

LIFE HISTORIES OF TWO PANAMANIAN ANTIBIRDS

By ALEXANDER F. SKUTCH

In tropical America, a large and important part of the avifauna is made up of passerine birds of the suborder Tyranni or Clamatores, comprising eight or nine families. Of this immense group of birds, only a single family, the Tyrannidae or flycatchers, is well represented north of the Tropic of Cancer and hence is generally known to North American bird-watchers. South of the Tropic of Capricorn, in Argentina and Chile, the suborder is somewhat better represented by members of the ovenbird family (Furnariidae) and other groups, as well as by the wide-ranging flycatchers. Some of these birds were studied many years ago by W. H. Hudson (1920); his work on the "Birds of La Plata" is probably our richest single source of information on the habits of the Tyranni.

One of the largest families of the Tyranni is the Formicariidae, or antbirds. They are, all in all, the least specialized of the larger families of the suborder, lacking, so far as known, the peculiar courtship habits of many of the manakins, cotingas and flycatchers, the complex nest-architecture of so many of the ovenbirds, and the specialization of structure associated with tree-trunk foraging of the woodhewers. Since this family scarcely ranges beyond the tropics either to the north or south, little attention has been given to the life histories of its members. Some years ago I published a brief account of the nesting habits of the Slaty Antshrike, *Thamnophilus punctatus* (Skutch, 1934). The present paper is devoted to the habits of two additional species, both of which were studied on Barro Colorado Island in the Panamá Canal Zone.

THE SPOTTED ANTIBIRD

The Spotted Antbird (*Hylophylax naevioides*) dwells in the undergrowth of the heavy tropical forest from eastern Nicaragua southward through the Caribbean lowlands of Costa Rica to Panamá, Colombia and Ecuador. It is distinctively marked and easy to recognize, for its plumage is somewhat more boldly patterned than that of the majority of the inhabitants of the lowest stratum of the tall forest. The pure white breast of the male, crossed by a curving necklace of heavy black spots, immediately takes the eye and serves to distinguish him at a glance from any other bird of the forests where he dwells. His upper plumage is rich chestnut-brown, with the top of his head and hindneck gray, and the wing coverts are black boldly spotted with white. The female resembles the male, yet is easily distinguished by her buff-tinged rather than snowy white underplumage, her whitish rather than black throat, and the olive rather than solid black spots on her breast.

On Barro Colorado Island in the Canal Zone, the Spotted Antbird is abundant in the undergrowth of the forest, rarely ascending as much as six feet above the ground. Here it is most often seen hovering above the foraging swarms of army ants, in company with other small camp-followers of the destroying legions. Its frequent associates, or rather rivals for the morsels stirred up by the ants, are the Bicolored Antbird (*Gymnopithys bicolor*), the Sclater Antbird (*Myrmeciza exsul*), the McLeannan Antthrush (*Phaenostictus mcleannani*), the Gray-crested Tanager (*Eucometis cristata*), the Barred Woodhewer (*Dendrocolaptes sancti-thomae*), the Brown Dendrocincla (*Dendrocincla lafresnayei*), and at times even the Chestnut-headed Tinamou (*Tinamus major*).

As the deployed battalions of ants flow over and under the ground litter of fallen leaves and other debris of the forest, in the dry season creating an audible rustling,

every living creature able to creep, walk or fly scurries forth from its lurking place to make a dash for safety. These fugitives, spiders, millipedes, isopods, insects of many kinds, and even frogs, lizards and snakes, ordinarily are so well concealed that they can be discovered only through long and painstaking search, but they heedlessly expose themselves as they attempt to escape the ants. This is the birds' opportunity. About the van and the flanks of the hunting army, insect food is to be had with less careful searching, or less watchful waiting, than in almost any other part of the understory of the forest. Some of the forest birds appear to depend almost entirely upon the ants to stir up their prey for them, as the anis and other birds of the clearings take advantage of grazing domestic animals for the same purpose, or as men use hunting dogs. Among the almost constant followers of the army ants are the Spotted Antbirds.

As one follows in silence a trail through deep forest, the sylvan stillness will be broken suddenly by a chorus of mingled churrings, squeakings and trillings, sent up by a score of small, protesting voices, as the heterogeneous throng of disturbed camp followers melts away through the dim vegetation. Only the myrmecine hosts remain, grimly intent upon their plunder, blindly indifferent to bird and man alike. But if the intruder draws off a few paces and watches in silence, one by one the birds will come flitting back to their interrupted feast. Among the first to return are the Spotted Antbirds. One or several pairs may be present in a single gathering. Of all the motley feathered crowd, they are among the smallest and most active. Perching upon low branches, only a foot or two above the ground, or else clinging sideways to some slender upright stem, they intently watch the ground-litter, which is turned a deeper brown by the legions of ants swarming over and through it. Suddenly one of the antbirds flies down, snatches up a cockroach, a beetle or a spider as it abandons its hidden retreat in the face of the advancing army, quickly regains a low perch with its booty, then beats it against a twig and at last swallows it. Then it continues to perch quietly, close above the ground, peering down with bright black eyes, until another tempting morsel calls forth another quick descent among the ants. Whether the antbird devours small creatures with ants actually attached to them, I cannot tell. Apparently it is never interested in the ants themselves as food.

