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THE HISTORY OF A FAMILY OF BLACK PHOEBES

WITH THREE ILLUSTRATIONS

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My study of the Black Phoebe (*Sayornis nigricans*) was begun in August, 1937, and was continued until mid-July, 1938. Observations were made on the campus of the University of California at Berkeley, especially in Strawberry Canyon east from the Memorial Stadium to the Botanical Garden (fig. 31). Because of the scarcity of this bird on the campus, this paper is based on frequent and intensive observations of a few birds rather than on a broad comparative study of many individuals. The study was carried on with headquarters at the Museum of Vertebrate Zoology where discussions of my problem were held with Joseph Grinnell, Alden H. Miller and Jean M. Linsdale.

METHOD OF FEEDING

In fall, winter, and early spring Black Phoebes spend most of the time on convenient perches from which insects are sighted and pursued. A bird turns its head in irregular movements: up, down, tilting to one side then to the other, now and then twisting almost completely around to the rear. No rhythmical to and fro movement is evident. Instead, the direction of turning is variable and often accompanied by elongation or shortening of the neck as the bird peers to follow the flight of a passing insect, or searches some crevice above its perch. Periods of head-turning on the perch typically are followed by pursuits in which the bird darts away, snaps up an insect, and returns to the same or near-by perch to resume its watch. These flights are remarkably direct, never haphazard; each appears to be directed to a single insect in the air, on the surface of water, motionless on some leaf, or in a crevice of a wall. The periods of active foraging and resting are too regular in length to be correlated with any fluctuation in the supply of insects.

After resting awhile the bird typically assumes an "energetic attitude" as manifested by increased frequency of the *tsip* note, the more rapid downward tilting and fanning of the long tail simultaneously with each vocal response, and most conspicuously by a series of pursuit flights as if in response to increased hunger. This period lasts for about three minutes, then as if satisfied, a longer resting period again occurs. Notes and tail tilting continue but become less frequent and the tilting may change to an upward movement in which the tail rises and falls but does not fan out.

The longest rest on one perch lasted fifteen minutes; perching for even half this time was rare. Hence the flow of material into the digestive tract was relatively steady throughout the day.

Where the prey can be observed, remarkable efficiency is manifested in overtaking it. When an insect does evade the bird's charge, one or more additional attempts are sometimes necessary to end the chase; usually, however, the first attempt is successful. The grace and accuracy of this flight is especially noticeable when the bird lifts an

insect from water, with scarcely a disturbing motion except for the touch of the bill and an occasional dip of the long tail in the upward turn.

Pursuit flights are usually downward from the perch level so that most insects are taken from or within a few inches of the lawn, water, or weed patch below the perch. This downward drop is conspicuously frequent when the bird feeds, as it usually does, from a perch four to six feet high. Of 82 pursuit flights observed at random about a swimming pool in the fall, 87 per cent were directed to insects on or near the water. In the herb and grass patches, between December 30 and March 4, the directions of six groups of flights, a total of 118, were recorded in sequence of occurrence. Eighty-eight per cent were directed below the perch level; 49 per cent actually contacted the grass from which the insects were plucked. In cold weather when insects are scarce, this method of gleaning them from plants is no doubt important in maintaining the bird.

This capture of insects below the perch level seems to be correlated with their greater abundance there. Observed insects slowed down in flight when they hovered about patches of weeds and lawn. This apparently makes for ease of catching. On bright days I found it difficult to see insects when they were flying high in the glaring light, yet when they chanced to fly between me and a dark background, sighting became easier. Hence, it seems probable that the increased visibility of insects sighted below the phoebe's perch might be another factor influencing the number of flights directed downward.

A complete reversal of this flight direction came with the approach of darkness. Late in the evening a pair at the Botanical Garden moved to perches near their roosts, which were beneath the eaves of buildings. In the dim light the insects could not be sighted near the ground among the long shadows, yet hundreds were visible in the air above. Of 117 flights noted during the approach of darkness, 79 per cent were directed upward. The number of upward flights increased with increasing darkness as shown in a recorded sample of flights.

Usually no hesitation is apparent before an insect is pursued. Yet the directness of flight as well as the usual capture of but a single insect on each trip indicates that the insect is sighted from the perch rather than while flying. Where the bird feeds over a lawn, insects are sighted again and again from ten to twenty feet from the perch; the bird flies directly to the exact position on the lawn where the insect is located, plucks it up without the slightest indication of uncertainty and returns to the perch.

Where slow flying insects are numerous in the air, two insects are occasionally taken in one flight, the second presumably sighted in the air but probably after the first, since a series of insects, regardless of their abundance, never was taken without the bird returning to its perch.

When insects were scarce, on rainy days and early on cold mornings, hovering was noted over grassy areas or alongside walls. Evidently these hoverings were a means of sighting insects hidden in the tall grass. These hovering flights are not the regular method of feeding, nor does the bird regularly range away from the perch in this manner; instead, they seem to be an adaptation to unfavorable conditions where it is necessary to search out insects that can not be sighted from the perch, and less frequently for detecting insects already sighted from the perch but lost from the bird's view after flight began.

The method of searching from a perch not only enables the phoebe to locate insects with a minimum of energy, but the rejection of unsuitable species apparently occurs before leaving the perch. Common yellow cabbage butterflies (*Eurymus*) frequently were observed to pass slowly in jerky flight, unmolested, within a few feet of a phoebe.

Once, however, a bird darted out and snatched a cabbage butterfly, but after it was carried back to the perch, this apparently distasteful insect was flipped from the bill and allowed to flutter slowly away. The bird evidently had failed to distinguish this insect as undesirable. This delayed rejection of an insect until it was caught and possibly tasted was rarely observed, though it was found to occur with several other species.

In late spring and early summer the adult phoebes were observed to pass up dozens of checkered fritillary butterflies (*Argynnis*); there was not a single pursuit of this insect even though individuals passed within a few feet of the birds. These butterflies had a wingspread of more than 50 mm. and were easily caught by hand as they hesitated on leaves and blooms. The young phoebes fresh from the nest were not so selective as their parents in foraging. On three occasions the young were observed to snatch a fritillary and swallow it, gulping down the large wings as well as the body. These incidents indicate that the older birds become conditioned against this insect.

Several experiments indicated trial tasting in the older birds. A feeding perch was baited with a large queen ant (*Camponotus*). The bird returned to the perch and picked up and worked the insect in its mandibles for about ten seconds. Then the bait was cast aside as the bird left the perch to pursue another insect. I recovered the rejected insect, the abdomen smashed, but otherwise uninjured, and apparently cast aside because of its unpalatability. Similar results occurred with an angleworm and a locust. When a wasp (*Ceropoles*) was placed on the perch, the bird moved toward the bait, peered down in hesitation several inches above the wasp, then turned away from the perch as if frightened. Finally after using near-by perches for awhile, the bird seemed to lose its fear and brushed the bait away with its foot in returning to the perch. This insect was rejected by sight alone.

