

## A SYSTEMATIC STUDY OF THE RED-BACKED HAWKS OF SOUTH AMERICA

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The Red-backed Hawk (*Buteo polyosoma*, Quoy and Gaimard, 1824) and the Gurney Red-backed Hawk (*B. poecilochrous*, Gurney, 1879) present a difficult taxonomic problem which has been mentioned by Chapman (1926), Hellmayr (1932), and Hellmayr (*in* Hellmayr and Conover, 1949). These authors treat the two birds as species but emphasize that the status of *poecilochrous* is not settled, the inference to be drawn from their statements being that *poecilochrous* may represent individual variants of *polyosoma*. Dean Amadon, of the American Museum of Natural History, who initiated the present study, has suggested that *poecilochrous* might be an altitudinal form of *polyosoma*.

The relationship of the two birds will probably remain unsettled until they are studied exhaustively in the field, but the large amount of material that I have seen suggests that *poecilochrous* is a distinct species, not an individual variant or altitudinal form of *polyosoma*. The latter (fig. 1) is widely distributed in western South America from the central Andes of Colombia south to Tierra del Fuego and the Falkland Islands. Hellmayr (*in* Hellmayr and Conover, 1949) implies that *polyosoma* does not breed in the Falkland Islands, saying that it spreads to these islands during the winter, but Cobb (1933) has described the nests and eggs in the Falklands, illustrating his account with a good photograph. The specimens that I have seen from these islands were taken in nearly every month of the year, including some that were said to have been nesting. *Buteo polyosoma* breeds also on the Juan Fernandez Islands off Chile. *Buteo poecilochrous* inhabits the Andes from about southwestern Colombia to northern Jujuy in northwestern Argentina. The entire range of *poecilochrous* is overlapped by that of *polyosoma*.

It may be said at the outset that *polyosoma* differs from *poecilochrous* by being smaller, by a slight difference in the wing formula (its third from the outermost primary is constantly longer than the fifth, as against the reverse in *poecilochrous*), by having a color phase in the adult plumage which is not found in *poecilochrous*, and, in the immature plumage, which is paler, more variegated, and more streaked in the great majority of individuals than in *poecilochrous*. These characters will be discussed beyond.

Stresemann (1925), who considers that the two birds are separate species, supplies a key for distinguishing them based on the differences in the wing length and wing formula, and he lists nine specimens, eight from the collection of the British Museum and one from the Berlin Museum, which he believes are *poecilochrous*. Hellmayr (*in* Hellmayr and Conover, 1949:91) grants the difference in size but states "Stresemann's principal criterion, the proportion of the fifth primary (equal to or even longer than the third), holds only in half of the specimens [of *poecilochrous*] listed by him, all of which have been examined by the senior author [Hellmayr]. Even in the type, the fifth primary is decidedly shorter than the third."

I have examined the eight specimens in London and of these, I believe that the two from "Chaquecamata, Bolivia" were misidentified and are *polyosoma*, not *poecilochrous*. These two together with a few other controversial specimens mentioned beyond I do not include in my study of the plumages and wing formula, or list of measurements. After eliminating these, I find that in the remaining six, the fifth primary is longer than the third in two, shorter in one (the type of *poecilochrous*), equal to the third in one, and

not fully grown in one; in the remaining specimen the fifth is longer than the third on the right side but shorter on the left.

Hellmayr is therefore correct but only as far as Stresemann's series is concerned, because, as shown in table 1, the difference in the wing formula is remarkably constant. In round figures, the third primary averages about 14 mm. longer than the fifth in *polyo-*

