

THE BREEDING CYCLE OF THE YELLOW-BELLIED SEEDEATER IN PANAMA

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This report on the Yellow-bellied Seedeater (*Sporophila nigricollis*) is part of a five-year study of the life histories of some common tropical birds of the Panamá Canal Zone. The species is widely distributed in the tropics and occurs in a variety of habitats over a great range of altitude. On the Isthmus of Panamá, it is a "common open-country species" (Eisenmann, *Smiths. Misc. Coll.*, 117, no. 5, 1952:58). Sturgis (*Field Book of Birds of the Panama Canal Zone*, 1928:394), using the former name *S. gutturalis*, states that it is present in the Canal Zone "chiefly in the rainy season." Wetmore (*Smiths. Misc. Coll.*, 102, no. 2, 1952) notes that the "distribution of the species in Panamá is not clearly understood at present and seems in part to be seasonal as the birds are reported to appear during the rains in localities where they are absent during the dry season."

The author watched these seedeaters closely in 1956, 1957, and 1959. In these years, a pair nested so near the house that they could be seen from inside the house or from the breezeway below. Occasional observations were made on other pairs. A total of eight pairs and nine nests was watched. The males of 1956, 1957, and 1959 were different individuals, as indicated by plumage characters.

In 1956, one pair built three nests. Although all of the nests were unsuccessful, nest building was watched for 25 hours and singing behavior was followed for a period of 20 days. In 1957, the female disappeared midway through the nestling period and the male carried on until the nest was vacated. In 1958, one nest was checked for length of the incubation and nestling periods. In 1959, a nesting pair was checked occasionally from July 31 to August 15 and from September 7 to 26. The nest of this pair was watched for nearly 87 hours from September 27 to October 9 from inside the house, some 15 feet away.

THE STUDY AREA

The area in which these seedeaters were observed is situated in South Gamboa, Panamá Canal Zone. It is south of the Chagres River near the point where the river flows into the Canal. The elevation is 110 feet; the vegetational cover is tropical deciduous forest.

The year at this locality can be divided into two seasons: the dry season which extends from mid-December to mid-April and the wet season which occurs during the remaining eight months. Relative humidity varies greatly between the two seasons, the averages being in the middle seventies and the high eighties, respectively. The average rainfall from 1955 to 1959 varied only from 87.55 to 87.17 inches. Monthly variation for these years ranged from no precipitation in March, 1957, to 17.4 inches in October, 1959. These meteorological data were supplied by the Meteorological and Hydrographic Branch of the Panamá Canal Company.

LENGTH OF THE BREEDING SEASON

Table 1 presents the dates for the first and last local appearances of Yellow-bellied Seedeaters, the length of their stay, and the dates of first songs in the study area, for the years 1956 through 1959. Since these birds are silent on arrival, some leeway should be granted for the dates of first arrival and the tabulation should be regarded as approximate.

In 1956, the site of the first nest was selected on June 20, 79 days after the arrival of the first male. This nest was complete 18 days later, on July 8. In 1957, the long drought which had started in December, 1956, was not broken until May 11. In May, the gauge at Gamboa, about one mile from the study area, registered 1.74 inches of rainfall above average. The Yellow-bellied Seedeaters arrived almost a month later. Their early departure on October 14 made this the shortest of the four seasons. In 1958, the Gamboa station recorded subnormal rainfall in every month except January and May. The accumulated deficit for the year was 17.57 inches. The birds arrived on

TABLE 1
LENGTH OF BREEDING SEASON

| Year | First appearance | Last appearance | Number of days | First songs |
|------|------------------|-----------------|----------------|-------------|
| 1956 | April 3 | October 28 | 209 | May 23 |
| 1957 | June 8 | October 14 | 128 | — |
| 1958 | April 25 | December 14 | 224 | May 9 |
| 1959 | April 7 | October 18 | 195 | May 14 |

April 25; rainfall in May was 2.3 inches above average and the first song was heard on May 9. As late as December 7, a pair of adults was feeding a juvenile in a small flock of seedeaters beside the Panamá Railroad at the Gamboa end of the bridge over the Chagres River. Twelve individuals were present in this flock; they disappeared on December 14. In 1959, the first individual was seen on April 7. The preceding year had ended with a rainfall deficit, and the first four months of 1959 were all below average. Even so, there was enough moisture for growth of the grass and other vegetation on which this species depends. The rainfall in May was 2.13 inches above average. The first song was heard on May 14.

