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MUTATION IN *CAPITO AURATUS*

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INTRODUCTION

Examination of a large series of barbets from upper Amazonia, recently received by the American Museum, has revealed several facts in distribution and variation of exceptional interest. It soon became clear, however, that any attempt to determine their significance must be preceded by a revision of the group to which the birds belonged. That is, the facts themselves must be defined, as adequately as the available material would permit, in the terms of the systematist: names; characters; extent and nature of variations; boundaries of range.

To my regret I find that the nomenclature of the group is sadly involved. Certain ill-advised changes, accepted without question a quarter of a century ago, require correction to restore us to a situation that we should never have left. It is assuredly a misfortune to have to make unavoidable changes in nomenclature, but to make them when they are needless is a tragedy.¹

Furthermore, in spite of the ancient lineage of the barbets, as such, the group here under review is still actively "speciating" to an extent and in a manner well-designed to confuse the systematist. To the six recognized forms I have found it necessary to add no less than six more, five of which are described as new. Several of the forms proposed are but slightly differentiated, but these differentiations give expression to a condition which can most conveniently and usefully be recognized through the medium of zoological nomenclature.

The distribution of certain of these forms places an additional stumbling block in the path of the classifier. Forms so closely related that they have been considered the same, appear at the extreme boundaries of the range of the species, others so unlike that they have heretofore been considered specifically distinct are found side by side; some have wide ranges, others seem almost to have remained within sound of their type-locality. Finally, the description of races from specimens without

¹I may add that the nomenclatural views here presented are endorsed by my colleagues in the American Museum.

data or labelled with inaccurate localities has made confusion more confounded. Thanks, however, to Mr. W. E. Clyde Todd, who has generously loaned me the superb collection of barbets from the Amazon in the Carnegie Museum, to Mr. Outram Bangs, of the Museum of Comparative Zoölogy, who has sent me two types, and to Dr. W. H. Osgood of the Field Museum, who has contributed a series from Peru, I am in possession of an incomparably finer array of these birds than has ever before been assembled.¹ I venture to hope that it has enabled me not alone to define the races represented but to throw some light on the nature and significance of their variations.

In a word I shall attempt to show that these variations are individual or mutational and not geographic or climatic. In three instances, individuals resembling one race have been found in the habitat of another. It might be suggested that they are of accidental occurrence, but the evidence indicates that they merely express the extent of variation which occurs in this group. This variation apparently arises independent of environment and supplies the stuff of which, under the perpetuating influences of isolation, new forms are evolved.

A study of the origin of new races in the Andes has shown that their appearance is closely related to the degree of segregation, topographic or zonal, which their ranges afford. In Amazonia it is evident that this segregation is supplied by a river system whose broad streams cut this vast area into districts where races living within sight of each other, and apparently under similar conditions, may nevertheless evolve solely through the cumulative effects of isolation acting on inherent variations, the origin of which remains unknown.

The same conclusions were long ago reached in a study of 'The Origin of the Avifauna of the Bahamas,'² in which it was said: "In several instances Bahaman forms inhabiting contiguous islands have become differentiated from each other without, so far as we can observe, being subjected to changed climatic or physiographic conditions.

"We may, perhaps, assume from this that these birds originally owe their characters to individual variations which, among a [limited] number of individuals, have become permanent."

REVISION OF THE *Capito auratus* GROUP

With the exception of the piculets, the barbets are the smallest birds common to the tropics of both hemispheres. Their distribution, therefore, presents in an especially interesting manner the problem of the

¹Specimens not credited to the museums just mentioned are in the American Museum.

²American Naturalist, 1891, pp. 528-539.

geographic origin of tropicopolitan groups. We are here concerned, however, only with certain members of the American genus *Capito* which hitherto have been treated as two species but which a study of the specimens at my disposal indicates should be referred to but one.

Capito contains nine species all confined to the humid Tropical Zone and ranging from Panama to Bolivia, but not to southeastern Brazil. Some are exceedingly rare and known from but few specimens taken at or near the type-locality. Possibly these are decadent or disappearing forms. Others are common, more widely distributed, and plastic. They evidently represent the growing twigs on the *Capito* branch. It is one of these species that forms the subject of this paper. Hitherto it has been known as *Capito amazonicus*, a red-throated bird, and *Capito auratus*, a yellow-throated bird. Of the former, no subspecies were recognized; of the latter, five races were current, as follows:

auratus auratus
 " *aurantiicinctus*
 " *intermedius*
 " *bolivianus*
 " *insperatus*

If my views are correct, we shall have to apply the name *auratus* to the red-throated bird, but as the material examined shows complete intergradation of all the races they will rank as subspecies of *auratus* and the names of most of the existing races will read as before, though the combination will stand for a different relationship.

A list of the races proposed in the succeeding pages follows:

SCARLET-THROATED RACES.

1. *Capito auratus auratus* (Dumont).
2. " " *nitidior* Chapman.
3. " " *amazonicus* (Deville and Des Murs).

ORANGE-THROATED RACES.¹

4. *Capito auratus orosæ* Chapman.
5. " " *novaolindæ* Chapman.
6. " " *arimæ* Chapman.

YELLOW-THROATED RACES.

7. *Capito auratus punctatus* Lesson.
8. " " *intermedius* Berlepsch and Hartert.
9. " " *aurantiicinctus* Dalmás.
10. " " *hypochondriacus* Chapman.
11. " " *insperatus* Cherrie.
12. " " *bolivianus* Ridgway.

¹A new group represented by undescribed races in both the Carnegie Museum and the American Museum.

These birds are known only in the humid Tropical Zone, east of the Andes from the lower Rio Orinoco south to the department of Santa Cruz, Bolivia, west to the Andes, east to the Rios Madeira and Negro.

1. *Capito auratus auratus* (Dumont)¹

Bucco auratus DUMONT, 1816, Dict. Sci. Nat., IV, p. 54 (based solely on "Le Barbu orangé du Perou" of Levaillant, 1806, 'Hist. Nat. des Ois. de Paradis et des Rolliers suivre de celle des Toucans et des Barbus,' II, p. 63, Pl. xxvii. I suggest Sarayaçu, Peru, on the Rio Ucayali, as the type-locality).

[*Bucco peruvianus* CUVIER, 1817, 'Régne Animal,' I, p. 428; footnote (based on "Le Barbu orangé du Perou" of Levaillant, Pl. xxvii).

Capito auratus SHELLEY, 1891, 'Cat. Birds, B. M.,' XIX, p. 113 (in part, specimens from Pebas only).

