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from the mountains of West Virginia and North Carolina. A specimen collected in January, 1937, at Blacksburg, Montgomery County (altitude 2,100 feet) and referred to *O. z. zibethica* apparently gives the first conclusive evidence for this race in Virginia and makes available additional study material to substantiate Hollister's (1911) range.

*Napaeozapus insignis roanensis* (Preble). This bright colored jumping mouse is known to occur in wooded boreal spots in the Virginia Allegheny and Blue Ridge mountains from southern Grayson County to northern Augusta County. It was first recorded from the State by Greenfield (1938) who took two specimens from snake stomachs collected in Augusta County. A specimen trapped June 18, 1937, near Mountain Lake, Giles County (altitude 3,600 feet), and those in the United States National Museum from Mount Rogers, Grayson County and Eggleston, Giles County, agree in color with specimens from the type locality, and show definitely that this form occurs in the southern mountain region of the State.

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## NOTES ON THE MAMMALS OF ROWAN AND ADJACENT COUNTIES IN EASTERN KENTUCKY

BY WILFRED A. WELTER and DWIGHT E. SOLLBERGER

Rowan County is typical of the eastern mountainous section of Kentucky. The hills are steep and heavily eroded while the valleys are usually narrow and subjected to periodical flooding. The vegetation has not been able to establish a thick humus because of erosion and also because of systematic burning of the leaves and underbrush. Since the establishment in 1930 of the Cumberland National Forest, part of which is in Rowan County, and its protection by the C. C. C., the areas are no longer burned. This has resulted in a noticeable increase in all forms of wild life.

Garman (1894) published a preliminary list of vertebrates of Kentucky in which he enumerated 25 species of mammals. Funkhouser (1925) listed 42 native species exclusive of those which had been exterminated. The available data on the eastern section when these lists were compiled were less abundant than for other parts of the state. Hamilton (1930) published a list of the mammals of Breathitt County which constitutes the first published list from the mountains of Kentucky. Because of the apparent shortage of

material from the mountains, the following notes, obtained during the last six years, may prove useful. Questionable forms were identified at the United States National Museum, and specimens collected are deposited in the museum at Morehead State Teachers College.

*Didelphis virginiana virginiana* Kerr.—Opossum. Opossums are found throughout the region studied, especially in the low lying districts. They are frequently found dead on the highways. A litter on the back of a female was observed June 15, 1938. Local residents go 'possum' hunting from November to January and find the animal's flesh quite palatable.

*Parascalops breweri* (Bachman).—Hairy-tailed mole. This species is not as common as *Scalopus aquaticus*; but numerous specimens have been taken in the low, often flooded areas along Triple Creek near Clearfield, Kentucky.

*Scalopus aquaticus machrinus* (Rafinesque).—Prairie mole. Numerous specimens have been taken from lawns and gardens. This species is regarded as a pest by local residents as its tunnelling activities cause considerable damage.

*Sorex fumeus fumeus* Miller.—Smoky shrew. Apparently this species is not common. A single specimen was picked up dead on top of a hill near the C. C. C. Camp one mile east of Morehead.

*Cryptotis parva* (Say).—Little short-tailed shrew. This shrew is an inhabitant of old fields and pastures where it makes its runways beneath rocks. A female and a litter of six nearly grown young were taken from a nest of dried grass beneath a roughly circular flat rock thirty inches in diameter on April 16, 1938. The weight of the adult female the day following capture was 5.4 grams. The weight of the combined litter of six was 17.5 grams making an average of 2.91 grams per individual young. When first captured, the young fed entirely from the mother, but during the following week, they learned to eat ants, ant pupae, and crickets which were first killed by the parent. On April 18, it was definitely established that the eyes of the young were open. The litter was kept for five days with little change in weight although the young became better able to care for themselves during this period. Finally two young were eaten by the parent and others in the litter, and it was thought best to preserve the remainder of the group.

When killing crickets the adult female gave a few vigorous bites on the head and then moved to another kill. In this manner six crickets were killed while none were eaten until later.

Attention is called to the weight of the litter, the individuals of which for two days were observed to feed entirely from a parent weighing one-third as much as the combined group.

Another specimen was obtained from the stomach of a blowing viper, *Heterodon contortrix*, collected on Clack Mountain near Morehead, Kentucky. Another was collected in a pasture in Morehead.

*Blarina brevicauda talpoides* (Gapper).—Short-tailed shrew. This is by far the most common shrew in the region. Specimens were taken in brush areas, orchards, damp meadows, and open fields. Seven shrews and 40 white-footed mice were taken with 120 traps during one night of trapping at Carter Caves in Carter County.

*Myotis lucifugus lucifugus* (Le Conte).—Little brown bat. This species is fairly common during the summer months. About 5000 hibernate each winter in Carter Caves in Carter County in company with *M. sodalis*.