The fluctuating amount of rainfall over the more than 70 years for which there are records has apparently not produced conditions of drought over periods long enough to change the nature of the vegetation on which these seedeaters depend. Each year the new crop of food plants grows in time to assure food throughout the nesting season. Further attention should be given to the relation of the food supply to the length of the breeding season. The presence of a juvenile still being fed as late as December 7, 1958, points to the need for more data.

TERRITORY

Territory is quickly established and territorial boundaries can be defined by the location of song perches. Boundaries are defended by aggressive behavior ranging from soft warning calls to furious attacks. Perches used for territorial advertising were much the same in 1956 and 1957. Those most frequently used were telephone, power or clothes lines, and trees of several kinds, including broad-leaved species and palms. In both seasons, the Yellow-bellied Seedeaters shared the perches of the Blue-black Grassquits (*Volatinia jacarina*) on three inflorescence stems of a palm. When the last stem fell, the grassquits quickly adjusted to the new location on the ground, whereas a Yellow-belly was seen to use it only once as a perch.

Because of the great amount of suitable terrain in the study area, territories were established without conflict from 1955 through 1958. In 1959, three males attempted to establish territories in the study area. The only conflict noted was between August 10 and 14 of that year, when a male tried to settle in an occupied territory. After four days, the intruder finally left, leaving the original pair in full possession.

Yellow-bellied Seedeaters are not particularly aggressive in defense of territory. Only when another bird came near the nest did the pair show marked belligerence. The male, or the female, or both together, would rush the intruder and drive it away. There was a tendency for the male to advertise territory while the female attacked the trespasser. The male tended to be concerned with the entire territory while the female was concerned with the nest proper. In territorial disputes, aggressive displays often were effective without physical contact. Second nests are usually located within the territory in which the first nest is built. After the nestlings of the first brood have been fledged, territorial defense is relaxed temporarily and resumed when the new nest is under construction. Territories are abandoned after the last fledgling of the last nest has been safely hidden at considerable distance, or when conditions of weather and climate bring the breeding season to an end.

VOICE

The male Yellow-belly's song is a single, unpunctuated phrase ending in a short trill, the last one to three notes of which are slurred. When disturbed, a male may abruptly break off singing in mid-phrase, leaving the song incomplete. During pauses between songs, males frequently preen.

The male has a variety of other vocalizations. While weaving the nest, he makes rapid, chittering sounds in a low monotone. He recognizes the arrival of the female with a single note repeated a few times and occasionally followed by a song. Short, low, nasal notes uttered in rapid succession—a sort of purring—may be used while approaching the nest, or from the interior of the nest during construction. A low *hist* is interspersed with *chee* notes when a male, on the alert, watches the nest from nearby. The alarm notes are single, given in a rapid series in a high, harsh tone.

The female does not sing. On arrival at the nest during the incubation period she usually gives a trill to which the male replies with a single note. No listener could mistake the purpose of her harsh, scolding notes when she drives an intruder away from the nest. When chased, her flight is accompanied by sharp, high-pitched notes. When weaving, she makes soft *chip-chip* sounds and also gives a high-pitched, chittered trill followed by single, sharp notes. Repeatedly, the end of her flight to the nest while building is accompanied by a series of rapid, descending notes.

