

HABITS OF THE SHORT-TAILED SHREW, *BLARINA BREVICAUDA* (SAY).

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The following notes are presented in the hopes that they may be of interest to students of the smaller mammals. The observations submitted here have been made over a period of six years, commencing in 1924 and continued as time permitted.

MOLTING.

Molting appears to take place without regard to season, and specimens taken in December and June alike show changing coats. The most pronounced change from winter to summer may best be observed in May and June, while specimens taken in November will usually show some indication of a change to winter pelage.

The short summer coat usually makes its appearance on the back, slightly caudad of the shoulders. From here it proceeds backward and forward in no particular manner. Full shedding occupied approximately six weeks in two captive animals.

WEIGHTS.

Average weights of 53 adult males from Ithaca, N. Y., 20.35 gms. Average weights of 27 females from Ithaca, N. Y., 18.3 gms. It would seem that weight is a fair indicator of maturity in this animal, when coupled with the measurements. The health of the individual and the amount of available food are potent factors in determining weight. However, specimens under sixteen grams were never found to be mature. The heaviest shrews secured were two males, that weighed 27 gms. and 26.3 gms., respectively.

RANGE OF THE INDIVIDUAL.

The home range of any mammal is a difficult thing to determine, more so with the smaller forms than with the larger. The range of any *Blarina* is probably restricted to an acre of ground, while the ranges of two pair or individuals most surely overlap at all times.

As to the numbers, some light may be thrown on this by systematic trapping. The numbers will of course vary with the environment. Where one woodlot will yield upward of a hundred an adjoining field will contain perhaps a single pair. Various writers have endeavored to determine this point. Seton (1909) says:

“After a fall of snow I walked for a mile through the woods at Cos Cobb and found labyrinths of fresh *Blarina* tunnels every fifty yards. There was doubtless a *Blarina* for every system of tunnels, and many of the species were probably not yet represented, as it was but three or four hours since the fresh snow came. This then, affords a minimum gauge of the creature's numbers. In these woods, there were certainly fifty *Blarina*'s to the acre.”

Shull (1907) estimates their numbers at four per acre. Brooks (1908) regarding their numbers, says:

“In less than a week the traps caught over twenty short-tailed shrews under a single chestnut tree.”

This can not be considered a good normal index of the shrew population, the shrews being attracted to the weevil larvæ in the chestnuts, as Brooks subsequently points out.

In a tract of woodland where the short-tailed shrew was exceedingly abundant, the writer took nineteen in one night from fifty traps. Trapping was confined to ten yards each side of a path and one hundred and fifty yards along it. In three nights the total catch amounted to thirty-seven. This area totaled 27,000 square feet or about three-fifths of an acre. This gives very little indication of the numbers to the acre in this particular woodland, as the shrews' individual range is not known. It is very likely that these individuals ranged over an area many times as great as the boundaries of my trap line.

In one trap set in a small swale I caught eleven shrews in fifteen nights. Again, in a hilly tract, sparsely wooded, eight *Blarina*'s were caught in a single runway in seventeen days. On another occasion three short-tailed shrews were caught in the same runway in twenty-four hours.

Collecting in a wooded tract that appeared to be favorable to these creatures, I placed out fifty traps and attended them daily for a week. The total catch resulted in two shrews and two deer mice.

From these observations and more made while collecting the writer should judge that there could exist about four pairs of shrews to an acre in a choice locality.

PERIOD OF ACTIVITY.

Blarina is active both by day and night. On several occasions I have seen this shrew, in the wild state, moving about during the brightest hours, but invariably in subdued light or shade. Captive specimens do not avoid light that is not too bright, but cannot stand the bright rays of the sun for more than a few moments without fatal consequences. One which I had captive, when placed in direct sunlight, became at once uneasy, and in a minute appeared very much agitated. It ran about ceaselessly, attempting to find cover, and at the end of four minutes, lay on its side, breathing very hard. Another which I had died in less than ten hours, due, I believe, to the very bright enclosure in which I had placed it. It had no cover.

Over thirty specimens have been taken in open runs between the hours of 7 A. M. and 5 P. M. and examination of the stomach showed they had fed during this time.

While setting traps in a rather dense copse in late May I saw one of these little animals running among the dead leaves at the side of a fallen log. The hour was close to noon and the sun shining brightly, but somewhat diffused by the thick growth of alders. The shrew was apparently hunting insects, as he repeatedly picked up small morsels. A very low chattering, not unlike the faint squeaking of bats, was heard, and this was kept up continually while the animal was under my observation.