If a number of Spotted Antbirds be present, one will occasionally rush at another even when there seems to be sufficient food for all. The pursuer spreads the chestnut feathers of his back, revealing in their midst a conspicuous white patch ordinarily quite invisible. Such concealed areas of white are present in the backs or shoulders of a number of species of antbirds and becards, and like the similarly concealed patches of yellow, scarlet or white on the crowns of many American flycatchers are displayed in periods of excitement.

Voice.—The call of the Spotted Antbird is a high, sharp *psip*, or at times a short, soft *peep*. It also utters a low *churr*, a note of anger or alarm. It sings a high-pitched trill and at least two other songs, both delivered in a thin, dreamy voice that sounds far away even when the bird is close at hand. One may be paraphrased *peede weede weede weede weede weede weede*, the successive notes uttered slowly and slightly descending in pitch. The second sounds much like *peede peede peede peede sip sip sip sip*. I have heard the female reply with the *peede weede* song to the similar song of her mate. As with other antbirds, there is little or no difference in voice between the sexes. These songs, at best subdued utterances, are sometimes delivered in a whisper.

Courtship.—On March 22, 1935, while I sat quietly in my small wigwam of brown cloth in the undergrowth of the forest on Barro Colorado Island, watching a nest of the Red-headed Manakin, I had the good fortune to be approached by a swarm of small

army ants. Happily they did not, as has more than once occurred to me, invade my retreat and drive me forth, to put an end to observations. Among the attendants of the ants were a lone Chestnut-headed Tinamou, a lone Brown Dendrocincla, and a pair of Spotted Antbirds who appeared to be preparing to nest. The antbirds foraged in their habitual manner, perching from only a few inches to a foot above the ground on low horizontal twigs or upright stems, from which they made instantaneous darts down into the midst of the swarming ants. The male was most attentive to his mate, and time and again, when he secured a fine morsel, he called her to his side with low twitters and passed it to her. Their hunger satisfied for a while, they rested close side by side on a fallen dead branch and preened. When the buff-breasted female antbird again became hungry, she pecked gently at her mate's black bill, whereupon the two returned together to forage with the ants. They were rather silent, uttering only a low churr note, occasionally a sharp call, and once the *peede weede* song in an undertone.

Strong conjugal attachment seems to be characteristic of the genus *Hylophylax*. Some years later, in the dripping forests of the eastern foothills of the equatorial Andes, I watched a pair of antbirds belonging to an undetermined but rather closely related species. They resembled our Spotted Antbird in general appearance but were easily distinguished by the prominent white, black-margined spots on the brown back of the male; the spots were buff-colored in the female. The birds were following a swarm of army ants, snatching up small fugitives very much in the manner of their relatives farther north. Among their associates in the motley flock were a single spotted-breasted Nightingale-Thrush (*Catharus dryas*), and at least three other kinds of antbirds, including a pair of those most extraordinary representatives of the family, the White-faced Antcatchers (*Pithys albifrons*), predominantly rufous-chestnut in plumage, but with the head ornamented by a frontal crest of stiff, elongate, upstanding, white feathers arising at the base of the bill, and a moustache of similar white feathers. The male and female *Hylophylax*, when not actively engaged in catching insects, perched side by side on a fallen branch, only a few inches above the ground. There the male affectionately preened the plumage of his mate's neck. They called *peede peede peede peede*, many times repeated in a small, high voice, sounding very much like the song of *H. naevioides*, and they uttered sharp but weak monosyllables in measured cadence.

Courtship feeding has apparently never before been recorded in the antbird family. In addition to the Spotted Antbird, at least two other species have this habit. With the wide-ranging antwren *Microrhopias quixensis*, I have seen the black male give food to his slaty-backed, chestnut-breasted mate both in Panamá and in southwestern Ecuador. On Barro Colorado Island, I have seen a male Black Antwren (*Myrmotherula axillaris*) feed the female, and I have seen her return the courtesy.

Nest and eggs.—On Barro Colorado Island, the Spotted Antbird nests during April and May, normally the first two months of the rainy season. Its breeding, without much doubt, covers a longer period, but I have records of occupied nests only in these months. While I sat in a blind amid dense forest undergrowth on March 13, watching an incubating manakin, I found an unoccupied nest, apparently that of some kind of antbird. It was in a sapling off to my left, about three feet above the ground. The empty nest, a neat cup of black fibers, suspended by its rim in a horizontal fork, appeared newly made. In the course of a day it was visited by two male antbirds of different species. First, a male Slaty Antshrike (*Thamnophilus punctatus*), passing with his mate, paused to perch on the rim, where he uttered low, not unmusical churring notes. Later, when a pair of Spotted Antbirds came by, the male alighted beside the nest and whispered a pleasing little song, then went off and did not return. Neither the female Slaty Antshrike

nor the female Spotted Antbird gave any evidence of having noticed the nest. Since upon subsequent visits I never found it occupied, I did not succeed in proving its ownership. The episode illustrates the interest that male antbirds take in nests during the early part of the nesting cycle.