The most frequent use of the male's song was for territorial advertising, but it may also have helped to maintain the pair bond. When the male fed the young, he often preceded or followed each feeding with a song. Singing began before nest building and continued until well after the young had fledged. In 1957, after his second mate had apparently lost interest in nest building, the male continued to sing vigorously for many days. This male roosted at the extremity of his territory east of the house. His first and longest song period began at dawn. Depending on the amount of light present, the time of beginning his dawn song varied as much as 15 minutes. If it was raining heavily, dawn singing was omitted. After his dawn song, the male regularly came near the nest and sang while the female was still sitting. He remained within sight of the nest and sang from several perches while his mate took her first, and usually longest, recess. In 1956, July 8 was the last day of nest building and the day before the first egg was laid. The male began this day with vigorous singing, moving from perch to perch. In 46 minutes, from 5:54 to 6:40 a.m., he sang 233 times, singing from one to 23 times on different perches. At other times of the day he moved from one song perch to another, preening between songs and occasionally feeding briefly on green seeds of Guinea grass. Song periods at one perch usually lasted about eight minutes, occasionally as long as 15 to 18; from one to 100 songs were given from a single perch.

THE NEST AND NEST BUILDING

The nest tapers slightly to a blunt cone which fits into the crotch formed by three or four twigs in a small tree or shrub; the cup is round and shallow. Invariably clusters of leaves conceal the nest from above, although it may be seen from the side or below. The materials used are brown, dry grass stems with some rather stiff fibers, such as those in the sheath at the base of a date palm leaf. The outside wall, so thin that the nestlings can be seen in silhouette through it, affords good ventilation.

Each member of the pair takes part in building. The male takes the initiative and does most of the work for a few days. The female then takes over and completes the nest; the male accompanies her when she goes after materials but does no more weaving. The supporting twigs are first wrapped with gossamer. Although these fine filaments are invisible to the observer, each member of the pair has been seen at the nest site making the motions of attaching something to a twig and then stretching its head around to the opposite side of a stem to complete the fastening. Eight days of such work were put in by one pair before any signs of construction could be seen from a distance of 15 feet. Several days more are required to make the hammock-like foundation. The nest wall is then completed and topped by a slight but firm rim which is used for landing and takeoff. The completed structure withstands successfully torrential rains and high winds. The first nest of 1958 took 18 or 19 days to build.

When the first nest is empty, the pair starts a second nest, using the materials from the first. Second nests require less time for construction, in part, perhaps, because of the availability of materials from the first nest, and in part because of the demands of the advancing season.

Six of nine nests built in three seasons were measured. All but one had inside diameters of 2 inches by $1\frac{3}{4}$ or $2\frac{1}{2}$ inches. The sixth nest measured $2\frac{1}{2}$ by $2\frac{3}{4}$ inches. Five nests were about 10 feet above the ground; the others were 5.3, 6.0, 7.7, and 9.5 feet up.

All but two nests were placed in hibiscus shrubs; of the other two, one was on a branch of a lime tree and the other near the top of a croton. Six nests were placed in a hibiscus hedge. In 1959, this hedge had been cut back to less than four feet in height. Although the male frequently sang from a shrub in the hedge, the pair located its nest in a croton which was about 11 feet high, only 12 feet from the hibiscus hedge.

The behavior of three pairs suggests that the male selects the site for the nest and that the female, after much exploring, both alone and accompanied by the male, finally settles on the site originally selected by the male. This is illustrated by the behavior of the unfortunate pair watched in 1956. After two nests had been built and the eggs in each had been destroyed by snakes, the female apparently wanted to build the third nest in a mango tree outside the limits of the territory. For several days she industriously carried materials to a spot in the tree much higher than any in which a nest had been located. The male accompanied her on these trips but did not give up his territory. In the end, the third nest was located in the eastern section of the same hibiscus hedge in which the first two had been built.

THE EGGS AND INCUBATION

The eggs are ellipsoid and very dark. They are greenish white in color mottled thickly with brown to purplish blotches which are slightly more concentrated at the larger end. There were no noticeable differences in size or color among clutches laid by various females in different seasons. In every case the complete set contained two eggs. On August 16, 1955, a female was seen to eat the shell of a newly hatched egg. Whether or not the male also eats the eggshells was not observed.

