# THE BLACK-AND-GOLD COTINGA

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THE Black-and-gold Cotinga (*Tijuca atra*) has for long remained a bird known only as the possessor of a remarkable voice. Confined to a few forested mountain ranges in southeastern Brazil in the states of Rio de Janeiro, eastern São Paulo, and southern Minas Gerais, it has not received detailed study. It is indeed a difficult bird to come to grips with, as is clear from the memorable account by Holt (1928) of his experiences with it in the Serra do Itatiaia, a passage that may serve as the best introduction to the following account of our recent observations.

"My acquaintance with the Saudade,"[1] Holt wrote, "was considerable before I had actually seen the bird. My notebook contains altitudinal records based on song alone, but these are as sure as if the birds had been in hand, for the song once heard is not soon forgotten. In my experience it is unique, and to have heard it delivered amidst the full wealth of its lonely forest setting was one of the greatest privileges of my work upon Itatiaya. My first audience was impressive.

"I had been long hours in the saddle. Now, amid lengthening shadows, I was traversing the upper reaches of the forest zone. . . Unexpectedly there floated out upon the thin, clear air a vibrant note, a long-drawn plaintive whistle that rose in pitch and intensity, and then faded away in a mere thread of sound—withal so sad, so mournful, that it seemed the cry of some languishing wood sprite rather than a vibration of purely organic origin. With every sense alive, I craned my neck to see the tallest tree tops. Nothing moved except a great sparkling drop which fell from a rosette of bromeliads high overhead to splash into a puddle in the trail. After a tense moment, the disembodied voice drifted again through the trees, this time joined by another, the two singing in unison. I turned in my saddle then, and looked back and down as well as up, for the air seemed filled with sound, but the notes died away leaving on every hand only silent green gloom. It was not until weeks after, when I trudged those high trails day after day, that I stumbled by chance upon the owner of that wonderful voice."

In late 1972 we had the opportunity to study *Tijuca atra* for 2 weeks in the Serra dos Orgãos, in the state of Rio de Janeiro. The observations were limited, and a great deal remained obscure; but it became clear that this species has a form of group display by males that is, so far as is known, unique. In the following pages we describe what we

[1] "The word *saudade* is a poetic Portuguese term signifying memory imbued with longing. Its application to *Tijuca nigra* [= *T. atra*] is evidence of the impression made upon the Brazilians by this bird's remarkable song" (Holt). It also has the more prosaic Brazilian name *Sobiador* or *Assubiador*, "the whistler."

were able to find out about the behavior of the males, with such other information on the species' natural history as we were able to obtain.

## General Appearance and Size

*Tijuca atra* is a medium-large cotinga, unusually thrushlike in build for a member of its family. Males are all black in plumage, except for a large patch of pure yellow on the flight feathers, which is visible at all times but becomes especially conspicuous if the wings are drooped. The beak is brilliant orange, the eye dark brown and the legs and feet also dark. Females are olive-green all over, paler on the underparts and a little yellower on the edges of the flight feathers, with a dull brownish or orange-brown beak. Males are a little larger than females, immature males being intermediate (average and range of winglengths of 20 adult males, 146.8 (141–151); 5 immature males, 144.4 (142–147); 7 females, 142.7 (140–145).

The male immature plumage is nearly or exactly the same as the female plumage. The juvenal plumage has not been described. The zoological museum of the University of São Paulo has a most puzzling specimen, identified as a juvenile *Tijuca atra*, which is so unlike what would be expected that the possibility should be considered that it belongs to an undescribed species of cotinga, unlikely though this may seem. The bird in question was collected at or near Teresópolis (within a few miles of where our observations were made) on 24 October 1942, and was sexed as a female, the ovary (from the detailed sketch on the label) measuring 9 × 7 mm. It bears a general resemblance to a female of *Tijuca atra*, especially in proportions and general color, but differs as follows. It is extremely small, with measurements well outside the range for undoubted *Tijuca* specimens: wing 121, tail 107, culmen from anterior edge of nares 12.5, tarsus 26; cf. means for females of *Tijuca* of 142.7, 116.8, 14.5 and 29.2 mm respectively. The beak is not only shorter but also much less deep than in undoubted *Tijuca*; the feet are much smaller and more slender. The body plumage is brighter, yellower green than in females of *Tijuca*, and the throat is a little grayer; but the most striking plumage difference is that the flight feathers, instead of being olive-green, are edged with an almost silvery blue-gray, only faintly washed with greenish on the inner secondaries, and the tail feathers are also gray. Moreover the shape of the wing and tail feathers does not suggest a juvenal plumage. There is no other species of cotinga that in the unlikely event of hybridization with *Tijuca* could conceivably produce a hybrid with this plumage, and the specimen must for the present remain an enigma.

