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GEOGRAPHIC VARIATION IN MIDDLE AMERICAN PARROTS
OF THE *AMAZONA OCHROCEPHALA* COMPLEXBy BURT L. MONROE, JR.,¹ AND THOMAS R. HOWELL²

THE PARROT *Amazona ochrocephala* (Gmelin) ranges from northern Mexico to southern Brazil and is currently divided into seven recognized subspecies (Peters, 1937). The species shows considerable geographic variation in size and color, especially in the pattern and extent of yellow areas on the head and neck. The vernacular names yellow-headed, yellow-naped, and yellow-crowned parrot, all of which have been applied to one or another form, are indicative of the color variation. This paper deals primarily with the Middle American populations of this widely distributed species, but some remarks on the South American forms are included.

The approximate range of *A. ochrocephala* in Middle America is shown in Figure 1. Within this area the populations may be grouped into three distinct color types, the distribution of which is essentially allopatric. Yellow-headed birds (Figure 2a) are found on both slopes of Mexico (including the Islas Tres Marias, off Nayarit) south into Oaxaca and Tabasco; the species is unrecorded from most of the Yucatan peninsula and from north-eastern Guatemala, but a similar color type, with somewhat less yellow on

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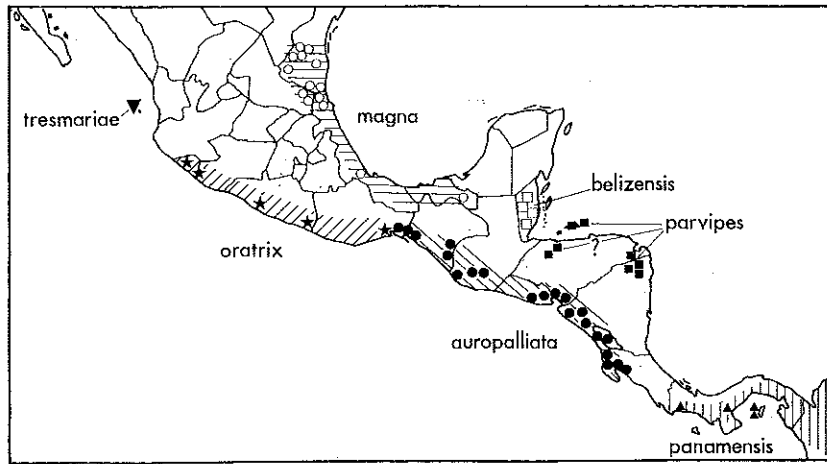


FIGURE 1. Distribution of the Middle American subspecies of *Amazona ochrocephala*. Localities indicated on the map are those from which specimens were examined.

the head (Figure 2b), occurs in British Honduras. Yellow-naped birds (Figure 2c) are found on the Pacific slope of Mexico and Central America from eastern Oaxaca to northwestern Costa Rica. Yellow-crowned birds (Figure 2d) occur throughout most of Panama, and the South American populations are also of this color type. This relatively simple picture is complicated by the presence of yellow-naped birds on part of the Caribbean slope of northeastern Nicaragua and Honduras (as well as on some of the Islas de la Bahía). In addition, there seems to be a population of the yellow-crowned type in the Sula Valley of north-central Honduras, and yellow-naped birds have also been collected there. A further complication is that these parrots are favored as pets and are widely transported; unusual locality records are often suspect since they may represent escaped cage birds. We undertook this study originally to clarify the status of the poorly known birds of the Caribbean slope of Honduras and Nicaragua, but this led to a critical re-examination of all the Middle American populations. Eventually, specimens were examined from the entire range of *A. ochrocephala*, except from the Ilha Marajó region of eastern Brazil.

THE YELLOW-HEADED GROUP

Adults of Mexican populations of the yellow-headed color type are all very similar in appearance and have sometimes been considered a distinct

species, *A. oratrix*. The head and throat are entirely, or almost entirely, yellow, and there is usually much yellow on the lower thighs. The bend of the wing is extensively marked with red or red and yellow, and one or both of these colors are usually conspicuously present on the alular edge of the wing. The bill in life is entirely ivory-colored; there is little postmortem change, and the bills of most museum specimens appear quite light-colored. The cere is yellowish or ochre, even in dried specimens, and the small bristle-like feathers on the cere are pale yellow. The tarsi and toes are deep ochraceous in dried skins.

Only five specimens from British Honduras are available, and in all these the yellow on the head is restricted to the forehead and crown (extending to a line just behind the eyes), the lores, and the auriculars; the remainder of the head is green. These birds closely resemble the Mexican yellow-headed populations in coloration of the thighs, bend and edge of wing, cere, and tarsi and toes.