The majority of insects caught were small enough to be swallowed in flight. But when forms larger than the house fly were taken, the catch was carried back and tapped against the perch several times as if to smash and kill it before swallowing. In one instance the bird continued the beating and crushing for forty seconds; the insect was then dropped to the base of the post; the bird promptly landed in the grass and picked it up again to continue the manipulation until finally the prey was gulped down. On another occasion the insect, apparently a damsel fly, was squeezed and manipulated in the bird's bill for two minutes during which it was struck against the post perch at least twenty times. Finally, after the insect appeared to be crushed and broken, it was swallowed.

After catching large insects the birds exhibit noticeable preference for substantial flat perches against which they can break up their prey. Occasionally they change from a wire perch to a post while holding the insect in the bill. Most frequently, however, the flat perch is chosen without attempting to use wire perches. When feeding on small insects, this perch selectivity is not apparent; wire perches are then used as much or more than posts.

FEEDING AREAS

Although the pair observed most closely used different feeding grounds according to the season, the areas chosen always had certain features in common. Even when the male ranged from the Botanical Garden to the Stadium, feeding activities were restricted to areas which had certain features.

In the fall when the male foraged extensively about Strawberry Pool, it would sometimes remain several hours, resting and feeding in alternating periods about the cleared area surrounding the water. Even when the bird was stopping briefly en route to other areas, the activities were restricted to the opening about the pool; there was no gradual venturing into the surrounding thickets. When leaving the area, there was no

warning other than the selection of a relatively high perch. The bird would leave in direct and deliberate flight, pass over the trees and brush, and head for another cleared area such as the fenced fields about the veterinary laboratory, or the Stadium where

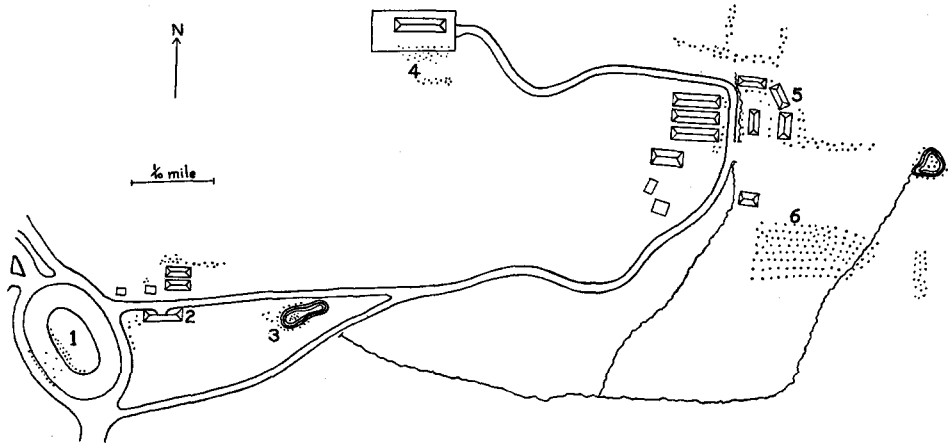


Fig. 31. Map of lower Strawberry Canyon, University of California campus, Berkeley, showing areas frequented by pair of Black Phoebes. 1, Memorial Stadium; 2, Veterinary Laboratory; 3, Strawberry Pool; 4, dairy; 5, camp buildings; 6, Botanical Gardens; stippling represents feeding areas.

the proper types of perches and clearings existed. Not only did thickets and forested areas delimit the feeding ground available to the bird, but there were also limiting factors in open grassy areas where the insect fauna was rich. In these open fields the lack of convenient perches of proper size and distribution limited the feeding ground just as rigidly as did thickets.

The peripheral part of the Stadium field was a particularly favorable feeding ground. The bird did not range over the entire field, although insects were apparently as abundant in the center as around the edges. Presumably because perches were lacking in the center, foraging was confined to a peripheral area extending from the five-foot wall a maximum of thirty feet. This wall together with the pipe railings provided convenient perches from which the phoebe could sight insects on or over the grass. To feed beyond this range was apparently impossible for the perch-sighting method of finding insects.

The bird did, however, range unrestrictedly over the bleachers, using the edges of the benches as perches and more often yet the four-foot banisters around the doorways halfway up the bowl. This area was used most frequently in the evenings before roosting and on dark rainy days when light intensity was low and skyward flights became the rule. Lack of perches was not the limiting factor in this area. The narrow open spaces between the benches greatly restricted the amount of insect-harboring surface visible to the perching bird, hence the taking of insects from the air above the perch in this area.

The walls of high campus buildings were also feeding areas, especially where perches were well-distributed beneath insect harboring ledges, as on the west Stadium wall. (See fig. 32.) Feeding in this area was observed in twenty-two out of twenty-seven evenings from January 20 to March 14. The exceptions occurred on dark, rainy days when light was poor and the bird spent excess time in the bleachers or was late in arriving at the Stadium. Even on this vertical surface the requirements of a phoebe feeding ground were easily identified. There were shelves about one foot square distributed along the wall about one-fourth the way from the top. From the edges of these shelves,

pierced in the center by flag poles, the bird peered into the crevices, grooves, and corners, which were numerous under the ledges approximately eight feet above. The corners of the shelves were used exclusively. From this position the bird could easily see into crevices eight to fifteen feet away. The factor of perch distribution was provided,



Fig. 32. Feeding area of Black Phoebe on west wall of Memorial Stadium.

since eight shelves were spaced along the wall in addition to the ledges near the top. The latter were used infrequently and mostly in movements between shelves, presumably because they exposed fewer wall crevices from the perching position than the regularly used shelves below.

The available insects were apparently largely in or near these crevices. Each flight, except for infrequent hoverings about the wall, was evidently directed from the perch to a specific insect in a crevice or less often several inches from one. Flights far out from the wall or down below the shelf to the shaded lower wall were relatively rare.

In a sample of 76 flights, 94 per cent were directed above the perch in contrast to the high percentage (88 per cent) of downward directed flights in the canyon feeding areas. The lower part of the Stadium wall below the shelf perches was rarely invaded during feeding activities since there were no perches except the banisters between arches.

The north and south walls were neglected entirely, possibly because the evening light was less intense there than on the west wall. Even on the latter where a series of

eight shelves was used in the early part of the evening, increasing darkness caused the bird gradually to narrow the range of its feeding activities to two or three shelves near the entrance to the roost.

The bird began to use the wall for briefer periods with the onset of spring until March 14 when the habit of making the long flight from the Botanical Garden was broken in favor of remaining with a newly acquired mate in the upper canyon. The roosting habit had evidently prolonged the use of the winter feeding grounds for brief evening and morning periods long after the upper canyon had come to be used exclusively during the day.

