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Systematic Notes on the Bird Family Cracidae. No. 9 The Genus *Crax*

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CRAX

The genus *Crax* is widely distributed in heavily forested regions from the twenty-fourth parallel in northeastern Mexico, south along the escarpment of eastern Mexico to the Isthmus of Tehuantepec, and through southern Mexico, Central America, and South America to Florida and Misiones in northeastern Argentina, but reaches only northwestern Ecuador west of the Andes. It is composed of seven species: *alector*, *globulosa*, *blumenbachii*, *daubentoni*, *fasciolata*, *alberti*, and *rubra*, which replace one another geographically and form a superspecies. *Alberti* and *rubra* have been collected a few miles apart in the valley of the upper Rio Sinu in Colombia, as stated by Blake (1955), and it is possible also that two other species (*alector* and *globulosa*) meet near the mouth of the Rio Negro below Manaos, but there is no proof of overlap in either case.

The color of the base of the bill and of its fleshy appendages varies specifically in the males, but their plumage is black and white, and its pattern is virtually identical in all the species. The lower abdomen, under tail coverts, and the long tufts of feathers that grow from the lower flanks and base of the thighs are snow white, and the rest of the plumage is

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black. The only difference in the color pattern consists in the fact that the tail feathers are broadly tipped with white in *daubentoni*, *fasciolata*, and *alberti*, with the exception of the central pair which is black, whereas all the tail feathers are black in the other species. The crest is also more developed in some species than others, and the extent of the small area of bare skin around the eye varies slightly.

The fleshy appendages at the base of the bill consist of a large rounded knob on the upper bill and of a pair of wattles on the mandible about the shape and size of an olive of medium size. *Alector* lacks these appendages altogether, and the knob is only slightly developed in *fasciolata*. The latter and *rubra* have no wattles, but the knob is very highly developed in *rubra*. These appendages are best developed and most highly colored during the period of sexual activity, and shrink after death, losing their color, but the contrast between the species is very sharp in life, especially between the species the ranges of which probably come in contact. In the two pairs mentioned above, the bill of *alberti* is provided with both a knob and wattles which are large and vivid cobalt blue, whereas the knob is bright yellow in *rubra*, and this species has no wattles (as stated above). *Alector* has no knob or wattles, and the base of its bill is very bright yellow, whereas the knob and wattles are very highly developed in *globulosa* (as its name indicates) and are bright scarlet red. These very conspicuous differences no doubt play an important role in species recognition.

The females lack these appendages, but their coloration is far more variable than that of the males. In *alector*, the females are black and white and are identical to the males, with the sole exception that the black feathers of the crest are interrupted by two very narrow bands of white. These white bars are present in the females of all the species but vary greatly in width from species to species, as well as individually, and intraspecifically, as the crest is virtually all white in one subspecies of *fasciolata*. In *globulosa*, the white areas of the plumage of the male are replaced by dark reddish cinnamon in the female. *Blumenbachii* is rufous and similar to *globulosa* below, but it differs from *globulosa* by being heavily mottled with reddish chestnut on the wing. The plumage of female *daubentoni*, *fasciolata*, *alberti*, and *rubra* is barred, but the variation is great and is complicated by color phases in *alberti* and *rubra*. Two phases can be recognized in *alberti* and three in *rubra* in which the variation is most complex.

Crax alector

Crax alector is distributed from the delta of the Orinoco, and Venezuela

south of the Orinoco, west to the foothills of the Andes in Colombia, including the Cordillera de la Macarena, and south to the Rio Negro, Rio Urubu, and the north bank of the Amazon east of the Rio Urubu. On the north bank of the Amazon, it ranges at least as far east as Lago Cuipeua (longitude $54^{\circ} 55' W.$), as I have seen a specimen from this locality, and probably reaches Amapa also, as suggested by one bird that I have examined that had been taken on the upper Arucaua River, about 50 kilometers south of the border of French Guiana which is the type locality of *alector*.

The range of *alector* is not clear near the mouth of the Rio Negro, however, where its range and that of *globulosa* may come into contact. The records of Natterer, reported by Pelzeln (1870), place the two birds at the same locality. Pelzeln stated that Natterer collected *alector* in September, 1830, at the "Barra do Rio Negro," and *globulosa* at the same locality in June and July, 1834. But this locality is a bit vague. Some doubt may exist concerning these records, because Oliveira Pinto, who had included the Barra do Rio Negro in the range of *globulosa*, but not in the range of *alector*, in his first account (1938), reversed the records later (1964), listing this locality in the range of *alector*, but not in that of *globulosa* which is known from Manaos.

Oliveira Pinto reported a specimen of *alector* from the Rio Urubu in his second account, but he unfortunately did not say where on the river this bird had been collected. The latter flows from the northwest to empty into Lake Amajari, which is situated about 130 kilometers east of Manaos, and about 10 kilometers north of the Amazon to which it is connected by canals. But farther upstream, the Rio Urubu comes within about 80 kilometers of Manaos. It is clear, at any rate, that the ranges of the two species approach closely, and they may meet east of Manaos, or near the mouth of the Rio Negro.

Another record that requires comment is that of *fasciolata* from Obidos, cited by Oliveira Pinto (1938, p. 95). The authenticity of this record was questioned by Hellmayr and Conover (1942, p. 124), because Obidos is situated on the north bank of the Amazon, about 65 kilometers west of Lago Cuipeua, and if this record were valid it would imply that *fasciolata* and *alector* overlap in this region. Oliveira Pinto and Camargo (1948, p. 299) have, however, retracted this record, prompted by Hellmayr and Conover, and have stated that the specimen concerned was not collected at Obidos, but most probably south of the Amazon in the region of Santarem near the mouth of the Tapajoz. The original label of this specimen had been lost before it was catalogued, but the error could be corrected because the collector and his itinerary are known.

