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In preparing maps showing the geographic distribution of North American microtines, conflicting statements in the literature and identifications that, if accepted, would result in improbable geographic ranges have led to the examination of pertinent specimens with the results given below. The studies here reported upon were aided by a contract between the Office of Naval Research, Department of the Navy, and the University of Kansas (Nr 161-791), by funds provided by the University of Kansas from its Research Appropriation, and by grants for out-of-state field work from the Kansas University Endowment Association. Grateful acknowledgment is made to persons in charge of the collections at each of the following institutions for permission to use the collections under their charge: Biological Surveys Collection, United States National Museum (herein abbreviated USBS); California Museum of Vertebrate Zoology (MVZ); Chicago Natural History Museum (CNHM); University of Kansas Museum of Natural History (KU); Museum of Comparative Zoology (MCZ); United States National Museum (USNM); Department of Economic Zoology, University of Wisconsin (UWDEZ); and Zoological Museum, University of Wisconsin (UWZM).

Synaptomys cooperi saturatus Bole and Moulthrop

1942. *Synaptomys cooperi saturatus* Bole and Moulthrop, Sci. Publs. Cleveland Mus. Nat. Hist., 5:149, September 11, type from Bloomington, McLean County, Illinois.

When Bole and Moulthrop named *Synaptomys cooperi saturatus*, with type locality in Illinois, they, in effect, divided the geographic range of *Synaptomys cooperi stonei* into two parts (see A. B. Howell, N. Amer. Fauna, 50:10 (fig. 2), August 5, 1927) since Bole and Moulthrop (*op. cit.*) did not assign to any subspecies the specimens from southern Wisconsin that Howell (*op. cit.*) had identified as *S. c. stonei*. Bole and Moulthrop's inclusion in their newly named subspecies of a specimen from as far west as East Columbia, Missouri, left in doubt the subspecific identity of specimens from Iowa and a specimen from Arkansas. Howell (*op. cit.*) had assigned this material from Iowa and Arkansas to *S. c. gossii*.

Howell recognized that the one individual (168266 USBS) from Lake City, Arkansas, was too young to be identified to subspecies with certainty and assigned the specimen to *S. c. gossii* "upon geographical grounds" (*op. cit.*:19). Keith R. Kelson and one of us (Hall) compared this specimen with pertinent materials. As a result of this comparison we refer the specimen, on the same grounds employed by Howell, to *Synaptomys cooperi saturatus*.

Specimens from approximately the southern half of Wisconsin (from Kelly Lake southward) were referred to *S. c. stonei* by Howell (*op. cit.*:16). Now that *S. c. saturatus* has been recognized, these specimens from southern Wisconsin would be expected to be referable to *S. c. saturatus*. When these specimens were examined and compared (by Hall and Kelson) with other specimens in the United States National Museum the skulls were found to be much larger than in *S. c. cooperi*, smaller than in *S. c. gossii*, and nearly the size of those of *Synaptomys cooperi saturatus*, to which subspecies we refer the specimens in question.

Howell (*op. cit.*:16) referred a specimen from Cassopolis, Michigan, a locality that might

be presumed to fall within the range of the more recently named *S. c. saturatus*, to *S. c. stonei*. Bole and Moulthrop did not mention this specimen when they described and named *S. c. saturatus* (1942). Neither did Burt, but Cassopolis is within the geographic range ascribed to *S. c. cooperi* on his map (The Mammals of Michigan, Univ. Michigan Press, p. 213, 1946). Examination (by Kelson and Hall) of the specimen (41777 MCZ) reveals that it resembles *S. c. cooperi* in shortness of hind foot (18 mm.), shortness of tail (18 mm.), narrowness across zygomata (16 mm.), and grayish pelage. In the long braincase, heavy rostrum, greater condylobasilar length, greater lambdoidal breadth, long rostrum, and longer incisive foramina, it agrees closely with specimens of *S. c. saturatus*, to which subspecies we refer the specimen.

Necker and Hatfield (Bull. Chicago Acad. Sci., 6:54, 1941) referred specimens from Rosiclaire, Illinois, to *S. c. gossii*. These specimens were not mentioned by Bole and Moulthrop (*op. cit.*) when they named *S. c. saturatus* although the specimens presumably would be referred to the newly-named subspecies. We have examined the pertinent specimens (Nos. 15781-15786 and 16049-16054 CNHM) and find that on the basis of dark color, long and slender skull, heavy incisors, and small cheek-teeth, they are referable to *S. c. saturatus* Bole and Moulthrop. None, however, has a tail so short as the type of *S. c. saturatus*. For that matter, the average length of the tail of six near topotypes (5 mi. W, 2½ mi. S Monticello, Piatt County, Illinois, Nos. 32037-32042 KU) exceeds that of the type (17.4 mm., range 12-20, as compared to 14 mm. for the type).

Synaptomys cooperi gossii (Coues)

1877. *Arvicola (Synaptomys) gossii* Coues, Monogr. N. Amer. Rodentia, p. 235 (published as a synonym of *Synaptomys cooperi*, but name stated to apply to Kansan specimens of which description and measurements are on p. 236), type from Neosho Falls, Woodson County, Kansas.

1897. *Synaptomys cooperi gossii*, Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 49:307, June.