In midwinter when the open fields and garden plots of the upper canyon had turned green, certain parts of the garden and surrounding area apparently became increasingly favorable as phoebe feeding grounds, especially where perches were distributed between patches of herbs and grasses. Even before the first pairing, between January 20 and January 23, the male began to spend less time in the areas used in the fall and longer periods in the Botanical Garden and dairy, although it had not been seen in either place before December 30.

It was soon apparent that certain well-defined feeding areas were being worked to the exclusion of near-by territory. Not once was the bird observed to feed in the thick chaparral east of the garden, the thick shrubs and trees to the south, the conifer stand to the northeast, or the eucalyptus grove to the north. But, the edges of fields, the open, staked gardens, the lawns with well-spaced shrubs, the convenient wires between upper canyon buildings were occupied again and again by the foraging bird.

The bird watched for insects from a conspicuous perch. In this way it could sight insects in the air or on some herb or grass blade. These insects were readily available to the phoebe in its swooping flight. There was need of more than one perch in a given clearing as the bird worked or reworked a given area during an active period. Even the most favorably located perches were not used long without change. There was a continual progression to expose new areas or to rework areas beneath "favorite" perches.

After moving to a new perch the bird finds many new insects without using energy in flight. At the same time the previously used areas recover; insects which might have escaped the first search crawl from hiding places among the leaves and become conspicuous. Using a series of perches is more economical than the use of a single perch over a long period. For example, when the bird sights an insect ten feet straight out from a fence, the return flight is equal to the outgoing flight. If, however, the insect is sighted at a forty-five degree angle with the fence, the outgoing flight is ten feet, but the return to the nearest perch, which the bird almost invariably utilizes, is cut to seven feet, a saving of three feet. Obviously the closer the insect is to a second perch the greater saving in flight. This "short cutting" along conveniently spaced perches occurs consistently in feeding so that a series of well-spaced perches in a clearing seems to be desirable.

The birds feed over grassy fields rather than barren roadways and parking spaces or corrals of the dairy. Where a bird frequently utilized a feeding area of green grass, flights from the fence were directed almost exclusively to the grassy, insect-harboring side of the fence rather than over the barren road on the opposite side. When the pair worked the area, this preference for grass-covered foraging ground was more strikingly evident.

In the green pastures of the upper canyon, the birds moved in high, direct flights, passing over territory where perches were lacking. The telephone wires connecting the two places never were used for more than a brief rest. The birds concentrated their activities in places where buildings were available for roosting. (See fig. 31.)

The presence of streams and ponds seemed to increase the attractiveness of a feeding area. Water is generally an obvious part of the Black Phoebe's ecological niche. Certainly in the nesting season water is necessary for the mud of the nest. In the fall and winter, water surface provides variety in the insect diet. Drinking was observed but once as the bird dipped its bill into a water trough and held its head up as if to allow the water to trickle down its throat. In the late afternoon running water was used for bathing. The birds would perch near the stream, preen for a time, then fly several feet upstream, drop directly into the water, and submerge the lower breast and belly for an instant. After a prompt return to the perch, shaking and preening continued. Then the dipping would be repeated until feathers stuck together before they were rearranged in the final preening.

The feeding area used for longest periods in late winter and spring was within the Botanical Garden. Three- to four-foot stakes provided the perches; these were distributed over a 100-square-foot area, covered with green herbs and grasses. In midwinter the single bird, and later the pair, worked this area repeatedly. Fifty-four per cent of the insects were taken from the fresh green leaves, mostly of *Malva borealis*. The rounded, horizontally arranged leaves, contrasted with narrow, vertical grass blades, possibly increased visibility of insects. The gulch to the east afforded a retreat on windy days. The bare willows and buckeyes provided numerous perches on both sides of the stream there.

Even in this favorable feeding area, after an hour or so of foraging, the birds would shift to open, fenced areas, or occasionally over the shrubs and trees to the pond in the northeast corner of the Botanical Garden. This pool was surrounded by shrubs and overhanging trees and was never occupied in feeding activities as regularly as the lower canyon pool had been in the fall. The water was teeming with goldfish so that insects did not accumulate on the surface. The birds sought to catch the inch-long minnows which dimpled the water surface in the evening. They were not often observed to be successful, but daring attempts to snatch these choice morsels were made. Once, when a phoebe sighted a minnow, such a desperate attempt was made to get it that the bird dipped its head in the water nearly to the eyes. When a wiggling fish was caught, it was held in the bill, and tapped against the perch in the same manner described for large insects until finally, with gulping, the fish was swallowed.

After April 22, when incubation had begun, the feeding activities of the female were restricted to within a hundred feet of the nest. The male alone continued to move about the upper canyon. Both birds had become silent, and to follow them was difficult. When the first nest was disrupted, the pair was observed for a week again foraging together, then a new nest was started and once more the female limited her foraging to the few perches near the nest. The male continued to feed near the camp, but was not so restricted as the female until after the young hatched; then both birds remained within two hundred feet of the nest. As the insects became more abundant, the birds became more restricted in their range. There was no longer the necessity of covering the large winter and spring territory.

TERRITORIAL BEHAVIOR

The upper part of Strawberry Canyon had been occupied by phoebes in the spring of 1936 and 1937, but none was found there in the fall of 1937. This region, however, was occupied in the late winter and spring of 1938. In fourteen visits to the upper canyon after August 17 there was no sign of a phoebe until the last visit on December 30.

After a single bird first appeared, the upper canyon was frequented daily for increasingly longer periods. After February 7 the two birds of the pair that was then present spent much time in the gardens in the day, although they repeatedly left in the afternoon. By February 27 the female had started a nest, and on March 2 she roosted near it. The male did not change his roost to the upper canyon until March 14, after which the territory was occupied day and night by the pair. The territory over which the birds ranged became more and more restricted until finally they stayed within a few hundred feet of the nest site.

Because of the difficulties in catching and marking Black Phoebes, it was not possible to identify for certain the bird which frequented Strawberry Pool during the fall and early winter until the roosting site was discovered on January 20. Nevertheless, it seemed that this solitary bird which frequently remained about the pool for more than three hours at a time, using essentially the same feeding and resting perches, and moving to and from the open areas of the veterinary laboratory and Stadium, was the same individual which had been observed in this lower canyon more or less since September.

Except for the brief appearance of another bird about the pool on September 24, and again on October 10 when there were several chases, I found only one bird in Strawberry Canyon until the first pairing, on January 23.

Finding the single bird was possible in the fall and winter by my recognition of the characteristic *tsip* note given in flight. The bird rarely flew twenty feet without a series of these notes. By reason of the frequency of these utterances in flights, one could easily tell, without seeing, when the bird was in flight and when it was perching. Even while perched, the bird was rarely silent for more than a few minutes. Not until mid-April, when the territory was relatively restricted and incubation had begun, did the birds become silent and difficult to follow.

