

AMERICAN MUSEUM NOVITATES

Number 261

Published by
THE AMERICAN MUSEUM OF NATURAL HISTORY
New York City

March 28, 1927

59.88, 18

THE VARIATIONS AND DISTRIBUTION OF *SALTATOR AURANTIIOSTRIS*

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Saltator aurantiiostris is a robust finch-grosbeak somewhat resembling the cardinal (*Cardinalis*) in habits. In northern Argentina, Wetmore writes: "The species inhabited clumps of dense brush in pasture lands where safe cover was available. At intervals males came out on open perches on dead limbs often near the tops of the trees in order to sing, but at the slightest alarm pitched down into heavy growth below."¹

In the Cuzco region of Peru I found this species to be common in the arid Temperate Zone, where it lived in the dense growth of bushes and low trees bordering streams, and also in the arborescent vegetation about dwellings and in cultivated areas. In northern Peru Stolzmann states: "Il se tient dans les lieux découverts, comme dans les champs cultivés et dans les broussailles basses."²

While, therefore, *Saltator aurantiiostris* requires cover, it is not a forest-inhabiting bird and frequents arid or semi-arid, rather than humid, areas, a fact it is important for us to remember as we study its distribution.

The range of *Saltator aurantiiostris* extends from sea-level in the subtropical portions of northeastern Argentina and southeastern Brazil to the arid Temperate Zone in northern Peru, while in southern Ecuador and the adjoining parts of Peru it is evidently represented by the bird that I described some years ago as *Pitylus nigriceps*.

Throughout this wide range *Saltator aurantiiostris* exhibits much variation. It is the object of this paper to determine, in part at least, how this range was acquired and how these variations originated.

Before we proceed further it will be necessary to acknowledge the dependence of subjective on objective zoölogy, by pausing long enough to give names to certain forms which, expressing both the range and variations of *Saltator aurantiiostris*, enter into our discussion. Lack of topotypical specimens prevents me from definitely identifying *Saltator*

¹1926, Bull. U. S. Nat. Mus., p. 396.

²1884, Orn. Per., II, p. 546.

albociliaris Philippi and Landbeck, from Socoroma, above Arica, Chile, and I therefore accept current usage and apply this name to the race of southern Peru. It should be added, however, that the bird described by Philippi and Landbeck has the two outer tail-feathers tipped with white, and in this respect (as well as in others) agrees with the Peruvian form, and disagrees with those described below from the Temperate Zone of northern Argentina and of Bolivia. Nor can the name *aurantiistrois* Vieillot be applied with certainty to the bird for which it is commonly used. Azara, on whose description Vieillot's name is based, states that he saw this bird in Paraguay and as far south as thirty-two and a half degrees, but gives no definite type-locality. I have ten specimens from this region. Five are practically without white on the tail, in two it is barely suggested in the outer pair of feathers, in two more the outer two feathers show traces of white; and in one¹ the outer feather has a fairly definite white spot 15 mm. in length at the end of the inner web, and the second feather has an apical wedge of white. Azara, however, described a bird having "una grande mancha blanca" at the end of the outer tail-feather; the second feather had but little less white and the third almost none at all.

Although we have no means of knowing how large was the "white spot" described by Azara, it is evident that either he had an exceptionally colored bird or the specimen he described did not come from the range he ascribes to the species. I see, however, nothing to gain and much to lose by refusing to adopt the current application of Azara's name; nor, in my opinion, do the facts in the case warrant this proceeding.

The forms to be described are as follows.

***Saltator aurantiistrois tilcaræ*, new subspecies**

SUBSPECIFIC CHARACTERS.—Resembling *Saltator aurantiistrois aurantiistrois* Vieillot in general coloration, but inner web of the outer tail-feather with a clear, well-defined white end from 22–28 mm. in length along the shaft; the second feather sometimes with a small terminal wedge of white; bill larger, nearly if not quite as large as in *Saltator aurantiistrois nasica* Wetmore and Peters.

TYPE.—No. 142,130, Amer. Mus. Nat. Hist.; ♂ ad.; Tilcara, 8000 ft., Prov. Jujuy, Argentina; February 12, 1916; Miller and Boyle.

RANGE.—Arid Temperate Zone of northern Argentina in the Provinces of Jujuy, Salta, and Catamarca, and probably somewhat farther north and south.

¹No. 96,758, Mus. Comp. Zool., Santa Elena, Entre Rios, Arg.

***Saltator aurantiirostris bolivianus*, new subspecies**

SUBSPECIFIC CHARACTERS.—Similar to *Saltator aurantiirostris aurantiirostris* Vieillot, but slightly larger with longer tarsi and heavier bill; the inner web of the two and usually outer three tail-feathers white terminally; white on the outer pair averaging 40 mm. in length along the shaft. In worn plumage breast immediately posterior to the black pectoral-band averaging grayer. Similar to *Saltator aurantiirostris albociliaris* Philippi and Landbeck, of southern Peru, but averaging slightly smaller, with the black breast-band much narrower (usually under 10 mm. wide); black at the sides of the throat less extended, the whitish throat-patch correspondingly larger; in worn plumage underparts posterior to the breast-band less gray; tail with usually more white; adult female with the maxilla blackish, the mandible darker. Resembling *S. a. iteratus* Chapman, of the Cajamarca region in Peru, in the extent of black on the breast and sides of the throat, but feet lighter, tarsi shorter, bill not quite so heavy; white tail-marks much more extensive.

TYPE.—No. 139,630, Amer. Mus. Nat. Hist.; ♂ ad.; Tujma, 8200 ft., Dept. Cochabamba, Bolivia; September 25, 1915; Miller and Boyle.

RANGE.—Arid Temperate Zone of the greater part of Bolivia.

***Saltator aurantiirostris iteratus*, new subspecies**

SUBSPECIFIC CHARACTERS.—Most closely resembling *Saltator aurantiirostris bolivianus* Chapman, of the Temperate Zone in Bolivia, the black areas on the breast and sides of the throat as in that race; but white tail-marks on only the outer two feathers and much smaller, not more than 30 mm. long on the outer, or 10 mm. on the second feather measured along the shaft; breast in worn plumage grayer, as in *albociliaris*; bill averaging more swollen in outline. Similar to *Saltator aurantiirostris albociliaris* Philippi and Landbeck, but black pectoral-band much narrower, measuring 5-6 mm. instead of 10-25 mm. or more in width; the black at the sides of the throat less extended; the white tail-marks smaller; size somewhat smaller.