Capito peruvianus RIDGWAY, 1914, Bull. U. S. Nat. Mus., 50, part 6, p. 321 (Peruvian references only).

Capito amazonicus of recent authors but not of Deville and Des Murs.

CHARACTERS:—Throat scarlet, unspotted; male with crown yellow-ochre to primuline, the forehead thinly streaked with scarlet, nape like crown sometimes obscurely streaked with black; or forehead and crown heavily streaked or wholly covered with scarlet, extending in varying degrees to the nape which is usually more or less streaked with blackish; rump and flanks, in red-crowned specimens, usually margined with scarlet, in yellow-crowned specimens, usually without scarlet; female, with crown primuline, lightly streaked but not heavily suffused with scarlet; the nape more or less primuline streaked obscurely with black; no orange or cadmium on flanks or rump.

RANGE.—Humid Tropical Zone of the lower Ucayali; (left bank of Solimões at Pebas?).

SPECIMENS EXAMINED

PERU: Both banks Ucayali at Sarayaçu, 7 ♂, 6 ♀; Pebas, left bank Marañon, 1 ♂; mouth Apiyacu, near Pebas, 2 ♂, 3 ♀; Loreto,² near Pebas, 1 ♂.

The series from the Ucayali, which may be considered topotypical, varies more widely than any other I have seen. With the exception of

¹Levaillant's plate, based on a specimen in the collection of M. Raye Breucklerwert of Amsterdam, unquestionably figures the *Capito* with a red throat and red forehead. It can be closely matched by specimens from Sarayaçu on the Ucayali and from near Pebas, on the Marañon, whereas not one specimen in our series of over 80 yellow-throated birds (*punctatus*) from Colombia, Ecuador, and Peru agrees with it. The latter, indeed, apparently never has the forehead red as in the bird figured and described by Levaillant.

Dumont's name is based solely and exclusively on Levaillant. His description is merely an abridged and slightly altered reprint of the one accompanying Levaillant's plate to which he refers. He gives no type and he mentions no specimen other than the one on which Levaillant's plate was based. That he had no other specimen seems proved by the fact that after a discussion, largely in Levaillant's words, of the status of this species, which Levaillant suggested might be a climatic variety of the Guianan species, he adds: "jusqu'à ce que l'inspection d'autres individus ait fourni le moyen d'avoir une solution complète à cet égard, on croit lui devoir laisser une dénomination spécifique."

The statement by Dalmas (1900, Bull. Soc. Zool. de France, XXV, p. 178) that Dumont's "type" of *auratus*, in the Paris Museum, is a specimen of the common form of Ecuador and Colombia, in other words, the yellow-throated bird previously known as *Capito punctatus*, does not, therefore, affect the applicability of the name *auratus* to the "Barbu orangé du Perou" of Levaillant. In the primary application of the names *auratus* and *punctatus* we may thus return to the nomenclature of the British Museum Catalogue.

This view is now confirmed by Dr. J. Berlioz who kindly writes me that he is unable to find a type of Dumont, either in the collections or on the registry of the Muséum National d'Histoire Naturelle, and that as all their specimens of *Capito auratus* and *Capito amazonicus* were received subsequent to 1820 it is difficult to see how any of them could have served as a type for Dumont in 1816.

²Coll. Field Museum.

females from Tonantins every other red-throated race can be matched, or nearly matched, by this Sarayaçu series. It was collected on both sides of the Ucayali, but this fact does not explain its variations since examples of opposite extremes were taken on both sides of the river.

There are both males and females in which the throat is as pale as in the orange-chrome throated races from Orosa, Caviana and Arima. The crown, rump and flanks vary greatly in the male and but little in the female, but both sexes show the interesting variation, presented by the squamate-throated bird from eastern Ecuador (see *punctatus*) of having the rump and upper tail-coverts terminally margined instead of laterally bordered.

Three males and three females from near Pebas are intermediate between specimens from Sarayaçu and Tonantins. On geographical grounds they should be placed with the latter, particularly since from Puerto Indiana at the mouth of the Napo we have only *punctatus*. But in characters they are, on the whole, nearer to the Sarayaçu series. None of the females has orange or reddish on the rump; two have the paler crown and covert margins of *auratus*, but the third is near the Tonantins form in these respects.

2. *Capito auratus nitidior*, new subspecies

CHARACTERS.—The most richly colored form; the female, as well as the male, with the crown heavily streaked or wholly suffused with scarlet. Male not distinguishable from the most highly colored males of *auratus auratus* Dumont from the Ucayali; the flanks in six of seven specimens, the rump in all, washed or margined with scarlet; female similar to female of *auratus auratus* but crown much redder, as red as in the male; margins of the median and lesser wing-coverts deeper, Mars yellow instead of cadmium-yellow; margins on rump darker than those on foreback or upper tail-coverts; throat averaging less orange, more scarlet-red; the underparts less heavily streaked.

TYPE.—No. 97,093, Carnegie Museum; ♀ ad.; Tonantins, Brazil, left bank Rio Solimões, below mouth of Putumayo; July 6, 1923; S. M. Klages.

RANGE.—Known only from the type-locality; doubtless confined to the north side of the Solimões.¹

SPECIMENS EXAMINED

BRAZIL: Tonantins,² 7 ♂, 9 ♀.

This is a stable race, exceedingly constant in all its characters. The males can be matched by three specimens in a series of seven from near Sarayaçu, Peru. Not one of the nine females has its counterpart in our twenty-two specimens of the red-throated group from south of the Amazon.

¹Specimens obtained by Natterer on the Rio Negro (see Hellmayr, 1907, Nov. Zool., XIV, p. 8) may belong here.

²Coll. Carnegie Museum.

3. *Capito auratus amazonicus* Deville and Des Murs

C[apito] amazonicus DEVILLE AND DES MURS, 1849, Rev. et Mag. de Zool., p. 171 ("Ega et de Santa-Maria." *op. cit.*, p. 169. I propose Ega¹). DALMAS, 1901, Bull. Soc. Zool. de France, XXV, p. 178, footnote (in part). HELLMAYR, 1907, Nov. Zoöl., XIV, p. 81 (Ega).

Capito auratus (not of Dumont) SHELLEY, 1891, 'Cat. Birds B. M.,' XIX, p. 113 (Ega spec. only).

