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LIFE HISTORY OF THE BOUCARD TINAMOU IN BRITISH HONDURAS PART I: DISTRIBUTION AND GENERAL BEHAVIOR

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Most ground-nesting birds of the tropics are secretive in their habits. The tinamous that inhabit the forests of Middle America seem to excel in this trait. It is for this reason, perhaps, that so few studies of them have been conducted in Middle America. The literature contains virtually nothing about the natural history of the Boucard Tinamou, *Crypturellus boucardi*, a bird also known by the more descriptive name of Slaty-breasted Tinamou. Several accounts have noted its abundance, habitat, and the breeding condition of specimens; others have briefly discussed its taxonomic status. Leopold (1959) summarizes the existing knowledge of the habits of this species.

This paper presents a study of the Boucard Tinamou carried on in British Honduras in the spring of 1957 and 1958. The locale of the study was Gallon Jug, a lumbering establishment situated approximately 125 meters above sea level in the tropical forest of the northwestern part of the colony, about seven miles east of the Petén region of Guatemala at latitude 17° 33' N and longitude 89° 02' W.

ACKNOWLEDGMENTS

I wish to express my appreciation to the many people who have directly and indirectly made this study possible. Among those in British Honduras I wish to thank officials of the colonial government and especially the personnel of the Belize Estate and Produce Company, Limited, at whose camp the study was carried out. J. M. Guy was an invaluable assistant whether skinning birds or wielding a machete to clear trail. The United Fruit Company generously provided transportation to British Honduras. The plants were identified by Velva E. Rudd of the United States National Museum. Part of this study was accomplished with the aid of a fellowship from the National Science Foundation. Dr. P. P. Kellogg kindly prepared sonagrams of the calls of the Boucard Tinamou. Susan H. Hubbard assisted in the preparation of the figures. Dr. R. J. Newman examined the original manuscript and offered many helpful suggestions. Dr. George H. Lowery, Jr., directed the study.

METHODS

Because of its wary nature, data concerning the Boucard Tinamou were difficult to obtain. Using calls as an index, I selected a site where this species seemed to be common. There, one mile north of Gallon Jug, I set up a study area of approximately 140 acres, which was expanded in 1958 to about 183 acres (fig. 1). Compass-line trails were set up running north-south and east-west. These trails were approximately 330 feet apart as determined by pacing and were kept clean and open so that movement throughout the study area could be accomplished quickly and so that a tinamou crossing one of the compass lines could be seen up to a distance of several hundred feet.

Two factors regarding calls facilitated the investigation of *boucardi*: (1) the frequency of calls and (2) the variation of calls of different males. The calls of individual

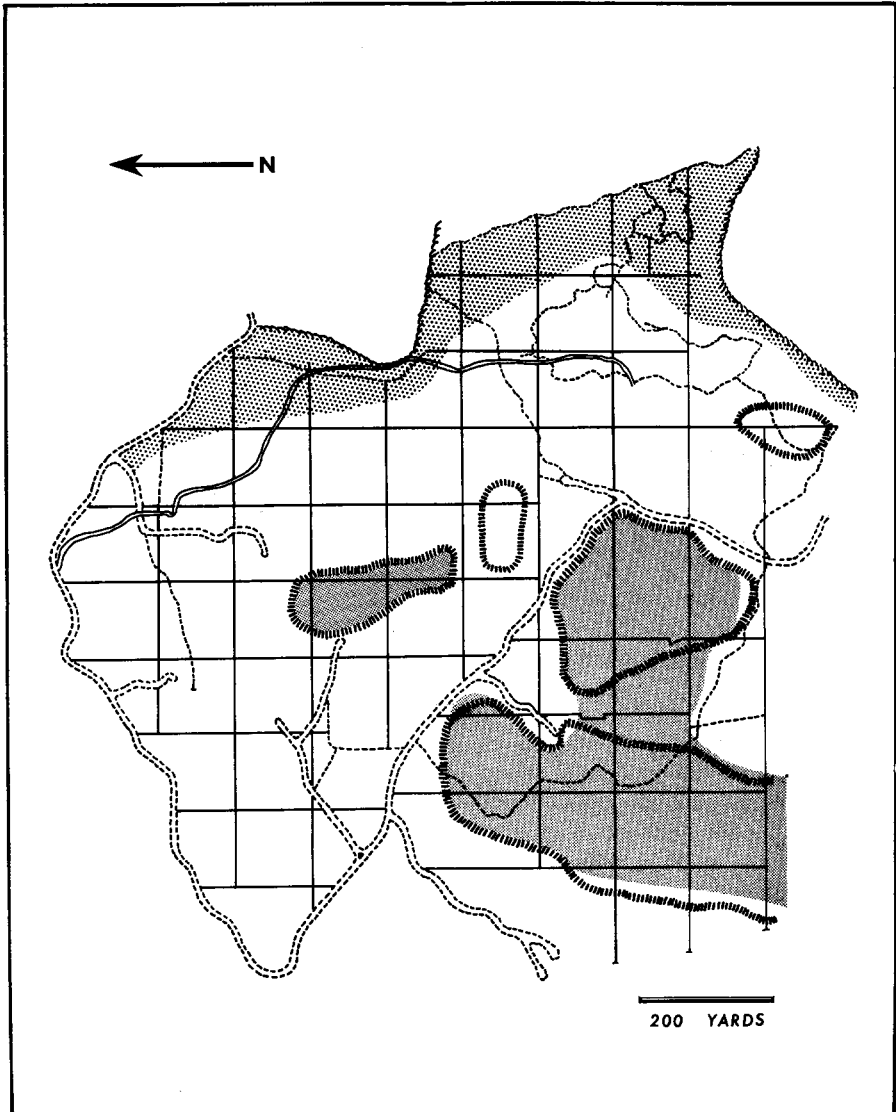


Fig. 1. The study area and its vegetation. The solid north-south and east-west lines represent compass line trails. Randomly cut trails are indicated by a single dotted line; double dotted lines are bulldozer trails. A creek bed (double solid lines) runs for some distance in a general north-south course. The vegetation subtypes are represented by stippling for huamil and shading for *Drypetes-Brosimum*. The unshaded portion is *Aspidosperma-Ampelocera*. See text for explanation.

males were sufficiently different as to enable me to identify each male within the study area. Likewise, males and females were easily differentiated by characteristics in their calls, the females having a call with a distinct whining quality.