Data on incubation are mainly from the nests of 1957 and 1958. Only the female

incubates. The first nest of 1957 contained two eggs, both of which hatched. The incubation period for the second egg was 12 days, from August 25, between 7:55 and 8:25 a.m., to September 6, shortly before 8:29 a.m. In 1958, the first egg was laid early on July 7 and the second on the morning of July 8. On July 19, at 2:20 p.m., both eggs were intact. On July 20, at 12:30 p.m., two nestlings were present, one obviously a few hours older than the other. The incubation period appeared to be about 12 days. In 1959, two eggs were laid on September 16 and 17, respectively. Incubation probably began late on September 17 and it was definitely under way on September 18. On September 28, there appeared to be one egg and one nestling visible through the bottom of the nest. At 8:41 a.m. on September 29, the male put his head into the nest. When he raised his head he was working his bill, possibly eating eggshell or a fecal sac. On the basis of his behavior, it seems likely that the second egg hatched prior to 8:41 a.m., September 29, and had an incubation period of 11 or 12 days.

For the nest watched in 1957, the average of 108 diurnal sessions of attendance (S) was 21.8 minutes. The average of 106 recesses (R) was 7.6 minutes. The sessions ranged from 2 to 67 minutes. The longest session recorded was 87 minutes on July 22, 1956. Recesses ranged from 1 to 24 minutes. Using Skutch's (Pac. Coast Avif. No. 31, 1954:15) formula for computing the percentage of time (T) spent on the nest, $T = S \div (S + R) \times 100$, attendance at the nest was 74.1 per cent.

Six pairs of seedeaters were watched from 1955 to 1959. They produced a total of 16 eggs of which ten hatched; of the ten young, six were fledged. Expressed in percentages of the total number of eggs laid, 62.5 per cent hatched and 37.5 per cent of the young were fledged. Of the ten eggs that hatched, 60 per cent of the young were fledged, including two young that were force-fledged in 1959. The known losses were the result of predation by tree-climbing snakes.

While sitting, the female changes position frequently, rakes in the nest with her feet, and pokes the nest wall with her bill from a sitting position. Very frequently she goes below the nest and works at the outside. Just what she accomplishes could not be determined but this behavior was characteristic of females watched in 1956, 1957, and 1959. The males pay close attention to the nest and visit it several times soon after the first egg has been laid. They may spend as much as four minutes peering at the egg from different angles.

From time to time, the members of the pair communicate with each other. On September 5, 1957, the last day of incubation, the male began his dawn songs at 5:37 a.m. in the jungle in which he roosted. He sang until 5:55 and then came near the nest and sang a few more times. His mate was still sitting and did not leave until 6:13 a.m. Thereupon the male sang four times, paused, and sang five times. The female returned at 6:20. The male sang twice at 6:24 and the female answered with a laconic *chip*. The male then moved and sang 15 times, paused, then sang four times. After a silence of 12 minutes he moved near the nest and sang 21 times. At 6:49 the female repeated her single *chip* 21 times until the male sang at 6:53 a.m. At 7:25 she gave her chitter and left the nest. As usual, the male sang when she left. The female returned at 8:14 a.m.

The complete record of incubation would include night sessions spent on the nest by the female. In 1959, her retiring time depended on the amount of light present but occurred sometime between 5:00 and 6:00 p.m. The female left the nest in the early dawn; her earliest departure was at 5:59 a.m. and her latest at 6:13 a.m. Her night sessions on the nest thus averaged about 12 hours.

THE NESTLINGS

The nestling period.—Of nine nests found in five consecutive seasons, only two pro-

vided data on the length of the nestling period. In 1957, the second nestling was fledged at eight days; in 1958, the second nestling was fledged at nine days; in 1959, the nestlings were force-fledged.

