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NOTES ON THE BEHAVIOR OF CERTAIN CAPTIVE YOUNG FRINGILLIDS

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AIDED by a generous grant from the Museum of Zoology of the University of Michigan, I spent the summer of 1940 at the Edwin S. George Reserve, in Livingston County, southeastern Michigan, continuing my research on the plumage growth and molts of certain North American birds. During August and the first half of September my principal task was the rearing of twelve young fringillids—three Vesper Sparrows, four Field Sparrows, three Cardinals, and two Indigo Buntings, whose juvenal plumage and postjuvenal molt I wished to study. Scarcely had I begun the feeding, weighing, and measuring of these when I realized that here was an unusual opportunity to observe and compare the behavior not only of several individual birds but of four more or less closely related genera. The following paper presents the more significant of my findings.

Pooecetes gramineus

Vesper Sparrow

The first of my charges was a twelve-day-old Vesper Sparrow, discovered August 2 in the middle of a big field. Motionless under a mullein leaf where its parents had been feeding

it, the little bird made no frantic rush to get away from me, did not squeal when I picked it up, and on its way to the laboratory gave only an occasional chirp from the darkened collecting creel in which I carried it. It was in perfect condition save that its left hallux pointed forward with the other toes, robbing that foot of most of its grasping power.

At the laboratory it made no attempt to get away or hide, exhibited no fear of me or my hands, but would not eat of its own accord. If a grasshopper were placed near it, it looked intently at the insect but made no attempt to pick it up. By moving a grasshopper about its head, it could sometimes be induced to strike out with its beak, but all feeding those first two days had to be done by main strength, so to speak, by holding the bird firmly in one hand, prying open its jaws, and sticking grasshoppers down its throat with forceps. Its only call note was a low, rough "churr," unlike any adult call note with which I am familiar. Between feedings it was silent most of the time. It did not hop about much and made no attempt to fly.

On August 4 (when the Vesper Sparrow was approximately fourteen days old) a fully fledged young male Cardinal was captured. This bird was so tractable that I let it hop and fly about the tables and chairs of the laboratory. Its cage was near the small screen-wire cylinder in which the Vesper Sparrow was kept between feedings. In the early afternoon, only a few hours after it had been captured, the Cardinal happened to flutter toward and on the Vesper Sparrow. The smaller bird squealed as if frightened or annoyed, opened its beak as if about to bite, then suddenly began to flutter its wings, stretched its head toward the passing Cardinal, and begged loudly for food. Not once during the two days of its captivity had I induced it to do this through my several somewhat awkward coaxing and enticing devices. The hunger cry I instantly recognized as that of the young Vesper Sparrow I had reared in 1936—a distinctive, harsh, almost belligerent "chu-eer." In giving the cry the bird did not point its bill upward, as a young bird in a nest might be expected to do, but

forward. From this time on I had little trouble in feeding it. When the bird became hungry it gave a loud, unequivocal signal for food. When I brought it a grasshopper it opened its mouth wide and begged, but never came forward, invariably backing away instead, sometimes quite rapidly and straight off the table. This habit apparently is characteristic of the species, as I was to learn later when rearing two younger birds.

The chance blunder of the Cardinal that induced the Vesper Sparrow's normal hunger cry strikingly changed what might be called the latter's whole mental attitude. It now was relaxed rather than resigned in manner between feedings; it began to play and after feedings indulged in vigorous stretchings and "calisthenic" exercises. There was a full stretching of one leg back of the body; then of the other leg; then of one wing, backward; then of the other wing, backward; then of the two wings over the back, archangel fashion; then a standing high on the legs, in which the bird sometimes lost its balance.

After stretching, the bird ran. It had a sort of personal territory near the window, an area about three feet long and two feet wide, in which it frisked when not in its cage. It could have stayed on the grass- and sand-covered paper with which its cage was floored, but it preferred to move out on the smooth masonite table top, to run the full width of the window, from one side to the other, stopping itself by lifting a wing but never failing to skid a little because the masonite was smooth. There was something very like military drill about the whole process of stretching and exercising. I had abundant opportunity to observe it for it happened after virtually every feeding, from forty to sixty times a day.

