

# MUSKRATS IN RELATION TO FARM PONDS

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There are at present approximately 8,000 farm ponds with an estimated 25,000 acres of fresh water impounded throughout the state of Alabama. The common muskrat (*Ondatra z. zibethica*) has been attracted to many of these farm ponds because they offer most of the important requisites for good muskrat habitat. They provide a continuous supply of water at fairly constant levels, which is favorable for the establishment of muskrat foods around the edges. Pond dams and banks provide places for muskrats to dig burrows, make their homes, and rear their young.

Wherever possible, muskrats dig burrows for homes in preference to building houses of mud and debris in shallow water. When muskrats move into a farm pond they are likely to dig some burrows in the dam. Many complaints had been made to Wildlife and Fisheries Biologists, County Agents, and others by owners of ponds with muskrat burrows in the dams. Therefore, the primary objective of the study was to determine the effects of muskrat burrows in the dams of farm ponds. Secondary objectives were to obtain information on the productivity and the economic value of muskrats in farm ponds.

Assistance in the study was received from the Alabama Cooperative Wildlife Research Unit, sponsored jointly by the Alabama Department of Conservation, U. S. Fish and Wildlife Service, Wildlife Management Institute and the Alabama Polytechnic Institute.

## BURROWING HABITS OF FARM POND MUSKRATS

Of 89 private farm ponds investigated, 41 were found to contain muskrats. Burrows were found in the dams of 11 of these ponds. All burrows found in dams of private ponds were investigated, while only a random sample was taken from burrows found in banks around the edges of ponds and in the narrow dikes and dams of ponds on the North Auburn Area of the Agricultural Experiment Station of the Alabama Polytechnic Institute.

Fifty-six muskrat burrows were excavated and measured. Of these, 50 were located in the dams of ponds. Forty-four were in dams with 12-foot top widths while six were in dams with top widths ranging from two and one-half to eight feet. Six burrows investigated were bank dens found around the edges of the ponds.

The number of entrances to a muskrat burrow or series of burrows ranged from one to nine. The average number of entrances was two, with an average distance of three feet between entrances. The maximum depth at which a burrow entered the dam below water level was two feet six inches, while some burrows entered the dam at the water surface. However, most entrances were located six inches below water level.

The maximum horizontal distance or penetration of a burrow into the dam of a farm pond from the entrance to the end of the burrow was nine feet. Average

horizontal penetration was five feet two inches. Increase in elevation of the burrows, measured from the point of entrance to the ceiling of the highest point in the burrow, ranged from six inches to four feet two inches. Average increase in elevation was two feet six inches.

The distance from the ceiling of the burrow to the ground surface ranged from two inches to two feet two inches. Average for this distance was ten inches. Average height and width of burrows examined was six inches and eight inches, respectively.

Nests were found in most of the major burrows excavated. They usually were made of a small amount of vegetation found growing in the vicinity of the burrow. They occupied cavities that were somewhat larger in width and height than the tunnels leading to them. There was an average of two nests in each burrow or series of burrows.

The distance from the end of the burrow — the farthest point of penetration — to the center line of the dam was recorded. Of the 44 burrows in dams with 12-foot top widths, not once did one penetrate to the center of the dam. The minimum for this distance was 12 inches recorded for one burrow. Maximum distance was 12 feet, while the average distance was 6 feet.

The investigation of muskrat burrows showed that, in general, all muskrats followed a similar pattern in their burrowing activities. Typical burrows began about six inches beneath the water surface, went in a short distance, and turned upward. The slope of the burrow was then maintained at about the same slope as the side of the dam which was usually two-to-one. Entrances to the burrow were connected at a point inside the dam above water level. Short branch burrows usually were found leading from the main tunnels. They were found at various points along the tunnels. Nest cavities were found usually at the end of the branch burrows. However, all branch burrows did not terminate in nest cavities. Bank burrows followed a similar pattern.

In those burrows with more than three entrances, a cross-tunnel connected each entrance passageway. This connecting tunnel ran parallel with the dam, and usually was about two feet in from the entrances. Branch burrows also connected with the main tunnel.

The investigation also showed that muskrats were somewhat selective in the type of soil in which they chose to make their burrows. For example, a series of five adjacent ponds in a sandy clay loam bottom in Montgomery County were investigated for muskrat burrows in the dams. Burrows were found in each of the dams. However, most functional burrows were concentrated in one dam and part of another that were more clayey in texture while the dams of a sandy texture contained mostly old, abandoned burrows. These abandoned burrows had caved as a result of heavy rainfall, high wave action, and trampling by fishermen. This resulted in the dam edges sloughing off and silting into the ponds.

Of the six burrows investigated in dams with top widths ranging from two and one-half to eight feet, one burrow extended the entire width of the dam, two others reached the center-line of the dam, and three were two, three, and four feet each from the center. The burrow that extended the entire width of the dam was located in the dike between two one-fourth acre A. P. I. Experiment Station ponds. This dike had a top width of two and one-half feet across with slopes approximately two-to-one. There was a difference in water level of about six inches for the two ponds. The burrow began at a distance 26 inches below the water

surface on the side of the dike with the lower water level. It sloped upwards to a point 30 inches above the point of entrance. The water broke through and drained from the pond with the higher water level into the other pond. As a result, the fish experiments in progress at that time were ruined. It should be noted, however, that the total horizontal distance of this burrow was only seven feet, which falls easily within the range of distances that were relatively safe in dams with 12-foot top widths — the width most commonly found in farm pond dams built with heavy machinery.

The two burrows that extended to the center of the dam were located in dams with top widths of four and five feet. These burrows penetrated the dams for distances of six and seven feet, respectively.

## DAMAGE CAUSED BY FARM POND MUSKRATS

Several owners of private ponds were not aware of the presence of muskrats in their ponds. When informed that their ponds contained muskrats, two questions invariably asked were 1) had they burrowed into the dam and 2) what was the extent of the damage. The next most frequent question asked was how to get rid of the animals. It was evident that most of these pond owners were more concerned with possible damage than they were about possible fur values. They were considering the question only on the basis that muskrats were a nuisance and that the thing to do was to get rid of them as quickly as possible.

This fear of potential damage to the pond dam rather than actual damage was found to be the basis for complaint by most pond owners. Repeated efforts were made during the study to find farm ponds where muskrats had burrowed through the dams and caused leaks or washouts. County Agents, State Department of Conservation personnel, and others were questioned, but none could provide evidence of washouts of dams as a result of muskrat burrows.

Damage to earthen dams with 12-foot top widths was found in very few instances. Such damage where it did occur was usually the result of the burrows caving because of sandy soil. Heavy rains, severe wave action, and cattle and fishermen walking over the burrows caused these cave-ins which resulted in the washed-out soil silting into the ponds. In some instances, large gaping cavities were found in the side of the dam where dogs, in pursuit of muskrats, had excavated the burrows.

Considerable damage has resulted from muskrat burrows in the narrow dikes and dams on the Agricultural Experiment Station ponds. Muskrats frequently tunnel through these narrow dikes and thereby ruin the fish experiments in progress. Besides the damage to dikes and dams on experimental ponds, muskrats sometimes hinder fish investigations by muddying the water in the small ponds. It is probable that some minnows and small fish used in the experiments are destroyed by muskrats. Fish culturists report that muskrats sometimes consume soybean and cottonseed meal cakes that are placed in the ponds as food for fish.

The owner of a hatchery for the production of bait minnows located at Decatur, Alabama reported some damage caused by cave-ins of muskrat burrows in the dikes and dams of his hatchery ponds. He also believed some of his bait minnows and fish food were eaten by muskrats. Therefore, it would seem advisable not to tolerate muskrats in experimental ponds or minnow-producing ponds since the

damage and potential damage that might be caused by them would be greater than the fur value of the animals themselves.

## PROTECTIVE MEASURES AGAINST DAMAGE BY FARM POND MUSKRATS

Where muskrats are a nuisance in farm ponds, probably the best method of control is to steel-trap them. They are easy to trap and can be "clean-trapped" if an effort is made to do so. Wherever possible such trapping should be done during the open season for muskrats.

Several pond dams investigated were found to contain some form of rip-rapping along the edge at the water level. This rip-rapping usually consisted of a tier of logs from six to ten inches in diameter, a layer of rocks, or in some instances, strips of tin, placed along the slope of the dam at the water's edge to prevent caving of the dam by heavy wave action. No burrows were found in dams of this type, and it is believed that such a procedure discouraged burrowing by muskrats. Rip-rapping might prove to be expensive in some instances. However, it might be well to carry out such a protective measure on dams that have burrowed to such an extent that there is danger of a break-through.

Dams constructed of good quality clay soil with top widths 12 feet across and slopes that have a rise of 1 foot or less for each 2 feet of horizontal distance are the best insurance against damage by muskrats.

## PRODUCTIVITY OF FARM POND MUSKRATS

Eleven farm ponds were censused by live-trapping. A total of 127 individual muskrats were handled during trapping operations. The size of the ponds ranged from two to 59 acres. The 59-acre pond was censused by live-trapping from November 20 to December 6, 1950, during which period 56 muskrats were live-trapped, ear-tagged, weighed, sexed, and released. Approximately one week later, from December 15 to December 23, the muskrats on the pond were harvested by means of steel-traps. Forty muskrats were taken, of which 33 were tagged animals and seven not tagged. From the data obtained, a practical application of the Lincoln Index can be made to compute the total population on the pond. Five animals died during the live-trapping operation. Accordingly, the total computed population was 67 muskrats on the 59-acre pond.