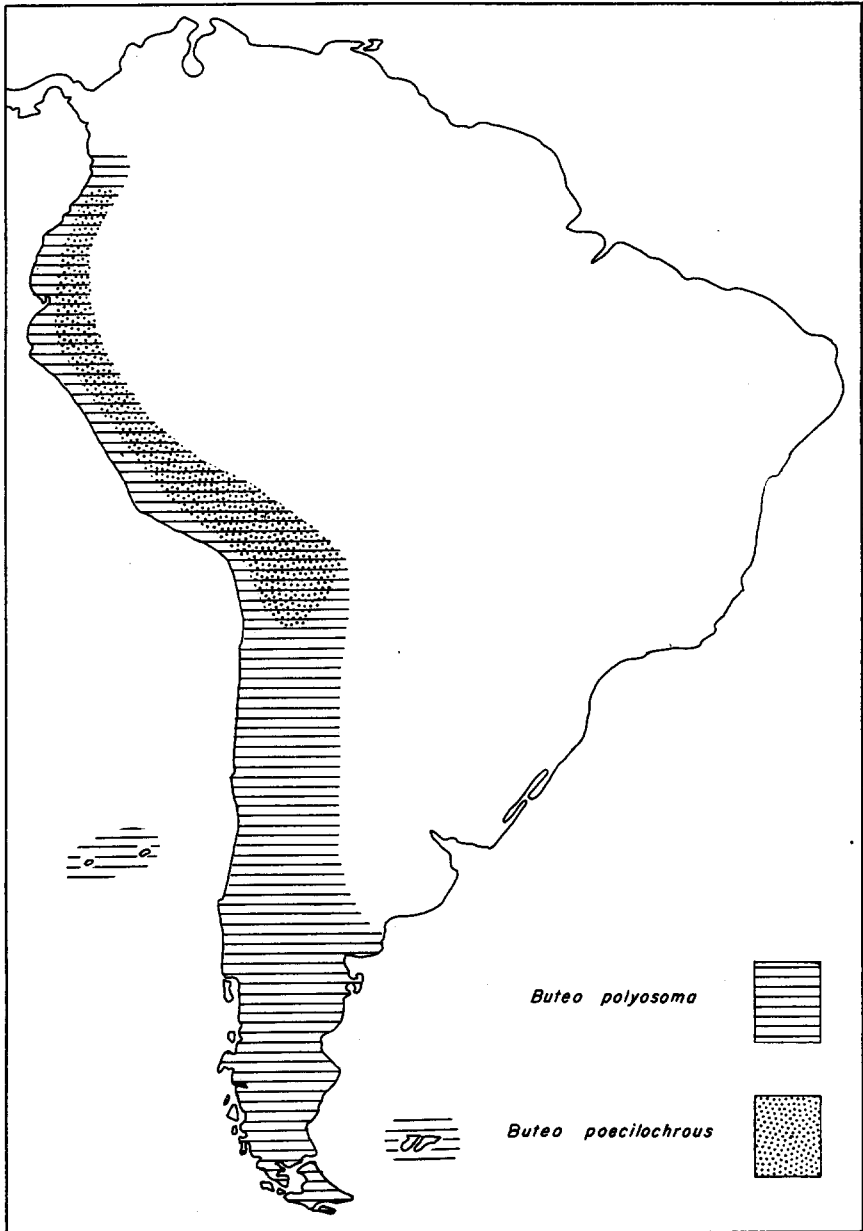


Fig. 1. Map of South America showing distribution of *Buteo polyosoma* and *B. poecilochrous*.

TABLE 1  
WING FORMULAE OF *Buteo poecilochrous* AND *B. polyosoma*

	<i>poecilochrous</i> Number	<i>polyosoma</i> Number
Adults		
5 > 3	10	1
5 < 3	1	122
5 = 3	4	2
Irregular	2 <sup>1</sup>	....
Immatures		
5 > 3	12	....
5 < 3	2	116
5 = 3	6	1
Irregular	....	....

<sup>1</sup> In one specimen, the fifth primary is longer than the third by 3 mm. on the left side, but shorter than the third by 2 mm. on the right side. In the other specimen, the fifth primary is longer than the third by 3 mm. on the left side but equal to it on the right side.

*soma*, as against about 7 mm. shorter than the fifth in *poecilochrous*. One should allow for a slight margin of error, caused by undetected irregular or incomplete growth of the feathers involved.

The two specimens from Chaquecamata were collected by P. O. Simons on July 29 and 30, 1901, at an elevation of 4000 meters and are actually sexed as females, although Stresemann lists them as males, probably because their plumage is gray. Their wing length measures 408 and 420 mm., and these measurements fit very well within the range of individual variation of the females of *polyosoma* that I have examined from the Andes. These measure from 397 to 435 mm. (414.3) in six individuals as against 445 to 473 mm. (464.5) in twelve *poecilochrous*. Hellmayr has examined some female *poecilochrous* that were even larger, stating (Hellmayr and Conover, 1949) that female *poecilochrous* measure from 460 to 490 mm. as against 400 to 440 mm. in female *polyosoma*. He also mentions a "giant" female *polyosoma* [a migrant from Buenos Aires Province, Argentina, apparently the specimen collected on May 26, 1893, at Santa Elena by Holland] with a wing length of 455 mm. but which my own measurement reduces to 445 mm.

One of the two birds from Chaquecamata was discussed earlier by Hellmayr (1932) who states that it is a female with a wing length of 415 mm. He questions whether this specimen is *poecilochrous* and questions also the identity of another listed by Stresemann as *poecilochrous*, the bird from Macaya collected by H. Rowland. He states, as Stresemann does, that this latter is a female (although no sex is indicated on its label) but does not agree about its wing length, stating that it measures 410 mm., whereas Stresemann reports it as having a wing length of 465 mm. This is a big discrepancy; my own measurement is 468 mm. I believe this specimen to be *poecilochrous*, one of the two individuals of this species that I have examined in which the wing formula is irregular (see preceding discussion and table 1). I have been unable to find Macaya or Chaquecamata on the map, but Hellmayr (1932) states that the former is near Mamiña, a locality at about 9025 feet in northern Chile, and that Chaquecamata is another spelling of Choquecamate in the department of Cochabamba, Bolivia.

These, and other controversial specimens, show that it is most desirable to determine the true morphological characters of the two hawks. Unfortunately, the zone of geographic overlap comprises the entire range of *poecilochrous*, although *polyosoma* can be

studied with confidence in regions where *poecilochrous* does not occur. For this purpose I am fortunate to have a large series of 126 skins collected far from the zone of overlap in southern Patagonia, Tierra del Fuego, and the Falklands. This series was used as a control in the study of plumages which follows and I may remark here also that, without exception, the third primary is longer than the fifth in these birds.