After the stretching and running came a period of complete relaxation. The bird chose a favorite spot, squatted, flattened out, and dozed. For this the inside of the cage was preferred. Here presumably it felt safe, everything about it being perfectly familiar. When given its own way it invariably squatted hard against the screen wire, so hard that certain feathers stuck through, and always on the side away from the

window. The cage was only about eight inches in diameter, a foot high, and open at the top. The bird never attempted to fly out and accepted the fact of its close confinement as if that were what might be expected in a well-ordered life.

While dozing the bird flattened out noticeably, sometimes lying on its side rather than on its belly. Now its measured breathing could be observed. The feather tips slipped silently back and forth, the folded wing tips moved outward and inward ever so slightly, the tail tip went up and down with every breath. Usually, the eyes were half closed. Frequently, a low whisper song was uttered, a delightful sound to hear, for it signified that all was well.

On August 6 I brought to the laboratory two more young Vesper Sparrows, six-day-old siblings, which I had been guarding zealously. The older bird paid no attention to the newcomers at first, but, later, when they refused to stay in their nest and began running about, it came with a rush whenever they were being fed, did its best to intercept food intended for them, wriggled between them, tried to burrow under them, and often had to be removed. It learned to get out of its cage by the simple device of a jump and a flutter. Whether hungry or not it was present at every feeding of the younger birds. If, by some chance, one of these hopped on it, it squealed in annoyance, sometimes sitting back on its short tail with its feet kicking frontward in something suggestive of a tantrum.

From August 7 to 10 this bird preened vigorously, but stretched only occasionally. Presumably, full body growth had been reached and attention was now directed toward the unsheathing of the incoming feathers. All three birds were playful, particularly the younger two, who romped after their exercises, chasing each other about boisterously, but usually confining their activities to the space near their particular window.

The oldest bird now began taking dust baths and devoted much time to nibbling at grass stems and pebbles. It was not yet eating by itself, however, and it apparently could not crack seeds in its bill.

I noted that the oldest bird was, from the first of its captivity, startled by unfamiliar sounds. At these times it became suddenly rigid in attitude, and its eyes became big and round.

Toward evening all three birds were unusually active. Not interested in food, they nevertheless scratched and pecked a good deal, walking or running about the cage with bodies trim, necks long, and eyes large. The two younger birds always slept side by side, heads pointed in the same direction, and usually against the screen wire or close to their sand box. Not once did I find them with heads tucked under their scapulars, though I am not sure that I ever saw them really asleep. When, later in the summer, all my birds lived together on a large screened porch, the three Vesper Sparrows usually roosted close together, side by side, heads pointed the same way, squatting against a box or the wire of one of the cages.

Spizella pusilla
Field Sparrow

The first of my four young Field Sparrows I found by itself in a raspberry tangle at the side of a road on the Reserve on August 7. It obviously had recently left the nest and was, presumably, about ten days old. Though difficult to manage the first day, it became much more tractable on the next, and fed well. I kept it in a screen-wire cylinder about eight inches in diameter and a foot high. Its perch therein was a tripod of twigs.

The other three were a full brood brought to the laboratory in their nest on August 16, when about five days old. They were not well feathered, and my principal reason for bringing them in at such an early age was that I feared their nest (in a tiny oak only a few feet from a much used path) would be destroyed. Small though these babies were, all tried to jump from the nest simultaneously as I lifted it from its moorings. They settled down peaceably when covered with the hand, however, and made no further attempt to leave until about twenty-four hours later. On August 17 they all sprang from the nest, hopped and fluttered about for fifteen minutes

and, though replaced individually and collectively several times, refused to stay in it.

On August 19 the oldest bird took its first bath in water. It was now about three weeks old. Its rectrices (about 42 mm. long) were far from full grown, though its remiges appeared to be almost free of their basal sheathing. It was not yet eating by itself, though it nibbled at grasses and may have swallowed bits of gravel occasionally. It was mildly interested in the three younger Field Sparrows, sometimes perching on their cylinder and cocking an eye at them, but their occasional fits of panic did not perturb it in the least.

All the young Field Sparrows held their heads up (never backing off as did the young Vesper Sparrows) when receiving food, and obviously preferred to be fed while perched on a twig or on the rim of their cylinder. Several times a day they had fits of extreme restlessness. At the same instant all three would spring from their tripod outward to the screen wire where, squealing and fluttering, they would climb to the rim and fly off. They refused food at such times and acted as if they were terrified; but so far as I could discover no certain thing (such as a loud noise or a human being suddenly passing the window near them) caused the panic. All three birds were, presumably, well fed and content. Everything in the laboratory was, so far as I could see, about as usual, when suddenly one bird would squeal, the other two would cry out, all three would jump and, squealing as if pursued by an enemy, flutter up the cage. If, at the top of the cylinder, they encountered a lid of some sort, they continued to flutter and bash themselves against this until, exhausted, they fell to the table top.