Capito aurantiiventris RIDGWAY, 1912, Proc. Biol. Soc. Wash., XXV, p. 87; type No. 7601 (examined), Mus. Comp. Zoöl., from "an unknown locality in the upper Amazon Valley."²

CHARACTERS.—With less red on the head than in any other scarlet-throated race, but with the flanks usually, and the rump always margined with cadmium or orange-chrome; throat flame-scarlet to scarlet, unspotted; male with crown primuline to analine-yellow, faint red streaks or suffusion, if present, confined to the forehead; nape more or less tinged with the color of the crown and obscurely streaked with black; rump, flanks, and, to a lesser degree, abdomen usually margined or washed with orange-chrome; female with nape more streaked; rump margined with orange; flanks and abdomen with usually a faint orange wash. Differs from *auratus auratus* chiefly in having less red on the crown and in the presence of orange margins on the rump and, usually, flanks and abdomen; from *nitidior* by the comparative absence of red on the crown.

RANGE.—Humid Tropical Zone; right bank of the Solimões from at least São Paulo de Olivença eastward to Teffé or beyond, southward to Hyutanahan on the left bank of the Rio Purus.

SPECIMENS EXAMINED

BRAZIL: Coll. by Newton Dexter, probably at Teffé,³ 3 ♂ (inc. type of *aurantiiventris* Ridgway), 1 ♀; Teffé, 2 ♂, 2 ♀; São Paulo de Olivença, right bank Rio Solimões, long. 69°, 7 ♂, 9 ♀; Hyutanahan,⁴ left bank upper Rio Purus, 8 ♂, 4 ♀.

¹These type-localities have hitherto been cited as "Santa Maria and Ega." That combination of these names, with the addition of "et des bords du Rio Javari," occurs on p. 167 of this paper, where the authors, in referring to their collection, mention all the localities from which it came. One page later, when about to discuss the relationships of the Amazon bird, they write: "C'est ce que de nombreux individus que nous avons rapportés d'Ega et de Santa-Maria, sur d'autres affluents de la rive droite et gauche du Haut-Amazone. . . ." It is, therefore, from this association of names that we should fix the type-locality of *amazonicus*. The matter is of importance, for although I am unable to discover the situation of Santa Maria, the fact that Ega (=Teffé) is on the right bank of the Solimões forces the conclusion that Santa Maria is on the left and it is doubtless, therefore, the home of another race of *auratus*, possibly the one herein described as *nitidior*. The fact that the authors include the Rio Javari (whence they apparently describe an orange-throated bird) in their first mention of localities shows that they were not there specifically referring to the localities whence came the red-throated bird which they subsequently described, "d'Ega et de Santa Maria." See also my remarks beyond under *C. a. orosæ*.

Since the above was written, Dr. J. Berlioz, in reply to my inquiry, writes from Paris that the collections in the National Museum of Natural History contain three specimens labelled as the "type" of *Capito amazonicus* of Deville and Des Murs. All three bear only the locality "Bresil." In default therefore, of a type bearing full data Ega must evidently be accepted as the type-locality for *amazonicus*.

²There is but little doubt that the three males and a female, on which Ridgway based his *aurantiiventris*, which were collected by Newton Dexter while a member of the Agassiz Expedition to Brazil, were taken at Teffé (=Ega) and that they are topotypical of, and hence synonymous with, *Capito amazonicus* from the same locality. From Mrs. Agassiz's account of this expedition ('A Journey in Brazil,' 3rd Ed., 1868) it appears that its members collected at Teffé from September 25 to October 21, 1865. Under date of October 17, she writes: "Mr. Dexter prepared a large number of forest birds for mounting—papagaios, toucans, and a great variety of small species of very brilliant plumage" (p. 242). Furthermore, from neither of the remaining localities at which Dexter collected (Mauaos and the Tapajoz) has a red-throated *Capito* been recorded. When, in addition to these facts, it is found that Dexter's specimens are not separable from a series from São Paulo de Olivença, west of Teffé, and like it on the right bank of the Solimões, or from a series from Hyutanahan on the Rio Purus south of Teffé, and the identity of *aurantiiventris* with *amazonicus* seems fairly proved.

³Coll. Mus. Comp. Zoöl., 2 ♂, 1 ♀.

⁴Coll. Carnegie Mus.

Accepting the four specimens collected by Dexter as topotypical of *amazonicus*, the series from São Paulo de Olivença is essentially typical of this race.¹ Individual variation in this series is found in the coloration of the head, which, in about half the series, is wholly without red and in the remainder the forehead is finely streaked with red; in the presence or absence of orange or sienna margins on the rump and flanks (absent in 2 ♂, 2 ♀, out of 17 specimens), and in the color of the throat, which ranges from scarlet to scarlet-red.

The Hyutanahan series is equally close to the Dexter birds but the orange margins on flanks and rump may be a little less pronounced. There is less individual variation in this series than in that from São Paulo de Olivença. Only one specimen shows evident trace of red in the forehead, and all but an immature female have orange on the rump and flanks. The throat is scarlet-red in all but one specimen, a male, in which the throat is very near that of *novaolindæ*.

4. *Capito auratus orosæ*, new subspecies

CHARACTERS.—Throat unspotted orange-chrome, intermediate in color between that of *auratus auratus* Dumont and *auratus punctatus* Lesson; crown primuline to analine-yellow; forehead brighter, with, in some specimens, faint, barely perceptible traces of red; no orange on flanks, the margins of the rump feathers little if any darker than those of foreback and rump. Most closely resembling *Capito auratus arimæ* Chapman, of the right bank of the lower Purus, but without orange on flanks and rump.

TYPE.—No. 231,307, Amer. Mus. Nat. Hist.; ♂ ad.; right bank of Rio Marañon near mouth of Rio Orosa, Peru, opposite a point midway between Pebas and the mouth of the Napo; Oct. 5, 1926; Olalla and Sons.

RANGE.—Known only from type-locality, but possibly extending eastward to the Rio Javari.

SPECIMENS EXAMINED

PERU: Orosa, 6 ♂, 1 ♀.

The males are constant in color but the single female has the throat as yellow as in average specimens of *punctatus*. In the color of the crown and absence of orange from flanks and rump it agrees with the male. Since this specimen has an unspotted throat it cannot be considered an example of *punctatus*, of accidental occurrence from the opposite side of the river; while the known ranges of forms having a yellow, unspotted throat are too distant to warrant its being referred to one of them. This specimen measures: wing 90; tail 54; culmen 24 mm., and is thus further unusual in having an exceptionally long wing. Apparently it represents an extreme case of individual variation. It was collected on October 30,

¹Two males and two females since received from Teffé confirm this belief.

one of our six males being taken the same day. As noted beyond, a similar yellow-throated specimen occurs in the series of the orange-throated *novaolindæ*.

