

QUICK, H.F.

(weasel)

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AN INVESTIGATION OF THE HABITS AND ECONOMICS  
OF  
THE NEW YORK WEASEL IN WASHTENAW COUNTY MICHIGAN

A thesis submitted in partial fulfillment of requirements  
for the degree of Master of Forestry, to the University of  
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H. F. Quick

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## TABLE OF CONTENTS

|   |                 |
|---|-----------------|
| Introduction                                  | Page 1          |
| Location of Study                             | Page 3          |
| Methods of Study                              | Page 3          |
| Poultry Damage Survey                         | Page 4          |
| Table I                                       | follows Page 6  |
| Table II                                      | follows Page 6  |
| Table III                                     | follows Page 6  |
| Discussion of Tables I, II, III.              | Page 7          |
| Hunting habits of Weasels                     | Page 10         |
| Tracking Techniques                           | Page 11         |
| Discussion of results of habits studies       | Page 14         |
| Weasel Tracks and Trails <u>illustrations</u> | Page 14         |
| Table IX                                      | follows Page 16 |
| Table X                                       | follows Page 17 |
| Table VIII                                    | follows Page 20 |
| Track Map samples                             | follows Page 20 |
| Tables IV, V, VI                              | faces Page 28   |
| Table VII                                     | follows Page 30 |
| Summary and Conclusions                       | Page 31         |
| Bibliography                                  | follows Page 32 |

AN INVESTIGATION OF THE HABITS AND ECONOMICS  
OF THE NEW YORK WEASEL IN WASHTENAW  
COUNTY, MICHIGAN

INTRODUCTION:

The weasel, *Mustela frenata noveboracensis*, has so long been a character of song and story that much of legend concerning it seems to have been taken for truth and applied to wildlife management. The literature, exhibiting a dearth of field study, and the important status acclaimed for the weasel by wildlife managers, prompted, and so presented, a purpose for this investigation.

LITERATURE:

From the standpoint of economics, the investigation of the Pennsylvania bounty system by Gerstell, 1937, is the most illuminating piece of work. In abstract, this study showed that \$1,879,600 was paid in bounties on the weasel by the Game Commission, over a period of twenty years. This amount, paid on a single species, the weasel, is 63.3% of the total bounty payments on all species. The figure is separate from the costs of operation, and represents only the actual payments to bounty collectors. Theoretically, this shows also that 63% of the operation costs of the bounty system, are on the red side of the ledger, charged against the weasel.

The average annual amount paid on weasels is \$75,812 in the Commonwealth of Pennsylvania alone. This is 80.9% of the total amount paid each year on all species. The above is also separate from the actual costs of operation, as before stated.

Gerstell concludes from this study, that the bounty system has not, to any extent, controlled the weasel.

Considering actual knowledge of the weasel's habits, no pertinent field investigation is known. The weasel appears often in the "Notes" section of the Journal of Mammalogy. The notes are usually observations that last for minutes only. They generally employ the descriptive terms, "ferocious," "blood thirsty," and "ruthless killers." These words describe single observations that last for short periods of time, but serve the psychological effect of impressing the human mind with lasting memories of the weasel's wickedness.

Studies on the weasel have largely been laboratory work. Hamilton, 1933, has kept captive weasels for the purpose of studying the moult, or pelage change, and reproductive habits. Svihla, 1934, has performed a number of physiological experiments on weasels kept in captivity. Dearborn, 1932, has examined 39 weasel stomachs to learn something of their summer diet.

Literature in the main has put a price on the weasel's head. Years of popular belief in legend resulted in acceptance, and bounties are continuously paid. Gerstell exonerated the weasel on an economic basis, by showing that twenty years of bounty payment had not controlled it.

Possibly there was, also, a natural basis for the discontinuation of bounty payments, which would result in the availability of more of the sportsmen's money for better use. At least, there seemed to be little known of the habits of

wild weasels. Many predatory birds have been found, upon investigation, to be beneficial where previously they were considered harmful. These, and other recent investigations, exposed a lack of actual knowledge which caused needless expense and mismanagement. Undoubtedly a thorough understanding of the facts and mechanisms would lead to more efficient management.

#### LOCATION OF STUDY:

Orientation trips extended over Washtenaw County, Michigan. After experiment, the sample method of obtaining information from farmers was abandoned because weasels were found to be unevenly distributed over the county.

In order to cover the ground completely, the area of study was reduced to one township. Lodi Township of Washtenaw County, was selected as typical of the farm country and for its accessibility. Geologically, the terrain is a ground moraine of the Fort Wayne - Huron Lobe glaciation. The cover is characteristic of Southern Michigan, with an interspersion of agriculture, upland hardwood and marsh types. About 70% is under agriculture, 15% wooded and 15% marshy pasture land. Section 1 of this township proved most fruitful for habits studies, as four weasels and a good population of other species were found here. From time to time trips were made to other areas, as checks on the specific area.

#### METHODS AND RESULTS OF STUDY:

The work plan was drawn to include three phases of study, the procedure of which could progress with the change of seasons

and so yield maximum correlation.

The first phase was a Poultry Damage Survey of the township selected. This work was done in the fall before snow. It was intended to collect data on damages done to poultry by wild-life, with particular emphasis on the weasel.

The second phase of work was a study of hunting and cruising habits, by tracking in the snow.

The third phase was a food habits study by fecal analysis and trail observations. Feces were collected while tracking and stored for analysis when tracking was no longer possible.

The three phases of the study are presented below, in the order in which they were pursued. Some overlapping of subject matter is apparent because of the close relationship of food habits and hunting habits.

#### POULTRY DAMAGE SURVEY:

##### Methods of Study:

The entire area of Lodi Township was investigated by direct interrogation of the farmers. Each farm was given a location number corresponding to rural postal service numbers for the convenience of future reference. A total of 181 farms were visited, using the 100 percent cruise system. Field work was begun October 4, 1939 and continued until December 15, 1939.

The data obtained was for the year just preceeding, starting October, 1938, and running to October, 1939. Since this was the period most fresh in the memory of the farmers, it was felt that a fair degree of accuracy was obtained. Conservative

figures, only, were used and every attempt was made to avoid any duplication or error due to lapse of memory on the part of the farmers.

The technique of questioning was to memorize the data and record it on form sheets after returning to the car. All especially pertinent facts were recorded in note form in the field note book. This procedure was followed after first learning that the farmers did not accept inquiry as readily when one approached them with a batch of official looking papers, as when not carrying any.

Obstacles encountered were few. Probably most of the error is that incurred through lapse of memory on the part of the farmers. In general, they were found quite cooperative, but occasionally became suspicious over such questions as number of trappers per family and number of traps set per trapper. On several occasions questions were refuted, but the information desired could usually be filled in by inquiring of a neighbor.

#### Explanation of Data Obtained:

##### Number of Poultry:

The population of various classes of poultry, chickens, ducks, turkeys, etc., was recorded. In many cases an approximation was made, as the farmers did not always know exactly how many they had. The conservative figure was always used.

##### Number of Trappers:

The number of trappers and age classes were obtained. Two classes were recognized: school boys up to 18 years, and adult trappers, over 18 years. This age was used as the dividing line on the basis that the average trapper begins to run more traps,

and to trap more sincerely at the age of 18 than does the boy trapper under that age.

Number of Weasels Killed:

The number of weasels killed, the causes of deaths and the year and month of each death were recorded for each farm. The classes of death causes were:

1. Trapped in the wild
2. Killed in the barn area
  - a. Trapped
  - b. Shot
  - c. Killed by dog
  - d. Killed by cat
  - e. Beaten to death

Poultry Loss:

The nature of any poultry loss inflicted by any wild species was obtained. Hawks and owls were included in the interrogation. No one complained of hawks and only one farmer complained of damage by owls, but since no specific complaint was registered, it does not appear in this study.

