

m. migratorius in the vicinity afforded a ready basis for comparison.—KENNETH C. PARKES, *Laboratory of Ornithology, Cornell University, Ithaca, New York.*

Effect of snow cover on feeding habits of starling in central New York.—

The winter roosts of starlings, *Sturnus vulgaris*, provide a source of profitable study for the biologist. Beneath these roosts droppings accumulate rapidly, furnishing abundant material for food habits research. The food of the starling has been studied in some detail by Kalmbach and Gabrielson (U. S. Dept. Agri. Bull. 868, 1921) and Lindsey (Wilson Bull., 51 (3): 176–182, 1939) with details on the seasonal nature of the dietary. The winter feeding behavior of this species has not been recorded and contrasted during periods of bare and snow-covered ground. Those who are familiar with the starling recall that it spends a good deal of time searching for food on the ground in the winter months. With a substantial blanket of snow, such a source is not available and the birds must presumably select other food items.

Starlings have occupied a cupola of one of the Veterinary College buildings on the Cornell University Campus for many winters. The accumulated droppings are several inches thick in places. In order to establish the time of deposition, large pieces of wrapping paper were spread below the roosts before the birds arrived in the evening and were removed with the accumulated droppings the following morning, after the majority of the roosting birds had departed. The few birds that have been taken in the early morning from this roost have invariably had empty intestinal tracts.

On February 20, 1947, the ground in the region of Ithaca, New York, was free of snow, the temperature ranging from 1° to 26° F. The following morning, 200 fresh droppings, deposited during the night, were removed from the papers below the roost. On February 22 and 23, 1947, the weather was stormy, with temperatures ranging from 1° to 16° F. Three to five inches of snow covered the ground, leaving no bare patches within the feeding range of the birds. Two hundred fresh droppings were collected from papers below the roost early in the morning of February 24, 1947. One hundred droppings from each lot were selected at random and examined under a binocular microscope. It was necessary to soak the individual droppings in water a few moments before making the examination. Identification of most food items is not difficult at this season, the choice of food being relatively limited.

TABLE 1

COMPARISON OF FOOD HABITS OF STARLINGS AT ITHACA, NEW YORK,
FEBRUARY 20–23, 1947. FIGURES INDICATE PERCENT FREQUENCY
OF OCCURRENCE BASED ON 100 DROPPINGS FOR EACH COLUMN.

<i>Food</i>	<i>Bare ground</i>	<i>Snow-covered ground</i>
Fruits and berries.....	45	49
Sumach.....	42	27
Garbage.....	7	19
Grains.....	19	4
Green vegetation.....	20	6
Insects.....	18	1
Millipedes.....	4	—
Snails.....	3	—

Relatively exposed fruits and berries, such as those of sumach, viburnums, grapes, Virginia creeper, poison ivy, *Craetagus*, and frozen apples, are available, irrespective of snow depth. Garbage is likewise available during periods of deep snow, for in

rural areas such is often dumped in the garden plot, later to be spaded in. Green vegetation includes winter wheat and the many succulents that are found around springs and in gullies during the severest weather. Unlike many other passerine birds which winter in the north, the starling secures most of its animal food at this season on the ground. Principal animal food at this season includes millipedes and dormant insects.

The month of January, 1948, was marked by frequent spells of sub-zero weather and a continued layer of deep snow in the Ithaca region. Observations of feeding starlings during this period corroborate their dependence on the fruits of many shrubs, most important among them being *Rhus typhina*, *Celastrus*, *Vitis* sp, and several viburnums, particularly *V. lentago*. Dietary changes are necessitated by snow cover; the temporary loss of one food source presumes another.—W. J. HAMILTON, JR., *Cornell University, Ithaca, New York*.

Sparrow adopts kingbirds.—On the morning of July 4, 1948, a female English sparrow, *Passer domesticus*, was seen to fly up to a young kingbird, *Tyrannus tyrannus*, perched on an automobile parked in a housing project just south of the University of Kansas campus in Lawrence. The fledgling kingbird opened its mouth and apparently received something from the sparrow.

Late in the afternoon three fledgling kingbirds of the same size as the one observed earlier in the day were seen near by. They were perched a foot above the ground on the edge of a sand box, within a few inches of each other, and were calling almost continually. During the 45 minutes that they were kept under observation no adult kingbird was seen, but at fairly regular intervals, six or eight times in all, the female sparrow flew up to the group and fed one of them. In delivering the food, the short-billed sparrow was usually caught in the wide gape of the kingbird's closing bill, and then would flutter for a moment, struggling to disengage itself.

On the following morning the three young kingbirds were noticed perched on another sand box about 100 feet from the first. The sparrow was making frequent trips to feed them with bread, from a piece dropped by a child at the edge of the first sand box. To obtain this food the sparrow had to compete with a quarreling and jostling group of its own species which was eating the bread and milling about it.

Late in the afternoon of the same day, the three young kingbirds were again observed near the same place, and the sparrow was again feeding them. Its trips were relatively infrequent, and the fledglings were restless. Occasionally they would make short flights along the edge of the field or into near by trees. Sparrows were numerous in the vicinity and often flew down to forage in the grass or to drink at puddles of rainwater. Many times the young kingbirds were observed flying up to sparrows, with mouths gaping to receive food. The sparrows approached in this manner usually hopped away or flew. In several instances one was followed by the kingbirds in flights of as much as one hundred feet. All such approached sparrows were in female or juvenal plumage. Those in adult male plumage were less numerous, but several times when males were near, the young kingbirds did not approach them. Twice in succession one young kingbird flew into a row of sparrows perched along the edge of a sand box. Each time some of the sparrows were frightened away by the sudden and direct approach of the larger bird. Soon afterward, when it had flown down to the ground, this fledgling was momentarily attacked by a female sparrow which flew down from the sand box and pecked it on the back. The kingbird did not attempt to escape or retaliate.

On the morning of the third day the three young kingbirds were at their usual location on the sand box, and the sparrow was again feeding them bread. After the