It seems not improbable that this is the *Capito peruvianus* of Deville and Des Murs. The bird they describe¹ formed a part of their collection from "Santa Maria, d'Ega et des bords du Rio Javari." It presumably came from the latter river which it is not unlikely may form the eastern boundary of the range of *orosæ*. They describe a bird with an orange throat, while the bird subsequently described as *amazonicus* from Ega and Santa Maria is said to have a red throat. It was chiefly this difference that induced these authors to suggest, provisionally, a name for the Amazon bird. If they had possessed a specimen of true *peruvianus* Cuvier, or as it is here called, *auratus* Dumont, it is not probable that they would have described a form "d'Ega et de Santa Maria." Singularly enough they make no mention of Dumont's name, although it was published 33 years prior to the date of their paper, and in Paris.

5. *Capito auratus novaolindæ*, new subspecies

CHARACTERS.—Similar to *Capito auratus amazonicus* Deville and Des Murs, but with the throat flame-scarlet instead of scarlet or scarlet-red; forehead with less red (usually no red); margins of rump feathers paler, cadmium-yellow rather than raw sienna; similar to *Capito auratus arimæ* Chapman of the right bank of the lower Purus, but throat flame-scarlet instead of orange-chrome. Closely resembling specimens of *auratus auratus* Dumont from Sarayaçu which have no red on head, but flanks and rump with orange.

TYPE.—No. 92,058, Carnegie Museum; ♂ ad.; Nova Olinda, left bank Rio Purus, Brazil; July 20, 1922; S. M. Klages.

SPECIMENS EXAMINED

BRAZIL: Nova Olinda,² 6 ♂, 7 ♀.

RANGE.—Known only from the type-locality.

This race is almost squarely intermediate between *amazonicus* and *arimæ* and while the characters on which it is based are slight, they are sufficiently pronounced and constant to prove the interesting biological fact that the opposite banks of the lower Purus have different, even if very closely allied, races of *Capito auratus*.

Included in the series of thirteen specimens, all taken at Nova Olinda between July 14 and August 2, 1922, is an adult female taken July 31, in which the throat is as yellow as in average specimens of *punctatus*! In all other respects, including an unspotted throat, it agrees with *novaolindæ*. It may be argued that this is an individual of *hypochondriacus*

¹1849, Rev. et Mag. de Zool., p. 168.

²Coll. Carnegie Museum.

of accidental occurrence from the north side of the Amazon, but in my opinion, like the similar specimen of *orosæ*, it is a mutant example of the race with which it was found associated.

6. *Capito auratus arimæ*, new subspecies

CHARACTERS.—Resembling *Capito auratus orosæ* Chapman, of the right bank of the Marañon, in having the throat unspotted orange-chrome, intermediate in color between that of *auratus auratus* Dumont and *auratus punctatus* Lesson, but differs from *orosæ* in having the flanks and rump margined with orange.

TYPE.—No. 93,055, Carnegie Mus.; ♂ ad.; Arima, right bank lower Rio Purus, Brazil; Sept. 19, 1922; S. M. Klages.

RANGE.—Humid Tropical Zone; right bank of the lower Rio Purus, Brazil, from the Amazon at least to Arima.

SPECIMENS EXAMINED

BRAZIL: Arima,¹ 9 ♂, 11 ♀; Caviana,¹ right bank Solimões opposite Manacapará, 3 ♂, 2 ♀.

In its orange-chrome throat this race resembles *orosæ* of the right bank of the Marañon. In its orange tinted flanks and rump it is like *hypochondriacus* of the opposite side of Solimões. It is fairly constant in color but in my series of 28 specimens two males and one female, all from Arima, have the throat as deeply colored in as *novaolindæ* of the opposite bank of the river.

7. *Capito auratus punctatus* Lesson

Capito punctatus LESSON, 1831, 'Traité d'Orn.,' p. 165 (no locality: I suggest Buena Vista, Colombia, in the eastern Bogotá region).² SHELLEY, 1891, 'Cat. Birds B. M.,' XIX, p. 112 (in part, Colombia, Ecuador and Peru specimens only).

Micropogon flavicollis BONAPARTE, 1837, Proc. Zool. Soc., p. 120 (Brazil bordering Peru).

Capito auratus (not of Dumont) DALMAS, 1900, Bull. Soc. Zool. de France, XXV, p. 178, footnote.

Capito auratus auratus (not of Dumont) HELLMAYR, 1907, Nov. Zool., XIV, p. 82 (Chuchuras and Pozuzo, Prov. Huánuco, C. Peru; Valle, upper Huallaga; Rio Napo, Ec.; Bogotá colls.). CHAPMAN, 1917, Bull. Amer. Mus. Nat. Hist., XXXVI, p. 326 (La Morelia, Florencia, Villavicencio, Buena Vista, Col.); 1921, Bull. U. S. N. M., 117, p. 73; 1926, Bull. Amer. Mus. Nat. Hist., LV, p. 342 (Macas region, Rio Suno, below San José, Ec.).

CHARACTERS.—Throat cadmium-yellow to orange, spotted with black in the female; crown and nape varying from analine-yellow through orange-citrine to medal-

¹Coll. Carnegie Mus.

²It may be argued that Lesson's description, based on a male without locality, is not certainly identifiable; to which it may be replied that Lesson's description does apply to the species in which the female has a spotted throat and that at the time he wrote it is probable that our only specimens of the yellow-throated *Capito* were from the countries in which only this form is found. As the region from which it is most probable that his specimen came, I suggest Buena Vista in the eastern Bogotá area as the type-locality of this form. When it can be definitely shown that Lesson's name was based on some form other than the one for which it is here used there will then be reason for refusing to use it for a species to which for many years it was applied.

bronze; the forehead usually with a more golden or yellow tint, the color of the crown less pronounced on the nape in the female than in the male; rump margined with yellow of foreback and upper tail-coverts, flanks and abdomen with yellow of breast; these parts, therefore, normally without cadmium or orange margin or wash.

RANGE.—Humid Tropical Zone at the eastern base of the Andes from the Bogotá region (Buena Vista) of Colombia, south to the Rio Perené and the junction of the Rios Ucayali and Urubamba, Peru.