TYPE.—No. 229,035, Amer. Mus. Nat. Hist.; ♂ ad.; "testes much enlarged"; Chugur, 9000 ft., 40 miles northwest of Cajamarca, northwestern Peru; April 17, 1926; H. Watkins.

RANGE.—Temperate Zone of northern Peru.

We have now, therefore:

<i>Saltator aurantiirostris</i>	<i>aurantiirostris</i>
"	" <i>nasica</i>
"	" <i>tilcaræ</i>
"	" <i>bolivianus</i>
"	" <i>albociliaris</i>
"	" <i>iteratus</i>
"	("Pitylus") <i>nigriceps</i>

VARIATIONS

The more obvious variations of these forms are found in the bill, tail, breast-markings and postocular stripe. They may be described briefly as follows.

THE BILL.—The bill in *Saltator aurantirostris* is more fringilline than in the type of the genus, *S. maximus*, and its near allies, "the commissure being abruptly deflexed basally and the sub-basal portion of the

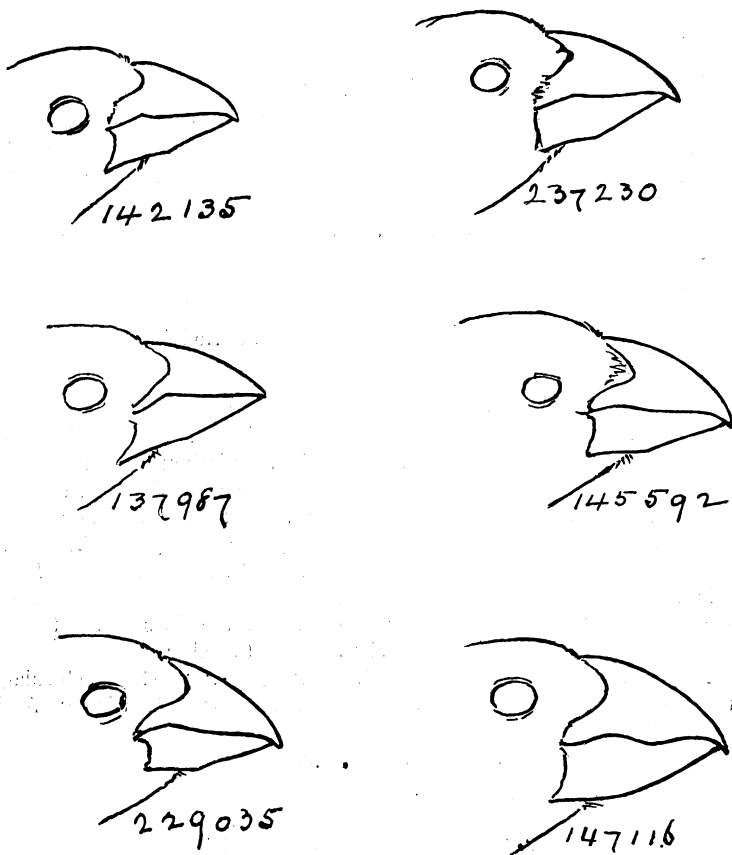


Fig. 1.—Variations in the dimensions of bill in the *Saltator aurantirostris* group.

Amer. Mus. No. 142,135. *Saltator a. aurantirostris*, Avai Terai, Arg.

Biol. Surv. No. 237,230, *Saltator a. nasica*.

Amer. Mus. No. 137,987, *Saltator a. bolivianus*, Parotani, Bol.

Amer. Mus. No. 145,592, *Saltator a. albociliaris*, Huaracundo Canon, Peru.

Amer. Mus. No. 229,035, *Saltator a. iteratus*, Chugur, Peru.

Amer. Mus. No. 147,116, *Pitylus nigriceps*, Palambla, Peru.

mandibular tomium distinctly angulated," a character that has led Ridgway (whom I have just quoted) to suggest that with *S. laticlavus* (= *S. aurantirostris albociliaris* of the present paper) it is generically unlike *Saltator*.

The variations in the bill of *aurantiiostris* affect both its size and color. It is largest in the two forms which are respectively at the southern and northern extremes of the range of the group *nasica*, of the Men-

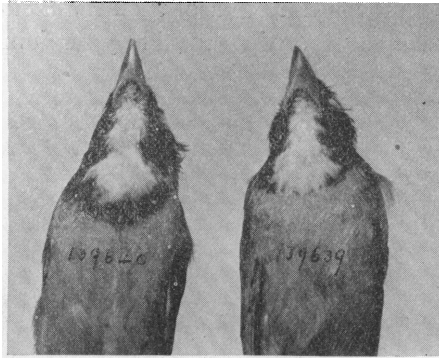


Fig. 2.—Individual variation in *Saltator*.

Amer. Mus. No. 139,640, Chilon, 5600 ft., Santa Cruz, Bol.

Amer. Mus. No. 139,639, California, 6600 ft., Santa Cruz, Bol.

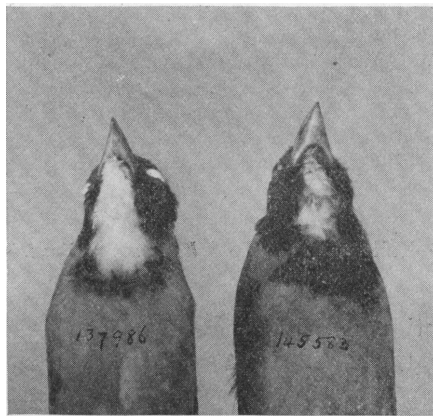


Fig. 3.—Seasonal differences in the fresh plumage.

Amer. Mus. No. 137,986, Parotani, 8800 ft., Bolivia, June 27, showing whitish tips on pectoral bands.

Amer. Mus. No. 145,583, near Cuzco, Peru, July 4; showing absence of whitish tips on pectoral band.

doza region, and *nigriceps* of Ecuador, the maximum size being reached in the latter. Between these extremes there is a slight average increase in length and depth from true *aurantiiostris* in northern Argentina to *albo-*

ciliaris in southern Peru, with an apparent decrease in the Junin region and a corresponding increase in the Cajamarca region (*iteratus*).