Crax globulosa

This species is distributed from the mouth of the Rio Negro (Manaos; see above), the Rio Madeira, and the Rio Guaporé, westward to the upper Rio Caqueta in Colombia and the foothills of the eastern Andes in Ecuador and Peru, south to the department of La Paz, and the northern and western part of the department of El Beni in Bolivia.

Crax blumenbachii

Crax blumenbachii is restricted to the coastal districts of Brazil and was distributed from southern Bahia south through eastern Minas Gerais and Espirito Santo to Rio de Janeiro, but it has vanished from most of this relatively small range and is facing extinction.

This species is very rare in collections, and the total number of specimens in existence seems to consist of only a dozen or fewer. The three that I have examined are in the collection of the American Museum of Natural History and consist of two females and one male. One of the females is a bird of unknown origin which died in the gardens of the New York Zoological Society. The other came from the collection of Prince Maximilian and is merely labeled Brazil, whereas the male was collected in 1942 on the Rio São José, north of the Rio Doce in Espirito Santo, by Dr. Helmut Sick who presented it to the American Museum.

This species has been reported also from Bolivia by Gyldenstolpe (1945, p. 58), but in error, as I find that the specimen concerned was misidentified and is *globulosa*. This specimen is a male, which was lent to me by the Naturhistoriska Riksmuseum of Sweden, and was collected by the professional collector A. M. Olalla, or by a member of his party, on November 19, 1937, at El Desierto, a small settlement on the Rio Beni at about latitude 13° 42' S. by longitude 67° 22' W.

Gyldenstolpe was handicapped in identifying this bird by not having comparative material of *blumenbachii* and *globulosa*, and also by relying on the description of the male of *blumenbachii* given by Hellmayr (1906) who compared *blumenbachii* to *alector* and *fasciolata*, but not to *globulosa*. For instance, the difference in the color of the gloss, which Gyldenstolpe wrote was greenish in the bird from Bolivia, as against purplish blue in *alector*, is diagnostic only when the specimen from Bolivia is compared to *alector*, but not when it is compared to *globulosa* which is distinctly more greenish than *alector*.

The specimen from El Desierto is misleading, because the fleshy appendages at the base of its bill are not developed, but this fact is not conclusive as these appendages may be present in or absent from both

blumenbachii and *globulosa*. Hellmayr's description of the male of *blumenbachii* (1906, p. 687) is misleading, through no fault of his own, because the appendages are not developed in the only male of *blumenbachii* that he examined,¹ although they are well developed in the male that Sick collected in 1942. Very few authentic specimens of *blumenbachii* have been examined, and the only other description of a male that I have found is by Oliveira Pinto (1935) which is confusing because it is contradictory.²

Gyldenstolpe's specimen is not fully adult, but can be identified as *globulosa* by a combination of several characters which consist of the development of the crest, the color of the gloss, the size of the bill, and the length of the tarsus. It agrees perfectly with *globulosa*, which differs from *blumenbachii* by having a smaller crest, a less greenish gloss, a larger bill, and a distinctly shorter tarsus. The latter measures 99 mm., a measurement similar to the length of the tarsus in *globulosa* which measures 88–104 (97) in the males of *globulosa*, as against 105–115 (110) in the males of *blumenbachii*. The fact that this specimen is not fully adult may also explain in part the lack of appendages.

The great development of these fleshy appendages and their bright red color are always emphasized in the descriptions of *globulosa*, which probably misled Gyldenstolpe also, because they are not developed in his specimen and the skin appeared to have been yellowish in life. It is worthy of comment that the appendages may be absent from *globulosa* and that the skin may be yellow rather than red. For instance, the appendages are not developed in one male that I have examined, which also had been taken on the Rio Beni and in the same general region where Gyldenstolpe's specimen was collected. Some males from the Amazon also lack them. This series from the Amazon was seen by Hellmayr and Conover (1942) who commented that it "shows every gradation from birds without any swelling on the bill to two with large swellings at the base of the culmen and distinct wattles on the lower mandible. The color of the basal portion of the bill is yellow in those with swellings, while the cere is practically red in the others. Natterer, in his notes on

¹ The only male of *blumenbachii* that Hellmayr (1906) or Hellmayr and Conover (1942) seem to have examined at any time is the type of *Crax rubrirostris* Spix, which lacks these appendages. *Rubrirostris* represents the male, and *blumenbachii* the female, of the same species, although they were described as different species by Spix (1825, pp. 50, 51, pls. 64, 67).

² Oliveira Pinto (1935) stated that the appendages are present in the male in his text "*O bico dos machos apresenta ainda tumefação na base do culme e barbelas membranosas, todas de cor vermelha,*" but he wrote the opposite, "*bico sem tuberculo nem barbelas,*" in a key to the curassows of Brazil published in the same paper.

freshly killed specimens, describes the cere and appendages as bright red." Dr. Sick has written to me that his experience shows that the appendages are either red or yellow.

I have dwelt on the appendages and their coloration because the variation is not recognized or is underestimated as a rule in the literature. It is highly probable, however, that the size of the appendages and the color of the naked skin are modified in all the Cracidae by an increase or decrease in vascularization correlated with the breeding cycle, the appendages becoming well developed only at the onset of the breeding season, and apparently changing from yellow (perhaps only in birds that have never bred) to red in *globulosa*.

Crax daubentoni

This species inhabits northern Venezuela, north of the Orinoco, from the tip of the Peninsula de Paria west to Merida and Zulia, and the mountains of neighboring Colombia from their northern extremity south through eastern Norte de Santander to northwestern Arauca. It has been reported from San Fernando in northern Apure, but not from southern Apure or Tachira, although it probably occurs in these regions of Venezuela as it has been collected on the Rio Arauca on the Isla de Charo.

The literature suggests that the ranges of *daubentoni* and *alberti* come in contact, but this is not correct as the records show that the two species are separated by a gap of about 130 kilometers of apparently unsuitable territory. *Alberti* inhabits the western and northern foothills of the Santa Marta Massif, but not the eastern foothills, and the easternmost record is from La Cueva in the northern foothills, whereas the westernmost records of *daubentoni* are from the Montes de Oca south of Carraipia, and from the Sierra Negra east of Fonseca.

Peters (1934, p. 11) considered *daubentoni* and *alberti* to be conspecific, but he has not been followed as conspecificity seems very implausible. The females are very well differentiated, and the normal coloration of the fleshy appendages of the male, bright yellow in *daubentoni* as against vivid cobalt blue in *alberti*, show also that the two birds are not conspecific. All the species of *Crax* are quite distinct, and the only two that vary geographically are *fasciolata* and *rubra*.

Crax fasciolata

Crax fasciolata has a more extensive range than that of any other species. It extends from Maranhão and northeastern Para west to the Tapajoz River, and south through central Brazil to central and southeastern Bolivia, Paraguay, and extreme northeastern Argentina where it

reaches eastern Formosa, northeastern Chaco, and Misiones. The range in Bolivia does not seem to extend farther west than the Provincia de Marbán in the southeastern corner of the department of El Beni, and apparently does not come in contact with that of *globulosa*. In Brazil, the eastern limits seem to extend, more or less, to the Tocantins River, the Rio São Francisco in Minas Gerais, and the western parts of São Paulo and Paraná.

Crax fasciolata varies geographically, and three very distinct subspecies can be recognized that are based entirely on the characters of the females. These are: *pinima* Pelzeln, 1870, type locality, Praia do Cajutuba, on the coast of Pará northeast of Belém; nominate *fasciolata* Spix, 1825, type locality, "in sylvis Parae"; and *grayi* Ogilvie-Grant, 1893, type locality, "South America." The type locality of nominate *fasciolata* is very vague, but it is difficult to suggest a definite locality, because the type has been lost and the region where it was collected is very uncertain. I have examined the two specimens on which *grayi* was based, and they seem to match the birds of Bolivia perfectly, but I was not able to compare them directly with specimens from Bolivia. *Pinima* is very dark, *grayi* is very pale, and nominate *fasciolata* is more or less intermediate but shows a very strong tendency toward *grayi* in the southern part of its range—all of which suggests that the variation is clinal, or probably was, because *pinima* seems to be extinct.

Crax f. pinima is extremely rare in collections, and its true characters were a matter of speculation before Hellmayr (1906) described the type which, fortunately, is a female. Another female was described by Oliveira Pinto (1935), and I discovered a third in the collection of the American Museum of Natural History which is subadult. All these specimens are very dark, dull greenish black above, barred with very narrow wavy lines of buffy white that are scarcely more than 1 mm. in width, on the upper surface of the wing, back, rump, upper tail coverts, and tail. These pale lines are much interrupted on the back and rump, and are much reduced on the tail, where they are restricted almost entirely to the outer web of the feathers. These whitish lines are present also on the remiges, but are less regular on the inner web where they are more or less interrupted. The crest is very dark and is black, barred with two narrow bands of white which average from about 3 to 6 mm. in width. The upper part of the breast is black, narrowly barred with buffy white, the lower part is creamy white and is heavily barred with black, and the abdomen is pale buffy yellow, with the black bars restricted to the flanks only. Hellmayr stated that the thighs are barred with black in the type, but they are immaculate in the specimen I have seen, perhaps because it is not

fully adult. The color of the thighs was not mentioned by Oliveira Pinto.

I have described *pinima* in detail because it is so poorly known. All the accounts and descriptions of *pinima* given in the literature before Hellmayr and Oliveira Pinto are not reliable, because they were not based on authentic specimens. Hellmayr remarked that even the original description is untrustworthy, because it was based by Pelzeln on mixed material.

Nominate *fasciolata* differs from *pinima* by being much more regularly and heavily barred above and on the remiges, by being paler on the rump, brown rather than black, and by being darker below, much more ochraceous, less buffy, but less heavily barred with black. The width of the bars on the upper parts varies individually, but they are invariably broader than in *pinima*, and vary from about 2 to 3 mm. in width in the individuals that are most broadly barred. The crest of nominate *fasciolata* is much whiter than that of *pinima*, but the white area varies a great deal individually, as shown by a series of seven females collected by Baer on the Rio Araguaya in July, 1906. In the individuals with the blackest crest, the proximal white bar is about 5 mm. in width, and the distal one is about twice as broad, but in other individuals the two white bars merge or are interrupted only by a small black spot. The size of the single white bar that results is quite variable, and in one individual the crest is virtually all white, with the exception of the black curly tips of the feathers and of their very base.

Crax sclateri G. R. Gray, 1867, was based on two specimens, which I have examined, which fall perfectly within the range of individual variation above described; *sclateri* is therefore a synonym of nominate *fasciolata* Spix, 1825, as Oliveira Pinto (1935) has already stated. The two cotypes of *sclateri* were said to have been obtained from "Mexico," clearly an error.