Shrews must be fairly sound sleepers. When coiled up in their box, asleep, the lid was raised and no heed paid to it. Even when lightly touched with a pencil they simply stirred slightly.

DISPOSITION.

Are shrews solitary or sociable animals? All the written evidence would point to their being extremely solitary. The oft repeated observation of Merriam, who placed three *Sorex* under a glass, where they immediately fell upon one another, would possibly bear this out. But Brooks (1908) indicates they are not adverse to one another's company when he says:

"On April 28, 1906, while collecting insects in a woodland near Morgantown, W. Va., I found an open sunny spot where I quietly stood for some time to sweep for passing butterflies. While thus engaged, a rustling in the leaves nearby attracted my attention and approaching noiselessly the part from which the sound proceeded, I saw three short-tailed shrews running about over the leaves, evidently foraging for insects. They were hunting within a few feet of one another, and several times were seen to rush about excitedly, as though in pursuit of some lively game."

Two captive males which I placed together were rather nervous, but this may be attributed to their close confinement. When one touched the other, the latter simply backed off. Indeed, they showed only indifference to one another. Large numbers caught in the same runway over a short period of time would possibly point to their toleration of one another. It appears certain that the male and female are much together during the pre-breeding season.

LOCOMOTION.

Blarina is such a short legged creature that little speed can be made. It usually runs, the tail invariably elevated, much after the fashion of the long-tailed soricids. Very rarely do they jump, yet tracks in the snow sometimes show where the gait changes from a run to a series of short leaps. Captive shrews rarely exhibited this tendency, but on one occasion, when I attempted to lift the nest box containing young, the mother leaped from the floor of her enclosure to her nest box opening, a distance in vertical elevation of about three inches.

The speed is less than *Microtus*. A very slow walker can readily overtake a shrew. They are incessant runners, and never seem to tire, appearing to be embodied with a restless spirit that keeps them forever on the go.

The mole shrew is well adapted for digging in loose soil. The fore paws are wide and strong, slightly larger than the hind feet. In digging, the fore feet are used to start the burrow, but the head and nose soon take up the burden of this task.

Shull (1907) remarking on the digging habits of this animal, says:

"In this soft soil, the shrew at once thrust its nose, and by violent backward and outward strokes of its forefeet, forced its way through the soil like a wedge. No difficulty was experienced in burrowing 20-30 cm. in a minute."

RUNWAYS.

The burrows and tunnels of this shrew vary considerably. They are from one to two and a half inches in diameter, rarely more. There appear to be two zones, one a few inches below the surface or directly upon it, and one at a considerably deeper level. These two levels are joined at irregular intervals by abrupt connections. The deeper runways will descend from sixteen to twenty-two inches below the surface, but it is uncommon to find where a shrew has ventured lower than this.

Some runs are more frequented than others. For example, certain well-worn runways near the surface of the ground yielded eleven and eight shrews respectively in a fortnight of trapping, while not infrequently others would yield from four to six in a week's time. Others close by would yield a single pair, and continued trapping in the same place would fail to take more. The two runways, regardless of yield, appear little if any different from one another. Often the runs will follow just beneath an old log, sometimes penetrating it when it is rotten enough. Such logs may be fairly honey-combed with the runs of this species, and on one occasion I found the resting nest of this shrew in such a situation.

These animals resort to the runways of meadow mice not infrequently and also are occasionally taken in the wider tunnels of the star-nosed mole and Brewer's mole.

SENSES.

Most scientists are in accord with the statement that sight plays little or no part in aiding the shrew in its hunt for food, the eyes merely allowing it to distinguish between light and darkness. But Brooks (1908) speaking about this species in the wild state, remarks that:

"The shrew made several frantic but well directed leaps for the cricket, caught it, and immediately darted out of sight beneath the leaves. The precision with which the shrew jumped towards its prey led me to suspect that the sense of sight is more perfect than the diminutive eyes would indicate."

Ryder (1888) made a careful study of *Blarina's* eye and concluded from a study of the ocular muscles that the eye is capable of adjustment for the direction of vision.

On one occasion I introduced a jumping mouse into an enclosure with a shrew. The shrew made several accurate

leaps at the agile *Zapus*, which was always too swift for the shrew. It certainly seemed as if the shrew saw the mouse on this occasion.

The eye is clearly seen when the animal is active, and I certainly think it has greater power than to simply distinguish light from darkness.