Environs of Farm Yard:

The condition of chicken houses, concerning resistance to mammalian predators was noted in three classes:

1. Good--Cement floored coops, rat proof; enclosed chicken yard.
2. Fair--Tight board floors, chickens not always confined to a yard.
3. Poor--Loose floors, sheeting incomplete or broken,

TABLE I

## POULTRY LOSS BY CAUSE IN PER CENT

| Poultry Class | Cases Reported | Poultry Population | Weasel | Mink | Opposum | Rat    | Fox  | Total Killed | Per Cent Killed |
|---------------|----------------|--------------------|--------|------|---------|--------|------|--------------|-----------------|
| Chicken       | 181            | 17,555             | 1.03   | .12  | .03     | .56    |      | 301          | 1.74            |
| Duck          | 6              | 240                | 4.16   | .41  |         | 41.57  |      | 111          | 46.24           |
| Turkey        | 2              | 80                 | 50.0   |      |         |        | 31.2 | 65           | 81.20           |
| Geese         | 4              | 59                 |        |      |         |        |      | 0            |                 |
| Guinea        | 1              | ?                  | 1 only |      |         |        |      | 1            |                 |
| Rabbit        | 1              | ?                  |        |      |         | 5 only |      | 5            |                 |
| Pet Dove      | 1              | 1                  | 1 only |      |         |        |      | 1            |                 |

TABLE II

## CAUSES OF POULTRY DAMAGE IN PER CENT

| Poultry Class | Weasel | Mink | Opposum | Rat    | Fox   | Skunk | Raccoon                | Total Kill |
|---------------|--------|------|---------|--------|-------|-------|------------------------|------------|
| Chickens      | 59.8   | 6.6  | 1.0     | 32.6   |       |       | Damages claimed.       | 301        |
| Duck          | 9.0    | .9   |         | 90.1   |       |       | No figures obtainable. | 111        |
| Turkey        | 61.23  |      |         |        | 38.77 |       |                        | 65         |
| Guinea        | 1 only |      |         |        |       |       |                        | 1          |
| Rabbit        |        |      |         | 5 only |       |       |                        | 5          |
| Pet Dove      | 1 only |      |         |        |       |       |                        | 1          |

TABLE III

## CAUSES OF DEATH TO WEASELS, LODI TWSP.

| Month                             | Weasels Killed in the Barn Yard |        |       |       |                 | Wild Trapped | Seen | Occurrence on Farms |
|-----------------------------------|---------------------------------|--------|-------|-------|-----------------|--------------|------|---------------------|
|                                   | Trapped                         | Shot   | Dog   | Cat   | Beaten to Death |              |      |                     |
| October 1938                      |                                 | 1      |       |       |                 |              | 2    | 3                   |
| November 1938                     |                                 |        |       | 1     | 2               |              | 3    | 4                   |
| December 1938                     |                                 |        |       |       |                 |              | 9    | 6                   |
| Jan. Feb. and March, 1939—no data |                                 |        |       |       |                 |              |      |                     |
| April 1939                        |                                 | 2      |       |       | 1               |              | 1    | 4                   |
| May 1939                          |                                 | 2      | 1     |       |                 |              |      | 2                   |
| June 1939                         | 1                               | 2      |       |       |                 |              | 2    | 4                   |
| July 1939                         | 2                               |        | 2     |       |                 |              | 1    | 4                   |
| August 1939                       |                                 |        | 1     | 1     | 1               |              | 2    | 5                   |
| September 1939                    | 1                               |        |       |       | 1               |              |      | 2                   |
| <u>Total Per Cent</u>             | 15.65%                          | 18.75% | 12.5% | 6.25% | 15.65%          | 52.0%        |      | 18.7%               |

chickens roaming at large.

A few were not recorded as it sometimes seemed undiplomatic to investigate or inquire.

#### Rat Population:

An attempt to evaluate the rat concentration on the farms met with little success. Since this was not the issue of the investigation, no special attempt was made. It was felt that rats had some bearing on the presence or absence of weasels, but this relationship was not established. All farms harbored at least a few rats. On farms where particularly high concentrations were known, special note was made.

#### RESULTS AND DISCUSSION:

The field data collected is analyzed in tabular form. Table I illustrates the loss, in percent, of the total population of each poultry class inflicted by the designated animals.

Weasels killed more in all classes except ducks, in which case rats were responsible for greater losses.

The raccoon and the skunk do not appear in this table. In many cases, as shown in the field notes, this was because the intruders were intercepted by dogs before damage was done. These larger, clumsier animals are caught more often than are the weasels.

Column 9 of Table I shows the total loss by all causes. The accuracy is subject to human error, and may be an overestimate. Farmers seem eager to tell of their losses.

In the case of chickens, 1.7% is probably a good total loss estimate since chickens are evenly distributed and present in large numbers. The exceptionally high loss of 46% of the ducks is probably not a good estimate as ducks were few and sporadic. Turkeys fall in the same class. Only two farms reported rearing turkeys last year. Obviously a fox learned where to find a good meal and returned every two to three days until it had killed 25 turkeys on one farm.

The other classes are insignificant because of the small numbers kept by the farmers but serve to round out the information.

Table II shows the relative destructiveness of the predatory mammals found on the area studied. The weasel appears most destructive, having killed more poultry than any other animal. Reading column 2, the weasel is shown to have inflicted 59.8% of the losses among chickens, 9.0% among ducks, 61.23% among turkeys and the rest is insignificant.

Rats are found to be the next worst loss factor, killing 32.6% of the total kill of chickens and 90.1% of the total kill of ducks.

The opossum, like the 'coon and skunk, shows relatively little damage; this is not the actual case, however, as this animal is also often intercepted by dogs before damage is done. All three of these mammals are potential dangers to poultry.

Table III shows the frequency of known occurrence of weasels on farms, numbers killed each month, and causes of deaths. It was found that 71.8% of the weasels taken were killed on the

barn area. The remainder, 28.2%, were taken in traps during the trapping season. It is significant to state that these were accidentally caught in sets made for more valuable fur bearers. The trappers questioned do not bother to trap weasels because the value of the fur is too low to warrant the time and work of skinning and casing.

Breaking down the above figures into "Death Cause" classes, the following calculations appear in the Totals column of Table III:

21.75% were shot

15.65% were trapped, mostly in traps set for rats

15.65% were beaten to death

12.50% were killed by the farm dog in most cases set on the weasel purposely

6.25% were caught by barn cats not purposely set on the weasel

These deaths all took place on the barn area which indicates that no special attempt was made to suppress the weasel except when it invaded the barn area.

The remaining 28.2% has already been accounted for as accidentally trapped in the wild during the trapping season.

It is believed that all farmers who saw weasels tried to kill them. Of those seen, 25.5% escaped, and 74.5% were killed. This occurred on 34 farms, 18.78% of the total number of farms on the township studied. At times, as shown in the table, more than one weasel appeared on a single barn area.

Concerning seasonal occurrence, it was found that 64.7% of the weasels seen on barn areas appeared during the spring and

summer months when young chicks are being reared by the farmers and the weasels are raising their litters. Specifically, this time is from April to August which is about the time from birth till independence for weasels of this locality.

During the dead of winter, December till April, no weasels were reported to have invaded the barn areas. This suggests that the farms are attractive to weasels during the maternal period, which is also when the farmers are raising chicks. There seems to be a tendency for the weasels to return to wild environs as winter sets in.

It has been shown that about three quarters of the weasels seen were killed, and that 71.8% of the total kills made, occurred on the barn area. Since Michigan offers no bounty to induce the killing of weasels, it is concluded from these figures that at least a measure of control is exerted by a natural attitude of defense on the part of the farmers. The best method of protection seems to be a good substantial hen house with a concrete floor.

#### HUNTING AND CRUISING HABITS:

##### Methods of Study:

##### Selecting the Area:

The initial step was to learn to positively identify the tracks of weasels. With brief study this became quite easy. The second step was to cruise at random in an attempt to cross trails. The first trail was picked up January 5, and followed for 3 hours, without completing the course. Thus, the first area

of study was selected.

After the areas to be studied were determined, cover maps were made to a scale convenient for field work. It was necessary that these be as accurate as possible, since greater accuracy could be attained in track mapping by referring to fence corners, and natural or cultural features.

#### Mapping Trails:

By following a trail and estimating the angle and distance of intersection with fences and from corners, the major traverses could be accurately plotted on the cover map. When necessity dictated, pacing was used to determine the distance of a trail from a map feature.

Mazes and meanders were the principle sources of error. Meanders could only be estimated by arc and chord distance and plotted according to judgement. Mazes were impossible to plot and only estimates were obtained.

#### Tracking Techniques:

Varying snow conditions made it necessary to devise different methods of tracking and plotting trails. When possible, the trails were followed until completed, and a map made as accurately as conditions would permit. On certain occasions, when a number of weasels had been on the area, and it was desired to determine their specific ranges, time was too limited to permit complete mapping of each trail. A system of "Box Tracking" was tried to obtain the information desired in the time available.

#### "Box Tracking"

In case of inimical weather threatening the obliteration

of trails, a rapid means of recording this valuable data was desired.

A means was found in the simple technique of "box tracking". In order to "box track" a weasel's nocturnal journey, the track mapper must circumvent the trail, taking care not to get within the area covered by the hunting animals. This was done by tracking forward by sight and walking at a tangent to the most distant visible meander, thus eliminating the necessity of tracing out the tedious meanders. The continuation of these courses tangent to the meanders, leads the tracker to circumvent the area hunted by the weasel, prescribing a closed traverse about it. The tracker has only to map his own course and thus derives the extent of the weasel's travels. This rapid method enables one person to "box map" in several hours, the areas covered by three or four weasels. If an overlapping of two weasel's tracks occurred, some confusion is experienced, but with practice and patience the trouble can usually be alleviated. It is seldom that such an overlapping is found. Box tracking does not, of course, yield information concerning the activities of the animals along the greater part of trail, but in the face of threatening obliteration by rain or snow, it is a speedy method of recording the areas hunted by the individuals.

#### "Spot Tracking:"

On numerous occasions snow conditions were so poor that continuous tracking became impossible. By making use of the knowledge already gained concerning the favorite haunts of the weasels, it was found practical to visit these haunts, such as

particular logs, stumps, wire piles and brush piles, in search of a fresh track on a patch of snow. By plotting these single tracks or short lengths of trails and noting their direction, a fairly accurate map could be pieced together as office work.