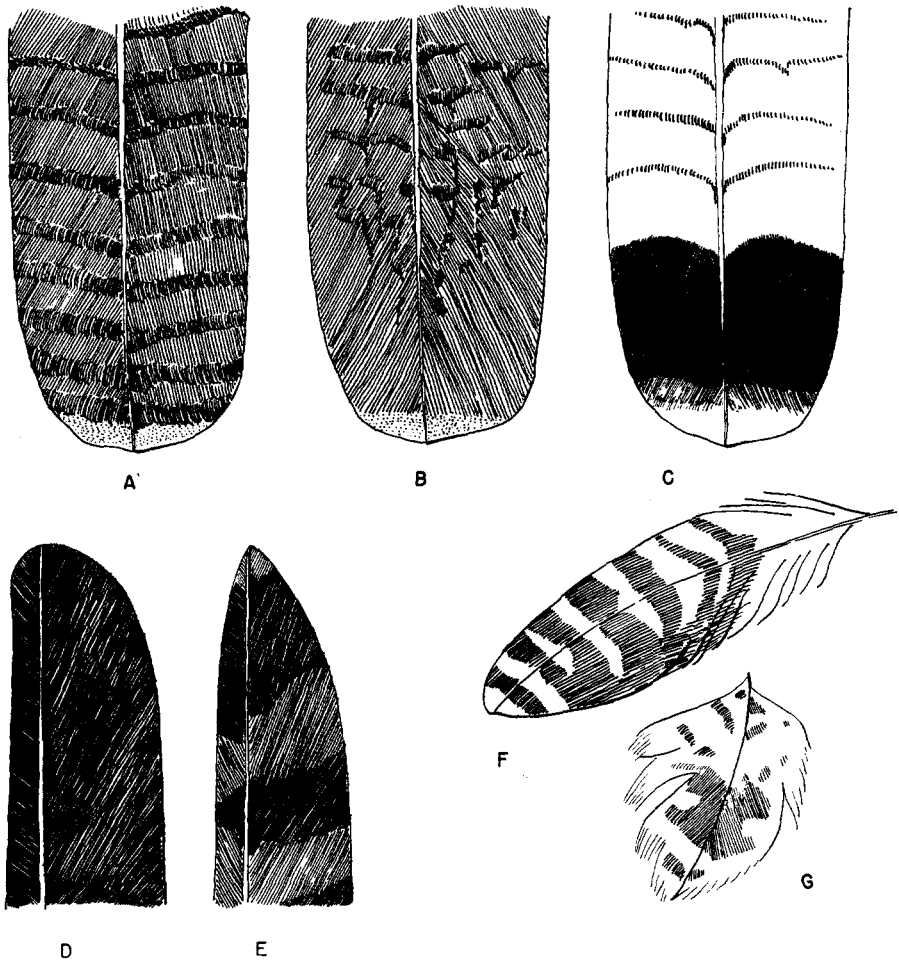


Fig. 2. Pattern of the end of the central tail feather (A, B, and C), shape and pattern of the end of the second outer primary (D, E), and pattern of a feather from the abdomen (F) and breast (G) in *Buteo polyosoma* and *B. poecilochrous*. Key: A, B, E, and G, immature plumage; C, adult plumage; F, adult plumage of color phase E (see text and figure 3) only.

#### PLUMAGES

The fact that *polyosoma* varies in coloration is well known and the scientific name *poecilochrous* denotes also a form which varies in coloration. Stresemann and Hellmayr have used the term "melanistic" to describe some of the plumages but it seems to me that this term is misleading in discussing these birds because the coloration of the adult

presents several pattern types (fig. 3) although in each pattern the degree of color saturation may vary individually. Melanism usually implies an individually variable excess of dark pigment that is not restricted to one or more areas of the plumage.

#### IMMATURE PLUMAGE

The immature plumage which predominates in *polyosoma*, is dark brown above and more or less mottled with rufous on the mantle and on some of the upper wing coverts; the rufous pigment invades the borders and webs of the feathers to a highly variable degree but is lacking on the crown and nape which, as a rule, are darker, less chocolate brown, than the back and coverts. The feathers of the crown and nape are white at the base, however, and the white may show through on the surface, especially on the nape. The ground color of the underparts is dark buff or ochraceous-white, the upper throat and sides of the neck being very heavily streaked with dark brown; then, below a clear patch on the lower throat and upper breast, the rest of the underparts is irregularly barred with rusty or rufous-brown. The design of a feather from the lower breast is shown in figure 2G, but this design is highly variable, although the overall pattern of the underparts is fairly regular in many individuals.

In other individuals, however, the whole of the underparts is invaded by dark brown streaks, and the barring which persists becomes very indistinct; these birds are also darker above and less spotted or mottled. Still other individuals, which comprise about 6 per cent of the specimens examined, are darker yet, being almost uniformly dark brown below, including the "thighs" and under tail coverts, and they also are darker above on the head, back, and wing coverts, showing only a few smaller spots of rufous cinnamon here and there. Finally, about 5 per cent of the specimens are extremely dark, sooty black rather than brown above and below, with very few small spots. I presume that these dark brown or sooty "uniform" *polyosoma* represent the form which Hellmayr (in Hellmayr and Conover, 1949) refers to as the "melanistic mutation (*Buteo unicolor* d'Orbigny) . . . [which is] much less common than the variegated, striped plumage." In immature *poecilochrous*, the ratio of dark and "uniform" birds rises to about 50 per cent and the remainder are darker in most instances than in variegated *polyosoma*.

Immature birds are always readily distinguished from the adult in both *polyosoma* and *poecilochrous* by the color of the tail and the color and shape of the primaries (fig. 2). In the immature bird, the tail has a regular pattern of closely spaced brownish bars on a paler grayish ground, or the pattern is very irregular and mostly mottled, whereas in the adult the tail is white with a very broad dull black subterminal band with narrow, gray bars above the band which become obsolete or disappear altogether in some individuals. Immature birds have pointed primaries that are narrower than in the adult and are rather indistinctly banded with very dark brown, whereas the adult primary is rounded, blackish, and concolorous. The color and pattern of the tail, and the color, pattern, and shape of the primaries, are identical in all the plumages of *polyosoma* and *poecilochrous*.

#### ADULT PLUMAGE

The coloration of the immature plumage shows much transition from pale to dark but the color patterns of the adult plumage show several contrasting types although it is an exaggeration to state, as Hellmayr does (Hellmayr and Conover, 1949) that "It is now an established fact that this buzzard [*polyosoma*] occurs in various mutational, strictly alternative plumages." The coloration of the adult presents five types (or color phases) that are illustrated diagrammatically in figure 3 where they are labelled A to E for the sake of convenience and discussion only, as no progression from one type