The impracticality of trapping and marking a bird as nervous and wary as a tinamou was apparent when I captured and marked a Little Tinamou (*Crypturellus soui*). When

released, the bird flew out of the study area and was never seen again. Following a tinamou visually in the forest, as anyone who has attempted it knows, is all but impossible. Even if it were a simple matter, it is unlikely that the tinamou's movements would be normal if it were aware of the observer's presence.

The method I most often employed was to determine the tinamou's location by its call. Since the bird frequently calls as it moves through the forest, I ascertained the direction of its movement and placed myself in front of it. Partly hidden from view, I was able to watch the tinamou approach and pass by. This method did not always succeed. The bird sometimes changed its course. Most of the time, however, the bird passed close enough to be viewed at least momentarily, permitting me to plot its location and movements accurately.

GEOGRAPHIC RANGE

The Boucard Tinamou is one of five species of the family Tinamidae whose range extends north of Panamá. This species and the Rufescent Tinamou (*Crypturellus cinnamomeus*) were once thought to be the only members of the Tinamidae whose geographic ranges were confined to Middle America (Hellmayr and Conover, 1942). More recently, however, races of both species have been described from northern South America, involving changes in the taxonomy of existing species. Thus, Blake (1955) maintains that *boucardi* is conspecific with the Colombian Tinamou (*Crypturellus columbianus*), which occurs in a disjunct range in northern Colombia. The geographic hiatus between the races in Middle America and South America is somewhat difficult to explain in view of the fact that the Caribbean side of Costa Rica and Panamá possesses a continuous, suitable habitat for this species. This general region of Middle America is enigmatic, however, with regard to the geographic distribution of a number of tropical birds, mostly passerines. I have not examined any skins of the Colombian Tinamou, but there can be little doubt of the similarity of the two forms on the basis of Blake's comments.

Collecting localities recorded in the literature (fig. 2) indicate that the range of *boucardi* extends along the Caribbean slope of Middle America from southern México (southern Veracruz, Tabasco, northern Oaxaca, northern Chiapas, southern Campeche, southern Quintana Roo) south through Guatemala, British Honduras, Honduras, and Nicaragua, to northern Costa Rica, reaching the western slope in northern Costa Rica and southern Nicaragua. The range shown in figure 2 is based solely on published collecting records and therefore represents the minimum distribution of the species.

Altitudinally *boucardi* ranges from sea level to 5000 feet and perhaps higher, but its altitudinal range is variable locally. Wetmore (1943:230) found that in southern Veracruz the Boucard Tinamou is confined to elevations above 1000 feet. In the region of the Cockscomb Mountains in British Honduras, *boucardi* ranges from sea level to about 1200 feet (Russell, personal communication). In the region of this study I have found the species to be locally common in some areas but uncommon in similar habitats one mile away. Human interference through logging operations, plantation cutting, and hunting may be the primary factor that results in this situation.

HABITAT

The forest at Gallon Jug is called a semi-evergreen seasonal forest by Beard (1944: 138). This forest is characterized by two tree stories. A few scattered individuals extend above the canopy, which is largely closed. Lianas are abundant. Epiphytes are not as common, but a few species are conspicuous. A distinct shrub layer prevails, and herbaceous ground cover is scarce. Whereas the canopy dries quickly from continued expo-

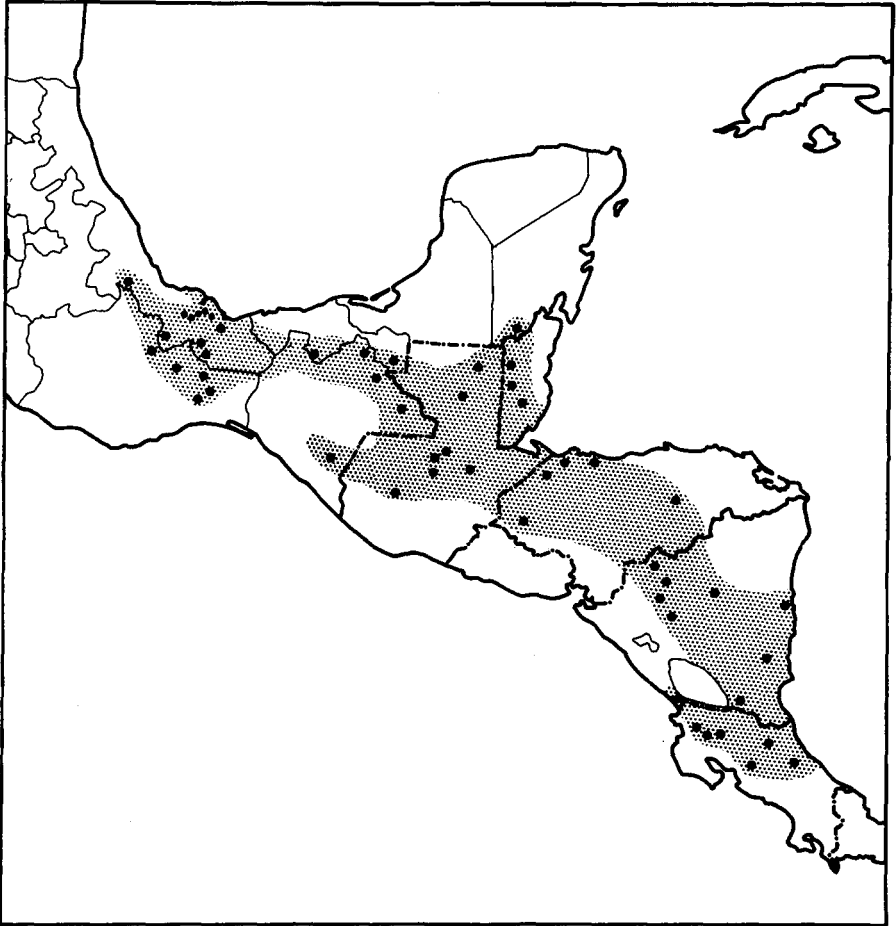


Fig. 2. Geographical range of the Boucard Tinamou (*Crypturellus boucardi*) based on locality records cited in the literature.

sure to the sun during the dry season (February to May), the understory manifests a different microclimate and retains some moisture at all times. Even during the dry season the floor of the forest at Gallon Jug is damp until at least mid-morning, and the moisture falling from the trees reminds one of a light rainfall.

