COYOTE RESEARCH PROGRESS REPORT
JUNE 1976

INTRODUCTION

This paper represents the second progress report concerning coyote (*Canis latrans thamnos*) research in the Huron Mountains of Upper Michigan.

The coyote has long been classified as a varmint, or an undesireable predator. It has been hunted, trapped, poisoned, and even tortured in almost every part of its range (Dobie 1947). Despite its prosecution by man, the coyote is one of the few predators to expand its range in recent years.

Coyotes were killed within the Huron Mountain area as early as 1925 (Manville 1942) and have been harvested to some degree to the present. Probably, the main reason for killing the animal is the State of Michigan coyote bounty ($15 for a male and $20 for a female) which has been paid since 1936 (Ozoga and Harper 1966). Even if it were necessary to control coyotes, the bounty appears to have little effect in controlling coyote numbers, as about 3,000 are bountied in Michigan each year, with no decline in numbers being shown (Cain et al. 1972).

Despite man's attempt to reduce coyote numbers, there has been very little quantitative information collected about it. It is our intent to collect data about the coyote in the Huron Mountain area to learn more about its ecology and behavior. Only through intensive research can we hope to gain enough insight into this remarkable predator's life cycle so that we may use this information for intelligent wildlife management.

This paper is a brief report on what has been done, and the direction our current research is taking.

Methods and Materials

In November 1973 an investigation into the coyote population at the Huron Mountains began. Data was collected on coyote distribution and relative abundance. Records of sightings were kept. An experimental index of abundance by counting tracks on selected routes was developed. This provided a rough estimate of coyote density and distribution which can possibly be used in the future to detect large fluctuations in the population (Smith 1975).

Besides distribution and abundance, data on coyote feeding habits were obtained. From May 1974 through August 1975 coyote scats (droppings) were collected by searching trails and roads within the study area. Analysis of contents were made with the use of dissecting and compound microscopes. Identification of food items was made by gross appearance and scale patterns of hair impressions (Adorjon & Kolenski 1969). Data were recorded by frequency, that is the percent of scats in which a food item occurred.

Results and Discussion

Table I presents the results of coyote scat analysis and compares our results with those of Manville (1942) and Ozoga and Harger (1966). Some changes in coyote feeding habits over the last 35 years can be noted by comparison with Manville's data.

The remains of white-tailed deer (Odocoileus virginianus) occurred in 25% of our sample of 48 scats. Manville recorded 17.6% frequency of deer in his sample of 34 scats. The difference in frequency between Manville's and our results is not statistically significant (.05 probability (=C.I.). But since there has been a marked decline in the deer population (Laundre 1976) since Manville's study it is possible that coyotes are actually taking a larger proportion of the available deer than they were 35 years ago. This could also relate to the poorer winter range of deer. Coyotes obtain most of their deer food through carrion (Ozoga and Harger, 1966, Manville 1942) although they are able to kill deer under some conditions. During the present study at least two deer were thought to be killed by coyotes. One kill was found in April 1975 on the south side of Pine Lake. An ice fisherman observed the evidence immediately after the kill. All evidence suggest that only one coyote killed the deer by an attack to the throat after chasing it out onto the ice.

Another dead deer was reported on the east side of Rush Lake late in December 1975. We were unable to determine the circumstances of the kill, but it appears that one or more coyotes made the kill on the ice and had been feeding on it for several days. The lower mandible of the deer was collected and an age of 4 1/2 to 5 1/2 years old was determined on the basis of tooth wear. Sex could not be determined from remains of either kill but on the Rush Lake kill the fat content of the bone marrow was high indicating good condition. Data on age, sex, and general condition of the Pine Lake kill could not be obtained.

Another interesting change in feeding habits has occurred with the porcupine (Erethizon dorsatum). Manville reported that porcupines

were very abundant during his study and a percent frequency of 32.4 was found in his coyote scat sample. During the present study a 20.8% frequency was recorded. These frequencies are also not statistically different at the 95% C. level. Laundre (1975) stated that there was a marked decline in porcupines around 1969 and presently numbers are comparatively low. Despite the low numbers of porcupines they still appear to make up a large portion of the coyotes diet. Since porcupines are slow moving and probably easy to catch, coyotes could be selectively hunting them. Several authors have speculated on the hunting technique used by coyotes to safely capture porcupines, but none have been conclusively proven. This is an area in which data is very lacking.

The percent frequency of porcupine found during the present study equals that of the snowshoe hare (20.8%), which is thought to be one of the major prey species of the coyote. Both Manville and Laundre reported hares to be common in second growth habitat of the Huron Mountains. We believe that local snowshoe hare populations might be significant in determining the winter range of the coyote. Some evidence from the study of abundance suggest this (Smith 1975). Manville reported a much higher occurrence of hare remains in his sample (55.8%), which is over twice as much as we found during the study (20.8%). This could be attributed to seasonal variation or cycles in the snowshoe hare population.