Nelson (1900) described the isolated population on the Islas Tres Marías as *tresmariae*, distinguishing it from mainland birds on the basis of a "light, grass green back, more bluish green underparts and much greater extension of yellow on neck, especially on the under side." This insular subspecies has been widely recognized, but the mainland populations of both slopes north of the Isthmus of Tehuantepec have always been regarded as a single taxon, currently the subspecies *oratrix*, the type locality of which is Petapa, Oaxaca. This village is on the Pacific slope of the Isthmus of Tehuantepec, approximately 18 miles north of Ixtepec, a town that may be found on most maps of the area. The Pacific and Atlantic slope populations are completely separate from one another for their entire range with the possible exception of the Tehuantepec region, and we know of no unequivocal data that demonstrate a continuity of the two populations across the Isthmus. Records from the central highlands of Mexico are based on escaped cage birds (Friedmann, *et al.*, 1950: 131).

We have examined and measured 35 specimens from the Atlantic slope, 14 from the Pacific slope mainland, and 13 from the Islas Tres Marías. Dr. Peter Grant has examined a total of 44 specimens from these islands, including all those seen by us, and he has generously permitted us to quote his wing and tail measurements from this large sample. The measurements are given in Table 1. It is clear that three distinct populations of yellow-headed birds are present in Mexico, each one highly isolated from the others: (1) a large form, *tresmariae*, confined to the Islas Tres Marías; (2) a much

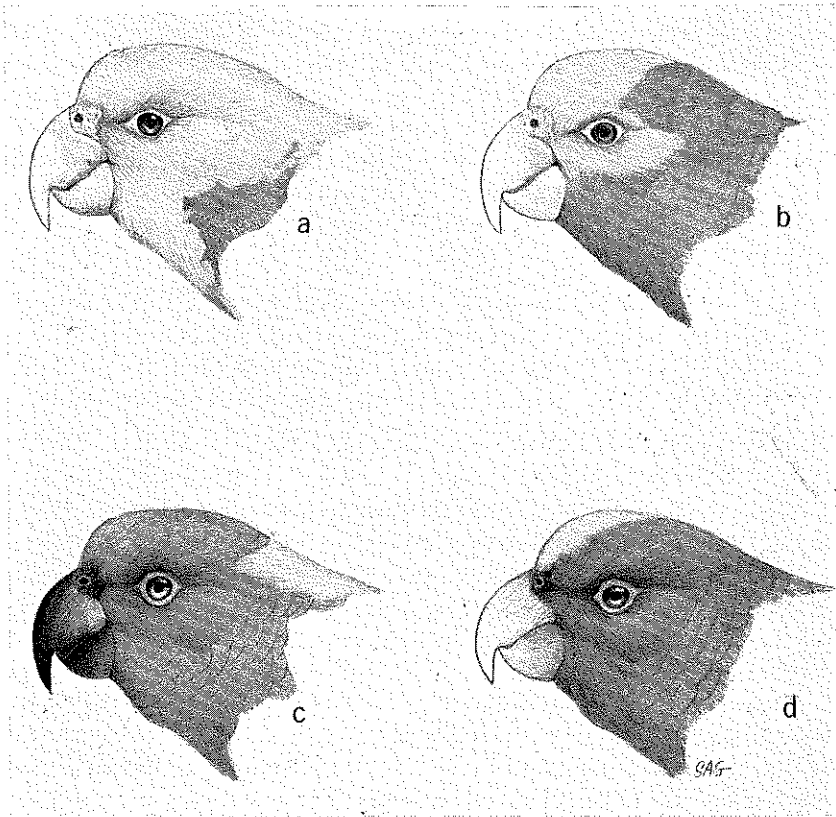


FIGURE 2. Color patterns of heads of *Amazona ochrocephala*. Light areas indicate yellow, shaded areas green. (a) Yellow-headed color type. [LSUMZ 5156, type specimen of *A. o. magna*, ♂, Victoria, Tamaulipas, México, 27 April 1941.] (b) Yellow-headed color type. [LSUMZ 21811, type specimen of *A. o. belizensis*, ♂, Hill Bank, Orange Walk Dist., British Honduras, 20 November 1956.] (c) Yellow-naped color type. [LSUMZ 29067, *A. o. auropalliata*, ♂, 7 mi. NE Choluteca, Depto. de Choluteca, Honduras, 9 October 1952.] (d) Yellow-crowned color type. [LSUMZ 29066, ♀, 3 mi. E La Lima, Depto. de Cortés, Honduras, 20 November 1962.]

smaller form occupying the lowlands of the mainland Pacific slope from Colima to eastern Oaxaca (the type of *oratrix* is a representative of this population, and that name therefore applies to the Pacific slope birds); (3) a large unnamed form ranging along the Atlantic slope lowlands from Tamaulipas to Tabasco, here described by us as a new subspecies.

AMAZONA OCHROCEPHALA MAGNA new subspecies

Type.—Adult male; no. 5156, Louisiana State University Museum of Zoology; Victoria, Tamaulipas, México; 27 April 1941; Thomas D. Burleigh; original number 10489.