In contrast to the regularity in late winter and spring, the irregularity of the bird's presence, even in the most persistently occupied territory, in the fall and winter was noted. I found it in the lower canyon pool area eight times in fourteen visits (September 12 to October 24). In spite of the uncertainty of finding the bird, it usually remained in the area from one to three hours when found. Most of my visits were made before one o'clock; the bird usually left the area before that hour.

The flights from the pool to the Stadium and the frequent disappearance of the bird in high flight, with my subsequent failure in relocating the individual, also indicated that the phoebe ranged far in early winter. Another instance of wandering was noted near Temescal Lake, Alameda County, on December 29; this individual was observed to make a deliberate, non-stop flight extending more than five hundred yards south from the lake, where it made flights from the bare branches of a tree. After a brief feeding period it flew several hundred yards farther south, out of sight over backyards. On December 2 a Black Phoebe was moving through my yard in Berkeley, although it was observed there at no other time.

The only other phoebe observed on the campus, apart from the lower-canyon bird, was one found more or less irregularly about the Life Sciences Building; it was first reported on September 29. This bird also wandered irregularly. On one occasion it was traced from the Life Sciences Building to the Engineering Building where it remained for more than an hour. Also it moved from the Life Sciences Building to Giannini Hall, Haviland Hall, and to the main library.

In view of the evidence for considerable wandering in winter, the absence of the phoebe in the lower canyon on December 30 and the bird's presence for the first time in the Botanical Garden indicated that the lower canyon bird had extended its range to the upper canyon. In subsequent visits, lower Strawberry Canyon was unoccupied when-

ever the bird was found in the vicinity of the Botanical Garden. The inference was that this bird flew back and forth from the Botanical Garden to the Stadium.

On January 20 the bird was found as usual in the upper canyon, feeding actively until 3:30 p.m. It then selected a relatively high perch (15 feet), rested five minutes, and without further delay headed down the canyon, flying about seventy-five feet high and in a straight line. It covered approximately one-third the length of the canyon before dropping out of sight. At 4:30 p.m. apparently the same bird was found feeding about the west wall of the Stadium where it remained until 5:18. It then flew under the west-side bleachers to roost. Thereafter the bird was found on each evening's observation at this roosting place. The roosting wire was found on January 25, and with the exception of one permanent shift, the bird used the same roost each night until March 14 when the Stadium was abandoned.

Droppings and pellets beneath the roost indicated that the bird had been using it before my finding it. Since the lower-canyon bird had previously been traced to the bowl of the Stadium where it had disappeared at roosting time, and since in all later observations the bird was using the same roost, the identity of this individual became certain. To all appearances it was the bird observed in the lower canyon after September.

On January 23 in the Botanical Garden, pairing of the birds was noticed for the first time; both were fluttering in and about the nest site of the preceding year and were chasing and feeding together. A careful search found the lower canyon completely deserted. On January 26 the Stadium-roosting bird moved out from its roost and remained feeding about the Stadium; by 10:15 a.m. the mate had arrived and the pair continued feeding and chasing about the lower canyon.

The Stadium-roosting bird separated from its mate early each evening and returned to the regular roosting place; the mate always roosted elsewhere. On February 7 the pair was found in the Botanical Garden during the day; by 3:30 one of the birds had disappeared; at 4:00 the remaining individual headed down the canyon, flying approximately one hundred feet high. On February 21 the pair was feeding in the upper canyon as usual; there had been no trace of the birds in the lower canyon, although the routine of roosting had been observed there the previous evening. Both birds moved about the feeding areas of the camp and Botanical Garden from 11:30 to 1:30. Then the birds were followed as they flew across the open fields to the dairy where they remained together feeding and resting until 3:45. Now the pair separated; one flew three hundred yards to the southeast; fifteen minutes later the other bird headed farther down the canyon, flying toward the Stadium, remaining one hundred to one hundred and fifty feet high until it disappeared in the vicinity of Strawberry Pool. At 4:30 the same bird, presumably, was feeding as usual in the Stadium. With increasing regularity, in thirteen evening observations from February 23 to March 11, the bird appeared from the east, usually within a half hour of the expected time.

Also in the morning the bird left the Stadium and headed up the canyon more regularly with the onset of spring. Before February 24 there was considerable delay in leaving the Stadium and lower canyon. The bird would loaf about the Stadium until its mate arrived before moving up the canyon. In all but one of the last twelve morning visits, from February 24 to March 14, the bird moved out from the roosting wire, finished its song, hesitated a few minutes in the Stadium bowl, and headed directly up the canyon. These flights were independent of weather conditions and seemed to be dominated by a strong urge to move to where its mate resided.

The mate of the Stadium-roosting bird made its last observed appearance in the Stadium on February 22 when it remained several minutes before dusk and then flew

away. On the morning of February 28 one of the birds was building a nest beneath the eaves of a camp building in the upper canyon. Then on March 2 when the Stadium-roosting bird headed down the canyon at 5 p.m., the mate followed a few hundred yards only to return to the nest, near which it roosted for the first time.

On March 4 when the Stadium-roosting bird moved down the canyon, the mate made no attempt to follow but remained perched near the nest. The bird left the upper canyon at 5:28 p.m.; I was ready and left at the same time to arrive at the veterinary laboratory in the lower canyon at 5:30; the bird came down the canyon past my position at 5:31 and passed into the Stadium. Evidently it had paused in the swimming pool area.

The female was killed by a shot on the nest on March 10; the pair had been reported together on March 9. The excessive singing and marked irregularity in the male's roost-leaving routine on the morning after the mate had been killed seemed to be correlated with the bird's urge to acquire a new mate.

A lengthened song occurred again on the following morning, March 12, but this time the male headed directly up the canyon after leaving the Stadium. It returned again that evening and again on the evening of March 13. On the morning of March 14, after the bird had left its roost, it was found alone, singing incessantly, in the upper canyon. The bird had been reported alone in the canyon on the preceding day. On the same afternoon another Black Phoebe had replaced the dead one. Both birds were feeding in the regular areas in such typical fashion that I would never have known that a substitution had been made if the dead female had not already been found on its nest. The territory for a female phoebe had been open for three and a half to four days. It seems probable that the singing and wandering of the male contributed to this rapid replacement.

On the evening of the day that the new mate appeared, both birds for the first time roosted beneath the eaves of camp buildings in the upper canyon. The lack of a mate for several days evidently had a thwarting effect on the habitual down-canyon flight of the male. He appeared reluctant to leave the newly acquired mate and roosted near the latter in the established territory.

To confirm the evidence for the identity of this male bird, the Stadium was searched on this evening, March 14, and was found unoccupied for the first time since January 20. After this first change both birds roosted in the vicinity of the camp; except for limited flights between feeding areas in the upper canyon, they remained in their established territory.

