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**RESEARCH
REPORT 61**

FOOD HABITS OF OPOSSUMS

IN SOUTHERN WISCONSIN

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ABSTRACT

To determine whether the opossum had any effect on wildlife in southern Wisconsin, a food habits study was conducted on 161 opossums, mostly car kills, during all seasons from 1953 to 1958. Most commonly found among the wide variety of foods eaten were earthworms, insects, mice, songbirds and cottontails.

The opossum is primarily a scavenger and is omnivorous. There is no evidence that it has a detrimental effect on game birds or their nests in southern Wisconsin.

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INTRODUCTION

The opossum (Didelphis marsupialis) is not the most admired member of our native fauna, so who really cares about him?

In the northern states it is usually someone with a problem that hopefully can be solved by blaming it on the opossum. This was the case in Wisconsin, as well as elsewhere, whenever pheasants and other farm country wildlife were at lower-than-desirable levels. Any animal that possibly could be implicated as a predator of nests, eggs, or chicks was apt to be accused by an uncritical public.

This led to our effort to find out what Wisconsin opossums really ate in all seasons. We knew from studies elsewhere (Allen, 1940; Fitch and Sandidge, 1953; Hamilton, 1958; Lay, 1942; Reynolds, 1945; Stieglitz and Klimstra, 1962; Taube, 1947) that opossums eat practically anything, animal or vegetable, dead or alive, fresh or carrion. They seemed to eat game bird eggs on occasion, but not to the point where they were major predators. But we could not answer the question of whether the opossum was good or bad in its effect on Wisconsin pheasants, cottontails, ducks, and other wildlife that raises its young at ground level.

POPULATION STATUS

The range of the opossum is presently the southern half of the state (Fig. 1). It is most common in the southern three tiers of counties, those nearest the state of Illinois. Opossums have greatly increased their number and extended their range northward since about 1920 and there are now scattered records as far north as Oneida County (Long and Copes, 1968).

Historical records indicate their presence in the southern counties at the time of first settlement in the 1830's, but there is no indication that they were common (Jackson, 1961). They probably were at no time extirpated after settlement, but it was not until the 1920's that their numbers and range began to increase. The reasons for this sudden change in status are unknown, although it happened in several other northern states at the same time (Jackson, 1961).

toes, and much of their tails from winter freezing, because they are not adapted to withstand severe cold. Jackson (1961) estimated that opossums in Wisconsin seldom average more than one animal per square mile and that the total state population does not exceed 30,000.

METHODS

Our food habits studies were based on 161 opossum stomachs taken at all seasons of the year during the years 1953 to 1958 in 13 Wisconsin counties. Thirty-six of our colleagues in the Madison area contributed opossum carcasses to our study. All the counties sampled (except Monroe) lie in the southeast quarter of the state and within Wisconsin's major pheasant range.

At least 5 animals were taken in each month of the year, but the largest single month (March) and largest seasonal total were in the spring quarter (Table 1). Opossums were collected primarily as road kills, with 145 of the 161 in this category. Of the remainder, 15 were trapped by muskrat trappers, and one was shot by a hunter. There is a very strong reason why samples in the summer months were small. An opossum at best is far from sweet-smelling, and midsummer road kills deteriorated so rapidly that unspoiled carcasses were hard to come by. Even with experience and a mouthful of cigar, anything but a fresh kill was too aromatic to work on. Stomachs were opened, contents identified, and their volumes measured as soon as possible after removal from the carcass. No preservatives were used.

Ninety-one percent of our opossums were car kills (Table 1). This source is important in evaluating stomach contents. Males made up 53 percent of the opossums examined. Males were most common in February and March, females in midsummer. In other months sexes were about equal.

Ninety-four percent (151) of the 161 stomachs contained food (Table 1). This impressed us as being an unusually high percentage; at any rate, the paucity of empty stomachs helped our data to accumulate faster than anticipated. Since the opossum is largely a nocturnal feeder, we speculate that most of them were run over at night while they were actively foraging.