By August 29 the three siblings (now about eighteen days old) were beginning to pick up and run through their bills bits of grass and grains of sand. They flew about briskly, sometimes chasing and pecking at each other, but they had no definite play period or "setting-up exercises" comparable to those of the young Vesper Sparrows.

They preferred to roost outside their cage. If obliged to stay inside they went to sleep high on the twigs, never on the

bottom of the cage. Two of them roosted side by side as a rule. The other (as did the bird first captured) roosted by itself. Asleep, they were fluffed up considerably, and their heads were stuck into their back plumage.

When they were fully fledged they showed reasonable fright at times. Whenever a Blue Jay screamed near the screened porch in which they romped they crouched, motionless and round-eyed, for as much as ten seconds. Assured of safety their eyes narrowed, their heads moved slightly, and normal activity was resumed.

All four Field Sparrows continued to beg for food long after their flight feathers were full grown. From their twentieth day the three younger birds bathed regularly in water. Liberated in mid-September, they continued to spend most of their time about the laboratory, sometimes flying suddenly down from roof or tree to beg for food.

Passerina cyanea
Indigo Bunting

The first of my two Indigo Buntings was captured in a clump of dogwood at the edge of a marsh, not far from the Camburn Laboratory, on August 3. Its tail was about 10 mm. long, so it may have been out of the nest as much as a day or more. The gray skin about its eyes was bare. It was exceedingly wild and untractable on August 3, but settled down and fed well the following day. It ate huckleberries, grasshoppers, and meal worms. One of its hunger cries reminded me a bit of a Scarlet Tanager's "chip-urr." By August 5 it had become accustomed to laboratory routine but, like the young Field Sparrows, was subject to fits of restlessness.

On August 5 I brought to the laboratory a nest with two more young buntings, the third of the brood having been banded and liberated. Neither of these new youngsters would stay in the nest, and the smaller, at its sixth attempt to get away, killed itself in striking the floor.

For two days my first captive bunting paid no attention to the newcomer, but by August 7 a sort of understanding be-

tween the two was reached, the older bird taking a faint proprietary interest in the younger, and obviously seeking its company in preference to that of the young Vesper Sparrow of about its own age.

Both buntings were unmanageable at nightfall. Though quite tame during the daytime they became unaccountably fractious and difficult to catch. In early September, when our "sparrow ranch" was in full swing, the twilight activity of the two buntings was noticeable. All Vesper Sparrows and Field Sparrows might be "tucked in" for the night, but the Indigo Buntings still flitted about, chirping loudly. It may be pointed out that adult male buntings, in giving their evening flight songs, may continue to perform so late that they are scarcely visible in the near-darkness.

The captive buntings never roosted side by side. If kept in their cage, they eventually went to sleep high on one of the twigs, with their heads stuck into their back plumage.

In mid-September, when all the captive fringillids were given the freedom of the large screened porch at the rear of the laboratory, the two buntings were obviously the dominant birds of the twelve. They would sometimes chase the Field Sparrows fiercely, and frequently asserted their superiority by biting or pulling at a toe. At this the Field Sparrows squealed in annoyance, but rarely fought back. The Indigo Buntings tweaked the toes even of the Cardinals, and there was something comical about the way in which the great-beaked birds slowly opened their mouths in protest against the slim, small oppressors, yet never actually bit in self-defense.

Richmondena cardinalis
Cardinal

The first of my three Cardinals was a young male in mixed plumage caught on August 3. It was at least three weeks old, the flight feathers being full grown, the underparts splotched with red, and the bill red about the nostrils and at the tip.

The behavior of this bird was surprising. It was perfectly tame from the start, ate and drank from the hand as if it had

been reared in captivity, and only occasionally dashed about recklessly as if bent on winning its freedom. Like young Cardinals reared in captivity, it took in its mandibles anything proffered it with human fingers—pieces of paper, a pencil, an eraser, a mouse trap—biting these as if to test their edibility, then dropping them. An object presented from the side sometimes was disregarded; but anything offered from straight in front of the bird's face would be looked at with both eyes, then firmly grasped.

