

**STUDIES ON RHOAD'S COTTON MOUSE,  
PEROMYSCUS GOSSYPINUS MEGACEPHALUS,  
IN ALABAMA**

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A survey of the literature revealed little information concerning the cotton mouse, *Peromyscus gossypinus*. This research was undertaken to increase our knowledge of this species with most of the emphasis placed on Rhoad's cotton mouse, *Peromyscus gossypinus megacephalus*, in Alabama. This publication represents a portion of the author's thesis which was written in partial fulfillment of the requirement for the degree of master of science at the University of Alabama.

McCarley (1954) made a study of population fluctuations of *P. gossypinus* in east Texas over a twenty month period. He concluded that these fluctuations were correlated with seasonal and environmental conditions, and that the population density was highest in January, February, and March, and lowest in July, August, and September. Harris (1949) reported that three phytozoars (foodballs) taken from the stomach of a laboratory bred cotton mouse contained vegetable fibres, peat moss, and an occasional hair shaft. Pournelle (1952) described the reproduction and postnatal development of the cotton mouse in Florida. His data were based on 888 wild-trapped and 265 laboratory-reared cotton mice. Pournelle found the average length of the estrous cycle was 5.26 days and the gestation period varied from 23-30 days, depending on whether or not a non-nursing or nursing female was involved. Most parturitions occurred in the morning hours. The size of the litters was recorded and compared during the spring and fall and no significant difference was noted. Dice (1940) conducted a study of the relationship between the wood mouse, *P. leucopus*, and cotton mouse, *P. gossypinus gossypinus*, in eastern Virginia. Even though these two species occur together in nature in the Dismal Swamp, they fail to interbreed. However, the contrary is true when mice of these two species are reared together in the laboratory. He attributed this to a psychological difference in the normal breeding of the two species.

Lillie, Dyer, and Topping (1939) reported that typhus nodes and vascular lesions are produced in endemic typhus in several species of mice, but that no lesions were noted in inoculated cotton mice. Brigham (1937), in a study of the susceptibility of some Alabama mammals to endemic typhus fever, reported that following inoculation with endemic typhus virus, a cotton mouse showed no gross sign of infection and retained its activity until

it was killed 18 days after inoculation. The virus was recovered from the mouse.

These studies were conducted from February, 1955, to August, 1956, with the period between February, 1955, to February, 1956, devoted to the trapping of specimens. A total of 137 mice were collected during 1643 trap nights. Ordinary commercial rat and mouse traps were used as well as live traps. The latter were built from quart tin cans from which the end had been removed. A piece of hardware cloth was attached over one end and a mouse trap was attached to the other end which had a piece of hardware cloth fastened to the guillotine to close the can when triggered. A small piece of cotton was placed inside the can for the protection of the mice from low temperatures. Skins and skulls were prepared of all mice collected and these were catalogued into the University of Alabama Mammal Collection. Three hundred specimens in the University of Alabama Collection were studied in addition to those trapped by the author. Specimens were available from the following counties: Lauderdale, Colbert, Marion, Walker, Jefferson, Tuscaloosa, Bibb, Hale, and Barbour. In addition to the data derived from the preserved specimens, the author gained valuable data by observing a colony of live mice kept in a terrarium over a period of approximately one year. The capitalized colors used in the subsequent discussion are based on Ridgway (1912).

Studies on the relative body proportions, color variation, osteology, habits, ecology, reproduction, and ectoparasites comprised most of the thesis data.

#### RELATIVE BODY PROPORTIONS

Data on the relative body proportions of Alabama specimens were accumulated. Measurements were made as follows: *Total length* was measured from the tip of the snout to the tip of the last caudal vertebrae (not the end of the hair); *tail length* was measured from the dorsal base of the tail to the end of the last caudal vertebra; *hind foot*, from the back of the heel to the end of the longest digit; *ear*, from the notch to the cartilaginous tip. No significant sexual differences were found in these measurements.

The variation in total length of the specimens studied is extensive. The majority of the adults ranged between 143 mm. and 165 mm., although one had a total length of less than 120 mm. No differences in total length between the sexes were noted.

The tail length varied proportionally with the total length, the latter averaging 2.35 times the former. However, the deviation from this ratio among individuals is too great for it to be considered as diagnostic for *megacephalus*.