When to its finch-like form there is added the robust proportions shown by *nigriceps*, there results a bill exceedingly close to that of *Pitylus* and obviously far removed from that of typical *Saltator*. The tendency of *nigriceps* to develop a "tooth" or maxillary tomium (to which I have

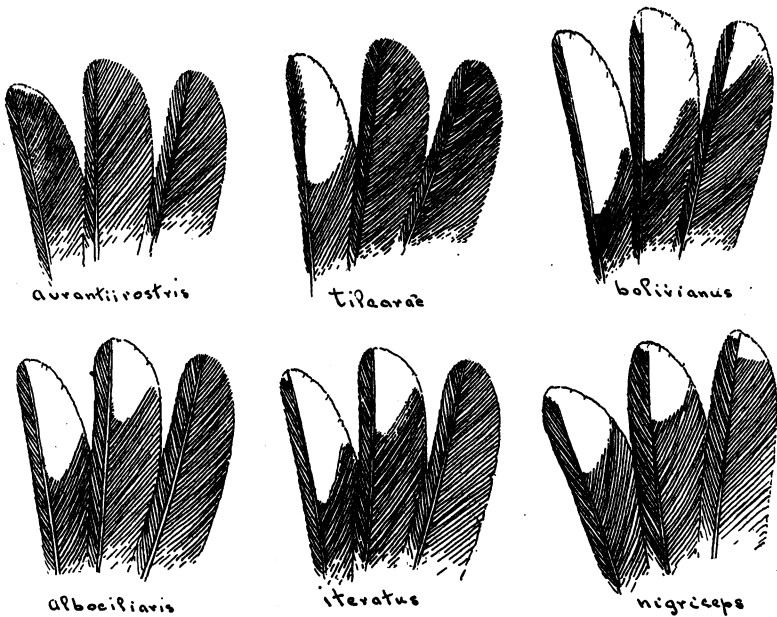


Fig. 4.—Tail-pattern in the *Saltator aurantiirostris* group.

before called attention) is, I find, shown by the other forms of the group. In form, therefore, the bill of *nigriceps*, differs from that of *aurantiirostris* only in size.

There is also geographic variation in the color of the bill. In true *aurantiirostris* the bill in the adult male is "zinc-orange" in life (Wetmore), usually drying to a buff-yellow in skins, but two males in worn breeding plumage from Santa Elena, Entre Rios, (January 16), and one from Embarcacion, Salta, (January 24), have the upper mandible almost wholly, the lower mandible partly, brownish. A similar coloration evidently characterizes the adult females of true *aurantiirostris*, *nasica*, and *tilcaræ*, and certainly of *bolivianus*.

In *albociliaris* and *iteratus* the bill of the adult male is, with but few exceptions, yellow; while that of the female is appreciably yellower than that of the southern forms. These two northern forms, therefore, seem to mark an approach to *nigriceps*, in our one female of which the bill is golden-yellow like that of our five males. All were taken in September and October.

THE TAIL.—In advancing from the subtropics of Argentina to the Temperate Zone of the Junin region, the increase in length of the tail is merely proportionate to the increase in general size which usually accompanies change from low to high altitudes. The lower level of Cajamarca and Chugur apparently accounts for the decrease in size shown by our specimens from that region, but the marked increase in size of *nigriceps* cannot be attributed to any known environmental influence.

The color variations in the tail are expressed by the extent of white in the terminal portion of the outer feathers. This ranges from the mere suggestion or complete absence of white in the more southern races (*aurantiistrois* and *nasica*) to its presence on the three (*bolivianus*) or occasionally even four (*nigriceps*) outer feathers. The accompanying cuts illustrate this range of variation better than a description, but they call for some comment. It is significant, for example, that in about half of the specimens of true *aurantiistrois* and *nasica* there is a pale area at the end of the outer pair of rectrices which seemingly foretells the development of a white spot on this part of the feather (see Figure 4). With the ascent of the species from the Subtropical to the Temperate Zone this development occurs and distinguishes *tilcaræ* from true *aurantiistrois* and *nasica*. Not only does this terminal white spot appear on the outer feather but its further growth is indicated by its appearance, in some specimens of *tilcaræ*, on the second pair of feathers. This indication is confirmed by the geographically nearest representative of *tilcaræ*, at the north, *bolivianus* of the Temperate Zone of Bolivia, in which, as will be seen by reference to Figure 4, the white area is much extended on the two outer feathers and reaches the third. As with the bill of this race, our series shows a sexual variation in the tail-markings. In only five of ten females does the white reach the third feather while in thirteen of fourteen males it reaches this feather.

The succeeding race to the north (*albociliaris*) shows a decrease in the white tail-area which appears only on the outer pair of feathers, and a further but slight decrease occurs in *iteratus* of the Cajamarca region, which otherwise closely resembles *tilcaræ*.

In *nigriceps* white occurs on only two feathers in two specimens, on three in two more, and on four in the two remaining birds of our series. The spots, however, are smaller than in those races of *aurantiistrotris* possessing this mark.

In form the tail shows no geographic variation in *aurantiistrotris*, but in *nigriceps* it is somewhat more graduated, the outer feather being 12–14 mm. instead of 5–7 mm. shorter than the longest. In this respect *nigriceps* approaches *Pitylus*.

THE BREAST MARKINGS.—The extent of black on the breast in *Saltator aurantiistrotris* is subject to wide individual and geographic varia-

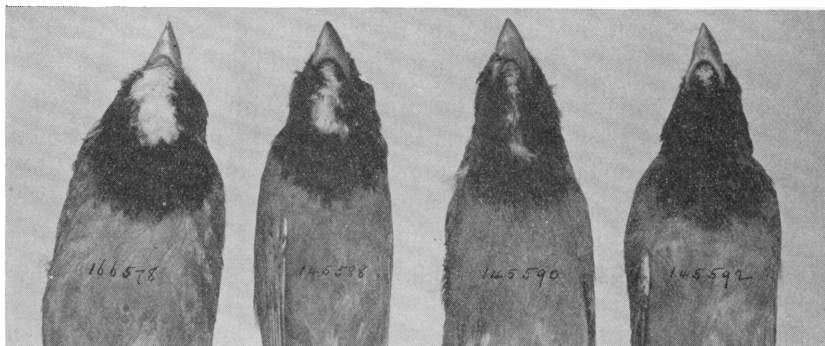


Fig. 5.—Individual variation in the development of the pectoral band in *Saltator aurantiistrotris albociliaris* from the upper Urubamba region, Peru.