Crax fasciolata grayi differs from nominate *fasciolata* by being much paler above and on the wings, and by being less heavily barred with black below. The under parts are ochraceous in *grayi* also, and of the same shade as in nominate *fasciolata*, but the black bars do not extend so far down, as they end at the border of the upper part of the breast, whereas they invade the breast to a varying degree in nominate *fasciolata*. The buffy bars on the remiges, upper wing, back, and tail of *grayi* are extremely broad and vary from about 9 to 13 mm. in width, whereas they do not exceed 3 mm. in nominate *fasciolata*. A character peculiar to *grayi* consists of a very large and conspicuous ochraceous patch at the edge of the wing, created by the fact that the outer rows of the lesser, middle, and greater upper wing coverts are not barred with black. The size of this patch varies individually but it is invariably well developed in *grayi*, whereas it is absent from the specimens of nominate *fasciolata* that I have

seen. The rump and upper tail coverts are also much paler in *grayi* and are chiefly ochraceous or cinnamon-buff, with irregular blackish markings. The white area in the crest of *grayi* seems to be more variable individually than in nominate *fasciolata*, the crest being nearly all white in some individuals, but blacker than in nominate *fasciolata* in others.

The center of the short feathers of the chin and upper throat is white in all the three subspecies, but the size of the white spots varies individually. These are least developed in *pinima*.

The measurements vary slightly (table 1), but not significantly, although it is impossible to ascertain the size of *pinima* because too few specimens exist. Possibly *pinima* was somewhat smaller, and Oliveira Pinto (1935; 1964, p. 102) stressed the fact that its bill is shorter and less high. It is difficult to compare his measurements with mine, but the bill, although somewhat less bulky in the subadult female that I have seen, is not shorter than the bill of nominate *fasciolata*.

The ranges of the three subspecies require further study, but *pinima*, which has not been collected since 1907, seems to be extinct and appears to have been restricted to northern Maranhão and northeastern Para west to the lower Tocantins. *Pinima* seems to be known from a total of only three males and four females. The oldest specimens are one male and one female that were collected by Sieber in the early 1830's in the region of Cameta, though perhaps not at Cameta itself which is situated on the left bank of the Tocantins.¹ The type of *pinima*, a female, is in the Vienna Museum, and was taken on February 24, 1835, by Natterer at Praia do Cajutuba, Para. The female in the American Museum of Natural History was collected by an unknown person at or in Para on September 4, 1842. The other three specimens, two males and one female, were collected in northern Maranhão by Schwanda at Boa Vista in January, 1907, and at Primeira Cruz in February, 1907. These records seem to indicate that *pinima* ranged west to the lower Tocantins and south to at least latitude 2° 30' S.

The other records of the species from the northern part of the range are very deficient, as they seem to consist of only one record from the region of Santarem near the mouth of the Tapajoz, and of one from Conceição do Araguaia, the subspecies involved being nominate *fasciolata* in both instances. Conceição do Araguaia is situated about 900 kilometers

¹ Snethlage (1914, p. 6) stated that Sieber collected "nos arredores," or around Cameta in the early 1830's, but that no complete report seems to have been published on his collection. The specimens concerned, which were mentioned by Hellmayr and Conover (1942, p. 123) are, or were, in the Berlin Museum.

TABLE 1
MEASUREMENTS OF *Crax fasciolata*

Form	N	Wing Mean	Wing Range	N	Tail Mean	Tail Range	N	Tarsus Mean	Tarsus Range
<i>C. f. pinima</i>									
Male ^a	1	—	345	1	—	300	1	—	105
Female ^b	1	—	350	1	—	310	0	—	—
<i>C. f. fasciolata</i>									
Males	7	369.6	360-380	7	318.0	310-330	7	98.4	93-102
Females	9	355.0	340-367	8	309.2	306-312	9	90.4	88-93
"Intermediates" ^c									
Males	9	367.1	350-385	9	320.0	310-340	9	95.2	90-97
Females	11	349.1	337-363	11	302.4	290-315	12	89.0	85-95
<i>C. f. grayi</i>									
Males	2	369.0	368, 370	2	325.0	320, 330	2	102.5	102, 103
Females ^d	10	358.9	346-373	10	319.2	308-335	10	92.6	86-103

^a Quoted from Oliveira Pinto (1964, p. 102).

^b Type of *pinima*; measurements quoted from Hellmayr (1906, p. 683). In the only specimen of *pinima* that I have examined, a subadult female, the wing measures 325; the tail, 285; and the tarsus, 95.

^c Specimens from southern Mato Grosso and Paraguay; see text.

^d The type of *grayi*, which is included in the measurements, measures: wing, 346; tail, 315; and tarsus, 96.

southeast of the mouth of the Tapajoz and about 600 from the nearest record of *pinima*. The gaps between the records are thus very great, but it is presumed that the range of nominate *fasciolata* still extends north to the Amazon west of the lower Tocantins, the Tapajoz probably constituting the western limits of the range, as no records exist beyond it.

The range of nominate *fasciolata* extends south to western Parana, Paraguay, and Argentina. The range of *grayi* seems to be restricted to Bolivia, but the specimens from the southern part of the range¹ of nominate *fasciolata* show a tendency toward *grayi*, especially in the Mato Grosso along the border of Bolivia. The specimens that I have seen from this last region were taken at Rio Do Cabaçal (latitude 16° S.), Descalvados (16° 44' S.), and Palmeiras (18° 58' S.) east of Corumba. The specimen from Palmeiras is, in fact, almost as pale and as broadly barred as *grayi* from Santa Cruz in Bolivia, but it lacks its conspicuous ochraceous patch on the edge of the wing. The specimens from Rio do Cabaçal and Descalvados are less pale than the bird from Palmeiras, but are considerably paler than specimens taken farther south at Vaccaria in the Mato Grosso (21° 14' S.) and from several localities in Paraguay between latitudes 23° S. and 26° S. (Riacho Caballero, Riacho Negro, Villarrica, and Mbutuy), although the bird from Mbutuy is rather similar to birds from Rio do Cabaçal and Descalvados.