Even more astonishing than its tameness was its occasional spasms of fright (no other phrase seems adequate), caused by happenings of the most ordinary sort. For example, on August 8, in mid-morning, a jar lid full of ripe huckleberries was placed in its cage (a wire structure about three feet long, two feet wide, and eighteen inches high). As the berries were slowly shoved into place the bird watched intently, gave a series of loud chirps, crouched, and dashed about the cage in a frenzy until the berries were removed. It is not known just what it was about the dish or the way it was put into the cage that induced such behavior. A broom standing in the corner or lying anywhere in plain sight caused no alarm. But if anyone began to use the broom in sweeping the Cardinal instantly showed fright. Here, again, I am at a loss to explain the bird's behavior, for I am certain that no one ever threatened to strike the Cardinal with the broom. More than once, in an attempt to discover just what the bird was afraid of, I permitted the broom to stand at one side for an hour or so, then came in, stood by the broom, grasped it, and lifted it as if to sweep. Exactly at this moment the bird began to show alarm, and actually using the broom invariably caused the bird to chirp loudly and jump and flutter about as if terrified. It was not the broom and I, but the sweeping broom that caused this.

On August 22, I brought to the laboratory in their nest two young Cardinals (male and female) about eight days old. They were fed on meal worms, grasshoppers, and various small fruits (as were my other captives), but from the first they did not swallow their food readily.

Of all my captives, the two young Cardinals seemed to be the least intelligent. They were given to chirping, lifting their crests in excitement or alarm, and flying from their perches from ten to fifteen times a day, apparently without the slightest cause. At such times they flew straight into wall, window, or bookcase, where they would flutter, scratching noisily, to the floor.

The older Cardinal paid not the slightest attention to them. When well fed, they were content to sit quietly most of the time. But at any moment one might suddenly rouse itself and hop into or upon the other bird, the other bird would chirp and begin hopping about, and off the two would fly, usually in opposite directions, but with equal heedlessness as to where the flight would take them.

I sensed in this behavior something comparable to the play periods of the young Vesper Sparrows, but the hopping about and flying of the Cardinals did not regularly follow feeding, and it was never restricted to any definite part of the room or screened porch. The sibling Cardinals showed no alarm when dishes of various sorts were shoved into or removed from their cage. They, too, objected to the sweeping broom, although less violently than did the older Cardinal. They roosted near each other (not side-by-side) on twigs, high in their cage, fluffing up considerably, and sticking their heads into their back plumage. The loose rump and flank feathers sometimes almost covered the wings.

By the time they had learned to fly they had become used to the several other young finches with which they were obliged to live. As a rule, the nagging of the buntings seemed to bewilder rather than anger them. Occasionally, a Field Sparrow chased one of them. They never fought *inter se,* nor offered to chase any other bird.

Comments on all Species

The young Vesper and Field Sparrows began running objects through their bills, taking dust and water baths, lying on their bellies in sand, and twittering or singing to themselves when they were rather young—well before their rectrices were

full grown. The young Indigo Buntings and Cardinals never lay on their bellies in the sand, did not take dust baths, and did not begin twittering to themselves until they were fully fledged.

The three Vesper Sparrows and four Field Sparrows obviously sought each other's company; the two Indigo Buntings went about together much of the time; the sibling Cardinals were virtually inseparable; but the older Cardinal never sought the company of the two younger Cardinals or of any other bird.

If a hawk, jay, piece of milkweed down, or other suspicion-rousing object passed the window, every one of the twelve birds expressed alarm through (1) becoming slim, (2) crouching, and (3) opening its eyes wide. In this position they were quite motionless, and they remained motionless obviously until they "thought" the danger past. The first sign of return to normal activity was a change in the shape of the eye. This was followed by cautious glances this way or that (without moving head or body), then by complete resumption of flying, chirping, and scratching.

The buntings were by far the most pugnacious of the four species, and the two individual buntings (sex not determined) were about equally combative. They chased the other birds, bit at the toes of any and all of them, and, in pulling feathers from the Cardinals, even alighted on these larger birds' backs. The Field Sparrows occasionally chased each other, or the Vesper Sparrows, but not for long. The Vesper Sparrows confined their chasing almost wholly to themselves, and the three Cardinals did not chase nor peck nor scold any other bird than themselves except, occasionally, in self-defense.