On April 18, I watched a pair of Spotted Antbirds build their nest. They had placed it in the fork of a horizontal branch of a small sapling, only about thirty inches above the ground, in the forest undergrowth. This same crotch contained the remains of an older nest, which had become partly detached from its support and hung by one side. The bottom of the new nest rested against the top of the older one. As with all the antbirds I have watched build their nests, male and female shared almost equally in the work. The male, however, did a little more than his mate; for, between seven and nine o'clock, he made nineteen visits to the nest, the female only thirteen. Although sometimes they flew up together with fibers in their bills, usually they alternated in their visits. Each placed and arranged the material it had brought; but the male seemed more careful in shaping the nest than the female. If one of the pair, flying up to the nest with fibers in its bill, found the other seated in the cup, it did not give these to the second, but waited beside the nest until the latter departed, then placed and arranged its own material. Either bird, arriving alone at the nest, called the absent mate with soft, short *peeps*. Sometimes the male antbird, as he sat in the cup with the female close at hand, sang in an undertone *peede peede peede peede, chip chip chip chip*. I did not hear him sing while he was alone at the nest.

At another time, when a swarm of ants with attendant small birds passed by this nest, still uncompleted, a Bicolored Antbird alighted for a brief period on its rim. The interest that antbirds take in nests not their own is doubtless responsible for some of the erroneous attributions of nests and eggs which appear in the literature of Neotropical ornithology. The nests of many forest birds can not be identified with certainty without watching them for considerable periods from concealment. Since collectors are rarely willing to devote so much time to nests, their records are not to be accepted without critical appraisal.

The three completed nests of the Spotted Antbird that I found on Barro Colorado Island were all situated in small saplings, among fairly dense undergrowth of the forest, at heights of 12, 28 and 30 inches above the ground. While the first was in the fork of a horizontal branch, the other two were suspended between two diverging branchlets which departed from the main stem at different levels. In one instance, one of the supporting branchlets was two inches higher than the other, and as a result one side of the nest was correspondingly higher than the opposite side. The structure was a deep, neatly made cup, attached by its rim in vireo fashion. One nest was constructed largely of brown, dry, thread-like pistillate inflorescences of *Myriocarpa izabalensis*, a widespread shrub or small tree belonging to the nettle family. In addition, there were fine brown fibers from other sources and an admixture of the tenuous black fungal filaments which creep over trunks and fallen branches in the undergrowth of humid tropical forests. Some fragments of dead leaves and twiglets were attached to the outside. This nest measured $2\frac{3}{4}$ inches in depth and $2\frac{1}{2}$ inches in internal diameter. Another nest was quite similar in form and construction, but was black rather than brown in color from the abundance of the fungal hyphae in its composition.

The nest the construction of which I watched was found empty on the day after the first egg was laid. The two other nests each contained two eggs when I found them. Antbirds are as consistent as hummingbirds, and more consistent than pigeons, in laying sets of two eggs. Those of the Spotted Antbird are very heavily and rather uniformly mottled all over with umber, which covers half or more of the surface and is diffused

into the whitish ground color. Those of one set measured 23.0 by 15.1 and 23.0 by 15.9 millimeters.

Incubation.—In the middle of May, I found a nest with two eggs well advanced in incubation. It was situated one foot above the ground, suspended between two diverging branches of a little sapling and well screened by the hanging dead frond of a small palm growing close by. From a blind I watched this nest for the whole of one afternoon and all of the following morning. The record which was made seems of sufficient interest to present in full:

May 18, 1935, 12:10 p.m. I enter the blind. The nest is unoccupied, eggs warm.

1:06. The female silently goes on the nest.

3:13. The male calls *chip chip chip chip* from the undergrowth about twenty feet from the nest. The female at once leaves the eggs and flies in his direction. The male approaches the nest by flying from slender sapling to slender sapling; to the upright stem of each he clings, about a foot above the ground, and repeats the same little call. He circles around the nest and approaches from the other side, settles on the eggs, and calls *chip chip chip* twice more from the nest. Then he continues quietly to warm the eggs.

3:55. A shower begins.

4:30. The male spontaneously leaves the nest in a lull in the rain.

4:38. He calls from a sapling near the nest, then returns to the eggs and calls *chip chip chip* several times more. Soon the rain comes down hard again.

5:22. He leaves the nest.

5:44. The female approaches quietly and settles on the eggs, then calls *chip chip chip* several times over. The rain has stopped.

6:20. She leaves the nest.

6:30. She returns silently to the nest, in the fading light.

6:50. I leave the female on the nest, which I can no longer see.

May 19, 5:40 a.m. I return to the blind. As it becomes brighter, I see that the female is still on the nest.

6:05. She leaves.

6:19. The male comes on the nest, calling *chip chip chip* as before.

9:56. The male silently leaves the nest, then his mate silently takes his place.

11:55. A hard rain begins.

12:40. The female leaves the nest. The rain has slackened. I leave the blind.