The wandering during the pre-nesting period seems to be correlated with the need of searching extensively for food during the time of year when insects are relatively scarce. In this period many feeding areas are utilized. Although territory is not strictly defined, certain areas are used more frequently than others; the bird is solitary and wanders about more or less irregularly. After pairing and with the approach of spring the birds gradually become more localized until finally the territory becomes restricted to the surroundings of the nest site.

PELLET-CASTING

On January 26, twelve pellets composed of indigestible remains of insects were found among the droppings beneath the roost in the Stadium.

The roosting perch chosen was a horizontal telephone wire. The bird faced the wall on the west or north. It never faced the open area to the south or east, but always turned its head away from the light. Apparently the bird rarely moved along the roosting wire in the night. Only twice was there shifting after the initial roosting position had been

assumed. One time the bird moved about fourteen inches; the next time about eighteen inches.

The spherical or cone-like form, the diameter from 4 to 9 mm. (usually 7 to 8 mm.), and the absence of white material, distinguished pellets from excrement. (See fig. 33.) The droppings were elongated, white-coated, usually 2 to 3 mm. wide, and frequently consisted of little more than a white splash with a narrow, dark-colored core of fragments of insects. Under the microscope the dark portions of the excrement appeared to be the same general type of insect remains as the pellets. The fragments in the pellets had greater range of size than those in the droppings, but frequently there was no noticeable difference. The pellets contained relatively little moisture; two pellets ejected in February consisted almost entirely of insect cocoon.

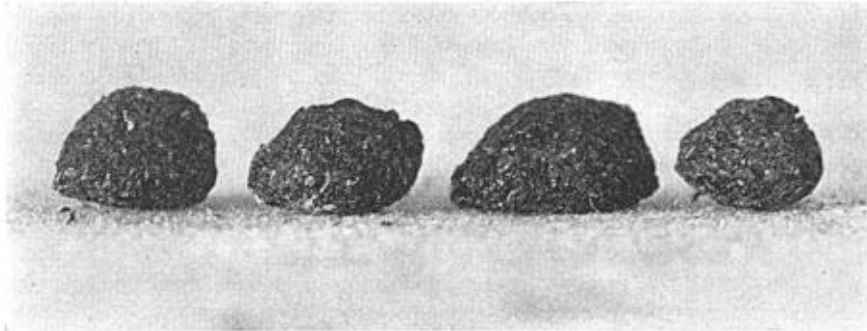


Fig. 33. Pellets composed of insect remains picked up beneath roost of Black Phoebe.

Fourteen pellets contained fragmented beetle elytra (the most numerous item), femora and tibiae (including joints), parts of compound eyes, simple eyes, spurs and spines, setae, cranial parts, strings of woody material, and pubescent soft palps (entire). The color was predominantly black and brown; occasionally a bright blue fragment appeared.

The bird finally changed its roost to a wire perch about fifty feet south of the first roost. The new roost was the only other wire perch in this part of the Stadium; the wire was forty feet above the stairs, approximately two feet from the ceiling, and slanted downward. Apparently the nearness of the ceiling and the great height from the stairway below lent a "feeling" of security not quite satisfied on the old perch in the presence of disturbing conditions. The numerous near-by rafters were never chosen as roosts since they afforded no perch "holds," although they were favorably located.

In the evening of February 28, which was dark and rainy, the bird faced north on the perch; the next morning it was in the same position. Even though the bird had faced in such a direction that pellets would have dropped on the stairs below, none was found there. They may have been washed or blown away, as pools of water were on the steps and the night had been windy, but more probably no pellets were regurgitated that night, since the day before had been dark, with rain in the evening, and feeding probably was restricted. Previously, during the rainy spell included in the period from February 9 to February 14, when the horizontal roost was being used, only one pellet was found in a period of five nights. In the period of rainy weather from March 2 to 12 only three pellets were found beneath the roost even though the bird had been observed to face north on the roost in each of eight observations.

Pellets then were not cast every night. The indication is that pellet-casting may be less frequent in rainy weather. The cloudy and rainy days possibly cause large, hard-shelled insects such as beetles to remain hidden during the day. As a result the phoebe not only probably gets less food, but must depend more upon the soft-bodied gnats and tiny flies which are active between showers. Great numbers of these insects apparently were taken by vertical, upward flights over the bleachers of the Stadium during and between showers in February and early March. These soft-bodied flies would hardly furnish enough indigestible débris for the formation of a pellet.

The maximum number of pellets found for one night was two. This happened three times, and in each instance one pellet was about one-third the size of the other. Usually one pellet was found. Pellet-casting was not peculiar to the male studied at the Stadium. On April 2 a pellet was found beneath the roost of the female.

Pellet-casting was not entirely confined to the roosting period. One pellet was found out in the open far from any roosting place. Also on one occasion after the bird had been feeding for half an hour, it perched on a wire ten feet from me, tilted its head up and down several times with the mouth open, and then with no sign of distress discharged a large pellet (8 mm. in diameter) which I recovered. The bird then continued its normal activity. Evetts (British Birds, vol. 25, 1932, p. 332) has made the following statement concerning certain experiments with captive European insectivorous birds. "The birds turned dull and comatose for periods varying from ten minutes to 2 hours before discharging the pellets." This interruption of activity was certainly not in evidence with the Black Phoebe. A comatose condition before or after pellet ejection may vary with the species or may be related to conditions of captivity.

It was not possible to determine frequency of daytime pellet-ejection. It seems likely that the riddance of indigestible material periodically during the day would speed up digestion. It is possible that this habit occurs regularly in other kinds of Tyrannidae. Ashbrook (The Blue Book of Birds of America, 1931, p. 18) in a brief discussion of the Say Phoebe (*Sayornis saya*) makes the following statement without comment: "... It ejects from its mouth in the form of pellets, the hard indigestible parts of its food."

LIGHT INTENSITY AND ROOSTING

Although degree of light intensity undoubtedly determines the strength of the urge to move to the roost in the evening, a complex of outside factors is evidently instrumental in delaying or hastening response to darkness. However, after a certain degree of darkness is reached, the roosting urge is irresistible. By measuring the light intensity at roosting time it was apparent that the bird did not always move to the roosting wire at the same intensity. Variation was noticeable even without reference to the meter. The roosts used were distinct from all daytime perches; hence, I knew at once when the bird moved on or off the roost. The Weston exposure meter, model 650, was exposed to maximum skylight each evening immediately after the bird moved to the roost and immediately after leaving the roost in the morning.

To avoid disturbing the bird, the same positions for observation were taken each morning and evening and the bird was watched through a glass. The dial of the exposure meter read in foot candles per square foot. It usually took approximately two minutes in the evening to lower the reading one unit. There was of course variation depending on the weather.