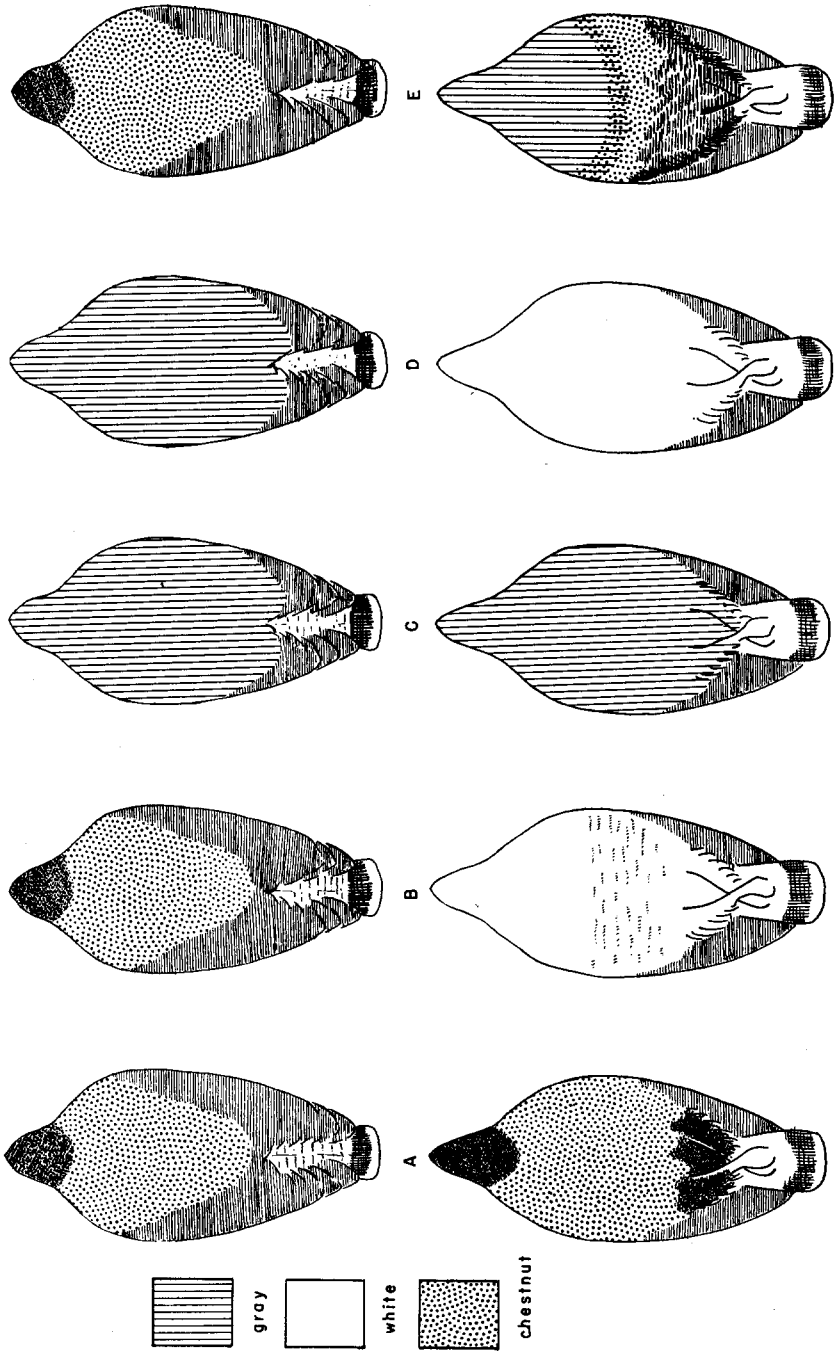


Fig. 3. Dorsal and ventral views of color phases of the Red-backed Hawks of South America: A through E, *Buteo polyosoma*; B through E, *Buteo poecliochrous*.

to another is implied; all the types found in both species are illustrated. The five types are described first and discussed later, but it should be emphasized here that although the types are not "strictly alternative" they show little transition from one to another.

*Type A.*—The crown, nape, throat, "thighs," and under tail coverts are dark sooty brown, or dark slate, the mantle and the rest of the underparts are chestnut, the under wing coverts pure sooty black, and the axillaries are, as a rule, pure dark reddish brown, not barred. This is one of the two "melanistic" plumages discussed by Stresemann and Hellmayr. Although I avoid the term melanistic in discussing these hawks, it is true that the dark pigment invades the chestnut of the underparts to an irregular degree in some individuals of type A, and that the color of the mantle is more or less pure. The demarcation between the colors of the nape and mantle remains clear cut, however, and the melanins never invade the pale parts of the wing or tail feathers.

*Type B.*—The crown, nape, and mantle are of the same color as in type A (although the chestnut of the mantle averages brighter), but the underparts are white, and the under wing coverts and the axillaries are white barred with gray, or sometimes with red-brown on the axillaries. A very occasional individual is more or less sparingly streaked with brown on the throat, but, with this exception, the throat and upper breast are pure white, the rest of the underparts being marked with narrow bars of dusky brown or gray. This barring varies a great deal individually in its intensity and no two specimens are identical, the bars becoming obsolete in some individuals and so very faint in others that the whole of the underparts appears to be pure white. I have the impression, which cannot be confirmed without specimens of known age, that the color of the plumage becomes purer in older birds, whiter below and brighter chestnut above. The individuals with brown streaks, or traces of them, on the throat are presumably birds which retain traces of immaturity.

*Type C.*—The entire body plumage, including the under wing coverts and axillaries, is gray, varying from rather pale slate to virtually black, but about half of the specimens show some chestnut on the upper border of the mantle and are narrowly barred with white in the under wing coverts and axillaries. When present, the chestnut is dull and invades only a few feathers along their borders or webs. This type constitutes the second of the two "melanistic" plumages mentioned by Stresemann and Hellmayr.

*Type D.*—The upper parts are gray, but almost always much paler than in type C, varying from "frosty" gray to pale bluish gray, or pale slate; the underparts and under wing coverts are white, and the axillaries are white barred with gray. This plumage is very pure and the most uniform, the great majority of the specimens being snow white below and about three-quarters being pure gray above. Those that are not pure gray above (13 out of 44) show some admixture of chestnut on the upper border of the mantle, but these usually have only a slight amount of chestnut which may be restricted to only one or two small spots. Below, an occasional specimen shows a few faint traces of gray bars on the lower abdomen.