### Breeding

Of 100 muskrats examined during the trapping season, November 20, 1950, to February 20, 1951, 54 (54%) were males and 46 (46%) were females, a ratio of 117 males:100 females.

The males were separated into age groups by means of the size and appearance of the reproductive organs. By this method of separation, 11 (25%) of the animals handled during the trapping season were found to be adults and 27 (71%) were subadults.

Of 33 females examined during the trapping season, 10 (30%) showed placental scars and were classified as adults while 23 (70%) showed thin, translucent uteri and were regarded as subadults.

Four litters of young handled during the investigation of farm pond muskrats averaged four per litter. Two females gave birth to young while held in captivity at the Research Unit.

Placental scars were found in the uteri of 10 of the females autopsied. The number of scars per female ranged from a minimum of three to a maximum of 23. The average number was 12.7 scars per female, which indicated that an average of approximately three litters per year were produced by each female. However, the ratio of subadults to adult females was found to be 5:1. By subtracting this number that survived to a harvestable age from the average total potential of 12.7 for each adult female, there was an indicated loss of 7.7 young (64%) between birth and the trapping season.

Three young muskrats that weighed 13, 15, and 16 ounces each were trapped during the week of January 18 to January 25, 1951. These were estimated to be from four to six weeks of age. On March 31, 1951, a 17-ounce kit was trapped that was estimated to be about six weeks of age. This evidence indicated that at least a limited amount of breeding occurs in Central Alabama during the winter months.

## Weights

The average weight of muskrats handled during the trapping season, all groups combined, was two pounds 10 ounces. Males and females were found to have a similar average weight. The maximum weight for an individual was three pounds 13 ounces while the minimum was 13 ounces.

Live-trapping of muskrats a second and third time on certain ponds provided information on weight variations for individual animals. In general, there was a weight increase varying from one to 22 ounces over approximately a 3-month period. Males showed a slightly greater weight increase than did females over a similar period of time.

## MOVEMENTS OF FARM POND MUSKRATS

### Range of Activity

Information on range of activity of muskrats was secured on all animals that were re-trapped at more than one trapping station. Traps were set at approximately 50-yard intervals along the margins of the ponds. The majority of animals recaptured were taken at the same trap station at which originally marked. One trapped female was recaptured at the same station each night for 16 consecutive nights.

Based on 286 re-captures of 56 tagged muskrats on the 59-acre pond, the maximum distance between points of capture was roughly 500 yards. The average known range of activity was approximately 50 yards. This, however, does not represent a true home range as some of the animals were not re-captured a sufficient number of times to determine such.

### Emigration

A male muskrat live-trapped on February 25, 1951, was re-captured on March 26 about eight miles distant from the pond where it was tagged originally. One

large creek and several small streams had to be crossed during the initial emigration. This muskrat then continued wandering, for on June 14 it was re-captured on a third pond about one-half mile distant from the pond where it was re-captured the second time. No information could be found in the literature indicating an emigration of such a distance by muskrats.

Evidence indicated that some other muskrats abandoned their homes in certain ponds. A pair of muskrats was live-trapped on a two-acre pond in October and again in December. These animals were not re-captured when the pond was live-trapped again the following May. It is believed they abandoned the pond as early as February, for an investigation at that time failed to show any signs of them. There is a possibility, however, that the animals may have been lost through predation. On another farm pond of three acres, three males and two females were handled in November, and again in February. The two females were re-captured in May, three months later, but neither of the three males were re-captured. However, another adult male was tagged during the latter period of live-trapping. This animal had not previously been handled.

### ECONOMIC VALUE OF FARM POND MUSKRATS

The greatest number of muskrats found on a farm pond was 67 on a 59-acre pond. However, live-trapping one three-acre pond resulted in a catch of seven muskrats, or 2.3 per acre. The owner of this pond revealed that nine individuals were steel-trapped from the pond the previous trapping season. The owner of another farm pond investigated told of steel-trapping 23 muskrats from his 2.5-acre pond the previous season, or a harvest of 9.2 muskrats per acre. Such a harvest compares favorably with those from some of the best natural muskrat marshes.

Seventy-four farm pond muskrats that weighed an average of two pounds 12 ounces each were pelted and sold at public auction in New York in April, 1951, at an average price of \$2.80 each.

Accordingly, muskrats are a natural resource in farm ponds that may be of considerable cash value to pond owners or to farm boys in many sections. The animals are relatively easy to harvest and do provide additional income, sport, and pleasure for those individuals who wish to trap.