The hind foot varied from 16 to 25 mm. in length, with the majority of the specimens having a hind foot length of 19 to 23

mm. The hind foot varied independently of the tail length and the total length so that the absolute measurement is of diagnostic value.

The ear length varied from 10 mm. to 21 mm., with the majority varying from 15 to 20 mm. It varied independently of the hind foot length and the total length, and it is of value diagnostically as an absolute measurement.

#### COLOR VARIATION

The fur of adult *P. gossypinus megacephalus* is composed of two types of hair, a heavy growth of short hair which covers all the body and a lesser growth of long black hair concentrated on the mid-dorsal region of the body. In general, the short hair is bi-colored. Those hairs on the dorsal surface have brown tips and a gray base, whereas those on the ventral surface have white tips and a gray base. The tail is bi-colored. The feet are white above and they have naked soles. The ears are gray, with black guard hairs

Young cotton mice have a coat of gray fur which becomes darker as the mice grow older. Juveniles are Light Mouse Gray on the dorsal surface, which has interspersed black guard hairs, and are white on the ventral surface. As the mice grow older, the dorsal coat changes to a Dark Mouse Gray. The tail is still bi-colored, being gray on top and white on the bottom. As they approach adulthood, the color of the dorsal surface changes to a light brown, except for the tail which becomes darker; this change first appearing on the flanks and head. When full adulthood is reached, the mice have a distinct brown mid-dorsal stripe.

There is some seasonal variation in the pelage of cotton mice. In general, the pelage tends to be lighter during the spring and through the summer, changing to a darker coloration during autumn and winter months. A detailed description of representative series collected at different seasons of the year follows:

Twenty-five adult specimens collected during March and April, 1955, in Moody Swamp, Tuscaloosa County, were examined. These cotton mice had black guard hairs in the mid-dorsal region, from the top of the head to the tail, underlain by fur which is Brussel's Brown at the tip and Light Mouse Gray at the base. The cheeks and flanks are Antique Brown. On the ventral surface of the body, the fur has white tips and gray bases. The feet are white above and they have naked soles. The tail is covered with a dense growth of hair which is blackish above and white on the undersurface.

Ten adult specimens collected during August, 1955, in Moody Swamp, Tuscaloosa County, were examined. The tips of the hair on the upper surface are Chestnut Brown, with the mid-dorsal region, from the top of the head to the tail, being inter-

persed with black guard hairs. The cheeks and flanks of the body have a Hazel coloration. Basally, the fur is almost a Dark Mouse Gray. On the ventral surface, the fur is almost entirely white except for bi-colored hairs with Light Mouse Gray bases in both the chest and abdominal region. The feet are white above and they have naked soles. The tail is densely covered with hair which is very dark, appearing to be black on the upper side and white underneath.

Ten adult specimens collected during October, 1955, in Moody Swamp, Tuscaloosa County, were examined. The tips of the hair on the upper parts are Auburn to Amber Brown. Basally, the fur is a Dark Mouse Gray. The mid-dorsal region of the body, from the top of the head to the tail, is interspersed with black guard hairs. The fur on the ventral surface is bi-colored with the tips of the fur being white and the bases a Light Mouse Gray. The feet are white above and they have naked soles. The tail, which is black above and white on the under-surface, has a relatively heavy growth of hair.

Nineteen adult specimens collected during February and March, 1955, in Moody Swamp, Tuscaloosa County, were examined in addition to six mice from other localities in the Tuscaloosa area. The tips of the hair on the upper surface of the body are Auburn, while basally the fur is a Dark Mouse Gray. The top of the head and back are interspersed with black guard hairs. Burnt Sienna is most prevalent along the cheeks and sides of the body. The fur on the ventral surface is bi-colored, having white tips and Dark Mouse Gray bases. The feet are white and they have naked soles. The tail has a relatively thick coat of hair which is black above and white on the under-surface.

#### OSTEOLOGY

The dentition of all species and subspecies of *Peromyscus* found in Alabama is similar. It is characterized by the presence of incisors and molars, and the absence of premolar and canine teeth. A large diastema separates the incisors from the molariform teeth. The dental formula is:  $I, 1; M, 3 -$

$\frac{1}{1} \frac{3}{3} - 16$  (Osgood, 1909).