In view of the taxonomic treatment accorded by Bole and Moulthrop (Sci. Publs. Cleveland Mus. Nat. Hist, 5:149-151, September 11, 1942) to the lemming mice of the species *Synaptomys cooperi*, as explained in the preceding account, it has seemed desirable to examine Iowan specimens of this species. Hall and Kelson examined the necessary material and made the following conclusions. An adult male from Hillsboro (168453 USBS) has the lighter color and large skull of *S. c. gossii* to which Howell (N. Amer. Fauna, 50:19, August 5, 1927) referred the specimen. The more western specimen from Knoxville, a young male (190358 USNM), is almost exactly the same age as a male of *S. c. saturatus* from Bascom, Indiana (143701 USNM), and is but slightly older than a male *S. c. gossii* from Ft. Leavenworth, Kansas (91583 USBS). The upper molariform tooth-row is the same length in the specimens from Kansas and Iowa, but is longer in that from Indiana. The fact that the specimen from Knoxville closely resembles the Kansan specimen in other dimensions of the skull, which is larger than in the specimen from Indiana, gives a basis for applying the name *Synaptomys cooperi gossii* to the specimen from Knoxville. This is the same name recently used by Fichter and Hansen (Bull. Univ. Nebraska State Mus., 3(2):2, September, 1947) for the Iowan specimens, although they seemingly applied the name without being aware of Bole and Moulthrop's earlier naming of *S. c. saturatus* (Sci. Publs. Cleveland Mus. Nat. Hist., 5:149, September 11, 1942).

Synaptomys borealis sphagnicola Preble

1899. *Synaptomys (Mictomys) sphagnicola* Preble, Proc. Biol. Soc. Washington, 13:43, May 29, type from Fabyans, Coos County, New Hampshire.

1927. *Synaptomys borealis sphagnicola*, A. B. Howell, N. Amer. Fauna, 50:30, August 5.

Howell (N. Amer. Fauna, 50:30-31, August 5, 1927) had only eight specimens of this subspecies available when he revised the genus *Synaptomys*. Of these eight (Maine: Mount Katahdin, 2; New Brunswick: Near Bathurst, 1; New Hampshire: Fabyans, 1, the type; Quebec: St. Rose, 4), only the type and one of the specimens from St. Rose are adults. Concerning the others, Howell wrote (*op. cit.*:31): "The example from near Bathurst is not adult and has a damaged skull, so is identified provisionally. All other specimens are too young for positive diagnosis."

Since Howell's revision only one additional specimen has been reported. Anderson (Ann. Rept. Provancher Soc. for 1939, p. 71, 1940) reported it from Table Mountain, 3888 ft., Gaspé County, Quebec.

In the collection of the University of Kansas Museum of Natural History there is still another specimen. It is an adult male topotype (No. 6483 KU, formerly No. 72 in the collection of Alfred E. Preble) obtained on August 21, 1905, at Fabyans, New Hampshire.

The measurements of this specimen are as follows (measurements in parenthesis are those of the type as given by Howell, *op. cit.*): Total length, 135 (132); tail, 26 (24); hind foot, 22 (20); condylobasilar length, 25.1 (25.8); rostral length, 6.5 (6.8); rostral breadth, 4.7 (4.9); interorbital breadth, 3.3 (2.8); zygomatic breadth, 15.4 (16.0); lambdoidal breadth, 12.1 (12.4); incisive foramina, 5.9 (5.7); height of skull, 9.1 (9.3).

Howell (*op. cit.*:30) characterized *S. b. sphagnicola* as: "Large and high [skull] with narrow interorbital sharply ridged, the ridges of the type being joined for a distance of 4 millimeters; interparietal narrow and rectangular. The rostrum is long, tapering very little, and the nasals, slightly constricted medially are quite narrow posteriorly. The incisive foramina are long and wide." Howell further stated (*op. cit.*:30-31) that: "It is hard to predict what will be found to constitute the most valuable cranial characters in distinguishing this race from adult *medioximus*. The discernible differences now are in the shape of the interparietals, rostral characters, and interorbital differences that will probably not hold good when animals of the same age are compared."

As can be seen from a comparison of the measurements given above for the type and the topotype, some of the characteristics given by Howell are not found in the topotype: The interorbital region is not narrow (in fact it is wider than it ordinarily is in some other subspecies of *Synaptomys borealis*) and the incisive foramina are not longer than in other subspecies of *Synaptomys borealis*.

As far as present material permits us to judge, *Synaptomys borealis sphagnicola* is characterized, cranially, by: Skull large; interorbital region sharply ridged (the ridges being joined for a distance of 4 mm. in the type and of 4.5 mm. in the topotype); rostrum long, tapering relatively little; nasals slightly constricted medially and unusually narrow posteriorly; interparietal narrow and rectangular.

Clethrionomys occidentalis caurinus (Bailey)

1898. *Evotomys caurinus* Bailey, Proc. Biol. Soc. Washington, 12:21, January 27, type from Lund, east shore Malaspina Inlet, British Columbia.

1935. *Clethrionomys gapperi caurinus*, Racey and Cowan, Rept. British Columbia Prov. Mus. for 1935, p. H 25.

Prior to 1935 *caurinus* was considered to be a monotypic species. In 1935 Racey and Cowan (Rept. British Columbia Provincial Museum for 1935, pp. H 25-H 26) examined material from southwestern British Columbia of *C. caurinus*, including a series of 24 specimens from Alta Lake, and compared it with *Clethrionomys gapperi occidentalis* and *C. g. saturatus*. They found *caurinus* to be distinct from *C. g. saturatus* but were "not convinced that *occidentalis* and *caurinus* both merit systematic recognition; should they prove to be indistinguishable, as the little available material indicates, *occidentalis* will take precedence on grounds of priority. It is our opinion that further study of the distribution of the genus in British Columbia will lead to the recognition of *occidentalis* as the form inhabiting coast-line and *saturatus* the interior of British Columbia" p. H 26. In the face of these opinions Racey and Cowan nevertheless recognized *caurinus* under the name *Clethrionomys gapperi caurinus* (Bailey).

In spite of the treatment by Racey and Cowan (*op. cit.*) of *occidentalis* and *caurinus* as subspecies of *C. gapperi*, later authors arranged *occidentalis* as a member of the "*californicus*" group although they retained *caurinus* in the *gapperi* group. For example, Davis (The Recent Mammals of Idaho, The Caxton Printers, pp. 307-308, 1939) assigned *C. caurinus* to the *gapperi* group, although he regarded *C. caurinus* as a species (not a subspecies). He regarded also *C. occidentalis* as a species (not a subspecies) but assigned it to the *californicus* group. Dalquest (Univ. Kansas Publ., Mus. Nat. Hist., 2:344, April 9, 1948) considered *occidentalis* to be conspecific with *Clethrionomys californicus* and wrote (*op. cit.*:101): "The *californicus* group, I feel, contains only the races of *Clethrionomys californicus*, while the *gapperi* group contains *C. gapperi* and its races, including *caurinus*, and possible other species." Dalquest gave no indication that he had examined any specimens of *caurinus*.