This at least was an index to minimum cruising radius if not representative of the maximum.

### "Circling"

Only the application of this technique is new. Years ago it was taught to white men by the Indian. A trail, lost on a hard surface, in a stream, or along a log could often be picked up by circling. This system is to search from the end of the trail, in ever widening circles, until the other, or "lost" end, is found. This was often necessary to complete the track maps.

The new application was used on track mazes that were quite impossible to trace out. By circling these mazes as in Box Tracking but on a smaller scale, the "lead out" trail could be picked up. The maze itself was random cruised to observe the signs of activity.

### Animal Relationships on the Area Studied:

Consequent with the study of the weasel, notes were kept on the activities and interrelationships of other species observed on the area. This was in effect, part of the Food Habits Study as well as part of the cruising habits study. The tracks of other species were mapped and followed for some distance in order to make clear any interspecific effects that it might be possible to observe.

### Live Trapping:

Live traps were set near den entrances. On the first night of setting, Weasel #1 was trapped. Hind foot measurements, sex and other notes were thus obtained. No success was realized with other traps, though in three instances the weasels climbed over the tops of the traps, but did not enter them. The traps were baited with pheasant feathers and rabbit fur with a little meat attached.

#### RESULTS OF WINTER HUNTING AND TRAVEL HABITS:

##### Gross Features:

The hunting habits of weasels are variable. Opportunity afforded a chance to observe the mink's hunting habits on a small scale, which offered a means of comparative study. The mink traveled mainly along creek bottoms, but wandered off from time to time cross country. The weasels observed on this area were very little concerned with the creeks, but preferred to hunt in the fields. Probably this was because its food species were more abundant in the agricultural types, where conversely, the mink found favorite foods in the thick coverts of marsh grass and kettle bottoms. Referring to Table VIII, it can be seen that the weasel travelled or hunted 52.69% of the time over crop covered and fallow land, 28.69% over plowed ground, and 18.62% through wooded and shrub-covered land.

##### Detailed features of Trails:

Weasel trails are usually a combination of meanders and traverses. The weasel would at times take off on a direct course paralleling a fence or road, but when it approached the signs of

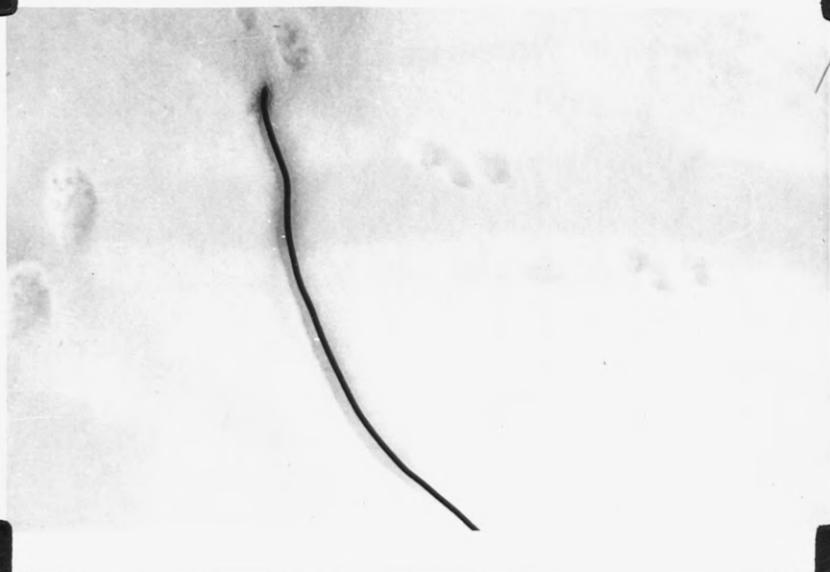
WEASEL TRACKS AND TRAILS



The Tracks of a Pair of Weasels

Weasel No. 1, a large male, left; Weasel No. 4, a female right.

February 28, 1940



A Close-Up of the Above Picture

Note front toe and hind toe marks in tracks of male weasel.

Note irregularity of track register in the female weasel.

This is unusual, but occurs at times.

Photographs by Doris V. Quick

WEASEL TRACKS AND TRAILS



Tunnels in Snow over Plowed Ground

February 10, 1940



The Trails of Skunk, Weasel and  
Red Squirrel  
Left to right respectively.

WEASEL No. 1  
Photographs by D. V. Quick  
Jan. 12, 1940

TRACKS OF THE NEW YORK WEASEL  
NATURAL SIZE IN 1/2" WET SNOW  
SITTING



WEASEL No. 1  
6001, SECT. 1  
JAN. 12, 1940

*Trink*

TRACKS OF THE NEW YORK WEASEL  
NATURAL SIZE ON POWDER  
SNOW OVER CRUST

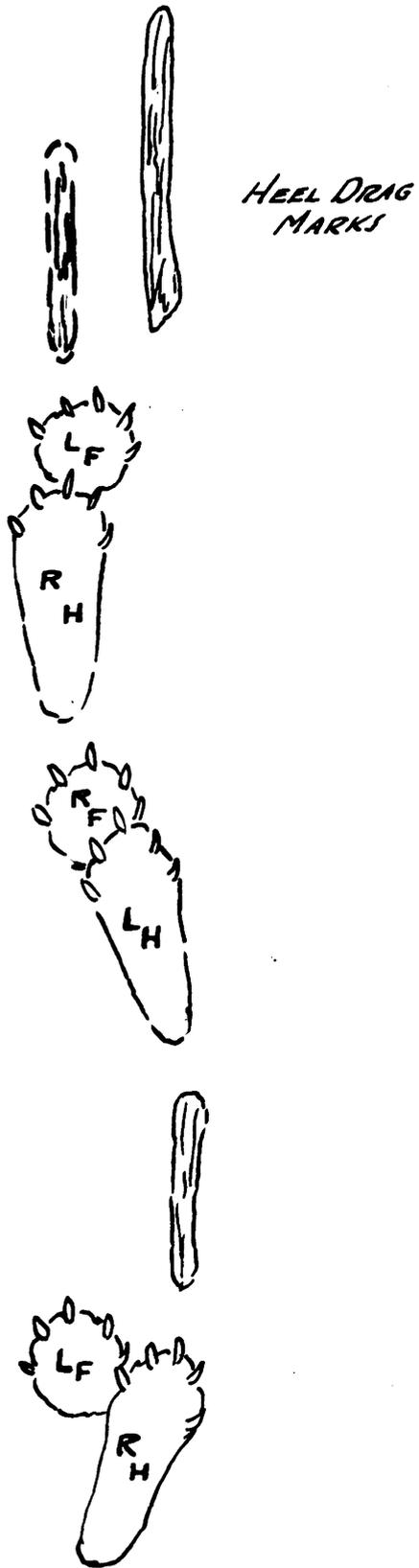
SITTING



WEASEL No. 3  
LOOI SECT 1  
FEB 10, 1940

Trick

TRACKS OF THE NEW YORK WEASEL  
WALKING IN WET SNOW



WEASEL No. 1  
LODI. SECT. 1  
FEB. 6, 1940

*Trick*

TRACKS OF THE NEW YORK WEASEL  
NATURAL SIZE IN  $\frac{1}{4}$ " DRY SNOW  
LOPING



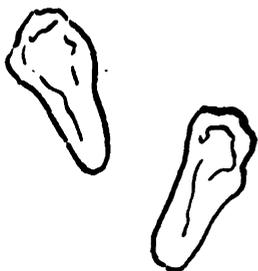
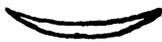
WEASEL No. 1  
LODI, SECT. 1  
JAN. 17, 1940

*Trick*

THE TRAIL OF A WEASEL CARRYING  
A PEROMYSCUS



Tail Marks of  
the Mouse



WEASEL No. 1  
LODI, SECT. 1  
MAR. 22, 1940

*Trick*

mice activities on the snow, it would usually begin its characteristic serpentine meandering.

Trails are composed of a series of bounds, as the weasels very seldom traveled at a walking gait. Less than fifty yards out of the many miles of weasel trails followed, showed that a walking gait was used.

Concerning the speed of the weasel, an experiment was made after having measured and marked a large male weasel which had been live trapped. The animal was released and chased. This was done twice and the animal caught in the hands both times. Bounds, measured later, were not as long as the average, measured in the undisturbed condition of normal travel. It seems that when under the pressure of pursuit, the animal shortens the length of bound to facilitate maneuverability. Thus the weasel appears to rely on shiftiness for escape, rather than speed. Murie Adolf, 1936, observed that a weasel could not outrun a rabbit even with the advantage of cutting across circles.

#### Track Characteristics and Measurements:

The accompanying photographs will illustrate the features of weasel tracks better than words can describe. Usually the weasel steps half way into the front foot print with the hind foot of the same side, thus causing both prints to appear as one. The gross effect of all four feet gives the impression of a hopping biped.

The attempt was made to apply Marshall's, 1936, technique of measuring mink tracks (length of hind foot) to the measurement of weasel tracks, but because of the character of overstriding with the hind foot, the lines marking the limits of the

toes of the hind feet are obliterated in the tracks of the front feet. This prohibits the exact measurement of the hind foot track. Mink tracks found on this area displayed the same characters and under these conditions were also impossible to measure accurately.

At times, however, when good snow conditions existed and a walking track was found, the hind foot length could be measured. These conditions were so rare that the writer considered it impractical to depend on this method.

Later in the study, the technique devised for the identification of the sexes was a "total width of straddle" measurement. This was taken to be the maximum span of the tracks from side to side.

The results of the straddle measurements of four weasels and a mink are shown in Table IX.

Weasel #1, found to be a male by trapping and sexing, shows an average width of straddle of 50.0 mm. The sex of the other two animals are unknown unless it be considered that females are noticeably one-quarter to one-third smaller in general proportions, and the conclusion be drawn on this basis, that numbers 2 and 4 are females. The mink straddle average is seen to be larger than the largest weasel. No sex data is available on this mink.

On the basis of this type of measurement, the indication is that some qualitative information as to sex could be obtained for mink and weasel tracks if enough figures be obtained. Burt, W. H., suggests large samples be taken, and due caution be exercised

TABLE IX

TRACK MEASUREMENTS

Based on Total Width of Straddle Method of Measurement

| Date Measured | Weasel No. 1<br>Millimeters | Weasel No. 2<br>Millimeters | Weasel No. 3<br>Millimeters | Weasel No. 4<br>Millimeters | Mink No. 1<br>Millimeters |  |
|---------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|---------------------------|--|
| Feb. 29       | 53                          | 44                          |                             | 38                          | 99                        |  |
|               | 48                          | 42.5                        |                             | 48                          | 97                        |  |
|               | 46                          | 38                          |                             | 38                          | 76                        |  |
|               | 46                          | 36                          |                             | 35.5                        | 74                        |  |
|               | 56                          | 38                          |                             | 35.5                        | 72                        |  |
|               | 58                          | 41                          |                             | 35.5                        | 63                        |  |
|               | 48                          | 34.5                        |                             | 33                          | Average 79.6mm.           |  |
|               | 48                          | 40                          |                             |                             |                           |  |
|               | 60                          | Average 39.2 mm.            |                             | 32                          |                           |  |
|               | 62                          |                             |                             | 50                          |                           |  |
|               | Mar. 28                     | 60                          |                             |                             | 33                        |  |
|               |                             | 55                          |                             |                             | 37                        |  |
|               |                             | 55                          |                             |                             | 39                        |  |
| 63            |                             |                             |                             | 40                          |                           |  |
| 52            |                             |                             |                             | 42                          |                           |  |
| 62            |                             |                             |                             | 49                          |                           |  |
| 68            |                             |                             |                             | 33                          |                           |  |
| 55            |                             |                             |                             | 37                          |                           |  |
| 53            |                             |                             |                             | 36                          |                           |  |
| 60            |                             |                             |                             | 37                          |                           |  |
| 65            |                             |                             |                             | 37                          |                           |  |
| 62            |                             |                             |                             | 37                          |                           |  |
| 64            |                             |                             |                             | 45                          |                           |  |
| 62            |                             |                             |                             | 40                          |                           |  |
| 58            |                             |                             |                             | 36                          |                           |  |
| 54            |                             |                             |                             | 42                          |                           |  |
| 48            |                             |                             |                             | 42                          |                           |  |
| 48            |                             |                             |                             | 41                          |                           |  |
| 56            |                             |                             |                             | 30                          |                           |  |
| 62            |                             |                             |                             | 35                          |                           |  |
| 57            |                             |                             | 40                          |                             |                           |  |
| 62            |                             |                             | 37                          |                             |                           |  |
| 68            |                             |                             | 34                          |                             |                           |  |
| 55            |                             |                             | 40                          |                             |                           |  |
| 52            |                             |                             | 37                          |                             |                           |  |
| 67            |                             |                             | 41                          | Average 37.9 mm.            |                           |  |
| 67            |                             |                             | 41                          |                             |                           |  |
| 60            |                             |                             |                             |                             |                           |  |
| 62            |                             |                             |                             |                             |                           |  |
| 59            |                             |                             |                             |                             |                           |  |

to avoid the confusion of small immature males with large adult females. Intensive live trapping to determine sex would facilitate this.

"Bound" measurements were often taken, but the results were of so little significance that no data is presented. It will suffice to say, that in general, the large weasels bounded greater distances than smaller ones. Average bounds for the smallest weasel were 9 inches as to 15.7 for the largest. Maximum single bounds recorded of the large weasel were 54 inches.

Only once during the winter were conditions such that separate hind foot print measurements could be made. These are indicated in Table X, but are not significant because of the lack of sufficient data.

#### Curiosity and Investigation:

The trails of weasels often led to the dens of other animals. It is not known if these dens were occupied, as most of the animals were spending short periods in winter sleep. The weasel's habits of investigating every hole encountered, made the location of their dens difficult.

The trails of weasels often showed where the animals had climbed low trees and bushes, evidently in search of roosting birds.

Where manure spreadings attracted mice, the weasel's trails showed that a particular interest was taken in the area, and the weasels hunted more intensely. Corn shocks, rock piles, drain culverts and piles of old wire were also favorite sites where special care in hunting was taken.

The account of one fortunate observation may be of value. Weasel #1, having been live trapped, was released and chased into a brush pile; the observer retreated to a blind and awaited the exit of the weasel.

After a quarter hour or so, the animal appeared loping through a small kettle in which it had sought refuge. It went under logs and through brush, shifting and changing its course frequently.

Finally it came out of the kettle onto snow-covered plowed ground. After having loped over this new terrain for a few yards, the gait was slowed to a cautious walk. The head was alternately raised and extended while walking, as if it were smelling for something. Once, it stopped and sat upright on its hind feet, with the front feet off the ground, and appeared to become more cautious. After a brief moment, it continued slowly and disappeared into the snow.

Having waited ten minutes, closer observation was made and a mouse burrow was found beneath the snow. The weasel may have smelled a mouse from a distance of six feet, as evidenced by the distance traveled while walking and smelling. There were no mice tracks on the snow, and it is likely that the mouse was not seen. Probably the odor of the mouse came from its warm burrow and was picked up by the weasel. This individual had been in a trap all night, and it was probably quite hungry.

A great deal of digging was done despite the frozen ground. Areas of 10 to 20 milacres or less, were often spotted with as many as a dozen diggings. Usually these led to mice tunnels less than an inch in diameter.

TABLE X

TRACK MEASUREMENTS

Based on Length of Hind Foot Method

measurements in millimeters

taken Feb. 6, 1940

| Weasel<br>No.1 | Weasel<br>No.2 | Weasel<br>No.3 | Weasel<br>No.4 | Mink<br>No.1 |
|----------------|----------------|----------------|----------------|--------------|
| 39             | None           | 28             | 35             | 52           |
| 38             |                | 34             | 35             | 65           |
| 39             |                | 34             | 29             | 61           |
| 40             |                | 36             | 28             | 64           |
| 42             |                | 34             | 32             | 55           |
| 38             |                | 35             | 34             | 58           |
| 40             |                | 34             | 28             | 66           |
| 39             |                | 30             | 37             | 64           |
| 37             |                | 29             | 30             | 58           |
| 41             |                | 32             | 33             | 61           |
| Average        | 39.12 mm.      | 32.00 mm.      | 31.50 mm.      | 60.40 mm.    |

The rims of these holes were frozen hard, and it did not appear that the weasel's efforts were fruitful, as it could not dig beyond the hard frozen rims.

Snow tunnels were often noted and many of these were carefully traced out by inserting the finger and raising the roof of the tunnel. No kills or signs of such were ever found in these tunnels.

In fall-plowed fields, where the furrows had frozen before the snow covered them, long tunnels were made. With alternate freezing and thawing, ice roofs were formed over them and as they were comparatively warm places, many mice used them. Weasel and mink tracks were also often found entering the tunnels, and probably many mice were killed there.

#### Favorite Routes:

The weasels seemed to have special areas where one could expect to find their tracks. These favorite coverts were used, at times, quite rhythmically. By way of illustration, the track maps show that a certain animal would hunt through the fields to the east of his den. This trail would lead through a certain hollow log, inspect a particular den, or go through a haystack. The following night, the weasel would hunt to the west of his den, ranging across a plowed field, meandering through the ruins of an abandoned shack, and thence through a kettle hole.

On a third night, it could well be expected that this animal would return to the east again, and search his same favorite hollow log, as on the first night. This did not always occur, but at least in the near future, the tracks of the

weasel would be found in a favorite haunt previously visited.

Fence rows were preferred as travel lanes and were used more often than open fields as highways of commutation. Trails leading along fence rows were usually quite straight, but sometimes crossed back and forth at irregular intervals. Whenever a trail took off across an open field it was at least meandering if not sinuous. Around manure spreadings, corn shocks and brush piles, trails became quite sinuous. Invariably it was absolutely impracticable if not impossible to unravel the maze.

#### Intraspecific Relations:

##### Home Range:

In Table VIII the movements of each individual weasel are presented mathematically, as interpreted from 36 days of track mapping, and notes made during the winter.

In calculating the range of the weasels, the maximum radius of action from the den was used as the radius of a circular tract which would represent the area one weasel was apt to search. However, in all cases the dens were located eccentrically of the cruising area which would reduce it to the area of a lopsided orb rather than of a circle. It was deemed that the circular plot calculation was a safer figure to state, until more data could be obtained.

By measurement, the cruising radius of weasel #1, was found to be .450 miles. On two separate dates, February 29 and March 22, this maximum distance was attained. On January 17, the same weasel traveled a maximum radius, for the month of January, of .403 miles. The expanding of range on the later dates may be correlated with

TABLE VIII

TRACK MAPS  
TABULAR SUMMARY OF DATA

| Weasel No. | Date | Cruising Radius, Chains | Travel Distance Chains | Per Cent of Travel By Cover Types |        |               | Character of* Track Set | Tracking** Conditions |
|------------|------|-------------------------|------------------------|-----------------------------------|--------|---------------|-------------------------|-----------------------|
|            |      |                         |                        | Plowed                            | Agric. | Timber        |                         |                       |
| 1          | 1/6  | 23.41                   | 95.0                   | 50                                | 50     | Incomplete, 3 | Good, P                 |                       |
| 1          | 1/7  | 27.22                   | 158.3                  |                                   | 100    | Incomplete, 3 | Snowing                 |                       |
| 1          | 1/8  | 24.7                    | 126.6                  | 99                                | 1      | Incomplete, 3 | Snowing                 |                       |
| 1          | 1/9  | 29.78                   | -                      | 30                                | 70     | Incomplete, 1 | Melting, c              |                       |
| 1          | 1/12 | 29.78                   | 171.0                  | 10                                | 90     | Incomplete, 2 | Wet, c                  |                       |
| 1          | 1/15 | -                       | -                      |                                   |        | Incomplete, 1 | Poor, d,p.              |                       |
| 1          | 1/16 | -                       | -                      |                                   |        | Incomplete, 1 | Poor, d,p,s.            |                       |
| 1          | 1/17 | 32.3                    | 159.5                  |                                   | 100    | Complete      | Good, new p.            |                       |
| 2          | 1/20 | 22.18                   | -                      |                                   | 100    | Incomplete, 2 | Fair, d,p.              |                       |
| 1          | 1/21 | -                       | -                      |                                   |        | Incomplete, 1 | Poor, d,p.              |                       |
| 1          | 1/22 | -                       | -                      |                                   |        | Incomplete, 1 | Poor, d,p.              |                       |
| 1          | 1/23 | 7.50                    | 48.5                   | 80                                | 20     | Complete      | Good, p.                |                       |
| 1          | 1/24 | 6.33                    | 30.0                   | 80                                | 20     | Complete      | Good, p.                |                       |
| 1          | 1/25 | 13.94                   | 100.12                 | 40                                | 60     | Complete      | Good, p.                |                       |
| 4          | 1/26 | -                       | -                      |                                   |        | Incomplete,   | Poor, d,p.              |                       |
| 4          | 1/27 | 17.71                   | 74.6                   |                                   | 100    | Complete      | Good, c.                |                       |
| 1          | 1/30 | 24.0                    | 227.9                  | 40                                | 60     | Complete      | Good, p.                |                       |
| 4          | 1/30 | -                       | 129.13                 | 60                                | 40     | Incomplete, 3 | Fair, c                 |                       |
| 1          | 1/31 | 6.33                    | 10.01                  | 10                                | 90     | Complete      | Fair, c.                |                       |
| 2          | 1/31 | 32.5                    | 190.0                  | 50                                | 70     | Incomplete, 2 | Fair, d,p.              |                       |
| 1          | 2/2  | 5.08                    | 10.01                  |                                   | 100    | Complete      | Fair, d,p.              |                       |
| 2          | 2/2  | -                       | -                      |                                   | 100    | Incomplete, 1 | Poor, d,p.              |                       |
| 3          | 2/2  | -                       | -                      |                                   | 100    | Incomplete, 1 | Poor, d,p.              |                       |

\* Character of Track Set

\*\*Tracking Conditions

Complete-Trail leads back to den.  
 Incomplete-Trail lost because of poor tracking conditions.

3-Trail leads to within 10 ch. of den.  
 2-Trail leads to within 20 ch. of den.  
 1-Trail not distinct enough to consider.

p-powder snow, dry  
 c-corn snow, wet  
 d-drifting snow  
 s-spotty, melting

TABLE VIII

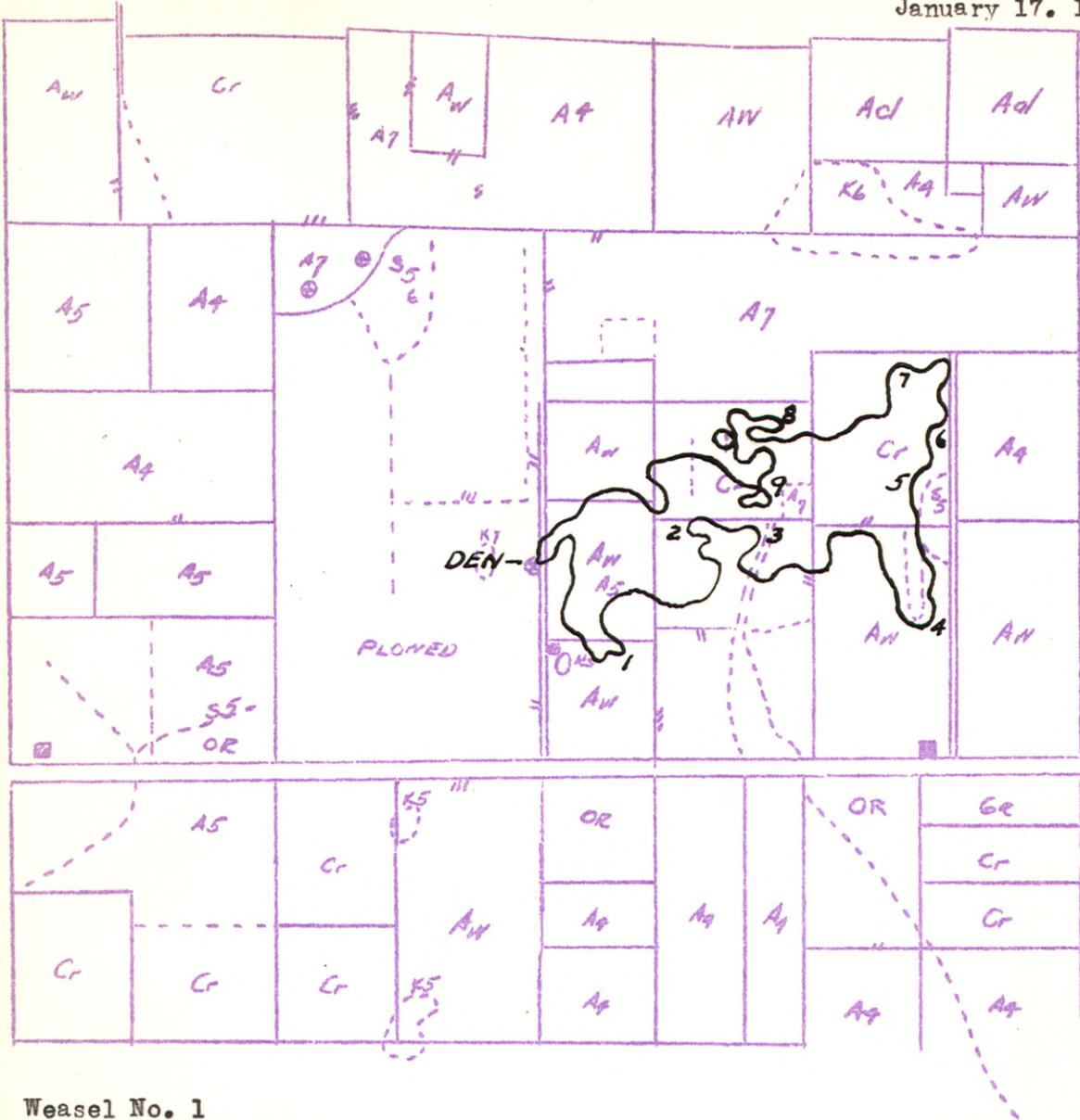
Continued

| Weasel No. | Date | Cruising Radius Chains                      | Travel Distance Chains | Per Cent of Travel by Cover Types |        |        | Character of* Track Set |                           | Tracking** Conditions |
|------------|------|---|------------------------|-----------------------------------|--------|--------|-------------------------|---------------------------|-----------------------|
|            |      |   |                        | Plowed                            | Agric. | Timber |                         |                           |                       |
| 1          | 2/3  | -   | -                      | 100                               |        |        | Inc. 1                  | Poor, s                   |                       |
| 4          | 2/4  | 30.04                                       | 154.5                  | 5                                 | 95     |        | Inc. 5                  | Poor, s                   |                       |
| 1          | 2/4  | -   | -                      | 90                                | 100    | 10     | Inc. 1                  | Poor                      |                       |
| 3          | 2/5  | 15.5  | 318.0                  |                                   | 100    |        | Complete                | Good, new c.              |                       |
| 2          | 2/5  | 22.18                                       | 129.0                  |                                   | 90     |        | Inc. 5                  | Good, c                   |                       |
| 4          | 2/5  | -   | 145.5                  | 10                                | 20     |        | Inc. 2                  | Good, c                   |                       |
| 3          | 2/6  | -   | -                      | 80                                |        |        | Inc. 1                  | Poor, d,c.                |                       |
| 1          | 2/6  | 3.16  | 13.92                  | 80                                |        | 20     | Complete                | Good, c                   |                       |
| 2          | 2/6  | -   | -                      |                                   |        |        | Inc. 1                  |                           |                       |
| 3          | 2/7  | 7.32  | 26.7                   |                                   | 10     | 90     | Complete                | Good, c                   |                       |
| 2          | 2/7  | -   | -                      |                                   | 100    |        | Inc. 1                  |                           |                       |
| 4          | 2/7  | 18.99                                       | 76.0                   |                                   | 100    |        | Complete                |                           |                       |
| 3          | 2/8  | 7.32  | 27.6                   |                                   |        | 100    | Complete                | Good, c                   |                       |
| 3          | 2/9  | 6.90  | 31.9                   | 80                                |        | 20     | Complete                | Good                      |                       |
| 4          | 2/9  | 4.45  | 18.99                  |                                   |        | 100    | Complete                | Good, new snow            |                       |
| 3          | 2/10 | 8.62  | 45.7                   | 100                               |        |        | Complete                | Good                      |                       |
| 4          | 2/10 | 30.0  | 200.85                 |                                   | 97     | 3      | Inc. 5                  | Good                      |                       |
| 4          | 2/12 | 25.32                                       | 78.5                   |                                   | 90     | 10     | Complete                | Good                      |                       |
| -          | 2/12 | Rainey thaw spell                           |                        | 2/18                              |        |        |                         |                           |                       |
| 4          | 2/19 | -   | -                      |                                   |        |        | Inc. 1                  | Poor, c,s,<br>melting     |                       |
| 1          | 2/25 | No data, crusted, high winds, poor tracking |                        |                                   |        |        |                         |                           |                       |
| 2          | "    | "   | "                      | "                                 | "      | "      | "                       | "                         |                       |
| 3          | 2/28 | 4.31  | 5.17                   |                                   |        | 100    | Complete                | Fair, crusted             |                       |
| 1          | 2/29 | 36.05                                       | 275.0                  | 20                                | 70     | 10     | Complete                | Fair, crusted             |                       |
| 2          | 3/1  | 34.2  | 163.2                  | 3                                 | 95     |        | Inc. 2                  | Poor, crusted             |                       |
| 1          | 3/22 | 36.05                                       | 226.5                  | 15                                | 75     | 10     | Inc. 2                  | Poor, crusted,<br>melting |                       |
| 4          | 3/28 | -   | 59.5                   | 20                                | 80     |        | Inc. 2                  | Poor, melting             |                       |

TABLE VIII

Continued

| Date | Cruising<br>Radius<br>Chains | Travel<br>Distance<br>Chains | Per Cent of Travel by<br>Cover Types |        |        | Character of*<br>Track Set | Tracking **<br>Conditions |
|------|------------------------------|------------------------------|--------------------------------------|--------|--------|----------------------------|---------------------------|
|      |                              |                              | Plowed                               | Agric. | Timber |                            |                           |
| 3/28 | -                            | 160.57                       | 50                                   | 50     |        | Inc. 2                     | Poor, melting             |
| 4/12 | 21.5                         | 21.5                         | 20                                   |        | 80     | Inc. 2                     | Fair, d,c.                |



Weasel No. 1

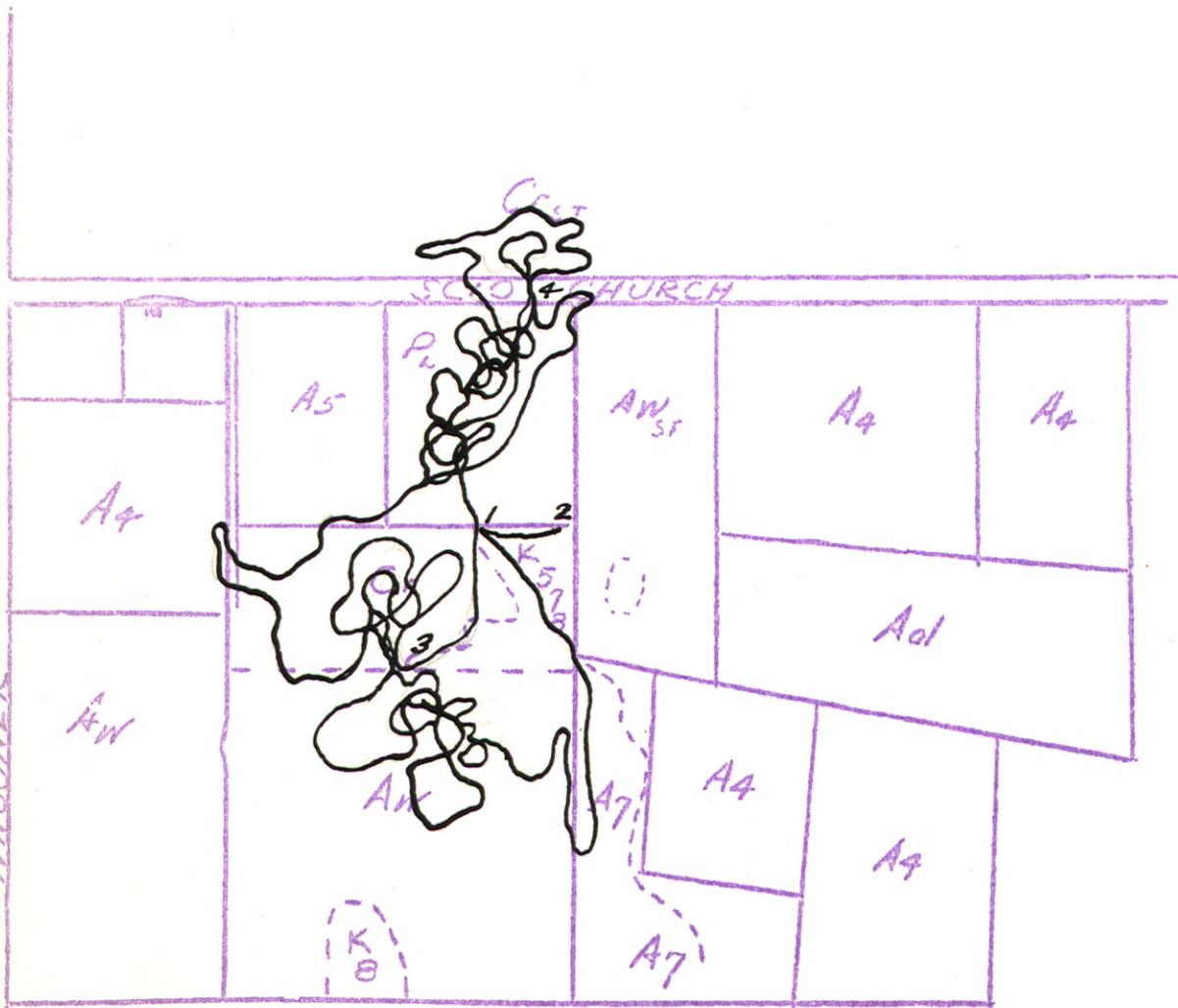
1. Dug for mice.
2. Ditto
3. Entered and left a den.
4. Water hole, may have drunk here.
5. Corn shock entered.
6. Ditto
7. Ditto
8. Dug for mice.
9. Ditto
10. Fecal sample No. 21 found at den.





Weasel No. 3

1. Three snow tunnels, possibly a den entrance. Trap set here.
2. Origin of tracks, but no return trail. Possible den.
3. Entered a den and exited. Possible den.
4. Went through culvert three times.



the approach of mating season, but not enough data is available to permit more than mentioning the occurrence. Using the maximum figure, by calculation a circular tract of 400 acres would comprise the home range of this animal.

The other weasels at times, traveled equivalent distances from their dens. There was no significant difference found between the sexes concerning home range. Although the calculated range for each weasel was 400 acres, and an overlapping of ranges existed, the four individuals rarely crossed trails.

On several fortunate occasions, late snows permitted tracking. On February 29, the tracks of weasel #4, supposedly a female, were found intersecting the tracks of a large male weasel. Defecations, presumably of each animal, were found at a fence post where the tracks met.

On March 28, a good tracking snow fell, and the trail of the female weasel was again found crossing that of the male at the same fence post previously mentioned. The tracks of the pair paralleled along a fence for 18 chains and both entered the den of the male, Weasel #1. The female exited and struck off across a plowed field. For obvious reasons it cannot be certain that both weasels traveled together along the fence.

These dates mark the first violation of home range habits as explained under that heading, and might be considered partial demonstration of expanded range during breeding season.

Since the writer was unable to make further observation due to the melting of snows, no data was obtained concerning territorial behavior.

### Daily Travel Distances:

Numerous writers have credited the weasel with travels of 4 to 7 miles in a single night. Column 4 of Table VIII presents the data collected on this subject. Column 8 indicates the quality of these data from the standpoint of completeness of track maps. Snow conditions were not always favorable to the completion of tracking, but in these cases total travel distances were reckoned by completing the broken trail with a straight line. This, at least, offers a minimum figure.

The average travel distance observed was 101.7 chains, or 1.271 miles. The minimum single night's travel was less than 1 chain, and the maximum amounted to 275 chains or 3.43 miles. A distance of 160 chains or 2 miles is the approximate mean for the total, and is more representative of the weasel's travel habits than is the average figure.

### Intergeneric Relationships:

Field notes and track maps on the movements of weasels and other animals show that the weasel is little concerned with other forms except food species such as small birds, and mice.

Occasionally, the tracks of various animals, 'coons, opossums and skunks, would parallel weasel tracks for short distances. No relationships were established other than that one species seemed to tolerate the other.

Red squirrels and opossums walked within 12" of weasel den entrances on numerous occasions. The courses never varied away from, nor toward the entrances. It is difficult to determine what relationship existed here.

Weasel #2, frequented a marshy field near a creek bottom through which a mink ran at intervals of 2 to 4 days. The weasel tracks were never found to have crossed this area on the same night as those of the mink. Similarly, the mink had a habit of occasionally hunting a certain small kettle through which Weasel #1 often roamed. It was noticed on one trip that the weasel's tracks led into, but not far into, the kettle. On investigation it was found that the mink had killed a cock pheasant, and dragged it across the kettle to an abandoned muskrat house where part of the pheasant was eaten. The weasel's tracks led a short distance into the kettle on this date, but did not search it in the usual manner. What relationship this implies is unknown.

A rabbit, killed in a steel trap, was left near a weasel's den. The weasel searched over the rabbit a number of times, but did not eat any part of it. Finally, the carcass was found by an opossum and nearly consumed.

Rabbits were observed all winter on the area, one living within 100 feet of the weasel's den. The weasel often crossed the rabbit's tracks but did not attempt to hunt down the rabbit. This is not to say weasels do not kill rabbits. However, ten rabbits were known to have started the winter on this area. One was killed in a steel trap, one by a mink and one by a bird of prey. No observations were made to indicate that weasels even so much as attempted to catch a rabbit.

In the early winter a covey of ten quail roosted and fed within 50 yards of the den of weasel #1. On several different occasions the weasel's tracks led through the roosts of these

quail but no kills were ever found on this individual's trail.

The covey moved in mid winter, to a stream bottom about  $\frac{1}{4}$  mile away. Weasel #2 often ranged through this area, but no observations were made that indicated any attempts on the lives of the quail, except for one incident noted in the "Winter Food Habits Study."

A thick grape vine fence row was a favorite covert for several hen pheasants. Weasel #4 and occasionally Weasel #1 hunted or traveled along this fence row. In the large kettle, where the mink killed a cock pheasant, a number of hens roosted. This kettle was often cruised by weasels as well as the mink. From the observations of one winter on this area, it can be said that weasels seemed to pay no attention to pheasants.

#### FOOD HABITS STUDY:

##### Methods:

The two methods employed in this study were trail observations and fecal analyses. The trail observations were indirect as no actual kills were witnessed. Fecal samples were obtained by collecting along the trails of weasels, and by reaching into dens and scraping out the droppings. The analysis was performed in the laboratory.

##### Trail Observations and Collection of Feces:

Simultaneous with tracking, the habits of hunting, capture and feeding were noted by observing trail signs. By random cruising of the area, weasel tracks were picked up, followed and plotted to scale on a cover map. This phase was described under "Tracking Techniques."

The frequency of diggings, methods of hunting, cover selected, and food species captured were noted. By locating dens, the remains of prey were retrieved from the den entrances. As discussed in "Intergeneric Relationships", a close watch was kept on the activities of other species on the area in order to note any influence the weasel might exert upon them.

Feces were collected along the trails as tracking progressed. Each sample was numbered and qualitative notes made concerning the individual origin, date of collection and relative freshness of the specimen. After the snow melted, and no more tracking was expected, the weasel dens were cleaned of all feces it was possible to reach. This was done late in the season to avoid disturbing the animals while the study was in progress.

#### Laboratory Analysis:

A total of 534 scats were collected representing four individual weasels. Of these, 294 were examined individually. The balance, 240 feces, was analyzed in bulk. This was done to determine in what proportions of bulk the various constituents occurred. These were categorized as bones, hair, feathers, and water soluble material. It was desired to compare these results with a similar analysis of owl pellets in an attempt to evaluate bulk scats in terms of number of mice eaten.

Since owl pellets often yield whole mouse skulls, it is possible to suggest the number of mice composing a pellet, and so compare the volume of hair representing a known number of mice from an owl pellet, with the volume of hair from weasel scats, thus determining the number of mice represented in the weasel

scats. This method was not practical as discussed later in the results.

Thirty seven feces were weighed air dry, to determine their relative weights. These samples were of known date and individual origin, and it was desired to ascertain if any seasonal variation in relative volume of feces existed, which might indicate abundance a scarcity of food.

The feces collected were from the following sources:

215 specimens--Den #1, weasel #1, a large male trapped, measured and sexed.

240 specimens--Den #2, presumably a female according to track measurements.

44 specimens--Den #3, presumably a female according to track measurements.

35 specimens--Collected along trails.

The method of dissection first followed, was to soak the feces in warm water until soft. Then each specimen was dissected with forceps, the feces having been placed in the fold of an absorbent paper towel. The towels were numbered, corresponding to the number of the feces. A sheak of these could be conveniently tied together for storage. Later in the study, it was found that the feces were readily dissected in a dry condition.

Results and Dissussions:

Trail observations:

During the entire study of 36 tracking days, only four kills were noted on the surface of the snow, along the trails of four separate weasels. Blood and a few hairs showed the spot where a Deer mouse's luck ran out. The mouse was evidently eaten on the

spot, as a *Peromyscus* being carried usually leaves a tail drag mark along side of the weasel's foot prints. No tail drag marks were found here.

The feathers of one quail were found in an old bank den on the side of a kettle hole. A quail covey had been observed to roost in this hole for some time, and it was feared that sooner or later at least one would fall prey to some animal. The trail of a weasel led through this den and the location of the kill. Later, quail feathers were recovered from the den of the weasel that made these tracks and also were found in a scat of the same weasel.

In early March, a few feathers of a junco were found on the snow under a thicket. The feathers of this species were later found to compose 8 entire feces, taken from the den of the same weasel which made this kill.

On April 12, a surprise snow storm offered excellent tracking. The beak, primaries, and both legs and feet of a Song sparrow were found along the trail of Weasel #1, where it meandered through a low thicket of *crataegus*.

Tail drag marks of *Peromyscus* were often found along weasel trails. If a mouse were caught near the den, it was usually carried home to be eaten there or stored. One habit was characteristic of Weasel #1. Within 15 feet of his den entrance was a brush pile. Often this brush pile was visited first, before any further journey, and on a number of occasions only this trip was made. Apparently the weasel ate its prey under the brush pile or, as once observed, carried it to the den to be stored or eaten there.

TABLE IV

## GROSS AIR DRY WEIGHTS OF FECES

| Source              | Number of Samples | Weight in Grams            |
|---------------------|-------------------|----------------------------|
| Den No. 1           | 215               | 33,520                     |
| Den No. 2           | 240               | 29.470                     |
| Den No. 3           | 44                | 4.013                      |
|                     | Total No. 449     | Average Weight .1499 grams |
| Collected at Random | 35                |                            |
|                     | Total No. 539     |                            |

TABLE V

COMPOSITION BY WEIGHT OF MASS OF 240 FECAL SAMPLES  
From Den No. 2

| Material      | Weight       | Per Cent of Total |
|---------------|--------------|-------------------|
| Bone          | 3,262 grams  | 11.06             |
| Hair          | 6.578 Grams  | 21.90             |
| Feathers      | .036 grams   | .01               |
| Water Soluble | 19.734 grams | 67.03             |

TABLE VI

## ANALYSIS OF 294 FECAL SAMPLES

## Per Cent of Total Frequency of Occurrence Method

| Source of Feces                | No. Feces<br>Containing<br>Peromyscus | No. Feces<br>Containing<br>Microtus | No. Feces<br>Containing<br>Feathers | No. Feces<br>Containing<br>Red Squirrel | No. Feces<br>Containing<br>Weasel Hair |
|--------------------------------|---------------------------------------|-------------------------------------|-------------------------------------|---|--|
| Den No. 1                      | 148                                   | 51                                  | 16                                  |   | 28                                     |
| Den No. 3                      | 29                                    | 15                                  | 1                                   |   | 6                                      |
| Random Collected               | 12                                    | 17                                  | 3                                   | 5                                       | 2                                      |
| Totals                         | 289                                   | 83                                  | 20                                  | 5                                       | 36                                     |
| Per Cent of Total<br>Frequency | 98.3                                  | 28.2                                | 6.8                                 | 1.02                                    | 12.5                                   |

On one occasion, while tracking a weasel, a frozen garter snake was found at the base of a small Crataegus bush. Part of the snake's tail had been eaten but this appeared to be the feeding of mice, whose scent may have attracted the weasel.