The forest is a part of the sabal-give and take association of Standley and Record (1936:22), so named for the two most conspicuous palms, the Botan palm (*Sabal mayarum*) and the give-and-take palm (*Cryosophila argentea*). Within the study area several subtypes or subassociations can be readily determined (fig. 1). The Boucard Tinamou inhabits them all. One subtype, called the huamil, includes an area that had been cut over in recent years, probably for planting corn and plantain. Because it is still in its early successional stages, it is an area that is changing rapidly. The vegetation is dense. Except for a few large trees the canopy rarely exceeds 10 to 12 meters. The huamil gradually intergrades into a second forest type in which the canopy is higher (about 15 to 17 meters) and the forest floor is more open and easier to traverse. Two conspicuous tree species are *Aspidosperma megalocarpon* and *Ampelocera Hottlei*. A well-marked shrub layer is present. Several hills are located within the study area.

The vegetation on these hills is somewhat different from the previous subassociation mentioned. Two of the characteristic trees are *Brosimum alicastrum* and *Drypetes Brownii*. The canopy is approximately 20 to 25 meters above the forest floor. The undergrowth is not dense and one can see for a considerable distance. A more detailed analysis of the vegetation within the study area can be found in my thesis (1960) at Louisiana State University.

The Boucard Tinamou is generally regarded as a bird of tall, wet forests (Leopold, 1959:122; Lowery and Dalquest, 1951:544). Although it is commonly found in this situation, it is by no means restricted to it. Paynter (1957:249), for example, found it to be most common in Chiapas in the low, dense, transitional association between the higher pine forests and the tropical evergreen forests. This association, called the *monte*, consists of dense stands of small, slender hardwoods with a low canopy (5 to 10 meters) and "relatively scant" undergrowth.

My experience with the Boucard Tinamou in British Honduras indicates that this species is commonly found in a variety of ecological situations. It may be found in low forests with relatively dense undergrowth as well as in the higher-canopied forests. It is equally at home in the three subassociations of the study area. Not far from the study site *boucardi* is common in an area that was a plantation not long ago. The cover is only five to seven meters high; yet the ground cover is no more dense than in much of the medium second growth of the study area. Dickey and van Rossem (1938:60) found that the Rufescent Tinamou was common in a variety of associations in El Salvador and that the one "requisite" seems to be a low protective growth. The density of the undergrowth seems to be one of the main factors, also, in limiting the local range of the Boucard Tinamou and the other tinamous in British Honduras.

The other tinamous found here show a decided overlap in habitat preference. The Great Tinamou (*Tinamus major*) is associated with the tall forest and an open forest floor (Aldrich and Bole, 1937:29; Leopold, 1959:113). Throughout its range in Middle America the Little Tinamou inhabits young forests, forest margins, and low bushy second growth (Griscom, 1932:98; Leopold, 1959:123; Peters, 1929:402; Skutch, 1963:224). The Rufescent Tinamou is regarded as a species of the arid, second growth forests and dense, low thickets (Sutton, 1951:173). But it is also found in the higher, more humid forests (Leopold, 1959:117; Lowery and Dalquest, 1951:545).

These four tinamous may be found in identical habitats. The three species of *Crypturellus* were twice heard calling together at Gallon Jug within 100 yards of each other in low woods with a moderate undergrowth. In the study area Great, Little, and Boucard tinamous were commonly seen in the huamil subassociation. The Great Tinamou and the Boucard Tinamou, however, were never found in the very dense second growth of an overgrown plantation where the Little Tinamou was most common. Nor was the latter ever found in the tall forest with little undergrowth inhabited by the Great Tinamou and the Boucard Tinamou.

GENERAL BEHAVIOR

Nonreproductive social relations.—Like most tinamous, *boucardi* is solitary in its habits. Aside from members of its own species the Boucard Tinamou does not regularly associate with any other species. Only four records of association between two species of tinamous were noted: a male foraging with the Great Tinamou; a female seen with the Great Tinamou; four with the Great Tinamou; and one individual in company with two Little Tinamous. Judging from the behavior of the Boucard Tinamou, these associations during the breeding season were strictly fortuitous.

Accidental meetings occur between *boucardi* and other terrestrial birds during for-

aging, but such encounters do not lead to any social behavior. The Gray-headed Dove (*Leptotila plumbeiceps*) and Black-faced Antthrush (*Formicarius analis*) cross paths occasionally with the Boucard Tinamou, but each species continues on its own way. Ant swarms sometimes bring tinamous together with a number of species with which they do not otherwise associate.

Intraspecifically, most tinamous are solitary, although several tinamous are gregarious at certain times of the day or year (Morrison, 1939; Pearson and Pearson, 1955; Schäfer, 1954; Wetmore, 1926). There is no evidence that any of the tinamous in Middle America are gregarious.

Feeding habits.—The foraging movements of *boucardi* are reminiscent of the movements of domestic fowl. The bird moves erratically on the forest floor with jerky motions of head and body. The head is generally held low, but periodically the bird stands erect to survey its surroundings. A male that is calling and moving a great deal may feed hastily, only picking up a seed every ten feet or so. On the other hand, males and females sometimes forage for several hours at midday in an area of 15 to 20 square yards. This tinamou frequently tosses leaves and twigs to one side with the bill when looking for food, but it does not use its feet to scratch for it.

Like all tinamous, *boucardi* is primarily a vegetarian and feeds upon fruit and seeds that have fallen to the ground. An examination of the crop and gizzard of ten specimens plus observations of foraging birds show that fruits or seeds of the following plants (plus seeds of seven additional unidentified plants) comprise much of the food of this species in the Gallon Jug area during the breeding season:

<i>Acacia acantlensis</i>	<i>Maytenis</i> sp.
<i>Acacia gentlei</i>	<i>Pouteria durlandii</i>
<i>Aspidosperma megalocarpon</i>	<i>Protium copal</i>
<i>Brosimum alicastrum</i>	<i>Pseudolmedia spuria</i>
<i>Cryosophila argentea</i>	<i>Rinorea guatemalensis</i>
<i>Dracaena americana</i>	<i>Sabal mayarum</i>
<i>Drypetes Brownii</i>	<i>Spondias</i> sp.
<i>Forchhammeria trifoliata</i>	<i>Swietenia macrophylla</i>
<i>Manilkara zapotilla</i>	<i>Trophis racemosa</i>

Protium copal was found in all but two of the examined specimens. *Pseudolmedia spuria* and *Brosimum alicastrum* were also dominant foods. Two plants, *Swietenia macrophylla* and *Aspidosperma megalocarpon*, present special difficulties to the birds, since their large winged seeds cannot be swallowed until the wings are broken off. The wing of *Swietenia macrophylla* projects from one end of the seed; the bird removes it by picking up the wingless part and knocking the seed against the ground. The winged portion in *Aspidosperma megalocarpon* is disciform and completely encloses the centrally located seed. In this case the seed itself is grasped, with the wing projecting from either side of the bill. The combined effect of knocking the winged seed against the ground plus vigorous head-shaking removes enough of the winged portion so that the seed can be swallowed.