## HABITAT

Holt noted that in the Serra do Itatiaia most of his records of *Tijuca* were from the upper limit of heavy forest, at 5,500–6,800 feet. In the Serra dos Orgãos we also found them near the upper level of heavy forest, at heights of ca. 3,900–5,000 feet (1,200–1,500 m). The main group of males we watched was established near the head of a forested valley whose sides rose so steeply that the surrounding rock slopes were partly bare or covered with scrub. Another group of males called in an adjoining valley in which thick forest extended a few hundred feet higher. Occasional calling was heard in the valley below the main group, but the lower area was apparently not in such regular use and may well have been used by birds from the main group. Birds were seen feeding down to about 3,750 feet.

The higher forest in the Serra dos Orgãos is thick, irregular in its facies, and difficult to penetrate. As is usually the case where forest grows on steep slopes, there is no uniform, unbroken canopy but an irregular mixture of tall trees and lower growth. A variety of climbing bamboos, swathing the lower and more open vegetation, makes progress difficult and often impossible away from paths. As Holt noted, it may often be impossible to see a bird calling from a treetop overhead, and effective observation depends on a convenient point of vantage from which one can look out over the treetops. Fortunately we found a place where the main path up the valley traversed a steep, semi-open slope, a little above the level of the low ridge on which the main group of males called, and we were able to keep individual males in view for prolonged periods.

*Tijuca* is not known to make regular vertical migrations, but apparently some wander to lower altitudes in the off-season. Thus Mitchell (1957) saw one in July with a "winter association" of birds foraging below Ponte Maromba (3,800 feet) on Itatiaia, some 2,000 feet below the usual level.

## ANNUAL CYCLE

Little is known of the annual cycle, except what can be learned from skins. Goeldi (1894–1900) mentions, without any details, a nest he found in November in a patch of forest that had been cut. This is the height of the general breeding season in southeastern Brazil. The considerable activity of the calling males and the visits by females we saw in October suggested that breeding was in progress or was about to begin.

Seven adults collected in the months January–March (5 males, 2 females) all were in wing molt. Not one of 18 birds collected in April–August was in wing molt. If the wing molt takes about 150 days to

complete, as it does in other cotingas of comparable size, extrapolation from the observed stages of molt indicates that the five males must have started to molt in the second half of October and the first half of November, and the two females both in the last 10 days of December. In several other cotinga species, especially those in which the males have conspicuous displays and take no part in nesting, the males begin to molt some weeks before the females, apparently at about the time that the females are beginning to nest. The slight evidence for *Tijuca* suggests that it follows a similar regime, and that the events of the annual cycle are well synchronized in the population as a whole.

## Food

*Tijuca* is predominantly frugivorous, but the males we watched occasionally made short sallies to seize prey, probably insects, from the foliage near their calling perches, and occasionally a bird fluttered apparently to take something in the air.

Birds were seen feeding at four lauraceous trees, one of which was near the main calling area and was visited by up to three males at a time. Three of these trees had dense canopies, and the birds typically perched on the outside of the foliage, stretching to take fruit and then fluttering to a new position. Birds watched feeding in the more open tree perched on the inner branches within the canopy, looking about for the rather sparse ripe fruits, tugging at many that would not come off and occasionally fluttering to pull at a fruit in flight.

Only one nonlauraceous tree was seen to be exploited. This was *Oreopanax fulvus*, a member of the Araliaceae, which bears bunches of fruits about the same size as the fruits of ivy (*Hedera helix*), the only European member of this family. It may be noted that the Lauraceae and the Araliaceae are two of the most important tree families in the diet of the very specialized frugivorous birds elsewhere in the Neotropical Region (Snow 1971).

At all these trees the Yellow-legged Thrush (*Platycichla flavipes*) was a more numerous visitor than *Tijuca*. If the wings are not seen, there is a striking similarity between the males of *Tijuca* and the smaller *Platycichla*, and at a distance some care was needed in distinguishing them. The other common thrush of the area, *Turdus rufiventris*, was the only other bird regularly seen feeding at these trees.

## The Calling Assembly of Males

### The Call

Holt's evocative description of the call, quoted in the introduction, was probably written some time after he heard it and is not quite

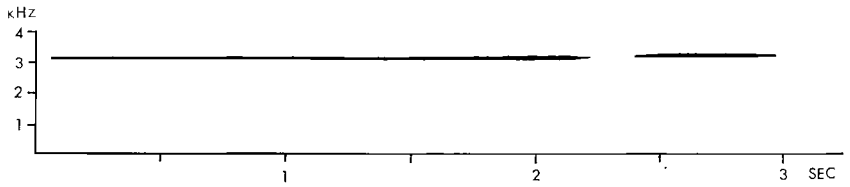


Figure. 1. Tracing of a spectrogram of the Black-and-gold Cotinga's call.

accurate. More recently Sick (1971) has described the call as an upwardly inflected creak, with an interval of a second or a minor third, beginning strongly and gradually dying away.

