SUMMER FOOD OF THE ROBIN DETERMINED BY FECAL ANALYSES

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THE food habits of North American birds have been the object of much study. The methods usually employed have been those of stomach analyses or direct observation of the feeding birds. These practices have been proved most useful and a voluminous literature has resulted. Little attention has been directed to the possibilities of determining avian food habits through a study of their fecal remains, although such methods are often employed when studying the dietary of predatory mammals.

W. L. McAtee (1908:23) writing of the nestlings of the Cardinal says:

> The character of the food could not be determined by observation, but it was learned in another way. None of the excrement was removed from the box, whereas the nest in which the youngsters had been was kept perfectly clean. The fecal matter was dried and examined, and while by no means all of its constituents could be identified, enough was learned to indicate that the study of excreta is a very satisfactory method of determining the food of nestling birds. The nest of any fairly bold bird may be kept under surveillance and the waste matter collected before the parents remove it. The extent of the information as to the food eaten by the young to be obtained in this way is astonishing.

From a single casting of a young Cardinal, McAtee recovered one insect egg, the leg and scutellum of a scarabeid beetle, head and other remains of a leaf hopper, bits of snail and 11 seeds and the core of a mulberry. Dalke (1935) has found that droppings provide a valuable source of information on the feeding habits of pheasants.

Several investigators have studied the food habits of the Robin (*Turdus migratorius*). The most detailed of these studies have been by several members of the U. S. Biological Survey. Beal (1915) reported on 1236 stomachs secured at various times of the year, the results of which indicate that 42 per cent of the Robin's food is animal matter, chiefly insects, while the remainder is composed principally of fruits and berries. Forbes (1903:96-115) examined 114 Illinois birds taken from February to December. The food consisted almost entirely of insects from February to May inclusive, but from that time forward these constitute but little over a third of its food, the remainder (64 per cent) being composed of wild and tame fruits. Taken as a whole, however, insects comprise almost precisely two-thirds of the food for the year. Earl Brooks (1939) has summarized well our present knowledge of this subject, listing 76 published references. From his report we find there is still a paucity of data on the summer food of the Robin. Forbes (*loc. cit.*) reported on 47 stomachs for June, July and August and found during this period that Robins were feeding principally upon caterpillars, Coleoptera, cutworms and fruit.

During the dry summer of 1939 I had an excellent opportunity to

study the feeding habits of Robins about my home at Ithaca, New York. These birds were attracted to a hedgerow of wild cherry (*Prunus virginiana*) from late June through early August. The birds usually perched on the bean poles in my vegetable garden prior to flying into the hedgerow and would often defecate while sitting there. Inasmuch as no other bird of comparable size and similar feeding habits utilized these poles (Starlings were never seen perching on the bean poles) it was assumed all the droppings collected below the supports were those of Robins. Water was placed in pans below the roosts, and the birds often drank there. Newspapers were spread below the bean vine supports and weighted down. In this manner the droppings could readily be seen and collected with ease. It took but a moment each day to collect the droppings. More than a quart of droppings, constituting well over 1000 samples, was secured; 700 of these were examined.

The droppings were soaked just prior to examination so that the various items would separate easily. Identification of Robin fecal remains are not difficult, for the stones and seeds of fleshy fruits are usually passed in good shape; adult insects are often passed in their entirety, while cutworms and similar insect larvae are preserved in unusually good condition (Fig. 1). No volumetric index to the different

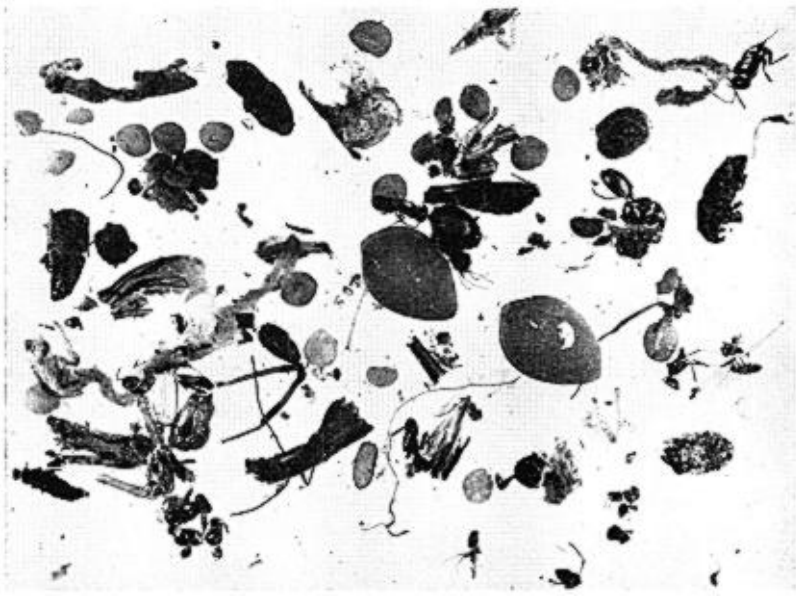

Figure 1. The remains from several Robin droppings, illustrating the ease with which identifications may be made. Cutworms, grasshopper fragments, larval European elm leaf beetles, ants (*Lasius*), various carabid elytra, entire weevils, and the seeds of wild cherry, raspberry, blue nightshade, and honeysuckle may be recognized.

