SOME COACTIONS OF CANADA GEESE AND SMALL MAMMALS

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Where Canada geese concentrate their feeding and resting activities, virtually all forage and seeds are consumed in a relatively few days; remaining vegetation is trampled to ground level or even into the ground. Because grazing geese tend to avoid or shy from roads, fence rows, field edges, or certain physical structures (Bell, 1957; Biehn, 1951; Helm, 1951; Washington State Game Department, 1953), the last available foods are found adjacent to these sites. On occasion, under extreme food shortages, these sites may be utilized by late winter; however, such is an exception. It appears that these feeding and resting activities of the geese might alter the availability of food and cover to small mammals so as to result in a reduction of rodent populations. To evaluate this and other coactions, a study of small mammals was conducted during the winter of 1961 by operating of traplines in wheat, pasture, and corn fields of the Union County Refuge. A similar agricultural area with little or no goose activity, approximately 10 miles north of the Refuge, was included for comparative studies.

The Union County Wildlife Refuge comprises 6,201 acres of bottomland 4 miles east of the Mississippi River and about 1 mile south of Ware. This sanctuary was originated in 1947 to provide a feeding and loafing area for part of the population of Canada geese, *Branta canadensis*, which winters in southern Illinois. The Refuge, as operated by the Illinois Department of Conservation, provides wheat, *Triticum aestivum*, corn, *Zea mays*, and pasture plants such as ladino clover, *Trifolium repens*, fescue grasses, *Festuca* spp., and orchard grass, *Dactylis glomerata*. Johnson grass, *Sorghum halopense*, common crab grass, *Digitaria sanguinalis*, and the panic grasses, *Panicum* spp. are common weeds in corn and pasture fields.

Trapping was initiated January 6 and terminated March 31, 1961. Hence, populations of small mammals were not studied prior to the arrival of geese in September nor after their departure in March. Museum special and regular mouse traps were utilized in determining the distribution and number of small mammals; a mixture of peanut butter and rolled oats was used as bait. In all areas sampled, intervals of 10 feet were maintained between stations; one trap was placed at each station. The straight-line method of trapping was used in Fields 1a and 3 through 9 (Table 1); grid trapping was employed in Fields 1b and 2. Fields 2, 5, and 7 were located near Wolf Lake, Illinois; the remaining fields including 8, which was subjected to

[1] Represents a contribution from Project No. 45, Cooperative Wildlife Research Laboratory.

TABLE 1. Results of Small Mammal Trapping in Agricultural Fields, Union County Wildlife Refuge and Private Property, Illinois, January-March, 1961.

Type of Field	Field Number	Number of trap Nights	Number Captures of Each Species				Total Captures of all Species	Percent Trapping Success
			Peromyscus maniculatus	P. *leucopus*	*Mus musculus*	*Microtus ochrogaster*		
Wheat								
Grazed	1a	1,798	23	0	10	15	48	2.7
(Refuge)	1b	3,398	5	0	15	12	32	0.9
	3	1,060	7	0	2	1	10	0.9
Totals		6,256	35	0	27	28	90	1.4
Ungrazed	2	750	8	10	15	7	40	5.3
(Control)		.....	..	..	..	..	..	...
TOTALS		7,006	43	10	42	35	130	1.9
Corn								
Utilized	4	542	12	0	9	0	21	3.9
(Refuge)	6	696	6	0	0	0	6	0.9
Totals		1,238	18	0	9	0	27	2.2
Nonutilized	5	542	0	0	9	0	9	1.7
(Control)	7	698	1	0	4	0	5	0.7
Totals		1,240	1	0	13	0	14	1.1
TOTALS		2,478	19	0	22	0	41	1.7

Type of Field	Field Number	Number of trap Nights	Number Captures of Each Species				Total Captures of all Species	Percent Trapping Success
			Peromyscus maniculatus	P. *leucopus*	*Mus musculus*	*Microtus ochrogaster*		
Pasture								
Grazed	9	900	16	0	0	4	20	2.2
(Refuge)								
Ungrazed	8	900	3	0	0	0	3	0.3
(Refuge)								
TOTALS		1,800	19	0	0	4	23	1.3
All Utilized		8,394	69	0	36	32	137	1.6
All Nonutilized		2,890	12	10	28	7	57	2.0
GRAND TOTALS		11,284	81	10	64	39	194	1.7

little use by geese, were within the confines of the Refuge.