It is believed that much of the food of the weasel is captured in tunnels and dens, below the surface and eaten at the location of the kill. Hamilton, 1940, states that weasels often cache food, both in the den and at other convenient sites along trails. During this study the only indications of caches were the carrying of mice to the dens. Whether or not the prey was immediately eaten or stored cannot be said. Only Peromyscus were known to have been carried to the den by finding the marks of the dragging tail.

#### Analysis of Feces:

The feces analyzed in this study were, in the majority, collected from the dens. Because of this no dates can be cited concerning the seasons represented by the feces. Since a number of them were found to analyze largely bird feathers, it is probable that some birds were killed before snow made tracking possible, as the signs of only three kills were found along the trails.

Table IV shows the air dry weights of the material collected from each source, and the number of feces represented in each source group.

In Table V is shown the results of analysis to determine what percent by weight each of the main constituents were for a bulk of feces of a known number and air dry weight. The bulk was screened and washed with boiling water to remove all dirt and

water soluble material.

Approximately 66% of this air dry weight was water soluble, dirt and vegetable material. The bone, 11.06% by weight consisted of small fragments and teeth. Only *Microtus* molars and incisors were retrieved, but *Peromyscus* hair was most abundant. Careful watch was kept for shrew or mole teeth, but none were found. Since it has often appeared controversial in the literature as to whether or not these are eaten by weasels, special care was taken. The feathers found were bleached and worn beyond identification, except as feathers. As shown in the table, they represented a very small percent of the total by weight.

Table VI shows the percent of frequency of each of the given classes of material found in 294 fecal samples.

The column showing Per Cent of Total frequency indicates the relative value of one class of material to the others as found in the 294 droppings. This shows that *Peromyscus* comprises 98.30% of the total frequency. It might be well to state that the 20 points of frequency under the column marked "Birds" represents 20 entire feces which analyzed 100% bird feathers each. The frequency of 36 or 12.3% under the column marked "Weasel" may be explained by understanding that weasels moult twice each year in some localities, and that most animals swallow some of their own hair while licking themselves. This should probably be cast out of the total frequency because it does not represent food ingested, but, however, it effects each class equally and only slightly.

It will be noted that the percent of frequency does not

total 100. This is because one separate feces may contain several food items.

No further quantitative value can be assigned to these figures other than to say *Peromyscus* was taken as food 289 times to 83 times for *Microtus* according to this study. Very likely, more *Peromyscus* are required to make a weasel meal than are *Microtus* because of the smaller size. Also, *Peromyscus* may present itself for capture more frequently than *Microtus*. Since it is more active on the surface, it is naturally more available as a food item. There is no reason to believe that the population of *Peromyscus* exceeded that of *Microtus*, since no study was made of this. However, this may have been a partial factor responsible for the greater occurrence of *Peromyscus* in the droppings.

There is no striking difference among the individual weasels concerning the selection of food items. Roughly, Weasel #1's diet was composed of approximately 70% *Peromyscus*, 23% *Microtus* and 7% birds. Similarly, the food taken by Weasel #3 was composed of 65% *Peromyscus*, 33% *Microtus* and 2% bird.

Table VII shows the results of weighing 37 individual feces, the average being 325.4 milligrams. During the field work, it was suspected that some correlation might exist between time of the year and the size of dropping which would indicate fluctuation in the amount of food taken, or in the amount utilized.

It was desired to establish a quantitative coefficient based on "one mouse meals," that would facilitate interpreting the bulk feces in terms of single mice. This was hoped to be obtained by feeding captive weasels, but not enough animals were available.

TABLE VII  
 WEIGHTS OF INDIVIDUAL FECES SHOWING  
 DATES OF DEFECATION

| Sample No.     | Date Collected | Weight in Milligrams |
|----------------|----------------|----------------------|
| 2              | 10/18          | 280                  |
| 6              | 10/20          | 490                  |
| 11             | 11/18          | 555                  |
| 14             | 1/6            | 40                   |
| 15             | 1/7            | 240                  |
| 16             | 1/8            | 125                  |
| 17             | 1/8            | 370                  |
| 18             | 1/9            | 375                  |
| 20             | 1/12           | 128                  |
| 21             | 1/17           | 588                  |
| 22             | 1/27           | 180                  |
| 23             | 1/31           | 170                  |
| 24             | 2/5            | 222                  |
| 25             | 2/5            | 46                   |
| 26             | 2/5            | 20                   |
| 27             | 2/6            | 240                  |
| 28             | 2/7            | 35                   |
| 29             | 2/10           | 90                   |
| 30             | 2/10           | 120                  |
| 31             | 2/14           | 95                   |
| 32             | 2/16           | 280                  |
| 33             | 2/16           | 80                   |
| 34             | 2/18           | 120                  |
| 35             | 2/18           | 45                   |
| 37             | 2/28           | 85                   |
| 38             | 5/1            | 60                   |
| 39             | 5/1            | 945                  |
| 41             | 5/22           |                      |
| From Den No. 2 | No Dates       | 605                  |
|                |                | 650                  |
|                |                | 550                  |
|                |                | 880                  |
|                |                | 490                  |
|                |                | 240                  |
|                |                | 915                  |
|                |                | 810                  |
|                |                | 420                  |
|                | Average weight | 325.4 milligrams     |

One weasel was captured and fed whole live mice. It consumed two mice completely in 48 hours, but died, presumably, from the effects of shock and a broken leg before any data of significance was obtained.

Another attempt to obtain such a coefficient was made by separating bone and hair from owl pellets, and noting the ratio of occurrence of these two constituents. This was described under Laboratory Methods. After washing and drying the hair, it was found that the consistence of it was so greatly altered while in the owl's gizzard that a comparison to similarly treated hair from weasel droppings was not feasible.

It is suggested that further study along these lines be made to convert present available figures into more tangible form. This would enable investigators to express wildlife economics in more certain terms than does the usual frequency of occurrence method of analyzing droppings.

#### SUMMARY AND CONCLUSIONS:

Although in no sense exhaustive, it is hoped that this study will supplement the present literature with some actual figures concerning the habits of wild weasels. Possibly an interest will be aroused that will permit further study of the weasel, since it represents a high economic position in wildlife management.

The conclusions drawn from the results of this work are:—

1. Weasels were reported to have killed 1.03% of the chickens on the township studied.
2. 59% of all reported wildlife damage to poultry was in-

flicted by the weasel.

3. Farmers kill 75% of the weasels seen on farms even though no bounty is paid. 25% of those seen escape.

4. Weasels invade farms mainly during the spring and early summer. 19% of the farms studied were reported to have suffered loss.

5. As fur, weasels represent a lower economic position than do opossums in terms of total annual value taken from this area.

6. The winter food habits of weasels appear to be beneficial to agriculture because of the large number of mice killed.

7. No significant damage was known to have been inflicted on wildlife during the winter months by weasels. One animal, only, of game species was known to have been killed by the weasels.

8. It might be possible to establish a track measurement technique as described in the part entitled "Track Measurements," that would permit the censusing of mink and weasels, qualitatively. This would also facilitate further field study.

9. In agricultural types, the home range of the weasel is probably a 400 acre circular tract.

10. The mean daily travel distance for weasels is 2 miles.

11. The evidence of this study leads to the conclusion that the weasel hunts largely by the sense of smell.

12. From the amount of feces found in dens, the conclusion is drawn that weasels habits are not as cleanly as the literature pretends.

13. Each individual weasel used one den only throughout the winter.

14. Weasels may remain in their dens for periods of 2 to 3 days without leaving.

15. Weasels and mink were active during the coldest weather of the season. On January 20, 1940, Weasel #2 traveled over  $\frac{1}{4}$  mile from it's den. The temperature for this date was 5° below zero. Weasel #4 also traveled, and a mink was tracked for over a half mile on this date.

SUGGESTIONS:

1. A more extensive study of this nature would be of some aid in determining more conclusively the economic status of the weasel.

2. In the light of Gerstell's, 1937, conclusions concerning the bounty on weasels and from the results of this study, it is suggested that the bounty payments on weasels should be discontinued for an experimental period of time. In Pennsylvania alone, this would result in the availability of \$75,000 per year for further study and other management phases leading to more efficient wildlife management.

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