Another fact uncovered was that 84 percent of the stomachs contained one or more variety of trematode. We did not identify them as to species, nor can we interpret their significance, except to point out that trematodes can be considered normal on the basis of this sample.

TABLE 1

Opossum Data Summary, 1953-58

Season	Month	No. of Opossums	Sex			Cause of Death		Food in Stomach?		Stomach Worms Present?		
			Male	Fem.	Unk.	Car	Other	Yes	No	Yes	No	Unk.
Winter	December	8	2	6	-	3	5	6	2	3	5	-
	January	10	7	3	-	10	-	10	-	5	4	1
	February	17	11	4	2	16	1	15	2	15	2	-
Spring	March	32	20	10	2	30	2	30	2	29	2	1
	April	21	8	13	-	20	1	21	-	18	2	1
	May	19	11	8	-	19	-	19	-	19	-	-
Summer	June	15	5	9	1	14	1	14	1	14	1	-
	July	5	-	5	-	3	2	4	1	3	2	-
	August	7	5	2	-	7	-	6	1	3	4	-
Fall	September	7	3	4	-	7	-	7	-	6	1	-
	October	8	4	4	-	8	-	7	1	6	2	-
	November	12	7	5	-	10	2	12	-	11	1	-
Totals		161	83	73	5	147	14	151	10	132	26	3
Percents			53			91		94		84		

ANNUAL FOODS

The word "omnivorous" must have been invented to describe the opossum. In our total sample of 151 stomachs with food, we found at least 65 different identifiable food items. Table 2 lists 6 major categories of food eaten by Wisconsin opossums, both in percentage occurrence and total volume.

In interpreting these data, we placed much importance on the frequency of occurrence of food items. High volumes do not always denote importance, since one large meal of one food item can produce

a large volume measurement in a subsequent stomach analysis. Because such large meals are infrequent, the large volume is not important. High occurrence frequencies, even though at lesser volumes, indicate importance as a sustaining food. In general, when occurrence and volume are both high, the food is important; when occurrence is high and volume is low, the food is moderately important; when occurrence is low and volume is high, the food may not be important.

Cottontail rabbits and several species of mice were the most common mammalian foods. Others included shrews, common mole, grey and fox squirrel, muskrat, white and Norway rats, domestic dogs and cats, and domestic swine. The fact that many of these animals when healthy would be too fast, too strong, or too large for an opossum to catch and kill is evidence that the opossum is a scavenger of dead animals. Confirmation of this was in the maggots and decayed condition of much of the flesh found in stomachs. We find it hard to believe that the opossum can have more than a rudimentary sense of taste!

After mammals the most important food group was composed of birds. Domestic chicken was by far the most common species; this again seems to represent scavenging of dead birds found in manure spreads on farm fields or in refuse dumping areas. Other birds represented were the pintail, green-winged teal, bobwhite, ring-necked pheasant, domestic pigeon, screech owl, crow, and several species of songbirds. Game bird remains were found in only 10 stomachs and in low volumes.

TABLE 2
Annual Opossum Foods by Groups

	Occurrence		Volume	
	No.	Percent	cc	Percent
Mammals	97	25	2332	41
Birds	47	12	1351	24
Invertebrates	76	19	581	10
Reptiles, Amphibians and Fish	38	10	697	12
Plants	27	7	367	6
Other*	107	27	362	6

* Garbage, trash, litter

Invertebrates included several species of insects, earthworms, crayfish, and one occurrence of snails. Earthworms were especially important.

The reptiles, amphibians and fish category included several species of small frogs, toads, garter snakes, yellow perch, carp and bullheads. Some of the fish remains were obviously cleanings discarded by a fisherman, and the remainder is believed to be from dead fish found on land. The opossum is no fisherman in his own right.

Plant items were mostly fruit, such as apples, cherries and grapes; grain such as corn and oats; vegetables such as Navy beans, carrots, potatoes, and lettuce; and some odds and ends such as acorns and elm buds. Apples were the big item in this group.

