mexican House Finch

(*Fringilla*) *mexicana* Müller, Syst. Nat. Suppl., 1776, p. 165 (based on *Bruant, de Mexique Buffon*, Pl. Enl., vol. VI, pl. 386, fig. 1).

C(arpodacus). rhodocolpus Cabanis, Mus. Hein., vol. I, August, 1851, p. 166. "Mexico," that is, Cuernavaca, Morelos; type in Berlin Mus.

Fringilla haemorrhoa Lichtenstein, Preis-Verz. Mex. Vög., 1830, p. 2. Mexico; type in Berlin Mus.

Subspecific characters.—Differs from all of the known races of *Carpodacus mexicanus* in having red both above and below very much restricted and sharply defined; red of forehead confined to U-shaped pattern, the uprights of the U consisting of broad superciliary stripes extending to the end of the postauricular region; red on under parts confined to chin and throat; no suffusion of red whatever on the rest of upper parts, not even on the occiput; size large, wings and tail about equal to *amplus*, smaller than *centralis;* bill large, but not nearly so large as in *amplus;* ground color of posterior under parts more buffy than in other races, the flanks ranging from Pinkish Buff to Clay Color; streaks on under parts of medium width.

Range.—Hidalgo, Mexico, a portion at least of Veracruz, District Federal, Tlaxcala, Puebla and Morelos.

Specimens examined.—Hidalgo, 3 ♂ ♂, 3 ♀ ♀; Veracruz, 4 ♂ ♂, 2 ♀ ♀; Mexico, 10 ♂ ♂; Puebla, 5 ♂ ♂, 4 ♀ ♀; Morelos, 7 ♂ ♂, 3 ♀ ♀; northwestern Oaxaca, 2 ♂ ♂.

I herewith restrict the type locality of (*Fringilla*) *mexicana* Müller to the Valley of Mexico, Mexico, a place from which the type might have come.

Van Rossem (1934, pp. 419-421) has shown that both *C(arpodacus). rhodocolpus* Cabanis and *Fringilla haemorrhoa* Lichtenstein are synonyms of (*Fringilla*) *mexicana* Müller.

C. m. mexicanus is found in areas that receive thirty to sixty inches of rainfall annually. This probably has had some effect on the dark ground color of the posterior under parts.

I have stated previously that as we proceed from the United States south through Mexico, we find the house finches more extensively red on the under parts; this reaches a climax in *centralis* of Guanajuato. Then suddenly we come upon *C. m. mexicanus,* the least extensively red race. A recent expedition to Guanajuato proves that they approach each other to within one hundred miles. No intergrade has yet been taken, although there is still some territory to explore. One must conclude that something extraordinary has happened to create such a sudden change. This bird may not be conspecific with *centralis* and the other races to the north. Should no intergrade be taken, after the small zoologically unexplored areas have been thoroughly combed, I feel that we will have to accord *mexicanus* full specific distinction.

Carpodacus mexicanus roseipectus Sharpe
Oaxaca House Finch

Carpodacus roseipectus Sharpe, Cat. Birds Brit. Mus., vol. XII, 1888, p. 424. Oaxaca, southern Mexico; type in Brit. Mus.

Subspecific characters.—According to Sharpe (1886, p. 424) differs from *C. m. mexicanus* in having the "forehead deep crimson" . . . ; "cheeks and throat dark crimson, the latter well defined" . . . ; "breast" . . . "all washed with pale rose-colour" . . . , and "under tail-coverts whity brown, washed with rosy. . . ."

Range.—Known only from type locality, "Oaxaca" (=Oaxaca City), Oaxaca, Mexico.

Specimens examined.—None. See note below on examination by van Rossem of British Museum specimens and the type.

The two specimens from "Huajualpam" (de León), Oaxaca, which Ridgway (1901, p. 133) listed under *C. m. roseipectus,* and which were the only ones he had inspected,

prove to be typical *C. m. mexicanus*. They have the flanks and under tail coverts Cinnamon Buff. These Huajuapan specimens were both taken on November 18 by Nelson and Goldman. It is probable that Ridgway thought they were taken at the Huajuapan in extreme southeastern Oaxaca, about sixty miles due east of Tehuantepec City. In a recent letter, Major Goldman assures me they were not, but were collected in Huahuapan de León in extreme northwestern Oaxaca almost on the boundary with Puebla. This probable error was undoubtedly the cause of Ridgway's skepticism (*loc. cit.*), and has been responsible for the doubt concerning this form that has existed since then.

Although I have examined no specimens of *roseipectus* for the purposes of this paper, Mr. A. J. van Rossem in an exchange of courtesies, has offered me the opportunity of quoting from his notes made in the "British Museum - - - May 18, 1938." These show that the type of *Carpodacus roseipectus* Sharpe is very different from the two Huajualpam males inspected by Ridgway. After giving the measurements of this specimen as "Brit. Mus. (No.) 85.12.14.1146, wing 76, tail 61, exp. culmen 10.5, depth at base 8.7, tarsus 18.0, middle toe minus claw 14.8, Fenochio, Oaxaca—W. Mexico," van Rossem adds, "Skin in good condition. Looks as though collected in midwinter or early spring. There is an *orange-red flush* [italics mine] over the *whole* of the under parts—very faint on abdomen and flanks—strongest on chest. Otherwise, like mexicanus, particularly in the sharply defined throat patch." Then van Rossem adds, "3 other Oaxaca (City) birds in the British Museum show the same characters. 2 ♀s show no color whatever." He tells me there are four males (including the type), which show the same characters. It would seem that *roseipectus* is a distinguishable race, differing from *C. m. mexicanus* in the "orange-red flush" over a large portion of the under parts, and should be recognized, at least until additional material is obtained.