Results and Discussion

Trapping success during the three months was low as 11,284 trap nights yielded 194 captures of small mammals, a success of 1.7 per cent (Table 1). Four species of mice were represented in the captures for the three types of fields (Table 1). *Peromyscus maniculatus* (81) was the most abundant and widely distributed, making use of all but one control harvested cornfield. *Mus musculus* (64) ranked second although it was not represented in the captures in pasture or one field of goose-harvested corn. *Microtus ochrogaster* (39), third most abundant, was not recorded in cornfields or ungrazed pasture. *P. leucopus* (10) yielded less than 5 per cent of the catch and was taken in an ungrazed wheat field.

In Field 1b, a lightly grazed strip of wheat 6 inches in height extended from a roadside 30 feet into the field; in this area 23 of a total of 32 captures for the entire field were recorded. In Field 2, where wheat was 12 inches in height throughout, 9 of a total of 40 captures were recorded in a strip 30 feet wide, parallel to the edge of the field. Of 12 captures of *Microtus ochrogaster* in Field 1b, 11 were recorded in the lightly-grazed strip of wheat at the field border; 11 of 15 *Mus* were captured in that section; and, of five captures of *P. maniculatus,* one was taken from that area. *P. leucopus* was collected only in Field 2.

In Field 3, a "no trespassing" sign was located 50 feet from a field corner bordered by the junction of two roads. The only *Microtus* taken in the field and one of two *Mus* were captured in this corner where the wheat was 8 inches high; the other *Mus* was taken near the corner. All *P. maniculatus* were collected outside this area in sections where grazing was more intense; two were taken in areas of bare ground.

In Field 1a, *Microtus* were caught only in the row of traps set 10 feet from the field border in a lightly grazed strip of wheat (6 inches high) which extended from a roadside 20 feet into the field; most of the *Mus* and a few *P. maniculatus* were taken in this area. Some *Mus* and the majority of *P. maniculatus* were collected 150 feet from the field edge where the wheat was 1 inch high.

Microtus seemed to show the most direct relationship to goose use of wheat as 27 of 28 specimens were taken in lightly-grazed areas in which the wheat was 6 inches or more in height. Although *Mus* was taken in heavily-grazed sections, it seemed to prefer taller, denser cover, as 20 of 27 specimens were taken in lightly-grazed areas. *P. maniculatus* was least affected by grazing; 29 of 35 captures were recorded where goose utilization was most intense.

Although direct evidence was lacking, some competition probably existed among small mammals for the greater supply of food and cover present in areas of light grazing. *P. maniculatus,* although found mainly in areas which lacked cover, were apparently able to compete successfully with other small mammals where heavy cover and an abundance of food were available (Table 1, Field 2). Linduska (1946) found

that numbers of *P. maniculatus* were somewhat higher toward the center of cultivated fields than nearer field edges which were adjacent to heavy fencerow cover. Johnson (1926) noted that this species was characteristically an animal of cultivated fields and was not found in relatively undisturbed areas which were inhabited by *Microtus*. The possibility that at the Union County Refuge *P. maniculatus* might have been foraging into denuded areas from living quarters in areas of light grazing was not substantiated by trapping data.

The majority of captures of *P. leucopus* in Field 2 (Table 1) was juveniles which ranged farther into the field than did the adults. Presence of a shrubby area at the field border probably accounted for the occurrence of this species. It has been suggested that *P. leucopus* enter open fields due to population pressure in adjacent woods (Blair, 1940).

All cornfields sampled were picked mechanically, much grain being lost during the harvesting process. Waste grain was abundant in the control fields as entire ears and individual grains were observed. On the Refuge, geese were thorough in gleaning the fields as no grain was found, although cobs were plentiful. Only *P. maniculatus* and *Mus* were captured, the former being most abundant in cornfields on the Refuge and the latter in control fields.

Canada geese have been found to eat the seeds and, in some cases, the dried stems of weeds which are found in cultivated fields (Bell, 1957; Helm, 1951). Thus, geese probably not only compete with small mammals for cultivated crops, but also for most other foods which are acceptable to the rodents; conversely, droppings of geese might have constituted a source of food if the rodents were coprophagous.