When Dalquest (*op. cit.*:344) arranged *occidentalis* and *californicus* as subspecies of the same species, he used the name combination *Clethrionomys californicus occidentalis* because he ignored, or was unaware of, the page priority of *occidentalis* over *californicus*. We regard the anterior position of *occidentalis* as nomenclatural priority and therefore employ *occidentalis* rather than *californicus* as the specific name.

Differences between the *gapperi* group and the *occidentalis* group include: postpalatal bridge (complete in both groups) truncate posteriorly in the *gapperi* group and with a median, posteriorly directed, spine in the *occidentalis* group (this character is not evident in all specimens; some *gapperi* have a spine, and some *occidentalis* have the spine much reduced); dentition of the *occidentalis* group is heavier; enamel pattern of M3 and m1 in *occidentalis* more simplified—the number of salient and re-entrant angles tends to be

reduced in adults of the *occidentalis* group.

An examination of specimens of *caurinus* (British Columbia: Mt. Seymour, 2 KU; Lund, Malaspina Inlet, 2 USBS; and Inverness, mouth Skeena River, 1 USBS), reveals that, in the presence of the median postpalatal spine and in the characters of the molars, *caurinus* agrees with the *occidentalis* group.

Clethrionomys occidentalis nivarius (Bailey)

1897. *Evotomys nivarius* Bailey, Proc. Biol. Soc. Washington, 11:136, May 13, type from northwest slope of Mount Ellinor, 4000 ft., Olympic Mts., Mason County, Washington.

The red-backed mouse of the Olympic Peninsula was originally accorded specific rank. Currently it stands in the literature as a subspecies of the wide-spread species *Clethrionomys gapperi* because Dalquest (Univ. Kansas Publ. Mus. Nat. Hist., 2:343, April 9, 1948) used the name-combination *Clethrionomys gapperi nivarius*. Taylor and Shaw had earlier (Occas. Papers Charles R. Conner Mus., 2:23, 1929) indicated the same status by using the name *Evotomys gapperi nivarius*. Davis (The Recent Mammals of Idaho, The Caxton Printers, Caldwell, Idaho, p. 306, April 5, 1939), however, indicated that the affinities of *nivarius* were with the *californicus* [= *occidentalis*] group, although he treated *nivarius* as a distinct species. We have examined two adult females (K. U. Nos. 10707 and 10708) of *nivarius* from Reflection Lake, 3800 ft., Jefferson County, Washington, and on the basis of their thick, instead of thin, pterygoid processes concur with Davis that the affinities of *nivarius* are with the named kinds of *Clethrionomys* now arranged as subspecies of *Clethrionomys occidentalis*, rather than with the kinds now arranged as subspecies of *Clethrionomys gapperi*. Although we are aware that Dalquest (*op. cit.*:101-102) did not find actual intergradation between *nivarius* and *Clethrionomys occidentalis occidentalis*—a ten-mile gap separated their ranges—we prefer to use the name combination *Clethrionomys occidentalis nivarius*. In doing so we recognize that intergradation ultimately may be found between the two species *C. occidentalis* and *C. gapperi*; in that event the name *gapperi* will apply as the name of the species because it has priority over *occidentalis*.

The following named kinds of *Clethrionomys* are considered to be subspecies of *Clethrionomys occidentalis*:

Clethrionomys occidentals occidentalis (Merriam).

1890. *Evotomys occidentalis* Merriam, N. Amer. Fauna, 4:25, October 8, type from Aberdeen, Chehalis County, Washington.

1894. *Evotomys pygmaeus* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, p. 284, October 23, type from mouth of Nisqually River, Pierce County, Washington.

1929. *Evotomys gapperi occidentalis*, Taylor and Shaw, Occas. Papers Charles R. Conner Mus., Washington State College, 2:23.

1948. *Clethrionomys californicus occidentalis*, Dalquest, Univ. Kansas Publ., Mus. Nat. Hist., 2:344, April 9.

Clethrionomys occidentalis californicus (Merriam).

1890. *Evotomys californicus* Merriam, N. Amer. Fauna, 4:26, October 8, type from Eureka, Humboldt County, California.

Clethrionomys occidentalis caurinus (Bailey).

1898. *Evotomys caurinus* Bailey, Proc. Biol. Soc. Washington, 12:21, January 27, type from Lund, east shore of Malaspina Inlet, British Columbia.

1935. *Clethrionomys gapperi caurinus*, Racey and Cowan, Rept. British Columbia Prov. Mus. for 1935, p. H 25.

Clethrionomys occidentalis mazama (Merriam).

1897. *Evotomys mazama* Merriam, Proc. Biol. Soc. Washington, 11:71, April 21, type from Crater Lake, 7000 ft., Mount Mazama, Klamath County, Oregon.

1936. *Clethrionomys californicus mazama*, Bailey, N. Amer. Fauna, 55:192, August 29.

Clethrionomys occidentalis nivarius (Bailey).

1897. *Evotomys nivarius* Bailey, Proc. Biol. Soc. Washington, 11:136, May 13, type from northwest slope of Mount Ellinor, 4000 ft., Olympic Mts., Mason County,

Washington.

CLETHRIONOMYS OCCIDENTALIS OBSCURUS (Merriam).

1897. *Evotomys obscurus* Merriam, Proc. Biol. Soc. Washington, 11:72, April 21, type from Prospect, 2600 ft., upper Rogue River Valley, Jackson County, Oregon.

1933. *Clethrionomys mazama obscurus*, Grinnell, Univ. California Publ. Zool., 40:185, September 26.