SPECIMENS EXAMINED

PERU: Junction Urubamba and Ucayali, 1 ♂; Lagarto, right bank upper Ucayali, near mouth Urubamba, 3 ♂, 3 ♀; Perené, 1 ♂; Monte Alegre, Pachitea, 1 ♀; Pozuzo,¹ 1 ♂; Huachipa,¹ left bank Rio Chinchao near junction with Rio Huallaga. 4 ♂, 2 ♀; Vista Alegre,¹ opposite Huachipa, 2 ♂; Rio Seco, 30 m. west of Moyobamba, 4 ♂, 3 ♀; Rio Negro, W. Moyobamba, 1 ♂; Moyobamba,¹ 1 ♂, 1 ♀; Santa Rosa, Marañon, below mouth of Chinchipe, 2 ♂, 1 ♀; Pomará, near Santa Rosa, Marañon, 2 ♂, 2 ♀; Puerto Indiana, left bank of the Marañon near mouth of Napo, 5 ♂, 3 ♀. ECUADOR: Mouth Rio Curaray and Napo, 8 ♂, 4 ♀; Rio Suno, 4 ♂, 4 ♀; below San José de Sumaco, 3 ♂; Macas region, 1 ♂. COLOMBIA: La Morelia, 1 ♀; Florencia,² 1 ♀; Buena Vista, above Villavicencio, 3 ♂, 4 ♀.

The specimens listed were all collected at comparatively recent dates and are accompanied by full data. They represent the known range of this form and should give some conception of its geographic and individual, or mutational, variations. So far as the former are concerned I find none that can be definitely associated with locality. The crown is the most generally variable character and its entire range of color is shown in series from the same locality; e.g., Puerto Indiana and Curaray. It is noteworthy, therefore, that although *punctatus* has far more extensive range than any other member of the group it exhibits no recognizable racial variation.

Its individual variations, however, are pronounced and significant. Those of the crown, for example, cover the range of geographic variation in all the yellow-throated races. That is, the crown in both *insperatus* and *aurantiicinctus* can be matched by examples of *punctatus* from Ecuador.

In the female from Monte Alegre, Peru, the crown is Sudan-brown, brighter on the forehead, and thus very closely approaches in this respect the type of *bolivianus*. The heavily spotted throat of this specimen is Mars-yellow, darker than that of any other bird in our series. The margins of the wing-coverts are also deeper, raw sienna instead of chrome, and those of the greater coverts are of essentially the same color as those of the remaining coverts. The specimen is further unusual in having whitish, not yellowish, postocular and nuchal streaks and in the nearly

¹Coll. Field Museum.

²Coll. Mus. Comp. Zool.

complete absence of streaks on the auriculars. The markings of the median wing-coverts differ from the normal in pattern as well as in color. In all our remaining females these are distinctly and evenly margined, but in the Monte Alegre bird they are subterminally marked with bars that do not reach the shaft. The same character is shown to a lesser degree on the lesser coverts. While the breast and abdomen of this specimen is soiled and darkened, this fact does not account for its brown crown and other marked characters. The receipt of a normally colored specimen of *punctatus* from Pozuzo, near Monte Alegre, leads to the conclusion that the Monte Alegre bird is not a representative of a highly localized race but a mutant example of *punctatus*. Its resemblance in head color to the type of *bolivianus* suggests the possibility of that bird being a mutant of *insperatus*.

Continuing the description of individual variation in *punctatus*: two males, one from Puerto Indiana the other from the mouth of the Curaray, have the flanks washed with deeper yellow than that of the breast and thus resemble some examples of *aurantiicinctus*. A related variation is shown by several specimens in which the margins of the rump feathers are slightly deeper than those of the foreback and upper tail-coverts. The most interesting and suggestive individual variation, or mutation, in *punctatus*, however, is found in the markings of the throat. The heavily spotted throat of this form is the most marked and constant racial character shown by any member of the entire group. Throughout the thousand or more miles covered by the range of this race it shows, as has been said, no appreciable geographic variation nor evidence of intergradation with allied races. It is, it is true, a representative form, but so are many birds whose specific standing is undoubted. The spotted throat of the female, a character of kind not of degree, the constancy of this marking, and the absence of anything approaching intergradation is the evidence to be considered, and if there were no other, I should treat *punctatus* as specifically distinct and leave it to the objector to prove the contrary. But the bird's status is apparently removed from the field of discussion by the occurrence in our series of twelve specimens from Curaray, on the Napo, of a female in which the throat is so nearly immaculate that it can be almost exactly matched, in this respect, by a specimen of *insperatus* from the type-locality. This specimen evidently demonstrates, therefore, the intergradation of *punctatus* with the group in which the female has the throat unspotted, by individual variation.

Further tendency in this race to vary individually is shown by a female from the Rio Suno in Ecuador, one of a series of eight from that place. In this bird the feathers of the throat lack the usual large roundish

or guttate terminal spots, but their exposed portion has a well-defined black crescent margined with a fine fringe of orange, giving the throat a strongly scaled appearance. The feathers of the upperparts, and particularly those of the rump, are terminally, rather than laterally, margined with yellow. Given isolation and a breeding stock and there is the material in these variations for the establishment of a well-marked form.

Our series of *punctatus*, therefore, shows sufficient individual variation to cover, not only all the characters distinguishing the yellow-throated races, but others which have not yet found opportunity for racial expression.

8. *Capito auratus intermedius* Berlepsch and Hartert

Capito auratus intermedius BERLEPSCH AND HARTERT, 1902, Nov. Zoöl., IX, p. 98 (Nericagua, near Maipures, Rio Orinoco). HELLMAYR, 1907, Nov. Zoöl., XIV, p. 92 (Nericagua specimens only); 1919 (1920), Archiv für Naturg., 85, p. 122 (Nericagua, Munduapo; crit.).

CHARACTERS.—Throat from cadmium-yellow to orange, unspotted in both sexes; the flanks and rump without orange or cadmium.

RANGE.—Known only from Nericagua and Munduapo on the Rio Orinoco in the Maipures region.

SPECIMENS EXAMINED

None.

Three males and a female of this form are known. They differ from *aurantiicinctus* in the absence of orange or cadmium on the flanks and rump. Some specimens from the Cunucunuma, near Mt. Duida, very closely approach this condition, while others show the characters of *aurantiicinctus*. A larger series, therefore, is required to determine the status of *intermedius*.

9. *Capito auratus aurantiicinctus* Dalmas

Capito aurantiicinctus DALMAS, 1900, Bull. Zool. Soc. France, XXV, p. 177 (Rio Caura, lower Orinoco, Ven.).

Capito auratus aurantiicinctus BERLEPSCH AND HARTERT, 1902, Nov. Zool., IX, p. 99 (Caura River, Ven.; crit.). HELLMAYR, 1907, Nov. Zool., XIV, p. 82 (Caura River, Ven.; (?) Barcellos, Rio Negro). CHAPMAN, 1921, Bull. U. S. Nat. Mus., 117, p. 73 (crit.).

Capito auratus (not of Dumont) RIDGWAY, Bull. U. S. Nat. Mus., 50, part 6, p. 320, footnote (Rio Caura, Ven.; crit.).