A graph was made representing the male's roosting time, beginning on February 9 and ending on April 2; it showed considerable fluctuation in light from day to day. Although low readings occurred on cloudy and rainy evenings, general weather condi-

tions were not sufficient to explain the fluctuation. For example, on the cloudy evening of February 14, when it had been raining continually for eighteen days and insects were scarce, the bird did not move to the roost before the exposure meter read 1.4, a low intensity. The next day, February 15, was clear, and the bird fed in regular fashion on the lighted west wall of the Stadium; it then moved into the roost apparently satisfied, at 10.9. It seemed that the rain and its effect on insects had caused the first delay of roosting. Nevertheless, on the drizzling evening of March 5 which was preceded by clear as well as rainy days, the bird moved to roost at a reading of 19.5. The next evening, March 6, was again wet; the bird continued to feed until a downpour of rain began, then flew to the roost as if stimulated by the drenching; the exposure meter read 10.5. The next evening there was no rain, although the day had been wet and cloudy, yet the bird went to roost at a reading of 19.5.

The factors which caused an extension of the feeding to a noticeably darker period one evening and for a much shorter period the next evening were evidently much too special and varied to be completely correlated with general weather conditions. The length of a period of unfavorable weather as well as the intensity of a brief storm might affect insect abundance. The amounts of energy used in feeding on windy and rainy days and in favorable days might have direct bearing on appetite and fatigue, and thus cause variation in the response to decreasing evening light.

If external factors cause this fluctuation in daily response to light, one would expect greater regularity in the readings for roost-leaving where the bird's physiological condition and the weather at a sheltered roost are more uniform than the corresponding conditions in the daytime. Tabulation of the results obtained showed that the fluctuation in light readings when the male bird moved to roost in the evening was greater than the lower and less varied readings when the same bird left the roost in the morning. Although fewer readings were available for the female, the results with the exception of one reading were similar. The male as well as the female moved from the roost at a much lower and less varied light intensity than that which prompted either to move to the roost in the evening.

Both birds reacted to outside disturbance by the observer in the morning before leaving the roost quicker than in the evening when already on the roost, although they were extremely sensitive at either time. In the morning, it was impossible for me to pass within fifteen feet of the bird without causing it to fly. Yet in the evening I could pass at the same distance without causing it to leave.

The female differed considerably from the male in sensitivity to light change. She went to roost from ten to twenty-six minutes earlier than the male and responded to the morning light from five to fifteen minutes later. This situation allowed me to take readings for both birds. Whether the female's longer roosting period was a sexual characteristic or merely an individual difference is not certain, for other pairs were not available for comparison.

Both birds were exposed to essentially the same environmental conditions; yet when the corresponding morning and evening lights at roosting or roost-leaving were compared, the fluctuations for the male were not paralleled by the fluctuations for the female. An evening of late roosting for the male might be an early one for the female.

From this evidence it might be assumed that outside factors influenced each bird differently. Slight differences in the physiological condition of the two birds would perhaps account for variation in the strength of the roosting urge under the same stimulation. Or, since even the maximum range of variation in readings usually came in less than fifteen minutes, it might be inferred that the bird moved by chance to or from the

roost within this range of light intensity. Yet if the factor were chance, there would be no explanation of the times when the bird flew to the roost, remained several minutes, then flew off again as if the light were still too intense. For example, the female moved to the roost at a reading of 22.5, remained a few minutes and moved out again to feed. After six minutes had passed, and at a reading of 15.5, she moved back to the roost and remained for the night. The bird did not roost at 22.5 on this evening, yet on the previous evening it had moved permanently to roost at a reading of 20.5, and several days before that at a reading as high as 26. Since late feeding was confined to the vicinity of the roost, the nearness of the roost to the bird at any particular moment was evidently not an inducing factor.

The roosting routine of the female was interfered with by the male on several occasions, when he chased her from her roost after she had apparently settled for the night. In one instance the male attempted to roost near the female and caused the latter to fly out several times before becoming permanently settled.

ROUTINE OF LEAVING AND MOVING TO ROOST

During winter when the male was roosting in the Stadium, it was relatively late in beginning its morning activity, being quite undisturbed by the early loud voices of the Western Robin, Brown Towhee, Spotted Towhee, Red-shafted Flicker, and White-crowned Sparrow which were heard more than twenty minutes before the Black Phoebe responded in any way to the light. The dark roost among the Stadium rafters, in contrast to the lighter condition outside, was evidently a factor in prolonging the roosting of the phoebe.

With the gradual increase in light at dawn the bird responded by the following routine of morning activities. When the bird was first clearly visible to me with an opera glass, and usually several minutes before light registered on the meter, the bird huddled close to the wire with its head pulled in, tail motionless and slightly drooping. As the outline of the bird became more distinct, the head began turning toward the light. When the bird was facing a wall, the body also turned on the wire. A soft, barely audible *tsi* usually was given, the tail fanned out in a brief downward tilt, one or both wings were stretched, and the head continued to extend out in peering movements toward the light as if to accommodate the eyes to the rays which came in through the passage-ways. Without further warning, a silent, bat-like flight would be made, fifty feet or so along the inside of the wall, where the light was the same as that at the roosting place. Then with an abrupt turn, one of three "favorite" shelves extending from the Stadium wall was selected for perching.

At the same time, a few soft *tsip* notes were audible; then the voice shifted to the clear and distinct *tieur* which gradually increased in frequency and volume until ten to thirteen notes per fifteen seconds had been reached. This *tieur*, which invariably preceded the song, resounded loudly for about a minute, then the bird suddenly burst into full song, *teehee teehoo*, two syllables of rising inflexion, an interval, then two syllables of falling inflexion and an interval. This song continued incessantly and energetically for several minutes. Sometimes the song was continued again after a few seconds of rest, but almost invariably it dropped to a series of *tieur* notes which in turn were followed by the common *tsip*, indicating that the song was over and that the bird was ready for feeding or mate chasing.

The regularity of the song in the early morning routine of the male is suggested by its occurrence on twenty-six out of twenty-seven mornings from January 26 to April 3. The singing appeared to have connection with early pairing (on January 23); it was not a part of the roost-leaving routine after the onset of summer.

In the Stadium in late February and early March, and later in the upper canyon roosting places, this male began notes preliminary to singing while on the roost. The first soft *tieur* notes would gradually build up to a level of ten to fifteen utterances per fifteen seconds. Then before the bird shifted to the song it would fly out and perch nearby; it would then immediately shift from the *tieur* into full song. The regular turning of the head was strikingly effective in making the same syllable of the song alternately loud and soft; this was an effective means of throwing the voice over a wide range of territory. One use of the song as a means of attracting a mate has already been mentioned in connection with the increased singing after the death of the male's first mate. This extended morning song period continued after permanent residence of the bird in the upper canyon territory where the song appeared to function as a territory claim long after the new mate had been acquired.