1936. *Clethrionomys californicus obscurus*, Bailey, N. Amer. Fauna, 55:192, August 29.

Clethrionomys gapperi pallescens, new name

1940. *Clethrionomys gapperi rufescens* R. W. Smith, Amer. Midland Nat., 24:233, July, type from Wolfville, Kings County, Nova Scotia (*nec Arvicola rufescens* de Selys Longchamps, 1836, from Longchamps-sur-Ger, Belgium).

The name *rufescens*, as applied by R. W. Smith (Amer. Midland Nat., 24:233, July, 1940) to the red-backed mouse of Nova Scotia, seems to be unavailable under the rules of the International Code of Zoological Nomenclature, since it is a homonym of *Arvicola rufescens* de Selys Longchamps, 1836, which in turn is a synonym of *Clethrionomys glareolus glareolus* Schreber, 1780 (Ellerman and Morrison-Scott, Checklist of Palaearctic and Indian Mammals, 1758 to 1946, p. 663, November 19, 1951).

Clethrionomys gapperi phaeus (Swarth)

1911. *Evotomys phaeus* Swarth, Univ. California Publ. Zool., 7:127, January 12, type from Marten Arm, Boca de Quadra, Alaska.

When Swarth (*loc. cit.*) named the red-backed mouse of the mainland of southern Alaska as a new subspecies, he characterized it as "Size rather large. Differs from *E.* [= *Clethrionomys*] *wrangeli*, nearest it geographically, in cranial characters and in much longer tail; from *E. caurinus*, the species to the southward in British Columbia, in larger size and longer tail." He remarked (*loc. cit.*): "I had supposed that the red-backed mouse occurring on the mainland coast of this region would prove to be *E. wrangeli*, but the latter appears to be purely an insular species. I have had no specimens of that race for comparison, but the *Evotomys* secured differ so widely from it in all the essential peculiarities of the species as given in the published descriptions that there seems little doubt of their belonging to a different species. *Wrangeli* has a short tail, less than twice as long as the hind foot—in adults of *phaeus* the tail is invariably more than twice the length of the foot, frequently more than a third of the entire length of the animal."

The external and cranial measurements of two subadults in the United States National Museum (No. 217413 from Quadra Lake and No. 217415 from Marten Arm, Boca de Quadra, taken in mid-February) and three old adults from Fort [= Port] Simpson, British Columbia (Nos. 90263-90264, 90272 USBS), are almost the same as those given by Swarth in the original description of *Clethrionomys phaeus*.

In cranial measurements, as well as in the structure of the palate and last upper molar, *C. phaeus* agrees with the *gapperi* group (to which it has been assigned by Davis, The Recent Mammals of Idaho, The Caxton Printers, p. 306, April 5, 1939, and by Orr, Jour. Mamm., 26:69, February 12, 1945) and differs from *Clethrionomys occidentalis caurinus* (which was assigned above to the *occidentalis* group, formerly the *californicus* group).

Since the measurements of specimens examined by us, as well as those recorded by Swarth (*op. cit.*), fall within the range of those of the species *Clethrionomys gapperi*, and since the differences between *phaeus* and *C. g. saturatus* are of the kind and degree that separate subspecies in *C. gapperi* we employ the name combination *Clethrionomys gapperi phaeus* (Swarth). *C. g. saturatus*, as understood by us, occurs to the southeast of *C. g. phaeus* in the Rocky Mountains of British Columbia, and in northeastern Washington, northern Idaho and northwestern Montana.

Specimens examined.—Total, 23, distributed as follows: Alaska: Chickamin River (Behm Canal), 15 (MVZ); Boca de Quadra, 3 (MVZ); Marten Arm, Boca de Quadra, 1 (USNM); Quadra Lake, 1 (USNM). British Columbia: Fort [= Port] Simpson, 3 (USBS).

Clethrionomys gapperi wrangeli (Bailey)

1897. *Evotomys wrangeli* Bailey, Proc. Biol. Soc. Washington, 11:120, May 13, type from Wrangell, Wrangell Island, Alaska.

When Bailey (*loc. cit.*) named the red-backed mouse from Wrangell Island, Alaska, he characterized it as "A large, dull-colored species entirely distinct from any known form," and remarked: "In no way does *E.* [= *Clethrionomys*] *wrangeli* show a close relationship to any other American species. In size and relative proportions it comes closest to *E. dawsoni*, from which it differs widely in coloration and more widely in cranial characters. With the long-tailed species south and east of its range there is no need of comparison."

Swarth (Univ. California Publ. Zool., 24:173, June 17, 1922) reported that three specimens from Flood Glacier and 23 from Great Glacier, British Columbia, and four from Sergief Island, at the mouth of the Stikine River, Alaska, were: "All *E. wrangeli*, indistinguishable from specimens at hand from Wrangell Island." Swarth further reported that, although he found no intergradation between *Clethrionomys wrangeli* from Flood Glacier and the nearly adjacent *Clethrionomys rutilus dawsoni*, "the two species, however, resemble each other so closely in form, and in some pelages in color also, that *wrangeli* would seem to be a coastal offshoot of *dawsoni*...."

Davis (The Recent Mammals of Idaho, The Caxton Printers, p. 306, April 5, 1939) and Orr (Jour. Mamm., 26:69, February 12, 1945) more recently have shown that *Clethrionomys wrangeli* is not a member of the *rutilus* group (to which *C. dawsoni* belongs) but is a member of the *gapperi* group.

Our comparisons of a series of eight topotypes of *wrangeli* (all in the Biological Surveys Collection) with several subspecies of *Clethrionomys gapperi* (including *phaeus*, *saturatus*, *galei*, *brevicaudus*, and others) reveal that the differences seen in *wrangeli* are of the kind and degree that serve to separate subspecies. The red-backed mouse from Wrangell Island, then, should stand as *Clethrionomys gapperi wrangeli* (Bailey).