*Type E.*—This is the most complex type and the one which varies the most individually below. The colors of the crown, nape, and mantle are similar to types A and B, but the underparts are much more variegated. The throat and upper breast are dark slate gray (exceptionally, sooty brown), the dark pigment invading the breast to a highly variable degree and overlapping a broad but variable transverse band of chestnut on the center of the breast; the rest of the underparts below this band, including the "thighs," are boldly barred slate and white. A typical feather from the abdomen is shown in figure 2F. In some specimens, however, the chestnut band across the breast is much reduced and in others may be lacking altogether, and the barring on the abdomen may be chestnut or brown on white, or the white bars may be obsolete on the abdomen as well as the "thighs" with the result that these parts are virtually concolorous and dark. The under wing coverts and the axillaries are boldly barred gray or slate on white.

#### OCCURRENCE OF THE ADULT PLUMAGE TYPES

The number of specimens of each type that I have examined in both species is shown in table 2. The specimens of *polyosoma* from southern Patagonia, Tierra del Fuego, and the Falklands that I used as a control are listed separately, and specimens from Juan Fernandez are not included.

TABLE 2  
 OCCURRENCE OF THE COLOR PHASES IN THE ADULT PLUMAGE OF  
*Buteo polyosoma* and *B. poecilochrous*

Species and region	Sex	Color phases				
		A	B	C	D	E
<i>polyosoma</i>						
Falklands, Patagonia, and Tierra del Fuego	♂	....	4	3	18	....
	♀	8	22	....	2 <sup>1</sup>	1
	0 <sup>2</sup>	4	6	1	1	....
<i>polyosoma</i>						
Regions other than above <sup>3</sup>	♂	....	2	2	15	....
	♀	5	20	1 <sup>1</sup>	1 <sup>1</sup>	1
	0 <sup>2</sup>	....	4	1	5	1
<i>poecilochrous</i>						
All regions	♂	....	2	....	2	....
	♀	....	5	....	....	7
	0 <sup>2</sup>	....	2	1	....	2

<sup>1</sup> See text. Three of these four specimens are probably males although they were sexed as being females.

<sup>2</sup> Sex not indicated.

<sup>3</sup> The subspecies *exsul* from Juan Fernandez is not included.

Type A apparently is not found in *poecilochrous*, but it occurs throughout the range of *polyosoma* and, most probably, is only a female plumage. The four specimens of this type in which the sex was not indicated are from the Falkland Islands and have a wing length of 390, 408, 408, and 412 mm. These measurements correspond very well with those of the females from these islands, but they do not correspond with those of the males (see list of measurements). Throughout this study, I have accepted the sexing indicated on the original labels rather than to "correct" it, although some birds were probably not sexed correctly.

Types C and D are found in both *polyosoma* and *poecilochrous* and are characteristic of males although rarely females may also be in these plumages. I have four specimens of these two types which are said to be females, but with the exception of one in plumage D which was collected at Tucuman, Argentina, and has a wing length of 420 mm. (typical of females), the other three measure 365, 370, 371 mm. and most probably are males and not females. The specimen with a wing length of 370 mm. was collected at Domeyko, Chile, and has been discussed by Hellmayr (1932) who says that it measures 367 mm. He does not question its sexing, but a wing length of 367 mm. (or 370) is considerably smaller than the average (407.3) of the females from Chile and Argentina. The eight unsexed specimens of *polyosoma* in plumage types C and D measure 366, 367, 370, 375, 380, 382, 382, and 383 mm., a wing length that is not inconsistent with that of male *polyosoma*. The lone specimen of *poecilochrous* in plumage type C was not sexed but it is probably a male as it measures only 418 mm.

Type B is characteristic of females in both *polyosoma* and *poecilochrous*, but, contrary to common belief, some males are also in this plumage as it is difficult to question the sexing of the six birds in table 2 which are said to be males because most of them are really small. Their wing length measures 370, 372, 375, 377, 378, and 382 mm., whereas the average wing measurement of female *polyosoma* is usually over 400 mm. The ten unsexed specimens of *polyosoma* in this plumage measure 382, 383, 398, 404, 406, 408, 410, 416, 417, and 420 mm. and, with the possible exception of the two smaller birds, are probably females. The two unsexed birds of *poecilochrous* in this plumage measure 460 and 468 mm. and are probably females also, but as the two which are said



to be males are big and measure 463 and 473 mm., it is doubtful that the latter were correctly sexed.

Type E which seems to be a female plumage (see discussion following) is found in both *polyosoma* and *poecilochrous*. Hellmayr (Hellmayr and Conover, 1949) gives the impression that this plumage is not found in *polyosoma*, but, although my study shows that it is more common in *poecilochrous*, I believe that my three specimens of *polyosoma* in this plumage are correctly identified. They are a female from Tierra del Fuego (very far from the range of *poecilochrous*), another from Tucuman, Argentina, and an unsexed adult collected by Brydges at some unspecified date in the Cordillera of Chile.

The latter (British Museum, registry number 44-10-7-1) has been discussed twice by Hellmayr and has caused much confusion. He states in his first report (1932) that it is a female of *polyosoma* with a white belly, similar to two "females" of the latter from Chile, one taken "near Sacaya" and the other on the Río Ñirehuau. The latter does have a white belly as it is of type B, but the specimen from Sacaya, that was actually sexed as male by the collector, and the one from the Cordillera do not have white bellies and are typical of type E. Hellmayr corrected himself in his second report (Hellmayr and Conover, 1949) by then identifying the bird from Sacaya as *poecilochrous* and by saying that the one from the Cordillera was rufous below [not white] but that despite this coloration it "cannot be anything else than *polyosoma*." I agree with him as far as the identity of this last bird is concerned because it has a wing length of 390 mm. and its third primary is 7 mm. longer than the fifth. I may add that when Hellmayr examined the birds in London he thought it important to add a new and signed label to the bird from the Cordillera which reads "Cordillera of Chile, Colchagua, Bridges coll., melanistic female of *B. polyosoma*, C.E.H." Previously, this bird had been identified twice as *polyosoma* and once as *poecilochrous*.

I have discussed these birds to show how difficult and controversial the identification of some of these buteos can be, even by such an experienced taxonomist as Hellmayr. Other controversial or unusual specimens are briefly mentioned below.

#### CONTROVERSIAL OR UNUSUAL SPECIMENS

The two birds from Chaquecamata which I believe are *polyosoma* were mentioned earlier. It will be recalled that Stresemann (1925) identified them as *poecilochrous* and that this was not questioned by Hellmayr. But these two birds have the wing length and formula of *polyosoma*, the third primary being longer than the fifth by 10 mm. in one specimen and 6 in the other. Dr. Stresemann may be correct, however, in believing that they are males, although the collector stated they were females, because one has type C plumage and the other type D.

A female from the province of Tarapaca, northern Chile, with a wing length of 453 mm. and a third primary 20 mm. longer than the fifth, was first identified by Hellmayr (1932) as *polyosoma*, but later (in Hellmayr and Conover, 1949) as *poecilochrous*. The long wing suggests the latter, but the big excess of the third primary over the fifth suggests *polyosoma*. This discrepancy made me hesitate to identify it but, after the specimen was no longer available to me, I found that Hellmayr had stated (1932) that its wing is distorted. I may say that this was not evident to me, but if Hellmayr is correct, this bird is probably *poecilochrous* as it has type E plumage which is rare in *polyosoma*.

I have mentioned previously the bird which was taken near Sacaya (actually at "3 leagues S.W. of Sacaya") which was first identified as *polyosoma* by Hellmayr and then transferred by him to *poecilochrous*. It is labelled male, measures 432 mm., and its third primary is 9 mm. longer than the fifth. It has type E plumage, and if the col-

lector was correct in his sexing, this bird, and another mentioned beyond from Colomi that is also said to be a male, would be the only males with this type of plumage that I have examined in either of the two species. If the bird from Sacaya is not a male, it becomes impossible to identify it with certainty, although, as stated, type E appears to be rare in *polyosoma*.

The four specimens just mentioned are in the collection of the British Museum, but there are also two in the Chicago Museum which pose a similar problem. One, identified as *poecilochrous* by Hellmayr, is a female collected at Junin, Perú, on May 3, 1914, by M. P. Anderson. Its wing length is 430 mm. and its third primary is 13 mm. longer than the fifth. It has type E plumage and this coloration and its sex suggest that it may be *poecilochrous*, but its wing is shorter than normal for female *poecilochrous* and the wing formula is "wrong." The second specimen, sexed as male by the collector, was taken at Colomi, Cochabamba, Bolivia, on June 11, 1939, and has type E plumage with a wing length of 425 mm. and a third primary that is 10 mm. longer than the fifth. I suspect that it is a male of *poecilochrous* despite the coloration and the fact that its wing formula is "wrong." I may add that it is identical in its coloration to the type of *poecilochrous*, an unsexed specimen (but most probably female) with a wing length of 480 mm.

The type of *poecilochrous* is not controversial, of course, as to identity but it is unusual in that it has the "wrong" wing formula (the third primary being about 3 or 4 mm. longer than the fifth), together with the fact that most probably it was not collected at its stated locality. Gurney, when describing *poecilochrous*, stated (1879) that the type had been collected at "Yauayacu, in the state of Ecuador" by a Mr. Buckley who sent it to Salvin and Godman "in December 1877" (the only date on the label). Hellmayr (Hellmayr and Conover, 1949) states that "Yauayacu" is the same as "Yanayacu, Ecuador," but there appears to be some confusion because Yanayacu, which is now in Perú, is on the Río Corrientes at 3° 52' S latitude and 75° 15' W longitude and about 325 kilometers southeast of the locality where the type was allegedly collected. But as Chapman (1926:719, 728) has made clear, Buckley, who employed native collectors, used as his headquarters a locality called Sarayacu (1° 45' S latitude by 77° 30' W longitude) at 1500 feet in the tropical zone of Ecuador, south of Canelos on the Río Bobonaza. Such a locality would be too low, however, for a montane form such as *poecilochrous* and if the type was not a migrant or wanderer, it was probably collected much higher in the Andes. This is suggested by Chapman (1926:728) when he says that Buckley's collection of "some 10,000 skins, referable to nearly 800 species" is said to have been formed on the "upper branches of the Rio Pastaza and on the spurs lying between this stream and its affluent, the Bobonaza' [S[clater] and S[alvin]. 1880]." Moreover, Chapman adds "I am told that the birds in this large collection were labeled by the dealer Gerard, Buckley's agent, after they reached London. Most of them are credited to Sarayacu. . . ." So we see that the margin for error is wide.

The six specimens mentioned previously from Chaquecamata, Tarapaca, Sacaya, Junin, and Colomi were not included by me in my study of the plumages or in the list of measurements.

#### GEOGRAPHICAL VARIATION

*Buteo poecilochrous* does not appear to vary geographically but *polyosoma* does. The population of the latter from the Juan Fernandez Islands, where it appears to breed only on Mas a Fuera Island, is very distinct. I have seen nine specimens from these islands, five adults and four immature birds. The adults are all of type D but differ from the specimens of *polyosoma* (or *poecilochrous*) in this plumage by being much darker above, very dark slate and almost black, and by having the feathers on the upper mantle

and, in some instances, the upper wing coverts, narrowly edged with white. Two of my adults were not sexed but the other three consist of two females and one male; these were collected by Dr. J. P. Chapin of the American Museum of Natural History who made certain of the sex. The three birds are identical in coloration with the sole exception that the male is a little less barred with gray on the abdomen; these gray bars are absent in the great majority of the specimens of *polyosoma* with this type of plumage. The fact that the birds from Juan Fernandez differ clearly from *polyosoma*, together with the fact that no other type of coloration has ever been reported from these islands, raises the question whether this isolated population (named *exsul* by Salvin in 1875) has not reached species level, but whether this has been attained or not, *exsul* is a geographical representative of *polyosoma*. In all the specimens of *exsul*, the third primary is distinctly longer than the fifth, and the wing length appears to average longer than in *polyosoma* from the continent or the Falklands, although I have not measured enough specimens of *exsul* of known sex to be sure of this.