*Myotis sodalis* Miller and Allen. A colony of more than 90,000 bats of this species hibernate in Bat Cave in Carter County each winter. Two thousand individuals of this species and *M. lucifugus* were marked with Biological Survey bird bands in April 1937, to study migration and longevity. This was but a short time before the bats left the cave for the summer. In November 1937, many of the clusters of bats were examined

and 70 banded individuals were found. The banded bats now were scattered through all the clusters in a large room in the cave. In banding, the year before, all bats banded were taken from five large clusters from one restricted area in the cave.

*Lasionycteris noctivagans* (Le Conte).—Silver-haired bat. A single specimen of this species was taken in Morehead on March 29, 1938. It is rare in this section. Funkhouser (1925) recorded a specimen from Bell County.

*Pipistrellus subflavus subflavus* (F. Cuvier).—Pipistrelle. This is one of the commonest bats in the county, being exceeded in numbers only by the red bat. It has also been found hibernating in small numbers in Bat Cave at Carter Caves. The average measurements of two males are: Length, 70, tail, 29; foot, 9.5; forearm, 30; tragus, 6.

*Eptesicus fuscus fuscus* (Beauvois).—Big brown bat. Not at all common in Rowan County although Hamilton (1930) found this to be one of the most common species in Breathitt County. Specimens were obtained near Morehead. A few individuals hibernate in Bat Cave each year.

*Lasiurus borealis borealis* (Müller).—Red bat. This is the commonest bat observed during the summer. Early in the evening they are first observed flying so high in the air that they are barely visible. As darkness approaches they fly lower and lower until they skim over the underbrush. Average measurements of five females are: Length, 103.6; tail, 48.2; foot, 8.8; forearm, 38.8; tragus, 6.

*Corynorhinus rafinesquii rafinesquii* (Lesson).—Big-eared bat. On December 12, 1932, a single individual was collected at Carter Caves. This bat was not in the interior of any of the caves but was hanging in a crevice which received considerable light. Apparently it was hibernating, as the guide had seen it in the same location on several days before it was collected. Hamilton recorded a single specimen for Breathitt County.

*Procyon lotor lotor* (Linnaeus).—Raccoon. This species was abundant formerly. Individuals are seldom encountered at present although a number still exist in the region. Stringent regulations will be necessary to preserve the species.

*Mustela frenata noveboracensis* (Emmons).—New York weasel. An individual was killed in a chicken yard along Triplet Creek at Clearfield. Occasionally they are reported by farmers as visiting hen houses. A few are still obtained by trappers.

*Mustela vison mink* Peale and Beauvois.—Mink. The mink was more abundant formerly than at present. Trappers occasionally obtain specimens.

*Spilogale putorius* (Linnaeus).—Spotted skunk. This species has not been encountered in the county by either of the writers; but fur dealers speak of a small spotted skunk which is sometimes taken.

*Mephitis mephitis nigra* (Peale and Beauvois).—Common skunk. Skunks are not very abundant but a number are taken each winter. It is unusual to find a dead individual on the highway. The species appears to be more common north of Morehead near the Fleming County line than in other sections. A female and five young about one-third grown were observed during the first week of June, 1934.

*Vulpes fulva fulva* (Desmarest).—Red fox. The red fox is much more common to the west in the bluegrass than it is in the hilly sections. A den with young was found in late May near Owingsville in Bath County. Fox hunters in Rowan County have difficulty in finding red foxes for their chases. They are much preferred to the grays, which have a tendency to hole-up when hard pressed by hounds. The red fox is protected by the fox hunters of the region; so its future is assured.

*Urocyon cinereoargenteus cinereoargenteus* (Schreber).—Gray fox. This fox is common in the rocky ridges of eastern Kentucky. It is sometimes seen along the highways and often makes depredations on farmers' poultry yards. A young male was killed by an automobile on the outskirts of Morehead early one evening and was brought to the laboratory while still warm.

*Lynx rufus rufus* (Schreber).—Bobcat. A mounted specimen which was taken near

Clearfield was examined. Several specimens have been captured near Morehead in the last five years. An occasional individual is reported from time to time from Lochege and Clack Mountain. Farmers along the North Fork of Licking often report hearing wildcats. One was trapped in Bat Cave three hundred feet from the entrance.

**Marmota monax monax** (Linnaeus).—Woodchuck. Woodchucks are fairly common in the cliffs and rocky areas along the ridges. Many are seen along the C. C. C. trail over Clack Mountain. Two specimens in the Morehead State Teachers College Museum were taken from this locality. A young individual less than one-third grown was brought into the laboratory during the third week of May.

**Tamias striatus fisheri** Howell.—Fisher chipmunk. This form is very abundant throughout the region. Hamilton lists *striatus* as the form from Breathitt County, but Dr. Remington Kellogg has identified the specimens from this region as *fisheri*.

**Sciurus carolinensis carolinensis** Gmelin.—Gray squirrel. Heavy hunting in and out of season has depleted the squirrel population to a considerable degree. A pair is occupying the hillside back of the college, but this is the only pair that has been encountered near Morehead for several years. They are rather common along Licking River near Farmers, and are also more abundant in Fleming than in Rowan County. Numbers can still be seen feeding any evening in the small remaining stand of virgin timber at Carter Caves. The season opened on July 1 this year, and the hunters still manage to obtain good bags.