Specimens examined.—Total, 31, distributed as follows: **Alaska**: Wrangell, Wrangell Island, 27 (19 MVZ., 8 USBS); Sergief Island at mouth of Stikine River, 4 (MVZ).

Clethrionomys gapperi solus, new subspecies

Type.—Male, adult, skin and skull, No. 74939, Biological Surveys Collection, United States National Museum; from Loring, Revillagigedo Island, Alaska; obtained on September 22, 1895, by C. P. Streator; original No. 4980.

Range.—Known only from two localities on Revillagigedo Island, Alaska.

Diagnosis.—A short-tailed, dark-colored member of the *gapperi* group. Dorsal stripe wide, between Chestnut and Bay (capitalized color terms after Ridgway: Color Standards and Color Nomenclature. Washington, D. C., 1912), with slight mixture of black-tipped hairs; sides and venter heavily washed with Ochraceous-Tawny. Skull flattened; rostrum proportionately short and wide; auditory bullae relatively uninflated.

Comparisons.—From topotypes of *Clethrionomys gapperi wrangeli*, *C. g. solus* differs as follows: dorsal stripe wider and slightly brighter; sides brighter; venter more heavily washed with Ochraceous-Tawny (heavy wash in all 13 *C. g. solus* examined; in *C. g. wrangeli* no wash in 11, slight wash in 16, and heavy wash in only one); nasals, alveolar extent of upper cheek-teeth and incisive foramina shorter; skull shallower when measured with tympanic bullae included; rostrum averages slightly broader.

From *C. g. phaeus* of the adjacent mainland, *C. g. solus* differs in: dorsal stripe slightly darker; ventral wash more prominent; tail shorter; skull smaller in all parts measured except that nasals are approximately the same length, auditory bullae notably smaller and teeth notably narrower.

Measurements.—External and cranial measurements of adults are shown in table 1.

Remarks.—Bailey (Proc. Biol. Soc. Washington, 11:120, May 13, 1897) referred 17 specimens from Loring to his newly named species, *E. wrangeli* [= *Clethrionomys gapperi wrangeli*] but based his description on specimens from Wrangell Island. He pointed out (*loc. cit.*) that all of the specimens from Loring had the "bellies strongly washed with buffy-ochraceous, while more than half of those from Wrangell have whitish bellies."

Specimens examined.—Total, 13, all in the Biological Surveys Collection, U. S. National Museum, from the following localities: **Alaska**: Revillagigedo Island: Loring, 10; mouth of Fish Creek, Ketchikan, 3.

Clethrionomys gapperi stikinensis, new subspecies

Type.—Male, adult, skin and skull, No. 30735, Museum of Vertebrate

Zoology, University of California; from Stikine River at Great Glacier, British Columbia; obtained on August 13, 1919, by J. Dixon; original number 7691.

Range.—Known only from the lower Stikine River Valley of British Columbia and the Cleveland Peninsula of Alaska.

Diagnosis.—A medium-sized, dark-colored member of the *gapperi* group. Dorsal stripe wide, near Auburn with mixture of black-tipped hairs; sides and venter washed with Ochraceous-Tawny. Skull small; cheek-teeth narrow; auditory bullae relatively uninflated.

Comparisons.—From topotypes of *Clethrionomys gapperi wrangeli*, *C. g. stikinensis* differs as follows: dorsal stripe slightly wider and brighter; sides slightly duller (lacking the olivaceous wash of *C. g. wrangeli*); all cranial measurements taken averaging smaller except height of skull, which is approximately the same; alveolar length of upper tooth-row and length of incisive foramina notably shorter; auditory bullae less inflated; cheek-teeth much narrower.

From topotypes of *C. g. phaeus*, *C. g. stikinensis* differs as follows: dorsal stripe and sides darker; auditory bullae less inflated; cheek-teeth narrower; skull smaller in most measurements taken (see table 1).

From topotypes of *C. g. solus*, *C. g. stikinensis* differs as follows: dorsal stripe lighter (more tawny underwash); ventral wash of buffy much paler (especially noticeable around mouth and on throat); zygomatic and lambdoidal breadths greater; skull deeper; auditory bullae more inflated; cheek-teeth slightly heavier.