As with a dozen other species of antbirds whose nest-life I have studied, male and female alternated on the eggs by day, the female attended the nest through the night. The diurnal sessions of incubation were long for birds so small, and with a single change of occupancy by male and female, they filled the morning or the afternoon. The male's separate sessions were, respectively, 77, 44, and 217 minutes; the female's, 127, 36, and 164 minutes, plus her long night session of 11 hours and 35 minutes. Counting only the diurnal period (1:06 to 6:30 p.m. on May 18, and 6:05 a.m. to 12:40 p.m. on May 19), the male covered the eggs a total of 338 minutes, the female 327 minutes, while the nest was unattended for only 54 minutes, of which 22 were accounted for by one long absence. As a rule, the male antbird covers the eggs or nestlings for somewhat longer periods by day than the female; but occasionally a nest will be found at which the female sits longer. This seems to be an individual rather than a specific difference. On the whole, the males among antbirds, as a family, are a little more zealous than the females in building, attending, and defending the nest.

With the loss of the only nest I had found before the eggs were laid, I was unable to determine the incubation period. The eggs of the Black Antwren (*Myrmotherula axillaris*) hatch in 16 days, those of the Bridges Antshrike (*Thamnophilus bridgesi*) in from 14 to 16 days; probably those of the Spotted Antbird will be found to require about 15 days of incubation.

When abroad in the forest, and especially when foraging with the army ants, the Spotted Antbirds are not particularly shy, but rather more confiding in the presence

of man than the majority of their feathered associates of the underwood. Yet at their nests they are exceedingly cautious; and it is difficult, without using concealment, to see them as they sit, or even to glimpse them as they steal unobtrusively away. I paid repeated visits to one nest without catching so much as a peep of its owners, until I hid myself in a tent of cloth and watched them feed their nestlings. At another nest, the male was somewhat bolder and perched about five yards away while I measured the eggs, repeating his little soft *peep* continuously so long as I remained in the vicinity.

The nestlings.—The eggs of one nest hatched on May 12. The nestlings were black-skinned, blind, and entirely devoid of down. In their nakedness they agreed with all other antbird nestlings I have seen except those of the Hoffmann Antthrush (*Formicarius analis hoffmannii*), which, strangely enough, are covered at birth with long, dark down, more than ordinarily copious for a passerine bird. They were fed and brooded by both parents and developed very rapidly. At the age of a week their feather-sheaths began to be prominent on the body, while those of the remiges were already long. Soon the little antbirds bristled with long, dark-colored pin-feathers. The sheaths, after reaching full length, were rapidly shed, leaving the nestlings completely clothed with feathers by their tenth day. On the eleventh day, their nest was empty, and although I failed to find the fledglings in the vicinity, I think it probable that they had survived. Eleven days is the approximate nestling period I found for two young Tyrannine Antbirds (*Cercomacra tyrannina*). The bigger Red-eyed Antshrikes (*Taraba major*) and Barred Antshrikes (*Thamnophilus doliatus*) linger in the nest 12 or 13 days if undisturbed. But I have actually watched a fully feathered young Bridges Antshrike hop from its nest and vanish through the undergrowth, quite spontaneously and undisturbed, at the age of 9 days and 22 or 23 hours; its younger brother followed the next morning at a slightly more mature age, not less than 10 days and 1 hour, nor more than 10 days and 19 hours after it hatched. Slaty Antshrikes (*Thamnophilus punctatus*), too, may spontaneously leave the nest, well feathered, when approximately 9 days old.

THE BLACK ANTWREN

The Black Antwren (*Myrmotherula axillaris*) inhabits lowland rain-forest from southern Honduras to Bolivia and eastern Brazil. In Central America, north of the Isthmus of Panamá, it seems to be confined to the more humid forests of the Caribbean side, where it ranges from sea-level upward to at least 1500 feet. Carriker (1910:608) questions the validity of two supposed records of this species from the Pacific coast of Costa Rica.

These little antwrens are among the smallest of birds, measuring slightly over $3\frac{1}{2}$ inches in total length. The male is almost wholly black, with white spots on the wing coverts and the tips of the rectrices. When he lifts his wings, he reveals a conspicuous area of long, soft, white feathers on each flank. He has also, in common with other members of the genus, a narrow white band on each shoulder, which is rarely displayed. The dorsal plumage of the female is olive, becoming gray on the head; her under parts are buff. She is a very plainly colored little bird, easily confused with other species among which she dwells.

None of the antbirds that I know frequents the tops of the higher trees. The forest-dwelling species remain well below the canopy, in the deep shade cast by the crowded lofty crowns of the forest giants. The Black Antwren is one of the higher-ranging of the forest antbirds, seldom foraging on the ground or through the lowest stratum of vegetation, yet at the same time avoiding the lofty upper stories. It probably spends most of the day between six and forty feet above the ground, in the tops of the shrubs and among the lower branches of the taller trees. Here it hunts among the foliage much in

the manner of a warbler, flitting from branch to branch and hopping along the finer twigs, inspecting leaves and bark for small insects and spiders, and sometimes darting out to snatch some tiny flying creature from the air. Like other members of the family, the Black Antwren is largely if not wholly insectivorous. As he flits from branch to branch, the male Black Antwren alternately exposes and conceals the white patches on his flanks as he spreads and folds his wings.

In the lowland forests of Central America where the Black Antwren dwells, there are no resident, arboreal warblers. The rôle which these birds play in the economy of the woodlands of the temperate portions of North America and the more elevated regions of tropical America is here largely taken by the smaller and more arboreal of the antbirds. In the forests of central Panamá, the three antbirds which most resemble the wood warblers in their manner of foraging are the Black Antwren, the Lawrence Antwren (*Myrmotherula fulviventris*), and the Panamá Antwren (*Microrhoptias quixensis virgata*). These three species often flock together, roaming through the forest in mixed parties even in March and April, when some at least of each kind are nesting. Frequently they are accompanied by other small birds, such as *Xenops minutus*, which finds much of its food inside small decaying twigs. In the spring, when warblers are passing northward through these forests, they may temporarily form part of the mixed flocks in which the Black Antwren forages.

The notes of the Black Antwrens, although frequently voiced, are weak and of an indescribable tonal quality. Little chirps, twitters, and low churrs are the only utterances I have heard from them.

Courtship.—At about four o'clock on the afternoon of February 10, 1935, in the undergrowth of the forest on Barro Colorado Island, I came upon a party of Black Antwrens, a male and two females, who behaved most oddly and seemed to be engaged in a courtship ceremony. Perching upon low twigs, usually between two and ten feet above the ground, they continually uttered a weak little call, or possibly it should be considered their song, consisting of two syllables. While calling they flitted their wings, raising them one at a time, with a very rapid motion, and closing them just as quickly. The movement was so rapid that it was difficult for the human eye to follow. As they lifted their wings, they turned rapidly from side to side, or about-faced on the perch and frequently flitted from one twig to another. The male and the females behaved in the same fashion; but the latter were more active both in calling and exercising their wings. In the male, the lifting of the wing revealed momentarily the long, white feathers of the flanks, which are practically concealed when the wings are folded; but the females, although they so assiduously moved their wings, had no similarly conspicuous plumage.

The birds continued these antics for about half an hour, moving about through a small area of undergrowth. The several actors never came very close together nor performed in any definite spatial relation to each other. One of the females voiced a low, rapid, churring call. The lifting of the wings by the male Black Antwren to expose the white feathers on his flanks may be compared with the Panamá Antwren's habit of spreading the black feathers of his back to reveal the snowy area in their midst, as he courts the female. Antbirds with concealed areas of white in their plumage generally display them at times of excitement, as in courtship, in disputes among themselves, and when trying to entice an intruder from the vicinity of their nests.

That the female Black Antwren may take the more active part in matters of courtship was likewise suggested by another observation I made two months later, also in the forest on Barro Colorado Island. On the morning of April 5, while I sat in my blind

watching a Brown Flycatcher (*Cnipodectes subbrunneus*) build her nest, a flock of small antbirds wandered through the forest above my head. Among them was a pair of Black Antwrens. When they were directly above me, I saw the female give the male an insect she had caught. The male was in adult plumage. Among other species of antbirds, as indeed among birds of all kinds of which one member of the pair feeds the other, it is more usual to see the male feed the female. But some years later, I watched a female Cabanis Euphonia (*Tanagra luteicapilla*) surrender to a male in fully adult plumage a caterpillar she had just found. Lack (1940:170) gives additional instances of female birds feeding their mates.

Nest and eggs.—The only nests of the Black Antwren that I have seen were on Barro Colorado Island. The first of these was found on March 29, 1935, when nearly completed, and contained its full set of eggs by April 3. The second was discovered with newly hatched nestlings on April 16; and in the third, incubation was in progress during the second week of May, after which the eggs were destroyed by some small predator. Cherrie (1916:282) found the nest of another race of this species at Maipures on the Orinoco River, in January, when it contained eggs. These four are the only records of the nest of the Black Antwren that have come to my attention.

I was not able to watch the building of the nest, as those which I found were nearly or quite completed; but from analogy with other antbirds, it is hardly to be doubted that the male takes a substantial part in this work. As we shall see, he performs a large share of the incubation; and when the male bird incubates, it is almost axiomatic that he aids in building the nest and caring for the nestlings.

Cherrie's nest was placed at a height of seven feet above the ground in the midst of a thick tangle of overhanging bamboo branches in the undergrowth of high, dense forest beside the Orinoco. My three nests on Barro Colorado Island were all considerably lower. The highest was four feet up, in the crotch of a slender bush, shaded by a palm leaf. The second was 28 inches above the ground, suspended between the petioles of two diverging leaves of a climbing aroid, well concealed by the foliage. The lowest was only 22 inches up, in a small sapling, beside a nearly dry stream bed. All were in heavy forest.

The nest is a deep, well made cup, attached by its rim to the arms of a slender, horizontal, forking branch, or in some similar position, as between petioles conveniently placed. A typical structure was composed chiefly of pieces of dead and partially decayed leaves, some completely skeletonized, bound together and attached to its supports by long, black fungal filaments. In the bottom there was a thin lining of these same black fibers. The nest described by Cherrie was apparently quite similar in construction to these on Barro Colorado Island; in this instance the component leaves were chiefly bamboo, the kind most readily available to these birds that built in a bamboo thicket.