Diagnosis.—Differs from *A. o. oratrix* Ridgway, of western Mexico, in decidedly larger size in all dimensions. Similar in size to *A. o. tresmariae* Nelson, of the Islas Tres Marías, but the tail averages shorter and the middle toe averages longer; differs in color from *tresmariae* in lacking any bluish cast to the green feathers of individuals in fresh plumage.

Measurements of the type in millimeters.—Wing (chord), 229.0; tail, 123.5; culmen from nostril, 35.2; length of middle toe without nail (measured from base of toe dorsally to most distal point of toe, excluding nail, with toe fully extended), 36.3.

Range.—Atlantic slope of Mexico from central Tamaulipas and extreme southeastern San Luis Potosí south through Veracruz to eastern Tabasco (Balancán).

Specimens examined.—In all, 35. TAMAULIPAS: Río Corona, near Güemes, 3; Río Cruz, 1; Río Pilón, 2; Victoria, 3; near Victoria, 1; "S. F. de Presas," 1; Jiménez, 1; Hidalgo, 3; Soto La Marina, 4; Tampico, 5. SAN LUIS POTOSÍ: 10.5 mi. W Ebano, 2; Ebano, 1; El Bonito, 1; Hacienda Limón, 1; 2 mi. N Tamaúín, 1. VERACRUZ: Río Tamesí, near Rayón, 1; Pasa Nueva, 2; Panuco, 1. TABASCO: 9 mi. N Balancán, 1.

Remarks.—This subspecies is found in the tropical lowlands of the Atlantic slope of Mexico and is apparently most abundant in xerophytic associations in that region; it is also found commonly in riparian situations and ranges into humid broad-leaved forest. Probably the Atlantic slope population has not hitherto been recognized as distinct because of the scarcity of specimens from the Pacific slope and because of the large size of *tresmariae*, which is comparable to that of *magna*. The latter circumstance gave the impression that there was no reason to expect mainland Pacific slope birds to be "small," and also that *tresmariae* was, despite its isolation, a poorly defined subspecies differing only in dubious color characters. When compared with the much smaller Pacific slope *oratrix*, from which it is almost surely derived, *tresmariae* is seen to be a well-differentiated form. Its large size shows convergence with *magna*, but the two populations are completely isolated and have probably never been in any closer contact than they are at present.

The status of the British Honduran population is also clarified by the recognition of distinct Atlantic and Pacific slope forms of the yellow-headed group. The British Honduran birds appear to be isolated from *magna*, which is not known to occur east or south of Tabasco, and are unquestionably completely isolated from *oratrix*. The small British Honduran series seems to differ from the Mexican yellow-headed group by the lesser extent of yellow; this may be a variable character, however, for Stephen M. Russell informs us (personal communication) that he has seen parrots in British Honduras that appeared to be fully yellow-headed. Nevertheless, the British Honduran population may also be distinguished on the basis of size. It is significantly smaller than *magna*, to which it is geographically closest. Although averaging only slightly smaller than *oratrix*, the British Honduran population is separated from the range of that form by approximately 400 miles; the intervening region includes highlands in Chiapas and Guatemala that are unsuitable for this species. We see no reason to feel that the similarity in size between *oratrix* and the British Honduran birds shows anything more than convergence, and we consider the latter population to represent a previously unrecognized subspecies, as described below.

AMAZONA OCHROCEPHALA BELIZENSIS new subspecies

Type.—Adult male; no. 21811, Louisiana State University Museum of Zoology; Hill Bank, Orange Walk Dist., British Honduras; 20 November 1956; Stephen M. Russell; original no. 1129.

Diagnosis.—Differs from *A. o. magna*, of eastern Mexico, in smaller size in all dimensions and in reduced amount of yellow on the head of adults, this color usually confined to the forehead, crown (extending posteriorly on crown to about level of eye), lores, and auriculars, occasionally with a few scattered yellow feathers on throat or posterior crown (see Figure 2b). Differs from the geographically more remote *A. o. oratrix* Ridgway, of western Mexico, only in the color characters mentioned above.

Measurements of the type in millimeters.—Wing (chord), 211.5; tail, 116.0; culmen from nostril, 31.8; length of middle toe without nail, 34.6.

Range.—Confined, so far as is known, to the lowland pine savanna and adjacent areas of British Honduras.

Specimens examined.—In all, 5. BRITISH HONDURAS: All Pines, 1; near Ycacos Lagoon, 1; Hill Bank, Orange Walk Dist., 2; Gallon Jug, Orange Walk Dist., 1.

Remarks.—Virtually all that is known about this population is summarized by Russell (1964). It is noteworthy that these birds show a decided affinity for stands of *Pinus caribaea*.