Apparently the sense of smell is developed to an average degree. Freshly killed mice, placed six inches from the floor of the shrew's enclosure, apparently baffled the animal. It repeatedly passed underneath the suspended rodent but the sense of smell was not sufficient to direct it to the dead animal. Shull (1907) however, believes that shrews distinguish between empty and occupied snail shells chiefly by their odor.

Hearing is perhaps better developed than the other senses. Many writers allude to the exquisite hearing. One which I was observing in a wooded thicket immediately ran to cover when I made a slight movement. Whether the noise of my foot, or the vibrations caused by it, alarmed the shrew, I am not in a position to say.

VOICE.

In general, the calls of shrews and bats are strikingly similar and one would think of the two orders these animals represented as being very close if voice plays any part in their classification. Dice (1925) speaks of it as "a high musical twitter" while Hahn (1908) says it is almost exactly like the rapid chip-chip-chip of the ground squirrel. Miller (1897) states that when angry, the shrews utter a sound much resembling a red squirrel chatter greatly reduced in volume, while Kennicott (1857) adds of hearing a short clear cry, the voice calling to mind that of the mink, but softer and lower.

A peculiar call, oft repeated when disturbed, was heard from captive specimens. This commenced with a shrill grating note, rather high pitched and ends with a slightly lower pitched chatter, like zeeeeee-che-che-che. Another note, apparently of contentment, is sometimes heard when the animal is feeding, and is entirely distinct from that of alarm or rage. This is very low and continuous, calling to mind the drowsy twitter of sparrows. The voice is developed at an early age, the young giving a sucking note when eight days old, and capable of a tiny chatter at twenty days.

ENEMIES.

Internal Parasites.

Cestodes were found in the greater majority of intestines examined. One tapeworm was as long as the shrew it was taken from. Ripe proglottids often fill the large intestine and extend it.

Nematodes are very abundant. Small eelworms, orange in color and measuring 16-20 mm. are particularly abundant in the stomach and duodenum, sometimes filling the pyloric orifice and almost closing this opening at times. It is obvious that the great abundance of this ascarid must cause some discomfort and possibly death.

Other roundworms occur just under the integument of the rump and shoulder region, imbedded in the mesenchyme. These worms are enclosed in a tissue sheath, and always coiled. They measure 3-4 mm. in diameter when coiled and average 35 mm. in length when outstretched. There may be twenty to thirty on a single animal.

External Parasites.

Acarinids from *Blarina* have been determined by Dr. H. E. Ewing. *Campylochirus*, *Parasitus*, *Myobia*, *Liponyssus*, *Laelaps*, *Haemogamasus* and *Ichoronyssus* are the genera determined. Generally mites are found about the inguinal region. Fleas are prevalent on this shrew. Among the species determined are the following: *Ctenophthalmus pseudagyrtes*, *Ctenophthalmus wemmanni*, *Ceratophyllus wickhami*, *Doratopsylla blarinae* and *Nearctopsylla genalis*.

Predatory Animals.

Among fish, a northern pike, *Esox lucius*, was found to have this shrew in its stomach by the authors of "Fishes of Lake Nipigon." Mr. John Meyer of Ithaca, N. Y. caught an eleven inch rainbow trout that had one of these animals in its stomach. Undoubtedly all predaceous fish would not resist a shrew if opportunity offered.

Among the reptiles, Surface (1906) records shrews from the stomachs of the spotted water snake, pilot snake, rattlesnake and copperhead. In most instances the shrews are not specifically identified. Dr. J. R. Greeley found this shrew in the

stomach of a milk snake. A black snake which I opened contained a *Blarina*.

Raptorial birds take a large toll of shrews. Fisher (1893) records the short-tailed shrew from the stomachs of the following: Red-tailed Hawk, Red-shouldered Hawk, Sparrow Hawk, Broad-winged Hawk, Barn Owl, Short-eared Owl, Barred Owl and Great-horned Owl. I found seven *Blarina* skulls in the pellets of a breeding pair of Long-eared Owls. Both the pellets and stomach contents of Barred and Screech Owls have yielded shrews.

Among mammals, Brooks (1908) found the most conspicuous thing about the den of a fox was the dead bodies of the short-tailed shrew. He did not count them but says there must have been twenty or thirty in sight. In the stomachs of *Mustela noveboracensis* and *M. cicognanii* I have determined the mammalian remains as those of this shrew. Among a large number of skunk stomachs examined by the writer, two contained parts of *Blarina*. It is likely preyed upon by a host of others, but whether habitually eaten seems unlikely.

PERIODIC MORTALITY.