**Sciurus niger rufiventer** Geoffroy.—Fox squirrel. This species is not at all common at the present time. Occasionally an individual is taken by a hunter. One specimen in the Morehead State Teachers College Museum was killed by a dog. The species is frequently seen in small stands of hickory in the bluegrass region to the west of Rowan County.

**Glaucomys volans volans** (Linnaeus).—Flying squirrel. This squirrel is very abundant in the region. A number of individuals enter a linen closet in one of the college dormitories each year and become pests. A gravid female was captured there on July 26, 1938, while five other individuals, possibly the first litter of the season, escaped. Young two-thirds grown have been taken in early April, indicating that the first litter is born in late January or early in February. It is very likely that three litters are raised each year in eastern Kentucky.

**Reithrodontomys humulis humulis** (Audubon and Bachman).—Southern harvest mouse. Howell in his revision of the American harvest mice records three specimens of *R. h. merriami* from Lexington, Kentucky. To the writers' knowledge there are no other published records of any form of *Reithrodontomys* for the state. According to Kellogg (correspondence), Howell's record as well as the specimens obtained at Morehead should be referred to *R. h. humulis*. Eight specimens were obtained in Rowan County. Two were taken in the Van Antwerp orchard in rather dry ground among the rows of trees, and six in the marsh beyond the Morehead State Teachers College athletic field. The traps were set in runways which could not be distinguished from those of meadow mice. The species is not common, judging from the few individuals taken.

**Peromyscus leucopus noveboracensis** (Fischer).—Northern white-footed mouse. This is the most common species of woodland mammal in this section. Specimens have been taken from all stations. Occasionally an individual was secured in rather open fields.

**Peromyscus nuttalli nuttalli** (Harlan).—Northern golden mouse. The golden mouse is less numerous than the white-footed mouse, but nevertheless it can be considered a common woodland form. It has been taken most frequently in pine thickets on level ground, particularly around old fallen pine trees. The nests are rather carefully woven structures placed in bushes or briars several feet from the ground. These nests are

easily found and as many as three adults have been taken from a single nest. A nest containing five small naked young was collected on April 15.

**Neotoma pennsylvanica** Stone.—Allegheny cliff rat. Wood or cliff rats are very common along the rock ledges near the tops of the ridges. Two specimens were secured in deadfalls and one was captured in a mouse trap. Tracks, droppings, and an accumulation of all sorts of debris bear testimony to the presence of these interesting rodents among the rocky cliffs.

**Synaptomys cooperi stonei** Rhoads.—Stone mouse lemming. Two specimens of this species were obtained near the Morehead State Teachers College athletic field. It is believed that they constitute the first record for the state. One was found beneath a stone in a dry grassy area which was near a low-lying grassy marsh grown up to alders, sedges, and swamp grasses. Sphagnum was present in the marsh. The other specimen was caught in a trap near this marsh. Traps were kept out for several days and no additional specimens were obtained. Meadow and harvest mice were taken from the same locality. Another sphagnum marsh at the Van Antwerp orchard, eight miles west of Morehead, was trapped for lemmings without success.

**Microtus pennsylvanicus pennsylvanicus** (Ord.).—Meadow mouse. This mouse was taken in a grassy area near the Morehead State Teachers College athletic field and in Van Antwerp's orchard. Hamilton (1930) reported no meadow mice for Breathitt County. It is certainly a common species in grassy fields and meadows in this section.

**Pitymys pinetorum auricularis** (Bailey).—Southern pine mouse. Four specimens were taken in pine thickets in low lying ground near the C. C. C. Camp at Rodburn. Many of the runways were merely burrows beneath the dry leaves and needles while others actually were subterranean in nature.

**Ondatra zibethica zibethica** (Linnaeus).—Muskrat. Several specimens were trapped in Triplet Creek near the entrance to Licking River. The river banks at this point were worn smooth by the animals. The species is very common at Lewis Pond where they make daily visits to the nearby corn fields. Well travelled paths connect the pond to the fields. It is also common at several points along Licking River and on East and North forks of Triplet.

**Sylvilagus floridanus mearnsii** (Allen).—Mearns cottontail. This mammal is common throughout the area. During certain winters it does considerable damage to fruit trees by gnawing the bark. Hunters manage to obtain good bags during the open seasons.

**Odocoileus virginianus virginianus** (Boddaert).—Virginia deer. In early times deer were common throughout this section. The only record in recent years is a sight record on the C. C. C. trail over Clack Mountain in the summer of 1938.

#### INTRODUCED SPECIES

**Mus musculus musculus** Linnaeus.—House mouse. The house mouse is very common.

**Rattus norvegicus** (Erxleben).—Norway rat. This species is very abundant. It causes considerable damage to stored grains of the farmer and is also a nuisance in towns and villages.

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