TABLE 1. *External and cranial measurements of Clethrionomys.*

Number of individuals averaged of each sex or specimen measured	Total length	Tail	Hind foot	Condy-lobasilar length	Zygomatic breadth	Lambdoidal breadth	Length of nasals	Alveolar length of upper tooth-row	Breadth of rostrum	Length of incisive foramina	Height of skull
Clethrionomys gapperi solus, Loring											
♂type	133	33	20	22.3	12.5	10.9	6.8	5.1	3.4	5.3	9.0
♂ 5 av.	131	34	20	22	12.7	10.8	6.8	5.3	3.5	5.1	9.1
min.	128	33	19	21.8	12.5	10.5	6.7	5.1	3.3	5.0	8.9
max.	133	36	20	22.3	13.0	11.2	7.1	5.5	3.6	5.3	9.5
♀ 5 av.	128	34	19	21.3	12.5	10.5	6.5	5.4	3.5	4.9	9.2
min.	124	31	19	20.9	12.3	10.3	6.0	5.2	3.3	4.8	8.9
max.	140	36	20	21.7	12.7	10.7	7.0	5.6	3.6	5.0	9.5
Clethrionomys gapperi stikinensis, Stikine River at Great Glacier											
♂ type	145	39	20	23.2	13.9	11.4	7.3	5.0	3.1	5.5	9.5
♂ 4 av.	136	5	20	22.2	13.0	11.1	6.8	5.2	3.4	5.2	9.4
min.	132	33	19	21.5	12.3	10.7	6.5	5.0	3.1	5.1	9.1
max.	145	39	20	23.2	13.9	11.4	7.3	5.6	3.5	5.5	9.7
♀ 7 av.	134	33	19	21.8	12.7[6*]	10.9	7.0	5.4	3.4	5.1	9.5
min.	125	30	19	21.5	12.5	10.5	6.7	5.3	3.2	5.0	9.2
max.	147	35	20	22.2	12.9	11.3	7.1	5.6	3.7	5.3	9.8
Clethrionomys gapperi wrangeli, Wrangell											
♂9 av.	139	36	19	23.4[8]	13.3	11.4[8]	7.3	5.6	3.6	5.6	9.6[8]
min.	130	31	18	22.9	13.0	10.9	7.1	5.5	3.3	5.4	9.2
max.	151	43	20	23.9	13.7	11.8	7.6	5.8	4.0	5.8	10.1
♀ 16 av.	134	34	18[15]	23.2	13.3	11.2[13]	7.3	5.8	3.5	5.5	9.4
min.	123	28	17	22.4	12.6	10.7	6.9	5.5	3.2	5.2	9.0
max.	156	45	20	24.1	14.1	11.8	8.0	6.1	3.7	5.9	9.7
Clethrionomys gapperi phaeus, Chickamin River											
♂ 5 av.	148	47	20	23.0[4]	13.7[4]	11.3[4]	7.5[4]	5.3[4]	3.5[4]	5.3[4]	9.7[3]
min.	138	38	20	22.3	13.0	11.1	7.1	5.3	3.4	4.9	9.3
max.	159	51	21	23.8	14.6	11.8	7.7	5.6	3.8	5.6	10.0
♀ 4 av.	153	49	20	23.1[3]	13.4	11.2[3]	7.6[3]	5.2	3.7	5.3	9.6[3]
min.	140	44	20	22.4	12.8	10.8	7.3	5.0	3.4	5.1	9.2
max.	164	56	20	24.2	13.6	11.4	7.7	5.3	3.9	5.5	9.8

*Superior numbers denote the number of individuals averaged.

Measurements.—External and cranial measurements of adults are given in table 1.

Remarks.—Morphologically *C. g. stikinensis* shows greater resemblance to *C. g. solus* of Revillagigedo Island, than to the geographically adjacent subspecies *C. g. wrangeli* and *C. g. phaeus*. Possibly the original stock of *C. g. solus* was rafted to Revillagigedo Island from the Cleveland Peninsula.

Specimens examined.—Total, 29, all in the Museum of Vertebrate Zoology, University of California, distributed as follows: **British Columbia**: Stikine River at Great Glacier, 22; Stikine River at Flood Glacier, 3. **Alaska**: Bradfield Canal, 1; Helm Bay, 2.

Pitymys pinetorum scalopsoides (Audubon and Bachman)

1841. *Arvicola scalopsoides* Audubon and Bachman, Proc. Acad. Nat. Sci. Philadelphia, 1:97, type from Long Island, New York.

1912. *Pitymys pinetorum scalopsoides* Miller, U. S. Nat. Mus. Bull., 79:229, December 31.

Hanson (Trans. Wisconsin Acad. Sci., Arts, and Letters, 36:124, 1944) reported two pine mice from near Prairie du Sac, in Westpoint Township, Columbia County, Wisconsin, as *Pitymys pinetorum scalopsoides* but cast doubt upon their subspecific identity. He also reported pine mice from Blue Mounds, Dane County, Wisconsin. We have examined these specimens (Westpoint, Columbia County, 2—No. 544, skin only, UWDEZ, and No. 521, skin only, H. C. Hanson's private collection; Westpoint, Dane County, 1, No. 11620, UWZM; Vermont, Dane County, 2, Nos. 11674 and 11694, UWZM) and have compared them with topotypes of *P. p. schmidti*, and with specimens of *P. p. nemoralis* and *P. p. scalopsoides*. The specimens from Columbia and Dane counties differ from *P. p. schmidti* in the greater zygomatic breadth, and lesser height of skull. They differ from *P. p. nemoralis* of comparable age in shorter tooth-row and generally smaller skull. The interorbital region, however, is wider. In all of the features mentioned above, the specimens in question agree with *Pitymys pinetorum scalopsoides*, to which subspecies they are here referred.

Microtus pennsylvanicus aztecus (Allen)

1893. *Arvicola (Mynomes) aztecus* Allen, Bull. Amer. Mus. Nat. Hist., 5:73, April 28, type from Aztec, 5900 ft., San Juan County, New Mexico.

Allen (*loc. cit.*) described this species on the basis of two specimens from Aztec, New Mexico, and three from La Plata, New Mexico. He characterized it as "Size large; pelage very full and soft; tail short; skull very narrow.

"Above grayish brown with a tinge of pale buff; fur blackish plumbeous beneath the surface, tipped with pale yellowish brown, and varied with longer, projecting, black-tipped hairs; below grayish white, the fur plumbeous beneath the surface and tipped with white, giving a whitish gray effect. Feet dusky; tail dusky brown above, dull white below."

Allen identified as this species "a large *Arvicola* from Estes Park, Colorado, which I have before been unable to allocate. I am unable to find that it differs in any particular from the specimens from New Mexico." He pointed out also (*op. cit.*:73-74) that "The type and only positively identified specimen of Baird's *Arvicola modesta* [= *Microtus pennsylvanicus modestus* (Baird)] from Sawatche Pass, Colorado, is a very young specimen in poor condition. An examination of a series of adult and young examples from the type locality will be necessary in order to determine its relationships to *A. alticolus* [= *Microtus longicaudus alticolus* (Merriam)] and *A. aztecus*."

Bailey, in his revision of the American voles of the genus *Microtus* (N. Amer. Fauna, 17:20), showed *Arvicola modesta* Baird to be a subspecies of *Microtus pennsylvanicus* but retained *Microtus aztecus* (Allen) as a distinct species. In describing *M. aztecus* he wrote "the size similar to *M. pennsylvanicus*, but with shorter tail and larger hindfoot; skull long; braincase narrow; interparietal long ..." and remarked that "*Microtus aztecus* belongs to the *pennsylvanicus* group. Externally it is not very different from *modestus*, but none of the specimens show any signs of intergradation; and the skull characters are so well marked that there seems no doubt of its full specific rank."