THE YELLOW-NAPED GROUP

Birds of this color type differ conspicuously from the yellow-headed group in that there is a well-defined yellow nape patch and sometimes a variable amount of yellow on the forehead; otherwise, the head is green. There is no yellow on the thighs or on the alular edge of the wing; red in the latter area and on the bend of the wing is relatively slight in extent, or absent; the bill is blackish, as are the cere, its sparse cover of bristly feathers, and the tarsi and toes. Immature birds may lack some or all of the yellow on the nape and forehead.

The birds inhabiting the Pacific slope of Central America from eastern Oaxaca to Costa Rica have sometimes been considered a distinct species, *A. auropalliata*. Specimens that appear to be typical *oratrix* and *auropalliata*, respectively, have been taken in eastern Oaxaca, and we have not seen any examples of unquestionable intermediates between these two forms. The zone of intergradation, if one exists, must be quite narrow. L. C. Binford, who has been studying the birds of Oaxaca intensively for the past several years, informs us (personal communication) that both color types are scarce in the region where their ranges approach closely.

The distribution of *auropalliata* coincides with the arid tropical lowlands of the Pacific slope of Central America, and its range and this habitat terminate together in northwestern Costa Rica. However, yellow-naped birds are found also on the humid Caribbean slope in eastern Honduras and northeastern Nicaragua. This region, which is variously known as the Miskito or Mosquito Coast or the Mosquitia, includes an extensive lowland pine savanna (Parsons, 1955; Radley, 1960; Taylor, 1963; Howell, 1965). The first example of this yellow-naped population was obtained by C. H. Townsend in 1887; it was tentatively referred to *auropalliata* (Ridgway, 1888). Townsend's specimens from this area are labelled "Segovia R., Honduras," and Ridgway did not give more precise localities. The river in question is also known as the Wanks River and the Río Coco; it courses through the pine savanna and forms most of the present boundary between Honduras and Nicaragua. Howell saw parrots of the yellow-naped type in northeastern Nicaragua in 1955 but did not obtain specimens until 1962 and 1963. Monroe found these birds to be fairly common near Puerto Lempira, Depto.

Gracias á Dios, Honduras, in April 1964, and they also occur on some of the Islas de la Bahía off Honduras. G. Gaumer collected five specimens on Isla Roatán in 1886 or 1887 (Salvin, 1889: 373), and Bond (1936: 358) reported these parrots as fairly common on Isla Guanaja (Bonacca Island). A. C. Twomey and R. W. Hawkins of the Carnegie Museum collected a series of specimens on these same islands and also on Isla Barbareta, an islet off the eastern tip of Roatán. The species does not occur on Isla Utila, the one closest to the mainland.

There are two additional specimen records of yellow-naped birds from Honduras; these were both taken in the Sula Valley (Ulúa Valley), a considerable distance west of the Mosquitia and in a different type of habitat. Erich Wittkügel obtained a specimen on 17 January 1892 at Chasniguas, a locality on the outskirts of La Lima in the Departamento de Cortés (specimen in Carnegie Museum, examined by Monroe). Another yellow-naped bird was collected by E. Bangs (Peters, 1929: 421) on 10 March 1928 along the Toloa Canal at Urraco, about 12 miles northeast of La Lima. All the records prior to 1930 were known to Peters and were the basis for his statement (1937: 221) that the range of *auropalliata* extends "into the Caribbean lowlands of northern Honduras east to the Ulúa Valley; Ruatan Island." However, there have been no other reports of birds of this color type from the Sula Valley.

The yellow-naped populations of the Islas de la Bahía and the Mosquitia of Honduras and Nicaragua are completely isolated from the Pacific slope *auropalliata* and are subspecifically distinguishable; this new form is described below.

AMAZONA OCHROCEPHALA PARVIPES new subspecies

Type.—Adult male; no. 51465, University of California, Los Angeles; Leicus Creek, 56 mi. NW Puerto Cabezas, Comarca de El Cabo, Nicaragua, elevation 200 feet; 26 January 1963; Thomas R. Howell; original no. 2550.

Diagnosis.—Differs from *A. o. auropalliata* (Lesson), of the Pacific slope of Central America, in smaller size, notably in smaller feet; in the presence of red at the bend of the wing; and in the generally paler, less heavily pigmented bill.

Measurements of the type in millimeters.—Wing (chord), 226.0; tail, 118.5; culmen from nostril, 30.9; length of middle toe without nail, 33.0.

Range.—Resident in lowland pine regions of the Islas de la Bahía (Roatán,

Barbareta, and Guanaja) and of the Mosquitia in eastern Honduras and northeastern Nicaragua; yellow-naped birds from the lower Sula Valley, in north-central Honduras from Lake Yojoa northward, are tentatively referred to this subspecies.