Two of my nests contained two eggs each, the third, two nestlings. The eggs were white, speckled with reddish-brown or chestnut; most or all of the spots were gathered in a wreath about the large end. The four eggs measured 16.7 by 12.3, 17.1 by 12.3, 17.5 by 12.7, and 17.5 by 12.7 millimeters. At one nest, an interval of two days separated the laying of the first and second eggs. At this nest the male antwren was found incubating at 8:45 on the morning when the second egg was laid, indicating that incubation begins promptly upon the completion of the set.

Incubation.—The first and lowest of my nests was found on March 29, 1935, when nearly completed. On April 2 there was a single egg, which possibly had been laid the preceding day; the second and last egg was deposited on April 3. On April 11, shortly before noon, I began a study of the antwrens' mode of incubation from a blind which had already been in place for two days. This is the record of the birds' activities:

- April 11, 1935, 11:50 a.m. I enter the blind without disturbing the male antwren, who is sitting.
 2:44 p.m. He silently leaves the nest.
 3:03. The female silently approaches and goes on the nest.
 5:23. The female leaves and joins her mate. I hear their voices in the distance.
 5:48. The male silently goes on the nest.
 6:08. The female quietly replaces the male on the nest.
 6:45. I can no longer see the nest, and leave the blind in the dim light.
 April 12, 6:00 a.m. I return to the blind.
 6:10. The female darts from the nest. The light is still very dim in the forest.
 7:44. The female returns to the nest.
 9:22. The male flies down to the nest, displaying his usually concealed white shoulder bands as he alights beside it. The female leaves, calling in her queer tones as she disappears among the foliage.
 9:25. In response to his mate's repeated calls, the male leaves the nest and follows her.
 9:36. The male returns to the nest, again showing the white under-feathers on his shoulders as he alights beside it.
 11:52. Hearing the calls of the female in the distance, the male leaves to join her.
 12:21. The female silently goes on the nest. I leave the blind.

This vigil at the antwrens' nest revealed certain features so unusual for antbirds that I decided to watch again the following morning. A fairly hard shower had fallen during the latter part of the night, and when I went out into the forest before dawn I found it dripping.

- 5:55 a.m. I enter the blind. A few minutes later a transient shower falls.
 6:12. The bird who has been covering (probably the female, but it is still too dark to see) suddenly leaves the nest.
 8:05. The female suddenly and silently returns to the nest.
 8:26. The male replaces the female in the same manner as at 9:22 yesterday.
 8:40. I leave the male on the nest.

The little cup-like nest was so deep that only the bill and the tail of the incubating birds were visible to me as I sat in the blind, with my eyes somewhat above their level. At the distance from which I watched them, in the subdued light beneath the big espavé tree that spread its massive boughs overhead, I could detect little difference in the colors of the tails of the male and female; but the male was always to be recognized by the white tip of each tail feather, which the female lacked. Both members of the pair always sat facing outward from the fork that supported the nest. This position is typical of antbirds of a number of species. Yellow-green Vireos (*Vireo flavoviridis*), on the other hand, regularly face inward as they incubate.

Incubation by the female during the night, and of both sexes alternately during the day, is the rule among antbirds. The surprising feature revealed by the study of this pair was the long periods of neglect, when the eggs were allowed to become thoroughly chilled while both parents roamed through the forest. Other antbirds that I have studied have kept their eggs far more constantly covered. Indeed, it is rare for any small bird to neglect its eggs for such long periods as these, and especially so when the two sexes share the responsibility of keeping them warm. On both April 12 and 13, the female, instead of waiting for her mate to come and replace her, darted from the nest soon after daybreak, while the light was still very dim beneath the high forest canopy. On the first morning, she remained absent for 94 minutes; on the second, for 113 minutes. On both mornings she returned alone to resume charge of the eggs that had been so long neglected, and only after she had been sitting for some time—98 minutes on April 12, 21 minutes on April 13, did her mate come to relieve her. During the remainder of the day, the interruptions to incubation were far shorter than that which started off the morning; the periods during which the eggs were left uncovered were no longer than with many small birds of which the female incubates without assistance from her mate.

Despite their periodic neglect of their eggs, the Black Antwrens were by no means restless sitters, for they remained on the nest for two or three hours continuously, which is long for such small birds. The occasional interruptions of incubation appeared to be caused by the antwrens' strong sociability and the insistence of the male and female upon foraging in company. This desire for companionship was well illustrated at 9:25 on the morning of April 12, when the male left the nest upon hearing his mate's calls, only three minutes after he had replaced her there. Following her, he remained absent for eleven minutes, then returned to the nest. At 5:23 p.m. on April 11, and again at 11:52 a.m. the following day, the calls of the mate also appeared to be responsible for drawing the sitting antwren from the eggs before relief arrived; but in each of these instances the bird had been on duty continuously for well over two hours. Most other kinds of antbirds forage alone during the period of incubation.