Not a few observers state that a decided mortality occurs in this species during the fall. Large numbers are found dead, some without apparent injury. Everman and Clark (1911) record twelve specimens from Lake Maxinkuckee, nine of which were found dead, and all in the month of October.

The same situation is met with in England. Some authors hold that insufficient food is the cause of their death, some that lack of water causes the high toll, while a few attribute the high death rate to predaceous animals, which, finding the shrew distasteful, have dropped it where caught. Adams (1909) writing on this phenomena in England, gives as his impression that the annual loss in the fall is due to nothing more than old age, this being reached in the Common and Lesser Shrew in, roughly, thirteen or fourteen months. This is based solely on the fact that all immature shrews are taken after December.

If there is a decided increase in the death rate of *Blarina* during the autumn, and my observations do not point to this, it may be simply due to the fact that the dead specimens are more readily seen at this season.

Internal parasites, particularly roundworms, appear to be more prevalent or larger at this season, and possibly may be an indirect means of the animal's death at this season. Some specimens examined were so parasitized, especially in the pyloric region of the stomach, that it was a wonder to the writer how food could pass by the obstruction caused by these nematodes.

ECONOMIC IMPORTANCE.

Most writers are in accord in ranking this shrew high as a direct aid in keeping down the host of injurious insects and mice. Shull has, I believe, greatly over-rated their importance in holding in check the meadow mouse. He has based the food eaten by these shrews on the relative abundance of various items in the swamp region studied. Shull did not know the predilections regarding food these animals exhibited in the wild state. He estimated four shrews to an acre, and decided that on a farm of one hundred acres, these shrews would account for 38,400. But the writer's studies (Hamilton, 1930) of the food of *Blarina* show that of 244 specimens examined in the flesh, only 4 contained mouse remains.

It is my opinion that the economic importance that has been credited to shrews has been greatly exaggerated. Shrews seldom occur in numbers sufficient to be of any real significance in cultivated areas. This animal usually prefers a habitat unsuited to crops, and while they may devour insects in large numbers, they certainly do not distinguish between noxious and beneficial forms. It is true that in a given locality they may be a potent factor in overcoming a small outbreak of a dangerous pest, but this is exceptional. This shrew is said to be the principal enemy of the larch sawfly in New Brunswick, and is credited with eating forty per cent of the cocoons. Brooks has shown that it may check the chestnut worm (*Balaninus*) in a small locality.

LITERATURE CITED.

- Adams, L. E. 1909. Hypothesis as to the cause of the Autumnal Epidemic of the Common and Lesser Shrew. *Memoirs of Manchester Lit. and Phil. Soc.*, Vol. 54.
- Brooks, Fred E. 1908. Notes on the Habits of Mice, Moles and Shrews. *W. Virginia Univ. Agr. Exper. Stat. Bull.* 113.
- Dice, L. R. 1925. A Survey of the Mammals of Charlevoix Co., Mich. *Occas. Papers of Mus. of Zool., Univ. of Mich.*, No. 159.

- Everman, B. W. and Clark, H. W.** 1911. Notes on the Mammals of Lake Maxinkuckee. Proc. Washington Acad. Science, Vol. 13.
- Fisher, A. K.** 1893. The Hawks and Owls of the U. S. in their Relation to Agriculture. U. S. Dept. of Agriculture, Div. of Ornithology and Mammalogy, Bull. 3.
- Fishes of Lake Nipigon.** 1926. Publications of the Ontario Fisheries Research Laboratory, No. 27.
- Hahn, Walter L.** 1908. Mammals of Indiana. Annual Report, State Geologist. Dept. Geol. and Nat. Resources, 33rd Ann. Report.
- Hamilton, W. J., Jr.** 1930. The Food of the Soricidae. Journ. Mammalogy, Vol. 11, No. 1.
- Kennicott, R.** 1857. The Quadrupeds of Illinois. Report U. S. Comm. of Patents, 1856.
- Ryder, A. J.** 1888. The Eye, Ocular Muscles and Lachrymal Glands of the Shrew Mole. Proc. Amer. Phil. Soc., Vol. 28, pp. 16-18.
- Seton, E. T.** 1909. Life Histories of Northern Animals, Vol. 2, pp. 1116-1135. Charles Scribner's Son.
- Shull, A. F.** 1907. Habits of the Short-tailed Shrew. American Naturalist, Vol. 41, pp. 495-522.
- Surface, H. A.** 1906. The Serpents of Pennsylvania. Penn. State Dept. of Agr. Monthly Bull. Div. Zool., Vol. 4, No. 4 and 5.