I can find no other evidence of geographical variation in coloration, but, as is well known, the wing length averages somewhat shorter in the population from coastal Ecuador and coastal Perú. This coastal population was named *peruviensis* by Swann in 1922, but its measurements are overlapped by those of the populations of Patagonia and of the Falkland Islands, the latter being the type locality of nominate *polyosoma*. I agree with Hellmayr, therefore, in synonymizing *peruviensis* with *polyosoma* Quoy and Gaimard. The wing length averages longer in the population of *polyosoma* from the Andes, as we might expect from the altitude, a fact which complicates the differentiation of these birds from *poecilochrous*.

#### LIST OF LOCALITIES IN THE ZONE OF OVERLAP

The following localities represent only those from which I have definitely identified specimens; none is quoted from the literature although it should be mentioned that *poecilochrous* is reported also from southwestern Colombia. Altitudes that were quoted in meters have been converted by me into feet. In a few cases where the collector did not indicate the altitude, I have been able to find it in Chapman's report (1926), or I have found it on, or determined it approximately from, the 1:1,000,000 maps of Hispanic America published by the American Geographical Society.

*Buteo poecilochrous*.—ECUADOR: Llanganates, no altitude indicated but probably collected on the Cordillera de los Llanganates which rises to over 15,000 ft.; Chimborazo, 13,600 ft., and no altitude indicated; Cotopaxi at 11,100 ft.; Bestion, 10,100 ft.; Guamani, 13,500 ft.; Cerro Corazon, no altitude indicated, this mountain rising to 15,820 ft.; and Iama, Urcu-Azuag, 11,880 ft. PERU: "High Perú at 16-18,000'"; La Raya, 14,010 ft.; Cachupata, 10,175 ft.; Checayani, Azangaro, 13,200 ft.; Junin, Oroya, 12,540 ft.; Lake Titicaca, 12,600 ft.; Cuyo Cuyo, 11,220 ft.; Yura, Arequipa, 8000 ft.; and Salinas, Arequipa, 14,000 ft. BOLIVIA: El Cumbre, 15,200 ft.; Challapata, 12,375 ft.; Esperanza, Pacajes, 13,860 ft.; Tiraque, Cochabamba, 11,220 ft. CHILE: Macaya, Iquique, no altitude indicated, this locality is near Mamiña which is at an altitude of 9025 ft. ARGENTINA: Rinconada, Jujuy, 13,035 ft.

*Buteo polyosoma*.—COLOMBIA: Santa Isabel, Quindio, 10,500 ft. ECUADOR: Chimborazo, 15,000 ft.; Ambato, 8540 ft.; Guapulo, 8750 ft.; Baños, Azuay, 9240 ft.; and Pichincha, 14,500 ft. PERU: Taulis, 8850 ft.; Lake Titicaca, 12,600 ft.; and "Arequipa," perhaps region of, the town being at about 8100 ft. BOLIVIA: Cuchacancha, Cochabamba, 11,000 ft.; Cerro Juno, Cochabamba, 11,220 ft.; Tiraque, Cochabamba, no altitude indicated (see remark under *poecilochrous*); Viacha, 12,705 ft.; and Oruro, 12,210 ft.

*Controversial specimens*.—BOLIVIA: Chaquecamata, 13,200 ft. (another spelling of Choquecamate, Cochabamba, *vide* Hellmayr); Colomi, Cochabamba, 10,147 ft. PERU: Junin, no altitude given but I have one specimen of *poecilochrous* from this locality that was taken at 12,540 ft. CHILE: 3 leagues

southwest of Sacaya, no altitude given, Sacaya itself is a little over 13,000 ft.; and "Province of Tarapaca," no locality or altitude given.

Finally, the type of *poecilochrous* is labelled "Yauayacu" which equals Sarayacu, 1500 ft., Ecuador, but probably was not taken at this locality as mentioned earlier.

#### LIST OF MEASUREMENTS

The wing length refers to the length of the fourth from outermost primary which is the longest feather in both species. The measurement following the wing formula is that of the difference between the two feathers, the fifth and the third; in some individuals where the wing was measured, the wing formula could not be determined because the third or fifth primaries were molting, missing, or damaged. The wing was measured flat in millimeters. Averages are inserted in parentheses following the range.

#### *Buteo poecilochrous*

Adult males (4): Wing length, 423-473 (450); wing formula,  $5 > 3$  by 2-8 (4.0) in three. Adult females (12): 445-473 (464.5);  $5 > 3$  by 3-15 (8.4) in five,  $5 = 3$  in three, and  $5 > 3$  by 3 on one side and  $5 = 3$  on the other side in one specimen. Not sexed (5), 418-480 (458.6);  $5 > 3$  by 4 and 7 in two,  $5 < 3$  by 3 in one,  $5 = 3$  in one, and  $5 > 3$  by 3 on one side and  $5 < 3$  by 3 on the other side in one specimen.

Immature males (15): 420-470 (439.5);  $5 > 3$  by 3-15 (7.4) in nine,  $5 < 3$  by 7 and 14 in two, and  $5 = 3$  in four. Females (5): 455-483 (471);  $5 > 3$  by 5-10 (8.6) in three,  $5 = 3$  in one, and  $5 > 3$  by 3 on one side and  $5 = 3$  on the other side. Not sexed (1), 432;  $5 = 3$ .

#### *Buteo polyosoma polyosoma*

FALKLAND ISLANDS: Adult males (5): 365-377 (369.8);  $5 < 3$  by 10-13 (11.8) in four. Adult females (12): 384-417 (402.7);  $5 < 3$  by 3-13 (8.1) in ten. Not sexed (8), 382-420 (408);  $5 < 3$  by 3-13 (7.5) in seven.