Specimens examined.—In all, 16. HONDURAS: Chasniguas, 1; Urraco, 1; Isla Barbareta, 3; Isla Guanaja (Bonacca Island), 2; Río Segovia, 1; "Honduras," 1. NICARAGUA: 15 km. SSW Waspam (also spelled Huaspam and Huaspan), 2; Leicus Creek, 4; 25 mi. SE Leicus Creek, 1.

Remarks.—This population, like *belizensis*, shows a marked affinity for stands of *Pinus caribaea*. These parrots are often seen in pines far out on the savanna, but we have not seen them feeding in these trees and no nests have yet been found. It seems likely that the birds require a habitat of open aspect such as that found on the arid Pacific slope occupied by *auropalliata*; the pine savanna is the only "open" area on the Caribbean slope, and pines as such may not be an ecological requirement.

THE YELLOW-CROWNED GROUP

This color type is found in the populations that range from Panama into South America. The yellow is usually confined to the forehead and crown region and is never found on the nape. In the subspecies *panamensis* of Panama and northern Colombia, the forehead and entire crown are yellow. In birds from the northern coast of South America, the yellow area is reduced by the presence of green feathers on the forehead; this tendency is carried to the extreme in birds from the Amazon basin, which have the yellow confined to a central spot on the crown. There is a small population (*xantholaema*) at the mouth of the Amazon on Ilha Marajó that also has extensive yellow on the sides of the head; this population has not been examined by us. In all these yellow-crowned types, red is present at the bend of the wing but is slight in extent; red is sometimes present on the alular edge of the wing and occasionally there is some yellow on the thighs, but these areas are usually pure green. Bill color is pale in *panamensis*, becoming more heavily pigmented in the South American populations. The cere, bristles, and tarsi and toes are blackish. Size ranges from small in *panamensis* to large in the birds of the Amazon region.

THE SULA VALLEY BIRDS

In view of the distribution outlined above, it is extremely puzzling to find records of yellow-crowned birds in the Sula Valley of Honduras—a

TABLE 1. MEASUREMENTS IN MILLIMETERS OF SPECIMENS OF *AMAZONA OCHROCEPHALA* EXAMINED. Columns indicate subspecies, feature that was measured (F), sex, sample size (N), range of variation, mean (M), standard deviation (SD), and standard error of the mean (SE). Features that were measured are abbreviated as follows: W—wing (chord); T—tail; C—culmen (from nostril); MT—middle toe without nail (from base of toe dorsally to most distal point of toe, excluding nail, with toe fully extended).

Subspecies	F	Sex	N	Range	M	SD	SE	
<i>magna</i>	W	♂♂	18	224.0-247.0	231.7	7.21	1.70	
		♀♀	13	212.0-241.0	224.5	8.15	2.26	
	T	♂♂	14	116.5-136.0	122.5	5.19	1.39	
		♀♀	12	108.0-124.5	115.8	4.40	1.27	
	C	♂♂	18	30.8-35.9	33.4	1.45	0.34	
		♀♀	15	29.7-33.0	31.5	1.12	0.29	
	MT	♂♂	13	34.0-38.5	36.2	1.64	0.46	
		♀♀	13	31.0-36.7	34.1	1.49	0.41	
	<i>oratrix</i>	W	♂♂	7	208.5-228.0	220.1	6.89	2.60
			♀♀	2	209.0-221.5	—	—	—
T		♂♂	4	114.0-123.5	119.9	4.17	2.09	
		♀♀	1	115.2	—	—	—	
C		♂♂	7	32.5-34.4	33.4	0.76	0.29	
		♀♀	1	31.8	—	—	—	
MT		♂♂	5	34.9-37.0	36.1	0.76	0.34	
		♀♀	1	35.9	—	—	—	
<i>tresmariae</i>		W	♂♂	28*	218.0-247.0	233.9	7.00	1.32
			♀♀	16*	218.0-237.0	226.1	4.75	1.19
	T	♂♂	27*	114.0-140.0	129.3	6.51	1.25	
		♀♀	16*	121.0-136.0	127.9	4.08	1.02	
	C	♂♂	7	32.1-35.0	33.6	1.07	0.40	
		♀♀	5	29.9-32.7	31.8	1.10	0.49	
	MT	♂♂	5	33.8-35.1	34.2	0.51	0.23	
		♀♀	4	31.8-33.7	33.0	0.85	0.43	
	<i>belizensis</i>	W	♂♂	4	211.5-220.0	215.8	3.52	1.76
			♀♀	1	202.5	—	—	—
T		♂♂	2	116.0-120.5	—	—	—	
		♀♀	1	106.5	—	—	—	
C		♂♂	4	31.2-33.5	32.5	1.18	0.59	
		♀♀	1	31.5	—	—	—	
MT		♂♂	3	33.3-35.6	34.5	1.15	0.67	
		♀♀	1	32.9	—	—	—	
<i>auropalliata</i>		W	♂♂	30	215.0-240.5	228.6	6.44	1.18
			♀♀	23	209.0-234.5	220.7	6.73	1.40
	T	♂♂	18	114.0-128.5	123.6	4.68	1.10	

* Wing and tail measurement data for *tresmariae* obtained by Peter Grant.

TABLE 1—Continued

Subspecies	F	Sex	N	Range	M	SD	SE	
<i>parvipes</i>	C	♀♀	15	112.0-130.0	121.7	5.63	1.45	
		♂♂	30	32.1-37.3	34.4	1.13	0.23	
	MT	♀♀	24	30.1-34.9	32.6	1.29	0.26	
		♂♂	26	34.8-40.9	37.6	1.49	0.29	
	W	♀♀	17	32.5-37.5	35.8	1.42	0.35	
		♂♂	6	210.0-240.5	219.4	12.13	4.95	
	T	♀♀	6	204.0-228.5	211.6	8.83	3.61	
		♂♂	6	107.0-127.5	116.4	7.06	2.88	
	C	♀♀	4	110.5-113.0	111.5	1.08	0.54	
		♂♂	6	30.9-33.2	32.3	0.80	0.33	
MT	♀♀	7	30.3-32.9	31.6	1.00	0.38		
	♂♂	7	31.7-36.9	33.8	1.94	0.87		
<i>panamensis</i>	W	♀♀	6	29.5-34.0	31.9	1.52	0.62	
		♂♂	13	185.0-210.0	198.1	7.06	1.96	
	T	♂♂	9	94.5-105.5	99.9	3.41	1.14	
		♀♀	6	96.2-109.5	103.3	4.95	2.02	
	C	♂♂	13	29.0-31.5	30.1	0.83	0.23	
		♀♀	14	27.9-31.4	29.9	1.14	0.30	
	MT	♂♂	10	28.0-36.9	33.1	2.53	0.80	
		♀♀	8	28.0-33.6	31.1	2.02	0.72	
	<i>ochrocephala</i>	W	♂♂	17	201.5-222.0	211.3	6.57	1.59
			♀♀	8	201.0-219.0	208.2	5.92	2.09
T		♂♂	11	104.6-127.0	113.7	6.14	1.85	
		♀♀	7	107.0-120.5	112.8	4.39	1.66	
C		♂♂	17	30.2-33.5	31.6	1.02	0.25	
		♀♀	12	28.3-33.0	30.2	1.22	0.35	
MT		♂♂	14	30.3-37.4	33.7	1.97	0.53	
		♀♀	7	30.5-33.5	31.8	1.05	0.40	
<i>nattereri</i>		W	♂♂	9	217.5-238.0	228.7	8.63	2.88
			♀♀	9	209.5-231.5	220.3	7.70	2.57
	T	♂♂	8	119.0-126.4	121.2	2.84	1.01	
		♀♀	7	107.2-122.0	115.5	5.45	2.06	
	C	♂♂	11	30.1-36.6	33.9	2.10	0.63	
		♀♀	12	29.7-36.2	31.8	1.61	0.46	
	MT	♂♂	8	34.2-38.6	36.3	1.37	0.48	
		♀♀	10	30.4-38.6	33.7	2.19	0.69	

locality for which there are also two "extralimital" records of yellow-naped birds. The known occurrence of yellow-crowned birds in this area dates back to 1858, when George Cavendish Taylor crossed central Honduras from coast to coast. After observing yellow-naped birds in the Pacific lowlands, Taylor (1860: 121-122) reported his observations at Lake Yojoa, on the Caribbean slope at the head of the Sula Valley, as follows:

"... nor did I see any large Parrots after I left the [Pacific] coast until I arrived at Yojoa, where there is a Parrot much resembling this [*auropalliata*] in plumage, but rather smaller, with the yellow on the fore part of the head instead of behind. They were flying in great numbers towards their roosting-places . . ."

J. T. Emlen, Jr., and C. B. Worth collected a male of the yellow-crowned type at Laguna Toloa, about five miles north of Urraco, Departamento de Atlántida, on 30 August 1930. Stone (1932: 308) recorded this specimen as *auropalliata*. We have re-examined it, and although many of the nape feathers are missing, those that remain are green; the forehead and crown are yellow. [In the same paper, Stone (1932: 309) listed "*Amazona oratrix oratrix*" as "Recorded from Yojoa (Taylor) and Ruatan Island (Salvin)."] He was presumably referring to Taylor's record of the yellow-crowned type at Lake Yojoa, and to Salvin's (1889: 373) citation of "*Chrysotis auripalliata*" as collected by Gaumer on Roatán. Stone's listing of *A. o. oratrix* from Honduras was a *lapsus*, for neither the observation nor the specimens cited pertain to the yellow-headed color type.] K. S. Hamilton of the United Fruit Company station at La Lima, Departamento de Cortés, collected a female of the yellow-crowned color type on 20 November 1962 about three miles east of La Lima. He informed Monroe that the flock from which this individual was taken consisted of about 50 birds; the few that he could observe closely were all of the yellow-crowned type.