Amer. Mus. Nos. 166,578, 10,000 ft.; 145,588, below Ollantaytambo, 9000 ft.; 145,592, Huaracóncono Cañon, 10,000 ft.

tion. Individually it varies in the adult male of true *aurantiistrotris* from practically complete absence to a width of 10 millimeters. In comparable specimens of *bolivianus* from nearly the same locality (California, Santa Cruz) it is broken in one, complete and 8 mm. wide in another. In males of *albociliaris* from the Urubamba region the white throat-patch ranges from 29 mm. in length to a mere chin-spot. So far as breast and throat are concerned, therefore, this specimen (No. 145,592, ♂, Huaracóncono Cañon) resembles *nigriceps* rather than *albociliaris*.¹ This condition is approached by other specimens of *albociliaris*. Here, then, is an inherent tendency to vary which, under favorable conditions, may develop into a racial character. Such development, indeed, has produced the most prominent distinguishing character in this group. Beginning with the

¹Berlepsch records a similar specimen from the Cuzco region. (Int. Orn. Cong., 1910, p. 1147).

southern forms (*aurantiiostris*, *nasica*, and *tilcaræ*) the breast-markings are least prominent. There is a slight average increase in their extent in *bolivianus*, marking an approach toward *albociliaris* in which a pronounced development is shown. Farther north, in the Cajamarca region, however, there is a return to the condition found in the southern forms, the race found here (*iteratus*) being barely separable from that of northern Argentina (*tilcaræ*).¹

Advancing to northwestern Peru and southern Ecuador the black breast-area, while somewhat smaller, covers the whole throat, but in

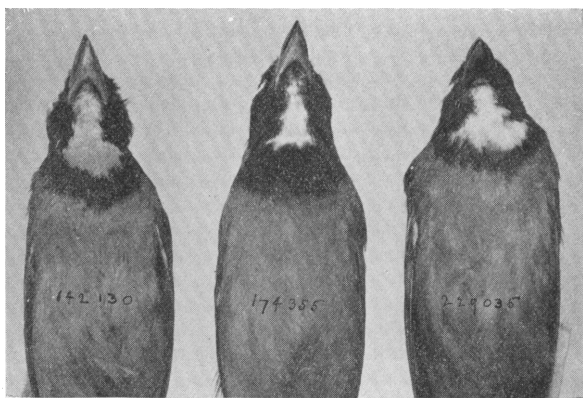


Fig. 6.—Reversion or parallelism in *Saltator aurantiiostris*.

- a. *Saltator a. tilcaræ* of northern Argentina (Amer. Mus. No. 142,130, type, Tilcara, 8000 ft., Jujuy, Arg.).
- b. *Saltator a. albociliaris* of southern and central Peru (Amer. Mus. No. 174,355, Chipa, 13,000 ft., Junin, Peru).
- c. *Saltator a. iteratus* of northern Peru (Amer. Mus. No. 229,035, Chugur, 9000 ft., Cajamarca, Peru) which more closely resembles *tilcaræ* of Argentina than it does the neighboring *albociliaris*.

five of our six specimens the basal third to half of the feathers of the throat is snowy white. In the sixth specimen there is a suggestion of this marking. The black-breasted, extreme example of *albociliaris* (No. 145,592) shows a similar concealed white throat-mark, evidence of the close relationship of these two birds. This form (*nigriceps*) appears to represent the logical and direct development of *albociliaris*, but it is apparently separated from that race by *iteratus*.

An interesting variation in the marking of the breast is seasonal in character. In fresh plumage the pectoral band of true *aurantiiostris* and *bolivianus*² is distinctly fringed with the color of the lower throat,

¹See also Berlepsch, *loc. cit.*, p. 1147.

²Possibly also in *tilcaræ*, but this plumage is not represented in our series of that race.

whereas in the corresponding plumage of *albociliaris* this fringe is lacking. It is apparently also lacking in *iteratus*, which, although it has the narrow breast-band of *bolivianus*, thus betrays its relationship to *albociliaris*.

A more significant seasonal geographic variation is shown by the area immediately posterior to the pectoral band. In fresh plumage this is light ochraceous-buff, duskier in *albociliaris* than in the more southern races. In worn breeding plumage the area immediately adjoining the black breast-band has become grayish in the southern races, while in

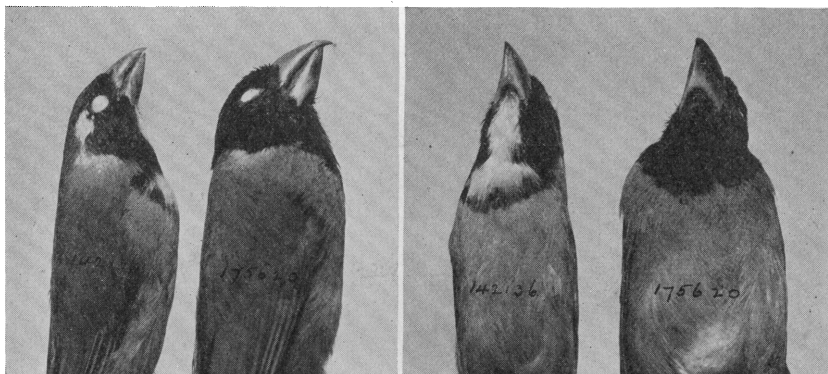


Fig. 7.—The extremes of the *Saltator aurantiirostris* group. Showing extent of divergence in the size of the bill and amount of black on the breast and head.

Amer. Mus. No. 142,136, *Saltator a. aurantiirostris*, Lavallo, 1800 ft., Santiago del Estero, Arg.
 Amer. Mus. No. 175,620, *Saltator nigriceps*, Palambra, 5000-6500 ft., Piura, Peru.

albociliaris the whole breast, down to the abdomen, has become pronouncedly gray, and some specimens in this plumage are practically indistinguishable from *nigriceps* in the color of these parts.