In May 1936, I observed individuals of *Carpodacus mexicanus* in the patio of a house near Mitla, Oaxaca, twenty-five miles in an air line southeast of the City of Oaxaca. Lacking a gun, I was unable to collect them, but a close examination within less than ten feet, indicated an extreme suffusion of red on the under parts.

Carpodacus mexicanus griscomi new subspecies
Guerrero House Finch

Type.—Male adult, no. 22668, collection of Robert T. Moore; Amogileca (=Amojileca), Guerrero, Mexico; April 5, 1937, collected by W. W. Brown.

Subspecific characters.—Closest to *Carpodacus mexicanus mexicanus* of Mexico, but males differ in nuptial plumage in having much less buff, if any, on the flanks; ground color of posterior under parts lighter, Pale Pinkish Buff instead of Pale Pinkish Cinnamon to Clay Color; upper parts much paler gray; streaking wider; size somewhat smaller (in males wing 77.2, tail 60.2, as compared with wing 80.3, tail 63.9). In the winter plumage males are much paler above and below. Females show the same differences.

Winter plumaged specimens of both sexes of *griscomi* are slightly more buffy on the posterior under parts than birds in nuptial plumage, but *mexicanus* is much more so, and is in some cases Clay Color. Differs from *roseipectus* in lacking altogether the orange-red flush over the under parts.

Range.—Apparently all the known specimens, a very large series, have come from the vicinity of Chilpancingo and Amojileca, at 4000 feet, in the Sierra Madre del Sur of Guerrero.

Specimens examined.—Guerrero, Chilpancingo, 19 ♂♂, 4 im. ♂♂, 4 ♀♀, 2 im. ♀♀; Amojileca, 8 ♂♂, 3 ♀♀.

Griscom (1934, p. 416) has stated that specimens from Chilpancingo "do not seem to show the slightest approach to the characters claimed for the little known *roseipectus* Sharpe from Oaxaca." It is clear from van Rossem's notes that this is true.

It is not surprising to find this new race isolated in the peculiar east-west range of the Sierra Madre del Sur, which is completely detached from the main plateau of

Mexico, referred to by geologists as the Anahuac plateau (Thayer, 1916, p. 62). The range is a very ancient one, going back at least to Paleozoic time, according to Schuchert (1935, p. 140), and is entirely separated from the Sierra Madre Occidental by the volcanic province which extends in wild rugged topography from Cape Corrientes on the west coast to Jalapa, Veracruz.

AVERAGE MEASUREMENTS OF MALE HOUSE FINCHES IN MILLIMETERS

Latitude	Group	No. of specimens	Place	Name	Wing	Tail	Exposed culmen	Tarsus	W—T:Tar.
40°	C.	18	N. California	(*grinnelli*)	77.6	58.0	9.7	17.6	M = 2.0
	D.	17	Nevada	(*solitudinis*)	78.2	58.4	9.9	17.4	M = 2.4
	P.	9	N. Colorado	(*smithi*)	78.1	69.9	10.2	17.6	M = .7
34°	C.	21	San Clemente	(*clementis*)	76.5	60.0	10.5	.....	.....
	C.	27	S. California	(*grinnelli*)	77.4	58.3	10.1	17.6	M = .9
	D.	22	Arizona	(*front.* × *ruberrimus*)	77.8	59.0	10.1	17.3	M = 1.5
	P.	19	N. Mex. and S. Colo.	(*frontalis*)	77.9	59.1	10.1	17.5	M = 1.3
30°	C.	18	Guadalupe Island	(*amplus*)	80.0	61.2	12.5	19.6	M = .0
	C.	6	San Benito Island	(*mcgregori*)	78.5	58.7	11.9	18.4	M = 1.0
	C.	5	N. Lower California	(*grinnelli*)	76.1	56.8	9.8	17.9	M = 1.4
	D.	27	S. Sonora	(*ruberrimus*)	73.7	57.4	9.9	17.1	L = .8
	P.	8	SW. Texas	(*front.* × *potosinus*)	78.9	60.4	10.4	17.8	M = .7
	P.	4	Kinney Co., Texas	(*potosinus*)	78.6	60.3	10.1	17.9	M = .4
25°	C.	7	Hawaii	(*mutans*)	77.8	57.0	9.9	17.4	M = 3.4
	D.	15	S. Lower California	(*ruberrimus*)	72.8	56.7	10.3	17.3	L = 1.2
	D.	22	Sinaloa	(*rhodopnus*)	71.2	54.9	9.5	16.8	L = .6
	P.	4	San Feliz, Chi.	(*altitudinis*)	72.8	55.1	10.3	16.5	M = 1.2
	P.	17	Jalisco, Durango	(*coccineus*)	79.3	59.0	10.1	18.1	M = 2.2
	P.	17	Guanajuato	(*centralis*)	82.1	64.1	10.5	17.7	M = .3
	P.	9	San Luis Potosi	(*potosinus*)	80.3	61.7	10.1	18.0	M = .6
	P.	2	Tamaulipas	(*nigrescens*)	78.2	60.4	9.8	16.9	M = .9
18°	S.	17	Guerrero	(*griscomi*)	77.2	60.2	10.8	18.0	L = 1.0
	S.	1	Oaxaca	(*roseipectus*)	76.0	61.0	10.5	18.0	L = 2.5
	S.	11	Hidalgo, Mex. / Puebla, Mor.	(*m. mexicanus*)	80.3	63.9	10.2	18.1	L = 1.7

Groups are as follows: C. = Coastal, D. = Desert, P. = Plateau, S. = Sierra del Sur.

The last column represents difference between length of wing and tail, compared with tarsus. M = difference is more than tarsus, L = less; the figures indicate the degree to which the difference is more or less than tarsal length.

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