The "Other" category included garbage, trash and litter. Garbage was human food waste such as cooked meat bones, cooked potato peelings, and cut carrot tops. Trash included items not usually considered edible -- leather, paper, twine, and copper BB shot. Most stomachs contained some litter (grass, leaves, dead twigs, dirt, and opossum hair). This type of material probably was ingested with other foods. Foods in this category rank at the bottom in our importance rating.



SEASONAL FOODS

Table 3 gives occurrence and volume percentages for all individual food items which appeared in at least 5 percent of the occurrences or volumes on an annual basis. There are 10 such food items.

TABLE 3

Annual and Seasonal Use of Important Opossum Foods
Expressed in Percentage and Based on 5 percent or More
of Total Occurrences, or Volumes, Excluding Litter

Food	Annual		Winter		Spring		Summer		Fall	
	Occ	Vol	Occ	Vol	Occ	Vol	Occ	Vol	Occ	Vol
Earthworms	29	8	-	-	31	11	54	8	35	10
Insects	18	2	14	2	11	1	29	1	31	2
Mice	17	7	23	8	17	8	4	6	19	10
Songbirds	17	6	6	1	19	7	25	17	15	1
Cottontail	13	14	29	27	9	6	-	-	19	27
Frogs	11	4	3	T	10	5	25	10	12	3
Garbage	8	3	16	7	9	3	4	1	-	-
Snakes	8	3	-	-	10	3	13	5	8	4
Apples	7	4	6	1	6	6	4	T	15	7
Chicken	6	6	10	9	4	2	13	17	-	-

T = Trace (less than 1%). Garbage = Human food waste (potato peels, carrot tops, cooked bones, etc.)

Our most unexpected finding was the importance of earthworms in the total diet, although this situation has been reported elsewhere (Hamilton, 1958 and Taube, 1947). In the annual picture, a group of four items of roughly similar importance followed earthworms -- cottontails, songbirds, mice, and insects. Items on the list following "Frogs" are of lesser importance.

Then compare the winter diet to the annual average. Earthworms in a cold climate were, as would be expected, at zero, and cottontails, mice, garbage and chickens gained in importance. This must represent an adaptation to food availability if the assumption can be accepted that the cottontails eaten were killed by cars. The winter insect diet was mostly larval forms of several species, usually beetles.

As the warm months came along there were some substantial diet changes: the increased frequency of earthworms, insects, snakes, frogs, and songbirds; less dependence (or could it be desire?) on garbage; absence of cottontails in the summer sample. We believe the latter to reflect the usual seasonal midsummer decline in rabbit roadkills on southern Wisconsin roads. Songbirds and mice possibly represented true predation, since it seems likely that opossums run across mouse and small bird nests in their wanderings.

We made a special effort to search stomach contents for egg shells, but found none whatsoever. Even though opossums may not eat whole eggs and only break them and lap the contents, shell particles should be expected in stomachs, especially in view of the amount of litter they take in with other foods. At any rate, we concluded that the series of opossums we examined did not prey on the eggs of gamebirds or any other kind of bird.

We recognize that our dependence on road-killed opossums for information may have placed a bias in our data. It is our subjective opinion, however, that dead animals are a major food source and that many dead animals are available along roads. This in turn makes roadways natural feeding areas for the opossum and also makes the opossum itself vulnerable to motor vehicles. Since both roads and opossums occupy the same range the year around in Wisconsin, there is as much merit in considering the car-killed opossum "normal" as there is in calling it abnormal.

In any event, we conclude that opossums are completely omnivorous and one of our least specialized mammalian feeders; that opossums serve as valuable scavengers on the landscape at all seasons; and that we have no evidence of a significant impact of opossums on game birds or their nests in southern Wisconsin.

Despite the fact that this homely creature with its unattractive personality is almost literally a garbage can, we are forced to agree with Burt (1957) in his admiration for its persistence in perpetuating its kind in a somewhat unfriendly environment. Even though it looks and acts stupid, the opossum has succeeded where other forms have become extinct. It's not easy to argue against a winner.

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