In cornfields on the control areas, a large quantity and variety of food were available to small mammals including corn, weed seeds, and a small amount of green vegetation. As a result, the rodents were possibly not readily attracted by artificial food used as bait in the traps. This may have been responsible for the low catch in control fields and the relatively higher catch in goose-used acreages.

Pastures contained many of the weeds found in cornfields; and, as in cornfields, geese would be expected to be in direct competition with rodents. Field 9 (Table 1) was perhaps the most heavily goose-utilized area at the Refuge; cover and food in particular were scarce. However, several litters of *P. maniculatus* and one litter of *Microtus* were brought off in this area during the latter part of March. This indicated that some rodents not only were able to survive a period of apparent stress but were able to reproduce.

Microtus were taken only at the border of Field 9 near a ditch and heavily traveled road where cover was heavier than in the rest of the field; also, some green vegetation was present. This situation seems similar to that Martin (1956) reported where *Microtus* were apparently absent in pasture which was over-grazed by cattle but occupied a nearby ungrazed area. As in wheat fields on the Refuge, a strip at the edge of Field 9 may have served as a sanctuary for *Microtus*

as little goose activity occurred there. This restriction of *Microtus* to a small area not utilized by geese indicated the importance of heavy cover. Although adequate cover is an important habitat requirement of this species, Dice (1922) concluded that sources of food—green vegetation and roots or tubers—are more necessary.

Fields 1a, 1b, and 3 each exceeded 100 acres in size, but suitable habitat available to *Microtus* was limited to a few acres of lightly grazed wheat. If it can be assumed that *Microtus* would occupy the entire area of each field if grazing were lacking, then it can also be assumed that *Microtus* populations were reduced to a great extent. There is little evidence to suggest that *P. maniculatus* and *Mus* populations were greatly reduced in heavily used fields.

When cattle were removed from an over-grazed pasture in Kansas, succession from coarse weeds to succulent grasses progressed; and, as an apparent result, *Microtus* increased from a very low population to a level of abundance in approximately 2 years (Martin, 1956). In fields of intense goose utilization at the Union County Wildlife Refuge, the ecological situation and time factor are somewhat different from that described in the above study. The effects of geese are temporary as they are absent during summer and most of spring when vegetative growth is greatest. In addition, the food supply of all small mammals is renewed each year by planting and growth of weed species; thus rodent numbers probably increase to a normal level as habitat restrictions terminate shortly after the geese migrate north and the vegetation is able to resume normal growth.

Summary

Species type and population level of rodents both seemed to show a relationship to the feeding activities of the Canada geese. However, this relationship could not readily be diagnosed as a direct result of goose utilization and destruction of cover. Land use and management practices of the previous summer and fall determined the kinds and amounts of cover and food available to the small rodents irrespective of the presence of the geese. Hence, differential degrees of effectiveness of goose utilization in enhancing or discouraging the occurrence of a given species of mouse could not be established with finality. Further, lack of data on stored food supplies as noted for several rodents by Wood (1910), Fisher (1945), and Kennicott (1857), prohibited a complete understanding of the food complex for each species captured.

In many cases the presence or absence of a given species of mouse showed a relationship to the nature of habitats immediately adjacent to areas which were grazed heavily. When grazed areas were bordered by roadsides or other natural field boundaries, the number of captures, distribution, and species of rodents seemed to reflect this. Frequently, due to the avoidance response of geese to field edges or isolated structures in a field, a lightly grazed or non-grazed spot or strip of wheat or pasture was present. The pres-

ence or absence of such areas was apparent in the trapping success of most species of mice.

In wheat fields where *Microtus* were restricted to lightly grazed areas, the depression on population size was most pronounced. On the other hand, the majority of captures of *P. maniculatus* was recorded in those areas of wheat which were heavily grazed by the geese; *Mus* usually preferred areas of light grazing. Of two pastures and four cornfields sampled, *Microtus* were taken only at the lightly-used edge of a pasture which provided heavy cover and green vegetation. In both pastures and cornfields, a greater number of captures was recorded from heavily-utilized fields than in control areas which were subjected to little or no use by the geese. The great quantity and variety of food available to the small mammals probably reduced the attractiveness of bait in control fields.

In a pasture which showed greater goose use than any other fields trapped, *P. maniculatus* and *Microtus* were able to bring off litters in late March. However, populations of rodents in all utilized fields were probably reduced.

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