The Boucard Tinamou does not feed exclusively on vegetable matter. Parasol ants (*Atta*) were found in the crops of several birds and individuals were observed feeding on these ants. An incubating male consumed many army ants (*Eciton burchelli* or *Labidus praedator*) that passed over the nest. A female fed for five minutes on a column of termites (*Armitermes intermedius*) making its way along the forest floor beneath the layer of fallen leaves. One bird was seen taking a lepidopteran larva, and remains of Coleoptera were found in another. Occasionally the prey is larger, as indicated by the female that chased, but did not catch, a lizard and by a male that killed a tree frog.

In the latter case the bird was decoyed into sight holding the frog in its bill; it shook the frog vigorously and beat it against the ground. One of a pair of foraging Little Tinamous killed a small frog in a similar manner and then swallowed it.

Alarm behavior.—When alarmed the Boucard Tinamou will react in one of three ways: (1) The bird may “freeze,” becoming motionless in an erect or crouched posture and almost imperceptible against a forest floor covered with a layer of leaves that blends with the browns and grays of the plumage. This behavior occurs most often when the bird is disturbed suddenly. (2) The common escape mechanism is a stealthy movement away from the source of disturbance; or, if the intruder is moving in the bird's direction and is within sight, the bird may dash quickly away on a zigzag course keeping behind as much vegetation as is available. (3) Rarely, *boucardi* may take to the air in a sudden roar of wings that is startling even when the bird is under surveillance. This latter type of behavior may be preceded either by “freezing” or running and is resorted to only when the bird is closely approached or is pursued.

In crouching the bird either adopts what appears to be a normal sitting posture with the body parallel to and touching the ground; or it assumes an attitude that when first observed might be mistaken for courtship behavior. The body is angled at about 30 to 40 degrees from the horizontal with the breast nearly touching the ground and the rump raised. The head and neck are drawn back. The tail is not fanned out, but from the rear a boldly patterned crissum is exposed. This “rump-up” posture, as I have termed it, was observed three times in two males. The males did not seem to be greatly alarmed. After I had watched one male in this posture for several minutes, it walked slowly away when I started toward it. Another male actually dozed, closing its eyes repeatedly while in this posture. After six minutes, during which time I remained motionless, the male resumed an erect posture, preened for 30 seconds, and walked slowly away. The “rump-up” posture as a reaction to alarm has been recorded in the adult and young of the Tataupa Tinamou (*Crypturellus tataupa*) by Seth-Smith (1904) and I have observed it in the Great Tinamou.

The reaction of immature birds of this species to alarm is almost always to crouch with the tail toward the object of disturbance; but they may move stealthily away if the danger is not imminent.

Flight.—The flight of tinamous is generally considered to be poor, both in maneuverability and endurance. The birds usually try to escape on the ground and take to the air only when hard pressed. The Boucard Tinamou is the most reluctant of the Middle American tinamous to take wing. In the course of 14 months spent in the field in British Honduras, I saw only five tinamous of this species leave the ground. Two were birds at which I had shot. One was flushed by a fox; another was flushed by a male *boucardi*. And a female flushed when I attempted to follow it. Thus few data were obtained regarding flight in this species. The flight of the Boucard Tinamou is direct and strong but of short duration. Flight of tinamous has been appropriately likened to the flight of quail. Tinamous rise with a series of rapid and loud wingbeats and then glide to the ground some distance away. I was able to follow only one flight of this species at Gallon Jug, and its distance was 30 to 40 meters. I recorded two *boucardi* in flight at heights estimated at six and seven meters.

According to various accounts in the literature, the flight of tinamous is direct and, in many cases, not well controlled. The rectrices are not well developed, and several instances are on record of tinamous colliding with objects (Beebe, 1925:200; Hudson, 1920:225). I did not witness any comparable uncontrolled flights. However, on two of the five flights I observed, males of *boucardi* caused considerable disturbance as they

came to earth through the underbrush; apparently they were unable to maneuver for a descent into a spot clear of vegetation.

CALLS

DESCRIPTION OF THE CALLS

The notes of tinamous are familiar sounds in the forests of Middle and South America. Calls of these birds thus far described in the literature seem to indicate that a certain whistle-like quality is common to members of the Tinamidae. The call of *boucardi* is distinctly different from the calls of other Middle American tinamous. It is characterized by a pigeon-like quality that sometimes makes its source hard to locate. L. I. Davis (personal communication) describes the phrasing as *uh-wuh* or *ah-wuh*. Although at a distance the call sounds like the two-note call described by Davis, I could clearly discern three notes when the bird was within 30 yards. I phoneticized these as *ah-oo-wah*. Shortly after the call begins it slurs down about one-quarter to one-half note, then slurs upward to the starting pitch. In all the males studied, the second and third notes were slurred together, but a momentary break existed between the first and second notes. Unless one is fairly close to the calling male, this break or pause is not detected in some individuals. The call lacks the waver or tremor characteristic of some tinamou notes and is much lower in pitch. The duration of the call is about two seconds, sometimes closer to three seconds.

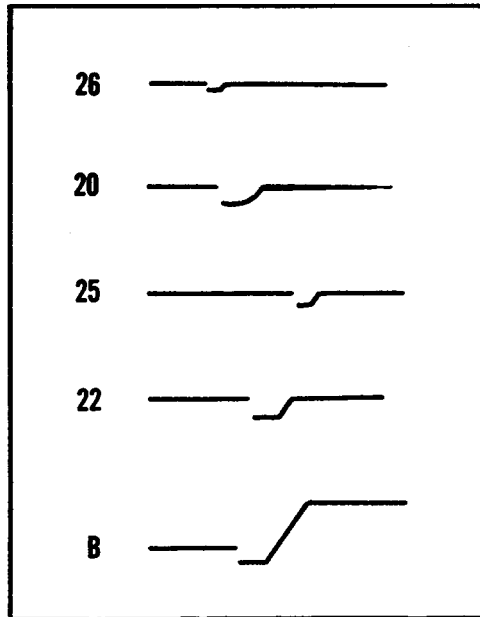


Fig. 3. Diagrammatic representations of the calls of several males of *C. boucardi*, showing variability. The numbers and letter preceding each diagram refer to particular individuals.