In *P. gossypinus megacephalus*, the incisors are convexly curved and average about 6 mm. in length. The molariform teeth in each jaw are three in number. They are characterized by alternating loops of dentine and enamel arranged in two longitudinal rows. The skull varies from 28 to 30 mm. in length and has a convex lateral profile. The zygomatic bone is deeply notched by the infraorbital foramen. The nasal bones are broad anteriorly, becoming narrower posteriorly and measuring over 10.5 mm. in length. On the ventral surface of the skull the anterior palatine foramen is greater than 7 mm. in length, and tapers considerably at the anterior end. The two tympanic bullae are markedly prominent.

## HABITS

## Observations of A Living Colony

An aquarium was adopted as a terrarium for the maintenance of a colony of cotton mice. This terrarium measured 60 inches in length, 18 inches in width, and 19 inches in height. The bottom was covered with two inches of dirt, on top of which was placed leaves, pine needles, cones, and a few dried branches. Rocks were piled at one end in the form of a shelter. At the other end of the terrarium there was a vertical piece of pipe about 17 inches high. The top of the terrarium was covered with a sheet of hardware cloth, and a hinged door of Masonite. Nine living mice were gathered with live traps and placed in the terrarium. These mice were observed for approximately a year, beginning in February, 1955, during which time data on behavior and habits were taken.

The mice seemed to seek elevated places in the terrarium. They frequently ran on top of the logs and also were often seen standing on top of the rock shelter. The small pipe at one end of the terrarium was seldom seen without an occupant balanced on its tip. In fact they would often struggle with one another to occupy this perch. These mice were active and quick in their movements, particularly at night. They would run from the rock shelter to a log and momentarily stop, as if they were listening for something, and then with quick movements ascend the pipe at one end of the terrarium. Then the route would be reversed and the cotton mice would traverse the distance from pipe to rock shelter with quick darting movements.

The mice were also observed cleaning themselves. They would lick both of their paws simultaneously and quickly run them over their head, face, and neck. After a pause of a few seconds, the mice would repeat this procedure. They were often observed licking and gnawing at their abdomen and flanks in an attempt to clean themselves.

While eating nuts, the mice would hold them with their front paws while they vigorously and noisily chewed. A series of food experiments were conducted by placing two different grains in separate bowls partially covered with hardware cloth to prevent the spilling of the food. The results showed that the mice preferred oats to alfalfa, sweet susans to June peas, and long okra to Tennessee pod beans.

The colony of mice constructed a nest of leaves and pine needles under the rockhouse. Bit by bit they would drag pieces of leaves and pine needles intertwining the nest. The mice invariably ran to this nest when frightened. Frequently the mice would also dig in the dirt, building tunnels in which they would hide when disturbed. The mice occasionally huddle together in an attempt to protect themselves.

The author observed the terrarium late one evening and noted that there were twelve mice. However, upon revisiting the

cage the following morning, only six mice were found alive, and fragments of fur and bones of the mice were scattered about the terrarium. Apparently, cannibalism of this type, which has been reported by Sterling (1953), occurs frequently in captive *Peromyscus*.

In March, 1955, a female in the terrarium gave birth to three young. These young were pinkish in color; their ears appeared to be covered by a sheath of skin. While nursing the young, the mother sat erect. The other mice in the terrarium seemed to be very curious about the newborn, and periodically one or more of the adults would make an attempt to attack them. The mother, becoming disturbed, viciously fought the curious mice. On the following day the litter was placed in another cage containing a box padded with some cotton. Shortly after their transfer to the new cage, one of the young was found dead, and the entire abdominal region was missing. Only one of these mice grew into adulthood, the others having died of unknown causes.

#### ECOLOGY

This animal is called "cotton mouse" because it was thought that it inhabits cotton fields. However, Hamilton (1943) states that the cotton mouse occupies a variety of habitats from the swamplands of the Atlantic Coastal Plain to the woodlands of the Smoky Mountain foothills at an elevation of 2000 feet. It also occurs in dense underbrush in the lowest and wettest parts of the bottomlands. Howell (1921) remarks that the species is scarcely if ever found in cotton fields unless they are on border of timbered swamps. According to Hamilton (1943). Major John LeConte, who described the species, mentioned its fondness for nesting under logs and under the bark of decaying trees. Howell (1921) states that in Big Bear Swamp, in Autauga County, it was common in bushy thickets, living in rotten logs and stumps not only around the borders, but in the interior of the swamp.