Since antwrens are not known to be active during the night, the records for April 11 and 12 give a continuous picture of events at the nest during slightly over 24 hours. The period of diurnal activity may be considered to extend from 6:10 a.m. to 6:08 p.m. The male took four sessions on the nest, ranging from 3 to more than 174 minutes, and averaging 83+ minutes. The female, in addition to the long night session, took two diurnal sessions, of 98 and 140 minutes, averaging 119 minutes. In the period of diurnal activity, the male covered the eggs for 333 minutes, the female for 238 minutes. The eggs were left unattended for five periods, ranging from 11 to 94 minutes in length, and totalling 178 minutes.

At the second nest with eggs, the pair likewise neglected them for long periods. Incubation at this nest began on May 7, and the following record was made on the morning of May 12:

5:45 a.m. I enter the blind.

5:58. While it is still too dark to distinguish things clearly in the forest, the bird which spent the night on the eggs leaves the nest.

7:28. The male goes on the nest, which has been left unattended for an hour and a half.

9:42. The male spontaneously leaves the nest, calling as he flies off into the woods.

10:57. The female approaches silently and alone; she goes on the eggs, which have been left deserted for an hour and a quarter.

11:30. The female is still on the nest. I go.

A brief record made at a nest of the Lawrence Antwren, which was despoiled before I could complete my study of it, suggested that these birds likewise leave their eggs unattended for considerable periods while male and female forage in company. But most antbirds keep their eggs far more constantly covered, as may be seen in the following table. At all of these nests, the birds, watched from a blind, were not interrupted and appeared to be quite at their ease while they incubated.

Species	Hours watched	Per cent time on eggs
Hoffmann Antthrush (<i>Formicarius analis</i>)	6	100.0
Red-eyed Antshrike (<i>Taraba major</i>)	11½	96.4
Slaty Antwren (<i>Myrmotherula schisticolor</i>)	6	93.9
Spotted Antbird (<i>Hylophylax naevioides</i>)	13	92.4
Black Antwren I (<i>Myrmotherula axillaris</i>)	13	76.2
Black Antwren II	5¾	50.3

At the first and lowest nest, the male sat far more steadfastly than his mate. He would remain on the nest while I approached and bent over him. As the eggs neared the point of hatching, he would linger upon them until my slowly advancing hand was less

than a foot distant, then jump from the nest and fly slantingly downward until he almost touched the ground. But he never permitted me to touch him. His more wary mate would always desert her eggs to dart rapidly away and vanish while I was still several yards distant.

At this low nest, the set of two eggs was completed on April 3, and both hatched on the 19th, giving an incubation period of 16 days. The eggs in the other nest were destroyed before they hatched.

The nestlings and their care.—The newly hatched antwrens were pink with blackish heads and were devoid of the slightest trace of natal down. Their eyes were tightly closed, and the interior of their mouths was yellow. They were typical antbird nestlings and developed very rapidly. On April 22, when three days old, their eyes were opening and their sprouting pin-feathers were already long. On April 25 the feathers were beginning to escape from the ends of their sheaths. The following day the nest was empty. It is not impossible that the week-old antwrens spontaneously departed their cradle; but I think it safest to await additional evidence before concluding that the nestling period of this species is only seven days. The Slaty Antshrike (*Thamnophilus punctatus*) and the Northern Antwren (*Dysithamnus mentalis*) both have a nestling period of nine days, but some of the larger species remain in the nest a few days longer.

On the morning of April 23, when the nestlings were four days old and bristling with long pin-feathers, I spent four hours (6:00-10:00 a.m.) watching their nest from the blind set in its former position. During this period the male brought food seven times, the female six. So far as I could determine, the nestlings' food consisted entirely of small insects. The female brooded thrice, for 3, 26, and 35 minutes, a total of 64 minutes. The male brooded once for 7 minutes, and at another time lingered upon the rim of the nest, guarding, for 6 minutes, before he settled down to brood, just as I was preparing to end my vigil. While the female antwren was sitting in the nest, some birds foraging in the crown of the big espavé tree above it knocked down a small dead branch which crashed to earth only a foot away from her. But she did not stir from her position. She continued quietly to brood while the fruits shaken down from above fell all around her.

Upon leaving the blind at ten o'clock, I advanced toward the nest, in which the male antwren had just settled down to brood after guarding for six minutes upon the rim. I bent over until my face was only a foot from his. The bird lifted his head and looked up at me with steady black eyes, but did not desert his post until I advanced my hand in an attempt to touch him. Before I could do this, he jumped from the nest, dropped to the ground, and skimmed rapidly over it for a distance of about twenty feet. Then he rose into the bushes and called for a long time, uttering a sort of chittering in his indescribably queer tones. His mate answered from a greater distance.

This male antwren's simulation of the actions of an injured bird was not nearly so convincing as that I had witnessed a few days earlier with the female of the second nest. This was situated four feet above the ground, and when found on April 18 it contained nestlings very recently hatched. Two days later, I twice found the female brooding when I visited the nest. Each time she sat until I came within a few feet of her, then dropped suddenly to the ground, and dragged herself over it for many yards, as though unable to fly. I have seen few birds convey more convincingly the impression that they were severely injured and trying frantically to escape. When she had led me a good distance from the nest, she flew up into the bushes and joined her mate in uttering the queer calls characteristic of her species. Many other kinds of antbirds also feign injury when their nests appear to be in danger.