THE POSTOCULAR STRIPE.—The races of *aurantiiostris* show little or no individual or geographic variation in the extent of the postocular stripe. In freshly plumaged specimens it is buffier in true *aurantiiostris* than in *bolivianus* or *albociliaris*, which agree, and in the black-throated specimens of the latter it is slightly smaller; but in *nigriceps* it has disappeared. That is, it has so nearly disappeared that on a former occasion I could discover no sign of it, but renewed search finds faint but unmistakable traces of it in one example (No. 130,262, the type!). This specimen also has the concealed white throat-markings and no one, I am confident, could compare it with our series of *albociliaris* without realizing that they were mutually representative.

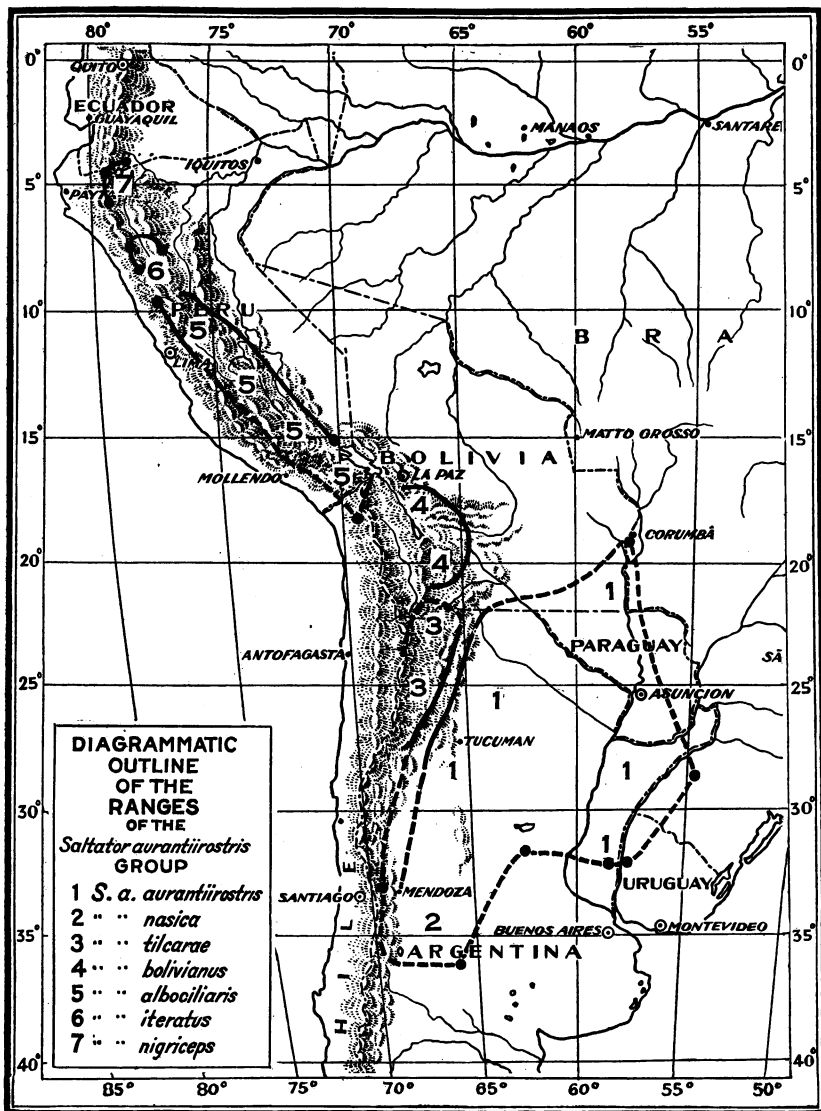


Fig. 8.—Diagrammatic outline of the ranges of the *Saltator aurantirostris* group.

DISTRIBUTION

The variations above described are correlated with certain geographic areas in which the environmental conditions have evidently been favorable for their expression. The plain-tailed, small-billed race, *Salvator a. aurantiirostris*, the only sea-level form, inhabits the subtropical portions of Argentina and northward to southern Matto Grosso and probably Bolivia, northeastward through Uruguay to Rio Grande do Sul, and westward to an elevation of at least 2300 feet. Three specimens from Concepcion, Tucuman, are referable to true *aurantiirostris*. Two others labeled "Concepcion, Tucuman" (J. Mogensen) have enough white in the tail to be referred to the Temperate Zone form (*tilcaræ*) of northwestern Argentina. Possibly they were taken in the Andes above Concepcion.

In the Mendoza region from the plains of Gobernacion de Pampa to an altitude of at least 6000 feet in the Andes a form (*nasica*) resembling true *aurantiirostris* in general size and color but with a larger bill occurs. Doubtless it intergrades with the Temperate Zone *tilcaræ* and the Subtropical *aurantiirostris*, but at points as yet unknown.

Farther north, above an altitude of 4000 feet (and possibly less), the incipient white mark in the outer rectrix of true *aurantiirostris* becomes well-defined and constant, distinguishing the form I have called *tilcaræ*. As above remarked, some specimens labeled "Concepcion" are referable to this form, which doubtless intergrades with true *aurantiirostris* between 2300 and 4000 feet wherever their ranges meet in Argentina, and possibly with *nasica* at between Concepcion and Potrerillos.

Advancing to the Bolivian tableland we find a form (*bolivianus*) having a maximum amount of white in the tail. Doubtless it intergrades with *tilcaræ* in southern Bolivia and possibly with true *aurantiirostris* (or an undescribed race) on the eastern slopes of the Andes of southeastern Bolivia.

Specimens of *bolivianus* from Parotani, Cochabamba, are sufficiently like *albociliaris* to warrant the belief that these two races intergrade somewhere between that point and Limbani east of Tirapata, southeastern Peru, the nearest point to Parotani from which we have specimens of the Peruvian bird. This race (to which I apply the name *albociliaris*), with the breast-band so broad that occasionally the entire throat is black, extends up the interandine tableland to at least the vicinity of Húanuco (Húanuco Mts., 10,500 ft.; Panao Mts., 10,300 ft.; Cullcui, Marañon River, 10,400 ft., J. T. Zimmer). I have no

specimens from eastern Peru north of this point and can find only one record of the species from east of the Marañon. This will be referred to later.