Brooding.—Only the female brooded the young. In 1957 during the first three days following hatching, the female invariably brooded after she had fed the young. This routine was followed until 11:26 a.m. on the fourth day and until 9:00 a.m. on the fifth day. Observations on each day were discontinued at 12:05 p.m. The female spent the night on the nest as she did in the incubation period.

The duration of brooding did not appear to be correlated with air temperature. Sometimes the young were brooded when the temperature was high and at other times they were left uncovered when air temperatures were lower. Although the nestlings were left uncovered when air temperatures were from 20° to 40° F. lower than the probable body temperatures of the adults, they did not seem to suffer. The location of the nest, under an umbrella of leaves which provided partial protection from the direct rays of the sun and from the worst battering of the rain, undoubtedly helped the young to survive. In 1957, the female of the first nest disappeared when the young were five days old, but the male continued to sleep on his perch as before. Although the young undoubtedly felt the cold during the night, they survived to fledging.

TABLE 2
FEEDING RATE BY SEX OF PAIR OF YELLOW-BELLIED SEEDEATERS IN 1957

| Date | Observation period in minutes | Male | | Female | | Total feedings | Notes |
|---------|-------------------------------|-------------------------|-----------------|-------------------------|-----------------|----------------|------------------------------------------------------------------------------|
| | | Number of meals brought | Number per hour | Number of meals brought | Number per hour | | |
| Sept. 6 | 120 | 2 | 1.0 | 2 | 1.0 | 4 | Two nestlings hatched early; each was fed approximately twice in the 2 hours |
| 7 | 308 | 7 | 1.3 | 14 | 2.7 | 21 | Workmen near house — very noisy |
| 8 | 210 | 8 | 2.3 | 11 | 3.1 | 19 | 1:10 p.m. to 4:40 p.m. |
| 9 | 358 | 18 | 3.0 | 18 | 3.0 | 36 | Both a.m. and p.m. tallies |
| 10 | 273 | 17 | 3.7 | 19 | 4.1 | 36 | Last day with both parents |
| 11 | 457 | 31 | 4.1 | .... | .... | 31 | Male alone with two nestlings |
| 12 | 667 | 106 | 9.5 | .... | .... | 106 | Same |
| 13 | 510 | 37 | 4.3 | .... | .... | 37 | One nestling; probably also one fledgling |
| 14 | 107 | 9 | 5.1 | .... | .... | .... | Not representative; nest vacated before 11:30 a.m. |

Feeding.—Both parents feed the young. Food is usually regurgitated, although some food is carried to the young in the bill. When feeding the young, the parents, in turn, poked from one gaping throat to the other in a fast and regular rhythm. The nearer a chick was to a parent, the more feedings it received. In the first four days of the nestling period in 1957, the older nestling used its sibling as a "pillow"; thus it was in position to receive food several times before the other had raised himself to feeding position. Sometimes the female, in subsequent feedings, compensated for this disparity, but the male never did. Fecal sacs were eaten by both parents during the first few days but later were carried considerable distances and dropped.

Data on feeding at the nests of 1957 and 1959 are given in tables 2 and 3. It is difficult to compare the data since the female of 1957 was present for only five days and, further, the exact hatching time in 1959 was not certainly known, so that the first day

recorded in table 3 may not be the first day on which the young were fed. Nevertheless, it is apparent that the females at both nests fed more often than their mates and that the female in 1959 made fairly consistent gains in feeding rate, reaching her maximum rate on the next-to-last day of the nestling period. The record of the male of 1959 is even more consistent, culminating in a maximum feeding rate on the last day of the nestling period. At this particular nest, the behavior of the parents was consistent with the increasing demands of the growing young. The feeding rates of the two males are comparable save for September 12, 1957, when the male more than doubled his feeding rate over that of the preceding day. This is explained in the following section.