Subsequent to the publication of Allen's (*op. cit.*) account and Bailey's account (*op. cit.*), additional material was collected that helps to clarify the relationships of *Microtus aztecus*. A comparison of six adult topotypes of *Microtus aztecus* with a series of nine adults of *M. p. modestus* from 1 mi. S, 2 mi. E Eagle Nest, 8100 ft., Colfax County, New Mexico, with three adults from 1½ mi. E Manassa, Conejos County, Colorado, and with four adults from Saguache County, Colorado (all in KU), reveals that the supposed "well

marked" external and cranial differences between the two forms are not nearly so evident as was indicated by Bailey.

The cranial differences that exist between these two forms (narrower nasals, slightly longer interparietal, slightly longer and narrower skull in *aztecus*) are evident only as averages. Although geographically intermediate specimens are lacking, the morphological differences between the two kinds of animals are of the degree and kind that separate subspecies, rather than species. We therefore judge *M. aztecus* (Allen) to be only subspecifically distinct from *M. pennsylvanicus modestus* and employ the name *Microtus pennsylvanicus aztecus*.

Microtus pennsylvanicus funebris (Dale)

1940. *Microtus pennsylvanicus funebris* Dale, Jour. Mamm., 21:338, August 14, type from Coldstream, 1450 ft., 3½ mi. SE Vernon, British Columbia.

Taylor and Shaw (Occas. Papers Charles R. Conner Mus., State College Washington, 2:24, December, 1929) list under *Microtus nanus* [= *montanus*] *canescens* material from Calispell Peak, Washington. Probably the basis for this record is a specimen in the Biological Surveys collection (adult male, 236474) taken on May 9, 1921, by G. G. Cantwell, and labelled as Calispell Peak, 9 mi. W Locke, 3500 ft., Pend Oreille County. An examination (by Hall and Kelson) of the specimen discloses that it is of the species *Microtus pennsylvanicus*, and that it falls within the geographic range ascribed to the subspecies *Microtus pennsylvanicus funebris* by Dalquest (Univ. Kansas Publ., Mus. Nat. Hist., 2:346, April 9, 1948).

Microtus oeconomus amakensis (Murie)

1930. *Microtus amakensis* Murie, Jour. Mamm., 11:74, February 11, type from Amak Island, Bering Sea, Alaska.

When Murie (Jour. Mamm., 11:75, February 11, 1930) named the meadow mouse from Amak Island, Alaska, as *amakensis*, he arranged it as a separate species. One of us (Hall) and K. R. Kelson examined the type and topotypes of *amakensis* in the Biological Surveys collection in the U. S. National Museum and compared them with series of *Microtus oeconomus operarius*, *M. o. sitkensis*, *M. o. elymocetes*, *M. o. yakutatensis*, and *M. o. kadiacensis*. Among the specimens examined of the latter subspecies were 17 from Izambek Bay, Kodiak Peninsula, on the mainland opposite Amak Island, the type locality of *amakensis*. The characters given by Murie (*op. cit.*) serve to separate *amakensis* from closely related neighboring kinds of meadow mice, but are of the degree and kind that, in this group of meadow mice, separate subspecies rather than species. Although actual intergrades are lacking, the animals from Amak Island are considered to be only subspecifically distinct and to belong to the *oeconomus* complex. The name *Microtus oeconomus amakensis* is applied to them.

Microtus longicaudus mordax (Merriam)

1891. *Arvicola* (*Mynomes*) *mordax* Merriam, N. Amer. Fauna, 5:61, July 30, type from Sawtooth (= Alturas) Lake, 7200 ft., east base of Sawtooth Mountains, Blaine County, Idaho.

1938. *Microtus longicaudus mordax*, Goldman, Jour. Mamm., 19:491, November 14.

Dalquest (Univ. Kansas Publ., Mus. Nat. Hist., 2:353, April 9, 1948) assigned all the meadow mice of the species *Microtus longicaudus* from approximately the eastern half of Washington State to *Microtus longicaudus halli* Hayman and Holt and, in doing so, excluded the subspecies *Microtus longicaudus mordax* from that state. This assignment of specimens in Washington had the effect of separating the geographic range of *M. l. mordax* into two parts. One part was in south-central British Columbia and the other part was mainly in the Rocky Mountain region of the United States. Hall and Kelson examined specimens in the Biological Surveys collection in the U. S. National Museum in an attempt to determine more precisely the ranges of the subspecies in southern Canada, Washington, and Idaho.

Microtus longicaudus angustus [= *M. l. halli*] was described by one of us (Hall, Univ. California Publ. Zool., 37:13, April 10, 1931) as differing from *mordax* in narrower braincase, higher skull near the anterior end of the frontals, darker coloration, and seemingly smaller size. After examining the material in the U. S. National Museum no reason is seen at the present time to amend this characterization, except to add that some specimens of *M. l. mordax* are as dark as seasonably comparable specimens of *M. l. halli*.

Examination of specimens of *Microtus longicaudus* from Washington east of the Cascade Range (those from the Blue Mountain area excepted) discloses that the skulls do not differ

essentially from those of topotypes of *M. l. mordax*, but do differ, as outlined above, from near-topotypes of *M. l. halli*. There is considerable variation in color among the Washington-taken specimens of *Microtus longicaudus*. Animals from the eastern flanks of the Cascades average darker than those taken, north of the Snake River, still farther east in Washington. Possibly Dalquest (*op. cit.*) relied mainly upon this darker color in assigning the specimens from eastern Washington to *M. l. halli*. Relying principally upon cranial characters, we conclude that most of the specimens are better referred to *M. l. mordax* and that *M. l. halli* is restricted, in Washington, to the Blue Mountains.

