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GEOGRAPHIC VARIATION IN HARVEST MICE OF
THE SPECIES *REITHRODONTOMYS HUMULIS*

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A FEW specimens and the published data on the taxonomy of *Reithrodontomys humulis* proved to be inadequate for the identification of specimens of that species recently collected in western Virginia by a field party from the University of Michigan Museum of Zoology. Accordingly, specimens were obtained on loan from other museums and private collections in the United States, and an attempt was made to analyze the relationships of the geographic races of the species. The present accumulation of 274 specimens includes most of the study skins and skulls of *Reithrodontomys humulis* in collections in this country. Specimens were kindly sent on loan from the following institutions and individuals (which hereinafter will be abbreviated as indicated):

Academy of Natural Sciences of Philadelphia (A.N.S.P.)	Museum of Comparative Zoology (M.C.Z.)
Cleveland Museum of Natural History (C.M.)	Ohio State Museum (O.S.)
Robert H. Coleman (C.)	H. B. Sherman (S.)
Field Museum of Natural History (F.M.)	United States Fish and Wildlife Service (U.S.F.W.S.)
Woodrow Goodpaster (G.)	Virginia Cooperative Wildlife Research Unit, Virginia Polytechnic Institute (V.P.I.)
Louisiana State University, Museum of Zoology (L.S.U.)	

Specimens in the University of Michigan Museum of Zoology are indicated by the symbol U.M.M.Z. I am especially grateful to Mr. Charles O. Handley, Jr., of Blacksburg, Virginia, for collecting specimens representing several critical localities and all seasons of the year.

All measurements are in millimeters and were taken in accordance with current custom. Those of the skin are the work of the collector of the specimen. All measurements of the skull were taken by me with sharp-pointed dial calipers and a low-power binocular microscope. The greatest breadth of the rostrum anterior to the zygomatic plate of the maxilla is given herein as simply "breadth of rostrum." "Nasal length" refers to the greatest length of the longest nasal bone. "Depth of cranium" is a measure of the greatest depth of the cranium, from the uppermost point on the mid-line of the dorsal surface to a plane touching the tips of the incisors and ventral surface of the auditory bullae (taken with the skull resting, bullae and incisor tips down, on a glass slide; the thickness of the slide is subtracted from the resulting measurement). Capitalized color terms are from Ridgway (1912).

VARIATION IN PELAGES.—Pelage in the species varies with the individual, with the season of the year, and with the amount of abrading and fading to which it has been subjected. Variation in the species is similar to that observed by Osgood (1909) in some species of the genus *Peromyscus*. In the material before me, almost all of the molting individuals were collected either in late fall or early winter, or early in spring, indicating that mice of the species *R. humulis* undergo two partial or complete changes of pelage in a year, and not one annual renewal, as indicated by Howell (1914: 12). The winter pelage, when unworn, is long, lax, comparatively thick, and dark. The black tipping of the overhairs is conspicuous, largely obscuring the cinnamon bands of the cover hairs and thus effecting a blackish appearance, particularly of the dorsum. The basal, dark gray bands are wide; those of the hairs in the middle of the back measure about 6–7 mm. above their insertion in the skin. This pelage is acquired in the fall

months concurrently with the molting of the old worn pelage, the new shorter hairs appearing among the old over the sides, mid-back, rump, and lastly, apparently, the nape. This pelage is retained until late spring, when it is replaced by a shorter, thinner summer pelage, in which the black tipping of the overhairs is less conspicuous (there appear to be fewer overhairs) and the cinnamon bands of the cover hairs are more evident. The basal, dark gray bands are narrower than those in the winter pelage; those of the middorsal hairs are about 4-5 mm. wide above the skin.

These two pelage changes are well demonstrated in two series of specimens, each representing all seasons of the year. One is from the vicinity of Blacksburg, Virginia, and Lewisburg, West Virginia, the other from the environs of Charleston, South Carolina. Specimens taken in the fall (October or November) either were entirely in the short pelage of summer, invariably showing considerable wear, or were in the process of acquiring the new, longer, denser, winter pelage. In an early stage of the change the skin appears dark, and the new pelage is visible beneath the old over most of the body. On the dorsum, it is only in the interauricular area and on the nape that the skin is unpigmented and no new pelage shows. All late December, January, February, March, and April adults are in full winter pelage. Some taken in the latter two months evidence considerable abrasion of the fur; the black tips of the overhairs are worn away, and the cinnamon bands of the cover hairs are more conspicuous. Late May and June specimens indicate a spring molt. Some individuals are in worn, winter pelage. Two have grown fully the short summer pelage. Others were in the process of pelage change, showing both worn winter and fresh summer fur. In each of two adults a definite molt line extends from the axillae posteriorly and dorsally to near the middle of the back, approximately dividing the upper parts into an anterior half of fresh summer fur and a posterior part of worn winter pelage. Such a condition indicates an antero-posteriad mode of progression of the molt.

In addition to the individuals constituting the above-men-

tioned series, specimens in the process of molting the summer pelage and acquiring the winter fur are at hand from Alabama, North Carolina, Ohio, and Virginia localities other than Blacksburg. Examples in full summer pelage or evidencing a spring change of pelage are from Ohio, West Virginia, Tennessee, and Virginia localities other than Blacksburg. Only about 10 per cent of the specimens examined were taken in late spring or summer months.

In addition to the differences in pelages correlated with seasons of the year, there are at least three stages attributable to age—a juvenile, a subadult, and an adult. Whether or not each of these so-called stages represents a separate coat, that is, whether each involves a complete change of pelage, I cannot determine from the material at hand. The material does show, however, that much if not all of the juvenile fur is molted concurrently with the appearance of the pelage which clothes the subadult animal. The emergence of the adult stage from the subadult may be merely a matter of the relatively slow addition or replacement of hairs between biannual molts, or it may involve a complete replacement in the succeeding fall or spring.

Compared with the subadult and adult, the juvenile pelage is uniformly blackish and shows little of the cinnamon hues. It is blackish gray dorsally, slightly paler and more rufescent on the sides, and gray ventrally. The fur has a wavy appearance and a finer, more silky "feel" when rubbed between the thumb and forefinger than does that of the subadult or adult. Three specimens collected in January near Charleston were molting this pelage and acquiring the subadult fur. Emerging hairs are visible between the old hairs on all of the upper parts except the head and nape, which retain the old pelage, and on the underparts in two of the three specimens. On the ventral surface of the third specimen, the new pelage has been acquired and the old fur lost. A specimen from Fairfield County, Ohio, is in the juvenile coat.

The subadult stage is more contrastingly colored than is the juvenile; more cinnamon pigment is visible over all parts, and

the hair has the coarser texture of the adult. About half of the skins examined are representative of the subadult stage. This pelage stage probably is to be seen in populations in every month of the year. Specimens at hand represent every month except July, September, and October.

The subadult grades into the brighter, less grayish adult. In a series of specimens arranged from oldest to youngest (as determined by size, tooth wear, and fusion of the sutures of the skull), differences in pelages between the oldest of those of medium age (subadults) are to me apparent, but the characters of those two groups merge and, in the last analysis, the relegation of intermediate individuals to one of these groups must be largely arbitrary.

Additional variations in color are attributed to the abrading and fading of the pelage. Abrasion of the fur removes the distal bands and exposes the more basal layers. Specimens evidencing the most wear have the hair of the back worn down to the basal gray bands; few of the distal cinnamon and black bands remain. A few specimens are much paler than other individuals from the same locality; the colors obviously have faded.

GEOGRAPHIC VARIATIONS.—Variations attributable to individual development and to age are sufficient in the specimens at hand to obscure most variation that can be correlated with geography or other features of the environment. Study of a larger number of well-prepared and well-preserved skins and skulls than is now available may reveal significant differences not presently apparent between populations. There are slight average differences in characters of coloration, body size, depth of cranium, and zygomatic breadth, however, which appear to have significant value. The darkest and most rufescent individuals are from coastal North Carolina and South Carolina. Those from more northern or western areas are grayer, and, compared with Carolina specimens, show little of the reddish tones. The largest individuals are from the northern part of the range of the species—in Virginia and northeastern North Carolina. Specimens from that region average largest not

only in absolute size, but they also have a relatively deeper cranium and a greater spread of the zygomata. Smallest sizes and narrowest, flattest crania are characteristic of specimens from South Carolina and Florida. Populations from the periphery of the areas around the centers of maximum and minimum development of these characters are variously different in, but not unique as to maximum or minimum development of, size, color, and the above-mentioned cranial features. They warrant no formal subspecific name.

Three geographic races of the species are here recognized, *merriami*, *humulis*, and *virginianus*. One of these, *merriami*, is represented by only thirteen specimens, an insufficient number for any satisfactory characterization of a race of a species showing as much individual variation as *R. humulis* does. Those specimens, however, exhibit certain characteristics which set them apart, as a lot, from series of *humulis* or *virginianus*.

It is probable that the species *R. humulis* has extended its range within historic time and now occupies areas previously uninhabited by harvest mice. The species is an inhabitant of open terrain—lands which support a cover of grasses and other low-lying annual and perennial seed-producing vegetation, whether those open grounds occur continuously over large areas or are small peninsulas of grasslands in forests. The clearing of forests and the subsequent cultivation of the lands by the white man made available to species with such predilections extensive areas in the eastern United States once forested and thus not suited to the needs of those species. The agricultural products were attractive to harvest mice. Gramineous crops, the cereal grains especially, were particularly suitable as food and cover. Abandoned farm lands grew to grasses and weeds, likewise desirable habitat, before again being covered by forests. In short, much of man's activity with the ax and plow in modifying habitats sooner or later worked to the advantage of the species. That the species availed itself of the increased habitats, until checked in its spread by some other factor, seems probable.

RELATIONSHIPS WITH OTHER SPECIES.—The species *Reithrodontomys humulis* is the only kind of harvest mouse now known to be present in the southeastern United States. West of the Mississippi River it is replaced, for the most part, by other representative kinds. In western Louisiana and eastern Texas it occurs in or near areas inhabited by *R. fulvescens* and *R. montanus*. The western periphery of its range also approaches the range of *R. megalotis*.

To facilitate, possibly, the identification to species of harvest mice from areas where two or more of the above-mentioned species occur, the following comparisons of examples in adult pelage of each of the four species are offered.

Reithrodontomys humulis

Small (length of hind foot, 15–17 mm.; condylobasal length of skull, about 16.5–18.0 mm.). Tail about equal in length to head and body; bicolor; the dark dorsal and light ventral stripes about equal in width. Upper parts deep browns and deep grays. Underparts grayish white, rufescent, or gray (basal gray bands of hairs visible over most of the under-surface). Sides comparatively dull and dark (not bright orange). Ears blackish, without mottling. Skull narrow (zygomatic breadth less than 57 per cent of the condylobasal length, averaging about 55 per cent). Nasals narrowing markedly posteriorly (least breadth of the dorsal part of the rostrum above the preorbital fossa no more than 82 per cent of the interorbital breadth). Interpterygoid fossa moderately broad (its least breadth about one and one-third to one and one-half times the greatest breadth of the incisive foramen).

Reithrodontomys montanus

Small (length of hind foot, 14–17 mm.; condylobasal length of skull, about 16.5–18.0 mm.). Tail about equal in length to head and body; bicolor; the dark dorsal stripe constitutes about one-fourth of the circumference of the tail. Upper parts pale buff or cinnamon gray. Underparts white (basal gray bands scarcely visible). Sides dull (not bright fulvous

or orange). Ears darker at base than at tips, yielding a mottled black and cinnamon appearance. Skull broad (zygomatic breadth usually 57 per cent, or more, of condylobasal length). Nasals almost as broad posteriorly as anteriorly (least breadth of dorsal part of rostrum above the preorbital fossa usually over 83 per cent of the interorbital breadth). Interpterygoid fossa narrow (its least breadth about equal to the greatest breadth of the incisive foramen).

Reithrodontomys megalotis

Medium to large (length of hind foot, 16–19 mm.; condylobasal length of skull, about 17.5–19.5 mm.). Tail length, 90–120 per cent (average near 100 per cent) of length of head and body, and sharply or indistinctly bicolor; the dark dorsal and light ventral stripes about equal in width. Upper parts buffy, brownish gray, or dark reddish brown. Underparts white or pale gray (few basal gray bands of hairs visible). Sides dull (not bright fulvous or orange). Ears pale, flesh colored or buffy cinnamon. Skull broad (zygomatic breadth usually 56 per cent or more of condylobasal length). Nasals narrow posteriorly (least breadth of dorsal part of rostrum above the preorbital fossa less than 82 per cent of the interorbital breadth). Interpterygoid fossa narrow (its least breadth about equal to the greatest breadth of the incisive foramen).

Reithrodontomys fulvescens

Large (length of hind foot, 17–21 mm., averaging about 19 mm.; condylobasal length of skull, about 18.5–20.0 mm.). Tail longer than head and body, ratio about one and one-fourth to one, and lighter below than above, but not sharply bicolor; the dark dorsal and light ventral stripes about equal in width. Upper parts deep brown, cinnamon, or buffy gray. Underparts white or grayish white (basal gray bands of hairs scarcely visible). Sides bright orange or cinnamon (little gray or black present). Ears blackish basally and cinnamon distally. Skull broad (zygomatic breadth usually 56 per cent, or more, of the condylobasal length). Nasals narrow posteriorly (least

breadth of dorsal part of rostrum above the preorbital fossa less than 84 per cent of the interorbital breadth). Interpterygoid fossa broad (its least breadth about one and one-fourth to one and two-third times the greatest breadth of the incisive foramen).

Reithrodontomys humulis merriami Allen

Reithrodontomys merriami Allen (1895: 119–20). Texas, Brazoria County, Austin Bayou, near Alvin.

DISTRIBUTION.—Tall-grass prairies and marsh grasslands of extreme eastern Texas and southern Louisiana, west of the Mississippi River. Known from the vicinity of Richmond, Fort Bend County, and Alvin, Brazoria County, Texas, north and east to Lafayette, Lafayette Parish, Louisiana (Map 1).

CHARACTERS AND COMPARISONS.—Dorsal coloration of fresh adult pelage of winter a grayish buffy-brown, paler on the shoulders and darker medially to form a dark grayish brown vertebral stripe; of subadult pelage dark gray, lightly suffused with buff and with a distinct blackish vertebral stripe. Compared with *virginianus*, fresh adult winter or subadult pelages similar in color tones (possibly slightly more buffy), with a much more distinct, dark brown or black dorsal stripe; skull shallower (depth of skull about 42 per cent of condylobasal length).

COLOR.—In fresh adult winter pelage upper parts mixed blackish and Pinkish Buff or Light Pinkish Cinnamon, the black predominant on the mid-back and forming a sharply defined (usually) vertebral stripe about one centimeter wide, running from the forehead to the base of the tail, the cinnamon hues prevailing on the head, shoulders, and sides, but usually purest in a spot before each ear and in a lateral line bordering the underparts. Ears blackish. Tail bicolor, blackish to Fuscous above, whitish below. Underparts pale gray, the chin and throat paler (hairs of underparts, except chin and throat, Dark Mouse Gray basally and white, Light Pinkish Cinnamon, or Pinkish Buff distally—the cinnamon hues most evident in the pectoral area). Upper surface of feet whitish.

In fresh subadult pelage darker and grayer than the adult pelage. Sides near Light Drab or Drab (cover hairs near Dark Mouse Gray basally, near Light Pinkish Cinnamon or Pinkish Buff terminally, the few cover hairs present similarly colored but the cinnamon band subtending a dark brown or black terminal band), with an indistinct lateral line of Light Pinkish Cinnamon; mid-back dark brown or black, forming a wide, vertebral stripe (with few or no cinnamon-pigmented hairs). Feet whitish dorsally. Tail lighter below than above, but not sharply bicolor. Ears reddish brown or blackish. Underparts as in adult pelage but with less or none of the cinnamon or buffy tones.

MEASUREMENTS.—Average and extremes of four moderately old adults from Alvin, Texas, and Lafayette and Mermentau, Louisiana: total length, 126 (121–132); tail vertebrae, 61 (54–68); hind foot, 15.9 (14.5–17.0); condylobasal length of skull, 17.7 (17.4–17.9); depth of cranium, 7.5 (7.3–7.7); zygomatic breadth, 9.7 (9.3–9.9); breadth of rostrum, 3.6 (3.5–3.8); interorbital constriction, 3.0 (3.0–3.1); nasal length, 7.1 (7.0–7.2); length of incisive foramen, 3.8 (3.6–3.9); length of hard palate, 3.4 (3.4–3.5); alveolar length of molar row, 3.0 (2.8–3.2).

REMARKS.—Only five entire adult and subadult skulls of the subspecies are at hand. Compared with topotypes of *virginianus* the five show a relatively shallower brain case. The rostrum is narrower and the incisive foramina relatively shorter, on the average, than in topotypes of *humulis*.

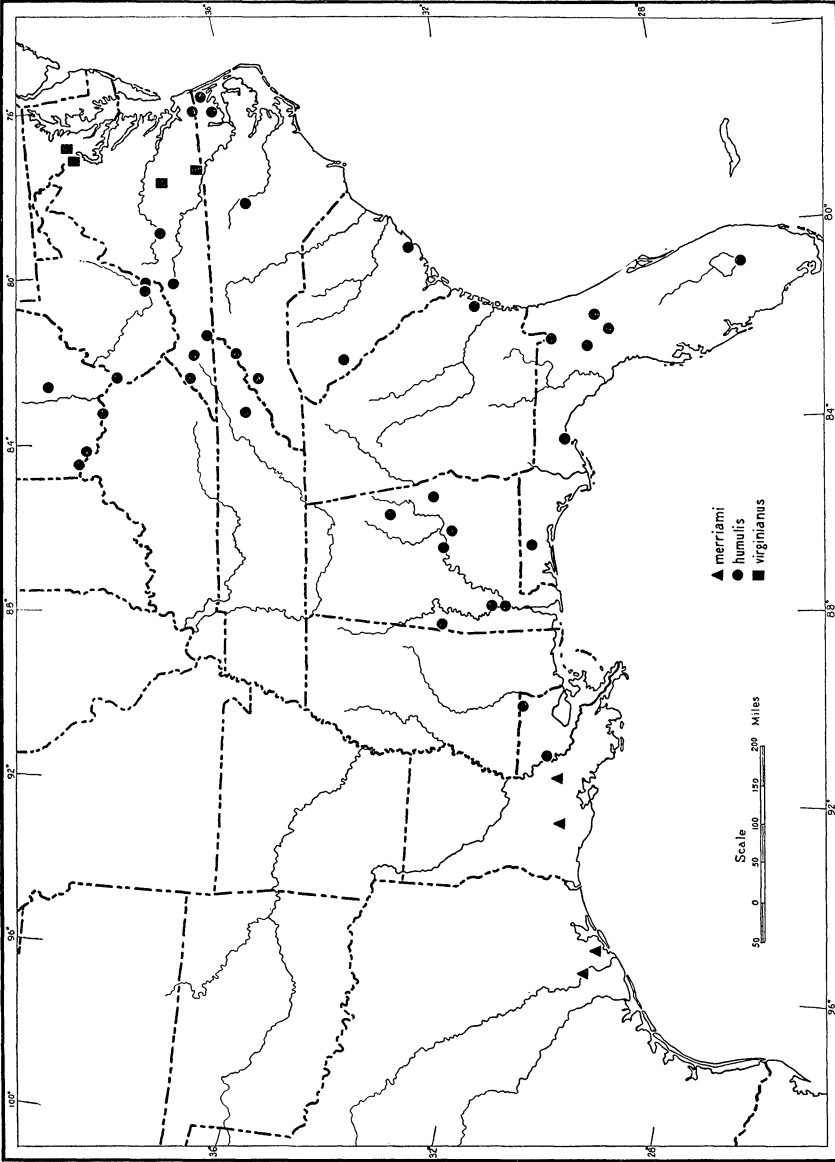
SPECIMENS EXAMINED.—A total of thirteen specimens from localities as follows:

Louisiana: Acadia Parish, Mermentau, 4 (F.M.); Lafayette Parish, Lafayette, 3 (U.S.F.W.S.).

Texas: Brazoria Co., Austin Bayou, near Alvin, 5 (U.S.F.W.S.); Fort Bend Co., Richmond, 1 (U.S.F.W.S.).

Reithrodontomys humulis humulis Audubon and Bachman

Mus humulis Audubon and Bachman (1841: 97–98). South Carolina, Charleston County, Charleston.



MAP 1. A part of the United States, showing the distribution of the three subspecies of *Reithrodontomys humulks* here recognized. Each symbol represents one or more localities whence specimens were examined.

- ?*Mus carolinensis* Audubon and Bachman (1842: 306-7). Maritime districts of South Carolina.
- Mus LeContii* Audubon and Bachman (1842: 307-8). Georgia [probably LeConte's plantation near Riceboro, Liberty County; description based on specimen collected by John LeConte].
- Reithrodontomys humulis dickinsoni* Rhoads (1895: 589-90). Florida, Pasco County, Willow Oak.
- Reithrodontomys lecontii impiger* Bangs (1898: 167). West Virginia, Greenbrier County, White Sulphur Springs.

DISTRIBUTION.—Cleared, cultivated, or abandoned farm lands and tall-grass lands of the southeastern United States. Known to range (Map 1) from near the Mississippi River in eastern Louisiana (East Baton Rouge Parish) eastward and northward through Alabama, Georgia, Florida, eastern Tennessee, North Carolina, and South Carolina to extreme southeastern Virginia (Wallaceton, Norfolk County), thence westward and northward through western Virginia and southern West Virginia to southwestern Ohio (Hamilton County).

CHARACTERS AND COMPARISONS.—Dorsal coloration of unworn adult winter pelage bright reddish brown without a pronounced blackish vertebral stripe; of fresh subadult pelage dark grayish brown with an indistinct or no vertebral stripe. Skull comparatively small, narrow and low (depth of cranium about 42-43 per cent of the condylobasal length).

Compared with *merriami*, in fresh adult winter pelage the dorsal surface and sides distinctly reddish, not buffy or grayish, the sides and shoulders but slightly paler than the back and near Cinnamon in tone (in *merriami* the sides and shoulders are much paler than the back and near Light Pinkish Cinnamon or Pinkish Buff). In fresh subadult pelage brownish gray on the sides, shoulders, and head, and blackish brown along the posterior part of the back, forming a "diffuse" dorsal stripe (in *merriami* the sides, shoulders, and head are buffy gray, contrasting sharply with a well-marked blackish brown or black vertebral stripe).

COLOR.—In fresh adult winter pelage upper parts near Sayal Brown or Snuff Brown, slightly paler on the sides (because of fewer black-tipped overhairs) and with no, or at best

an indistinct, darker vertebral stripe and Cinnamon lateral line; cheeks Cinnamon. Cover hairs Dark Mouse Gray basally and Cinnamon distally; overhairs Dark Mouse Gray basally and black or blackish brown distally. Chin and throat white, the remaining underparts pale gray or Light Pinkish Cinnamon (hairs Dark Mouse Gray basally and white or Pinkish Cinnamon distally), the latter hue most evident in the pectoral area. Ears dark brown. Tail not sharply bicolor, Fuscous above and whitish below. Upper surfaces of feet white. In fresh adult summer pelage fur shorter and more rufescent, with less of black tipping to hairs. Basal gray bands shorter (see accounts of pelages on preceding pages). In worn adult pelage grayer in tone, the grayness apparently due principally to the greater exposure of the basal gray bands effected by the abrading of more of the distal black and cinnamon bands.

In fresh subadult pelage much grayer and less reddish dorsally than the fresh adult pelage; darker than the worn adult pelage. Upper parts a mixture of Light Pinkish Cinnamon and black, the black predominant dorsally (but not forming a distinct vertebral stripe) and, to my eye, blending with the pale cinnamon hue to yield a blackish gray appearance. Coloration of the other parts much as in the fresh adult pelage, the underparts, however, more evenly gray (showing less of the cinnamon coloration).

MEASUREMENTS.—Averages and extremes of five old adults from Charleston, South Carolina: total length, 125 (117–135); tail vertebrae, 62 (58–67); hind foot, 16.5 (16.0–17.0); condylobasal length of skull, 17.2 (16.8–17.6); depth of cranium, 7.4 (7.0–7.6); zygomatic breadth, 9.4 (9.2–9.7); breadth of rostrum, 3.6 (3.5–3.7); interorbital constriction, 2.8 (2.7–2.9); nasal length, 7.2 (6.9–7.4); length of incisive foramen, 3.8 (3.6–3.9); length of hard palate, 3.2 (3.0–3.3); alveolar length of molar row, 2.7 (2.6–2.9).

REMARKS.—The characters of coloration of *humulis* are expressed over most of the range ascribed to that race, but are best developed in coastal North Carolina and South Carolina. Toward the north they grade into those of *virginianus*, the

characteristic rufescent hues giving way to grayish. Thus, specimens from Lynchburg, Blacksburg, and Konnarock, Virginia, although still with the reddish hues of *humulis* and herewith referred to that race, are nevertheless paler and more grayish than coastal specimens in comparable pelage, a tendency which I interpret as intergradation of *humulis* with *virginianus*. Similarly, toward the west the characters of *humulis* grade into those of *merriami*; specimens from western Florida and from Alabama are grayer than those from coastal South Carolina. In the series of specimens before me, arranged from west to east, the greatest break in coloration comes in eastern Louisiana, at about the Mississippi River. Examples from localities west of the river are gray; those from stations to the east are more reddish. Accordingly, specimens from Hackley and Baton Rouge are referred to *humulis*; those from Lafayette and Mermentau are included with *merriami*. The few specimens at hand from the northwestern extreme of the range of the race (Ohio) are similar to examples from localities nearer the center of its range (from stations in Florida and North Carolina, for example).

The distribution of the cranial features here considered to be characteristic of *humulis* is dissimilar to the distribution of the color characters of that race. Whereas the rufescent upper parts and all other characters of coloration are well developed in the series from Florida, coastal South Carolina, North Carolina, and the Dismal Swamp area of Virginia, the relatively small, shallow, narrow skull, with a small brain case and with a narrow spread of zygomata, is characteristic only of the specimens from South Carolina, Florida, and Alabama. Those from northern North Carolina (Raleigh and Currituck) and parts of southern Virginia (Dismal Swamp and, to a lesser extent, Konnarock and Blacksburg) have the larger broader skull, with broad, deep brain case and relatively broadly spread zygomata characteristic of *virginianus*. The external and cranial characters of *humulis*, thus, appear to have common centers of distribution (South Carolina, coastal Georgia, and Florida), but to have different geographic limits to their distribution.

Specimens from LeConte plantation near Riceboro, Georgia, the type locality of *Reithrodontomys lecontii* (described as *Mus LeContii* Audubon and Bachman, 1842: 307-8) are to me indistinguishable from topotypes of *humulis* and are accordingly designated by the latter name. The smallness of ears ascribed to topotypes of *impiger* Bangs (1898: 167) from White Sulphur Springs, West Virginia, apparently is in reality attributable to shrinkage. Those specimens are matched in detail with topotypes of *humulis*, and measurements of the ear taken on fresh specimens recently collected about eight miles west of White Sulphur Springs (near Lewisburg) are identical or larger than similar measurements of specimens from southwestern Virginia (Konnarock), Louisiana (Hackley), and Florida (Gainesville). In other details, also, topotypes of *impiger* fall well within the range of variation of *humulis*. I have seen no specimens from the type locality of *Reithrodontomys dickinsoni* Rhoads (1895: 589-90), Willow Oak, Pasco County, Florida, but because specimens from near that locality are similar to individuals from Alabama (*vide* Howell, 1914: 20) and because examples from more northern and more southern localities (Gainesville and Ritta) are referable to *humulis*, it seems safe to assume similarity of topotypes of *dickinsoni* and *humulis*.

Mus carolinensis Audubon and Bachman is retained in the synonymy of *Reithrodontomys h. humulis*, where it was relegated by Osgood (1907: 49). Previously, Allen (1895: 116) included it under *lecontii*, a name which, he believed, should take precedence over *humulis*. As Osgood and Allen pointed out, there is basis for rejecting *Mus carolinensis* as indeterminate. The diagnostic characters ascribed to that form by its authorities will apply to both *Reithrodontomys* and *Peromyscus*, but exclusively to neither.

SPECIMENS EXAMINED.—A total of 208 specimens from localities as follows:

Alabama: Autauga Co., Autaugaville, 1 (U.S.F.W.S.); Clarke Co., Carlton, 2 (U.S.F.W.S.), Jackson, 2 (U.S.F.W.S.); Clay Co., Dean, 1 (U.S.F.W.S.); Lee Co., Auburn, 3

(U.M.M.Z.); Montgomery Co., Barachias, 5 (U.S.F.W.S.); Sumter Co., York, 4 (U.S.F.W.S.).

Florida: Alachua Co., vicinity of Gainesville, 17 (11, M.C.Z.; 6, S.); Baker Co., Glen Saint Mary, 1 (U.S.F.W.S.); Marion Co. (?), Ocala National Forest, 3 (U.S.F.W.S.); Marion Co., Silver Springs, 1 (U.S.F.W.S.); Okaloosa Co., Crestview, 1 (U.S.F.W.S.); Palm Beach Co., Ritta, 1 (U.S.F.W.S.); Putnam Co., 1 mile south of Welaka, 1 (U.M.M.Z.); Wakulla Co., St. Marks, 1 (U.S.F.W.S.).

Georgia: Liberty Co., near Riceboro, LeConte plantation, 6 (U.S.F.W.S.); Liberty Co., 1 (U.M.M.Z.).

Louisiana: East Baton Rouge Parish, vicinity of University, 5 (L.S.U.); Washington Parish, Hackley, 5 (F.M.).

North Carolina: Currituck Co., Currituck, 25 (14, A.N.S.P.; 7, C.M.; 4, U.S.F.W.S.); Madison Co., Marshall, 1 (C.M.); Perquimans Co., Chapanoke, 1 (U.S.F.W.S.); Wake Co., Raleigh, 21 (4, U.M.M.Z.; 17, U.S.F.W.S.).

Ohio: Adams Co.: Rome [= Stout], 2 (C.M.); Clermont Co., 4 (G.); Fairfield Co., Hocking Township, 1 (O.S.); Hamilton Co., 1 (G.); Scioto Co., Nile Township, 1 (O.S.).

South Carolina: Abbeville Co., vicinity of Abbeville, 5 (C.); Charleston Co., vicinity of Charleston, 20 (C.).

Tennessee: Carter Co., three miles south-southwest of Roan Mountain (town), 1 (U.M.M.Z.); Jefferson Co., 1 (C.M.).

Virginia: Campbell Co., Lynchburg, 1 (U.M.M.Z.); Montgomery Co., vicinity of Blacksburg, 24 (23, U.M.M.Z.; 1, V.P.I.); Norfolk Co., near Wallaceton, Dismal Swamp, 10 (U.S.F.W.S.); Russel Co., Cleveland, 1 (U.M.M.Z.); Smyth Co., one-half mile east of Konnarock, 3 (U.M.M.Z.); Washington Co., Konnarock, 12 (U.M.M.Z.); Wise Co., two miles northeast of Wise, Hurricane, 1 (V.P.I.); six miles north of Wise, 2 (U.M.M.Z.).

West Virginia: Greenbrier Co., one mile west of Lewisburg, 2 (U.M.M.Z.); White Sulphur Springs, 6 (U.S.F.W.S.); Wayne Co., Ceredo, 1 (U.S.F.W.S.).

Reithrodontomys humulis virginianus Howell

Reithrodontomys humulis virginianus Howell (1940: 346). Virginia, Amelia County, Amelia Court House.

DISTRIBUTION.—Nonforested lands, particularly those under cultivation for grain crops, of the Piedmont and coastal plains of eastern Virginia and southwestern Maryland. Known from the vicinity of Triplett, Brunswick County, Virginia, north to Takoma Park (near Washington, D. C.), Maryland (Map 1).

CHARACTERS AND COMPARISONS.—Dorsal coloration of unworn, adult winter pelage grayish cinnamon—gray on the shoulders and darker and more brownish along the middle of the back, forming a moderately distinct stripe; of fresh subadult pelage pale brownish gray with little or no darker mid-dorsal stripe. Skull comparatively large, the brain case deep (depth of cranium averages about 44 per cent of the condylo-basal length).

Compared with *humulis*, fresh or worn, adult winter pelage grayer dorsally, the sides and shoulders a buffy gray, the mid-back dark gray (not distinctly or so evenly rufescent over the back and sides as in *humulis*). Unworn subadult pelage paler, particularly on the sides and shoulders (the subterminal bands of the cover hairs there obscured less by the black overhairs); cranium relatively deeper, and breadth across zygomata actually and relatively greater.

COLOR.—In fresh adult winter pelage upper parts near Wood Brown or Cinnamon, a visual effect produced by the blending of the blackish, the Pinkish Cinnamon or Pinkish Buff, and the Dark Mouse Gray of, respectively, the terminal bands of the overhairs and of the terminal and basal bands of the cover hairs. Vertebral region of back near Hair Brown, forming a fairly distinct dorsal stripe about one-half to one centimeter wide extending from the forehead to the base of the tail and blending gradually with the paler and grayer sides and head. A tuft before each ear and the lower parts of the sides clear Pinkish Cinnamon, sometimes forming a lateral line along the sides. Ears blackish. Tail distinctly bicolor, dark brown above (about Fuscous), whitish below. Underparts, excepting chin and throat, grayish white or buffy (hairs Dark Mouse Gray basally and white or Pinkish Buff distally); chin, throat, and upper surfaces of feet white.

In unworn subadult pelage pattern essentially the same as in the adult pelage, but with different amounts of blackish and cinnamon pigments; the former relatively more abundant than the latter, effecting a darker and grayer appearance to the upper parts.

MEASUREMENTS.—Averages and extremes of four young adults from Amelia, Virginia: total length, 122 (116–125); tail vertebrae, 53 (47–57); hind foot, 16.0 (15.5–17.0); condylobasal length of skull, 17.0 (16.9–17.1); depth of cranium, 7.6 (7.4–7.7); zygomatic breadth, 9.7 (9.4–10.1); breadth of rostrum, 3.5 (3.3–3.5); interorbital constriction, 2.9 (2.8–2.9); nasal length, 7.0 (6.5–7.5); length of incisive foramen, 3.7 (3.6–3.7); length of hard palate, 3.2 (3.1–3.4); alveolar length of molar row, 2.9 (2.9).

REMARKS.—Intergradation of *virginianus* with *humulis* is indicated in the material from western Virginia. Specimens from Lynchburg, Blacksburg, and Konnarock, for example, are larger and paler (more grayish) than coastal specimens of *humulis*, but, nevertheless, are best included with that race. The series from White Sulphur Springs, West Virginia, is likewise slightly paler than toponotypical *humulis*, but is here referred to that race because of the strongly reddish tones and relatively shallow cranium characteristic of *humulis*. In some areas the transition in color characters from *virginianus* to *humulis* takes place in a short distance. Specimens from Triplett, Virginia, for example, are referable to *virginianus*; those from a locality about eighty miles to the east near Dismal Swamp (Wallaceton) are clearly *humulis*.

The distributional limits of the cranial and external characters of *virginianus* do not correspond. The grayish shoulders and other characters of coloration are principally limited to eastern Virginia (essentially the range of *virginianus* as shown on Map 1). The deep, broad cranium, however, is present not only in the specimens from that area, but also in those from extreme southeastern Virginia (Dismal Swamp) and northeastern North Carolina (Currituck, Chapanoke, and, to a lesser extent, Raleigh), where the specimens exhibit the color

characters of *humulis*, not those of *virginianus*. The distributions of the cranial and the external characters appear to be clear-cut and to grade independently into those of the adjoining race, *humulis*.

SPECIMENS EXAMINED.—A total of fifty-five specimens from localities as follows:

Maryland: Prince Georges Co., Takoma Park, 1 (U.S.-F.W.S.).

Virginia: Amelia Co., Amelia Court House, 38 (1, U.M.-M.Z.; 24, V.P.I.; 13, U.S.F.W.S.), Truxillo, 3 (U.S.F.W.S.); Brunswick Co., vicinity of Triplett, 11 (9, U.M.M.Z.; 2, V.P.I.); Fairfax Co., Alexandria, 1 (U.S.F.W.S.); Falls Church, 1 (U.S.F.W.S.).

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