In summary, there are four specimens of *A. ochrocephala* from the Sula Valley, all collected within 20 miles of one another; two are of the yellow-naped type, and two are of the yellow-crowned type. In addition, there are published observations of large flocks of the latter color type, but no other records of the yellow-naped type from this area. In the yellow-crowned birds from the Sula Valley, the cere and its bristlelike feathers and the tarsi and toes are all blackish and not ochraceous; this indicates affinity with the *parvipes-auropalliata* and more southern group of subspecies rather than with the more northern yellow-headed forms. The yellow-crowned birds of the Sula Valley differ from the superficially similar *A. o. panamensis*

(Cabanis) of Panama and Colombia by their larger size and by their darker and longer, more massive bill.

There are several possible explanations for the existence of two color types in the Sula Valley: (1) the different color types represent individual variation associated with sex or age; (2) the population includes two morphs or color phases; (3) both populations are derived from escaped cage birds introduced from other areas; (4) the yellow-crowned birds represent an undescribed species, or subspecies, and the two yellow-naped specimens represent extralimital vagrants or escaped cage birds; or (5) natural populations of two sympatric species are involved.

Possibility "1" above is the least likely, for there is no conspicuous sexual dimorphism in color in other Central American *Amazona* species or in the known subspecies of *A. ochrocephala*. Large flocks of the yellow-crowned type have been reported, and it is unlikely that such flocks would include only one sex or age group. Possibility "2" cannot be ruled out, but such a situation would be unique in the widespread *Amazona ochrocephala* complex and does not seem probable. Possibilities "3," "4," and "5" overlap and may be considered together. In San Pedro Sula, Honduras, Monroe has seen caged parrots of several kinds (including Mexican yellow-headed parrots) that do not naturally occur there, and in February of 1963 Howell saw an uncaged yellow-naped parrot (presumably *auropalliata*) brought from Managua to Puerto Cabezas by airplane. Small flocks of *A. ochrocephala* are even resident in Los Angeles, California, and there can be no doubt that escaped parrots may live for many years in areas where they are introduced. It should be recalled, however, that Taylor reported a large flock of the yellow-crowned type at Lake Yojoa in 1858, and it is most improbable that introduced birds were established in such a remote area at that time. On the basis of present information, it is our guess that the yellow-crowned population (for there seems to be one) is an isolated, undescribed subspecies of *A. ochrocephala*, and that the two yellow-naped specimens taken in the Sula Valley were individuals of *parvipes* that had wandered outside their normal range or were escaped cage birds.

Recent attempts to obtain more information on the Sula Valley populations have not been successful. Monroe returned in April 1964 but was unable to find parrots of this species, and attempts by Hamilton to locate additional birds in 1963-1964 were also unsuccessful. These parrots are apparently very local in distribution in the valley, and until more data can be obtained their systematic status must remain in doubt; the two yellow-

crowned specimens from the Sula Valley are therefore not assigned to race and not listed in the specimens examined.

[An interesting and well-documented case of color change in a captive bird may be cited here. A parrot of the yellow-crowned type, an adult of unknown age, was obtained in 1954 by Dr. W. W. Plowden, Jr., of San Pedro Sula. This bird retained the yellow-crowned pattern for 10 years of captivity, but in the spring of 1964 a patch of yellow feathers developed in the nape region in addition to the crown. Monroe has seen and photographed this individual both prior to and after the appearance of the nape patch. Such a change in color pattern, coming after at least 10 years of life, is doubtless an unnatural condition. Yellow coloration in parrots can result from a lack of melanin deposition, and this lack is a common occurrence in cage birds. The instance cited above does suggest that there are several areas on the head with different thresholds of susceptibility to melanin pigmentation, and that the pattern variation in natural populations may be the result of such differences.]

OTHER SPECIMENS EXAMINED

AMAZONA OCHROCEPHALA ORATRIX Ridgway.—In all, 14. COLIMA: Río de Coahuayana, 1; Llano de Garritas, 12 km. NW Periquillos, 4. GUERRERO: Papayo, 1; Cuajinicuilapa, 3. OAXACA: Llano Grande, 1; Petapa, 3; El Barrio, 1.

AMAZONA OCHROCEPHALA TRESMARIAE Nelson.—In all, 14. ISLAS TRES MARIAS: Isla María Madre, 13; Islas Tres Marías, unspecified, 1.