Two factors with regard to calling facilitate a behavioral study of this species in the wild. One is the relatively long periods of calling of the males. The other is the distinctiveness or the individuality of the call of each separate male (figs. 3, 4). The calls of

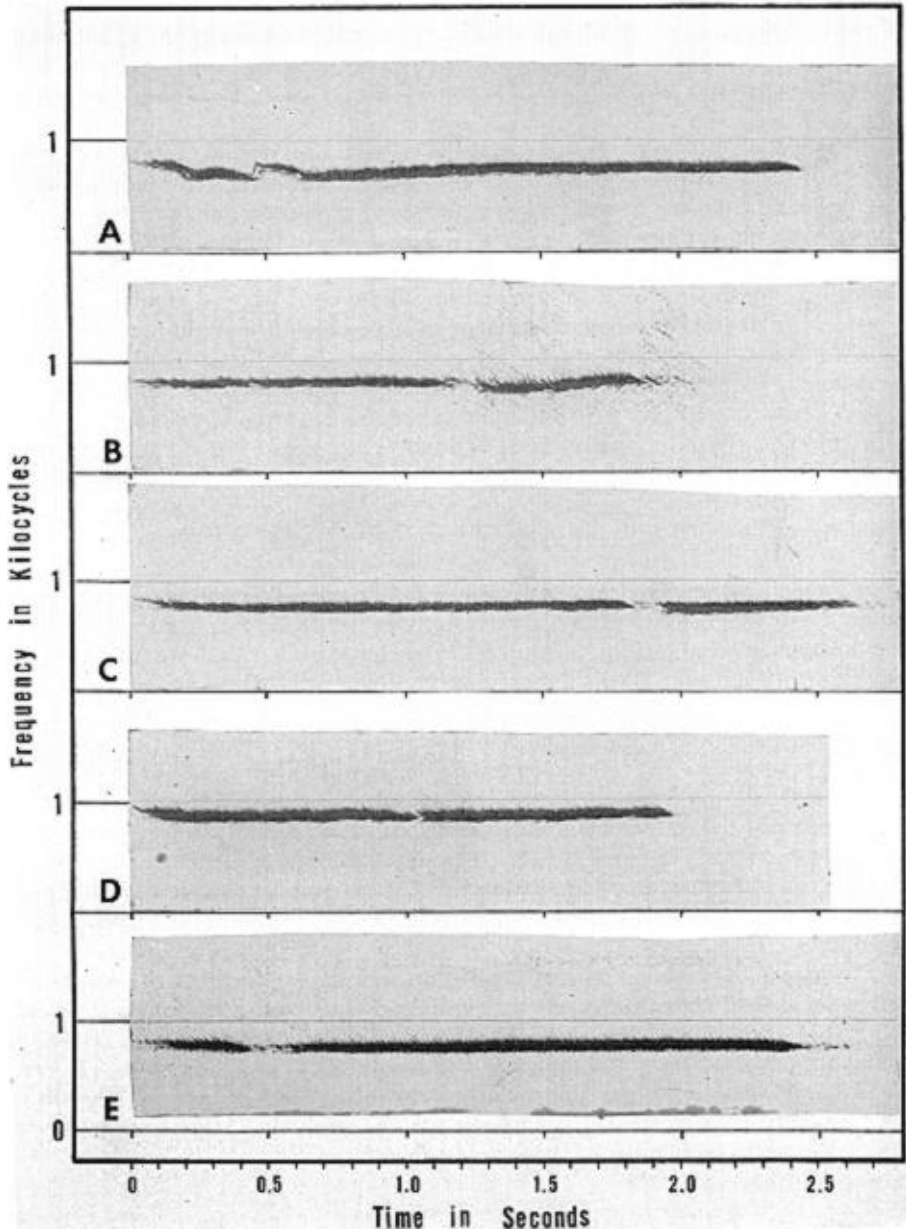


Fig. 4. Sonograms of calls of five males of *C. boucardi*.

any given male, on the other hand, are remarkably constant and rarely manifest any detectable variability.

This variability between individuals can best be illustrated by describing the differences in the notes of the males in the study area. Differences in pitch were the most easily detected variations. They extended over a range of slightly more than one full

note; most of them fell within a one-half note range. Yet any two males whose calls exhibited a difference of only one-quarter note in pitch were easily distinguished with a pitch instrument. Males 21, 23, 26, 29, 30, and 33 possessed calls beginning invariably on the same note. Males 20, 22, 24, and 31 always began their calls one-half note higher.

Although the starting notes of several males were on the same pitch, the pitch of the other notes varied sufficiently to make identification of specific individuals possible (figs. 3, 4). In some males the last note was on a slightly different pitch from the first note. Such was the case in male 28, in which the call terminated on a slightly higher note. In still another male the last note was almost one full note above the first note of the call. In males 26 and 33 the second or middle note dropped almost imperceptibly in pitch. In another male the middle note dropped almost one full note and the call terminated below the starting pitch. But even when the entire calls of two or more males were on the same pitch they could often be differentiated by other characteristics, such as relative length of the first and last notes of the call, and whether the call terminated abruptly or gradually faded in volume.

Variability in the calls of a particular male was noted only in the case of three individuals. Such variations occurred very seldom. When they did occur, they seldom changed the call to such a degree that it was not recognizable as belonging to a certain male.

The typical call rendered by the female is quite unlike the male's call. The female possesses a call that can briefly be characterized as more subdued, highly variable, and having a whining, nasal quality, in contrast to the more mellow, less variable, and more throaty note of the male. The call often covers a greater range of notes than the male's call and has a slightly higher pitch. The latter sometimes is more apparent than actual, however, because of the whining quality of the female's call. Her call carries for a distance up to several hundred feet and is usually heard only when a male is close at hand. The variability of these whistles is diagrammatically illustrated in figure 5. These calls were diagrammed one afternoon from three females mated with male 22. Such variations as those exemplified made it difficult to determine exactly how many birds were calling when the females were together and their calls were similar in pitch, especially since one female often called several times in succession with only momentary pauses between calls.