In the present study, the cotton mouse was trapped most extensively in swamplands with a large percentage of the specimens coming from Moody Swamp, located about 5 miles south of Tuscaloosa, Alabama. This area consists of mixed woods containing the following trees: *Quercus prinus* L., *Morus rubra* L., *Carpinus caroliniana* Walt., *Carya spp.*, *Pinus taeda* L., *Quercus lyrata* Walt., *Liquidambar styraciflua* L., and *Quercus nigra* L. Moody Swamp is located in the Upper Coastal Plain and is part of the flood plain of the Black Warrior River. The terrain is relatively level and has a thick floor of humus with an abundance of rotten logs and stumps.

An important trapping site was Big Sandy Creek located near Coaling, Tuscaloosa County, Alabama. The creek is winding and partly obstructed along its course by fallen trees and piles of leaves. The water was very clear and small rapids occur in a few places. The banks of the creek consist of jagged and un-

even limestone boulders. The flora of the area consists of several species of trees, the most abundant of these being: *Quercus prinus* L., *Fagus grandifolia* Walt., *Acer floridanus* (Chapm.) Pax., *Platanus occidentalis* L., *Cercis canadensis* L., *Pinus echinata* Mill., and *Juniperus virginiana* L.

The Bryce Lake area of Tuscaloosa served also as a trapping site. This region has a very uneven terrain interspersed with small seepages. The following trees are dominant: *Liquidambar styraciflua* L., *Liriodendron tulipifera* L., *Quercus alba* L., *Quercus marilandica* Muench., *Pinus taeda* L., *Fagus grandifolia* Ehrh., and *Carya spp.* Several ravines of the area were excellent for trapping. Felled trees, which had become rotten and somewhat hollow served as a habitat for the cotton mice in this area.

Another major trapping site was the Riverside area of the University of Alabama Campus. The main trees found in this area were: *Pinus taeda* L., *Prunus serotina* Ehrh., *Liquidambar styraciflua* L., *Morus rubra* L., *Ulmus americana* L., and *Lonicara japonica* L.

In general, these mice seem to prefer hardwood forest, rather than evergreen forest, based on the trapping sites at which the mice were most abundant.

#### REPRODUCTION

On one occasion a pregnant female cotton mouse (UA M-1330) containing four embryos was trapped in Moody Swamp. The mother had the following measurements: total length, 172 mm., hind foot, 22 mm., tail length, 71 mm., ear length, 19 mm. and weight, 40 grams. The four embryos had the following crown-rump measurements: 25 mm., 26.5 mm.; 24 mm.; and 25 mm. The embryo had a normally formed mouth with a well developed tongue; nose and nostrils were found to be well formed. On each side of the muzzle were approximately 25 vibrissae of varying length. The ears were poorly developed. The positions of the eyes were represented by small sockets in the face. Both the front and hind legs possessed digits. The tail was relatively small in comparison to the rest of the body and it was curved under the body. The whole embryo was light yellowish in color.

#### ECTOPARASITES

The following ectoparasites, which were studied in connection with this research, have been recorded from specimens of *Peromyscus gossypinus megalcephalus*. Many of these were contributed by O. L. Royal, M. D. 1952) of the Medical College of Alabama, who collected them as a graduate in biology at the University of Alabama. All specimens are in the University of Alabama Collection. The numbers which follow the dates are the mammal host catalogue numbers of the University of Alabama Collection.

DERMACENTOR VARIABILIS (SAY)  
(Dog Tick)

*Ixodes variabilis* Say, 1821, Orig. Descrip. p. 17  
*Dermacentor electus* Koch, 1844, p. 235.

Worth (1950) reported that *Dermacentor variabilis* (Say) was found on 94% of the cotton mice in the Everglades National Park. *Dermacentor variabilis* (Say) was collected on cotton mice by Royal as follows: Bryce Lake on September 12, 1951 (M-143); Paper Mill (near Tuscaloosa, Alabama) on March 7, 1952 (M-193 and M-198); and Talladega National Forest on March 27, 1952 (M-215 and M-233).

HAEMOLAEALAPS MEGAVENTRALIS (STRANDTMANN)  
(Mite)

*Haemolaelaps megaventralis* (Strandtmann), 1941,  
Journal of Parasitology, p. 112.

Morlan (1952) reports that he did take *Haemolaelaps megaventralis* from a cotton mouse in southwest Georgia, but he did not get this parasite from other animals, such as brown rat and roof rat.