The phoebes gradually narrowed their range of foraging to within a short distance of their respective roosts with the approach of late evening. When the male had a roosting place in the Stadium, it gradually restricted its feeding activities to two or three shelves just outside the roost where it continued to voice the regular *tsip* note; then without warning it would dart through the open archway to the regular roosting wire, sometimes making a pursuit flight on the way. When on the roost the *tsip* would resound loudly as if to invite the immediate appearance of any lurking danger before the approach of complete darkness. Following the series of *tsip* notes, there was almost invariably a shift to the *tieur* which continued in gradually decreasing volume and frequency, until the utterances were scarcely audible; finally there was complete silence.

Except for absence of song, the voice at the close of the day died away in the same fashion as it gradually built up in the morning. The voice changes seemed to reflect the gradual waning of the bird's alertness as it settled for rest in the evening. All head-turning and tail-movement stopped; the bird became completely motionless, a condition never observed in the daytime.

In the upper canyon this bird moved to the roosting site in essentially the same manner as described above. The earlier roosting female, on the other hand, was again distinguished in the evening by its complete lack of voice when moving to its roost. Although *tsip* notes were given during evening feeding, the voice immediately stopped as this bird moved to the roost where it assumed the motionless roosting position.

HABIT FORMATION FOR SPECIFIC ROOST SITES

Both birds roosted in the upper canyon for the first time on March 14. The birds on this evening were chasing each other and moving on and off several roosts. On March 17 the female had moved in on the roost beneath the eaves of house no. 7; the male moved in with her but soon came out again; he made three attempts to return but each time was rebuffed by his mate. Finally the male moved to house no. 14 where he roosted.

The next evening, March 18, both birds moved in together again at the same roost at house no. 7; the male was forced out again; it selected a new roosting place nearby, but did not use the roost at house no. 14; but by March 28 a change had been made to house no. 1 which continued, with one exception, to be used until April 24. The exception occurred on March 31 when the male again attempted to roost next to the female; he was rebuffed and selected, for this one night, a temporary near-by roost (house no. 6).

On the night of April 24 I frightened the male from its regular roosting place (house no. 1). It flew off in the dark and did not return the next evening. But by April 31 it was back again at the same roost. On May 18 I once more frightened the bird away from this roost after dark. This last scare caused a longer absence from this otherwise desirable roosting place. There was no evidence that the bird returned until June 11,

after which date it continued to use this roost regularly. The temporary desertion of this habitually-used roosting place after a single disturbance indicated extreme sensitivity.

As with the male, the female also tried several roosts before forming the habit of using a particular one. On March 21, the day following the preliminary use of house no. 7, both birds were attempting to catch fish in the pond in the northeast corner of the Botanical Garden. With the approach of darkness the female became motionless on a horizontal willow twig from which it had been watching for fish. The male being less sensitive to darkness continued his activity for a few minutes, then flew directly back to the camp to roost. Meanwhile the female remained motionless. She was found in precisely the same position at dawn of the next day when she was observed to fly directly back to the camp to join the already active male.

On March 24 and 25 the female again roosted in the camp, but both times at house no. 12. On March 26, as on the 21st, this bird remained to roost near the pond after feeding there. On March 28 the female again used the roost at house no. 12, and continued thereafter to return to this roost until some time between April 4 and 12 when it began to sit on the nest on house no. 14.

Both birds had taken nearly the same length of time to form the habit of returning to a roosting place. Both began roosting in the upper canyon on March 14. The male selected a permanent roost by March 26, the female by March 27. The advantage to the species in forming the habit of returning to a secure roost is in unfavorable weather. If a heavy storm had occurred when the female roosted temporarily on the exposed willow limb, the bird might have been drenched. At least it would have been forced in the dark to seek shelter. Hence the bird's chances of survival were fewer before the habit of returning to a sheltered roost was strong.

PAIRING AND NESTING

Except for two brief appearances of a second phoebe, on September 24 and on October 10, the bird in lower Strawberry Canyon was solitary in fall and early winter. Both times, the resident phoebe reacted to the intruding bird by rapidly chasing it and uttering a *tweedle-deedle-eeek* in each upturn of the darting pursuit. Afterwards the birds parted and resumed their respective perches. Both times the second bird disappeared after a few moments; immediately the residing bird moved to a high perch and sang energetically for several minutes; it then resumed the regular routine of feeding. This chasing was similar to that in the initial pairing and possibly represents declining of the mating urge in the fall.

In early fall the *tsip* note was frequently replaced by the drawn-out *tieur*. This call is evidently associated with the waning mating urge, since series of these utterances were heard irregularly but frequently (sometimes for several hours at a time) until after October 16; then with the exception of three on November 6, the *tieur* was entirely replaced by the regular *tsip*. The *tieur* was not heard again until the pairing on January 23, after which it was used frequently by both birds.

When the pair became separated by more than three hundred feet, it was common to hear this *tieur* given by one with the apparent effect of bringing the birds together. Also this *tieur* almost invariably preceded the regular song, which was relatively infrequent except during the roost-leaving in the mating season.

Since the bird in the Botanical Garden had been alone before January 20, pairing occurred first on January 23 or a day or two earlier. Both birds were then moving on and off the same site where a phoebe's nest had been built and removed in the previous year. Each bird peered at the nest site, then moved away to feed. Frequently the birds ap-

proached each other attentively, uttering a soft, wheezy sound; then without warning one would pursue the other closely for several seconds in a darting chase. The pair then parted to resume their respective perches, essentially the same as in the fall.

Each morning after the birds had left their roosts and had finished singing, there was much chasing and maneuvering about the nest site. The pair would then move to nearby areas to feed. They then usually remained from twenty-five to fifty feet apart, rarely separating more than two hundred feet. The pair wandered about considerably in the canyon early in the pairing season. The tendency to become localized grew stronger with the onset of summer. On the drizzly morning of February 28 the female was building a nest; gobs of mud were plastered around an electric wire where it pierced the wall under the protecting eave of house no. 14.

The mud and bits of dry grass were gathered from a stream bed sixty feet west of the nest. The bird continued to make trips, returning every few minutes with mud which was carefully pressed against the wall. The building was entirely done by the female; the male remained near, feeding and perching, and frequently flew off to the feeding areas of the Botanical Garden. Occasionally it would burst into song while perching near the nest.

When the nest builder arrived at the stream, it would pause on a willow branch, peer about for a likely spot, then flutter down on the leaf-strewn, muddy bed of the stream. Here it would take from six to thirteen pecks at the mud and pieces of dry grass, then fly quickly back to the nest. This work would last for ten to fifteen minutes; then feeding would be resumed, and the bird would move away to join its foraging mate.

By March 2 the nest was about half finished, but no building took place that afternoon. Instead, the pair moved about in feeding. On March 4 the nest appeared nearly complete; it remained in about the same stage until March 11, the date on which the female was found dead on the nest. The bird had been working on the nest just before it had been killed; this was evident from the mud-covered bill. The nest was almost complete except for a small hole, possibly knocked out by shot from an air rifle. This nest had been under construction for more than a week, indicating a less urgent drive to build than was present later in the season.