I have not seen any specimens from Argentina, but the birds of eastern Formosa and eastern Chaco are probably similar to the birds of Paraguay, judging by the comments of Laubmann (1930, p. 82) who reported a specimen from Rio de Oro.

Crax alberti

The range of *alberti* is quite small, relatively speaking, as it is restricted to northern Colombia, extending from the northern and western foothills of the Santa Marta Massif south to Bolivar, northern Antioquia, and the Magdalena Valley south to the region of Honda in extreme northern Tolima.

The females vary individually in coloration but show two very distinct types which correspond to the color phases of *rubra*. The two types, one of which is rufous and the other barred, have not been compared before this study and are described below.

In the rufous phase, the throat is uniformly black, not barred, the upper breast is uniformly black or slightly barred to a varying degree

¹ The measurements of these specimens are listed separately in table 1, where they are called "intermediates," because they average slightly smaller.

at its lower border, and the rest of the under parts, including the greater part of the thigh or the entire thigh, are dark reddish cinnamon and uniform, not barred with black or blackish brown. The lower abdomen, under tail coverts, and the long tufts of feathers that grow from the base of the thighs and lower flanks are immaculate and dull pale orange. The primaries are pale reddish chestnut and are uniform, with the exception of the extreme tip and the inner web of the inner primaries, which are more or less slightly mottled with brown, but the primaries are not black, barred with white on the outer web. The bend of the wing, outer primary coverts, and alula are reddish also, with or without a few brownish bars. The upper parts are black, narrowly but regularly barred with white, and the two white bars in the crest are narrow, the broadest of these bars averaging about 5 mm. in width.

In the barred phase, the whole of the under parts, including the throat and thighs, and also the bend of the wing, outer primary coverts, and alula are very heavily barred with black and white, or buffy or cinnamon white, the white bars broadening on the abdomen. The lower abdomen, under tail coverts, and the tufts of feathers are immaculate as in the rufous phase, but are much paler, being creamy or buffy. The primaries are black, barred with white on the outer web, mottled slightly with chestnut on the inner web. The upper parts are black, narrowly barred with white on the wing and scapulars as in the rufous phase, but the white bars have disappeared from the tail, or are reduced to faint traces, and to a few narrow edges or spots on the mantle and upper tail coverts. The crest, on the other hand, is much whiter than in the rufous phase, the white bars being very broad or merging to form a single and expanded white area.

One specimen that I have seen from Naranjo in the northern foothills of the Santa Marta Massif is intermediate between the two color phases, except for the coloration of the back which is well barred as in the rufous phase. All the other specimens, however, can be referred without question to either of the two phases, although some are slightly intermediate in one or two characters.

I have not seen a sufficient number of females to determine the geographical distribution of the two phases, but the barred phase may be restricted to northern Santa Marta and may be more common there than the rufous phase. All the females that I have seen from the rest of the range are of the rufous phase, although two or three are slightly intermediate, but those from northern Santa Marta consist of typical specimens of the two phases, and of the intermediate mentioned above from Naranjo. The other three females that I have examined from this

region are one typical specimen of the rufous phase from Bonda, and two typical specimens of the barred phase, one taken at Don Diego (the type of *annulata*), and the other at La Cueva. All these localities are not far from one another, as Naranjo is only 20 kilometers east of Bonda, Don Diego 25 kilometers east of Naranjo, and La Cueva 20 kilometers east of Don Diego.

I have seen two other typical specimens of the barred phase in the collection of the British Museum, but these had been aviary birds without localities. Hellmayr, who examined this collection, stated, in Hellmayr and Conover (1942, p. 129) that he found one of these specimens, but not the other. The one he found has the registry number 56.11.5.17 and is labeled "New Granada." The one he failed to find died in the gardens of the Zoological Society of London on December 2, 1877, and has the registry number 89.6.1.299. It is the more interesting of the two, because it was discussed by Sclater (1879, p. 544, pl. 93) who illustrated it with a very fine colored plate. Sclater said he believed that this bird was a "second example of the singular Curassow" that he had described earlier as a new species (1872, p. 690) which he named *incommoda*. The first example (and type of *incommoda*), however, turned out to be only a slightly aberrant female of *C. daubentoni* G. R. Gray, 1867, whereas the "second example," of 1879, represents the first published account of the barred phase of female *alberti*.

The barred phase was described by Todd (1915) as a new species which he named *annulata*. Todd was apparently unaware then that it had already been discussed by Sclater under the name *incommoda*, but he learned of this later and mentioned Sclater's bird in his more detailed discussion of *annulata* in his monumental report (1922) on the birds of the Santa Marta Massif.

Todd based *annulata* on one male and one female (the type) that were collected at Don Diego on January 26, 1914, by Carriker. Todd's belief that *annulata* is a valid form rested on the coloration of the female and the small size of his specimens. He was handicapped, however, by not having enough material and by failing to recognize the fact that the male is not adult, as he maintained, but a very young bird. The wing length of this male measures 343 mm., whereas it measures 380, 388 in two adults of *alberti* collected in northern Santa Marta by Carriker (one of them also at Don Diego five days later than the two specimens of *annulata* were taken, but this specimen was not mentioned by Todd, presumably because he identified it as *alberti*). The fact that the male of *annulata* is immature is shown in many ways, in addition to its small size, such as the presence of buffy edges on the feathers of the body, white

spots in the crest, which is a sure sign of immaturity in males, poorly developed gloss, and juvenal primaries and rectrices.

The adult females of the two color phases are identical in size, the wing length measuring 362 (type of *annulata*), 378, 380 (373.3) in three of the barred phase, as against 364–382 (374.0) in nine of the rufous phase. The wing length of the type appears to be 2 mm. shorter, but a measurement of 362 is not accurate, because the tips of its longest primaries are worn. The fourth female of the barred phase (from La Cueva) measures only 347, but it still has its juvenal flight feathers, although the body plumage is similar to that of the adult.