From the Pacific slope of the Peruvian Andes I have one specimen from Matucana above Lima, eight from Macate, northeast of Chimbote, and six from the Cajamarca region. These are of much importance.

If it could be shown that the black-throated *albociliaris* ranges up the eastern Andes and merges into *nigriceps* in extreme northern Peru and southern Ecuador, while the form of northern Chile (typical *albociliaris*, of which no specimens have been seen) extended up the higher altitudes of the Pacific slope becoming *iteratus* in northwestern Peru, we should have a satisfactory explanation of existing conditions, so far as geographical origins are concerned. Unfortunately, the facts do not support this theory.

The specimen from Matucana on the Pacific slope above Lima is as large as the largest *albociliaris*, has the breast-band about 18 mm. wide, and while the white throat-area is somewhat more extensive than the average, it is virtually matched by specimens from near Cerro de Pasco and Húanuco. While a series of specimens from Matucana and other points on the Pacific slope southward to northern Chile, the type-locality of *albociliaris*, would supply more conclusive evidence, so far as the available material goes, but one form occurs on the tableland and the Pacific slope in the latitude of Lima.

Eight specimens from Macate on the Pacific slope, some 250 miles north of Matucana, are obviously intermediate between *albociliaris* and *iteratus* of the Cajamarca region and northward. In size, particularly length of tail, they agree with the former. All but three have the pectoral band wider than in *iteratus*, and two have it as wide as in Cerro de Pasco and Húanuco specimens of *albociliaris*, and I should refer them to that race rather than to *iteratus*. In obviously proving the intergradation of *albociliaris* with *iteratus* these Macate specimens also strengthen our belief in the occurrence of *albociliaris* on the Pacific slope.

Reaching the Cajamarca region, we are within the range of *iteratus*, in which the breast-band is as narrow as in the southern forms.

Beyond Chugur this species is known in the West Andes only from Chota and Cutervo about 60 miles north of Cajamarca. It thus seems fairly clear that in spite of its reversion toward the southern races *iteratus* is a direct off-shoot of *albociliaris* in northwestern Peru. But now, it may be asked, what evidence is there that *albociliaris* does not send a branch up the East Andes, which, further developing the characters

already so well advanced, finds its logical expression in *nigriceps*? The evidence opposed to this theory is in part actual, in part circumstantial. I know of no recorded information regarding the bird-life of the region between Húanuco and Chachapoyas. The latter region, however, has been visited by several collectors including Stolzmann, Baron, Osgood, and Harry Watkins, who was resident there for a year. Only the first-named; however, found our *Saltator* there, and he secured but a single specimen. It was taken at Tamiapampa, a locality twelve leagues from Chachapoyas at an altitude of about 9000 feet and resembling Cutervo, west of the Marañon, in its characteristics. Obviously this specimen should tell whether in the East, as well as the West Andes *Saltator aurantiirostris* reverts from a form with a broad pectoral band (*albociliaris*) to one with a narrow pectoral band (*iteratus*), or whether it represents a further advance of *albociliaris* toward *nigriceps*. The specimen is doubtless in the museum at Warsaw but, thanks to the keen perceptions of Taczanowski, we have comments on its characters which show its relationships. He writes (Proc. Zoöl. Soc., 1882, p. 16) "Cet exemplaire, également comme celui de Cutervo, a la couleur rousse plus repandue sur l'abdomen, et le noir moins prolongé sur le haut de la poitrine que chez les oiseaux de Perou central."

The variation in the "rousse" of the abdomen has been shown to be seasonal, but the decreased amount of black on the throat, as compared with specimens from central Peru, seems undeniably to place the Tamiapampa specimen, as well as the Cutervo bird, with *iteratus*. It seems clear, also, that this species is a rare bird in the Chachapoyas region. Its voice, appearance, and habits make it conspicuous, and its absence from representative collections implies its absence or rarity in the localities where they were made.

We have now only to speak of the range of *nigriceps*. This species is known only from the six specimens in our collection from Loja (7000 ft.) and Celica (6900 ft.) in southern Ecuador, and Palambra (5000-6500 ft.) on the Pacific slope of the West Andes in northwestern Peru, about 150 miles from Cutervo, the most northern point from which *iteratus* has been recorded. All the localities in which *nigriceps* has been found are below the level of the Temperate Zone, which is present above Palambra at El Tambo (alt. 9000 ft.). It must, however, be remembered that in arid and semi-arid regions Temperate Zone species descend below their usual levels.

SUMMARY

Considered geographically, as they characterize the forms of this group, these variations and details of distribution may be summarized as follows.

1.—*Saltator aurantiirostris aurantiirostris* Vieillot.

BILL, small; usually yellow in the adult male; maxilla blackish in the female.

TAIL, without or with but faint indications of terminal white markings.

BREAST, with a comparatively narrow band fringed with buff in fresh plumage.

SIZE, smallest of group.

RANGE.—From the southern part of the Province of Entre Rios, Argentina, northeast to Rio Grande do Sul, north to Paraguay and casually to Corumbá, Matto Grosso, northwest to an altitude of between 2300 and 4000 ft., in Argentina (probably also southeastern Bolivia). (Type-locality, Paraguay.)

2.—*Saltator aurantiirostris nasica* Wetmore and Peters.

BILL, larger than in *aurantiistrostris aurantiistrostris*.

SIZE, breast- and tail-markings as in *aurantiistrostris aurantiistrostris*.

RANGE.—Mendoza region of western Argentina from at least the Gobernacion de Pampa westward to Potrerillos (alt. 6000 ft). (Type-locality, El Salto, Mendoza, Arg.)

3.—*Saltator aurantiirostris tilcaræ* Chapman.

BILL, nearly as in *nasica*.

TAIL, outer rectrix with a distinct white patch at the end of the inner vane.

BREAST, as in true *aurantiistrostris*.

SIZE, somewhat larger than true *aurantiistrostris*.

RANGE.—Temperate Zone of northwestern Argentina south at least to the latitude of Concepcion and probably farther north doubtless into Bolivia. (Type-locality, Tilcara, Jujuy, Arg.)