This nest was empty eight days after I found it with newly hatched nestlings, again suggesting a very short nestling period. But so many nests in the lowland forests of the tropics are despoiled by predatory animals that again I was not certain that the young antwrens departed spontaneously.

SUMMARY

The Spotted Antbird (*Hylophylax naevioides*) and the Black Antwren (*Myrmotherula axillaris*) inhabit the same heavy lowland rain-forests on the Isthmus of Panamá, but they occupy different ecological niches. The Spotted Antbird dwells in the lowest stratum of the forest, rarely ascending as high as six feet above the ground. The Black Antwren forages chiefly among the lower branches of the big trees and the tops of the bushes, from about six to forty feet above the ground.

Both these antbirds are largely if not exclusively insectivorous and were not seen to eat fruits of any kind. The Spotted Antbird was most often seen following army ants and picking up insects, spiders, and other small creatures that these ants drive from concealment as they hunt. It shows no interest in the ants themselves as food. The Black Antwren forages among the foliage in the manner of a small, active wood warbler.

The Black Antwren has a peculiar courtship performance. Males and females gather in the undergrowth of the forest and rapidly lift and lower their wings, an act which, in the case of the male, reveals the long, conspicuous, silky, white feathers of the flanks. At the same time they turn rapidly from side to side and call incessantly with squeaky notes.

The males of both the Spotted Antbird and the Black Antwren feed their mates during the period of courtship. Once a female Black Antwren was seen to feed a male in adult plumage. Courtship feeding by the male has been witnessed in still a third species of the Formicariidae, *Microrhopias quixensis*.

The nests of both the Spotted Antbird and the Black Antwren are small open cups attached by their rims, in vireo fashion, to two diverging branches in the undergrowth of the forest.

A nest of the Spotted Antbird was built by both sexes, the male performing a slightly larger share of the work than the female. In five other genera of antbirds the nest was built by both sexes working together.

Two nests of the Spotted Antbird and three of the Black Antwren contained each two eggs or nestlings. In the antbird family, the full set seems always to consist of two eggs.

In both the Spotted Antbird and the Black Antwren, as with a dozen other species of the Formicariidae watched for longer or shorter periods during the course of incubation, the sexes alternated on the eggs during the day. In the Spotted Antbird and the Black Antwren, individual sessions on the eggs tended to be long, ranging up to three hours or more of continuous sitting by day. During thirteen hours of observation, a pair of Spotted Antbirds together kept their eggs covered for 92.4 per cent of the time. But the Black Antwrens neglected their eggs to a degree which seems exceptional in the Formicariidae. At one nest, watched for thirteen hours, the pair spent only 76.2 per cent of the time on the eggs; at a second nest, watched for 5¾ hours, the eggs were covered only 50.3 per cent of the time.

With both species, the female incubates during the night.

At one nest of the Black Antwren, the eggs hatched in sixteen days.

The newly hatched nestlings of both the Spotted Antbird and the Black Antwren are blind and completely naked, as are the nestlings of all other antbirds, so far as

known, except in the genus *Formicarius*, in which the nestlings at birth bear a covering of down unusually copious for a passerine bird.

With both the Black Antwren and the Spotted Antbird, the nestlings are fed and brooded by both parents. So far as seen, they received only insect food.

One of the female Black Antwrens gave an unusually convincing display of "injury-feigning" when driven from the young nestlings she was brooding. Such displays have been witnessed among other species of antbirds.

The development of the nestlings of both the Black Antwren and the Spotted Antbird was very rapid, that of the former species somewhat the faster. The feathers of the young Black Antwrens began to escape from their sheaths on the sixth day after hatching, and on the following day the nest was empty. The nestling Spotted Antbirds were clothed with feathers on the tenth day, and the following day their nest also was empty. Although in neither instance could the young birds be located after their disappearance from the nest, it seems likely that they left in safety, the Black Antwrens when seven or eight days old, the Spotted Antbirds when eleven days of age. These nestling periods are about the same as those of other species of antbirds for which definite nestling periods have been established by watching departure of young of known age.

LITERATURE CITED

Carriker, M. A., Jr.

1910. An annotated list of the birds of Costa Rica including Cocos Island. Ann. Carnegie Mus., 6:314-915.

Cherrie, G. K.

1916. A contribution to the ornithology of the Orinoco region. Science Bull. Mus. Brooklyn Inst. Arts and Sciences, 2:133-374.

Hudson, W. H.

1920. Birds of La Plata (London, J. M. Dent and Sons, Ltd.), vol. 1, xvii + 244 pp.

Lack, D.

1940. Courtship feeding in birds. Auk, 57:169-178.

Skutch, A. F.

1934. A nesting of the Slaty Antshrike (*Thamnophilus punctatus*) on Barro Colorado Island. Auk, 51:8-16.

Finca "Los Cusingos," San Isidro del General, Costa Rica, August 1, 1945.