Peters (1934, p. 11) has synonymized *annulata* with *C. alberti* Fraser, 1852, which is correct, but not his statement that the type of *annulata* “while sexed as a ♀ is without doubt an immature ♂.” Todd (1932) has called attention to this error which was probably caused by a confusion of the two specimens.

Crax rubra

The range of *C. rubra* is very extensive. It reaches from about the twenty-fourth parallel in the region northwest of Ciudad Victoria in Tamaulipas, south along the forests of the escarpment of eastern Mexico to the Isthmus of Tehuantepec, and through southern Mexico and Central America to the Chongon Hills of western Ecuador. It is restricted to the Pacific region in South America and penetrates eastward only to longitude 76° 17' W. in the valley of the upper Rio Sinu in Colombia.

TABLE 2
WING LENGTH OF *Crax rubra*

Mexico	12 ♂	397–424	(410.0)	15 ♀	370–406	(385.7)
Central America ^a	12 ♂	390–420	(402.4)	18 ♀	361–406	(386.0)
Panama	11 ♂	382–415	(394.1)	6 ♀	364–380	(371.0)
Colombia and Ecuador	7 ♂	376–408	(390.3)	11 ♀	360–390	(371.2)
Cozumel Island	—	—	—	4 ♀	332–360	(344.0)

^a From Guatemala and British Honduras south to and including Costa Rica.

The mean wing length of the males decreases clinally from north to south (table 2). The measurements of the females vary less than those of the males, but nevertheless the females from the southern part of the range are smaller than those from the north. The population from Cozumel Island, off Quintana Roo, does not form part of the cline and is considerably smaller than the birds of the continent.

The coloration of the males is constant, but the females are extremely

TABLE 3
GEOGRAPHICAL DISTRIBUTION OF THE COLOR PHASES OF FEMALES OF *Crax rubra*
(For a description of the phases, see text. The numbers
in the columns refer to the number of specimens.)

Region	Phase A	Intermediates A × B	Phase B	Phase C
Mexico ^a	14	—	—	1 ^b
Yucatan Peninsula ^c	15	1	—	4
Cozumel Island	6	—	—	—
Chiapas	6	1	—	2
Central America ^d	17	11	7	—
Panama	—	—	11	—
Colombia	—	1	10	—
Ecuador	—	—	2	—

^a Does not include Yucatan Peninsula, Cozumel Island, and Chiapas.

^b From Tutla, Isthmus of Tehuantepec.

^c Includes British Honduras and the Peten region of Guatemala.

^d Consists of Guatemala (other than the Peten) south to and including Costa Rica.

variable. They can, however, be divided into three types, or color phases. These were described in detail by Ridgway and Friedmann (1946, pp. 13–15) as “dark phase,” “red phase,” and “barred-backed phase” (for the purposes of table 3 of the present paper they are called A, B, and C, respectively).

The three phases can be briefly characterized as follows. In the dark phase (A), the mantle is black or blackish, grading posteriorly into dark chestnut brown, and the inner secondaries and tail are blackish or dark chestnut brown and are uniform, or more or less mottled or vermiculated with reddish chestnut or buffy white, but not barred. In the red phase (B), all the upper parts, below the blackish lower nape, are dark reddish cinnamon or bright orange chestnut and are uniform, not mottled or barred, with the exception of the tail which is very boldly barred with dark buff, black, and dark chestnut, the dark bands varying from two to three times broader than the pale buffy bands. In the barred-backed phase (C), all the upper parts, including the tail, are very boldly barred with white or buffy white and with black or dark brown; the crest and neck are also very much whiter in this phase.

Very few specimens are identical, and the division between the first two phases (A and B) is more or less arbitrary, because these are connected by a complete range of intermediates (specimens that are on the borderline are listed separately in table 3). Phase C is quite rare; no intermediates have been reported, but they may exist.

A study of the geographical distribution of the three color phases, based on 110 females, shows (table 3) that all the specimens reported from Mexico, other than the Yucatan Peninsula, Cozumel Island, and Chiapas, are of the dark phase (A), with the exception of one of the barred-backed phase (C) that was collected on the Isthmus of Tehuantepec. If the Isthmus is excluded, all the birds of northeastern Mexico from Tamaulipas south to Veracruz are of the dark phase. Table 3 shows also that all the specimens from Panama, Colombia, and Ecuador are of the red phase (B), with the exception of one which is intermediate between the two phases.

This segregation of the dark and red phases at the opposite ends of the range does not imply, however, that these populations are subspecies, because the three phases are represented in the intervening and greater part of the range of the species. Typical specimens of the red phase (B) occur north to the Sierra de Espiritu Santo on the border of Guatemala and Honduras; typical specimens of the dark phase (A), south to the Cordillera de Talamanca in southern Costa Rica; and intermediates, north to northern Quintana Roo (Leona Vicario) near the tip of the Yucatan Peninsula. The barred-backed phase (C) seems to be restricted to the Isthmus of Tehuantepec, Yucatan Peninsula, and Chiapas, and it occurs there together with the dark phase, as both phases have been taken at Puerto Morelos in Quintana Roo, Champoton in Campeche, and Tutla in Oaxaca. The type of distribution shown by the specimens in table 3 is often shown by polymorphic species.

The only population that seems to warrant subspecific recognition is the population of Cozumel Island, which is very considerably smaller than any from the continent (table 2) and has been named *griscomi*. All the females reported from Cozumel are of the dark phase (A), although the latter and the barred-backed phase (C) are found directly opposite Cozumel on the coast of the mainland.