Capito auratus intermedius (not of Berlepsch and Hartert), CHAPMAN, 1917, Bull. Amer. Mus. Nat. Hist., XXXVI, p. 326 (Cunucunuma River, Ven.; crit.).

CHARACTERS.—Throat cadmium-yellow to orange unspotted in both sexes; forehead sulphine-yellow to orange-citrine; nape usually decidedly darker, Saccardo's olive to medal bronze, uniform or slightly margined with black; flanks, in some specimens, slightly tinged with cadmium-yellow, the rump feathers margined with light cadmium or orange noticeably different from the lemon-yellow margins of the fore-back and upper tail-coverts.

RANGE.—Humid Tropical Zone in Venezuela from the right bank of the Orinoco, near the mouth of the Caura, south to Duida and probably the upper Rio Negro.

SPECIMENS EXAMINED

VENEZUELA: La Union, lower Rio Caura, 2 ♂; upper Rio Caura,¹ 2 ♂; Rio Cunucunuma, east of Mt. Duida, 4 ♂, 2 ♀.

The type series of this race was taken on the Caura River (exact locality not stated) in 1897 and 1898. I have two males collected by Klages at La Union on the Caura, in 1901, which may be considered toptotypical. In the color of the crown they agree with Buena Vista, Col. (above Villavicencio), specimens of *punctatus*. One has the flanks slightly washed with cadmium-yellow, the rump with orange; the other has no trace of this color on the flanks but has the rump margined with light cadmium.

Two males collected by Klages in 1909, on the "upper" Caura River, have the forehead sulphine-yellow, the nape dark Saccardo's olive, the flanks are without orange but are a shade deeper yellow than the breast, and the rump is margined with light cadmium.

Four males and two females from the Rio Cunucunuma east of Mt. Duida on geographical grounds should be referable to *intermedius* rather than to *aurantiicinctus*. Nericagua on the Orinoco above Maipures, the type-locality of *intermedius*, is distant only about 150 miles from Cunucunuma, while Suapure, the probable type-locality of *aurantiicinctus*, is distant about 300 miles from that locality. While questioning the distinctness of *intermedius* from *aurantiicinctus* (1917, Bull. A. M. N. H., XXXVI, p. 326), I have previously referred the Cunucunuma birds to the former. In only two of them (both males) is the yellow of the flanks deeper than that of the breast, but in all the margins of the rump feathers are at least faintly deeper than those of the foreback and rump, though no more so, however, than in some specimens of *punctatus*. I am still, therefore, of the opinion that these Cunucunuma birds could be matched by specimens from Nericagua.

In the color of the crown five of the Cunucunuma birds are essentially like the two upper Caura specimens, the sixth (A. M. N. H. No. 120,481) the forehead is between raw sienna and antique brown and in this respect thus approaches the type of *bolivianus*, as I have before remarked (1921, Bull. U. S. N. M., 117, p. 74).

Natterer's specimens from Barcellos on the right bank of the lower Rio Negro, referred by Hellmayr to *aurantiicinctus* (*loc. cit.*), should probably be placed with *hypochondriacus* herein described from Mana-

¹Coll. Carnegie Mus.

caparú on the narrow strip of land between the Rios Negro and Solimões, opposite Manaos.

10. *Capito auratus hypochondriacus*, new subspecies

CHARACTERS.—Similar to *Capito auratus insperatus* Cherrie of Bolivia but with the feathers of the flanks, abdomen and rump strongly margined with rich cadmium-yellow, the sulphine-yellow of the forehead not so definitely extended to the nape, which is more conspicuously marked with black. Similar to *Capito auratus aurantiicinctus* Dalmás of Venezuela but flanks, abdomen and rump more strongly and more uniformly marked with cadmium-yellow, the crown averaging yellower, the nape blacker, and both without the brownish tinge often present on the crown, and usually on the nape of *aurantiicinctus*. Wing and tail averaging shorter than in either *insperatus* or *aurantiicinctus*.

TYPE.—No. 99,678, Carnegie Museum; ♂ ad.; Manacaparú, left bank Rio Solimões, near its junction with the Rio Negro, Brazil; June 19, 1924; S. M. Klages.

RANGE.—Right bank of the Rio Negro from its mouth northward an unknown distance.

SPECIMENS EXAMINED

BRAZIL: Manacaparú,¹ 4 ♂, 4 ♀.

MEASUREMENTS

	Wing	Tail	Culmen
3 ♂	79, 81, 84	45, 47, 49	24, 25, 25 mm.
3 ♀	78, 81, 82	46, 46, 47.5	22.5, 23, 23.5 mm.

The characters distinguishing this form are constant in the ten specimens from the type-locality. It is noteworthy that the feature of a "golden belt," on which the form of the Rio Orinoco is based, is far more pronounced in this race than in that one. Specimens collected by Natterer at Barcellos, on the right bank of the Rio Negro, above the mouth of the Rio Branco, are probably to be referred to this race rather than to *aurantiicinctus*. This appears to be the only form differing in size from other members of the group. Some of the specimens, however, are molting and the series measured is not large enough to present conclusive results.

11. *Capito auratus insperatus* Cherrie

Capito auratus insperatus CHERRIE, 1916, Bull. Amer. Mus. Nat. Hist., XXXV, p. 391 (Todos Santos, Rio Chaparé, Bolivia). CHAPMAN, 1921, Bull. U. S. Nat. Mus., 117, pp. 72, 73 (Todos Santos; Mission San Antonio; Rio San Antonio, Bolivia. Rio Cosireni; Astillero, S. E. Peru).

Capito punctatus (not of Lesson) BERLEPSCH AND STOLZMANN, 1906, Ornith., XIII, p. 123 (Rio Cadena, S. E. Peru).

Capito auratus intermedius (not of Berlepsch and Stolzmann) HELLMAYR, 1910, Nov. Zoöl., XVII, p. 395 (Calama, right bank upper Madeira, Brazil).

¹Coll. Carnegie Mus.

Capito auratus bolivianus (not of Ridgway) HELLMAYR, 1919 (1920), Archiv für Naturg., 85, p. 121 (Yahuarmayo, San Goban, Chaquimayo, Rio Huacamayo, Marcapata, S. E. Peru).

CHARACTERS.—Throat cadmium-yellow to orange, unspotted; forehead usually sulphine-yellow, but infrequently approaching citrine, its color extending well on to the nape, which is obscurely streaked with blackish; flanks and abdomen of the same yellow as the breast and without trace of cadmium-orange; margins of rump feathers pale lemon-yellow, of same shade as those of foreback and rump.