Specimens examined of Microtus longicaudus mordax.—Total, 74, all in the Biological Surveys Collection, distributed as follows: Washington: *Okanogan County*: mouth of Holmar Creek, W Fork Paysaten River, 4700 ft., 1; Conconully, 3; Twisp, 1; Omak Lake, 1200 ft., 3. *Stevens County*: 5 mi. N Colville, 1. *Pend Oreille County*: 9 mi. N Metalina, 2600 ft., 1; Sullivan Lake, 3000 ft., 3. *Chelan County*: Sethekin, 1079 ft., 3; head of Lake Chelan, 900 ft., 12; Hart Lake, Railroad Creek, 3900 ft., 1; Entiat, 20 mi from mouth of Entiat River, 1680 ft., 13; Wenatchee, 4. *Douglas County*: Waterville, 1. *Jefferson County*: Cleveland, 2. *Kittitas County*: 2 mi. S Blewett Pass, 3000 ft., 6: Ellensburg, 1500 ft., 4. *Whitman County*: Colfax, 2. *Yakima County*: McAllister Meadows, Tieton River, 3000 ft., 3; Gotchen Cr., 5500 ft., near Sava Spring, Mt. Adams, 2. *Klickitat County*: 8 mi. S Glenwood, base Mt. Adams, 2. *Asotin County*: Anatone, 3300 ft., 4; Bly, 1000 ft., 2.

Microtus miurus muriei (Nelson)

1931. *Microtus muriei* Nelson, Jour. Mamm., 12:311, August 24, type from Kutuk River (tributary of Alatna River), Endicott Mts., Alaska.

Rausch (Jour. Washington Acad. Sci., 40:135, April 21, 1950) proposed the name *Microtus miurus paneaki*, with type locality at Tolugak Lake (lat. 68° 24′ N, long. 152° 10′ W), Brooks Range, Alaska, for a meadow mouse of the subgenus *Stenocranius*. This place is only approximately forty miles east and north of the type locality of the earlier named *Microtus muriei*, also a member of the subgenus *Stenocranius*. Large series of specimens of this subgenus, from the Arctic Slope of Alaska, are in the Museum of Natural History of the University of Kansas. Study of these indicates that the differences, which Rausch (*op. cit.*:136) described as distinguishing his *M. m. paneaki* from *M. muriei*, result from differences in age of the specimens, and possibly in part from differences in seasonal condition of pelage. For example, Rausch thought that *M. m. paneaki* was larger than *M. muriei* but our specimens reveal that such is not the case. The measurements given below of the type specimen of *M. muriei* (after Nelson, original description) and measurements (in parentheses) of an immature female (43807 K. U.) of *Microtus miurus muriei* from Chandler Lake, 68° 12′, 152° 45′, 2900 ft., Alaska, show close correspondence in size. Total length, 119 (122); tail vertebrae, 24 (24); hind foot, 20 (20); condylobasal length, 24.3 (24.5); zygomatic breadth, 10.7 (11.0); greatest width of braincase, 9.0 (9.0); length of nasals, 6.5 (6.0); basal width of rostrum, 4.0 (4.3). In the light of all of the evidence now available, it seems best to treat *Microtus miurus paneaki* Rausch as a synonym of *Microtus muriei* Nelson.

Quay (Jour. Mamm., 32:95, February 15, 1951) identified fifty-eight specimens from the Seward Peninsula of Alaska as *Microtus miurus oreas* Osgood. Through the courtesy of Dr. Charles P. Lyman, fifteen of Quay's specimens in the Museum of Comparative Zoology at Harvard College have been examined by one of us (Hall). These specimens are as follows: Lava Lake (43378, 43379, 43381, 43382, 43386, 43467 and 43478); Mt. Boyan (43384, 43385, 43463 and 43477); Anvil Hill [= Peak], Cooper Gulch (43377, 43464 and 43473); ——? Lake, 43383. Although we are not prepared to say that these specimens are *M. m. muriei*, they seem to resemble *M. m. muriei* as closely as they do any other named form and we here refer them to that subspecies.

The facts are that a critical taxonomic study of the American specimens of the subgenus *Stenocranius* is required in order to ascertain the geographic variation. One of us (Hall) has examined the holotypes of the kinds named from Alaska, and the material listed by R. Baker (Univ. Kansas Publ. Mus. Nat. Hist., 5:109) of the two kinds named from Canada. The degree and nature of the variation shown by these specimens lead us to the conclusion that all are of a single species. If the American mouse is specifically distinct from any of the previously named Asiatic species—at this writing we lack material to decide this question—the named kinds from the mainland of the New World may stand as follows:

MICROTUS MIURUS ANDERSONI Rand.

1945. *Microtus andersoni* Rand, Bull. Nat. Mus. Canada, 99:42, prior to June 20, type from near headwaters of Little Keel River, 5500 ft., 82 mi. W Mackenzie River on Canol Road, Mackenzie.

MICROTUS MIURUS CANTATOR Anderson.

1947. *Microtus cantator* Anderson, Bull. Nat. Mus. Canada, 102:161, January 24, type from mountain top near Tepee Lake, 61° 35′ N, 140° 22′ W, N slope Elias Range, Yukon Terr.

MICROTUS MIURUS MIURUS Osgood.

1901. *Microtus miurus* Osgood, N. Amer. Fauna, 21:64, September 26, type from head of Bear Creek, in mts. near Hope City, Turnagain Arm, Cook Inlet, Alaska.

MICROTUS MIURUS MURIEI Nelson.

1931. *Microtus muriei* Nelson, Jour. Mamm., 12:311, August 24, type from Kutuk River (tributary of Alatna River), Endicott Mts., Alaska.

1950. *Microtus miurus paneaki* Rausch, Jour. Washington Acad. Sci., 40:135, April 21, type from Tolugak Lake (lat. 68° 24′ N, long. 152° 10′), Brooks Range, Alaska.

MICROTUS MIURUS OREAS Osgood.

1907. *Microtus miurus oreas* Osgood, Proc. Biol. Soc. Washington, 20:61, April 18, type from Toklat River, Alaskan Range, