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BUREAU OF BIOLOGICAL SURVEY
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A BIOLOGICAL SURVEY OF ALABAMA

I. PHYSIOGRAPHY AND LIFE ZONES
II. THE MAMMALS

BY

ARTHUR H. HOWELL

ASSISTANT BIOLOGIST, BIOLOGICAL SURVEY

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(Continued on page 3 of cover.)

LETTER OF TRANSMITTAL.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF BIOLOGICAL SURVEY,
Washington, D. C., January 18, 1921.

SIR: I have the honor to transmit herewith, recommending that it be published as No. 45 in the series of the North American Fauna, a report on the biological survey of Alabama, by Arthur H. Howell, assistant biologist of this bureau. This treats of the life zones and the mammals of the State. A further report on the birds has been prepared for separate publication. Both are based on natural history explorations conducted during recent years by the bureau. The first part of the present report defines the physiographic features of the State and characterizes the two transcontinental life zones represented; it is accompanied by a map showing the boundaries of each zone. The second part consists of notes on the distribution, abundance, and habits of the native mammals of the State, of which there are 65 forms now known, 10 having been added as a result of the Survey investigations, 3 of them new to science. This report will be of material assistance to farmers, students, and others interested in the habits and economic relations of our native wild animals.

Respectfully,

E. W. NELSON,
Chief of Bureau.

Hon. E. T. MEREDITH,
Secretary of Agriculture.

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A BIOLOGICAL SURVEY OF ALABAMA.

By ARTHUR H. HOWELL.

INTRODUCTION.

In the work of mapping the life zones of North America and the distribution of mammals and birds—a project upon which the Biological Survey has been engaged for many years—the Southeastern States have until very recent years received little attention. The more conspicuous birds and mammals found in that region were known in a general way, but exact knowledge of their distribution was lacking and, as a result, the boundaries of the life zones could be drawn only tentatively.

To secure definite information regarding the distribution, abundance, and economic relations of the birds and mammals and at the same time to study the distribution of the plant life of this region, a biological survey of Alabama was carried on during a period of several years. From these investigations, and with the aid of Mohr's detailed report on the plant life,[1] it has been possible to define the ranges of the mammals and birds and the boundaries of the natural life zones within the State. The report on the bird life has been prepared and tentative arrangements made for its publication; the reports on life zones and on the mammals are presented herewith.

The field collecting on which the present report is chiefly based was carried on by the writer, with the assistance of James S. Gutsell, Ernest G. Holt, James L. Peters, and Luther J. Goldman during parts of the years 1908 and 1911–1916. Collections had previously been made by C. S. Brimley in 1890, and by Russell J. Thompson in 1892. The writer's work covered every month in the year and practically all parts of the State. Valuable assistance was rendered also by numerous residents of the State, who were instrumental in

[1] Mohr, Charles, Plant life of Alabama: Contr. U. S. Nat. Herb., vol. 6, 1901.

securing needed specimens and information. Among those who rendered especially valuable aid were Lewis S. Golsan, of Prattville; Edward S. Graves, of Bentonsport, Iowa (formerly residing on Sand Mountain, near Carpenter, Ala.); Peter A. Brannon, of Montgomery; and H. P. Loding, of Mobile.

PART I. PHYSIOGRAPHY AND LIFE ZONES OF ALABAMA.

PHYSIOGRAPHIC FEATURES OF THE STATE.

Alabama presents a wide diversity of physiographic conditions, ranging from the low sandy islands and pine-covered flats of the coast region through the fertile valleys and rolling hills of the central parts, to the rugged and rock-crowned ranges of the northeast, reaching in Clay County an altitude of 2,400 feet above sea level. The principal natural divisions of the State are the following:[2] Mountain Region, Tennessee Valley, Warrior Basin and Tableland, Central Prairie Belt, Coast Pine Belt, and Coast Plain or Gulf Strip.

Mountain Region.

The Mountain Region comprises the southernmost spurs of the Appalachian system and covers approximately the northeastern portion of the State from northern Coosa County northward. The principal ranges are the Talladega Mountains, in Talladega and Clay Counties (Cheaha Peak, altitude 2,407 feet); Choccolocco Mountain, in Calhoun County (2,074 feet); Oakey Mountain, in Cleburne County (1,945 feet); Mount Weisner, in Cherokee County (1,900 feet); Lookout Mountain (1,847 feet, near Mentone); Sand Mountain (1,785 feet, near Carpenter) (the last two being parallel ridges extending from the vicinity of Gadsden and Attalla northeastward through Dekalb County), and the Cumberland Plateau, in Jackson and Marshall Counties.

On most of the mountains the soil is thin and rocky, supporting a rather open, stunted growth of pine, red cedar, oak, chestnut, hickory, and other trees, and it is on the upper slopes of these ridges that the Upper Austral Zone reaches its southern limit.

Tennessee Valley.

The Tennessee River flows through a broad, rolling valley, from 12 to 15 miles wide, crossing the State from the northeastern to the northwestern corner. Now largely cleared of timber and under cultivation, this valley is one of the most important agricultural sections of the State.

[2] Adapted in part from Mohr's map of the floral areas of Alabama, in "Plant Life of Alabama" (1901), where will be found a more detailed discussion of the physiographic conditions.

Warrior Basin and Tableland.

The Warrior Tableland comprises the elevated plateau in the north central part of the State, covering part or all of Winston, Cullman, Marshall, Blount, Etowah, Walker, Jefferson, Tuscaloosa, Shelby, and Bibb Counties. It is a region of low hills, interspersed with narrow valleys, many of the streams flowing through deep gorges bordered with high cliffs. A large proportion of this area is heavily forested, the prevailing trees being chestnut oak (*Quercus prinus*), Spanish oak (*Quercus digitata*), pines (*Pinus echinata*, *Pinus taeda*, *Pinus virginiana*, and *Pinus palustris*), hickories, chestnut, and sour gum (*Nyssa sylvatica*). On the moist slopes of the ravines a dense growth of shrubs is usually found, including laurel (*Kalmia*), azaleas, huckleberries, and the handsome oak-leaved hydrangea (*Hydrangea quercifolia*).

Central Prairie Belt.

The Prairie Region of Alabama comprises a belt from 35 to 45 miles wide crossing the State from Sumter County to Russell County, and including also part or all of Pickens, Greene, Hale, Perry, Dallas, Autauga, Lowndes, Montgomery, Macon, and Bullock Counties. It consists of a rolling plain, bordered on the north and south by pine-covered hills. Although it contains extensive tracts of prairie, it is by no means exclusively of this character, but includes many small areas of forested land, extensive wooded swamps, and numerous canebrakes.

Many varieties of trees are found in this region, among the more prominent of which are the post oak (*Quercus minor*), Texas white oak (*Quercus durandi*), water oak (*Quercus nigra*), overcup oak (*Quercus lyrata*), pecan, hickories, elms, hawthorns, red cedar, and several species of pine (*Pinus taeda*, *Pinus echinata*, *Pinus palustris*, and *Pinus glabra*).

Coast Pine Belt.

The Coast Pine Belt extends across the State from Choctaw to southern Barbour and Henry Counties, merging on the north into the Prairie Belt and on the south into the Coast Plain. Of its floral characters, Mohr says: "Broadly stated, it consists in the increased frequency of types which are at home in the Louisianian Area, and in distinction from regions farther north, of a tree growth in which, though otherwise similar, the long-leaf pine in its highest development predominates. * * * Fully one-half of the area of this region is under cover of the long-leaf pine * * *."[3] Other characteristic trees and shrubs are the shortleaf pine (*Pinus echinata*), southern spruce pine (*Pinus glabra*), basswood (*Tilia heterophylla*), magnolia

[3] Mohr, Charles, Plant life of Alabama, pp. 106, 110, 1901.

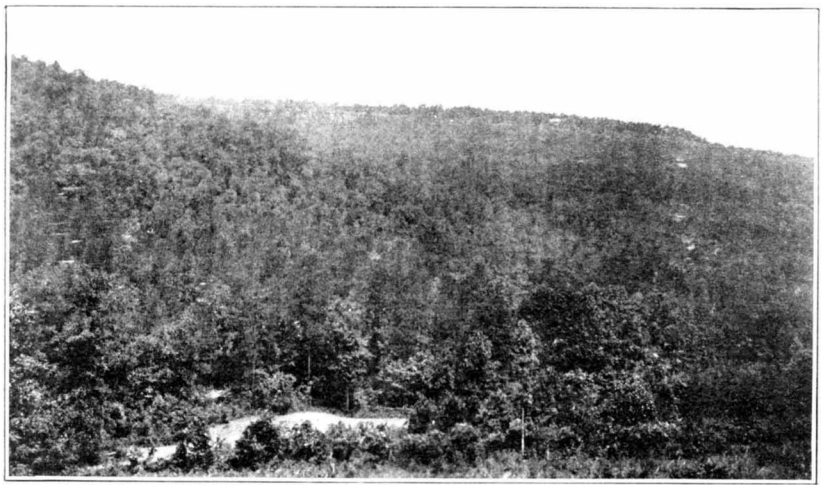

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FIG. 1.—EASTERN SLOPES OF SAND MOUNTAIN, FROM TRENTON VALLEY.

Rocky escarpment, heavily timbered, except on steepest slopes.

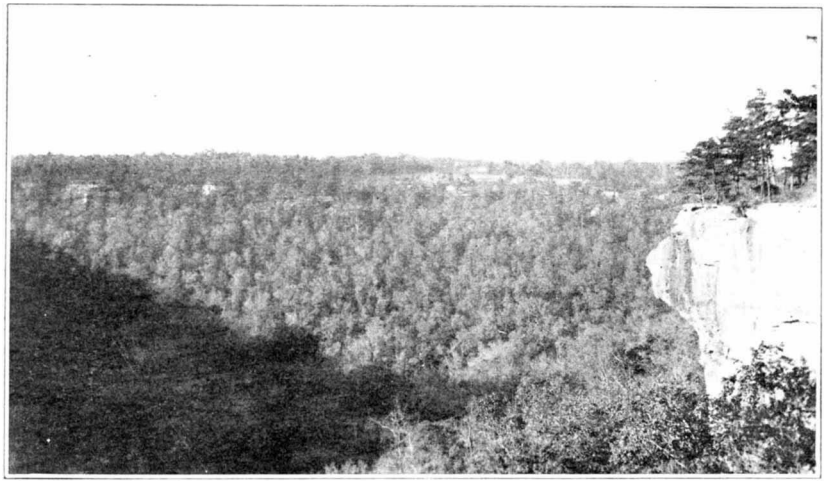

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FIG. 2.—GULCH OF LONG ISLAND CREEK, SAND MOUNTAIN.

Hardwood timber in the bottom of the gulch; shortleaf pines (*Pinus virginiana*) on top of plateau.

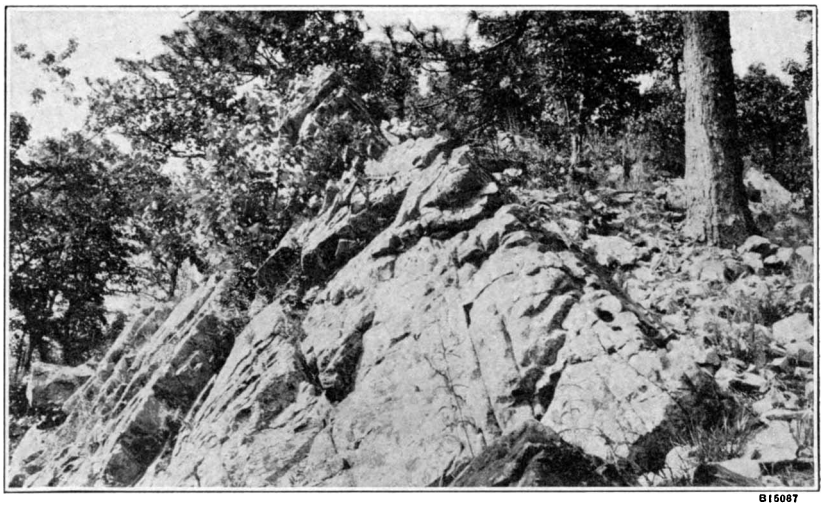

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FIG. 1.—ROCK RIDGE NEAR SUMMIT OF CHOCCOLOCCO MOUNTAIN.

Longleaf pine (*Pinus palustris*) growing on summit.

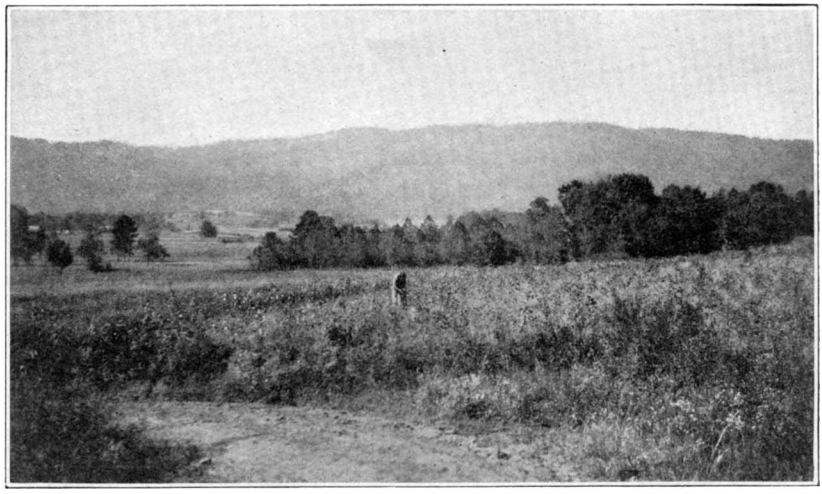

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FIG. 2.—CHOCCOLOCCO VALLEY, NEAR PIEDMONT. DUGGER MOUNTAIN IN DISTANCE.

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FIG. 1.—ROCKY SLOPES NEAR BASE OF TALLADEGA MOUNTAINS.

Young growth of longleaf pine (*Pinus palustris*).

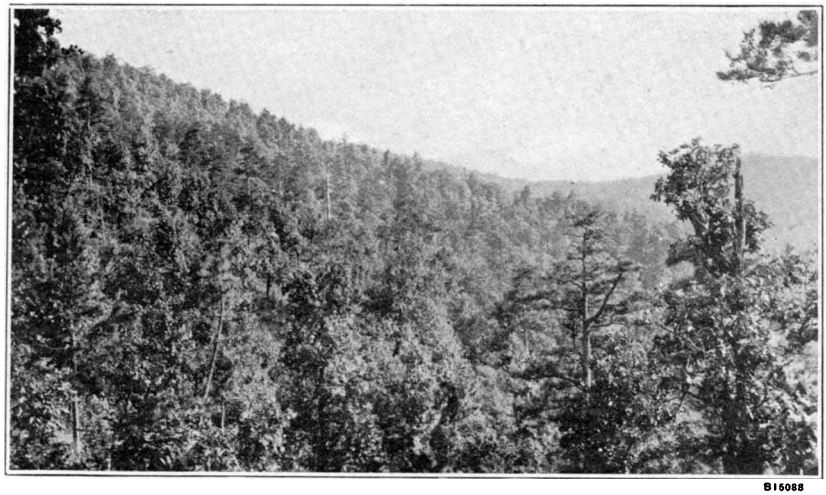

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FIG. 2.—UPPER SLOPES OF CHOCCOLOCCO MOUNTAIN.

Timber chiefly oaks and longleaf pine.

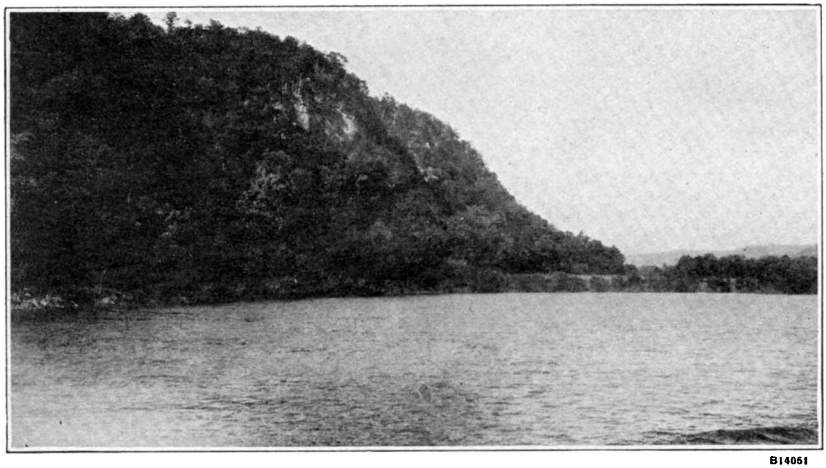

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FIG. 1.—TENNESSEE RIVER NEAR BLOOMFIELD.

Rock bluff covered with dense growth of mixed timber.

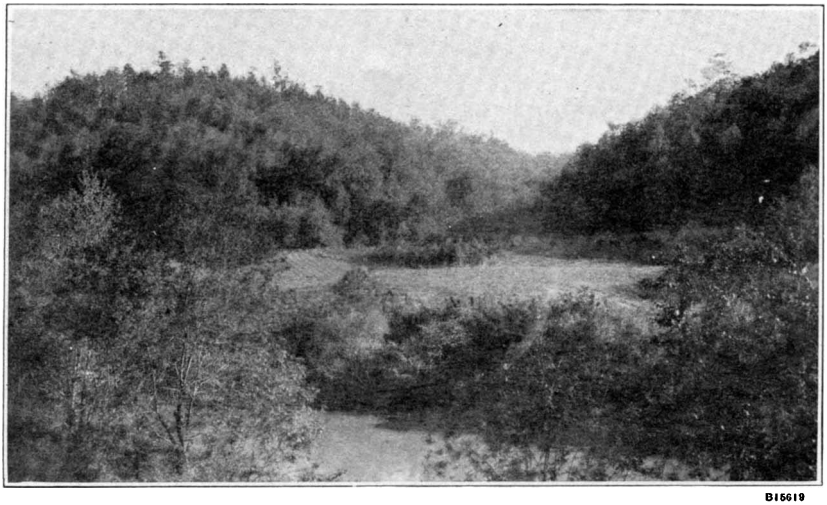

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FIG. 2.—SIPSEY FORK AT MOUTH OF BEAR BRANCH.

Wooded hills, with narrow valley bottoms under cultivation.

B15628

FIG. 1.—PINE FOREST NEAR JASPER.

Chiefly longleaf pine (*Pinus palustris*) with a carpet of ferns (*Pteridium aquilinum* and *Osmunda cinnamomea*).

B13509

FIG. 2.—TURPENTINE "ORCHARD" NEAR MOBILE.

Pure stand of longleaf pine.

B15633

FIG. 1.—CATOMA SWAMP, NEAR TEASLEY MILL.

Spruce pine, beech, oaks, hickories, etc.

B15640

FIG. 2.—RIVER-BOTTOM SWAMP NEAR SEALE.

Undergrowth of palmetto (*Sabal minus*) in hardwood forest.

(*Magnolia foetida*), red bay (*Persea borbonia*), beech, water oak (*Quercus nigra*), laurel oak (*Quercus laurifolia*), storax bush (*Styrax grandiflora*), sweet illicium (*Illicium floridanum*), white and red flowered buckeyes, and the Carolina allspice (*Calycanthus floridus*).

Coast Plain or Gulf Strip.

The Coast Plain, as used here, includes the Lower Coast Pine Belt, the Coast Plain, and the Littoral Belt of Mohr's "Map of the Floral Areas of Alabama." It comprises the sand-dune and salt-marsh areas of the coast and outer islands, the coastal pine flats, the extensive river swamps around the head of Mobile Bay, and the rolling sandy uplands of the southern tier of counties.

In the hill country, which attains an altitude of 250 or 300 feet above sea level, the longleaf pine (*Pinus palustris*) is the prevailing tree, with some loblolly pine (*Pinus taeda*), interspersed with a rather sparse and stunted growth of turkey oak (*Quercus catesbaei*), blue jack (*Quercus brevifolia*), huckleberry bushes, and the heatherlike shrub *Ceratiola ericoides*. In the depressions between the hills and about the heads of the numerous streams rising in this area are found many small swamps, in which is a dense growth of white bay (*Magnolia virginiana*), water oak (*Quercus nigra*), laurel oak (*Quercus laurifolia*), southern black gum (*Nyssa biflora*), swamp maple, white cedar (*Chamaecyparis thyoides*), pond cypress (*Taxodium ascendens*), and scattering pines.

On the flats along the coast is found an open forest of pines, chiefly the swamp pine (*Pinus elliottii*). In the hammocks—slightly elevated tracts rising from the swampy flats—occurs a profusion of large timber trees, including the magnolia (*Magnolia foetida*), beech, holly (*Ilex opaca*), water oak (*Quercus nigra*), laurel oak (*Quercus laurifolia*), and the magnificent live oak (*Quercus virginiana*), a tree characteristic of the coastal region. About the borders of the hammocks and in the small swamps is found a dense growth of shrubs, including the titi (*Cliftonia monophylla*) and the leatherwood (*Cyrilla racemiflora*).

Extensive river swamps cover the delta formed by the Mobile and Tensaw Rivers, much of the land being subject to long-continued overflows. Here grow magnificent forests of cypress (*Taxodium distichum*), tupelo gum (*Nyssa aquatica*), black gum (*Nyssa biflora*), red maple (*Acer drummondii*), water hickory (*Hicoria aquatica*), water oak (*Quercus nigra*), overcup oak (*Quercus lyrata*), water ash (*Fraxinus caroliniana*), green ash (*Fraxinus lanceolata*), swamp cottonwood (*Populus heterophylla*), and other trees, all heavily festooned with the long Spanish "moss" and hung with tangles of grape vine and other climbing plants.

On the shores of the coastal bays and on the outer islands are extensive salt marshes, largely occupied by the black rush (*Juncus roemerianus*) and inhabited by great numbers of the Louisiana clapper rail (*Rallus crepitans saturatus*).

On Dauphin Island is a considerable forest of pines and hardwoods. Petit Bois Island supports only a small tract of pines, but parts of the island are covered with dense thickets of yaupon (*Ilex vomitoria*). The lower parts of both Dauphin and Petit Bois Islands are given over to rolling sand dunes, and the shores are bordered with extensive mud flats.

LIFE ZONES OF ALABAMA.

Only two of the seven transcontinental life zones of North America are represented in Alabama—the humid divisions of the Upper Austral and Lower Austral Zones, known, respectively, as the Carolinian and Austroriparian (or Louisianian), and corresponding in the West to the arid divisions, the Upper Sonoran and the Lower Sonoran, respectively. The Lower Austral Zone covers the greater part of the State and is subdivided into two fairly well-marked regions.

Upper Austral Zone.

The humid, or Carolinian, division of the Upper Austral Zone occurs in rather dilute form on the higher mountains in the northeastern part of Alabama, reaching its southern limit in the Talladega Mountains of Clay County. This zone is chiefly confined to the upper slopes, above 1,500 feet altitude, and is therefore of little agricultural importance in the State. Its most important crops are hay, corn, oats, wheat, tobacco, cowpeas, white potatoes, sweet potatoes, apples, pears, peaches, and plums. A large number of plants and a smaller number of birds and mammals occurring in this zone serve to mark approximately its southern boundary. The most important species in Alabama are the following:

CHARACTERISTIC BREEDING BIRDS—UPPER AUSTRAL ZONE.

Ruffed grouse (*Bonasa umbellus umbellus*).
Sparrow hawk (*Cerchneis sparveria sparveria*).[4]
Whip-poor-will (*Setochalchis vocifera vocifera*).
Phoebe (*Sayornis phoebe*).[4]
Scarlet tanager (*Piranga olivacea*).[4]
Worm-eating warbler (*Helmitheros vermivorus*).
Ovenbird (*Seiurus aurocapillus aurocapillus*).
Southern robin (*Planesticus migratorius achrusterus*).

CHARACTERISTIC MAMMALS—UPPER AUSTRAL ZONE.

New York weasel (*Mustela noveboracensis*).
Allegheny cliff rat (*Neotoma pennsylvanica*).
Southern woodchuck, or ground-hog (*Marmota monax monax*).[5]

[4] Breeds rarely in the Lower Austral Zone.
[5] Occurs also in mountainous parts of the Lower Austral Zone.

CHARACTERISTIC PLANTS—UPPER AUSTRAL ZONE.[6]

Trees and shrubs.