BEHAVIOR OF THE MALE AFTER LOSS OF MATE

When the female of the pair watched in 1957 disappeared, it seemed questionable that the male could provide for the needs of his half-grown nestlings. On September 11, his first day alone, the nestlings were in their sixth day. After his dawn songs the male visited several perches and advertised territory before going to the nest. Between 7:20 and 8:10 a.m., he gave the young five meals. This was quite as usual. Between 8:45 and 9:45 there were no feedings. In this period, the male was first disturbed by an iguana that ate a hibiscus flower directly over the nest. After the iguana departed, a

TABLE 3
FEEDING RATE BY SEX OF PAIR OF YELLOW-BELLIED SEEDEATERS IN 1959

| Date | Observation period in minutes | Male | | Female | | Total feedings |
|----------|-------------------------------|-------------------------|-----------------|-------------------------|-----------------|----------------|
| | | Number of meals brought | Number per hour | Number of meals brought | Number per hour | |
| Sept. 30 | 470 | 15 | 1.9 | 14 | 1.8 | 29 |
| Oct. 1 | 368 | 15 | 2.4 | 23 | 3.7 | 38 |
| 2 | 500 | 27 | 3.2 | 26 | 3.1 | 53 |
| 3 | 480 | 30 | 3.7 | 28 | 3.5 | 58 |
| 4 | 592 | 32 | 3.2 | 43 | 4.3 | 75 |
| 5 | 631 | 43 | 4.0 | 51 | 4.8 | 94 |
| 6 | 590 | 43 | 4.3 | 46 | 4.6 | 89 |
| 7 | 422 | 33 | 4.7 | 49 | 6.9 | 82 |
| 8 | 560 | 52 | 5.6 | 45 | 4.8 | 97 |
| Totals | | 290 | | 325 | | 615 |

Rufous-tailed Hummingbird (*Amazilia tzacatl*) darted about the nest shrub and flew up and down the length of the hedge in which the nest was located. The male moved about through the bushes, alert, but he did not leave the area despite the begging of the nestlings. Between 10:18 a.m. and 12:25 p.m., he fed the young eight times. Observations were resumed at 2:30 p.m., but he brought no food to the nest until 3:00; from then until 5:37 he fed the young 18 times. His feeding rate for the entire 7 hours and 37 minutes of observation was 4.1 trips to the nest per hour, but in the last two hours and 37 minutes of observation he fed at the rate of 6.9 trips per hour, an indication of the speed which he had worked up in the latter part of the day. On September 12, the male fed the nestlings 106 times in 11 hours and 7 minutes and achieved his highest feeding rate of 9.5 trips per hour. On September 13, only one nestling was present when observations were begun at 7:30 a.m. This nestling was not fed until 9:02, although the male had come once to inspect the nest. The feeding rate of the male for the eight and one-half hours of observations was 4.3 trips per hour, almost the same as the feeding rate noted on September 11. Whether the male was devoting all his time to

the one remaining nestling or dividing his time between it and a fledgling could not be ascertained.

The singing rates of the males of 1957 and 1959, exclusive of dawn song, are compared in table 4. The great decrease in the hourly singing rate of the male of 1957 after his mate disappeared is quite evident. On his first day alone, September 11, almost all of his singing was done in the morning; between 2:30 and 6:00 p.m. only one song was heard. On September 12, exclusive of dawn singing, no song was heard. As his feeding rate picked up, his singing rate decreased sharply. On September 13, when only one nestling remained, with, perhaps, a fledgling outside the nest, his singing rate started to pick up again. The male observed in 1959 tended to increase his singing rate toward the end of the nestling period, even though his feeding rate was also increasing. If the performance of this male was normal, then it is obvious that the singing rate of the male of 1957 was greatly influenced by the disappearance of his mate and his having to carry on alone after September 11.