Summary

A young Vesper Sparrow caught in a field when about ten days old and held captive for two days, did not beg normally for food until a captive Cardinal chanced to hop on it.

The Cardinal's accidental assault caused the young Vesper

Sparrow to cry out as if in anger, but the cry almost instantly changed into the normal food cry.

Once the young Vesper Sparrow had given the food cry, it begged normally for food and was fed (with forceps) without difficulty.

Three stub-tailed young Vesper Sparrows reached their heads forward when begging for food, and backed away while being fed. Four young Field Sparrows, two young Indigo Buntings, and two young Cardinals reached their heads upward when begging, and obviously preferred to perch on a twig rather than to stand on the ground while receiving food.

The two- to four-weeks-old Vesper Sparrows devoted a certain amount of time each day to stretching exercises and play. These play periods usually followed feedings, and the playing was done in definite areas. The young Cardinals, when two to five weeks old, also had exercise periods, but their jumping, crest-lifting, and flying did not seem playful. The young Field Sparrows and Indigo Buntings chased each other about, but had no definite play periods or play areas comparable to those of the young Vesper Sparrows.

The young Vesper Sparrows, Field Sparrows, Indigo Buntings and Cardinals, while resting, often picked up and chewed bits of sand, grass stems, or sunflower seed husks.

The young Vesper Sparrows, when completely at rest, squatted and flattened out on the bottom of their cage. The young Field Sparrows sometimes did this, too, but the young Cardinals and Indigo Buntings kept to their perches.

The young Vesper Sparrows roosted only on the ground and did not tuck their heads under their back feathers when asleep. The young Field Sparrows roosted on twigs, fluffed up, and stuck their heads into the space between the back and scapular feathers. The young Indigo Buntings preferred to roost high, were noticeably active and noisy throughout much of the twilight period, and, apparently, greatly disliked being confined. The young Cardinals were active and noisy throughout the earlier part of the twilight period. Like the young Indigo Buntings they preferred to roost well above the ground. They

fluffed up, and stuck their heads into their back plumage while asleep.

The young Vesper Sparrows, Field Sparrows, Indigo Buntings, and Cardinals all were subject to what appeared to be unreasonable spasms of fright. In the young Cardinals such an object as a sweeping broom induced a spasm. In young Field Sparrows and Indigo Buntings spasms occurred daily, sometimes several times a day, without any noticeable cause. Such spasms affected the whole brood, rather than individuals, and lasted from one to three minutes.

Konrad Lorenz on Fleeing Reactions

I sent the foregoing to Margaret Morse Nice for her comments. She expressed regret that I had not recorded more definitely the exact age at which the various young birds took their first bath in water and in dust and began nibbling grass-stems, and sent me part of a letter written December 31, 1934, by Konrad Lorenz to Wallace Craig. The following excerpts from this letter deal, in part, with the "fright spasms" discussed above:

> Many young birds, as for instance daws, geese, cranes have no innate "inlet" for the reactions of fleeing, except the warning call and general behavior of their parents. They do not react on seeing a cat, dog, or man, but on seeing their parent frightened or in flight. Just these species grow very tame, if raised from infancy by man, but they lack an outlet for their fleeing reaction. Just these tame birds actually are "afraid of nothing," certainly of no one in particular. They will take some quite irrelevant small stimulus to "get off" their fleeing reactions, just as one of your doves took a certain corner in a room in which it was confined to bow-and-coo to (what Freud calls *abreagieren*).
>
> Birds with innate stimuli for the fleeing reactions, as for instance magpies, who recognize a carnivore for what it is, even if they have never seen one and give all the specific enemy reactions that wild magpies give, never show these blind ex-vacuo panics, except perhaps when confined alone.
>
> [As to animals in herds] if the reactions of "running for dear life" are not released for a considerable space of time, they tend to go off in vacuo, without any, or at least on account of a disproportionately small stimulus. . . . It is nearly impossible to keep some antelopes in herds in

zoological gardens; sooner or later they will break their legs and necks on the bars of their enclosure, which they do not do if kept singly. I wonder, if this could be prevented by having them chased about by a stuffed lion on wheels twice weekly.

This ever-growing appetite for fleeing. . . . shows that very probably appetite plays an important part in every instinctive action, however "negative" the response may seem.