Hemlock (*Tsuga canadensis*).
Butternut (*Juglans cinerea*).
Cherry birch (*Betula lenta*).
Scarlet oak (*Quercus coccinea*).
Chestnut oak (*Quercus prinus*).
Hairy syringa (*Philadelphus hirsutus*).
Mountain black cherry (*Prunus serotina neomontana*).
Clammy locust (*Robinia viscosa*).
Rose acacia (*Robinia hispida*).
Mountain privet (*Ilex monticola*).
Bitter-sweet (*Celastrus scandens*).
Fetid buckeye (*Aesculus glabra*).
Blue grape (*Vitis bicolor*).
Sweet-scented azalea (*Azalea arborescens*).
Mountain blueberry (*Vaccinium pallidum*).
Blue ash (*Fraxinus quadrangulata*).
Withe-rod (*Viburnum cassinoides*).
Bush honeysuckle (*Diervilla rivularis*).

Herbaceous plants.

Moccasin flower (*Cypripedium acaule*).
Showy orchid (*Orchis spectabilis*).
Virginian spring beauty (*Claytonia virginica*).
Round-leaved campion (*Silene rotundifolia*).
Smooth meadow-rue (*Thalictrum dioicum*).
Sweet wood-violet (*Viola leconteana*).
Pale violet (*Viola striata*).
Long-spurred violet (*Viola rostrata*).
Colored willow-herb (*Epilobium coloratum*).
Spikenard (*Aralia racemosa*).
Canada lovage (*Ligusticum canadense*).
Sweet cicely (*Osmorrhiza claytoni*).
Spotted wintergreen (*Chimaphila maculata*).
Four-leaf loosestrife (*Lysimachia quadrifolia*).
Mountain steironema (*Steironema tonsum*).
Four-leaved milkweed (*Asclepias quadrifolia*).
Creeping purple phlox (*Phlox reptans*).
Virginia lungwort (*Mertensia virginica*).
Bradbury horsemint (*Monarda bradburiana*).
Gerardia (*Agalinis asperula*).
Narrow-leaved houstonia (*Houstonia tenuifolia*).
Upland boneset (*Eupatorium sessilifolium*).
White goldenrod (*Solidago bicolor*).
Broad-leaved goldenrod (*Solidago flexicaulis*).
Hispid goldenrod (*Solidago hispida*).
Slender aster (*Aster gracilis*).
Sky-blue aster (*Aster azureus*).
Canada leaf-cup (*Polymnia canadensis*).
Mountain cone-flower (*Rudbeckia monticola*).

Lower Austral Zone.

The Austroriparian (Louisianian) Division of the Lower Austral Zone occupies all the lowlands of Alabama and the lower slopes of the mountains below 1,500 feet altitude, thus including practically all the agricultural lands in the State. The principal crops in this zone are cotton, corn, oats, sorghum, peanuts, sweet potatoes, water-

[6] Partial list.

melons, cantaloupes, strawberries, peaches, figs, and pecans. Lumber and turpentine also are important products.

A subdivision of the Lower Austral Zone, known as the Semitropical or Gulf Strip, is recognized as occupying the southern tier of counties from about the latitude of Castleberry southward, its northern boundary practically coinciding with that of Mohr's "Lower Coast Pine Belt." In this belt many varieties of subtropical fruits flourish which will not live farther north.

The Lower Austral Zone in Alabama is characterized by the presence of a large number of southern animals and plants, among which the following are the most important:

CHARACTERISTIC BREEDING BIRDS—LOWER AUSTRAL ZONE.

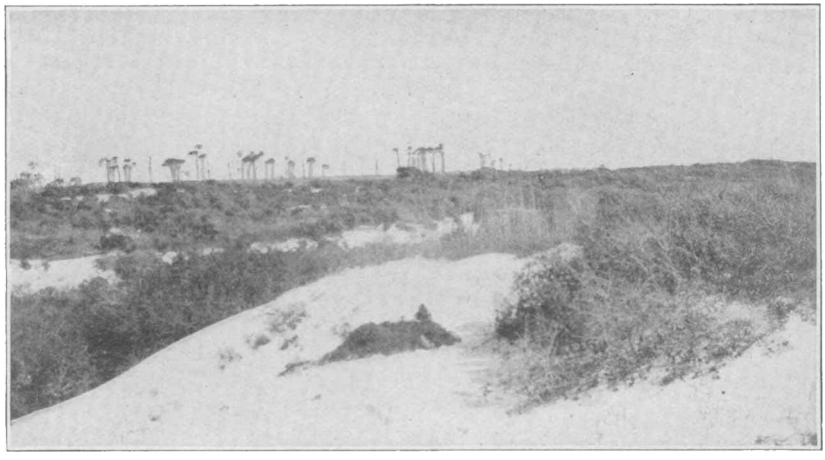
(*a*) SPECIES RANGING NEARLY THROUGHOUT THE LOWER AUSTRAL ZONE AND LIMITED NORTHWARD BY IT.

Black vulture (*Coragyps urubu urubu*).
Florida red-shouldered hawk (*Buteo lineatus alleni*).
Florida barred owl (*Strix varia alleni*).
Florida screech owl (*Otus asio asio*).
Southern hairy woodpecker (*Dryobates villosus auduboni*).
Downy woodpecker (*Dryobates pubescens pubescens*).
Red-cockaded woodpecker (*Phrenopicus borealis*).
Flicker (*Colaptes auratus auratus*).
Chuck-will's-widow (*Antrostomus carolinensis*).
Florida blue jay (*Cyanocitta cristata cristata*).[7]
Southern meadowlark (*Sturnella magna argutula*).
Bachman sparrow (*Peucaea aestivalis bachmani*).[8]
Alabama towhee (*Pipilo erythrophthalmus canaster*).
Blue grosbeak (*Guiraca caerulea caerulea*).[8]
Swainson warbler (*Limnothlypis swainsonii*).
Bachman warbler (*Vermivora bachmanii*).
Yellow-throated warbler (*Dendroica dominica dominica*).[8]
Florida white-breasted nuthatch (*Sitta carolinensis carolinensis*).[9]
Brown-headed nuthatch (*Sitta pusilla*).

(*b*) SPECIES RANGING NORTH TO ABOUT THE MIDDLE OF THE STATE (AUTAUGA AND HALE COUNTIES).

Ground dove (*Chaemepelia passerina passerina*).
Little sparrow hawk (*Cerchneis sparveria paula*).
Florida nighthawk (*Chordeiles minor chapmani*).[10]
Florida red-wing (*Agelaius phoeniceus phoeniceus*).
Loggerhead shrike (*Lanius ludovicianus ludovicianus*).
Florida yellow-throat (*Geothlypis trichas ignota*).

[7] Formerly known as *Cyanocitta cristata florincola*.
[8] Occurs also in the Upper Austral Zone.
[9] Formerly known as *Sitta carolinensis atkinsi*.
[10] Possibly throughout the zone.



B14021

FIG. 1.—SAND DUNES, ORANGE BEACH.

Thickets of yaupon (*Ilex vomitoria*) and dwarf live-oak (*Quercus virginiana maritima*); home of the white-fronted beach mouse (*Peromyscus polionotus albifrons*).

B13512

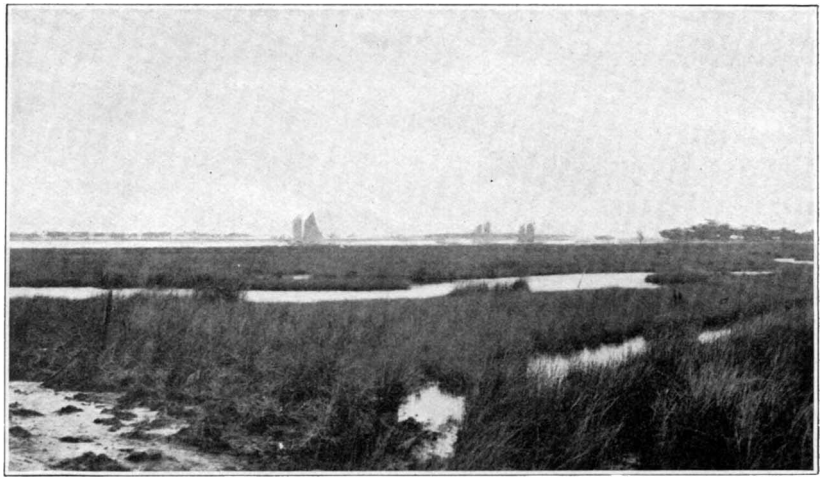
FIG. 2.—SWAMP ON DAUPHIN ISLAND, OVERFLOWED BY SAND.

Black rush (*Juncus roemerianus*) in foreground; swamp pine (*Pinus elliottii*) in background.

B15644

FIG. 1.—STIGGINS LAKE, TENSAW RIVER DELTA.

Shores bordered with cypress (*Taxodium distichum*) and various hardwood trees.



B15124

FIG. 2.—MARSH ON BAY SIDE OF DAUPHIN ISLAND.

Dense growth of black rush (*Juncus roemerianus*).

(c) Species Confined to the Semitropical, or Gulf, Strip.

Louisiana clapper rail (*Rallus crepitans saturatus*).
Purple gallinule (*Ionornis martinicus*).
Florida grackle (*Quiscalus quiscula quiscula*).
Boat-tailed grackle (*Megaquiscalus major major*).
Howell seaside sparrow (*Passerherbulus maritimus howelli*).[11]
Marian marsh wren (*Telmatodytes palustris marianae*).

Characteristic Mammals—Lower Austral Zone.

(a) Species Ranging Nearly Throughout the Lower Austral Zone and Limited Northward by It.

Carolina short-tailed shrew (*Blarina brevicauda carolinensis*).
Evening bat (*Nycticeius humeralis*).[12]
Alabama weasel (*Mustela peninsulae olivacea*).
Old-field mouse (*Peromyscus polionotus polionotus*).
Cotton mouse (*Peromyscus gossypinus* subspp.).
Southern golden mouse (*Peromyscus nuttalli aureolus*).
Swamp rice rat (*Oryzomys palustris palustris*).[12]
Cotton rat (*Sigmodon hispidus hispidus*).
Florida wood rat (*Neotoma floridana floridana*).
Alabama pocket gopher (*Geomys tuza mobilensis*).[13]
Swamp rabbit (*Sylvilagus aquaticus aquaticus*).

(b) Species Confined to the Semitropical, or Gulf, Strip.

Mahogany bat (*Nycteris seminola*).
LeConte free-tailed bat (*Nyctinomus cynocephalus*).[14]
White-fronted beach mouse (*Peromyscus polionotus albifrons*).
Louisiana muskrat (*Fiber rivalicius*).
Bayou gray squirrel (*Sciurus carolinensis fuliginosus*).
Coast swamp rabbit (*Sylvilagus aquaticus littoralis*).
Marsh rabbit (*Sylvilagus palustris palustris*).

Characteristic Plants—Lower Austral Zone.[15]

(a) Species Ranging Nearly Throughout the Lower Austral Zone and Limited Northward by It.

Trees and shrubs.

Loblolly pine (*Pinus taeda*).
Longleaf pine (*Pinus palustris*).
Spruce pine (*Pinus glabra*).
Swamp cypress (*Taxodium distichum*).
Saw palmetto (*Serenoa serrulata*).
Pecan (*Hicoria pecan*).
Nutmeg hickory (*Hicoria myristicaeformis*).
Water hickory (*Hicoria aquatica*).
Southern wax myrtle (*Myrica cerifera*).
Overcup oak (*Quercus lyrata*).
Texas white oak (*Quercus durandi*).
Turkey oak (*Quercus catesbaei*).
Swamp Spanish oak (*Quercus pagodaefolia*).

[11] Cf. Griscom, Ludlow, and J. T. Nichols, Abstr. Proc. Linnaean Soc. New York, no. 32, p. 22, Nov. 3, 1920.
[12] Occurs locally in the Upper Austral Zone.
[13] Ranges north to Tuscaloosa County only.
[14] Ranges north to Greensboro.
[15] Partial list.

Water oak (*Quercus nigra*).
Laurel oak (*Quercus laurifolia*).
Upland willow oak (*Quercus brevifolia*).
Winged elm (*Ulmus alata*).
Planer tree (*Planera aquatica*).
Southern hackberry (*Celtis mississippiensis*).
Magnolia (*Magnolia foetida*).
Sweet-shrub; calycanthus (*Calycanthus floridus*).
Red bay (*Persea borbonia*).
Swamp red bay (*Persea pubescens*).
Prairie plum (*Prunus umbellata*).
Southern prickly-ash (*Zanthoxylum clava-herculis*).
Sebastiana (*Sebastiana ligustrina*).
Leatherwood (*Cyrilla racemiflora*).
Tall inkberry (*Ilex lucida*).
Pale-bark maple (*Acer leucoderme*).
Florida maple (*Acer floridanum*).
Drummond red maple (*Acer drummondii*).
Southern basswood (*Tilia australis*).
Virginia stewartia (*Stewartia malacodendron*).
Southern St. Peterswort (*Ascyrum hypericoides*).
Southern black gum (*Nyssa biflora*).
Tupelo gum (*Nyssa aquatica*).
Fetterbush (*Pieris nitida*).
Evergreen blueberry (*Vaccinium myrsinites*).
Elliott blueberry (*Vaccinium elliottii*).
Fuscous blueberry (*Vaccinium fuscatum*).
Southern buckthorn (*Bumelia lycioides*).
Southern silver-bell tree (*Halesia diptera*).
Powdery storax (*Styrax pulverulenta*).
Large-flowered storax (*Styrax grandifolia*).
Water ash (*Fraxinus caroliniana*).
Devil-wood (*Osmanthus americana*).
Yellow jessamine (*Gelsemium sempervirens*).
Catalpa (*Catalpa catalpa*).
Opossum haw (*Viburnum nitidum*).

Herbaceous plants.

Cane (*Arundinaria macrosperma*).
Downy eriogonum (*Eriogonum tomentosum*).
Red-flowered pitcher-plant (*Sarracenia rubra*).
Short-leaved sundew (*Drosera brevifolia*).
Sensitive pea (*Chamaecrista multipinnata*).
Lanceolate false-indigo (*Baptisia lanceolata*).
Round-leaved rattlebox (*Crotalaria rotundifolia*).
Spreading lupine (*Lupinus diffusus*).
Hairy lupine (*Lupinus villosus*).
Pine-barren prairie-clover (*Kuhnistera pinnata*).
Wild indigo (*Indigofera caroliniana*).
Hispid goat's-rue (*Cracca hispidula*).
Narrow-leaved tick-trefoil (*Meibomia tenuifolia*).
Large-flowered milkwort (*Polygala grandiflora*).
Queen's-delight (*Stillingia sylvatica*).
Rough rose-mallow (*Hibiscus aculeatus*).
Carolina violet (*Viola carolina*).
Lance-leaved meadow-beauty (*Rhexia lanceolata*).
Deer grass (*Rhexia glabella*).
Hoary ludwigia (*Ludwigia pilosa*).
Miterwort (*Cynoctonum mitreola*).
Rabbit's-milkweed (*Asclepias humistrata*).
Carolina morning-glory (*Ipomaea caroliniana*).
Low breweria (*Breweria humistrata*).
Florida phlox (*Phlox floridana*).
Spanish "cypress" (*Gilia rubra*).
Carolina vervain (*Verbena carolinensis*).
Swamp basil (*Hyptis rugosa*).
Carolina thyme (*Clinipodium carolinianum*).
Azure salvia (*Salvia azurea*).
Fascicled gerardia (*Agalinis fasciculata*).
Southern bluehearts (*Buchnera elongata*).
Fimbriated ruellia (*Ruellia humilis*).
Southern bluets (*Houstonia pusilla*).

Narrow wild lettuce (*Lactuca graminifolia*).
Narrow-leaved vernonia (*Vernonia angustifolia*).
Blazing-star (*Lacinaria elegans*).
Vanilla plant (*Trilisa odoratissima*).
Hoary-leaved golden aster (*Chrysopsis trichophylla*).
Hoary golden aster (*Chrysopsis pilosa*).
Narrow-leaved goldenrod (*Solidago angustifolia*).
Short-leaved goldenrod (*Solidago brachyphylla*).
Mouse-ears (*Sericocarpus bifoliatus*).
Wandlike aster (*Aster purpuratus*).
Seaside aster (*Aster exilis*).
Southern daisy fleabane (*Erigeron quercifolius*).
Rosinweed (*Silphium asteriscus*).
Oxeye (*Heliopsis minor*).
False sunflower (*Tetragonotheca helianthoides*).
Short-leaved helenium (*Helenium brevifolium*).

(*b*) Species of the Subtropical Division, or Gulf Strip, of the Lower Austral Zone.

Trees and shrubs.

Swamp pine (*Pinus elliottii*).
Sand pine (*Pinus clausa*).
Pond cypress (*Taxodium ascendens*).
Coast red cedar (*Juniperus barbadensis*).
Bartram wax-myrtle (*Myrica inodora*).
Dwarf live-oak (*Quercus virginiana maritima*).
Twin live-oak (*Quercus geminata*).
Seaside scrub-oak (*Quercus myrtifolia*).
Narrow-leaved papaw (*Asimina angustifolia*).
Deer plum (*Chrysobalanus oblongifolius*).
Ceratiola (*Ceratiola ericoides*).
Titi (*Cliftonia monophylla*).
Low andromeda (*Pieris phillyreaefolia*).
Hoary huckleberry (*Gaylussacia frondosa tomentosa*).
Scarlet balm (*Clinopodium coccineum*).
Seaside balm (*Conradina canescens*).
Carolina boxthorn (*Lycium carolinianum*).

Herbaceous plants.

Elliott yellow-eyed grass (*Xyris elliottii*).
Creeping orchis (*Habenaria repens*).
Small yellow pondlily (*Nymphaea chartacea*).
Sea rocket (*Cakile chapmani*).
Parrot-beak (*Sarracenia psittacina*).
Drummond trumpet-leaf (*Sarracenia drummondi*).
Capillary sundew (*Drosera capillaris*).
Pursh rattlebox (*Crotalaria purshii*).
Slender prairie-clover (*Kuhnistera gracilis*).
Goat's-rue (*Cracca smallii*).
Prostrate goat's-rue (*Cracca chrysophylla*).
Acute-leaved vetch (*Vicia acutifolia*).
Florida milk-pea (*Galactia floridana*).
Erect milk-pea (*Galactia erecta*).
Pine-barren pitcheria (*Pitcheria galactioides*).
Chapman milkwort (*Polygala chapmani*).
Dwarf St. Peter's-wort (*Ascyrum pumilum*).
Opaque St. John's-wort (*Hypericum opacum*).
Seaside rock-rose (*Helianthemum arenicola*).
Divaricate pinweed (*Lechea divaricata*).
Crowfoot cactus (*Opuntia pes-corvi*).
Swamp meadow-beauty (*Rhexia stricta*).
Narrow-leaved gaura (*Gaura angustifolia*).
Large-leaved sabbatia (*Sabbatia macrophylla*).

Gentian sabbatia (*Lapithea gentianoides*).
Michaux milkweed (*Asclepias michauxii*).
Goat's-foot morning-glory (*Ipomoea pes-caprae*).
Seaside morning-glory (*Ipomoea littoralis*).
Fog-fruit (*Lippia nodiflora*).
Large-flowered pennyroyal (*Dicerandra linearifolia*).
Narrow-leaved ground-cherry (*Physalis angustifolia*).
Florida toad-flax (*Linaria floridana*).
Rough hedge-hyssop (*Sophronanthe hispida*).
Leafless gerardia (*Agalinis aphylla*).
Night-blooming ruellia (*Ruellia noctiflora*).
Round-leaved houstonia (*Houstonia procumbens*).
Short-leaved lobelia (*Lobelia brevifolia*).
Azure-flowered stokesia (*Stokesia laevis*).
Slender blazing-star (*Lacinaria gracilis*).
Large-flowered golden aster (*Chrysopsis oligantha*).
Few-flowered goldenrod (*Chrysoma pauciflosculosa*).
Small-leaved aster (*Aster adnatus*).
Rayless sunflower (*Helianthus radula*).
Lance-leaved Indian plantain (*Mesadenia lanceolata*).
Smooth thistle (*Cirsium nuttalli*).
LeConte thistle (*Cirsium lecontei*).

PART II. REPORT ON THE MAMMALS OF ALABAMA.

HISTORY OF ALABAMA MAMMALOGY.

Alabama was visited in the early years of its settlement by numbers of travelers and a few naturalists, some of whom have published accounts of their journeys, but the references in their works to mammals are for the most part brief and incidental.

Apparently the first naturalist to visit the State was William Bartram, who, in the summer and fall of 1776 (or possibly 1777, the date not being clear from his narrative), in the course of extended travels in the Southern States passed through Alabama from the old Muscogee town of Uche, on the "Chata Uche" River, to Tallassee, on the Tallapoosa River, thence southward along the general course of the Alabama River to "Taensa" and Mobile. His narrative,[1] although replete with interesting descriptions of the flora, contains only a few brief references to the larger mammals, such as wolves, bears, "tygers" (cougars), and deer. In 1820 Adam Hodgson made an extended journey through the Southern States, crossing Alabama twice—first from Ouchee Bridge, in Russell County, to Blakely and Mobile, and later from Franklin County eastward to Madison County, via Tuscumbia, Muscle Shoals, Athens, and Huntsville. In his narrative he refers casually to "panthers" (cougars), gray foxes, and bears.[2] In 1830 James Stuart journeyed across Alabama from Fort Mitchell to Montgomery, thence to Mobile. Apparently, the only mammals which attracted his attention were deer, which he mentions incidentally.[3] Two years later, in 1832, C. D. Arfwedson covered practically the same route and likewise in his narrative mentions only deer.[4] In 1856 Charles Lanman published an account of his "Adventures," in which are included four chapters on Alabama, with a few casual references to mammals.[5]

Audubon and Bachman, in their monumental work on the North American quadrupeds[6]—the first and in some respects the best ever published on the subject—have given us many excellent biogra-

[1] Bartram, William, Travels, pp. 520, London, 1792.

[2] Hodgson, Adam, Letters from North America, vol. 1, pp. 117–154, 262–273, London, 1824.

[3] Stuart, James, Three years in North America, vol. 2, pp. 164–226, Edinburgh, 1833.

[4] Arfwedson, C. D., The United States and Canada, vol. 2, pp. 1–47, London, 1834.

[5] Lanman, Charles, Adventures in the wilds of the United States and British American Provinces, vol. 2, pp. 146–188, 1856.

[6] Audubon, J. J., and John Bachman, Quad. North Amer., 3 vols., New York, 1846–1854.

phies of southern mammals, largely based on Bachman's careful observations in South Carolina, but containing numerous incidental references to Alabama mammals. In Baird's great work on North American mammals[7] only a few Alabama specimens are listed. Gosse, in his "Letters,"[8] referred briefly to a number of mammals and gave interesting accounts of deer hunting and of a nocturnal "possum" hunt.

Later references to Alabama mammals are found chiefly in monographs and technical revisions, and as a rule do not treat at all of habits or distribution. In 1909, however, the present writer published a paper containing brief notes on the distribution of southern mammals based on a field trip made during the summer and fall of 1908. This paper—apparently the first local list from the State—contains records of 20 species occurring in Alabama.[9] In 1916 John H. Wallace, jr., published in his Fifth Annual Report of the Department of Game and Fish of the State of Alabama a list of the mammals of Alabama, comprising 50 species. The paper is evidently based on a nominal list furnished by the Biological Survey; the annotations are descriptive and biographical and contain no information as to distribution.

The present report, resulting from the field investigations carried on by the Biological Survey from 1908 to 1916, comprises an annotated list of 65 forms, 10 not heretofore recorded from the State and 3 new to science.[10]

ANNOTATED LIST OF MAMMALS.

Order MARSUPIALIA.

Family DIDELPHIIDAE: Opossums.

Didelphis virginiana virginiana Kerr.

VIRGINIA OPOSSUM.

Didelphis virginiana Kerr, Animal Kingdom, p. 193, 1792.

Opossums are common and generally distributed throughout Alabama, dwelling chiefly in timbered regions, either in swampy bottom lands or the drier upland woods and in ravines among the hills. Two specimens from Ardell and one from Leighton are typical *virginiana*, as was also a captive specimen examined at Piedmont, but there are no specimens available to show where this race merges into *pigra* of the coast region. The species is reported from Sand

[7] Baird, S. F., Mamm. North Amer.: Rept. Expl. Surv. R. R. Pac., vol. 8, 1857.

[8] Gosse, P. H., Letters from Alabama, pp. 306, London, 1859.

[9] Howell, A. H., Notes on the distribution of certain mammals in the southeastern United States: Proc. Biol. Soc. Washington, vol. 22, pp. 55–68, 1909.

[10] The new forms are *Scalopus aquaticus howelli* Jackson, *Mustela peninsulae olivacea* Howell, and *Glaucomys volans saturatus* Howell.

Mountain, Woodville, Elkmont, Fort Payne, Mount Weogufka, Natural Bridge, Greensboro, Wilsonville, Talladega Mountains, Auburn, Tidewater (Tuscaloosa County), and other places.

The 'possum is a stupid, clumsy creature, with scarcely enough sense to keep out of reach of a cur dog; it often blunders into any sort of a trap. Young individuals are frequently taken in spring-wire rat traps set for small mammals, and the adults in small steel traps. Opossum hunting is a favorite sport in the South, and thousands of the animals are captured every season by local hunters without seriously reducing their numbers. This is due, doubtless, to the great fecundity of the species. It is reported to breed three or more times in a season, usually (according to Bachman) in March, May, and July, and to produce from 6 to 13 young in a litter.

The animals are chiefly nocturnal, remaining during the daytime in their retreats in hollow logs or in old nests of the gray squirrel or the Florida wood rat. At Leighton, in July, 1911, while hunting for wood rats along the osage-orange hedges, the writer poked a full-grown opossum out of a large rat nest 10 feet up among the thorny branches of the hedge trees.

Audubon and Bachman describe the feeding habits of the opossum as follows:

> It enters the cornfields (maize), crawls up the stalks, and sometimes breaks them down in the manner of the raccoon, to feed on the young and tender grains; it picks up chestnuts, acorns, chinquapins and beechnuts, and munches them in the manner of the bear. We have, on dissection, ascertained that it had devoured blackberries, whortleberries, and wild cherries, and its resort to the persimmon tree is proverbial. It is also insectivorous, and is seen scratching up the leaves in search of worms and the larvæ of insects, of which it is very fond. In early spring it lays the vegetable kingdom under contribution for its support, and we have observed it digging up the roots of the small atamasco lily (*Zepherina atamasco*), and the young and tender shoots of the China brier (*Smilax rotundifolia*), as they shoot out of the ground like asparagus. It is moreover decidedly carnivorous, eating young birds that it may detect on the ground, sucking the eggs in all the partridge, towhee-bunting and other nests it can find in its persevering search. It destroys mice and other rodentia, and devours whole broods of young rabbits, scratching about the nest and scattering the hair and other materials of which it was composed. We have observed it squatting in the grass and brier thickets in Carolina, which are the common resort of the very abundant cotton rat (*Sigmodon hispidum*), and from patches of skin and other mutilated remains we satisfied ourselves that the opossum was one among many other species designed by Providence to keep in check the too rapid increase of these troublesome rats. We must admit that it sometimes makes a sly visit to the poultry house, killing a few of the hens and playing havoc among the eggs. The annoyances of the farmer however from this mischievous propensity, are not as great as those sustained from some of the other species, and can not for a moment be compared with the destruction caused by the weasel, the mink, or the skunk.[11]

[11] Audubon and Bachman, Quad. North Amer., vol. 2, pp. 112–113, 1851.

Didelphis virginiana pigra Bangs.

FLORIDA OPOSSUM.

Didelphis virginiana pigra Bangs, Proc. Boston Soc. Nat. Hist., vol. 28, p. 172, 1898.

The Florida opossum, characterized by darker colors, with less white on the toes, occupies the southern part of the State. Two specimens from Castleberry and one from Bon Secour are referable to this subspecies, but the northern limits of its range are at present uncertain. Allen refers four skulls from Sylacauga to this form. Reports of the occurrence of opossums at Seale, Hayneville, Catoma Creek (Montgomery County), Myrtlewood, Thomasville, Carlton, Mobile, and Alabama Port should probably be assigned to the present form.

Order INSECTIVORA.

Family TALPIDAE: Moles.

Scalopus aquaticus howelli Jackson.

HOWELL MOLE.

Scalopus aquaticus howelli Jackson, Proc. Biol. Soc. Washington, vol. 27, p. 19, 1914.

The Howell mole, which is a form of the common mole, ranges over practically the whole State and inhabits a great variety of situations. Sandy or loamy soil is preferred by the mole, and its wanderings take it into meadows, gardens, cultivated fields, river bottoms, mountain slopes, and both coniferous and hardwood forests. The tunnels are usually near the surface and appear as a network of tortuous ridges or sometimes as a single ridge running approximately straight for some distance. During periods of drought moles burrow deeper and at times almost desert the surface ridges. They practically never leave their burrows and when forcibly brought to the surface at once seek safety by burrowing again into the soil. Although possessing rudimentary eyes, moles probably are unable to distinguish objects by sight, but they may be able to perceive light from darkness.

The mole is considered a pest by most farmers and is accused of destroying newly planted corn and injuring potatoes and other field crops, as well as garden bulbs. Its diet, however, is composed largely of insects and earthworms, and much of the damage attributed to it is really done by pine mice, which follow its tunnels and attack the plants or seeds near which they lead. It is true, nevertheless, that moles do cause both annoyance and damage by uprooting lawns and by tunneling among the roots of plants, thereby aiding the incursions of injurious rodents.

The form of the common mole inhabiting Alabama is intermediate in size between the eastern mole (*Scalopus aquaticus aquaticus*) and the Florida mole (*Scalopus a. australis*), but it is usually paler than either, with a flat skull and a long, narrow rostrum. Specimens have been taken at Huntsville, Sand Mountain (near Carpenter), Auburn, Ardell, Autaugaville, Greensboro, Cottondale, Eutaw, and Castleberry. Evidence of the presence of moles has been noted at Elkmont, Natural Bridge, Talladega Mountains, Seale, Dothan, Carlton, Mobile, Bayou Labatre, Orange Beach, and many other places.

Family SORICIDAE: Shrews.

Blarina brevicauda carolinensis (Bachman).

CAROLINA SHORT-TAILED SHREW.

Sorex carolinensis Bachman, Journ. Acad. Nat. Sci. Philadelphia, vol. 7, pt. 2, p. 366, 1837.

The Carolina short-tailed shrew is the largest of the three species of shrews found in the State; it occurs in all sections, but less abundantly in the south. In Bear Swamp, near Autaugaville, a number of specimens were trapped by the writer around rotten logs in the swamp, and at York a number were secured at rotten logs in weedy fields. In Bucks Pocket, on Sand Mountain, two were caught in the same spot beside a log in a wooded ravine. L. J. Goldman found the animals plentiful in pine woods at Ardell, and at Greensboro, Jackson, and Seale individuals have been taken in fields of broom sedge. Single specimens have been taken also by J. L. Peters, at Alabama Port, and by H. P. Loding, at Spring Hill.

In the shrews the senses of hearing, smell, and touch are acute, while that of sight is practically useless, serving apparently only to distinguish light from darkness. The little creatures are exceedingly fierce and voracious, easily capturing and killing animals larger than themselves.

The present species, like most of its tribe, is almost wholly nocturnal. It lives chiefly in hollow logs and stumps and in underground burrows, usually in moist or peaty soil. It also makes shallow runways under the surface vegetation and uses the burrows and runways of other animals.

Studies of the northern race of this species (*Blarina brevicauda brevicauda*), by A. Franklin Shull, showed that its food consists mainly of meadow voles (*Microtus*), mice, insects, earthworms, and land snails. The snails were hoarded in little piles near the entrances to the burrows, and also moved back and forth into the galleries. The burrows were found to be 25 to 30 millimeters in diameter, entering the ground at a steep angle, and extending from 15 to 40 centime-

ters (6 to 15¾ inches). The nests were "usually made of grass, sedge, and leaves of nettle, goldenrod, or ash, arranged in the form of a hollow ball, the shell of which was 1 to 3 cm. thick."[12]

Bachman mentions having found two nests of this species composed of root fibers and withered blades of grasses about a foot beneath the surface. One nest contained five, the other six young. On another occasion in one of the tunnels of the mole he found "a small cavity containing a hoard of coleopterous insects, principally composed of a rare species (*Scarabaeus tityus*), fully the size of the animal itself; some of them were nearly consumed, and the rest mutilated, although still living."[13]

Cryptotis parva (Say).

LEAST SHREW.

Sorex parvus Say, Long's Exped. Rocky Mountains, vol. 1, p. 163, 1823.

The least shrew is the smallest of the short-tailed shrews, and but little larger than the Bachman shrew (*Sorex longirostris*). Although few specimens have been taken, it is apparently generally distributed over most of the State and in some localities is not uncommon. In the Merriam collection is one taken at Mobile in 1890 by the late Dr. Charles Mohr. E. G. Holt secured seven specimens, December 14, 1911, from beneath an overturned stack of old alfalfa hay in an open field at Barachias. H. P. Loding captured two around manure piles in his garden in the suburbs of Mobile. Three skulls of this species were found in the stomachs of two barred owls (*Strix varia alleni*) killed at Autaugaville in December, 1911. Specimens have been trapped on Sand Mountain (near Carpenter), on Cane Creek, Marshall County (near Oleander), and at Woodville and Alabama Port.

Relatively little is known about the habits of this little shrew. It is believed to be partly diurnal, and is an inhabitant of dry, grassy fields, rather than the woods or marshes preferred by most other shrews. It is frequently taken in runways of cotton rats (*Sigmodon*) and may also make small runways of its own. A nest found under a log at Victoria, Texas, by J. D. Mitchell was built of coarse, broad-leaved grass and lined inside with fine grass, the outside neatly and strongly woven.

Sorex longirostris Bachman.

BACHMAN SHREW.

Sorex longirostris Bachman, Journ. Acad. Nat. Sci. Philadelphia, vol. 7, pt. 2, p. 370, 1837.

The Bachman shrew, a tiny long-tailed species, even smaller in bulk than the least shrew (*Cryptotis parva*), is the smallest mammal

[12] Shull, A. Franklin, Amer. Nat., vol. 41, pp. 495–522, 1907.
[13] Audubon and Bachman, Op. cit., vol. 2, p. 177.

found in Alabama, and likewise the rarest. It is known only from a single specimen taken from the stomach of a barred owl killed by Lewis S. Golsan on the borders of Bear Swamp, Autauga County, December 1, 1911. The writer, in company with Mr. Golsan, trapped carefully for several days in and around Bear Swamp, where the owl responsible for the single Alabama specimen was killed, but no shrews of this genus were secured.

Originally described from the lower Santee River, South Carolina, the species has since been taken in North Carolina, Virginia, Maryland, Indiana, Illinois, and Georgia. Although ranging over a wide area, it is apparently uncommon or else difficult to trap, since comparatively few specimens have been taken.

Little is known of the habits of this shrew, but apparently they are similar to those of the other long-tailed shrews, which are found chiefly in moist woodland, living in or beneath rotten logs or stumps or in crevices of rocks. One of the original specimens, described by Bachman, was found by laborers while digging a ditch through grounds nearly overflowed with water. Another was taken from the throat of a hooded merganser, presumably killed in a swamp or rice marsh.[14] In southern Illinois, Edmund Heller secured a number of specimens in low, swampy woods; but Brimley, at Raleigh, North Carolina, states that the species is "found on comparatively high ground, not in swamps nor on the edges of them * * *."[15]

Order CHIROPTERA.

Family VESPERTILIONIDAE: Typical Bats.

Myotis grisescens Howell.

GRAY BAT.

Myotis grisescens Howell, Proc. Biol. Soc. Washington, vol. 22, p. 46, 1909.

The gray bat, a medium-sized species, is abundant at several localities along the Tennessee River, but has not been taken elsewhere in Alabama. It was first discovered in Nickajack Cave, Tennessee, which is in the north face of Sand Mountain, about half a mile north of the Alabama-Georgia-Tennessee boundary, where in August, 1908, the writer collected the series from which the species was described.[16] Colonies have since been found near Fort Deposit, on the Tennessee River, and at Rogersville.

The gray bat lives in caves, both winter and summer, usually in large colonies. In Nickajack Cave large clusters hung from the

[14] Audubon and Bachman, Op. cit., vol. 3, p. 250.
[15] Brimley, C. S., Amer. Nat., vol. 31, p. 448, 1897.
[16] Howell, A. H., Op. cit., pp. 45–47.

high ceiling of a large chamber about 300 yards from the entrance, and smaller numbers were found in crevices in the ceiling close to the entrance. In the cave near Fort Deposit the bats occupied a small, low chamber, reached by following a narrow, winding passage for about half a mile. They hung from the ceiling in one compact mass, 3 or 4 feet square and several bats deep. On the evening of June 18 the bats were observed coming out of this cave about 7 o'clock; they swarmed out in large numbers, feeding in the mouth of the cave and among the trees on the river bank. Of the 18 specimens collected in this cave, all were males; while in Saltpetre Cave, near Rogersville, of 62 specimens collected by Holt, 46 were females. Holt, writing of his visit to the Rogersville Cave, says:

> The bats were not hanging in clusters, but thousands of them lined the ceiling in a solid sheet, hanging separately head downward. A couple of shots were sufficient to cause pandemonium, and immediately I found myself in almost total darkness (my assistant having retreated around a corner with the lantern), surrounded by a swirling mass of squeaking bats. They were everywhere, the flying thousands filling the air, and in their panic rushing against me and sticking all over my head and body; I had to keep kicking to prevent them crawling up my breeches legs. On my way out the scattered bats seemed to fill the whole cave. Their droppings covered the floor in places to the depth of several feet.

At Limekiln, on the Tennessee River north of Leighton, we observed a number of bats, believed to be of this species, coming out of a small cave on the river bluff, from which issues also a cold spring.

[Myotis lucifugus lucifugus (LeConte).

LITTLE BROWN BAT.

V[espertilio] lucifugus LeConte, McMurtrie's Cuvier, Animal Kingdom, vol. 1, p. 431, 1831.

The little brown bat has an extensive range from northern Canada south to Florida, but apparently is absent or very scarce in Alabama. Miller records a skin from Greensboro in the Merriam collection,[17] but the specimen can not be located, nor is there any record of it in Dr. Merriam's catalogue. There is considerable doubt, therefore, as to the occurrence of this species in the State.]

Lasionycteris noctivagans (LeConte).

SILVER-HAIRED BAT.

V[espertilio] noctivagans LeConte, McMurtrie's Cuvier, Animal Kingdom, vol. 1, p. 431, 1831.

The silver-haired bat is a northern-breeding species, and occurs in Alabama only as a migrant or possibly a winter resident. It is known at present only from five specimens taken by the writer, as follows: Squaw Shoals, April 11, 1912 (2); Autaugaville, April 17, 1912 (2);

[17] Miller, G. S., North Amer. Fauna No. 13, p. 62, 1897.

and Sand Mountain, near Carpenter, October 29, 1916 (1). At Squaw Shoals a specimen was seen which had been taken from a hollow tree by J. T. Winchester, in the fall of 1911.

These are the most southerly records for the species. It breeds in the northern United States and south to North Carolina and possibly northern Georgia[18] and migrates in autumn to the Southern States and even to Bermuda. The silver-haired bat is a tree-dwelling species. Vernon Bailey states that in Minnesota it roosts under bark on old trees, and C. S. Brimley, in North Carolina, has on several occasions taken specimens in winter in hollow trees. Its flight is rather slower and less erratic than that of the red bat.

Pipistrellus subflavus subflavus (F. Cuvier).

SOUTHEASTERN PIPISTRELLE.

V[espertilio] subflavus F. Cuvier, Nouv. Ann. Mus. Hist. Nat., Paris, vol. 1, p. 17, 1832.

The southern pipistrelle is the smallest and one of the commonest of the bats in the South. It ranges to Florida and southern Louisiana, but apparently is scarce or absent in southern Alabama. Specimens have been collected at Leighton, Elkmont, Stevenson, Huntsville, Fort Payne, Bucks Pocket (near Grove Oak), and Greensboro. A number of small bats seen at Abbeville were thought to be of this species.

This little bat may usually be distinguished by its small size and its erratic, butterfly-like flight. It frequents caves in winter and to a less extent in summer. Hahn says of it, as observed in Indiana:

Pipistrellus subflavus is solitary in habit. Occasionally two are found side by side, though I have never seen them clinging to each other except in mating. However they do not avoid the vicinity of others of their own kind or other species. This species seems to prefer the side walls of the higher passages. I have never seen it suspended from the roof except where there was a crevice or prominent ledge.[19]

In Bucks Pocket, on Sand Mountain, a semitorpid individual was found November 5, 1916, clinging to the side of a large rock in a cool ravine. Hahn mentions seeing one under a ledge of rock near Mitchell, Indiana, in February.[20]

Eptesicus fuscus fuscus (Beauvois).

LARGE BROWN BAT.

Vespertila [sic] *fuscus* Beauvois, Cat. Peale's Mus., Philadelphia, p. 14, 1796.

The large brown bat is moderately common in the northern part of the State, but has thus far never been taken in the southern part. It

[18] Specimens are known from Bertie County, North Carolina, July 1, 1891, and December 26, 1892 (Brimley, Amer. Nat., vol. 31, p. 239, 1897); Highland, North Carolina, April 18, 1886 (Merriam collection); Toccoa, Georgia, May 26, 1916 (Biological Survey collection).

[19] Hahn, W. L., Biological Bulletin (Indiana Univ.), vol. 15, No. 3, p. 145, 1908.

[20] Op. cit., p. 144.

has been taken during the breeding season at Leighton, Sand Mountain (near Carpenter), Erin, and Greensboro; two specimens taken at Autaugaville, January 17 and February 26, 1912, may have been migrants.

This species frequents caves to some extent in winter, but in summer is most often found concealed about buildings, either in the attic, in some dark corner under the eaves, or behind a shutter. In a schoolhouse at Leighton on July 3, 1913, Holt found eight individuals hanging to the wall of the open vestibule, just beneath the ceiling. They were seen there about 9 p. m., but were not to be found during the day. Dr. Fisher states that in southern New York this species is the last to make its appearance in the evening and that its favorite hunting grounds are fields well surrounded by trees.[21]

Nycteris borealis borealis (Müller).

RED BAT.

Vespertilio borealis Müller, Natursyst, Suppl., p. 21, 1776.

The red bat is one of the commonest bats, ranging practically all over the State, except in the coast region, where its place is largely taken by the mahogany bat (*Nycteris seminola*). Specimens have been collected at Leighton, Sand Mountain (near Carpenter), Guntersville, Attalla, Logan, Mount Weogufka, Squaw Shoals, Greensboro, Hayneville, Autaugaville, Barachias, Point Clear, Ashford, Castleberry, and Abbeville. In the coast region it is of rare occurrence and the few specimens taken there (Point Clear, Apr. 21, 29, 1892; Ashford, Nov. 27, 1916) may have been migrants.

The red bat, though sometimes found in caves in winter, is in summer a dweller in trees or garrets. On one occasion at Lake Grove, New York, in summer, the writer came upon a number of these bats closely bunched together hanging to a low branch of a small hickory tree. This is one of the first bats to appear in the evening, being seen usually half an hour or more before dark and sometimes also during the middle of the day. On Sand Mountain, April 16, 1914, one was seen about noon feeding in bright sunlight; it flew leisurely up and down over a creek for a period of 20 minutes or more. Holt reports seeing one drinking, swallow-fashion, over the Tennessee River.

This bat is known to perform extended migrations and has even been observed migrating during the daytime.[22]

Nycteris seminola (Rhoads).

MAHOGANY BAT.

Atalapha borealis seminola Rhoads, Proc. Acad. Nat. Sci. Philadelphia, p. 32, 1895.

The mahogany bat is a dark-colored species occurring commonly in the coast region, where it takes the place of the red bat of the more

[21] Fisher, A. K., Forest and Stream, vol. 16, p. 490, 1881.

[22] Miller, G. S., Science (N. S.), vol. 5, pp. 541–543, April 2, 1897; Mearns, E. A., Bull. Amer. Mus. Nat. Hist., vol. 10, p. 345, 1898.

northern counties. Specimens have been taken at Point Clear, April 25, 1892; Orange Beach, January 24, 28, 1912; and Mobile, May 10, 1911, August 1, 1913, and February 27, 1916. It ranges sporadically also as far north as Autaugaville and even Fort Payne, where specimens were taken April 17, 1912, and June 30, 1911, respectively. These show no evidence of intergradation with *borealis*, and the material at present available indicates that this form is a distinct species. Apparently it does not differ materially in habits from its near relative, the red bat. Like the latter species, it is an early flier, often seen abroad shortly after sundown. At Orange Beach, the last week in January, one was seen flying a few minutes after 5 p. m. During the winter season it apparently feeds only on mild days. In South Carolina the writer found this bat resting in long bunches of Spanish moss.

Nycteris cinerea (Beauvois).

HOARY BAT.

Vespertilio cinereus Beauvois, Cat. Peale's Mus., Philadelphia, p. 15, 1796.

The large and handsome hoary bat occurs in the State only as a rare migrant; only two specimens have thus far been taken—one by Russell J. Thompson, at Point Clear, Mobile Bay, April 19, 1892, the other by Lewis S. Golsan, at Autaugaville, January 15, 1912. Its summer home is chiefly within the Canadian Zone, from northern New York and Wisconsin northward, but during the winter season it migrates southward for long distances, having been taken in central Mexico, southern Lower California, and the Bermuda Islands. Little is known of its habits, but, like its smaller relative, the red bat, it is undoubtedly a tree-dweller. Merriam writes of its habits as observed in the Adirondack region of New York:

> The Hoary Bat can be recognized, even in the dusk of evening, by its great size, its long and pointed wings, and the swiftness and irregularity of its flight. It does not start out so early as our other bats, and is consequently much more difficult to shoot. The borders of woods, water courses, and roadways through the forest are among its favorite resorts, and its nightly range is vastly greater than that of any of its associates. While the other species are extremely local, moving to and fro over a very restricted area, this traverses a comparatively large extent of territory in its evening excursions, which fact is probably attributable to its superior power of flight.[22]

Nycticeius humeralis (Rafinesque).

EVENING BAT.

Vespertilio humeralis Rafinesque, Amer. Monthly Mag., vol. 3, p. 445, 1818.

The evening bat is abundant and generally distributed throughout the State. Specimens have been taken at Leighton, Guntersville,

[22] Merriam, C. Hart, Mamm. Adirondack region: Trans. Linnaean Soc. New York, vol. 2, p. 78, 1884.

Ardell, Squaw Shoals, Erin, Mount Weogufka, Auburn, Greensboro, Hayneville, Seale, Abbeville, Bon Secour, Point Clear, and Castleberry. In flight it appears of small or medium size and of a very dark color. Like the red bat, it begins to hunt considerably before dark; at Guntersville, in the middle of June, the first ones were seen flying about 7 o'clock in the evening. Compared with that of other species, its flight is rather slow and steady, often close to the earth, though sometimes at a moderate height. In winter this bat probably hibernates in the same manner as other species. A specimen was taken at Bon Secour on October 19, 1908; and at Autaugaville the writer saw several flying on November 20 and 21, 1916.

Corynorhinus macrotis (LeConte).

LECONTE BIG-EARED BAT.

Plec[otus] macrotis LeConte, McMurtrie's Cuvier, Animal Kingdom, vol. 1, p. 431, 1831.

The LeConte big-eared bat is apparently of rather local distribution and nowhere very common in the State. Only a few specimens have thus far been captured—one each from Huntsville, Town Creek, and Greensboro, and two from Autaugaville. The Huntsville specimen was obtained in a small outhouse on Monte Sano (altitude 1,600 feet), having been stupefied by the smoke of a fire built in the house, so that it dropped from the ceiling, to which it was clinging. F. W. McCormack described some very long-eared bats which he caught some years ago in the garret of an old mill on Town Creek; later a specimen was obtained (July 4, 1913) from this mill by E. G. Holt. Miller lists a skin in the Merriam collection from Greensboro, but the specimen can not now be located, nor is there any other record of it.[23] L. S. Golsan obtained two specimens at Autaugaville, August 22 and September 3, 1912. Hahn states that in Indiana this species has been found only in dimly lighted parts of caves near the entrances, where it was clinging to the side walls, its long ears folded down along the neck.[24]

Family MOLOSSIDAE: Free-tailed Bats.

Nyctinomus cynocephalus (LeConte).

LECONTE FREE-TAILED BAT.

Nyct[icea] cynocephala LeConte, McMurtrie's Cuvier, Animal Kingdom, vol. 1, p. 432, 1831.

The LeConte free-tailed bat probably occurs more or less commonly over at least the southern part of Alabama, but thus far it has been taken only at Greensboro and Orange Beach. It is primarily

[23] Miller, G. S., North Amer. Fauna No. 13, p. 52, 1897.
[24] Hahn, W. L., Biological Bull. (Indiana Univ.), vol. 15, no. 3, p. 145, 1908.

a house bat, often infesting the attics of dwellings in such numbers as to become a decided nuisance. It hides also in the crevices of wooden bridges. Vernon Bailey states that the species possesses a rank, musky odor, so strong as to be noticeable from the outside of an infested house. The late Dr. W. C. Avery caught about 400 specimens by setting nets on the outside of an old building at Greensboro; 30 specimens, secured July 31 and August 1, 1890, are preserved in the Biological Survey collection. At Orange Beach, January 24 and 28, 1912, two specimens shot by local hunters were secured. The writer has shot many bats in various parts of the South, but as yet has never taken this species.

Order CARNIVORA.

Family URSIDAE: Bears.

Ursus floridanus Merriam.

FLORIDA BLACK BEAR.

Ursus floridanus Merriam, Proc. Biol. Soc. Washington, vol. 10, p. 81, 1896.

Bears doubtless ranged over all of Alabama in early times, but at present are exterminated everywhere except in the swamps of the southern counties. In the big swamps bordering the Tensaw and Mobile Rivers they are still common and a number are killed there every fall. A. J. McIntyre, of Carlton, is reported to have killed in recent years over 100 bears and to have caught 10 cubs. In April, 1911, he killed an old male, estimated to weigh 500 pounds, which for 25 years had been known to settlers in that region as "Old Nubfoot," being recognized by his peculiar track. This bear had become very bold in raiding hog pens and was charged with the destruction of a considerable number of calves and hogs. Bears are occasionally found in the swamps of southern Mobile County, and are reported fairly numerous near Bayou Labatre, where they do considerable damage to stock. In November, 1915, T. J. Pendarvis killed a large male, near Irvington, estimated to weigh 400 pounds. The animal was baited in the swamp through which he had been passing and was shot by moonlight from a place of concealment near the bait. This bear was said to have a regular trail through the swamps and to cross a public road not over 3 miles from Bayou Labatre by climbing a wire fence.

At Bon Secour a single bear was reported about 1905—the only one for many years. At Ashford, Houston County, bears are rarely found, but during a big freshet in July, 1916, the tracks of one were seen in a field near a swamp.

Four skulls of the southern Alabama bear have been examined and they indicate that the form found there is intermediate between

floridanus and *luteolus*. The skull of an old adult male from Carlton agrees in general with *luteolus* of comparable age, from Louisiana, but differs in having smaller teeth, a somewhat shorter muzzle, and a shorter palate. Compared with the type of *floridanus* (from Dade County, Florida) and with an adult from New Smyrna, Florida, this skull differs in having the palatal floor more level, the molars somewhat larger, the muzzle shorter and relatively broader, and the frontal region slightly less elevated. An old adult (probably female) from the same locality and a young adult male from Bayou Labatre agree with *floridanus* in size of teeth, depression of palatal floor, shape of muzzle, and elevation of frontal region. The single skin from Alabama (Bayou Labatre) is glossy black all over, except the muzzle, which is brownish black above, the sides of the face ochraceous-tawny.

The extermination of the bears of northern Alabama makes it impossible to say what race was found there; quite likely typical *americanus* ranged at least in the mountainous parts.

Family CANIDAE: Wolves and Foxes.

Canis floridanus Miller.

SOUTHEASTERN WOLF.

Canis floridanus Miller, Proc. Biol. Soc. Washington, vol. 25, p. 95, 1912.

Wolves in former times doubtless ranged over the greater part of Alabama, but are now on the verge of extinction. Their last stronghold appears to be the rough, hilly country stretching from Walker County northwestward to Colbert County.

It was reported that three or four wolves were killed in September, 1912, on the Blackwater near South Lowell by the O'Rear brothers, and during the spring of 1914 the animals were heard howling (according to reports) at points in Walker County within 12 miles of Jasper. C. H. Harbison, living on Ryan Creek, in western Cullman County, states that wolves were destructive to stock in that region in 1915, and that, after eating up most of the sheep and lambs, they left the country and moved westward into Winston and Marion Counties. This migration is apparently confirmed by the appearance of the animals about that time in Franklin and Colbert Counties. D. L. Paden, whose home is in the hill country, 12 miles south of Cherokee, writes (in 1917) that the wolves came into that country "several years ago"; that they killed thousands of dollars' worth of sheep and goats, and practically stopped the raising of these animals; and that some calves also were killed by them. In April, 1917, in the same locality, G. G. Paden killed an adult male wolf, the skin and skull of which were secured by the Biological Survey.

This is the only specimen from the Southeastern States, excepting a single one from Florida, that has come into the possession of any museum, and is therefore of extreme interest. It may be described as follows·

Upperparts mixed blackish and cinnamon-buff; shoulders, sides of neck and body, and fore back washed with light buff; top and sides of head grizzled iron gray (produced by a mixture of black and light buff), tinged medially with cinnamon-buff; muzzle light pinkish cinnamon, shading to light buff around edges of lips and on sides of face beneath the eyes; ears cinnamon-buff, shaded with blackish; front legs and feet light buff, washed with cinnamon-buff and with a faint median stripe of blackish; hind legs and feet light buff, strongly washed with cinnamon; tail mixed cinnamon and light buff, shaded above and on tip with blackish; underparts mixed light buff and cinnamon-buff, washed with whitish. Compared with the type of *Canis floridanus* (from Putnam County, Florida) the Alabama specimen differs in the following particulars; Top and sides of head more grayish; muzzle slightly paler; ears less tawny; fore legs paler and with less extensive median black line; hind legs paler (less strongly ochraceous). It differs from Michigan specimens (*lycaon?*) in being slightly paler, especially on the fore legs and muzzle, with the ears less intensely tawny.

The skull (adult ♂) agrees essentially with that of *floridanus* (type, adult ♀), but is slightly larger and relatively narrower across postorbital processes, with a slightly longer rostrum. It agrees in dental characters with the Louisiana wolf (specimens from Tallulah, Louisiana), but differs in being relatively broader with a shorter, broader rostrum. Compared with *lycaon* of eastern Canada (specimens from 40 miles northeast of Mattawa, Quebec) it differs as follows: Skull of nearly the same size, but with braincase and rostrum relatively narrower; upper premolars and carnassial longer and relatively narrower, the latter with antero-internal heel more strongly developed; first upper molar broader, with posterior middle cusp more strongly developed.

Wolves ranged in some numbers in the Talladega and Choccolocco Mountains until about 1896, in which year, in northern Clay County, 17 were said to have been killed in two days. The last one killed in that region was about 1905 and it was mounted and exhibited in Talladega for a number of years. Wolves were heard howling on Duggar Mountain near Piedmont as late as 1914, but at the present time they are almost, if not quite, exterminated in that region. A black wolf was reported to have been killed on La Grange Mountain, near Leighton, about 1906 and more recently another was seen there.

Strangely enough, in the big swamp country in Baldwin and Mobile Counties, where deer are still numerous, wolves apparently were exterminated many years ago; the last one of which there is record was reported killed near Carlton about 1894.

Little is known of the habits of the Alabama wolves except that they roamed the mountains in small droves and fed considerably on the smaller domestic animals—sheep, goats, pigs, and sometimes calves. Bartram, writing in 1791, mentions the occurrence of wolves on the lower Tombigbee River, and describes pups of a litter found

in July, 1776, on the Tallapoosa River, near Coolome, as "half the size of a small cur dog and quite black."[25]

Vulpes fulva (Desmarest).

RED FOX.

Canis fulvus Desmarest, Mammalogie, vol. 1, p. 203, 1820.

The red fox apparently is not native in the Southern States, but has been introduced or has extended its range into that region within historic times. Regarding the early history of the animal in America, Audubon and Bachman make the following statements:

Red Foxes have gradually migrated from the Northern to the Southern States. This change of habitation may possibly be owing to the more extensive cultivation to which we have alluded * * * as a reason for this species having become more numerous than it was before the Revolution. This idea, however, would seem to be overthrown by the continued abundance of Gray Foxes in the Eastern States. In the early history of our country the Red Fox was unknown south of Pennsylvania, that State being its Southern limit. In process of time it was found in the mountains of Virginia, where it has now become more abundant than the Gray Fox. A few years afterwards it appeared in the more elevated portions of North Carolina, then in the mountains of South Carolina, and finally in Georgia, where we have recently observed it.

This species was first seen in Lincoln County, Georgia, in the year 1840, since then it has spread over the less elevated parts of the country, and is not rare in the neighborhood of Augusta. We are informed by Mr. Beile, an intelligent observer of the habits of animals, that on one occasion near Augusta, as he was using a call for wild turkeys, a little before sunrise, in the vicinity of Augusta, two Red Foxes came to the call, supposing it to be that of a wild turkey, and were both killed by one discharge of his gun.[26]

Whether the species extended its range naturally into Alabama is not known. Numerous reports from residents, however, indicate that foxes from other States have been imported and liberated in many widely separated localities. Statements to this effect have been made by people at Dean, Wilsonville, Castleberry, Abbeville, and Orange Beach. Red foxes are reported to occur in small numbers also at Elkmont, Leighton, Sand Mountain, Woodville, Huntsville, Fort Payne, Mount Weogufka, Jackson, Dothan, and Bon Secour, and in Elmore, Wilcox, and Montgomery Counties. Two skulls from Alabama (Tennessee River, north of Leighton; Catoma Creek, Montgomery County) agree essentially with a specimen from Virginia assumed to be typical *fulva*.

The den of the red fox is said to be in caves or clefts of rocky bluffs, sometimes in old stumps or hollow logs, or in burrows in the ground. Merriam describes the animal's feeding habits as follows:

[25] Bartram, William, Travels, pp. 396, 410, 1792.
[26] Audubon and Bachman, Op. cit., vol. 2, pp. 269–270.

He is both nocturnal and diurnal in habits, and preys upon skunks, woodchucks, muskrats, hares, rabbits, squirrels, mice, and small birds and eggs. He is a well-known and much-dreaded depredator of the poultry yard, destroying, with equal alacrity, turkeys, ducks, geese, hens, chickens, and doves; and has been known to make off with young lambs. He will also eat carrion, and even fish, and is said to be fond of ripe grapes and strawberries.[27]

Urocyon cinereoargenteus cinereoargenteus (Schreber).

GRAY FOX.

Canis cinereo-argenteus Schreber, Säugthiere, vol. 3, pl. 92, 1775.

The gray fox is reported from all sections of the State and is still common in many localities, though much reduced in numbers in the more thickly settled regions. Fox hunting with hounds is a favorite sport and has resulted in extermination of the species in some localities. The gray fox is a sly and cunning creature, but he lacks the wonderful shrewdness and sagacity of the red fox, which has made the latter so popular as an object of the chase. Audubon and Bachman give a good account of the animal's habits, from which the following is quoted:

The Gray Fox is shy and cowardly, and the snap of a stick or the barking of a dog will set him off on a full run. Although timid and suspicious to this degree, his cunning and voracity place him in a conspicuous rank among the animals that prey upon other species weaker than themselves. * * *

In the Southern States this species is able to supply itself with a great variety and abundance of food, and is consequently generally in good condition and often quite fat. We have followed the track of the Gray Fox in moist ground until it led us to the scattered remains of a marsh hare, which no doubt the fox had killed. Many nests of the fresh water marsh hen (*Rallus elegans*) are torn to pieces and the eggs devoured by this prowler. In Pennsylvania and New Jersey, the meadow mouse (*Arvicola Pennsylvanica*) is often eaten by this species; and in the Southern States, the cotton-rat and Florida rat, constitute no inconsiderable portion of its food. We have seen places where the Gray Fox had been scratching the decayed logs and the bark of trees in order to obtain insects.

Although this Fox is nocturnal in his habits we have frequently observed him in search of food at all hours of the day; in general, however, he lies concealed in some thicket, or in a large tuft of tall broom-grass, till twilight invites him to renew his travels and adventures.

On a cold starlight night in winter, we have frequently heard the hoarse querulous bark of this species; sometimes two of them, some distance apart, were answering each other in the manner of the dog.

Although we have often seen this Fox fairly run down and killed by hounds, without his having attempted to climb a tree, yet it not infrequently occurs that when his strength begins to fail he ascends one that is small or sloping, and standing on some horizontal branch 20 or 30 feet from the ground, looks down on the fierce and clamorous pack which soon comes up and surrounds the foot of the tree. * * * We were unable to obtain any information in regard to the manner in which the Fox climbs trees, as he does not possess the

[27] Merriam, C. Hart, Trans. Linnaean Soc. New York, vol. 1, p. 45, 1882.

retractile nails of the cat or the sharp claws of the squirrel, until we saw the animal in the act. At one time when we thus observed the Fox, he first leaped onto a low branch 4 or 5 feet from the ground, from whence he made his way upward by leaping cautiously and rather awkwardly from branch to branch, till he attained a secure position in the largest fork of the tree, where he stopped. On another occasion, he ascended in the manner of a bear, but with far greater celerity, by clasping the stem of a small pine. We have since been informed that the Fox also climbs trees occasionally by the aid of his claws, in the manner of a raccoon or a cat.[28]

This genus has not been revised, and material is lacking from eastern United States to determine the ranges of the various forms. Two skulls (adult ♂) from Cullman County agree essentially with skulls from Maryland, assumed to be typical *cinereoargenteus;* an adult (unsexed) from Orange Beach has somewhat larger molar teeth, in this respect apparently approaching subspecies *floridanus.* The skin of the latter does not differ appreciably from those of typical individuals. Immature specimens have been examined from Autaugaville, and the animal is reported by residents to occur at Leighton, Woodville, Huntsville, Elkmont, Sand Mountain, Fort Payne, Piedmont, Talladega Mountains, Natural Bridge, Ardell, Wilsonville, York, Reform, Hayneville, Jackson, Seale, Dothan, Castleberry, Carlton, Mobile, and Bayou Labatre. At Abbeville the native fox is said to have about disappeared, and fox hunters have imported and turned loose a number from Kentucky and Tennessee.

Family PROCYONIDAE: Raccoons.

Procyon lotor lotor (Linnaeus).

RACCOON.

[*Ursus*] *lotor* Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 48, 1758.

The "coon" is one of the commonest and best known of the southern mammals. 'Coon hunting is one of the most popular sports and many animals are captured in nocturnal hunts; thousands are trapped also every season by boys and by professional trappers, so that in many localities the animal is now becoming scarce.

Raccoons dwell chiefly in timbered swamps and river bottoms, where they forage extensively along the banks of the streams. Although good swimmers they do not take to the water from preference, but usually cross a stream on a fallen tree. On the coast the salt marshes prove attractive, for in them 'coons find an abundance of shellfish and crustaceans, which are favorite articles of diet. In January, 1912, while hunting with dogs on a marsh island near the mouth of Perdido Bay, the dogs ran down and captured a 'coon that was hiding in the marsh grass. 'Coon tracks are numerous through-

[28] Audubon and Bachman, Op. cit., vol. 1, pp. 164, 166–167.

out these wet marshes and along the shores of the bays. In the big swamps of the Tensaw and Mobile Rivers, 'coons are, or have been, very numerous. In March, 1912, going up the Tensaw in a launch, the writer shot two out of the tops of tall trees in the swamp, where they were curled up asleep. The raccoon is by no means confined to the swamps, however, but makes frequent visits to the adjacent cornfields and feasts upon the ripening ears in the milk stage, often doing considerable damage.

The diet of the raccoon includes a great variety of food; wild fruits and berries are eagerly sought when available; shellfish, crustaceans, fish, small mammals, reptiles, and birds are secured as opportunity offers; and occasional raids are made on the farmers' hen roosts. Audubon and Bachman speak of the animal's fondness for birds' eggs and for those of the soft-shelled turtle, and of its habit of feeding on fresh-water mussels and the small oysters growing in shallow waters at the mouths of the rivers, known locally as "raccoon oysters." Stone and Cram speak of its feeding habits as follows:

> From the accounts of numerous eye-witnesses it would appear to be a pretty regular practice with them to lie in wait at the edge of the water and hook out any fish that comes within reach by a smart stroke of the fore paw with claws extended.
>
> Being night wanderers, they undoubtedly often manage to surprise sleeping birds, both on the ground and among the branches, as it is a common custom with them in thick woods to travel for long distances among the tree-tops without once descending to earth, robbing the nests of birds and squirrels on the way.[30]

Specimens examined from Huntsville, Sylacauga, Barachias, Castleberry, Hurricane, and Orange Beach are all referable to typical *lotor;* the skulls show no approach to the characters of the Florida form (*elucus*), although the skins are somewhat more ochraceous above than Maryland and Virginia specimens.

Family MUSTELIDAE: Weasels, Minks, Skunks, Otters, etc.

Mustela noveboracensis (Emmons).

NEW YORK WEASEL.

Putorius noveboracensis Emmons, Rept. Quadr. Massachusetts, p. 45, 1840.

The New York weasel occupies the northeastern United States, extending south into Alabama in the mountains of the northern counties. It is definitely known only from a single specimen trapped by the writer at the base of a cliff on Lookout Mountain, near Fort Payne, at an altitude of 1,500 feet. Records of weasels from Sand Mountain, Gunters Mountain, Talladega Mountains, Elkmont, and Woodville are provisionally referred to this species. A

[30] Stone, Witmer, and William Everitt Cram, American animals, p. 250, 1902.

resident of Carpenter (Jackson County) related that he had seen a den of weasels in a rock pile at that place; two weasels were reported to have been killed in April, 1910, in a sawmill slab pile at Dean. Stone and Cram describe the feeding habits of this weasel as follows:

> In winter the larger weasels kill large numbers of gray rabbits. * * * In summer they catch grasshoppers, crickets, and beetles of various sorts, and rob every bird's nest they find. Ground-feeding birds are especially liable to be caught by them, and they have even been seen to spring into the air and catch birds on the wing.[31]

Mustela peninsulae olivacea Howell.

ALABAMA WEASEL.

Mustela peninsulae olivacea Howell, Proc. Biol. Soc. Washington, vol. 26, p. 139, 1913.

Weasels are apparently scarce everywhere in the Southern States and specimens are difficult to obtain. The Alabama weasel is related to the Florida weasel and not to the Alleghenian species. It inhabits practically the whole of the State except the mountainous regions of the northeastern part, but the limits of its range are at present unknown. Specimens have been examined from Autaugaville, Ardell, Leighton, and Muscle Shoals; the animals are reported from Greensboro, Myrtlewood, Oakchia, Reform, Teasley Mill (Montgomery County), Seale, Jackson, Castleberry, Newville, Dothan, Abbeville, and Point Clear.

This is a rather large weasel. The upperparts in winter are buffy brown, with a tinge of olivaceous; in summer mummy brown, decidedly darker than the winter pelage; the underparts are washed with straw color or buff.

Little is known of the habits of this species. It lives in the drier parts of the timbered swamps, making its den usually under the roots of a tree or in a hollow stump, and ranges also into the rocky hill country, where it inhabits crevices in cliffs or rock piles. J. S. Tharp, of Ashford, states that he once saw two of these weasels run under the roots of a large tree in a swamp near Dothan. The late Dr. W. C. Avery, of Greensboro, writes that the weasel, although not common, at times proved very destructive to chickens and young pigeons, cutting the throats and sucking the blood of a dozen or more fowls, the bodies of which it never touched except to drink the blood. L. S. Golsan, who secured the type specimen of this race near Autaugaville, states that these weasels have been found in nests of the swamp wood rat (*Neotoma floridana*). He says they take to trees almost as readily as squirrels.

[31] Stone and Cram, Op. cit., pp. 236, 237.

Mustela vison mink Peale and Beauvois.[32]

MINK.

Mustela mink Peale and Beauvois, Catalog Peale's Mus., p. 39, 1796.

Minks are generally distributed over most of Alabama, except the most southern counties, where they are very scarce. In many localities they have been almost exterminated, and the recent high prices of fur have led to a great decrease in their numbers everywhere.

A series of 12 skulls from Barachias and Autaugaville and 4 from Winston and Cullman Counties are practically typical of this subspecies. A series of 5 skulls from the Mobile River swamps is also referable here, though showing approach to subspecies *vulgivaga*, of Louisiana, in the small size of the females; the single male skull is typical *mink*.

The species is reported also from Leighton, Elkmont, Woodville, Piedmont, Natural Bridge, Greensboro, Reform, Wilsonville, Talladega Mountains, Mount Weogufka, Hayneville, Thomasville, Myrtlewood, Carlton, Jackson, and Abbeville. At Dothan, Orange Beach, and Bayou Labatre it occurs rarely.

Minks are semiaquatic in habit, always found along streams or in swamps or marshes. They are rapid swimmers, perfectly at home in the water, and able to capture with comparative ease good-sized fish. They feed also on frogs, lizards, crawfish, rats, mice, and rabbits, and are destructive of ducks or other marsh-dwelling birds, and, to a less extent, of upland birds. Audubon and Bachman state that in the South the cotton rat furnishes a considerable part of their food, and mention on one occasion seeing a mink issuing from a hole in the earth dragging by the neck a large Florida wood rat. Minks are often very destructive of poultry, especially ducks. Dr. Avery mentions a case where a mink visited a poultry house at Greensboro several times in a single week and dragged off at least a dozen small hens, which it devoured beneath an outhouse.

Spilogale putorius (Linnaeus).

ALLEGHENIAN SPOTTED SKUNK.

Viverra putorius Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 44, 1758.
Spilogale ringens Merriam, North Amer. Fauna No. 4, p. 9, 1890 (Greensboro, Alabama).

The little spotted skunk occurs commonly over the greater part of the State, where, in common with the large skunks, it is known as "polecat." It lives chiefly about cultivated lands, the borders of brushy swamps, and in waste lands generally, though not in wet swamps or in heavy timber. Its burrows are dug beneath the roots

[32] For use of this name, cf. Hollister, Proc. Biol. Soc. Washington, vol. 27, p. 215, 1914.

of a tree or stump, a rock or slab pile, or in a cut bank. These skunks are much more agile than their larger relatives (*Mephitis*), and readily climb small trees or bushes when pursued by dogs.

They subsist largely on insects (particularly beetles and grasshoppers), mice and other small mammals, lizards, salamanders, crawfish, and occasionally small birds, and are sometimes destructive to poultry and occasionally to peanuts. Henry Golson, of Autaugaville, informed the writer in November, 1916, that these little skunks had gained an entrance to a storehouse in a field where he keeps peanuts, peas, etc., and had eaten a considerable quantity of the peanuts; he caught several of the animals on the pile of peanuts; and quantities of chewed shells which they had left were in evidence.

This observation is confirmed by one related by the late Dr. Avery, of Greensboro, in a letter dated November 7, 1893, stating—

> Last summer I was told that something was destroying the ground peas of a neighbor. Some steel traps were set and a little striped skunk was caught. * * * The skunks were eating the ground peas and eight were caught in my traps in less than two months. The stomachs of these skunks contained ground peas mixed with the débris of insects. I found a persimmon seed in the rectum of a skunk of which I made a skin.

The late Dr. Charles Mohr, in a letter dated June 1, 1890, gives interesting original notes on the habits of this little skunk near Mobile; he says:

> I will give some notes on the habits of the small striped skunk, and in particular describe the manner in which it disposes of the eggs which it is very fond of stealing at its nightly visits to the chicken house. Its proceedings, in reaching its aim, seem to me strange, in fact almost incredible. I have, however, the facts from an intelligent and close observer, a personal friend of mine, one whose word I can not doubt. He says the skunk is unable to open the egg by the aid of its teeth or to take hold of it with its mouth in order to carry it away. It removes the egg from the nest, rolls it with the front paws to a place presenting a solid, hard surface, then the egg is taken in its paws, the animal assumes an erect posture, lifts it from the ground, then lets it drop from the height of its body to insure its breakage in striking the hard ground.
>
> This animal is at nearly all seasons a frequent visitor to the basements of the premises not only in the country but in the suburbs of the city. If not disturbed it becomes quite fearless. My friend tells me it hunts mice, young rats, roaches, etc., and in that way is of benefit when there are no hen nests to be depredated upon.

Specimens of the little spotted skunk have been examined from Leighton, Greensboro, Autaugaville, Prattville, Mobile, and Ashford. It is reported to occur also at Fort Payne, Piedmont, Ardell, Squaw Shoals, Talladega Mountains, Reform, Jackson, Castleberry, and Bon Secour. It seems to be unknown at Orange Beach.

Mephitis mephitis nigra (Peale and Beauvois).[33]

EASTERN SKUNK.

Viverra nigra Peale and Beauvois, Cat. Peale's Mus., p. 37, 1796.

The common skunk, or "polecat," is found in moderate numbers throughout the State, but the recent high prices of fur have led to a considerable reduction in its numbers. Skunks den in burrows of their own construction or in deserted burrows of other animals, choosing for their headquarters a thicket or brushy fence corner in a field, a rock pile or slab pile, a gully or wash, or some similar protected location. They frequently burrow beneath a house, barn, or shed, and in such situations are liable to become very objectionable to human residents.

The food of skunks consists largely of insects, small mammals, reptiles, and amphibians. Almost any animal food is relished by them and even carrion is frequently eaten. While occasional raids are made on the poultry yard or on the nests of wild birds, their destruction of insects and noxious mammals doubtless more than offsets any damage they may do to poultry or game.

Specimens examined from Ardell, Reform, Squaw Shoals, and Jackson indicate that the skunk of northern and central Alabama is fairly typical of *nigra*. As in other regions, there is great variation in the coloration, ranging from an animal with broad white stripes the entire length of the body to one nearly black except for a patch of white on the nape and shoulders.

Skunks are reported as occurring in moderate numbers at Leighton, Elkmont, Woodville, Sand Mountain, Fort Payne, Talladega Mountains, Anniston, Jasper, Auburn, York, Thomasville, and Teasley Mill (Montgomery County).

Mephitis mephitis elongata Bangs.

FLORIDA SKUNK.

Mephitis mephitica elongata Bangs, Proc. Boston Soc. Nat. Hist., vol. 26, p. 531, 1895.

The Florida skunk, characterized by long tail and rather heavy skull, occurs in the coast region of Alabama. Three specimens from Perdido Bay are all that are available, so that the northern limits of the range of the subspecies are unknown. Skunks reported from Ashford, Bon Secour, Bayou Labatre, Mobile, and Castleberry are provisionally referred to this race. On Dauphin Island, in February, 1912, numerous tracks of this animal were seen about logs and driftwood along the shores of the Sound.

[33] For use of this name, cf. Hollister, Proc. Biol. Soc. Washington, vol. 27, p. 215, 1914.

Lutra canadensis canadensis (Schreber).

OTTER.

Mustela lutra canadensis Schreber, Säugthiere, pl. 126 B, 1776.

The otter is generally distributed in the State, but in most places occurs rather sparingly. It is perhaps most numerous in the middle and southern counties, but is everywhere decreasing rapidly through persistent trapping. It is an exceedingly shy and retiring creature, choosing for its home the most remote and unfrequented swamps, streams, or ponds.

The species is reported to occur at Muscle Shoals, Ardell, Myrtlewood, Oakchia, Wilsonville, Mount Weogufka, Hayneville, Teasley Mill (Montgomery County), Jackson, Carlton, Mobile, Bayou Labatre, Bon Secour, Point Clear, Orange Beach, Ashford, and Abbeville. A trapper at Whistler caught four otters in the creek near his home during the winter of 1911–12; Will Matthews shot four at one time near Castleberry, in 1911, as they were playing around a log in the creek.

The only specimen at hand is one caught by a trapper in Mobile River, near the Louisville & Nashville Railroad bridge, in January, 1917, and with so little material it is impossible satisfactorily to define the status of the Alabama otters. The single specimen is very dark blackish brown, shaded about the lips and throat with grayish, thus agreeing in color with the otters of the Northern States, and differing from the Florida form (*vaga*), which is decidedly redder; the skull of the Alabama specimen, however, approaches that of *vaga* in being relatively long and narrow, with the postorbital region constricted. This specimen weighed 17 pounds in the flesh. A skin, taken near Jackson, which I examined in a dealer's store, was also of the same dark color, and the animals referred to above, killed by Mr. Matthews, were described as being black.

Otters are almost as aquatic as seals, which, indeed, they somewhat resemble in appearance and actions in the water. In the Southern States, according to Audubon and Bachman, the young are brought forth about the middle of March.[34] The habits of the species are well described by Stone and Cram, as follows:

> When traveling overland otters follow the smoothest course they can find, going round stumps and hummocks and beneath logs in preference to climbing over them. Following the same course week after week, often in families of four or five together, they soon establish a distinct path clear of obstacles; crooked and tortuous yet keeping to the same general direction, and in most cases leading to some rapid or springhole beneath the bank where the water seldom freezes.
>
> Otters are beautiful swimmers; they glide and shoot along through the water, twisting and turning like the fish they so delight in chasing. I have seen one

[34] Audubon and Bachman, Op. cit., vol. 2, p. 10.

pursuing a muskrat, as a pickerel pursues a shiner, splashing through the shallow water where the stream had overflowed its banks. At times both would be invisible beneath the surface for several minutes, to appear again perhaps out in the current at a distance, the muskrat always diving and dodging for its life.

Otters will also catch wild ducks on the water, raising and seizing them from beneath. They catch their fish by fairly swimming them down in spite of all their twisting and darting. * * *

The otter's home is a den beneath the bank, usually with the entrance under water for safety. This is evidently not regarded as absolutely essential, however, for otters have been known to have their nests in caves, high up in the banks and at the bottom of hollow trees. * * *

They get the greatest fun from sliding; where the bank is sufficiently steep and slanting they make a roundabout path leading up to the top of the bank and from there they slide down the slippery surface into the water one after another like boys sliding down hill on the snow.[34]

Family FELIDAE: Cougars, Wildcats, etc.

Felis couguar Kerr.

COUGAR; PANTHER; PUMA.

Felis couguar Kerr, Animal Kingdom, p. 151, 1792.

The cougar, or "panther," as this animal is usually called, doubtless in early times occupied the greater part of the State; it is now nearly, if not quite, exterminated. Bartram, writing in 1791, speaks of "tygers" as occurring on the lower Tombigbee River, this statement probably referring to the cougar.[35] Hodgson records one killed in March, 1820, on "Ouchee Creek," and mentions seeing a mounted specimen near Blakeley, Baldwin County, the same year.[36] Hallock in 1877 reported the "panther" occasional in Dekalb County.[37] An old resident of Sand Mountain, near Carpenter, reported seeing one there some 20 years ago [1896]. Recent reports, although rather indefinite, indicate that a very few may still remain in the big swamps of the southern counties. Tracks of two of these animals were seen by an experienced trapper about 1912 in Big Uchee Creek Swamp, near Seale, and one is reported to have been seen about 1905 in the region of Nigger Lake, Baldwin County. Lack of any specimens from the State makes it impossible to say which form of the species occurs here.

The cougar is a shy, retiring beast, of cowardly disposition, inhabiting the wildest parts of the forest, the cliffs among the mountains, and the deep canebrakes of the river-bottom swamps. With the advent of settlers it quickly disappeared from the vicinity of civilization and retired to more secluded regions.

[34] Stone and Cram, American animals, pp. 220–223, 1902.
[35] Bartram, William, Travels, p. 410, 1792.
[36] Hodgson, Letters from North America, vol. 1, pp. 123, 149, 1834.
[37] Hallock, Charles, Sportsman's Gazetteer, p. 3 [of Sportsman's Directory], 1877.

Roosevelt describes the habits of the cougar as follows:

In its essential habits and traits, the big, slinking, nearly uni-colored cat seems to be much the same everywhere, whether living in mountain, open plain, or forest, under arctic cold or tropic heat. When the settlements become thick, it retires to dense forest, dark swamp or inaccessible mountain gorge, and moves about only at night. In wilder regions it not infrequently roams during the day and ventures freely into the open. Deer are its customary prey where they are plentiful, bucks, does, and fawns being killed indifferently. Usually the deer is killed almost instantaneously, but occasionally there is quite a scuffle, in which the cougar may get bruised, though, as far as I know, never seriously. It is also a dreaded enemy of sheep, pigs, calves, and especially colts, and when pressed by hunger a big male cougar will kill a full-grown horse or cow, moose or wapiti. It is the special enemy of mountain sheep. In 1886, while hunting white goats north of Clarke's fork of the Columbia, in a region where cougar were common, I found them preying as freely on the goats as on the deer. It rarely catches antelope, but is quick to seize rabbits, other small beasts, and even porcupines.

No animal, not even the wolf, is so rarely seen or so difficult to get without dogs. On the other hand, no other wild beast of its size and power is so easy to kill by the aid of dogs. There are many contradictions in its character. Like the American wolf, it is certainly very much afraid of man; yet it habitually follows the trail of the hunter or solitary traveller, dogging his footsteps, itself always unseen. I have had this happen to me personally. When hungry it will seize and carry off any dog; yet it will sometimes go up a tree when pursued even by a single small dog wholly unable to do it the least harm. It is small wonder that the average frontier settler should grow to regard almost with superstition the great furtive cat which he never sees, but of whose presence he is ever aware, and of whose prowess sinister proof is sometimes afforded by the deaths not alone of his lesser stock, but even of his milch cow or saddle horse.[38]

Mr. Roosevelt states also that the cougar has been known to attack human beings, but authentic instances of such attacks are exceedingly rare.

Lynx ruffus floridanus Rafinesque.

FLORIDA WILDCAT; BOBCAT; CATAMOUNT.

Lynx floridanus Rafinesque, Amer. Monthly Mag., vol. 2, p. 46, 1817.

Wildcats occur in moderate numbers throughout the wilder parts of the State. In the mountains they live about the gulches and rocky bluffs, while in the lowlands they seek the shelter of the swamps and of brushy thickets. On the outer beach bordering Perdido Bay numerous tracks were seen in the palmetto scrub, and the animals are trapped every winter in this vicinity. Specimens from Orange Beach and Castleberry agree closely with specimens of *floridanus* from Florida; the race is characterized by dark colors, with abundant, distinct blackish spots on the body and legs and narrow blackish streaks along the median line of the back.

[38] Roosevelt, Theodore, With the cougar hounds: Scribner's Mag., vol. 30, no. 4, pp. 431–432, October, 1901.

Whether this race ranges throughout the State or whether typical *ruffus* occurs in the northern part can not, in the absence of specimens, be determined. Wildcats are reported from many localities, including Sand Mountain, Talladega Mountains, Mount Weogufka, Piedmont, Ardell, Natural Bridge, Autaugaville, Hayneville, Seale, Oakchia, Myrtlewood, Jackson, Carlton, Abbeville, Dothan, and Mobile.

These cats destroy many young pigs and some lambs, kids, and poultry. Hunters secure the animals both by chasing with hounds and by trapping. Audubon and Bachman describe the habits of the wild cat in the Southern States as follows:

> It is abundant in the Canebrakes (patches or thickets of the *Miegia macrosperma*, of Michaux, which often extend for miles, and are almost impassable) bordering the lakes, rivers, and lagoons of Carolina, Louisiana, and other Southern and South Western States. This species also inhabits the mountains and the undulating or rolling country of the Southern States, and frequents the thickets that generally spring up on deserted cotton plantations, some of which are two or three miles long, and perhaps a mile wide, and afford, from the quantity of briers, shrubs, and young trees of various kinds which have overgrown them, excellent cover for many quadrupeds and birds. In these bramble-covered old fields, the "Cats" feed chiefly on the rabbits and rats that make their homes in their almost impenetrable and tangled recesses; and seldom does the cautious Wild Cat voluntarily leave so comfortable and secure a lurking place, except in the breeding season, or to follow in very sultry weather, the dry beds of streams or brooks, to pick up the cat-fish, etc., or cray-fish and frogs that remain in the deep holes of the creeks, during the drought of summer.
>
> The Wild Cat not only makes great havoc among the chickens, turkeys, and ducks of the planter, but destroys many of the smaller quadrupeds, as well as partridges, and such other birds as he can surprise roosting on the ground. * * *
>
> The domicile of the Wild-Cat is sometimes under an old log, covered with vines such as the *Smilax, Ziziphus volubilus, Rubus*, etc., but more commonly in a hollow tree. Sometimes it is found in an opening twenty or thirty feet high, but generally much nearer the ground, frequently in a cavity at the root, and sometimes in the hollow trunk of a fallen tree, where, after collecting a considerable quantity of long moss and dried leaves to make a comfortable lair, it produces from two to four young. These are brought forth in the latter end of March in Carolina; in the Northern States, however, the kittens appear later, as we have heard of an instance in Pennsylvania where two young were found on the 15th day of May, apparently not a week old.[39]

Order RODENTIA.

Family MURIDAE: Mice, Rats, etc.

Reithrodontomys humulis merriami Allen.

MERRIAM HARVEST MOUSE.

Reithrodontomys merriami J. A. Allen, Bull. Amer. Mus. Nat. Hist., vol. 7, p. 119, 1895.

The Merriam harvest mouse is known from only a few localities, but probably ranges nearly throughout the State. It inhabits old

[39] Audubon and Bachman, Op. cit., vol. 1, pp. 6, 13.

fields and the brushy borders of cultivated land, selecting usually for its home a thick tangle of matted grass, weeds, or briers, often in a wet bottom or the edge of a marsh.

At York, in February, 1912, these mice were numerous in wet patches of broom sedge and about the brushy borders of fields. Holt has taken a number of specimens on the prairie at Barachias in dry broomsedge fields, where they travel in runways made by cotton rats. A few were caught by him also at Carlton, Jackson, and Dean (Clay County); and the writer took one near Autaugaville.

Reithrodontomys humulis humulis (Bachman).

EASTERN HARVEST MOUSE.

Mus humulis Bachman, Proc. Acad. Nat. Sci. Philadelphia, p. 97, 1841.

Two specimens of the eastern harvest mouse, trapped in weedy fields on Sand Mountain, in the extreme northeastern corner of Jackson County, at an elevation of 1,500 feet, are decidedly paler than specimens from the central part of the State, and although not typical of *humulis*, they are best referred to that form. The older one of the two (an adult female) is less intensely brownish than typical examples of *humulis*, being strongly shaded with fuscous; the younger is uniform fuscous above.

In habits this subspecies does not differ from *merriami*, which occupies most of Alabama. Audubon and Bachman state that its food consists largely of the seeds of wild grasses, they having found in its nest small stores of seeds of broom grass, crab grass, and other meadow grasses.[40]

Peromyscus polionotus polionotus (Wagner).

OLD-FIELD MOUSE.

Mus polionotus Wagner, Wiegmann's Arch. f. Naturg., IX, vol. 2, p. 52, 1843.

The little old-field mouse occurs rather commonly in suitable situations throughout the eastern, central, and northeastern parts of the State. It ranges northward to the extreme northeastern corner of Jackson County, but apparently is not found north of the Tennessee River. Its western limit is not known with certainty; it has been taken at Centerville, Bibb County, but rather careful trapping at Reform, Pickens County, and Jackson, Clarke County, failed to secure it (fig 1).

At Abbeville it was found abundant in a neglected sandy field on a hillside, where cactus grows in abundance but grasses only sparsely. Where cactus was most abundant the mice were most numerous. Their burrows were found at frequent intervals, each one marked

[40] Audubon and Bachman, Op. cit., vol. 2, p. 105.

by a heap of soil, usually about 6 or 8 inches across and 2 inches high. The entrance holes were of irregular shape, about 1½ inches in diameter; a few were found plugged with sand, but the majority were open. No definite trails were observed in this colony and the soil was too hard to show tracks well.

In the sandy fields of Autauga County this species is apparently more abundant than in other sections visited. Here they live chiefly in cultivated land, particularly in cornfields, but range also into open timbered tracts. Numerous burrows, scratched out by the mice, are seen in both these situations, and fresh scratchings observed in the cornfields seem to indicate that the mice dig up some freshly planted corn. The holes are in some cases considerably larger than seems necessary for the mouse to enter and the piles of dirt indicate burrows of considerable depth. L. S. Golsan, however, frequently has dug out the mice with his hands.

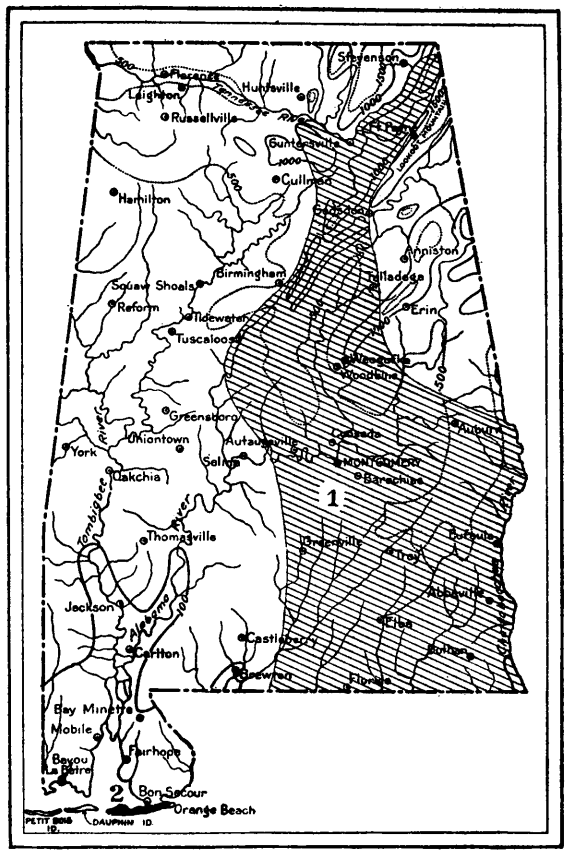


FIG. 1.—Provisional distribution of races of the old-field mouse in Alabama.

1. *Peromyscus polionotus polionotus.*
2. *Peromyscus polionotus albifrons.*
(Limits of range imperfectly known.)

On Sand Mountain these mice were found in fair numbers in two localities—Bucks Pocket, near Grove Oak, and at a point about 9 miles southeast of Carpenter Station. Here they live in cultivated fields of cotton and corn, preferring sandy soils, but ranging into some that are rather clayey and also to some extent into weedy hedgerows and the edges of open timber. In Greenbrier Cove, on Cane Creek, Marshall County, they were common in similar situations.

Little is known of the food habits of this species, but it is believed to feed largely on the seeds of grasses, weeds, and grain; several stomachs from Abbeville contained remains of blackberries with other finely chewed food.

The Alabama examples of this race agree well with specimens from Georgia—the type region.

Peromyscus polionotus albifrons Osgood.

WHITE-FRONTED BEACH MOUSE.

Peromyscus polionotus albifrons Osgood, North Amer. Fauna No. 28, p. 108, 1909.

The white-fronted beach mouse, a pale race of the old-field mouse, is confined in Alabama, so far as is known, to the drifting sand dunes along the coast of Baldwin County; it may occur, however, in sandy tracts at some distance from the coast and doubtless intergrades with *Peromyscus p. polionotus* in some of the southern counties. Mobile Bay apparently forms a barrier to its westward distribution, as no signs of its presence have been found on the beaches of Mobile County or on the Gulf coast of Mississippi (fig. 1).

In the dunes which extend along the Gulf coast from the Little Lagoon eastward to the mouth of Perdido Bay these mice occur in abundance in situations where their pale colors harmonize with the very light-colored sand. They seem to be most numerous in the line of dunes nearest the surf, where the cover is very sparse, consisting of stunted live-oak bushes, yaupon, pokeberry, patches of "sea oats" (*Uniola paniculata*), and a few low herbaceous plants. Here their tracks and trails are seen everywhere in the sand, leading in and out among the clumps of sea-oats or from one clump of bushes to another.

The mice dig little burrows in the sand, usually beneath a bush, the entrance holes being usually small and round, though sometimes larger than the size of the animal. Most of these entrances are left open, but a few were found closed with sand. On the rolling sand flats nearer the bay, where the growth of bushes and palmetto scrub is more dense, the mice were found in smaller numbers. The stomach of one contained remains of red berries, and of another finely chewed vegetable matter, probably seeds.

Peromyscus leucopus leucopus (Rafinesque).

WHITE-FOOTED MOUSE.

Musculus leucopus Rafinesque, Amer. Monthly Mag., vol. 3, p. 446, 1818.

The white-footed mouse is one of the commonest and most widely distributed species of eastern United States, the typical race ranging

from Virginia to Arkansas and Louisiana; in Alabama, however, it is restricted, so far as known, to the northern half of the State, from Montgomery County northward, and is in general less numerous than in the more northern parts of its range. Specimens have been taken at Muscle Shoals, Leighton, Woodville, Stevenson, Sand Mountain (near Carpenter), Erin (Clay County), Choccolocco Mountain, Greensboro, and Barachias (fig. 2).

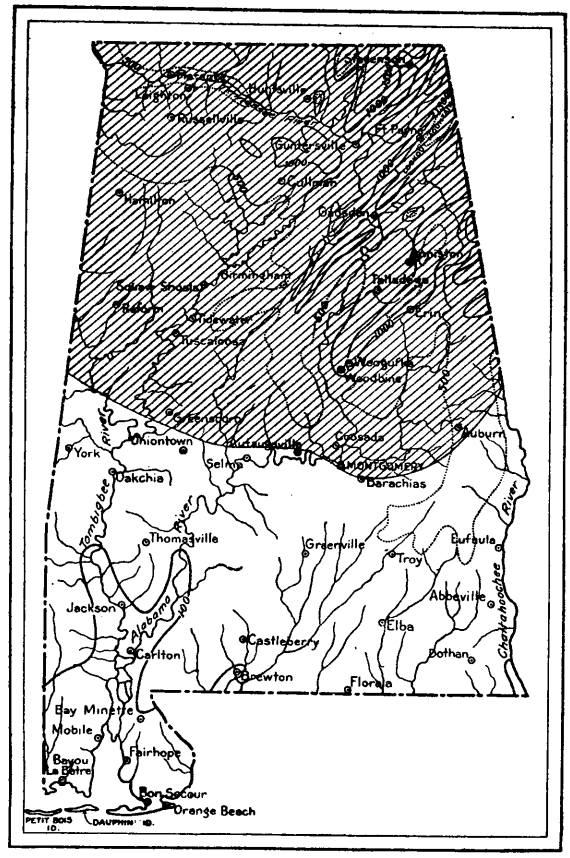


FIG. 2.—Distribution of the white-footed mouse (*Peromyscus leucopus leucopus*) in Alabama.

This species lives in a great variety of situations, but usually in or near timber tracts. It is not so fond of the swampy bottomlands as its relative, the cotton mouse, but is parial to upland woods, the borders of cultivated fields and brushy hedge rows; it ranges also up to the summits of the mountains, where it lives in rock piles and crevices in the cliffs. At Leighton, while hunting for wood rats (*Neotoma*) along the osage-orange hedges, the writer punched two of these mice out of a large rat nest about 10 or 12 feet high, among the branches of one of the trees. This species, like the cotton mouse, often dwells in hollow logs or stumps, or sometimes in hollow trees at no great distance from the ground. At times it appropriates the deserted nest of a bird in a bush or low tree, adding to it sufficient material to make a warm, covered nest; it is said, also, occasionally to construct a complete nest of its own in the branches of a bush, 5 to 15 feet from the ground. Audubon and Bachman describe such

nests as being of oval shape, 7 inches long and 4 inches broad, composed of dried moss, shreds of grape vine bark, and dry leaves.[41] The food of this mouse is described by the same authors as follows:

> In its wild state it is continually laying up little stores of grain and grass seeds. We have seen it carrying in its mouth acorns and chinquapins. In the Northern States these little hoards are often composed wholly of wheat; in the South, of rice. This species, like all rats and mice, is fond of Indian-corn, from which it only extracts the choicest, sweetest portions, eating the heart and leaving the rest untouched.[42]

Stone and Cram state that the white-footed mouse climbs for rose hips and red alder berries and also gathers and stores the seeds of the garget.[43]

Peromyscus gossypinus gossypinus (LeConte).

COTTON MOUSE.

Hesperomys gossypinus, LeConte, Proc. Acad. Nat. Sci. Philadelphia, vol. 6, p. 411, 1853.

The cotton mouse is probably the most abundant and widely distributed mammal in the State, where it is often called "wood rat."

The name "cotton mouse" suggests a habitat in cotton fields, but this species is scarcely ever found in such places, unless the fields are on the borders of a timbered swamp. It is a typical timber mouse and most abundant in the heavy swamps of the river bottoms; it is found also in upland timber, and wherever rocky ledges or bluffs occur it utilizes the shelter afforded by the crevices or caves in these formations. In the swamps, hollow trees or logs, or rotten stumps and woodpiles furnish convenient retreats. LeConte, who discovered and named this species, says of it:

> It forms its nest under logs and under the bark of decaying trees, generally of cotton, frequently using more than a pound of this material for its purpose.[44]

Little is known of the food habits of this mouse, but in view of its close relationship to *Peromyscus leucopus* its food is probably similar, consisting largely of wild berries, nuts, seeds, and such insects as can be obtained. The mice are frequently captured in traps baited with either salt or fresh meat.