The second mate, 1957.—On September 13, when the lone male was still feeding one nestling, a young female Yellow-belly perched on the clothesline, gave two *cheep* notes,

TABLE 4
RATES OF SINGING AND FEEDING BY MALE YELLOW-BELLIED SEEDEATERS IN 1957 AND 1959

| Male, 1957 | | | | Male, 1959 | | | |
|------------|-------------------|----------------|---------------------------------------------------|------------|-------------------|----------------|---------------------------------------------------|
| Date | Feedings per hour | Songs per hour | Notes | Date | Feedings per hour | Songs per hour | Notes |
| Sept. 7 | 1.3 | .... | Songs not tallied | Sept. 30 | 1.9 | .... | Songs not tallied, but frequent |
| 8 | 2.3 | 28.8 | Both parents | Oct. 1 | 2.4 | .... | Same as above |
| 9 | 3.0 | 44.5 | Both parents | 2 | 3.2 | 46.4 | Both parents from beginning to Oct. 9 |
| 10 | 3.7 | 25.2 | Both parents | 3 | 3.7 | 45+ | |
| 11 | 4.1 | 6.0 | Male alone; two nestlings | 4 | 3.2 | 49.0 | |
| 12 | 9.5 | 0 | Same as above | 5 | 4.0 | 65.7 | |
| 13 | 4.3 | 5.5 | One nestling | 6 | 4.3 | 46.4 | |
| 14 | .... | .... | Nest vacated before 11:30 a.m., workmen near nest | 7 | 4.7 | 148.9 | |
| | | | | 8 | 5.6 | 88.3 | |
| | | | | 9 | .... | .... | Nestlings forced from nest by Southern House Wren |

and preened; she was soon joined by another female. The male moved to a perch about 18 inches from the nest, and the two visitors perched beside him. One of them scolded and both flew away but they soon returned, one to the male's perch. He chased them away but they did not go far and one returned to perch directly above the nest. The male scolded, and when the female started toward the nest he drove her away. Again she used his perch, but briefly. In quick succession he sang seven times from as many perches and was answered each time by a Yellow-belly in the area south of the lane. For a time he continued to feed the nestling without interference, but at 11:15 a.m. the intruding female again came to his perch, then she moved to the nest and picked at the bottom. Moving around it she picked up a fiber which she held for some time. Again she perched beside him and again he drove her away and fed the nestling.

It rained from 11:22 a.m. to 12:45 p.m., but the male, looking bedraggled, fed

the nestling. In one 12-minute period he sang a few times and was again answered by a male to the south. At 1:45, a female, possibly the same one seen before, perched on the top stem above the nest, then on the male's look-out perch. He scolded and threatened her and she moved away but promptly returned to the nest while he watched her. She flew away for a moment and he fed the nestling again. When she returned and began to pick at the nest he drove her away, sang once, and followed her out of sight. She was not seen again that day, and the male continued to feed the nestling at intervals of about five minutes.

This female was very persistent and obviously ready to nest. It seems likely that she was the second mate with whom he soon built a nest in another section of the same hedge, although it was not possible to determine this on the basis of individual identification. The first nest was vacated on September 14. On September 17, the male's singing rate had risen to 94.8 songs per hour, and on September 23 he sang 201 songs in one hour. The new nest was started between September 17 and 23. The only egg was laid on September 28 and was lost on October 10. If the second mate was indeed the female that stayed so persistently near the nest on September 13, and had picked at it several times, it is of interest that she made no attempt to feed the lone nestling present. This may have been an indication that she was in an early stage of the reproductive cycle, ready to build, but not yet ready to feed young. The male, on the other hand, although he had lost his mate, defended the nest against the intruding female and continued to feed his young.

SUMMARY

The Yellow-bellied Seedeater (*Sporophila nigricollis*) at South Gamboa, Panamá Canal Zone, was seen during the rainy season only, when the vegetation on which these birds depend for food is present.

Territory is established quickly. The male tends to defend the entire territory, whereas the female tends to defend the nest only.

The nest is built by both members of the pair. The male takes the initiative and does most of the work for a few days; the female then takes over and completes the nest. One nest took 18 or 19 days to build.

Complete clutches invariably contain two eggs. Only the female incubates; she spends about 74 per cent of her time on the nest.

The nestling period is eight or nine days. Only the female broods, but both sexes feed the young.

North Miami Beach, Florida, January 24, 1961.