On occasions the female rendered a call that was similar to that of the male. This variation was usually heard when the females began to call in the afternoon in response to the call of their prospective mate. If a female was both some distance away from the male and separated from the other females, her calls often followed the pattern of the male's call but were usually slightly longer and often more wavering. The calls had a less nasal quality than the typical whistle of the female, yet lacked the mellowness of the male's call. The number of these calls seemed to depend on the proximity of the females to the male and also on the number of females together at the time. As the females approached closer to the male, they commenced the whining and more subdued call, which was the call previously described and the one most often heard. The male-like calls were more numerous when the females approached the male from separate points. Females seldom rendered this call when they approached the male together. A solitary female sometimes called in this manner until its mate was within sight. In addition to these two calls, barely audible *app* notes were heard when a female laid an egg.

While the female possesses a male-like call, the male also has a call that, in quality, is much like that of the female. It is a call that retains the pattern of the male's pri-

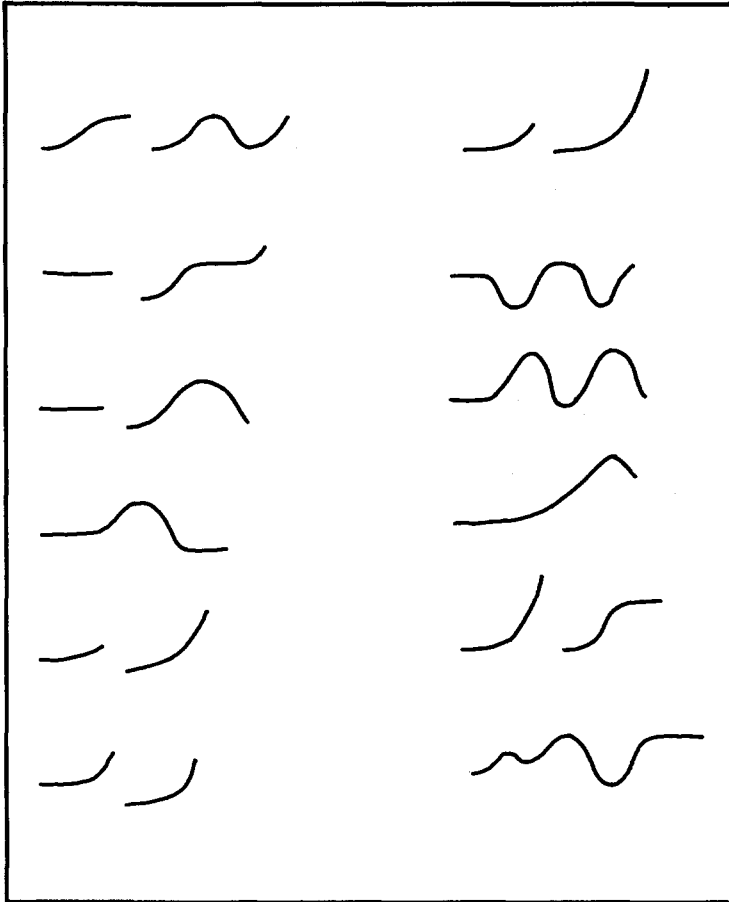


Fig. 5. Diagrammatic representations of the calls of three females of *C. boucardi* showing the degree of variability.

mary call but takes on a whining quality. This call was heard most frequently in two situations: (1) after the male had successfully attracted one or more females, (2) and after the young had appeared. The soft, subdued, whining whistles issued from both sexes when the females were in the company of the male. After the first egg hatched, male 1 emitted very soft notes, 10 to 15 seconds apart, that were hardly detectable 30 feet away. These monotone, whining whistles lasting one-half to one second were the first sounds heard from this male either on or off the nest after incubation had begun. As the male prepared to leave the nest with the young, these recognition calls became louder, more prolonged, and similar in pattern to the primary call. This was the only call heard from male 1 as long as the brood remained with him.

These were not the only conditions, however, under which the whining, female-like calls were heard from the males. They were heard several times in the morning when the males (5 and 22) foraged out of sight of the females. They were also heard several times in the afternoon when mated males (20, 22, and 25) called to females that were not in the vicinity.

Morrison (1939:461) characterizes one of the calls of *Tinamotis pentlandii* as "a sort of laughing gurgle." The description is applicable to one of the calls rendered by males of *boucardi*. The call consists of three ascending, staccato notes (usually two notes in the case of male 22) and lasts less than one second. The notes have a throaty and gurgling quality and were not audible unless I was within 50 feet of the male. The gurgle calls were heard most often just after a female had joined its mate in the evening. On several occasions the calls were repeated in rapid succession with faster and faster tempo, until for short periods of up to 20 seconds they sounded like a single continuous gurgle (males 20 and 27). The gurgle call was also heard on a number of instances after a male had been decoyed into sight.

An alarm call consisting of short, high-pitched, staccato notes was heard only once—when male 21 was flushed by an attacking male.

SEASONAL PATTERN OF CALLING

In British Honduras the breeding season for the Boucard Tinamou begins shortly after the start of the calendar year. The first indication of the breeding condition is the calling of males in late January and February. The breeding season was already underway in 1957 when field work began. In 1958 the first calls of *boucardi* were heard on January 20 (field work began January 18), but none was heard in the study area until January 27 when male 20 called nine times at midday. Other males in the study area were first recorded as follows: male 22, January 31; male 21, February 1; males 23 and 24, February 26; males 25 and 26, February 28; male 27, March 1; male 35, March 3; male 28, March 4. Thus after their initial state of winter quiescence, one male after another began calling. Although sporadic at first, the calling periods of each male became more numerous and longer in duration. A period of five weeks passed before all the males in the study area came into breeding condition.

The peak months of calling are probably April and May, and a gradual decline after the commencement of the rainy season in June is likely. But since no field study was undertaken in the fall of the year, no data are available regarding the calls of *boucardi* or the other tinamous in British Honduras in this period.