The typical race (*gossypinus*) has been taken at Orange Beach, Point Clear, Ashford, Castleberry, Carlton, and Jackson. It may range somewhat farther north than these records indicate, but material is lacking to show its exact northern limit (fig. 3). Intergradation with the northern race (*megacephalus*) takes place in the region between Castleberry and Montgomery.

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[41] Audubon and Bachman, Op. cit., vol. 1, p. 302.
[42] Op. cit., p. 303.
[43] Stone and Cram, American animals, pp. 132–133, 1902.
[44] LeConte, John, Proc. Acad. Nat. Sci. Philadelphia, vol. 6, p. 411, 1853.

Peromyscus gossypinus megacephalus (Rhoads).

RHOADS COTTON MOUSE.

Sitomys megacephalus Rhoads, Proc. Acad. Nat. Sci. Philadelphia, p. 254, 1894.

The Rhoads cotton mouse, distinguished chiefly by larger size, occupies the northern half of the State, south at least to Autauga County. The type specimen came from Woodville, and a fine series of 32 topotypes in winter pelage (March) secured by the Biological Survey includes a number of old adults as well as younger individuals. Specimens have been taken, also, at Muscle Shoals, Leighton, Scottsboro, Sand Mountain (near Carpenter Station), Cane Creek (Marshall County), Guntersville, Bucks Pocket, Fort Payne, Attalla, Ardell, Melville, Squaw Shoals, Erin (Clay County), Autaugaville, Elmore, and Montgomery (fig. 3).

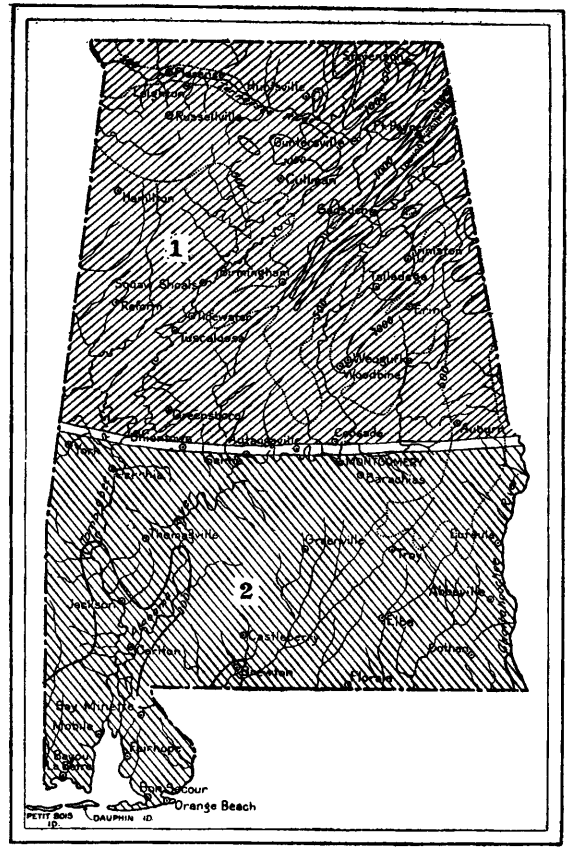

FIG. 3.—Distribution of races of the cotton mouse in Alabama.

1. *Peromyscus gossypinus megacephalus.*
2. *Peromyscus gossypinus gossypinus.*

(Unshaded area represents region of intergradation from which no specimens have been examined.)

The series of 12 from Autaugaville (taken chiefly in and around Bear Swamp) is clearly referable to *megacephalus*, but two specimens from Montgomery indicate that in this region intergradation with typical *gossypinus* takes place. A series of 5 specimens from Guntersville also are decidedly smaller than typical *megacephalus* (the hind foot averaging about 21.5 mm.), and thus strongly approach *gossypinus;* their assignment to that race, however, is inconsistent with our knowledge of the ranges of the two forms in the State, the latter being found chiefly in the coast region.

Occasional specimens taken in the range of this race seem to be intermediate in characters between it and *leucopus*, which also occupies in part the same territory. These specimens—two from Ardell and one each from Dean and Tidewater—resemble *leucopus* rather closely in external appearance and measurements, but have decidedly larger skulls; the writer regards these individuals as hybrids between the two species.

In habits this race is, of course, quite similar to the typical form of the species (*gossypinus*). Since its habitat includes much hilly and mountainous country, where cliffs and rocky bluffs abound, it is very frequently found about caves, crevices, and "rock houses" in company with the Florida wood rat or the Allegheny cliff rat. In the Big Bear Swamp it was common in brushy thickets, living in rotten logs and stumps not only around the borders but in the wet interior of the swamp. On one occasion (Oct. 15, 1911) L. S. Golsan captured a female of this species which was carrying a young one in her mouth. In the stomach of a rattlesnake killed on the rocky, pine-covered slope of Choccolocco Mountain, near Piedmont, October 20, 1916, the writer found the remains of a mouse of this species.

Peromyscus nuttalli aureolus (Audubon and Bachman).

SOUTHERN GOLDEN MOUSE.

Mus (*Calomys*) *aureolus* Audubon and Bachman, Proc. Acad. Nat. Sci. Philadelphia, vol. 1, p. 98, 1841.

The golden mouse occurs nearly throughout the lowlands of the State, being confined here, as elsewhere, almost exclusively to the Lower Austral Zone. Specimens examined from Huntsville, Ardell, Seale, Dothan, Brewton, Mobile, and Point Clear agree well with specimens of this race from Florida.

This mouse lives chiefly in canebrakes and swampy woodland, more rarely in dry, thickety flatwoods or among the hills. It is somewhat arboreal in habits, and builds for itself a globular or oval-shaped nest in a bunch of cane, a bush, or a tree. The nest is beautifully woven of grass or shreds of bark and lined with fur or fine grass stalks. Audubon and Bachman state that they have observed this mouse run up tall trees with great agility and conceal itself in a hole at least 30 feet from the ground. In a swamp at Dothan, Alabama, the writer caught one as it was running up the trunk of a tree. Dr. A. K. Fisher found a nest in the Dismal Swamp, Virginia, in dead brush, about 2 feet from the ground; when the nest was touched a female golden mouse with two young clinging to her teats dropped to the ground, and after a few moments ran up the stem of a bush and reentered the nest.

Oryzomys palustris palustris (Harlan).

SWAMP RICE RAT.

Mus palustris Harlan, Silliman's Amer. Journ. Sci., vol. 31, p. 386, 1837.

The rice rat, or marsh rat, apparently is generally distributed in the State, living in wet, marshy areas in fields, as well as in wooded swamps and in the coastal salt marshes. It is particularly numerous in the latter situations, as on Blakely Island, in Mobile River, and about Little Lagoon, on the coast of Baldwin County. Fishermen who ply their trade at night on the Lagoon state that these rats are common there and that at night they often come around the tents on the shore of the lagoon to feed on scraps of fish and other food thrown out by the men.

Although living to some extent in cultivated lands, this rat probably is not sufficiently numerous to do any appreciable damage to crops. It is similar in appearance to the common barn rat, but slightly smaller, with a slenderer tail and whiter belly. Specimens have been taken at Huntsville, Sand Mountain (near Carpenter), Reform, Weogufka, Elmore, Gallion, Autaugaville, Seale, Mobile, Bayou Labatre, and Little Lagoon, Baldwin County. Audubon and Bachman describe the habits of this species in South Carolina as follows:

> The Rice Meadow-Mouse, as its name implies, is found in particular localities in the banks of the rice-fields of Carolina and Georgia. It burrows in the dykes or dams a few inches above the line of the usual rise of the water. Its burrow is seldom much beyond a foot in depth. It has a compact nest at the extremity, where it produces its young in April. They are usually four or five. * * * We have observed it scratching up the rice when newly planted and before it had been overflowed by the water. When the rice is in its milky state this animal commences feeding on it, and continues during the autumn and winter, gleaning the fields of the scattered grains. We have also seen its burrows in old banks on deserted rice-fields, and observed that it had been feeding on the large seeds of the Gama grass (*Tripsicum dactyloides*), and on those of the wild rye (*Elymus Virginicus*). * * * Its nest is suspended on a bunch of interlaced marsh grass. In this situation we observed one with five young. At certain seasons this little animal feeds on the seeds of the marsh grass (*Spartina glabra*). When these fall it sometimes retires to the shore for food, but has no disrelish to the small crustacea and mollusks that remain on the mud at the subsiding of the tide.
>
> This species swims rapidly, and dives in the manner of the European water rat (*Arvicola amphibia*), or of our *Arvicola Pennsylvanica*. In an attempt at capturing some alive, they swam so actively, and dived so far from us, that the majority escaped. Those we kept in captivity produced young in May and September; they were fed on grains of various kinds, but always gave the preference to small pieces of meat.[45]

[45] Audubon and Baehman, Op. cit., vol. 3, p. 215.

Sigmodon hispidus hispidus Say and Ord.

COTTON RAT.

Sigmodon hispidus Say and Ord, Journ. Acad. Nat. Sci. Philadelphia, vol. 4, pt. 2, p. 354, 1825.

The cotton rat is perhaps the most abundant rodent on the farm lands of Alabama. It lives in grassy fields, brushy pastures, marshes, and along the brushy or weed-grown borders of cultivated fields, practically in all sections except on the mountains. It makes well-defined beaten trails through the grass and under fallen vegetation and brush piles, and apparently lives both in shallow burrows and in grass nests constructed above ground. Its food consists mainly of the stems and seeds of various wild grasses or other plants, and it doubtless consumes some grain also, but in this section of the country is not accused of damaging crops to any extent. It is partly diurnal and may often be seen in broad daylight scurrying across a road or other open space. The only vernacular name I have heard applied to it is "gopher rat." The species has been found in abundance at Leighton, Woodville, Ardell, Dean, Barachias, Jackson, Carlton, Bon Secour, Ashford, and Bayou Labatre; specimens have been taken also on Sand Mountain (near Carpenter), at Piedmont, Cane Creek (Marshall County), Greensboro, Gallion, Catherine, Auburn, Seale, Castleberry, and Abbeville.

Neotoma floridana floridana (Ord).

FLORIDA WOOD RAT.

Mus floridana Ord, Bull. Soc. Philom. Paris, p. 181, 1818.

The Florida wood rat occurs abundantly over the greater part of Alabama from the Tennessee Valley southward. It dwells in a variety of situations, but is most frequently found in wooded bottoms or swamps, where it constructs medium-sized nests of sticks, leaves, and rubbish, placed on or near the ground in hollow logs or trees. In the cultivated lands of the Prairie Belt and the Tennessee Valley the rats live chiefly in the osage orange hedges, where they build very large nests in the branches of the trees, often 10 or 15 feet above the ground. When driven from their nests they run swiftly and deftly about among the branches. In many places it is a common pastime for boys to poke the rats out of their nests and hunt them with dogs. Wherever rocky bluffs or cliffs occur within the range of this species, the rats may be found dwelling in them, seeming to prefer (as do most members of the genus) rocks to trees or logs. When occupying such situations they do not build large nests, but are content to carry a small quantity of sticks and rubbish into crevices in the rocks or into caves. On Sand Mountain, in niches in the cliffs in Long Island Creek Gulch, I found small nests or "forms" made of grass and small sticks, similar to those made by

Neotoma pennsylvanica. These, I believe, were constructed by the rats and probably are used at night as resting places, as were those of *pennsylvanica* at Mammoth Cave, Kentucky, in the daytime.

Judging from the accumulation of hickory-nut shells found about the cliffs occupied by these wood rats, nuts must form an important item of their food in winter. Papaw seeds have also been found near their dens. In summer the rats doubtless feed largely on succulent herbs and berries.

The range of this species in Alabama, so far as worked out, seems to be strictly complementary to that of *pennsylvanica*, the latter being found only north of the Tennessee River, and *floridana* only south of it. At Muscle Shoals *pennsylvanica* lives in the cliffs on the north shore and *floridana* in the cliffs directly opposite. The present species has been taken also at Leighton, Sand Mountain (Long Island Creek, near Carpenter), Choccolocco Mountain (2,000 feet altitude), Dean (Cedar Mountain, 1,500–2,000 feet), Lock 14 on Warrior River, Autaugaville, Barachias, Castleberry, Mobile, Point Clear, and Orange Beach (fig. 4).

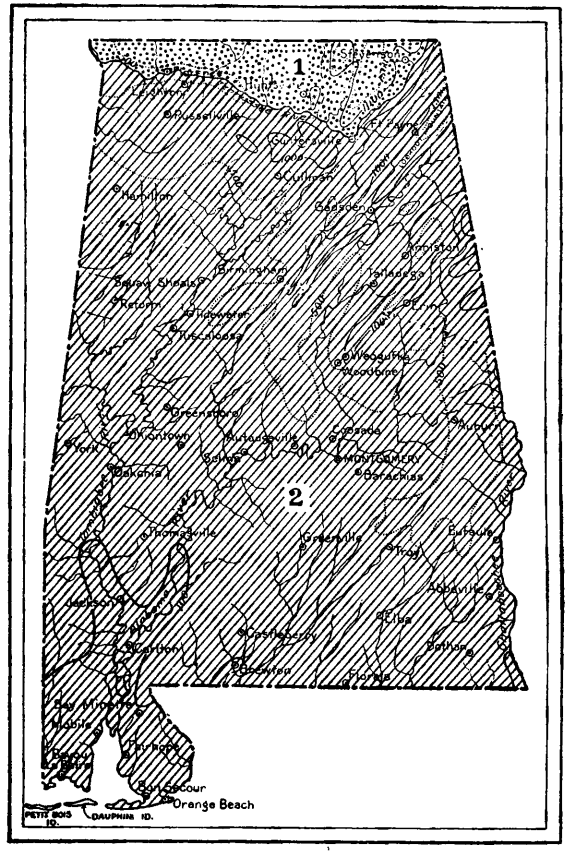

FIG. 4.—Distribution of wood rats in Alabama.

1. *Neotoma pennsylvanica.*
2. *Neotoma floridana floridana.*

Neotoma pennsylvanica Stone.

ALLEGHENY CLIFF RAT.

Neotoma pennsylvanica Stone, Proc. Acad. Nat. Sci. Philadelphia, p. 16, 1893.

The Allegheny cliff rat, a large gray species, ranges from southern New York and Pennsylvania southward to northern Alabama, where

apparently it is limited by the Tennessee River. It has been taken at Woodville, Monte Sano (near Huntsville), Gunters Mountain (near Fort Deposit), and at Muscle Shoals (north shore) (fig. 4).

It occurs in scattering colonies, chiefly about cliffs on the mountain sides, but sometimes descends to low altitudes along streams, where it dwells in rock bluffs or in caves. It is never found, however, in lowland swamps, as is its relative, the Florida wood rat. This species carries into its dens in the crevices of the cliffs considerable quantities of sticks, leaves, nut shells, and other rubbish, but does not construct large stick nests such as the rats of the *floridanus* group use. At Mammoth Cave, Kentucky, the writer found these wood rats living in small nests or "forms" made of finely shredded cedar bark, placed on ledges or on the floor of a small cave.[46]

The food of this species is mainly of vegetable origin and consists in part of hickory nuts, acorns, chestnuts, and the tender leaves and stems of herbaceous plants. The cliff rats, dwelling as they do in the remoter parts of the mountains, rarely cause any damage to man's industries. Sometimes, however, where the cliffs in which they live are close to farm buildings, the rats may enter corn cribs and destroy some of the corn.

Pitymys pinetorum pinetorum (LeConte).

PINE MOUSE.

Psammomys pinetorum LeConte, Ann. Lyc. Nat. Hist. New York, vol. 3, p. 133, 1830.

Pine mice occur in moderate numbers over the greater part of the State, at least as far south as Houston County. Specimens from Autaugaville, Prattville, Greensboro, and Ashford are provisionally referred to the typical race, which occupies the South Atlantic coastal plain of the Carolinas and Georgia, but additional material from southern Alabama may render necessary a different decision as to the status of this form. In color, and size of ears, the specimens agree well with *pinetorum*, and the skulls, although decidedly smaller, have the V-shaped interpterygoid notch characteristic of that race.

These mice are moderately common in sandy fields near Autaugaville, and one was taken also in a grassy bog in the heavy timber on the borders of Bear Swamp. The name "pine mouse" is somewhat a misnomer, for, although the animal occasionally lives in open pine lands, it is more often found in cultivated fields, meadows, or even in wet bottom-land timber. It is largely subterranean in habit, and for that reason is not very well known to most people. It is a sleek, silky little mouse of a rich tawny-brown color, with a blunt nose, small, beady eyes, and a very short tail. It makes little bur-

[46] See Howell, Proc. Biol. Soc. Washington, vol. 23, pp. 27–28, 1910.

rows and runways in the grass of meadows or under the dead leaves and rubbish in the woods, and also makes extensive use of the runways of the common mole. This habit has resulted in fastening on the innocent mole the responsibility for the damage done by the pine mouse to vegetables, bulbs, etc.

This species is probably the most destructive of any of the native field rodents of the Eastern States. It attacks white potatoes, sweet potatoes, bulbs, strawberry, blackberry, and other plants, nursery stock, orchard trees, and stores of vegetables of all kinds. Freshly planted seeds of melons or cantaloupes are extensively eaten, as well as the roots of the growing plants. The damage to orchards, which consists in gnawing off the bark near the surface of the ground, is often extensive, and in the apple-growing regions of Virginia and West Virginia, where the mice are abundant, presents a serious problem.

Pitymys pinetorum auricularis (Bailey).

BLUEGRASS VOLE; PINE MOUSE.

Microtus pinetorum auricularis Bailey, Proc. Biol. Soc. Washington, vol. 12, p. 90, 1898.

The bluegrass vole, an interior race of the pine mouse, occupies the lower Mississippi Valley, ranging northward through northern Alabama, Tennessee, and Kentucky. Typical specimens have rather larger ears than the other subspecies. Specimens examined from Ardell, Woodville, and Sand Mountain (near Carpenter) are referred to this race because of the close resemblance in skull characters, the interpterygoid fossa being U-shaped rather than V-shaped. In habits this race probably does not differ much from the other subspecies. On Sand Mountain their signs were rather numerous in cultivated land, where as usual these rodents travel mainly in mole runways. At Ardell and Woodville, L. J. Goldman found them in heavy timber and trapped specimens under rotten logs.

Fiber zibethicus zibethicus (Linnaeus).

MUSKRAT.

[*Castor*] *zibethicus* Linnaeus, Syst. Nat., ed. 12, vol. 1, p. 79, 1766.

The common muskrat of the Northern States occurs in moderate numbers in most of the streams and ponds in the northern part of Alabama, south as far at least as Clarke, Lowndes, and Pike Counties. In the southern part of the State no muskrats are found, except in southern Mobile County, where *Fiber rivalicius* occurs (fig. 5). It is difficult to understand why the present species does not range all the way to the coast, as conditions in the southern counties seem as well suited to its needs as in the more northern parts.

Specimens have been examined from Reform and Autaugaville, and the animal is reported from Leighton, Elkmont, Scottsboro, Guntersville, Erin (Clay County), Ardell, Squaw Shoals (Warrior River), Greensboro, Mount Weogufka, Barachias, Seale, Hayneville, Teasley Mill (Montgomery County), Myrtlewood, and Coffeeville. Inquiries made of many residents and trappers indicate that the species occurs at Jackson only sporadically. Most of the people questioned had never seen a muskrat, but two persons had seen a few taken there.

C. W. Howe, a trapper of long experience, states that muskrats first appeared near Linwood, Pike County, in 1906, and are now quite plentiful on the upper Conecuh River between Troy and Union Springs, where in 1898 none were to be found. He states also that in 1912 he found unmistakable signs of muskrats in Little River, on the northern line of Baldwin County. The animals are very scarce so far south, and Mr. Howe thinks this colony probably drifted down from a point higher up the river. In the spring of 1916 he saw a single individual still farther south, in Mobile River at Twelve Mile Island, where by the light of a jack lantern it was plainly seen swimming in the river at night. As no other signs of muskrats have ever been found in that vicinity, this individual doubtless was a stray. Muskrats are chiefly of nocturnal habit and are rarely seen abroad in daylight except in the dusk of evening, when they emerge from their dens and begin to feed.

The muskrat's method of constructing its house varies in different parts of its range. In a region of ponds and marshes it constructs large domed houses of rushes, sticks, leaves, mud, and other rubbish. In creeks and rivers where the banks are steep, however, it tunnels into the banks from beneath the surface of the water and constructs its nest in a cavity excavated at the upper end of the tunnel, above high-water mark. This appears to be the usual habit of the species in Alabama.

The food of the muskrat consists largely of the stems, leaves, and roots of various aquatic plants, including rushes, sedges, arrowhead (*Sagittaria*), pondlilies, golden club (*Orontium*), and various marsh grasses. It is said to feed on timothy, redtop (*Agrostis*), and clover, as well as on Indian corn and various garden vegetables. Joel Burgess, of Dean, Clay County, states that he has known the muskrats to cut 100 or more stalks of corn in three nights and drag them into the creek. The animal varies its fare in some localities by feeding on mussels; and piles of shells are often found about shallow places in the rivers, where they have been left by muskrats.

Fiber rivalicius Bangs.

LOUISIANA MUSKRAT.

Fiber zibethicus rivalicius Bangs, Proc. Boston Soc Nat. Hist., vol. 26, p. 541, 1895.

The small, dark-colored Louisiana muskrat is found at present in Alabama only in the coast region west of Mobile Bay (fig. 5). The animal has apparently extended its range into the State within very recent times, since it is unknown to most hunters and trappers in the region where it is now found, and many of those who are acquainted with it state that it first appeared there shortly after a big storm in 1906.

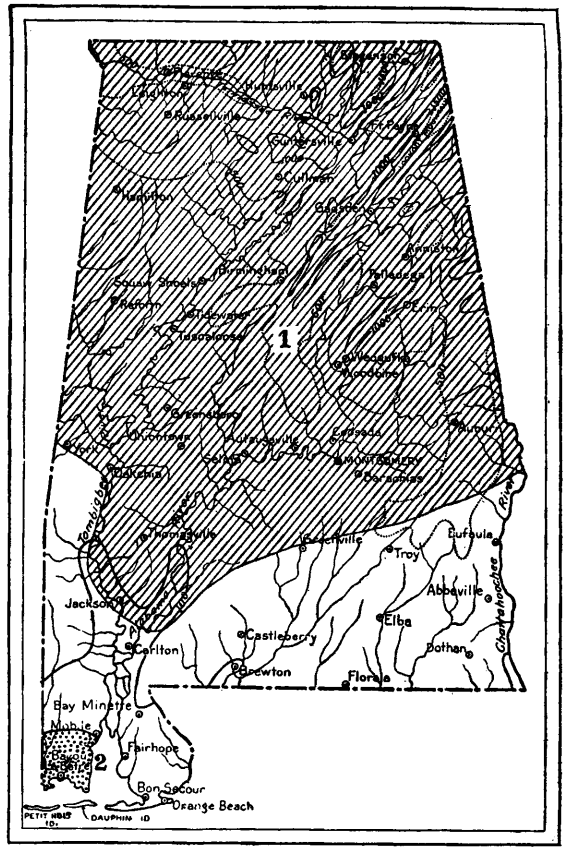

FIG. 5.—Distribution of muskrats in Alabama.
1. *Fiber zibethicus zibethicus.*
2. *Fiber rivalicius.*

This species is not as yet widely dispersed, as it is known at present only from the coast marshes about Bayou Labatre. Signs of its presence were seen also in Three Mile Creek, near Mobile, in 1913, by the late Kenneth Beale, but no specimens have been taken there. It will undoubtedly spread out and become more abundant along the coast of Mississippi Sound and the western shore of Mobile Bay, and there seems to be no reason why it should not extend its range into the big marshes of the Delta region and along the eastern shore of the Bay.

At Bayou Labatre, residents reported a number of muskrat houses on the marshes between the mouth of the bayou and Little River, but a storm and high tide in the fall of 1915 apparently broke up this colony, and in December of that year search for them in that locality was unsuccessful. A considerable colony, however, was located close

to the town in a little marsh between the public road and the pine woods. The animals had constructed four large houses of rushes, the largest fully 6 feet in diameter and 3 or 4 feet high. For quite a space around each house all the growing rushes had been cut close to the ground, and the marsh was honeycombed with underground trails leading in various directions from the houses to the banks of the bayou, most of the exits being under water except at very low tide.

This species is a valuable fur bearer, and as it increases in numbers doubtless will provide a profitable industry for the residents of the coast counties. In the rice-growing districts of Louisiana it is a serious pest by reason of its habit of burrowing into dikes and levees.

Rattus norvegicus (Erxleben).

NORWAY RAT; BARN RAT; "GOPHER RAT."

[*Mus*] *norvegicus* Erxleben, Syst. Regni Anim., vol. 1, p. 381, 1777.

The common Norway rat—an exotic species, imported from the Old World—is widely distributed in the State, and is everywhere a serious pest. It lives chiefly in towns and around farm buildings, but often ranges out into the fields for a considerable distance, particularly along ditch banks and about the borders of marshy bottoms. In the open it digs burrows in the banks of ditches or streams, and becomes practically a "wild" animal. It does an immense amount of damage to stores of feed or grain, to corn in cribs or in the field, to rice and sugar cane, and to young poultry. The losses resulting from its depredations are much greater than those occasioned by all the native species of rodents combined.

Rats are responsible also for the dissemination of bubonic plague, trichinosis, and other serious diseases. Every effort, therefore, should be made to reduce their numbers and to exclude them from storehouses and farm buildings.[47]

Rattus rattus rattus (Linnaeus).

BLACK RAT.

[*Mus*] *rattus* Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 61, 1758.

The black rat was introduced into North America soon after the settlement of the early colonies, and before long was established in the towns and villages. After the arrival of the brown rat, however, it began to decrease in numbers and at present is rare and local in the eastern United States. Specimens were taken near Greensboro in 1891 and on Lookout Mountain, near Fort Payne, in

[47] Suggestions for destroying rats are contained in Farmers' Bulletin 896, U. S. Dept. Agr., "House Rats and Mice," by David E. Lantz; pp. 24, 1917. Cf. also Separate 725, Yearbook 1917, U. S. Dept. Agr., pp. 235–251, 1918, "The House Rat: the Most Destructive Animal in the World," by the same author.

1911. It is slenderer and longer tailed than the brown rat, and is said to live almost exclusively in the walls of houses.

Rattus rattus alexandrinus (Geoffroy).

ROOF RAT.

Mus alexandrinus Geoffroy, Descr. de l'Egypte, Mamm., p. 733, 1818.

The roof rat is believed to be a native of Egypt. It resembles the black rat closely in size and proportions, but differs in color, being of about the shade of the brown rat, but with whiter or more yellowish underparts. It is well established in the Southern States, and has been taken in Alabama at Greensboro, Castleberry, Bayou Labatre, and Abbeville. Roof rats live chiefly about the roofs of dwellings or outhouses, but occasionally wander out into the fields. At Abbeville the writer observed them on a moonlight evening in June climbing silently and dexterously up and down the branches of an oleander bush growing close to the hotel porch.

Mus musculus musculus Linnaeus.

HOUSE MOUSE.

[*Mus*] *musculus* Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 62, 1758.

The house mouse, a species introduced from Europe, is abundant and generally distributed throughout the State. It is by no means confined to the vicinity of buildings but ranges widely in waste lands and cultivated fields. So far as known, however, it does not seriously damage farm crops except as they are stored in granaries or shocks. In houses and farm buildings it is a serious pest, though to a less extent than its larger relative, the brown rat.

Family GEOMYIDAE: Pocket Gophers.

Geomys tuza mobilensis Merriam.

ALABAMA POCKET GOPHER; "SALAMANDER."

Geomys tuza mobilensis Merriam, North Amer. Fauna No. 8, p. 119, 1895.

The pocket gopher (usually, though incorrectly, known in the South as "salamander") is found rather locally in southern Alabama, east of the Tombigbee River, and ranges north to Tuscaloosa County (fig. 6). The Tombigbee-Warrior Basin marks the western limit of its range, and no member of the genus is again encountered until after crossing the Mississippi River.

The usual habitat of the pocket gopher is in sandy pine flats, but in Tuscaloosa County, near Lock 14, Warrior River (the most northern point from which the species is known), it is found on gravelly ridges in mixed timber—longleaf pine, oaks, etc. Its presence is

easily detected by the numerous mounds of earth which it throws up at frequent intervals, usually in a more or less continuous line. Only rarely may the pocket gopher be seen above ground, and then only for a few seconds as it pushes the earth from its burrow. By digging open the mound, however, until a clear tunnel is exposed, and setting a steel trap or pocket gopher trap in the runway, the animal may easily be captured.

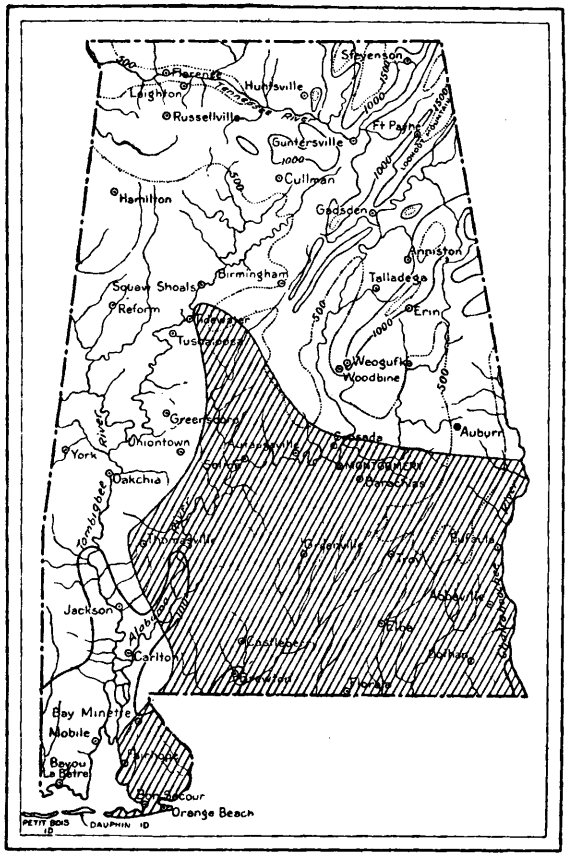

FIG. 6.—Distribution of the Alabama pocket gopher (*Geomys tuza mobilensis*) in Alabama.

Unlike its western relative, the Alabama pocket gopher is not injurious to cultivated crops. It lives almost entirely in waste lands, in poor, sandy, or gravelly soil, and is said to desert a locality as soon as cultivation is begun.

Specimens have been examined from Orange Beach, Point Clear, Brewton, Steadham, Seale, and Lock 14, Warrior River. Evidences of the animal's presence have been seen at Castleberry, Evergreen, Andalusia, Ewell, Thomasville, Magnolia, Selma, Kingston, and Chehaw.

Family SCIURIDAE: Marmots, Squirrels, etc.

Marmota monax monax (Linnæus).

SOUTHERN WOODCHUCK; GROUND-HOG.

[*Mus*] *monax* Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 60, 1758.

The woodchuck, or ground-hog, as it is usually called in the South, occurs plentifully in the rough, hilly country of northern Alabama as far south as Tuscaloosa and Coosa Counties and the Talladega

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FIG. 1.—MOUNDS OF POCKET GOPHER (GEOMYS TUZA MOBILENSIS) IN OPEN PINE FOREST.

Gravelly hills near Lock 14, Warrior River.

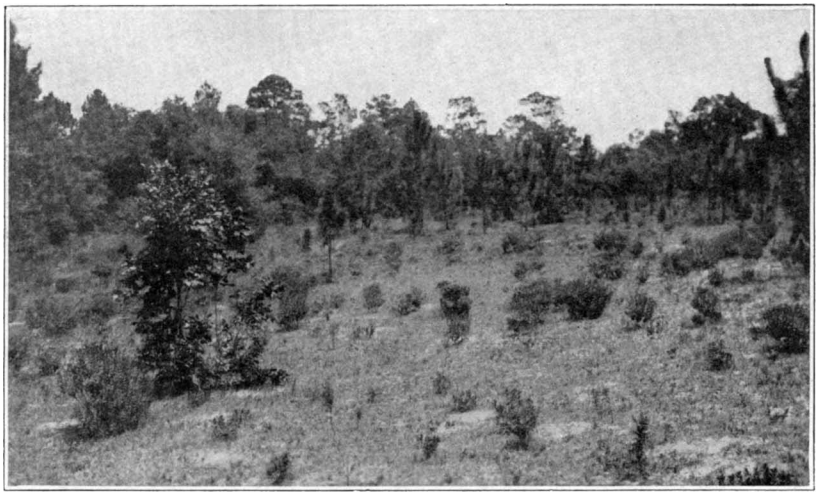

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FIG. 2.—MOUNDS OF POCKET GOPHER IN SANDY FIELD.

Waste land near Point Clear.

Mountains of Talladega and Clay Counties (fig. 7). Stragglers are sometimes found somewhat farther south. L. S. Golsan states that a single individual—the only one ever known in the vicinity—was killed near Autaugaville a number of years ago (about 1890); and Peter Brannon states that he has seen the woodchuck a few times at Seale.

In the South woodchucks live chiefly in rocky bluffs along streams or on mountain sides, their burrows usually being constructed under bowlders or ledges of rock or beneath roots of trees—almost always on a steep, wooded slope. From these retreats they pay visits to near-by fields and do considerable damage to such farm crops as oats, hay, corn, and pumpkins, and to beans and other garden vegetables.

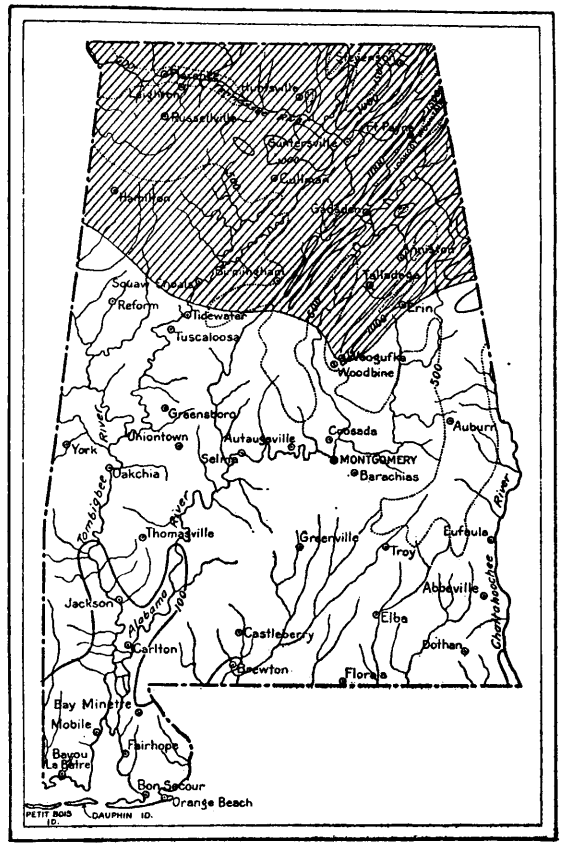

FIG. 7.—Distribution of the southern woodchuck (*Marmota monax monax*) in Alabama.

The woodchuck is a famous sleeper, spending usually from four to six months during the winter season in its burrow in a state of torpor. In the Northern States it retires in fall often as early as the last of September, remaining until the middle or last of the following March; in the South it remains out later, perhaps till November, and reappears early in February.

Specimens of the woodchuck have been examined from Ardell, Cullman County, and the species is reported also from Leighton, Monte Sano, Sand Mountain, Woodville, Guntersville, Natural Bridge, Piedmont, Attalla, Jasper, Squaw Shoals, Mount Weogufka, and the Talladega Mountains, near Erin.

Tamias striatus venustus Bangs.

SOUTHWESTERN CHIPMUNK.

Tamias striatus venustus Bangs, Proc. Biol. Soc. Washington, vol. 10, p. 137, 1896.

The chipmunk, or ground squirrel, occurs abundantly in certain of the northern counties of the State and sparingly in the central part as far south as Carlton, Castleberry, and Dothan. It is apparently shyer and less noisy than the chipmunk of New England, but this may be due in part to its relative scarcity.

In most localities in the State where the species is reported to occur, it has been possible usually to see only an occasional individual and that for only a brief moment. The usual haunts of the chipmunk are the heavily forested hillsides and rocky mountain slopes where there is an abundance of brush and fallen timber, over and beneath which it loves to romp and in the shelter of which it finds safe retreats. In the low country chipmunks are found in the moist bottomland woods and even in timbered swamps. They live chiefly on or near the ground and make burrows in the side of a hill or bank, beneath a rock or the roots of a tree, or in a decaying stump. Audubon and Bachman describe a burrow which was excavated in January (locality not stated, but probably New York) when the snow lay about 5 inches deep on a piece of ground covered with leaves to a depth of 8 inches:

> The hole descended at first almost perpendicularly for about three feet. It then continued with one or two windings, rising a little nearer the surface until it had advanced about 8 feet, when we came to a large nest made of oak leaves and dried grasses. Here lay, snugly covered, three Chipping Squirrels. Another was subsequently dug from one of the small lateral galleries, to which it had evidently retreated to avoid us. They were not dormant, and seemed ready to bite when taken in the hand; but they were not very active, and appeared somewhat sluggish and benumbed, which we conjectured was owing to their being exposed to sudden cold from our having opened their burrow.
>
> There was about a gill of wheat and buckwheat in the nest; but in the galleries we afterwards dug out, we obtained about a quart of the beaked hazel nuts (*Corylus rostrata*), nearly a peck of acorns, some grains of Indian corn, about two quarts of buckwheat, and a very small quantity of grass seeds.[48]

From this account it is evident that the chipmunk does not hibernate in the true sense, but stores up food for winter use. The same authors state that in Louisiana they caught a chipmunk which had in its cheek pouches no less than 16 chinquapin nuts and that another received from Pennsylvania contained "at least one and a half tablespoonfuls of bush trefoil (*Hedysarum cannabinum*) in its widely distended sacks."[49] Merriam states that the chipmunk feeds upon a variety of nuts and roots, corn and other grain, and the larvae of cer-

[48] Audubon and Bachman, Op. cit., vol. 1, pp. 69–70.
[49] Op. cit., p. 69.

tain insects; and that in the Adirondack region of New York beechnuts form its principal food.[50]

Chipmunks with varying quantities of nuts and grain in their pouches have been observed by Mr. Sewell, of Dean; one had 90 grains of small corn; and others, 2 chestnuts and 1 or 2 chinquapins; 5 chinquapins; 2 hickory nuts; and 5 peanuts in the shell. In Bucks Pocket, on Sand Mountain, chipmunks were feeding on acorns, one individual taken having five large pieces of acorn in its pouches. At this locality these animals were more numerous than the writer ever saw them elsewhere in the South. In the timber at the foot of the steep slopes of the canyon they were constantly seen and heard. Their call notes, which were heard throughout the day, were of two forms—one a low *chuck* or *cluck*, the other a high-pitched *tchip*, much like the alarm note of the hooded warbler. When badly frightened the chipmunks uttered a hurried chippering note, twitched their tails nervously, and scurried into their retreats.

The species is reported to occur commonly in the Talladega Mountains, at Guntersville, and at Elkmont; in smaller numbers at Leighton, Huntsville, Squaw Shoals, Mount Weogufka, and Greensboro; and sparingly at Jackson, Carlton, Castleberry, Booth, Wilsonville, Seale, Teasley Mill, and Dothan.

The Alabama series as a whole is intermediate between *Tamias striatus striatus* and *T. s. venustus*, but rather nearer the latter. The skulls are decidedly larger than typical *striatus* from the Carolinas (Roan Mountain specimens) and agree with those of *venustus* from Arkansas. In color, some individuals agree with *venustus* in having lighter gray backs and brighter rumps than *striatus*, while others are almost as dark as typical *striatus*. The grayest specimens are from Ardell, Guntersville, Bucks Pocket, and Talladega Mountains. Those from Woodville and Greensboro approach *striatus* in color. The series differs also from *striatus* in having a larger hind foot (average 36.6 mm. instead of 33.6), this being even larger than typical *venustus* (which measures 35.5).

Sciurus carolinensis carolinensis Gmelin.

GRAY SQUIRREL; "CAT SQUIRREL."

[*Sciurus*] *carolinensis* Gmelin, Syst. Nat., vol. 1, p. 148, 1788.

The gray squirrel is one of the most abundant and generally distributed mammals in the State. It inhabits for the most part moist bottom lands and swamps, where there is an abundance of oak, hickory, and other nut-bearing trees. It is found also in lesser numbers on the wooded hills and the lower slopes of the mountains, but does not range at all into pine timber.

[50] Merriam, C. Hart, Mamm. Adirondack region: Trans. Linnaean Soc. New York, vol. 2, pp. 135–136, 1884.

Gray squirrels live both in hollow trees and in nests among the branches, constructed of leaves, Spanish moss, etc. The young, usually five or six in number, are brought forth early in spring, and sometimes a second litter is born in the summer. This species is said to be irregularly migratory, its wanderings probably induced by a search for desirable feeding places. Acorns and hickory nuts form its principal food, but it is fond also of the fruit of the great magnolia (*Magnolia foetida*). It is most active during the early morning hours and about sundown; and Audubon states that it is to some extent nocturnal, having frequently been observed by moonlight.

The flesh of the gray squirrel is tender and juicy and is highly esteemed for food. Thousands are shot by local hunters, and in many localities the species has been greatly reduced in numbers. As its tameness renders it usually an easy mark to one who understands its habits, if it is not afforded better legal protection it will before many years become very scare.

Typical specimens have been examined from Sand Mountain (near Carpenter), Lookout Mountain (near Fort Payne), Ardell, Greensboro, Barachias, Castleberry, Point Clear, Bon Secour, and Orange Beach. Four specimens from the Tensaw River swamps above Hurricane and two from Stiggins Lake are intermediate between *carolinensis* and *fuliginosus*. The species is recorded also from Cherokee, Muscle Shoals, Elkmont, Guntersville, Talladega Mountains, Piedmont, Mount Weogufka, Squaw Shoals, Natural Bridge, Auburn, Autaugaville, Reform, Oakchia, Seale, Teasley Mill, Jackson, Carlton, Abbeville, and Ashford.

Sciurus carolinensis fuliginosus Bachman.

BAYOU GRAY SQUIRREL.

Sciurus fuliginosus Bachman, Proc. Zool. Soc. London, p. 97, 1838.

The bayou gray squirrel ranges from the coast of Louisiana to the head of Mobile Bay, being confined to the shores of the bayous and the deep cypress swamps. At Stiggins Lake (3 miles east of Mount Vernon), these squirrels were abundant on May 26, 1914, and of three specimens obtained, one is typical of *fuliginosus*, the others intermediate between it and *carolinensis*. A typical specimen was taken also at Chuckvee Bay, May 12, 1911, and one at Bayou Labatre, January 6, 1917.

Sciurus niger niger Linnaeus.

CAROLINA FOX SQUIRREL.

[*Sciurus*] *niger* Linnaeus, Syst. Nat., ed. 10, vol. 1, p. 64, 1758.

The Carolina fox squirrel is the form ranging through South Carolina, southern Georgia, and northern Florida; it enters Alabama only in the southeastern counties, ranging west to Castle-

berry, where it intergrades with the interior form, *texianus* (fig. 8). Six specimens from Abbeville are typical *niger*, with grayish backs and whitish underparts; one is solid light gray above except the head, which is black, this one agreeing perfectly with specimens from South Carolina, the type region. Of 11 specimens from Castleberry, 5 are typical *niger*, 2 typical *texianus*, and 4 intermediate, perhaps nearer *texianus*. This squirrel is reported to occur in some numbers at Headland, and rarely at Seale.

The fox squirrel is a lover of the dry pine forests and is never found in the low bottoms inhabited by the gray squirrel. It is a very shy species and is seldom seen moving about except by hunters who remain concealed near its haunts. It is easily "treed," however, by the aid of a good squirrel dog, and in most places, through persistent hunting, has become very scarce. When surprised on the ground (so Bachman tells us), these squirrels will usually run for a considerable distance to reach a tree containing a hollow, in which they take refuge. Their usual nesting place is in a hollow tree, but outside nests, composed of sticks, leaves, and moss placed in the forks of a tree, are used for temporary homes during a part of the year.

This squirrel is wholly diurnal and is said to remain in its retreats until the sun is well up. Its alarm note is rather harsh barking, not unlike that of the gray squirrel, but usually recognizable. Audubon and Bachman have given a good account of its feeding habits, as follows:

> The food of the Fox Squirrel is various; besides acorns, and different kinds of nuts, its principal subsistence for many weeks in autumn is the fruit extracted from the cones of the pine, especially the long-leaved pitch pine (*Pinus palustris*). Whilst the green corn is yet in its milky state, this Squirrel makes long journeys to visit the fields, and for the sake of convenience frequently builds a temporary summer house in the vicinity, in order to share with the little Carolina squirrel and the crow a portion of the delicacies and treasures of the husbandman; * * * The Fox Squirrel does not appear to lay up any winter stores—there appears to be no food in any of his nests, nor does he, like the red squirrel (*Sciurus hudsonius*), resort to any hoards which in the season of abundance were buried in the earth, or concealed under logs and leaves. During the winter season he leaves his retreat but seldom, and then only for a little while and in fine weather in the middle of the day. He has evidently the power, like the marmot and raccoon, of being sustained for a considerable length of time without much suffering in the absence of food. When this animal makes his appearance in winter, he is seen searching among the leaves where the wild turkey has been busy at work, and gleaning the refuse acorns which have escaped its search; at such times, also, this squirrel does not reject worms and insects which he may detect beneath the bark of fallen or decayed trees. Toward spring he feeds on the buds of hickory, oak, and various other trees, as well as on several kinds of roots, especially the wild potato (*Apios tuberosa*). As the spring advances farther he is a constant visitor to the black mulberry tree (*Morus rubra*), where he finds a supply for several weeks. From this time till winter, the fruits of the field and forest enable him to revel in abundance.[51]

[51] Audubon and Bachman, Op. cit., vol. 2, p. 136.

Sciurus niger texianus Bachman.

BACHMAN FOX SQUIRREL.

Sciurus texianus Bachman, Proc. Zool. Soc. London, p, 86, 1838.

The Bachman fox squirrel ranges from southern Louisiana through Mississippi and the greater part of Alabama (except the southeastern counties) to eastern Tennessee (fig. 8). It is a richly colored form, somewhat resembling the common fox squirrel of the northern Mississippi Valley (*rufiventer*), but differing in having the head black and the nose and ears white.

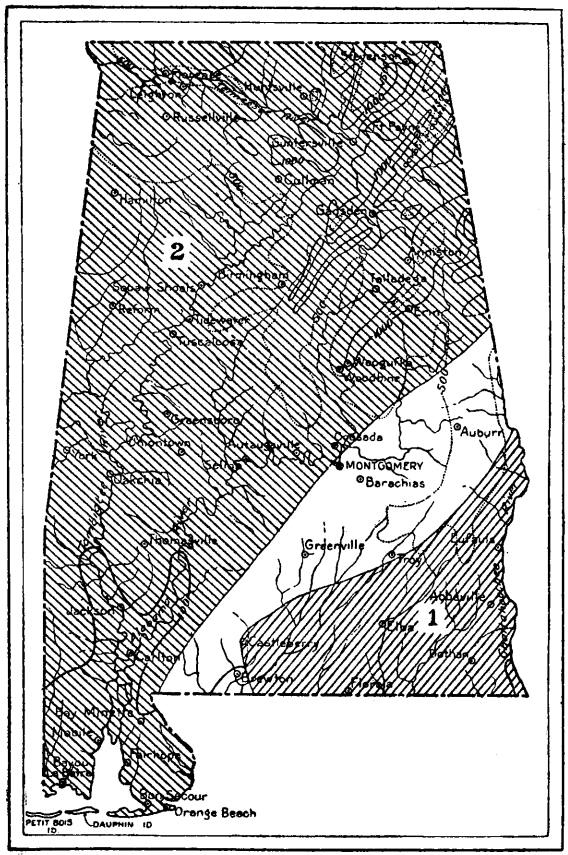

FIG. 8.—Distribution of fox squirrels in Alabama.
1. *Sciurus niger niger.*
2. *Sciurus niger texianus.*
(Unshaded area indicates region from which no specimens have been examined.)

Six specimens from Autaugaville and two from Sand Mountain (near Carpenter) are typical *texianus*, except that one from the latter place has buffy ears; the underparts vary from light ochraceous-buff to deep ochraceous-orange; one from Autaugaville is nearly black. One specimen from Jackson is very dark, the underparts, legs, tail, and ears being rich tawny, and the back overlaid with the same color; another from the same place, however, is of the normal buff color, with buff-tipped ears. Two specimens from Orange Beach and two from Castleberry also have the upperparts rather heavily tinged with tawny. Four specimens from Castleberry are clearly intermediate between *texianus* and *niger*, showing more or less gray on the sides. Others from this locality, as already stated, are typical *niger*.

This race has practically the same habits as the Carolina fox squirrel; in the mountainous regions of the State, however, it is not confined to pine timber, but ranges as well into the mixed woods of pine, hickory, and oak. Like the other forms of the species, it is never found in wet bottoms, but always on dry uplands or mountain slopes. It is reported to occur plentifully at or near Cherokee, Scottsboro, Piedmont, Talladega Mountains, and Mount Weogufka, and rarely at Huntsville, Woodville, Fort Payne, Ardell, Reform, Myrtlewood, Carlton, and Bayou Labatre.

Family PETAURISTIDAE: Flying Squirrels.

Glaucomys volans saturatus Howell.

SOUTHEASTERN FLYING SQUIRREL.

Glaucomys volans saturatus Howell, Proc. Biol. Soc. Washington, vol. 28, p. 110, 1915.

Flying squirrels occur commonly in all parts of the State, but on account of their nocturnal habits are seldom seen unless driven from their retreats. They inhabit chiefly hollow trees or stumps, but frequently take up their abode in an attic or outbuilding. If one wishes to observe their interesting and graceful movements, he may easily dislodge them from their retreats in hollow trees by rapping sharply on the trunk with an axe or club. Launching from a point well up in a tree the squirrels glide swiftly to a lower point on a near-by tree, then scramble up among the branches and are ready for another flight.

Flying squirrels feed chiefly upon various nuts, berries, and seeds; they are fond of meat and occasionally destroy insects. They are looked upon with disfavor by many people by reason of their depredations on pecan groves or on stores of nuts in the lofts of houses; but the damage done by them is usually inconsiderable.

Specimens of this dark southern race have been examined from Sand Mountain (near Carpenter), Ardell, Greensboro, York, Autaugaville, Carlton, Dothan, Mobile, and Perdido River, and there are records of its occurrence at many other localities.

Family CASTORIDAE: Beavers.

Castor canadensis carolinensis Rhoads.

CAROLINA BEAVER.

Castor canadensis carolinensis Rhoads, Trans. Amer. Philos. Soc., N. S., vol. 19, p. 420, 1894.

The beaver in early times doubtless occupied practically the entire State; with the coming of the settlers the animals decreased greatly in numbers, but in some localities have held their own remarkably

well, even in well-settled farming districts. Apparently they are more numerous at present in the central part of the State, in Montgomery and Lowndes Counties, than in either the wild hill country of the northern part or the big swamps of the south.

Old residents in Montgomery County, near Teasley Mill, stated that in the early days of the settlement of the country beavers were found in abundance, often building extensive dams and forming large ponds in the swampy bottoms. Although comparatively few were trapped, they are said to have disappeared entirely from this region for a number of years. About 1908 they appeared again, working up from the lower stretches of Catoma Creek, and at present they seem to be confined to this creek where it runs through Catoma Swamp.

In December, 1913, E. G. Holt visited this locality and secured one young beaver, and in April and May, 1914, the writer spent several days there and trapped an adult female. At the point where the adult specimen was trapped were several "slides" on the steep bank of the creek and two well-worn trails leading through a dense canebrake to a shallow slough. The animals were living in the creek where it runs through the timber and beside cultivated fields. Here the stream is not over 10 to 20 feet wide and for the most part shallow, though in places perhaps 8 or 10 feet deep. Beavers had constructed small dams across the creek, generally utilizing the trunks of fallen trees (not of their own cutting) for a foundation, filling in the space beneath the logs with sticks, brush, cane stalks, leaves, and mud. They had constructed no houses, but were living in burrows in the banks of the creek. Occasional small trees had been felled by them, the largest, a cottonwood 27 inches in circumference; the end of this log, which rested in the middle of the stream, showed marks of the beavers' teeth where they had gnawed the bark; a few other trees growing along the creek showed marks of their gnawings—a pine (*Pinus glabra*), a water beech (*Carpinus caroliniana*), and a sweet gum (*Liquidamber styraciflua*).

In April, 1915, L. J. Goldman visited the region about Hayneville, Lowndes County, and noted considerable evidence of the occurrence of beavers in numbers. Several dams were found at intervals along Big Swamp Creek and in Jones Lake. At the latter place three houses had been constructed of sticks, cane stalks, and mud, but they were not in use at the time, although they had been occupied the previous summer. Wherever cornfields bordered the lake Mr. Goldman found deeply worn trails leading into the fields, and he was informed that in summer beavers resort regularly to the corn patches and consume a considerable quantity of corn.

Beavers are occasionally surprised in the fields even in daylight, and a large one was reported to have been taken in that manner on Pintlala Creek in the spring of 1915. At Teasley Mill a planter

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FIG. 1.—DENSE CANE BRAKE BORDERING CATOMA CREEK.

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FIG. 2.—BEAVER DAM IN CATOMA CREEK.

Views in Catoma Swamp near Teasley Mill, Montgomery County.

told of finding a beaver in a cornfield, some 100 yards from the creek, standing up reaching for an ear of corn. On moonlight nights it is often possible by remaining concealed near the creek to observe beavers as they swim by in the stream. During periods of low water, by cutting the dams and lowering the stream so that the entrances to the burrows are exposed, they can be driven from their dens with the aid of dogs and easily secured. At present there seems to be very little trapping done for their fur, but the flesh is eagerly sought for food, especially by negroes on the plantations. Beavers have been protected by many of the planters, which doubtless is the reason they have not been exterminated. They are now protected by law between March 1 and November 1 each year.

B. I. Garner, a trapper working in Autauga County, caught two beavers on the Alabama River, 12 miles below Prattville, in November, 1916. A colony was reported to be living on Beaver Creek, Conecuh County, a few miles from Evergreen, in 1919, where they are said to occupy a body of water covering many acres of ground.[52] Beavers were common until a few years ago in Big Uchee Creek, Russell County. Hundreds are said to have been taken in a pond in a dense canebrake about 12 miles northwest of Seale, the last having been trapped about 1912. A small colony was still located on the Moreland plantation, about 8 miles northeast of Seale, in 1915. In 1912 a few were reported living on Horse Creek, near Thomasville, and on Beaver Creek, near Myrtlewood. In 1911, a small colony was reported near Mount Weogufka, and in 1915 L. J. Goldman found signs of a small colony on the lower part of Rock Creek, Winston County, where during the year previous 3 or 4 had been caught.

In the northern part of the State beavers seem almost to have been exterminated; they formerly occurred in small numbers in the Tennessee River at Muscle Shoals, but disappeared about 1895; they lived about the "towheads" (small islands) in the river and burrowed into the banks, but did not build dams. A few were reported in 1916 in Big Wills Creek, near Collinsville. They disappeared from Talladega Creek, near Dean, about 1896.

In the southern counties rather vague reports of the beaver have been gathered, indicating that a few may still remain near Jackson, Abbeville, and Bayou Labatre. A professional trapper reports taking three in Bassett Creek, near Jackson, in February, 1913,[53] and C. W. Howe, also a trapper of long experience, relates that in 1915 he noticed a few signs of beavers in Little River, on the northern line of Baldwin County.

Besides the adult female and young male from Montgomery County, there has been obtained through C. H. Harbison an adult

[52] Montgomery (Ala.) Advertiser, October 24, 1919.
[53] Kuhn, A. L., Hunter-Trader-Trapper, vol. 28, pp. 41–42, June, 1914.

male skull taken at Ardell, Cullman County. Comparison with specimens of *canadensis* from interior Canada (Oxford House) shows that the present form has a shorter and relatively broader skull; heavier, broader, and more widely expanded zygomata; wider braincase and interorbital region; and larger audital bullae. The lower jaw is relatively heavier, the inferior border of the angle flattened into a broad ledge, and the coronoid process heavy.

The adult female specimen taken in Catoma Creek weighed 38½ pounds; one taken at Jackson, by A. L. Kuhn, weighed 54 pounds;[54] and one killed on Pintlala Creek was reported to weigh 65 pounds, which probably represents about the maximum size attained by this species. External measurements of the adult from Catoma Creek are as follows: Total length, 1,035 mm.; length of tail, 290 mm.; greatest breadth of tail, 163 mm.; hind foot, 170 mm.

Order LAGOMORPHA.

Family LEPORIDAE: Hares and Rabbits.

Sylvilagus floridanus mallurus (Thomas).

EASTERN COTTONTAIL.

L[epus] n[uttalli] mallurus Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 2, p. 320, 1898.

The cottontail rabbit occurs abundantly in all parts of Alabama; it lives chiefly in old fields, brier patches, and the brushy borders of woodland, and to some extent in swampy bottoms. Cottontails are chiefly nocturnal in habit, and usually spend most of the daylight hours concealed in a " form " in a tussock of grass or a bunch of weeds or briers, or beneath a small bush. When startled from their retreats, they run with great swiftness, twisting and doubling through the brush, and seek shelter in a near-by thicket or a hollow log or stump. They make occasional inroads upon the farmer's kitchen garden and often seriously damage orchards and nursery stock by gnawing the bark, coming out to feed in the early morning and again about sundown. Nelson, in his revision of the rabbits of North America,[55] referred most of the Alabama cottontails to the subspecies *alacer*, the type locality of which is Stillwell, Oklahoma; more abundant material, now available, however, indicates that they should be placed with *mallurus*, the form ranging throughout the South Atlantic States. They agree very closely with this race in color and differ only in having slightly smaller audital bullae.

Specimens have been examined from Sand Mountain (near Carpenter), Huntsville, Talladega Mountains (Erin), Ardell, Auburn,

[54] Kuhn, Arthur L., Op. cit.
[55] Nelson, E. W., North Amer. Fauna No. 29, pp. 174–176, 1909.

Carlton, Castleberry, Mobile, Alabama Port, Bon Secour, Point Clear, Orange Beach, and Dothan. The species is reported, also, from Leighton, Elkmont, Natural Bridge, Attalla, Greensboro, Anniston, Barachias, Seale, Abbeville, Bayou Labatre, and many other places.

Sylvilagus transitionalis (Bangs).

NEW ENGLAND COTTONTAIL.

Lepus sylvaticus transitionalis Bangs, Proc. Boston Soc. Nat. Hist., vol. 26, p. 405, 1895.

The New England cottontail ranges from New York and New Hampshire southward to northern Georgia and Alabama, inhabiting chiefly mountain slopes and the rough foothill country. By reason of its close external resemblance to the common eastern cottontail (*Sylvilagus floridanus mallurus*) it is difficult to distinguish between the two except by critical examination of specimens, and as a result little is known of the peculiar habits or exact distribution of the New England cottontail. It resembles the common rabbit rather closely, but differs in smaller size, shorter ears, a greater amount of black on the back, and in peculiar skull characters. Its range overlaps that of *mallurus* with no indications of intergradation. It is said to be more of a forest-inhabiting species than is the common rabbit.

At present, *transitionalis* is known from only one locality in Georgia (Brasstown Bald Mountain, where it was taken by the writer in 1908) and three localities in Alabama—Erin and Dean, at the foot of the Talladega Mountains, in Clay County, and Ardell, in the rough hill country along Sipsey Fork, Cullman County—from each of which a single specimen has been obtained (fig. 9). More extensive collecting in the northern part of the State will doubtless result in a considerable extension of its known range.

Sylvilagus aquaticus aquaticus (Bachman).

SWAMP RABBIT; "CANE-CUTTER."

Lepus aquaticus Bachman, Journ. Acad. Nat. Sci. Philadelphia, vol. 7, p. 319, 1837.

The large swamp rabbit is abundant and generally distributed over the lowlands of the State except in the extreme southern counties east of Mobile Bay, which region is occupied by the eastern marsh rabbit (*Sylvilagus palustris*) (fig. 10). It is found in all the river swamps and ranges up along the small streams to the very foot of the mountains, where it reaches an altitude of 1,200 feet in Clay County. In the Tennessee Valley it is reported as far north as Crowtown Island and Big Crow Creek, near Stevenson.

Although living by choice in the wet bottoms, these rabbits when pursued will sometimes leave the swamp and cross the dry, wooded

hillsides. They usually remain hidden most of the day in thick brush, but occasionally one may be seen sitting in an opening in the swamp, and if the observer remains quiet it will often wait a few seconds before running off, or rarely it will stop after running a few steps and look around. When pursued by dogs these rabbits make very fast time and usually have no difficulty in distancing the pack. When hard pressed, however, they are quite likely to take refuge in a hollow tree, up which they scramble for a distance of several feet. In such situations hunters often secure them by inserting in the hollow a slender switch, which being twisted into the fur and gently pulled, usually induces the rabbit to come down far enough to be seized by hand or by a dog. When running from hounds they very frequently jump into a creek and swim across or some distance up or down the stream. During periods of high water these rabbits are often compelled to seek safety on the high ridges or small islands in the bottoms, and at such times large numbers are sometimes killed by hunters with guns or clubs.

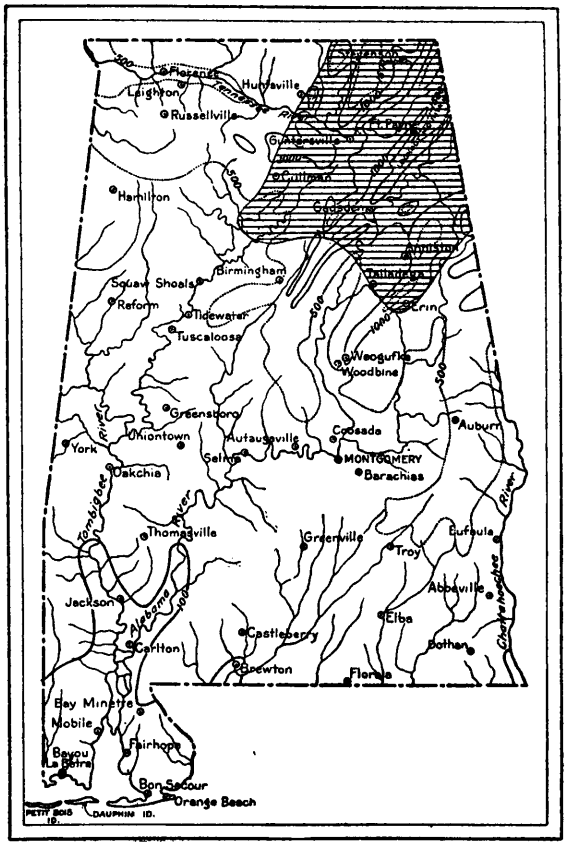

FIG. 9.—Distribution of the New England cottontail rabbit (*Sylvilagus transitionalis*) in Alabama.

Bachman states that this rabbit feeds on the roots of various aquatic plants, especially on a species of iris growing in water. The common name in use for this animal in many parts of the South—"cane-cutter"—indicates its fondness for the stems of the cane (*Arundinaria*), which grows in abundance in its favorite haunts. Where cultivated fields adjoin the swamps, swamp rabbits often for-

age in corn or other crops and at times causes considerable damage. Bachman states that the young, which are from four to six in number, "are frequently found in nests formed of leaves and grasses, placed on hillocks in the swamps, or in the hollow of some fallen tree."[56]

Bachman described this species in 1837 from specimens sent to him by Dr. J. M. Lee and Capt. Benjamin Logan from western Alabama. Typical specimens have been examined from Ardell, Dean, Huntsville, Reform, Greensboro, Auburn, Teasley Mill, Castleberry, Carlton, and Abbeville. The animal is recorded also from Elkmont, Leighton, Fort Payne, Piedmont (Nance Creek), Natural Bridge, Squaw Shoals, Weogufka, York, Autaugaville, Jackson, and Seale. Specimens from Stockton and Whistler are approaching the subspecies *littoralis*. Its southern limit is apparently between Castleberry and Flomaton and between Abbeville and Dothan. As yet, it never has been taken at the same locality with *palustris*.

Sylvilagus aquaticus littoralis Nelson.

COAST SWAMP RABBIT.

Sylvilagus aquaticus littoralis Nelson, North Amer. Fauna No. 29, p. 273, 1909.

The coast race of the swamp rabbit is confined to a narrow belt along the coast from Matagorda Bay, Texas, eastward to the west side of Mobile Bay. It ranges but a short distance from the coast marshes (specimens from so near as Whistler being referable to the interior form, *aquaticus*) and is practically limited to the tidewater region. In the marshes of Blakely Island, opposite Mobile, it is very numerous and three specimens taken there are typical of the race. Specimens from the Tensaw River, four miles north of Hurricane, however, are intermediate between *littoralis* and *aquaticus*, but are best referred to the former. The species occurs only sparingly about Bayou Labatre and the coast region westward; it is occasionally taken on Grand Batture Island. In habits this rabbit differs very little from the typical race, but those observed in the Blakely Island marshes seemed less fleet of foot and very averse to leaving the cover of the marsh. In fact, about the only way to get them out of the rushes is to set fire to the vegetation; when driven out by the flames, they skulk along with ears laid back and dart into the nearest patch of cover.

Sylvilagus palustris palustris (Bachman).

MARSH RABBIT.

Lepus palustris Bachman, Journ. Acad. Nat. Sci. Philadelphia, vol. 7, p. 194, 1837.

The marsh rabbit occurs in Alabama only in the southern counties east of Mobile Bay; its northern limit has not been definitely ascer-

[56] Audubon and Bachman, Op. cit., vol. 1, p. 289.

tained, but is roughly indicated by records of its occurrence at Gordon, Ashford, Dothan, Orange Beach, and Flomaton (fig. 10).

In the salt marshes of Perdido Bay and Bon Secour River the rabbits are abundant, and there their droppings and well-beaten trails may be seen everywhere. In localities back from the coast they live in the small, wet, timbered swamps which are found at frequent intervals along the streams and around ponds in the timber. They never leave the cover of the swamps unless driven out by dogs or fire, and on such occasions they quickly seek the nearest thicket or take refuge in a hollow log or tree. Their short legs prevent them from attaining much speed; when pursued they depend for escape on their facility in doubling and twisting. When driven from a marsh by the firing of the dry grass, often many are killed by men waiting for them with clubs. In the marsh they are frequently caught by dogs. They take to the water readily and swim easily and swiftly.

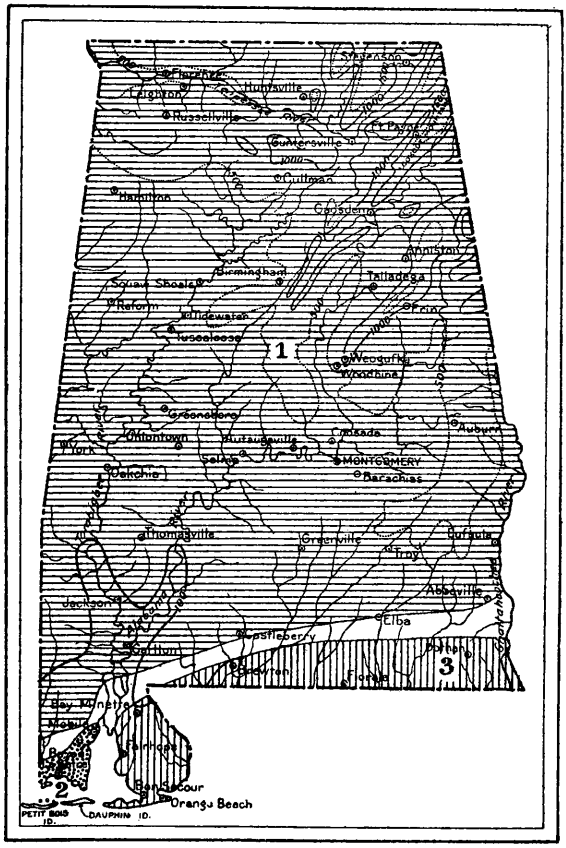

FIG. 10.—Distribution of swamp and marsh rabbits in Alabama.

1. *Sylvilagus aquaticus aquaticus.*
2. *Sylvilagus aquaticus littoralis.*
3. *Sylvilagus palustris palustris.*

Bachman states that the marsh rabbit feeds on various grasses and gnaws the twigs of young sassafras and of the pond spice (*Benzoin*). He has also found it digging for the bulbs of the wild potato (*Apios apios*) and the atamasco lily.[57] Nelson states that the marsh rabbits examined from Bon Secour are intermediate between *palustrus* and *paludicola*, but nearer the former.[58]

[57] Audubon and Bachman, Op. cit., vol. 1, p. 155.
[58] Nelson, E. W., North Amer. Fauna No. 29, p. 268, 1909.

Order ARTIODACTYLA.

Family CERVIDAE: Deer.

Odocoileus virginianus virginianus (Boddaert).

VIRGINIA DEER.

Cervus virginianus Boddaert, Elenchus Animalium, vol. 1, p. 136, 1785.

Deer once ranged in large numbers over all of Alabama, but they are now exterminated in all but the wilder and more inaccessible parts. Their former abundance is attested by the records of early travelers. Bartram, who visited the State in 1776, notes that in the region of the lower Tombigbee River, about 300 deer were killed annually by one planter;[59] and Gosse records them as being very abundant in Dallas County in 1858, when 70 were killed in a single hunt.[60]

The only part of the State where deer are still abundant is in the big wooded swamps of the lower Tensaw and Mobile Rivers. In that region a number are killed during the open season every fall. They are hunted with dogs, each hunter selecting a "stand," where he remains in expectation that the deer will pass within range of his gun—usually a shotgun loaded with buckshot. The deer take readily to the water and swim easily from one island to another in this great swamp; in this way they are able to keep ahead of the dogs, but are often shot while swimming a creek or river or when crossing an opening in the timber. Deer are still found in moderate numbers in the sandhills and swamps of southern Baldwin County. In 1915 they were reported to be numerous between Foley and the shores of Perdido Bay and were occasionally seen near Orange Beach, on the south side of the bay. Twenty years ago or more they were common in the sandhills and small swamps of Mobile County, but now apparently all have been exterminated from that region.

Small numbers of deer still range over the hill country from Winston to Colbert Counties; three were killed in November, 1916, on Buzzard Roost Creek, south of Barton. Reports during the same year indicated that a few deer still remained in northern Cleburne County near Borden Springs. In Russell County they are said to have been exterminated within the last decade. A specimen in the National Museum collection was taken at Selma in 1891.

Specimens have been examined from Orange Beach, Gravine Island (Tensaw River), Mount Vernon Barracks, Selma, and Barton. These all agree rather closely with a skin of *virginianus* from Hali-

[59] Bartram, W., Travels, p. 410, 1792.
[60] Gosse, P., Letters from Alabama, p. 266, 1859.

fax, North Carolina, and differ from skins of *osceola* in darker color. The skulls also of both the Barton and the Tensaw River specimens agree essentially with the two skulls of *virginianus* examined (Halifax, North Carolina, and Meadow Creek Mountain, Greenbrier County, West Virginia); compared with skulls of *osceola* from Florida, these Alabama specimens (as well as those from North Carolina and West Virginia) differ but little in size or other characters, except that in *osceola* (as stated by Bangs in the original description) the nasal and premaxillary bones meet, while in *virginianus* they are separated by an arm of the maxillary. In describing *osceola*, Bangs made comparison with the large northeastern deer, since separated by Miller under the name *borealis*, so that the differences between the Florida deer and typical *virginianus* are much less than would be inferred from reading Bangs's description.

The horns of the Alabama deer are of medium size, decidedly smaller than those of the Louisiana deer (*Odocoïleus louisianae*); the breadth of beam in a fully adult buck from Tensaw River is $14\frac{3}{4}$ inches. The hoofs on the hind feet in the specimen from the Colbert County hills are decidedly shorter and broader than those from the swamps and sandhills of the coast or than those of the Florida deer.

The general color tone of the upperparts and legs in winter pelage is cinnamon-drab, much mixed with blackish, the muzzle and ears light drab; in the Barton specimen there is a band of blackish along the middle line of the back and the upper surface of the tail is cinnamon, becoming fuscous toward the tip; in the Baldwin County specimens the surface hairs on the tail are likewise cinnamon, but by reason of wearing away of the tips the basal color (blackish brown or clove-brown) appears as a solid band. The summer coat is a bright tan color, very different from the drab winter coat.

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