On March 14, after the male had been without a mate for three and a half days, another female arrived. Mate chasing became more frequent than ever; both birds remained in such close association that for a few evenings the male attempted to roost on the same wire with the female. During the day the pair continued to feed and range over the same feeding areas used before the substitution of the new female. It seemed that the male influenced the ranging of the newly acquired mate, since this female began to fly in and out of the ready-made nest and moved back and forth over the same feeding areas without any noticeable departure from the routine of the previous mate.

By April 9 this nest had become slightly detached from the wall; it was securely fixed in place by the new female. More lining was added, but the small hole in the bottom was left unrepaired. This new mate substituted for the lost one even to the extent of using the ready-made nest. Meantime both birds had become surprisingly silent; rather long quiet periods had been noted on the part of the female for several weeks, but by mid-April both birds had ceased to give the *tsip* note in flight and were silent for long periods while perched. Occasionally a few *tsip* and *ticur* notes would be heard but more frequently the pair would feed in complete silence. This silence made them inconspicuous and as a result they became difficult to follow. They began to focus most of their feeding activities about the nest. The male still wandered about in the Botanical Garden, but the female remained relatively close to the nest.

On April 12 the female was on the nest; she remained perfectly still, moving off for a period of quiet feeding. The same was observed on April 13, 16, and 17; as yet no eggs were laid. By April 22, five eggs had been laid and the female was incubating. When leaving the nest, she would drop silently to within a few feet of the ground and glide inconspicuously away to perch and feed. Little sign of distraction was exhibited at my approach until after the eggs had hatched. The male continued to move to the near-by feeding areas alone, but returned to his regular roost and apparently took no part in incubation. It was common for the female to leave the eggs for as long as thirty to fifty minutes at a time, but she did not range, even in foraging, with the male.

On May 9, seventeen days after the last egg was laid, one egg hatched. The next day, May 10, two more eggs had hatched; the young were orange and had traces of neossophtiles on the head, back, and wings.

On May 11, one dead nestling, one injured nestling, and two broken eggs were found on the ground below the nest; the third nestling could not be found. The injured bird was replaced in the nest but was dead the next day. The female deserted and again ranged with the male. Both birds, however, continued to be silent. The stomachs of the two fledglings contained mostly soft dipterous debris, including small compound eyes, parts of legs, and soft body parts. There were no wings or other large indigestible fragments.

By May 18 another nest was being built. This new one was plastered beneath the south eave of house no. 7, the base being supported by a wire. A stream of water was running below the nest. The construction again was apparently entirely by the female; the male merely perched and fed near-by, wandering considerably more than the female. The latter was now shy and appeared reluctant to continue work when I came within a hundred feet. Instead of collecting material from banks of the stream immediately below the nest, the bird flew more than two hundred feet upstream to get mud and grass. Apparently this extra exertion was necessary to obtain mud of proper adhesive character.

On May 22 the nest was lined with soft, dry grass and ready for eggs. Four days later, on May 26, four eggs were found, and another on May 27, when incubation had begun. The female remained near-by, completely silent, when the eggs were inspected. On the evening of June 10 the eggs were still unhatched, but the next day, June 11, fifteen days after the last egg had been found, two nestlings were completely hatched and a third was breaking through its shell. The female, now greatly distracted at my approach, darted at me with loudly snapping bill. The male also was showing greater attention than ever before. Next day the fourth nestling appeared; the remaining egg failed to hatch. Both parents now became extremely noisy at the slightest disturbance; neither strayed far from the nest, although the female was far more attentive. It was impossible to observe the feeding, but both parents moved to and from the nest frequently during the day, apparently bringing food.

On June 25 the four fully feathered nestlings were banded with Biological Survey bands, numbers: 38-8447,-48,-49,-50. Both parents now remained almost exclusively within seventy-five feet of the nest; the insect supply was rich both in the air and on the dry grass and stream bank. On June 30 the young birds were nearly grown, and the nest was conspicuously overcrowded. By July 1, twenty-one to twenty-two days after hatching, the nest was deserted. Parents and young were feeding together in the near-by Botanical Garden. No longer were the parents silent, instead the *tsip* was voiced continually as if it were a means of keeping the yet dependent young together. The voices of the young birds were distinctly higher in pitch than those of the parents. Although

the young were successfully taking slow-moving butterflies and other easily obtained insects, they continued eagerly to accept the morsels brought by their parents.

On July 2 both parents were found noisily feeding near the empty nest; they were engaging in numerous mate-chasing flights. Two of the young birds made their appearance from time to time and were fed, whereupon they separately moved away. The other two birds could not be found. The parents continued to be together, loudly voicing their presence, but not following their offspring for more than a hundred feet. Already the young birds ranged independently about the feeding areas.

On July 7 the four young phoebes were together along the Botanical Garden fence. They were actively foraging; their voices could no longer be distinguished from those of the parents, one of which was feeding near-by. At my approach they scattered to various feeding areas within the Garden.

On July 16 three young and one of the parents were again feeding together over a grassy area in the garden. The young birds were tapping their insect food against the perches in the same manner as that already described for their parents. Although they appeared then to be fully grown, an occasional morsel was accepted from the parents.

San Francisco, California, February 6, 1939.

FALL WANDERINGS OF CLAPPER RAILS

By ROBERT T. ORR

Records of Clapper Rails (*Rallus obsoletus*) wandering from their normal environs in the fall and early winter are becoming so numerous as hardly to justify the publishing of further instances. Linsdale (Condor, vol. 38, 1936, p. 216) and Wythe (Condor, vol. 39, 1937, p. 44) record several dead individuals of this species found in Berkeley and Oakland in the months of September and October. The Gull for November, 1936, March, 1937, and December, 1938, lists many other records of occurrence of Clapper Rails in unusual localities in the San Francisco Bay region in the fall of the year. However, certain additional information obtained relative to the adaptability of Clapper Rails seems to deserve comment.

We normally look upon the California Clapper Rail as a very restricted race, resident in the salt marshes of San Francisco and Monterey bays. In fact, all four races of *Rallus obsoletus* are extremely restricted in range and habitat. In central California the species is associated with salt marshes and sloughs bordered by extensive growths of pickleweed. When, therefore, members of such a species are observed to survive and carry on their normal activities for a time in environmental surroundings totally different from that to which they are accustomed, such information becomes important from the viewpoint of specific adaptability.

The presence of a Clapper Rail in the immediate vicinity of the California Academy of Sciences in Golden Gate Park, San Francisco, was first called to my attention on November 25, 1938, on which date one of the staff mentioned seeing an individual of this species on the previous day next to the Simpson African Hall. On inquiry I discovered that park gardeners had seen this bird daily, since about November 15, in this immediate vicinity. I was personally able to make almost daily observations upon it until December 5, 1938, after which date it was no longer seen about the Academy buildings. On December 2, one of the gardeners reported seeing two Clapper Rails, one