Immature males (5): 376-410 (392.2);  $5 < 3$  by 9-21 (14) in five. Immature females (7): 397-432 (417);  $5 < 3$  by 4-17 (11.3) in seven. Not sexed (12), 368-436 (404.2);  $5 < 3$  by 7-17 (12.2) in nine.

PATAGONIA: Adult males (17): 350-387 (373.3);  $5 < 3$  by 8-26 (16.7) in seventeen. Adult females (19): 372-427 (406.8);  $5 < 3$  by 4-27 (15.8). Not sexed (1), 382 mm.;  $5 < 3$  by 22.

Immature males (9): 348-385 (367.9);  $5 < 3$  by 5-27 (14) in nine. Immature females (11): 392-422 (407);  $5 < 3$  by 4-20 (14.3) in eleven. Not sexed (1), 404 mm.;  $5 < 3$  by 18.

TIERRA DEL FUEGO: Adult males (4): 375-385 (380.5);  $5 < 3$  by 8 and 15 in two. Adult females (2): 425, 442;  $5 < 3$  by 7 and 15 in two. Not sexed (2), 382, 420;  $5 < 3$  by 16 in one.

Immature males (3): 375-385 (380);  $5 < 3$  by 10-12 (14) in three. Immature females: 390-435 (410);  $5 < 3$  by 8-23 (16) in six. Not sexed (1), 415 mm.;  $5 < 3$  by 27.

ARGENTINA (other than below or above) AND CHILE (other than above) AND PARAGUAY (one specimen): Adult males (8): 363-376 (371);  $5 < 3$  by 7-20 (12.5) in eight. Adult females (9): 382-445 (407.3); (1) 370;  $5 < 3$  by 8-23 (15.7) in eight. Not sexed (7), 366-404 (381);  $5 < 3$  by 5-26 (14.8) in six, and  $5 > 3$  by 6 in one from "central Chile."

Immature males (7): 360-422 (390.2);  $5 < 3$  by 3-20 (14.8) in six. Immature females: 388-433 (402.3);  $5 < 3$  by 7-28 (15.7) in seven. Not sexed (4), 360-405 (384);  $5 < 3$  by 7-14 (11.3) in three.

NORTHERN ARGENTINA (Departments of Tucuman and Salta): Adult males (2): 356, 380;  $5 < 3$  by 15 in one. Adult females (5): 391-435 (415.6);  $5 < 3$  by 8-22 (14.4) in three, and  $5 = 3$  in one.

Immature males (7): 357-380 (367.7);  $5 < 3$  by 3-22 (14) in seven. Immature females (16): 363-450 (407);  $5 < 3$  by 4-34 (22) in fifteen.

BOLIVIA AND ANDES OF COLOMBIA, ECUADOR, AND PERU: Adult males (5): 360-425 (380);  $5 < 3$  by 8-18 (12.8) in five. Adult females (6): 397-435 (414.3);  $5 < 3$  by 8-26 (18) in six. Not sexed (1), 395 mm.;  $5 < 3$  by 15.

Immature males (10): 363-410 (383);  $5 < 3$  by 10-25 (15.9) in nine. Immature females (10):

385-435 (411.5); 5 < 3 by 6-31 (14.3) in seven, and 5 = 3 in one. Not sexed (2), 392, 398; 5 < 3 by 3 and 13.

COASTAL ECUADOR AND COASTAL PERU: Adult males (5): 361-373 (368); 5 < 3 by 15-18 (16.6) in four. Adult females (5): 378-406 (390.4); 5 < 3 by 10-11 (10.6) in three, and 5 = 3 in one.

Immature males (2): 357, 370; 5 < 3 by 13 and 15. Immature females (6): 376-406 (386); 5 < 3 by 6-22 (12) in four.

#### *Buteo polyosoma exsul*

MAS A FUERA ISLAND, JUAN FERNANDEZ: Adult male (1): 393 mm.; 5 < 3 by 10. Adult females (2): 415, 420; 5 < 3 by 9 in one. Not sexed (2), 412, 420; 5 < 3 by 7 and 10. Immatures, not sexed (4), 393-432 (403); 5 < 3 by 8, 8 and 9 in three.

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#### SUMMARY

Two similar buteonid hawks inhabit western South America, one (*Buteo polyosoma*) ranges from the central Andes in Colombia south to Tierra del Fuego and the Falkland Islands and breeds also in the Juan Fernandez Islands, the other (*Buteo poecilochrous*) ranges from southwestern Colombia to extreme northwestern Argentina. The range of *poecilochrous* is completely overlapped by that of *polyosoma*. It has been suggested that *poecilochrous* represents an individual variant or an altitudinal form of *polyosoma*, but the two birds are generally considered to be distinct species, an interpretation which is supported by this study.

The two species are found at about the same altitude in the Andes, have been collected at the same localities, and the morphological differences which distinguish them suggest that they have reached species level.

*Buteo poecilochrous* is distinctly larger than *Buteo polyosoma*, has a different wing formula, and, in the adult plumage, lacks one of the color phases of *polyosoma*, the adult exhibiting also a color phase which is rare in *polyosoma*; its immature plumage is also darker in the great majority of specimens. In *polyosoma*, the fifth from outermost primary is almost invariably shorter than the third, with four exceptions out of a total of 242 specimens. The reverse is true in *poecilochrous* although its wing formula is less constant than that of *polyosoma*. A few individuals, however, present a difficult problem of identification and these suggest a certain amount of hybridization.

The immature and adult plumages are described in detail. The adults exhibit five color phases, four of which are found in both species. Some of these phases tend to be restricted to one sex.

*Buteo poecilochrous* does not vary geographically, but in *Buteo polyosoma* the wing length increases with altitude and, on Juan Fernandez, the population has evolved into a very distinct subspecies, *B. p. exsul*.

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