The fully developed call (Figure 1) has a characteristic form, which is not always evident when a bird is heard at a distance, especially if it is turning its head so that the volume reaching the hearer fluctuates. It is an extremely pure whistle, starting at a frequency of about 3.1 kHz and increasing very gradually to about 3.15 kHz. After a little over 2 seconds there is a short break, and the whistle is then continued for about ¾ second at a pitch of ca. 3.2 kHz. The total duration of the call is about 3 seconds. Heard at a distance it sometimes seems to die away, but in fact there is a gradual increase in volume throughout the first part of the call to a peak just before the break, and the volume of the short terminal note is also high. The volume sometimes sounds highest just before and sometimes just after the break, probably depending on how the bird is turning its head. The call is not always given in its complete form; not infrequently the terminal note is omitted.

The call lasts about 3 seconds and the interval between calls about 2 seconds. A male calling uninterruptedly repeats the call at a maximum rate of 12–13 per minute. Repeated timings showed that this rate was often maintained for minutes on end, but lower rates were also common, especially when a calling bird was looking around, preening intermittently, or shifting its position.

Because the interval between calls is shorter than the duration of the call itself, when two males call at the same time they can produce continuous sound, as long as they more or less alternate their calling. We regularly heard continuous, sustained calling in chorus, especially when females were known or suspected to be present. The relationship between males, both when calling and at other times, is described in more detail below.

## DAILY ACTIVITY

A dawn watch at the main calling ground showed that calling began at 05:05 (local time). On 3 days when we left the calling area between

16:45 and 17:00 in order to get down before dark, calling was still in progress although the valley was in deep shadow. Throughout the 12 intervening hours, sustained calling continued almost the whole time. Thus during long watches of over 4 hours each on 5 different days the combined periods of silence averaged only 8–16% of the total time, being nearly all between 2 and 8 minutes in length, with periods of continuous calling lasting for up to an hour or more. Usually during long watches it was impossible to follow individual males for very long periods, but during one 75-minute watch a single male that was in view all the time called continuously.

In the very early morning the birds called from exposed treetops. Later, after the sun had entered the valley, they seldom appeared on exposed perches but called from within the canopy where they were sometimes difficult or impossible to see. At about 16:00 the sun was cut off from the calling area by the steep mountainside, and within a few minutes the birds were again calling from exposed perches. On one very dull day, with thick hill fog, the birds called from exposed perches in the middle of the day.

### Relationships between Males

Adult males could not be identified individually, and could not always be kept in view as long as was desirable. Consequently our interpretation of the relationship between males at the main calling area is partly tentative.

Whenever we were able to keep the birds in view for long it was apparent that most of the calling was done by one male. As the male that was doing most of the calling tended to occupy the same favored perches in a large emergent tree on different days, we thought that the same individual was involved, and concluded that he was the dominant male of the assemblage.

From time to time this male was joined by one or two other adult males. Many times three adult males were in sight together, but never more. Often the other male or males would perch silently in the same tree as the calling male or in an adjacent tree, but at times they would call in chorus with the dominant male. It may have been that calling in chorus was always stimulated by the presence of a female (see next section), but we could not be certain of this. Nor could we be certain whether one of the other males ever called sustainedly while the dominant male was silent, but it was certain that the other males were very often silent for long periods while the dominant male was calling. It also seemed certain that the subordinate males were often near by, but out of sight, while the dominant male was calling, as several times when a female was seen to fly in to the calling area one or two additional

males were at once in evidence, but they were never seen flying in from a distance as the females were.

In the absence of any female there was some interaction between adult males. The calling bird was sometimes aggressive to one of the others if he approached closely, though on other occasions he would continue to call and completely ignore another adult male in the same tree. Some aggressive interactions were also seen between adult males and birds in female plumage, which may well have been immature males.

### VISITS BY FEMALES

Several times birds in female plumage were seen to visit the calling area, sometimes flying directly in from a distance of a few hundred yards. On some occasions the presence of these birds seemed to cause no special activity by the adult males, but merely some aggression, and it may have been that the visiting bird was a young male or a female who showed by her behavior that she was not interested in mating. Several times when the visits were accompanied by greatly increased calling and other activity by the males, it seemed certain that the visitor was a breeding female. The sequence of events was variable, but the following patterns of behavior were apparent. Sometimes the female flew directly to a low perch in the trees below the calling male, nearly always out of sight. One or more of the males at once flew down after her, and continuous calling in chorus began from the place where the birds had gone. On two occasions when the female landed on a low perch that was in view, two males at once flew down to perches below the female and started to call in chorus, and on one of these occasions a third male joined them half a minute later. It is probable that all three males called in chorus on this and other occasions, but it is hardly possible to tell how many birds are contributing to the continuous, fluctuating whistle of birds calling in chorus.