This parasite was collected by Royal (1952) on cotton mice as follows: Bryce Lake on September 15, 1951 (M-149); Bryce Lake on September 18, 1951 (M-153); and Bryce Lake on September 22, 1951 (M-143).

LIPONYSSUS BACOTI (HIRST)  
(Tropical rat mite)

*Leiognathus bacoti*, Sp. N., Hirst, 1914, Bulletin of  
Entomological Research, Vol. IV, pp. 119-124.

Worth (1950) reports that the tropical rat mite, *Liponyssus bacoti* (Hirst) was taken from four hosts in the Everglades, being found on 28 per cent of the cotton mice, and on all roof rats. Morlan (1952) reports finding 18 specimens of this mite on the cotton mouse in southwest Georgia in 1949.

One specimen of *Liponyssus bacoti* (Hirst) was found by Royal on an Alabama cotton mouse as follows: Bryce Lake on September 22, 1952 (M-142).

HOPLOPLEURA HESPEROMYDIS (OSBORN)  
(Louse)

*Haematopinus hesperomydis* (Osborn), 1891, USDA; Division of  
Entomology, Bulletin (Old Series) 7:26; fig. 14.

Morlan (1952) records this louse from the cotton mouse in southwest Georgia. Royal (1952) has recorded this louse from Alabama cotton mice as follows: Bryce Lake, Tuscaloosa County, on February 20, 1952 (M-190); and Talladega National Forest, Bibb County, on May 13, 1952 (M-235).

STENOPONIA AMERICANA (BAKER)  
(Flea)

*Hystriochopsylla americana*, Baker, 1898, Ent. News, 10:37.

I. Fox (1940) records *Stenoponia americana* (Baker) from cotton mice taken in Dale County, Alabama, on April 14, 1937. Royal (1952) records this flea from cotton mice as follows: Bryce Lake, February 20, 1952 (M-170 and M-189); Cottondale, Alabama, March 22, 1952 (M-232). The author collected it from a cotton mouse caught in Moody Swamp, February 19, 1955 (M-1144).

PEROMYSCOPSYLLA SCOTTI (FOX)  
(Flea)

*Peromyscopsylla scotti* L. Fox, 1939, Proc. Ent. Soc.  
Washington, 41:49, Plate 6, fig. 4.5.

Royal (1952) recorded this flea from a cotton mouse taken at Tanklewood Biological Station in Hale County, Alabama, on March 25, 1952 (M-213).



CTENOPSYLLUS SEGNIS (SCHONHERR)  
(Mouse flea)

*Pulex segnis* Schonherr 1811, Kongl., Svenska, Vetenskakad Nya.  
Handl. (2nd S.), 32:98, Plate V, figs. A, B.

Morlan (1952) records one specimen of this species recovered from a cotton mouse in southwest Georgia. Royal (1952) recorded this flea from a cotton mouse trapped at Tanglewood Biological Station on March 25, 1952 (M-212).

EPITEDIA WENMANNI (ROTHCHILD)  
(Flea)

*Ctenophthalmus wenmanni* Rothschild, 1904, Nov. Zool.  
642, Plate 14, figs. 75, 76 and 77.

*Neopsylla similis* Chapin, 1919, Bull. Brooklyn Ent. Soc. 14:50.

Royal (1952) reported the collection of one specimen of *Epitedia wenmanni* (Rothschild) from a cotton mouse taken at Bryce Lake on February 21, 1953 (M-192).

SUMMARY

1. Studies on the morphology, color variation, habits, osteology and ecology of *Peromyscus gossypinus megacephalus* were conducted from February, 1955, to August, 1956.

2. A detailed description of color variation with age and season is presented.

3. Observations of a captive colony of *P. gossypinus megacephalus* are summarized, along with additional information on reproduction, ecology, and habits.

4. A list of ectoparasites of *gossypinus megacephalus*, along with an account of previous workers who had collected from cotton mouse hosts, is presented.

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## NEWS OF TENNESSEE SCIENCE

(Continued from Page 122)

Raymond Shapira, who has been associated with the Biochemistry Group, left the Division December 31, 1957. Dr. Shapira has accepted a position on the staff of Emory University.

Sohei Kondo, a citizen of Japan, has joined the Biophysics Section as a visiting investigator. Dr. Kondo received the Ph. D. degree from Kyoto University, Japan, and since January, 1956, has been in charge of radiation facilities at the National Institute of Genetics in Misima, Japan.