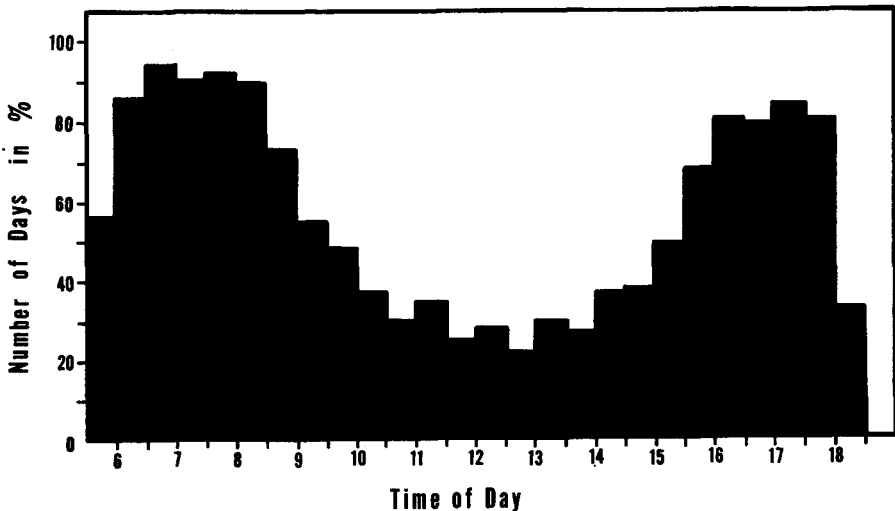


Fig. 6. Daily pattern of calling of *C. boucardi*, based on 63 full field days in 1958.

DAILY PATTERN OF CALLING

In the Boucard Tinamou the daily pattern of calling is similar to that found in many tinamous. The calling periods are more extensive in the morning and evening than at other periods of the day (fig. 6). The pattern differs considerably, however, from that found in the other species in British Honduras. The Boucard Tinamou is heard more often during the middle part of the day than are the other species of tinamous. Calling drops off sharply around 6:00 p.m., whereas the other species reach their peak of calling at this time or later. No *boucardi* have been heard after 6:26 p.m. Calling is somewhat heavier during the early morning in this species than it is in the evening.

For *boucardi* the pattern of individual calling is more erratic than the daily and seasonal pattern presented by a population of the species. The individual males of this species call for much longer periods during the day than do individuals of the other tinamous in British Honduras. It is this characteristic, more than any other, that facilitated certain aspects of this study.

The general pattern for each individual male (figs. 7-10) indicated periods of calling in the early morning and later afternoon and evening, the former more pronounced in the morning.

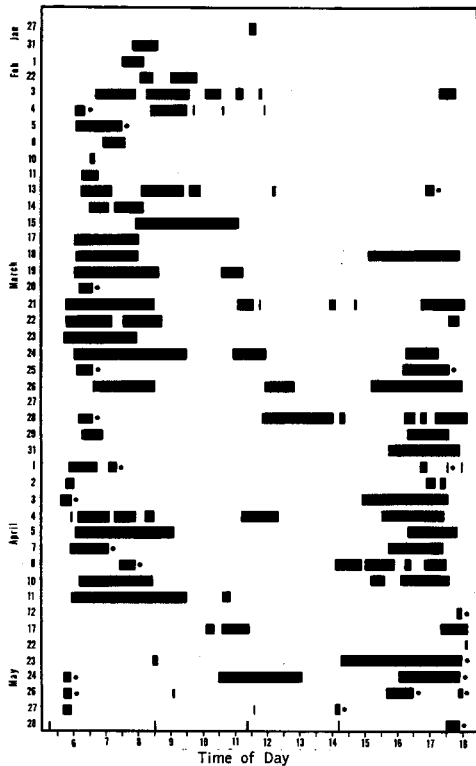


Fig. 7. Daily pattern of calling of male 20. Each bar indicates a calling period. A dot following a bar indicates that I left the vicinity of the male while he was still calling.

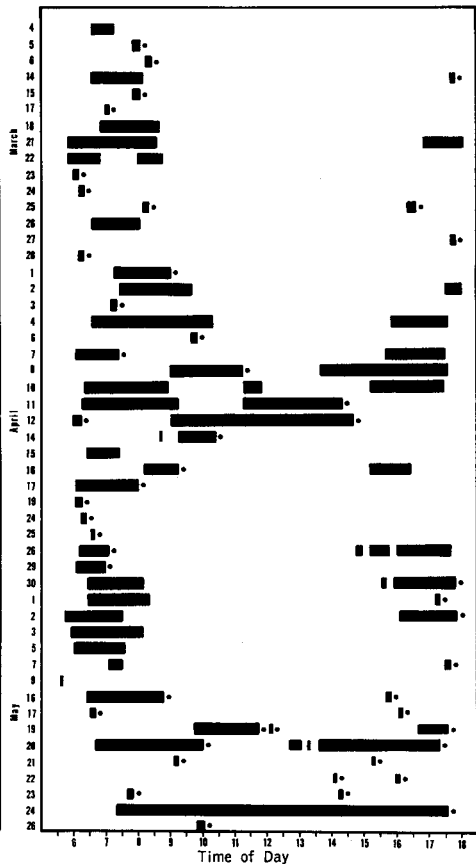


Fig. 8. Daily pattern of calling of male 23.

From February 22, 1958, until the end of May, not a single day of silence was noted in the study area with regard to this species. Even so, a given male, after calling most of one day, may call for a short period on the following day. For example, male 20 on April 11 called for about four hours during the morning but did not call at all the following morning. Male 21 on March 17 and 19 called for periods of 30 to 60 minutes, but the same male called for a total period of five to six hours on March 18. Male 22 on April 17, 18, and 19 called for periods of approximately five hours, two minutes, and three hours, respectively.

On days when several males are silent, or are heard for only a matter of minutes, other males occupying adjacent areas may call for many hours. Thus male 21 on April 16 was heard for only a few minutes around 6:30 a.m., while male 26 called from 5:50 a.m. to 5:45 p.m., with only short punctuating periods of silence. This inconsistency in day-to-day calling is apparent in the graphs in figures 7 to 10, which show the daily pattern of calling of four males of *C. boucardi*. These bar graphs do not represent all calling by the four males during the entire breeding season, for there were days in

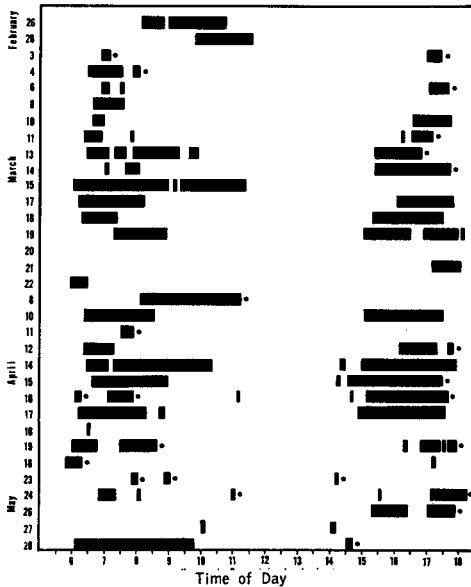


Fig. 9. Daily pattern of calling of male 22. This was the only male whose calls were not recorded between noon and 2:00 p.m.