RANGE.—Humid Tropical Zone of Bolivia north at least to Calama, Brazil, on the right bank of the Rio Madeira, west to southeastern Peru.

SPECIMENS EXAMINED

BOLIVIA: Rio Yapacani,¹ Dept. Santa Cruz, 2 ♂, 2 ♀; Rio Surutu,¹ Dept. Santa Cruz, 1 ♂, 2 ♀; Todos Santos, Dept. Cochabamba, 3 ♂ (inc. type), 2 ♀; Mission San Antonio, Rio Chimoré, Dept. Cochabamba, 4 ♀. S. E. PERU: Astillero, 1 ♂.

The characters of this form are on the whole constant, but one male and one female from Rio Yapani and a female from Mission San Antonio have the margins of the rump slightly deeper yellow than that of the foreback and upper tail-coverts.

12. *Capito auratus bolivianus* Ridgway

Capito auratus bolivianus RIDGWAY, 1912, Proc. Biol. Soc. Wash., XXV, p. 87 ("Rio Beni,² Bolivia"; No. 47,379, Coll. Mus. Comp. Zoöl.). CHAPMAN, 1921, Bull. U. S. N. M., 117, p. 74 (crit.).

CHARACTERS.—Male with throat orange, forehead and crown antique brown, rump margins of the same color as those of foreback and upper tail-coverts; abdomen with a very faint suggestion of cadmium-yellow. Female unknown.

RANGE.—Unknown.

SPECIMENS EXAMINED

The type and only known specimen, No. 47,379, Mus. Comp. Zoöl. No definite locality.

I can add nothing to what I have already said about this bird (*loc. cit.*). The crown is unlike that of any other specimen seen by me but is most closely approached by that of a bird from the Cunucunuma, upper Orinoco. It is possibly significant that the range of variation in the color of the crown in our specimens from the Rio Cunucunuma is nearly as great as that existing between *bolivianus* and *insperatus* suggesting, therefore, that the type of *bolivianus* is a mutant of *insperatus* and hence may have come from Bolivia. On the other hand, *insperatus* is constant in color and not one of my seventeen specimens, covering the range of the species, from Santa Cruz to southeastern Peru, shows the slightest suggestion of a brown crown; whereas *aurantiicinctus* is a variable form.

¹Coll. Carnegie Mus.

²The locality is evidently erroneous. The type, a flat skin, was found by Dr. Thomas Barbour attached to an Indian necklace in a museum in La Paz, Bolivia (Chapman, *loc. cit.*).

The wide-ranging *punctatus*, however, is also fairly constant but there are several strangely marked mutants in our series of over 80 specimens, one of which, from Monte Alegre, Peru, has a brown crown.

AVERAGE MEASUREMENTS OF FIVE MALES

(In millimeters)

	Wing	Tail	Culmen
<i>C. a. auratus</i> , Sarayaçu, Peru	86.5(84-88)	52.5(51-54)	24.6(23 -25.5)
" <i>nitidior</i> , Tonantins, Brazil	86.0(84-88)	52.8(51-56)	24.2(24 -25)
" <i>amazonicus</i> , Hyutanahan, Brazil	85.5(85-86)	53.0(52-54)	23.6(23 -25)
" <i>orosæ</i> , Rio Orosa, Peru	85.1(84-87)	52.9(52-54)	24.4(23 -26)
" <i>arimæ</i> , Arima, Brazil	85.0(84-86)	52.4(51-55)	24.2(24 -25)
" <i>novaolindæ</i> , Nova Olinda, Brazil	86.2(84-88)	51.6(50-53)	24.0(23 -25)
" <i>punctatus</i> , Rio Curaray, Ec.	85.0(83-87)	52.6(52-54)	24.0(23.5-24.5)
" <i>aurantiicinctus</i> , ¹ Mt. Duida, Ven.	84.0(81-85)	51.4(50-53)	24.3(23.5-25)
" <i>insperatus</i> , Todos Santos, Yapacani, Bol.	85.0(83-88)	52.4(51-53)	24.5(24 -25.5)
" <i>hypochondriacus</i> , ² Manacapará, Brazil	81.3(79-84)	47.0(45-49)	24.6(24 -25)
" <i>bolivianus</i> ³ ?		52.0	25.5

SUMMARY AND CONCLUSIONS

From the data contained in the preceding review, I present now a summary of what appear to be the more salient facts together with my conclusions concerning them.

VARIATIONS

It is a well-known but unexplained fact that certain species or groups of birds may vary in quite different ways. Some may be variable in size and stable in color, with others the reverse occurs. Again variations in size may affect one part in one species, another part in another species. Likewise, differences in color and in pattern of marking are restricted to certain areas in one species to other areas in another species. The superciliary, pectoral band, wing-bars, outer rectrices, are parts frequently affected, but the entire plumage may be more or less involved. Where the variations are apparently to be attributed to climatic influences, darker colors being associated with humid conditions, paler colors with arid conditions, the range of individual, that is, local variation is comparatively limited; but where the variation is mutational, the range of local or individual variation is comparatively wide. We should not, for

¹Four specimens only.²Three specimens only.³Type; primaries missing.