TABLE 1

ANALYSES OF 700 ROBIN DROPPINGS COLLECTED BETWEEN JUNE 24 AND AUGUST 11, 1939. THE FIGURES INDICATE THE PER CENT FREQUENCY OF OCCURRENCE OF DIFFERENT FOOD ITEMS.

Animal		80.13
Annelida (Earthworms)	.57	
Arthropoda	78.86	
Arachnida	3.43	
Cheliferidae (Pseudoscorpions)	.43	
Phalangidae (Harvestmen)	.28	
Lycosidae (Wolf spiders)	1.57	
Araneae (Undet. spiders)	2.14	
Myriapoda	.43	
Chilopoda (Centipedes)	.43	
Insecta	74.06	
Orthoptera	5.57	
Locustidae	4.91	
Gryllidae	.57	
Coleoptera	11.30	
Scarabeidae	4.43	
Staphylinidae	.28	
Elateridae	.71	
Chrysomelidae	1.86	
Curculionidae	6.28	
Hemiptera	.71	
Pentatomidae	.57	
Miridae	.43	
Homoptera	.14	
Membracidae	.14	
Lepidoptera (Chiefly cutworm larvae)	6.86	
Mecoptera	.71	
Bittacidae	.71	
Hymenoptera	38.43	
Formicidae (*Lasius*, etc.)	34.47	
Parasitic Families	5.43	
Mollusca	3.28	
Valloniidae (*Vallonia pulchella*)	.71	
Cochlicopidae (*Cochlicopa lubrica*)	2.57	
Plant		73.14
Saxifragaceae		
Ribes satirum. Red Currant	1.14	
Rosaseae		
Amelanchier canadensis. Shadberry	2.43	
Fragaria virginiana. Field Strawberry	1.29	
Rubus idaeus. Raspberry	21.10	
Rubus allegheniensis. Blackberry	40.09	
Prunus pennsylvanicus. Pin Cherry	17.00	
Prunus virginiana. Choke Cherry	58.29	
Prunus serotina. Rum Cherry	11.71	
Solanaceae		
Solanum dulcamara. Blue Nightshade	5.86	
Caprifoliaceae		
Lonicera sp.	8.28	

food items was obtained, for it is apparent that such reckoning would not be significant. The different food items have a variable rate and degree of digestion. Thus ants and billbugs were passed almost entire, whereas only the skin of cutworms and the seeds of fleshy fruits could be recovered from the droppings.

The best clue to the relative importance of the various food items was obtained by tabulating the frequency with which each item occurred in the total droppings that were studied. Thus the per cent frequency of occurrence gives us some index to the importance of the different good items discussed.

Droppings were collected from June 24 to August 11, 1939. It is surprising that the Robins restrict their diet to so few items during this period of 49 days. It hardly seems likely that any food item of importance could have escaped our notice, for even the smaller fragments were quite prominent. The scant selection may have been occasioned, in part, by a subnormal rainfall, for during this 7-week period there was only 4.67 inches of rainfall at Ithaca.

The droppings frequently contained certain characteristic remains which left no doubt as to their identity. Thus the Harlequin cabbage bug (*Murgintina histriona*), ants (*Lasius*), blue-grass billbugs (*Calendra parvulus*), strawberry root weevils (*Brachyrhinus ovatus*), larval European elm leaf beetles (*Galerucella luteola*), and a number of other insects were passed through the digestive tract entire and were easily determined. The male genitalia of *Phyllophaga rugosa* were found several times. On the other hand, some remains could not be certainly identified more closely than to family rank. The case is quite different with fruits. Seeds are usually determined with ease.

It appears probable that, under favorable conditions, the feces of many birds particularly in summer, could be profitable studied. Bird baths that are under close scrutiny should provide suitable material for analyses, and the species responsible for the droppings determined with certainty. Moreover, advanced nestlings of many species may be removed from the nest and placed in boxes where the feces may be collected and studied with a view to determining the specific nature of the diet.

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