On other occasions the female flew into a high tree near the calling male, and a chorus at once developed (the other male or males being out of sight). The dominant male then flew down out of sight into the trees below, and the female followed. Several times also, when no female was in view, the calling male dived steeply down from his high perch into the lower trees. No chorus developed, and the male returned to a high perch after a minute or two, so that it seemed probable that the dive to a lower perch was spontaneous behavior occurring in the absence of a female. On many other occasions the males began to sing in chorus, no female could be seen, and we had no clue as to whether the chorus was stimulated by a female hidden from our view or was spontaneous.

It was tantalizing that almost nothing could be seen of the birds

when they dived down into the lower trees, apparently to court a female. For the first few days they seemed to go to the same place, below and to the left of the main tree from where we watched, and we decided to attempt to reach the place although there seemed little hope that anything could be seen through the matted vegetation, even if we could find the place. The following day the birds flew down repeatedly to another place, and we gave up the idea. We can therefore say nothing about the later stages of courtship, except that it must begin, at least, with a sustained chorus from the males, who probably maintain positions below the female. Probably the wings are spread to some extent to display the brilliant yellow patch to better advantage. Several times males in the higher trees were seen to crouch and half spread their wings, but it was not clear in what circumstances this was done. Once an apparent display was seen from a male who, perched higher than and a little distance from the female, orientated himself sideways to her and repeatedly lowered his head almost to perch level with slow bowing movements.

## Discussion

The Black-and-gold Cotinga is clearly a lek bird of a remarkable kind. The lek is advertised primarily by sustained calling, apparently by the dominant male. Other, presumably subordinate, males are constantly at hand, and their role seems to be to call in chorus with the dominant male, thereby enhancing the effectiveness of the vocal display. With a call lasting 3 seconds, followed by a 2-second interval, even a single bird can fill more than half of its calling time with sound; two birds can and do produce continuous sound. The bellbirds (*Procnias*), though they produce louder sounds, call far more intermittently, and the total volume of sound that they produce may be a good deal less.

The cooperation between two or more males to produce a more striking stimulus for the female has its nearest parallel in the displays of manakins of the genus *Chiroxiphia* (Snow 1963), in which two or more males join in a coordinated dance before the female. The social organization of the males seems also to be similar in *Tijuca* and *Chiroxiphia*, as in the latter too the evidence suggests that one male is dominant at each display ground, with attendant subordinate males; but further observations are needed to establish this (Snow 1972). In *Chiroxiphia* mating is preceded by a display different from the earlier stages of courtship, in which the dominant male alone takes part while the subordinate birds remain at a distance. It would be interesting to know how the dominant male *Tijuca* gets rid of the other males, as he presumably does in the final stages of courtship.

*Tijuca* occupies an isolated position in the Cotingidae. It might be

thought, from considerations of distribution and the general similarity of plumage colors (black, green, and yellow), that *Carpornis* is the nearest ally. Our observations of *Carpornis cucullatus* in the Serra dos Orgãos and the Boraceia forest reserve in the State of São Paulo strongly suggested, however, that this species lives in pairs, and in general behavior and feeding habits it is very unlike *Tijuca*. The relationships of these isolated cotingid genera are likely to remain obscure for a long time to come. In any event, it is probable that the kind of lek behavior shown by *Tijuca* is unique in the Cotingidae, and practically certain that it has been evolved independently of the similar system found in *Chiroxiphia*.

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## SUMMARY

The Black-and-gold Cotinga (*Tijuca atra*), endemic to the mountains of southeastern Brazil, was studied for 2 weeks in October 1972 in the Serra dos Orgãos. Males were actively displaying, and the little other evidence available, which is summarized, suggests that the breeding season was about to begin or had begun.

The male's remarkable whistle is described and figured. Groups of males were found to occupy limited patches of forest where they kept up sustained calling from the tree tops. Prolonged observation of one group suggested that one male was dominant and did most of the calling, but when a female visited the calling area one or more other males joined in and a chorus of continuous calling developed, which was often sustained for minutes on end.

The later stages of courtship were not observed, for the arrival of a female was usually the signal for the males to dive down to lower perches below the canopy, preceded or followed by the female, where they continued their chorus out of sight.

*Tijuca* appears to have evolved a form of group display that has its closest parallel in that of manakins of the genus *Chiroxiphia*. In such systems the advertising display of a dominant male is enhanced by synchronized displays of subordinate males.

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