The color phases were believed to be distinct species and have been described as *panamensis* by Ogilvie-Grant in 1893, *hecki* by Reichenow in 1894, and *chapmani* by Nelson in 1901. *Hecki* and *chapmani* were based on individuals of the barred-backed phase, but Nelson was not aware that this form had been named earlier by Reichenow. *Panamensis* was based on some specimens of the red phase that Ogilvie-Grant compared to some of the dark phase.

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SPECIMENS EXAMINED

Crax alector

SURINAM: Para River, 1 ♀; Kaiserberg airstrip, Zuid River, 2 ♀.

GUYANA (FORMER BRITISH GUIANA): Upper Cuyuni River, 1 ♂, 1 ♀; Kurupung River, 1 ♀; Apanachi, Mazaruni River, 1 ♂, 1 ♀; Potaro Landing, 1 ♀; Takutu River, 1 ♂; Camacusa, 1 ♀; Berbice, 1 ♂; Oko Mountains, Essequibo River, 3 ♂, 4 ♀; Rockstone, 1 ♂; no locality, 4 ♂, 1 ♀.

VENEZUELA: Auyan Tepui, 2 ♂, 4 ♀; foot of Mt. Duida, 1 ♀; Valle de los Monos, Mt. Duida, 5 ♂, 3 ♀; Nericagua, 1 ♀; Boca de Sina, upper Orinoco, 1 ♂; Cerro Yapacana, upper Orinoco, 2 ♂, 1 unsexed.

COLOMBIA: Rio Duda, La Macarena, 2 unsexed; plateau of La Macarena, 1 ♂; Rio Guapaya, La Macarena, 2 ♂, 2 ♀; Rio Yerly, La Macarena, 1 ♂, 1 ♀; Rio Sausa, La Macarena, 1 ♀; Los Micos, San Juan de Arama, 1 ♂, 2 ♀; Buenavista, above Villavicencio, 1 ♀; no locality, 1 ♂, 1 ♀ (type of *erythronatha*).

BRAZIL: Upper Arucaia River, Amapa, 1 ♀; Obidos, 1 ♂, 1 ♀; Serra Grande, Rio Branco, 1 ♂; Lago Cuipeua, 1 ♂; Itacoatiara, 1 ♂; Igarapé Arriba near Itacoatiara, 5 ♂, 4 ♀; Lago Canacary, 1 ♂; Castanhal, Rio Jaimunda, Faro, 1 ♂, 2 ♀; Rio Paratucu, Faro, 1 ♀; Serra do Espelho, Faro, 1 ♂; Rio Curicuriari, Rio Negro, 1 ♀; São Gabriel, Rio Negro, 1 ♂; Barra do Rio Negro, 1 "♀."

Crax globulosa

COLOMBIA: Tres Troncos, La Tagua, Rio Caqueta, 1 ♂.

ECUADOR: Rio Negro, 1 ♀.

PERU: Apayacu, 2 ♂, 1 ♀; near Iquitos, 1 ♂; mouth of the Rio Curaray, 2 ♀; Rio Mazan, 1 ♀; mouth of the Rio Colorado, Madre de Dios, 1 ♀; Samiria, 1 ♀.

BOLIVIA: El Desierto, Rio Beni, 1 ♂; lower Beni River, 1 ♂.

BRAZIL: Ilha do Comprido, Rio Solimões, 8 ♂, 8 ♀; Rio Manacapuri, Amazonas, 1 ♂, 1 ♀; no locality, 2 ♂, 1 ♀, 1 unsexed.

NO LOCALITY: 1 ♂, 1 ♀.

Crax blumenbachii

BRAZIL: Rio São José, Espírito Santo, 1 ♂; no locality, 2 ♀.

Crax daubentoni

VENEZUELA: Cristobal Colon, Paria Peninsula, 1 ♂; Rio Cogollo, Zulia, 1 ♀; El Hacha, Yaracuy, 1 ♂, 1 ♀; Montañas de Limones, Merida, 1 ♂; no locality, 1 ♂, 3 ♀, 1 unsexed.

COLOMBIA: El Bosque, south of Carraipia, Sierra Negra, Guajira, 2 ♂, 1 ♀; Monte Elias, Sierra Negra, southeast of Fonseca, Magdalena, 1 immature ♂; Rio Bojaba, Arauca, 2 ♀.

SOUTH AMERICA, NO LOCALITY: 1 ♂ (type of *daubentoni*), 3 ♀ (including type of *incommoda*).

Crax fasciolata pinima

BRAZIL: Para, 1 subadult ♀.

Crax fasciolata fasciolata

BRAZIL: Rio Araguaya, Goyaz, 7 ♂, 7 ♀; Palmeiras, Mato Grosso, 1 ♀; Agua Verde, Mato Grosso, 1 ♂; Descalvados, Mato Grosso, 1 ♀; Fazenda Capão Bonita, Vaccaria, Mato Grosso, 4 ♂, 2 ♀; Bocaina, Mato Grosso, 1 immature ♀; Rio do Cabaçal, Mato Grosso, 1 ♂, 1 ♀.

PARAGUAY: Riacho Caballero, 45 kilometers west of Puerto Rosario, 2 ♀; Riacho Negro, 235 kilometers west [of the Paraguay River], 2 ♀; Paraguay River at latitude 24° 30' S., longitude 57° W., 2 ♂; Mbutuy, 1 ♂, 1 ♀; Villarrica, 1 ♀.

SOUTH AMERICA, NO LOCALITY: 1 ♂, 3 ♀. "Mexico," error for South America, 2 ♀ (including type of *sclateri*).