4.—*Saltator aurantiirostris bolivianus* Chapman.

BILL, slightly larger than in *tilcaræ*.

TAIL, with maximum amount of white, usually the outer three feathers white at the ends.

BREAST, pectoral band averaging wider than in true *aurantiistrostris*.

SIZE, slightly larger than true *aurantiistrostris*.

RANGE.—Arid Temperate Zone of Bolivia. (Type-locality, Tujma, Cochabamba, Bolivia.)

5.—*Saltator aurantiirostris albociliaris* Philippi and Landbeck.

BILL, in size, resembling that of *bolivianus*, in color, bill of the female averaging browner than that of the more southern forms.

TAIL, outer two tail-feathers white at the end.

BREAST, maximum development of the pectoral band; the throat in some specimens wholly black, but the feathers basally white.

SIZE, averaging larger than *bolivianus*; largest of the subspecies of *aurantiistrostris*.

RANGE.—Arid Temperate Zone from northern Chile north in Peru to the vicinity of Húanuco in the East Andes, and to Macate in the West Andes. (Type-locality, Socoroma, Chile.)

6.—*Saltator aurantiirostris iteratus* Chapman.BILL, as in *albociliaris*.TAIL, white mark on outer two feathers, averaging smaller than in *albociliaris*.BREAST, pectoral band much narrower than in *albociliaris*; resembling that of *bolivianus* or *tilcaræ*.SIZE, smaller than *albociliaris*; resembling *bolivianus* and *tilcaræ*.

RANGE.—Temperate Zone of northwestern Peru from the Cajamarca region at least to Cutervo in the West Andes; eastward (casually; one record) to the vicinity of Chachapoyas. (Type-locality, Chugur, Cajamarca, Peru.)

7.—*Saltator nigriceps* (Chapman).

BILL, largest in group; yellow in both sexes.

TAIL, with small white marks at the end of outer two to four feathers.

BREAST, black, the bases of the feathers snowy white.

POSTOCULAR STRIPE, not evident but traces shown by one specimen.

SIZE, largest of group.

RANGE.—Northwestern Peru (Palambra) to southern Ecuador; known only from an elevation of from 6000 to 7000 ft. (Type-locality, Loja, Ec.)

CONCLUSIONS

DISTRIBUTION.—The genus *Saltator* is characteristic of the arid or semi-arid Tropical Zone and ranges from Argentina to Mexico. Its most southern form is *Saltator aurantiirostris aurantiirostris*, which bears a sufficiently close resemblance to any one of several Brazilian species to be considered as its representative. It is natural, therefore, for us to consider this race as of tropical origin rather than as derived from the Andean races of the species.

Furthermore, it is the only member of the group living at sea-level and since, as a rule, zonal forms are derived from lower, not higher, levels, it seems clear that the zonal races have been derived from the basal race rather than the reverse.

With *Saltator aurantiirostris aurantiirostris* as the ancestral form, we apparently have a case in range-extension in which a tropical group has given rise to a hardy form that pushed southward into the subtropics until it has reached approximately the limit of the area that meets its habitat requirements.

On the western boundary of this area it has ascended the Andes to the arid Temperate Zone, which offers it a favorable habitat, and ranging northward through this zone has reached its present limits in northern Peru.

The intergradation of every one of the six races of *aurantiiostris* with its neighbors has been proved or indicated by our material, and through them the geographic origin of a race inhabiting the Temperate Zone of northern Peru is traced to subtropical latitudes in Argentina.

The conclusion is unexpected but seems unavoidable. It warns the zoögeographer to treat each case in distribution as an individual problem and to be wary of generalizations.

VARIATIONS.—The distribution of *Saltator aurantiiostris* may be explained more readily than its variation. Omitting for the moment the surprisingly distinct *nigriceps* and confining our attention to the intergrading races, we find that so far as size is concerned their variations conform in the main to the law that leads us to look for increase in size with increase in altitude, the sea-level race, true *aurantiiostris*, being, therefore, the smallest race; *albociliaris*, with the highest range, the largest.

When, however, we come to color I am unable to correlate the wide variations shown with the definite action of any known environmental factors. It is important to observe that, except for the somewhat greater buffness of true *aurantiiostris*, these variations are all occasioned by change in pattern and not by change in the color itself. No new element, therefore, has been evolved and the changes observed are due to the extension or contraction of the markings of certain more or less definite areas.¹ They are the terminal white markings on the outer tail-feathers, the pectoral band, and, in *nigriceps*, the postocular stripe. There is no logical sequence or geographic regularity in the variations of these markings. Beginning with no white tail-patches in true *aurantiiostris*, we find one patch in the neighboring *tilcaræ*, but advance to three in the adjoining *bolivianus*, and retreat to two in *albociliaris* and *iteratus*.

From a minimum development of the breast-band in the more southern races, we find an average increase in *bolivianus*, a maximum development in *albociliaris* of south and central Peru, and a return to the minimum in *iteratus* of northern Peru which is barely separable from *tilcaræ* of northern Argentina.

Such variation defies explanation. But we note that it merely expresses on a grand scale the variations presented or suggested by each of the races of which we have large series. Recall the specimens of true *aurantiiostris* and *bolivianus* in which the pectoral band is either wholly or almost absent, and the specimen of *albociliaris* with the breast and throat practically as black as in *nigriceps*. Consider the examples of true *aurantiiostris* showing incipient white patches in the tail. In short, *Saltator aurantiiostris* is what the systematist calls an "individually variable" species. But this inherent tendency to vary would lack oppor-

¹See in this connection my 'Mutation among Birds in the Genus *Buarremon*,' 1923, Bull. Amer. Mus. Nat., Hist., XLVIII, p. 273.

tunity to express itself racially if *Saltator aurantirostris* were not also possessed of the temperament that prompts it to enter new lands, and of the physique that adapts itself to changed conditions.

In other words, without new habitats or ranges there would have been no new races. Whether these new ranges have done anything more than afford the isolation so essential to the development of new forms, I do not pretend to say. We know too little of environmental factors in the regions these races occupy to connect effect with cause. But, at least we may venture the theory that the variations in markings exhibited by *Saltator aurantirostris* are mutational in origin, and that they have become subspecific characters under environmental conditions which have stimulated their development and been favorable for their retention.

As for *Pitylus nigriceps*, I am at a loss to explain its striking differences from *aurantiurostris*, and still I am convinced that it represents that species.

In northwestern Peru, *iteratus* presents a proved and pronounced case of reversion or parallelism, and it may be argued that *nigriceps* is a reversion to the *albociliaris* type which it so nearly resembles. But I have a feeling that the evidence in this case is not yet all in. Meanwhile it will be wise not to theorize further.

SPECIMENS EXAMINED

I am indebted to Mr. Outram Bangs, of the Museum of Comparative Zoölogy, Dr. Charles W. Richmond, of the United States National Museum, Dr. E. W. Nelson, of the Biological Survey, and Dr. C. E. Hellmayr of the Field Museum, for the loan of most helpful material from the collections under their charge.

Saltator aurantiurostris aurantiurostris.—ARGENTINA: Concepcion del Uruguay, 2¹; Santa Elena, Entre Rios, 3¹; Corrientes, 1²; Formosa, 2²; Las Palmas, Chaco, 3²; Avia Terai, 350 ft., Chaco, 2²; Embarcacion, 1700 ft., Salta, 2; La Valle, 1800 ft., Santiago del Estero, 2; Suncho Corral, 800 ft., Santiago del Estero, 3; Tapia, 2300 ft., Tucuman, 3²; Tucuman, 1²; Concepcion, Tucuman, 3.⁴ PARAGUAY, 1² (Page).

Saltator aurantiurostris nasica.—ARGENTINA: Potrerillos, 6000 ft., 1¹ (type); Alto Verde, 1²; Mendoza, 1²; Victoria, Pampa, 1.²

Saltator aurantiurostris tilcarae.—ARGENTINA: Concepcion, Tucuman (above ?), 2¹; Rosario de Lerma, 4800 ft., Salta, 3; Perico, 4000 ft., Jujuy, 2; Tilcara, 8000 ft., Jujuy, 4 (inc. type).

Saltator aurantiurostris bolivianus.—BOLIVIA. Dept. Sucre: Rio Pilcomayo, 8000 ft., 8; Rio Cachimayo, 8700 ft., 2; Pulque, 9400 ft., 4. Dept. Santa Cruz:

¹Coll. Museum Comparative Zoölogy.

²Coll. United States National Museum.

³Coll. Biological Survey.

⁴Coll. Field Museum.

California, 6600 ft., 2; Chilon, 5600 ft., 1. Dept. Cochabamba: Parotani, 8800 ft., 9; Tujma, 8200 ft., 6 (inc. type); Vinto, 8600 ft., 5.

Saltator aurantirostris albociliaris.—PERU: Limbani, 10,000 ft., Dept. Puno, 3; upper Huaracundo Canon, 17; Dept. Junin, Accobamba, 10,000 ft., 3; Rumicruz, 9700 ft., 3; Chipa, 13,000 ft., 7; La Quinoa, near Cerro de Pasco, 2¹; Huanaco Mts., 10,500 ft., 1¹; Panao Mts., 10,300 ft., near Huanaco, 1¹; Cullcui, Marañon River, 10,400 ft., 1¹; Matucana, 8700 ft., 1¹; Macate, 8¹ (intermediate between *albociliaris* and *iteratus*).

Saltator aurantirostris iteratus.—PERU: Dept. Cajabamba, Chugur, 9000 ft., 3 (inc. type); Cajabamba, 9000 ft., Cajamarca, 1.¹

Saltator nigriceps.—PERU: Palambla, 6000 ft., Dept. of Piura, 3. ECUADOR: Celica, 6900 ft., Prov. of Loja, 2; Loja, 7000 ft., Prov. of Loja, 1 (type).

MEASUREMENTS IN MILLIMETERS

Locality	No. and Sex	Wing	Tail	Culmen	Depth of bill at Gonys
Pampa, Victorica, Arg.	♂ ²	93	85	20	13
Alto Verde, Arg.	♀ ²	90	84.5	20.2	13.5
Potrerrillos, Arg.	♀ ²	92	87	21	14
Santiago del Estero, Arg.	2 ♂ ³	89, 90	85, 88	18	11, 12
Chaco, Las Palmas, Arg.	♂ ³	92	85	18	12.5
Concepcion del Uruguay, Arg.	♀ ³	93	86	19	12.5
Tilcara, 8000 ft., Jujuy, Arg.	2 ♂ ⁴	98, 99	91, 93	19, 20	13
Rosario de Lerma, 4800 ft., Salta	♀ ⁴	92	88	19.5	13
Parotani, 8800 ft., Bolivia	3 ♂ ⁵	98-101	89-95	18.5-20	12.5-13
Parotani, 8800 ft., Bolivia	3 ♀ ⁵	99-100	92-97	19.5-20.5	12-14
Huaracundo Canon, 10,000 ft., Peru	3 ♂ ⁶	105-107	99-100	19-21.2	12-13
Huaracundo Canon, 10,000 ft., Peru	3 ♀ ⁶	102-103	98-102	20-21	13-14
Accobamba, Peru	♀ ⁶	105	102	20	13
Chipa, 12,500 ft., Peru	3 ♂ ⁶	100-105	95-98	19.5-20.5	11.5-12.5
Matucana, 8700 ft., Peru	♂ ⁶	105	105	20.3	13.5
Macate, Peru	4 ♂ ⁷	100-102	100-103	19.5-20.5	13-13.5
Chugur, 9000 ft., Peru	♂ ⁸	99	95	20	13
Chugur, 9000 ft., Peru	2 ♀ ⁸	95-97	92	20, 21	13, 14
San Pedro, Peru	♀ ⁸	95	92	19	13.5
Palambla, Peru	3 ♂ ⁹	106-107	105-108	23-25	15-15.5
Celica, Ecuador	♀ ⁹	100	100	23.5	15

¹Coll. Field Museum.

²*Saltator aurantirostris nasica*.

³ " " *aurantiiröstris*.

⁴ " " *tilcaræ*.

⁵ " " *bolivianus*.

⁶ " " *albociliaris*.

⁷ " " *albociliaris*—*S. a. iteratus*.

⁸ " " *iteratus*.

⁹ " *nigriceps*.