AMAZONA OCHROCEPHALA AUROPALLIATA (Lesson).—In all, 57. OAXACA: Santa Efigenia, 1; Río Ostuta, 5 mi. W Zanatepec, 1; near Ixhuatán, 8 mi. S Ostuta, 1. CHIAPAS: Monte Piedad, Acacoyagua, 1; Esperanza, 1; Huehuetán, 4. GUATEMALA: Finca Los Arcos, 1; Tiquizate, Escuintla, 2; Concepción del Mar, Escuintla, 1; San José, 2; Finca El Cipres, 4; Hacienda California, 2. EL SALVADOR: Lake Olomega, San Miguel, 6; Puerto del Triunfo, Usulután, 2; "El Salvador," 1. HONDURAS: San Lorenzo, 1; 7 mi. NE Choluteca, 1; "Honduras-Nicaragua boundary" [near Pacific coast], 1. NICARAGUA: San Gerónimo, Chinandega, 6; Volcán de Chinandega, 2; Managua, 1; Chinandega, 1; Ometepe, 1; Realejo, 1; "Nicaragua," 1. COSTA RICA: Tenorio, 3; Bolsón, 1; Piedra de Blanca, Guanacaste, 1; Bebedero, Guanacaste, 1; Liberia, Guanacaste, 1; Puntarenas, 1; "Costa Rica," 3.

AMAZONA OCHROCEPHALA PANAMENSIS (Cabanis).—In all, 33. PANAMÁ: Aguadulce, 2; Divalá, 1; Parita, 1; Natá, Coclé, 1; Isla San José, Pearl

Islands, 6; Isla Pedro González, 1; "Panamá," 5. COLOMBIA: Lórica, Bolívar, 2; Calamar, Bolívar, 1; Depto. Bolívar, 1; Malena, Antioquia, 1; Río Atrato, Sautatá, 1; Fundación, Santa Marta, 3; Depto. Santa Marta, 2; Gamarra, Magdalena, 1; Puerto Berrio, Río Magdalena, 2; Honda, Río Magdalena, 2.

AMAZONA OCHROCEPHALA OCHROCEPHALA (Gmelin).—In all, 47. COLOMBIA: Villavicencio, base of Eastern Andes, 2; Barrigón, head of Río Meta, 3; "Meta," 1; Palmar, Boyacá, 1; Cobaría, La Ceiba, Arauca, 3; "Bogotá," 1; Río Caura, 2; "Colombia," 3. VENEZUELA: Sab. Mendoza, 3; San Carlos, 1; El Trompillo, Carabobo, 1; El Sombrero, 1; Urama, 1; Guachi, Zulia, 1; Empelado Savanna, Zulia, 1; Santa Elena, Mérida, 1; Cantaura, Anzoátegui, 2; Altagracia, Orinoco, 5; Caicara, Orinoco, 7; Maripa, Río Caura, 1; Maipures, Río Orinoco, 1; Puerto Ayacucho, Río Orinoco, 2. BRITISH GUIANA: Annai, 1; Abary Creek, 1. "GUIANA": unspecified, 1.

AMAZONA OCHROCEPHALA NATTERERI (Finsch).—In all, 31. PERÚ: mouth Río Curaráy, 2; mouth Río Urubamba, 2; Sarayacu, Río Ucayali, 1; "Oroso, Río Amazonas," 1; Chuchurras, 2; Pucallpa, Río Callería, Loreto, 1; Río Curanja, Loreto, 2. BOLIVIA: Yungas, 1; Rurrenabaque, 1. BRAZIL: Puerto Velho, rio Madeira, 1; São Paulo de Olivença, rio Solimões, 2; Boa Vista, Amazonas, 2; Islandos Obidos, rio Amazonas, 3; Santarém, through Southwick, 3; Tapaiuna, rio Tapajóz, Pará, 1; Arara, rio Tapajóz, Pará, 2; Urucurituba, rio Tapajóz, Paía, 1; "Pará," 1; Frechal, rio Surumú, 1.

SUMMARY

The current study of *Amazona ochrocephala* indicates that there are at least seven recognizable subspecies in Middle America, three of which (*magna*, *belizensis*, and *parvipes*) are described herein as new.

Three groups of populations, based primarily on head patterns of adults, may be recognized in the species complex. The "yellow-headed" group, in which the head is entirely, or almost entirely, yellow, is represented on the Atlantic slope of Mexico by the large race *magna*, on the Pacific slope by the smaller *oratrix*, and in the Islas Tres Marías by another large form, *tresmariae*. The British Honduran population (*belizensis*) is similar to this color type but usually lacks the yellow on the hindcrown, nape, and throat. The "yellow-naped" group is represented by *auropalliata* on the west coast of Middle America from Oaxaca to Costa Rica and by *parvipes* on the Caribbean coast in the Islas de la Bahía off Honduras and the Mosquitia of

eastern Honduras and northeastern Nicaragua. Birds from the Sula Valley of Honduras include a "yellow-crowned" color type in addition to the "yellow-naped." Otherwise, the "yellow-crowned" group, in which the yellow is restricted to the forehead and crown, is represented in Middle America only by *panamensis* in Panama. Other subspecies of the yellow-crowned type are found throughout most of tropical South America.

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