Crax fasciolata grayi

BOLIVIA: Buenavista, Santa Cruz, 1 ♂, 1 immature ♂, 5 ♀; Rio Ichilo, lower Rio Grande, Santa Cruz, 1 ♀; San Carlos, Santa Cruz, 1 ♂; Rio Mamoré, Provincia de Marban, El Beni, 1 ♀.

SOUTH AMERICA, NO LOCALITY: 3 ♀ (including type of *grayi*).

Crax alberti

COLOMBIA: *Magdalena*: La Tigrera, 1 ♂; Bonda, 1 ♀, 2 chicks; Don Diego, 1 ♂, 1 immature ♂, 1 ♀ (type of *annulata*); La Cueva, 1 ♀; Cincinnati, 1 ♂; Naranjo, 1 ♀; Camp Costa Rica, 76 kilometers northeast of Plato, 2 ♀. *Bolivar*: Volador, 1 ♂; Socarré, Rio Sinu, 1 ♂, 1 ♀; Catival, upper Rio San Jorge, 1 ♀; Alto de Quimari, 1 ♂. *Antioquia*: Nechi, 1 ♀, 1 immature ♀; El Real, Rio Nechi, 1 ♂; Valdivia, 1 ♀. *Cundinamarca*: "Bogota," 1 ♂; "vicinity of Bogota," 1 ♀. *Tolima*: "Within 20 miles [west] of Honda," 1 ♂. "New Granada," 1 ♀. Colombia, no locality, 1 ♂. "South America," no locality, 3 ♂ (including type of *viridirostris*), 2 ♀.

Crax rubra rubra

MEXICO: *Tamaulipas*: Cañon Cavilleros, 2 ♂, 1 ♀; Ciudad Victoria, 3 ♀; Sierra Madre above Ciudad Victoria, 1 ♀; Aldama, 1 ♂. *Veracruz*: Cerro Tuxtla, 1 ♂; [Rivera], 75 miles southwest of Tampico, 1 ♂; Misantla, 1 ♀. *Oaxaca*: Tutla, 2 ♂, 3 ♀; Chimalapa, 1 ♀. *Chiapas*: Cerro Madre Vieja, near Escuintla, 1 ♂, 1 ♀; Acacoyagua, near Escuintla, 1 ♀; Selva el Mercadito, 60 kilometers north of Cintalapa, 1 ♀; Catarinas, 1 ♀; Rio de las Playas, 2 ♂, 3 ♀. *Yucatan*: Izamal, 1 ♀; "northern Yucatan," 2 ♂.

GUATEMALA: Tiquisate, 1 ♂; Savana Grande, 2 ♂, 2 ♀; Coban, 1 ♂; near Guatemala City, 2 ♀; Uaxactun, Peten, 1 ♂; Chantuqui, Peten, 2 ♀; Sacchich, Peten, 1 ♀; Escobas, Izabal, 1 ♀; Chapulco, Izabal, 3 ♂, 1 ♀; no locality, 1 ♂, 2 ♀.

BRITISH HONDURAS: Manatee Lagoon, 1 ♂; Cock's Comb Mountains, 1 ♀; no locality, 1 ♂.

HONDURAS: La Ceiba, 3 ♂, 4 ♀; Catacombas, Sierra de Espirito Santo, 1 ♀; no locality, 1 ♀.

NICARAGUA: Peña Blanca, 1 ♂, 2 ♀; San Emilio, Lake Nicaragua, 1 ♀; San Geronimo, Chinandega, 2 ♂; Rio Grande, 1 ♀.

COSTA RICA: [Cordillera de] Talamanca, 1 ♂, 1 ♀; Miravalles, Guanacaste, 1 ♂, 1 ♀; Volcan de Turrialba, 1 ♀; La Iberia Farm, Volcan de Turrialba, 2 ♀; Pozo Azul, 1 ♀; Port Parker Bay, 1 ♀; Valza, 2 ♀.

PANAMA: Wilcox Camp, San Lorenzo River, Veraguas, 1 ♀; Cerro Viejo, Veraguas, 1 ♂, 1 ♀; Lion Hill, 1 ♂ (type of *panamensis*), 1 ♀; Isthmus of Panama, 1 ♂; Cerro Bruja, Colon, 1 ♂; Tigrillo, Rio Chiman, 1 ♂; Rio Chiman at mouth of Rio Curutu, 1 ♀; Cerro Carhunco, Rio Tranca, San Blas, 1 ♂; Armila, 1 immature ♂; Rio Chucunaque at Rio Subcuti, 1 ♀; Rio Chucunaque below Rio Subcuti, 1 ♂; Cituro, Cupe River, 2 ♂; Tacarcuna, 1 ♀; Puerto Obaldia, 4 ♂, 3 ♀, 1 immature ♀.

COLOMBIA: Rio Nain, Bolivar, 1 ♀; upper Rio Sinu, 1 ♂; Rio Salaqui, Choco, 2 ♂; Unguia, Choco, 2 ♂, 1 ♀; Sautata, Rio Atrato, 1 ♂; Bagado, Choco, 1 ♀; Baudo, Choco, 1 ♀; Rio Baudo, Choco, 1 ♀; Sierra de Baudo, Choco, 1 ♀; Rio San Juan, Choco, 1 ♀; Rio Jurado, Choco, 3 ♀; Las Pavas, 1 ♂.

ECUADOR: Pulun, northwestern Ecuador, 1 ♀; Paramba, northwestern Ecuador, 1 ♂, 1 ♀; Cerro de Bajo Verde, Chongon Hills, western Ecuador, 1 ♂.

NO LOCALITY: 4 ♀.

Crax rubra griscomi

MEXICO: *Quintana Roo*: Cozumel Island, 4 ♀ (including type of *griscomi*).

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