Also recorded during the present study was the occurrence of Red squirrel (Tamiasciurus hudsonicus) and Eastern chipmunk (Tamias striatus) in coyote scats. Although the occurrence of these two species was much higher than that recorded by Manville, statistical analysis shows that there is no significant difference at the 95% confidence level. Both Manville and Laundre reported Red squirrel to be common in the Huron Mountains, perhaps here also coyotes are taking a greater proportion of the squirrel population. Laundre did, however, report that the eastern chipmunk appears to be more abundant at the present, this could explain an increase in the occurrence of chipmunk in coyote scats. From the data we have collected it appears that these two small mammals are frequently included in the coyotes diet.

Manville reported an 11.7% occurrence of muskrat (Ondatra zibethica) and a 5.6% occurrence of meadow vole (Microtus pennsylvanicus) neither of which were recorded in the present study. This could be attributed to the random variation. There was no statistically significant difference in occurrence. Muskrat populations were reported to be very localized and by chance could have been utilized by one or two coyotes.

The occurrence of insects and of vegetative matter were not significantly different during the present from the data that Manville recorded.

We can also compare our data with that gathered in a coyote feeding habits study near Shingleton, Michigan. Ozoga and Harger collected 44 scats over a nine year period (Table I). White-tailed deer occurred in over 3.7 times as many scats in the Shingleton area as in the Huron Mountains. Porcupine, which occurred in over 20% of the scats we analyzed, occurred in only 2.3% of the Shingleton area sample. Our analysis revealed 15 different food items compared with 6 found by Ozoga and Harger. Snowshoe hare was less than one-half as frequent in the Shingleton area as in the Huron Mountains despite the rather low snowshoe hare density within the Huron Mountains. Further interpretation of this data will be made after a larger sample is taken.

Present research techniques.

At present we are concentrating on learning more about coyote ecology and behavior. There is very little published information available on this subject. Intensive research requires monitoring coyotes so that observations can be made. The method which has been proven to be the most efficient is radio telemetry (Mech 1973). Under this type of study, coyotes are being live-trapped with traps checked daily, using a method identical to that which is used by Mech in the Superior National Forest of Minnesota to radio tag wolves. Once the animal is trapped it is tranquilized and a variety of measurements, weights, and blood samples are taken to obtain background data. A radio collar is attached and the coyote is released at its point of capture. Investigators are able to follow movements, pinpoint locations, and make direct observations (usually by aircraft) to learn more about the coyote's ecology and social behavior.

This type of study has never been done in wooded habitat such as the Huron Mountains. We feel that this type of study will be extremely useful in obtaining the information to help develop a much needed sound ecological management program and a reevaluation of the advisability of continuing the bounty on coyotes.

TABLE I

OCCURRENCE OF FOOD ITEMS FOUND IN 48 SCATS
COLLECTED IN THE HURON MOUNTAINS 1974-76

Food Item	% Occurrence (1) Present Study 48 scats	% Occurrence (2) Huron Mts. 1939-41 34 scats	% Occurrence (3) in Shingleton area 1956-65 44 scats
Mammals			
White-tailed deer (*Odocoileus virginianus*)	25.0	17.6	93.2
Porcupine (*Erethizon dorsatum*)	20.8	32.4	2.3
Snowshoe Hare (*Lepus americanus*)	20.8	59.8	9.1
Red Squirrel (*Tamiasciurus hudsonicus*)	16.6	2.9	0.0
Eastern Chipmunk (*Tamias striatus*)	14.5	5.9	0.0
Beaver (*Castor canadensis*)	4.2	0.0	0.0
Woodchuck (*Marmota monax*)	4.2	8.8	0.0
Raccoon (*Procyon lotor*)	4.2	0.0	0.0
Shorttail Shrew (*Blarina brevicaude*)	2.1	0.0	0.0

Table 1 (continued)

Food Item	% Occurrence (1) Present Study 48 scats	% Occurence (2) Huron Mts. 1939-41 34 scats	% Occurrence (3) in Shingleton area 1956-65 44 scats
Mammals			
Red-backed Vole (Clethrionomys gapperi)	2.1	0.0	9.1
Deer Mouse (Peromyscus maniculatus)	2.1	0.0	4.5
Short-tailed Weasel (Mustela erminea)	2.1	0.0	0.0
Other Mammals	0.0	23.1(4)	0.0
Birds			
Unidentified	10.4	0.0	4.6
Insects	6.3	5.6	0.0
Plant Material (Grasses, leaves, etc.)	10.4	5.6	0.0

(1) The measurement is the percent of scats containing particular food item

(2) From Manville (1942)

(3) From Ozoga and Harger (1966)

(4) 11.7% contained muskrat (Ondatra zibethica) and 5.6% contained Meadow Vole (Microtus pennsylvanicus)

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Respectfully submitted

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