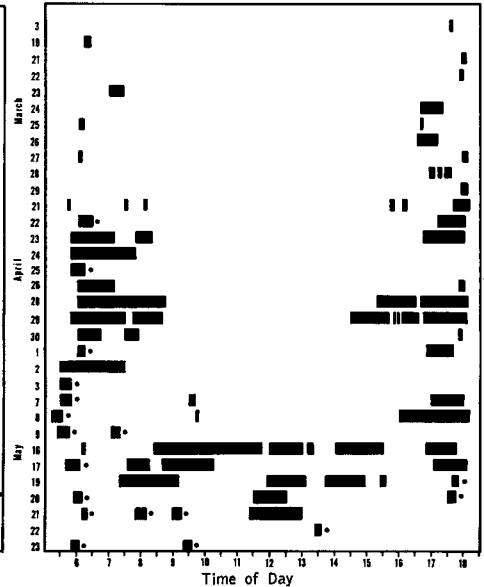


Fig. 10. Daily pattern of calling of male 35.

which their calls were not recorded. Nor were these males under observation for the entire day in many cases, as indicated by the dots which signify my departure from the area of that particular male while he was still calling.

There was no apparent correlation with regard to the duration of calling among any two males on a given day, except between males that were establishing adjacent territories in the earlier part of the breeding season. At this time the calls of one male initiated a vocal response from another male within easy hearing range. The two or more males then exchanged calls. It is probable that males soon learned the calls of nearby males, for later in the season a given male did not respond as readily to the call of a member of the same sex occupying an adjacent territory. The same was true dur-

ing decoying. It became increasingly more difficult to decoy a given male within sight after several successful attempts.

A mated male called consistently no more or less than one that had not succeeded in attracting females. Nor did two males exchanging calls in close proximity to one another show a consistent increase or decrease in the number of calls. In all males studied, the first call (or first several calls) of the afternoon calling period was usually followed by a rather long pause (up to two minutes), longer than the usual interval between succeeding calls.

Females call much less frequently than do the males. Almost all of the subdued calls of females that were recorded came from mated individuals. I have never heard the Boucard Tinamou after dark.

RATE OF CALLING

To determine the rate of calling, the calls of different males were periodically recorded for varying time intervals. Forty-one such samples of 25 minutes duration or more were taken for 14 males to ascertain the variation, if any, in the rate of calling under various conditions.

The average rate of calling of all samples ranged from one call every 25 seconds to one call every 62 seconds. Where adequate sampling was accomplished the results indicate that each male has a rather extensive range of interval between calls. In no male was a correlation noted between the average rate of calls during a given calling period and either time of day or the progressing season.

WEATHER FACTORS AND CALLING

I once thought that perhaps weather conditions might in some way be the cause of the sporadic day-to-day calling of male *boucardi*. It has been shown, however, that on no day were all males silent. And regardless of weather factors one male might call most of the day while an adjacent male could be heard for only a few minutes. Neither cloud cover nor temperature seemed to affect daily calling. Beebe (1925:197) has stated that the Variegated Tinamou (*Crypturellus variegatus*) can occasionally be heard at noon on cloudy days. In British Honduras as much calling was recorded on cloudy days as on sunny ones. There was no correlation between cloud cover and length of calling periods. One of the heaviest calling periods, early morning, is more often cloudy than not, whereas the other heavy calling period, late afternoon, is usually sunny.

Temperatures were taken daily at regular intervals in the forest. There is an average difference of approximately 15°F. between early morning and midday temperatures from March through May. It might be suggested that rising temperatures inversely affect the vocalization of tinamous. But often the males call through the heat of the day, although frequently the calling ceases around 9:00 a.m., long before the temperature below the canopy has risen to the midday level. Furthermore, the afternoon calling period commonly begins between 3:00 and 4:00 p.m., when the temperature has fallen a few degrees, at most, from the peak that is attained between 1:00 and 2:30 p.m.

I have never heard a tinamou call during a rain. Precipitation will halt the calls of the Boucard Tinamou. I have been close to calling males on a number of occasions when it began to rain, and within two minutes the males ceased calling.

SUMMARY

In the springs of 1957 and 1958 a behavioral study of the Boucard Tinamou (*Crypturellus boucardi*) was undertaken at Gallon Jug, British Honduras, in a 183-acre

study area in which compass lines were cut to facilitate movement of the observer and the plotting of birds under consideration.

The habitat of *C. boucardi* in British Honduras varies from a low second-growth forest to tall stands of second-growth timber, indicating a wider tolerance of habitat than usually recorded for this species. A great density of undergrowth may be a possible limiting factor locally.

In food habits, this species is primarily a vegetarian but was noted feeding upon various insects, mostly ants. Even frogs and lizards may occasionally be preyed upon. Eighteen plant species representing 17 genera were identified among the seeds taken as food.

No evidence was found that the Boucard Tinamou is gregarious. Observations of other species of tinamous in company with *C. boucardi* were rare enough to suggest that such associations occur only accidentally.

When reacting to alarm, the Boucard Tinamou "freezes" its position, runs or moves stealthily away, or flies. The last response was rarely witnessed. The Boucard Tinamou is a reluctant flier, taking wing only when pursued or when suddenly alarmed. Its flight is short, noisy, and direct.

Individual males were identified by their calls. The individual peculiarities of the calls of any given male plus the large number of calls rendered daily were the most important factors in facilitating the collection of data. The call of the male is of low pitch and pigeon-like in quality. The females call less frequently and their calls are easily distinguished from those of the males.

The calling periods of males were variable and could not be correlated with mating, weather factors, or in many cases, with the calling of other males. Calling periods were most extensive in the early morning and late afternoon, but all males of the study area called occasionally in the middle part of the day.

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