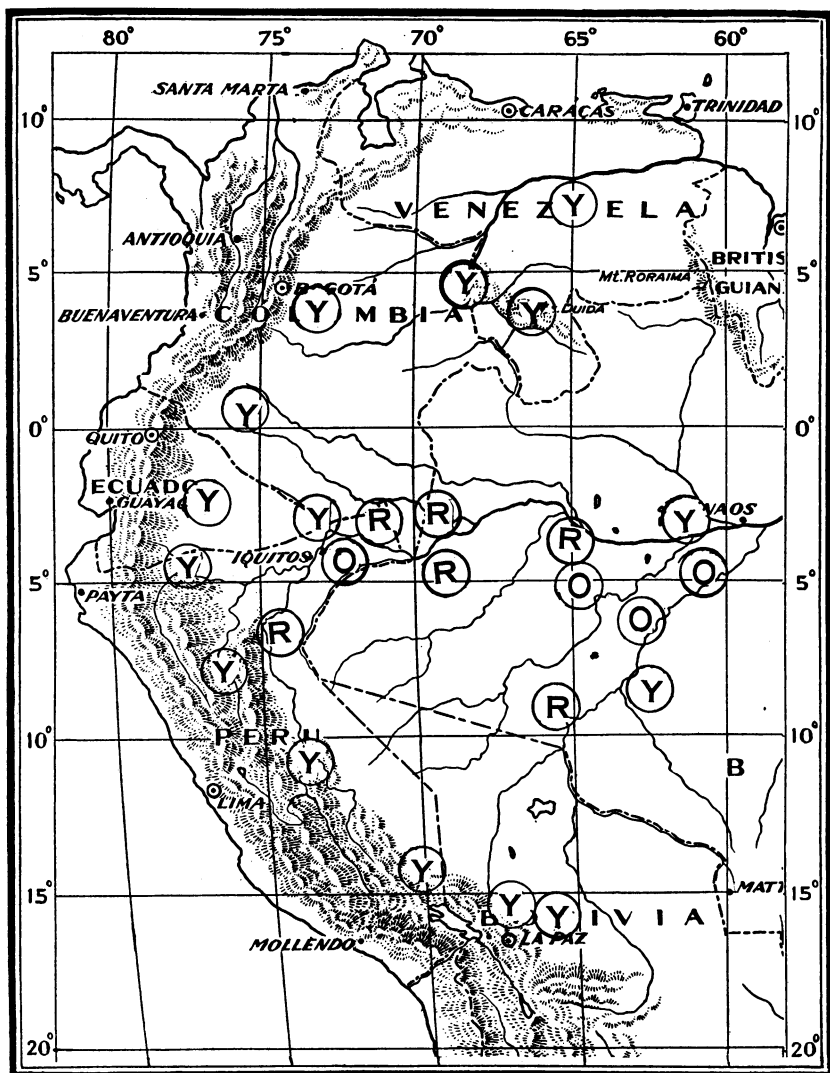


Fig. 2. The Distribution of *Capito auratus*, to show that the yellow-throated races are found at the periphery of the range of the species.

Y = yellow-throated races. R = red-throated races. O = orange-throated races.

example, expect to find a song sparrow on the northwest Pacific coast as pale as one from the Colorado Desert. In the group here reviewed, on the contrary, I repeatedly find individuals in the range of one form that cannot be distinguished from specimens of another and quite different form. We do not look for such wide variations in the song sparrows for, in the belief that their variations are caused by environment acting through climate, we do not expect similar influences to produce different results on the same organism at the same place. The fact, therefore, that the racial differentiations of *Capito auratus* are in large part covered by the range of variation at one place, and hence presumably under similar conditions, leads to the belief that these variations are not environmental but individual or mutational in nature. These variations affect the throat, crown, rump, flanks and abdomen.

VARIATIONS OF THE THROAT.—*Capito auratus* is differentiated primarily by the color and pattern of the throat. This may be loosely described as scarlet in three races, orange in three, and yellow in six. In one of the latter it is spotted with black. Between the extremes of color and pattern there is complete intergradation through individual variation. In every instance this variation appears to be retrogressive. That is, orange-throated individuals are found in the range and associated with a scarlet-throated race, yellow-throated individuals are found in series of the orange-throated races, and a spotless throated individual is found in the range of the spotted throat race. If these variants are atavistic they lead to the assumption that a yellow throat is more primitive than an orange one, that an orange throat preceded a red one, and that a spotted throat evolved from a spotless one.

VARIATIONS OF THE CROWN.—In the scarlet-throated species the crown varies from yellow-ochre or primuline to scarlet and these extremes are found at one locality. In the yellow-throated species the crown varies from analine-yellow to medal-bronze and this range of color may also be found at one locality. The orange-throated birds have the crown primuline or analine-yellow with, in some specimens, faint traces of red on the forehead. It is worthy of note that red is not found in the crown of a yellow-throated race but may be wholly wanting in the crown of a red-throated race.

VARIATIONS OF THE RUMP, FLANKS, AND ABDOMEN.—One-half the known races of *Capito auratus* are distinguished from their nearest allies by having the feathers of the rump margined, those of the flanks and abdomen washed with a deeper yellow than that on the forehead, upper tail-coverts and breast. The color of the rump is comparatively stable,

that of the flanks and abdomen less so than any other of the differentiating characters of the species.

UNFIXED VARIATIONS.—The series of *Capito auratus punctatus*, possibly because it is much larger than that of any other race, contains unique individuals showing marked variations. In one the throat is scaled, not spotted, in another the crown is brown, not yellow. These individuals illustrate the inherent tendency of the species to vary.

VARIATIONS IN SIZE.—*Capito auratus* presents but little individual and racial variation in size, only one of the twelve forms here recognized appears to differ from the others in this respect.

DISTRIBUTION

Capito auratus is an inhabitant of tree-tops and has well-developed powers of flight, but the narrow boundaries separating the ranges of many of the races well illustrate the sedentariness of most tropical birds. The race having the largest range is found at the base of the Andes, those having the smallest, inhabit the valley of the Amazon. The former occupies an area holding no effective barriers to range extension. There are no latitudinal mountain ranges and the rivers are too narrow materially to affect distribution.

The latter, on the other hand, inhabit a region where the rivers are broad enough to confine birds to one side or the other and they thus form an effective barrier to range extension.

In four instances opposite sides of the Amazon and Purus are occupied by different races of *Capito auratus*. On the Marañon, at the mouth of the Napo, *punctatus* is faced by *orosæ*; at Tonantins on the Solimões *nitidior* by *amazonicus* and at Manacapará, *hypochondriacus* by *arimæ*; and on the Purus, *arimæ* by *novaolindæ*.

Taking the color of the throat as the most pronounced differentiating character affecting all the forms, it will be seen, from an examination of Figure 2, that the yellow-throated forms are all peripheral, while the orange- and red-throated birds are central. If, as has been suggested, the yellow-throated form is the more primitive, we have here an illustration of the type of distribution in which, according to the theory advanced by W. D. Matthew,¹ new forms originate at the center of dispersal, while the ancestral one is found at the outer limits of the range of the group. Hence it follows that closely related forms (e.g., *aurantiicinctus* and *insperatus*) may be widely separated.

¹1915, Ann. N. Y. Acad. Sci., XXIV, p. 180.

CONCLUSIONS

The conclusions reached support the thesis advanced. They may be briefly stated as follows:

Capito auratus varies widely in color and in pattern. The origin of these variations remains undetermined. In some instances they appear to be reversionary and indicate the route over which the form has travelled; in others they seem to be progressive, pointing the way to possible future development. All, however, may be characterized as individual or mutational rather than as geographic or climatic. The perpetuation of these variations as racial characters is directly related to the degree of isolation that the birds exhibiting them are afforded. At the base of the Andes, where the nature of the country fails to provide this isolation, forms are wide-ranging; in the valley of Amazonia, where broad rivers divide the heart of a continent into insular areas, the range of forms is correspondingly limited.

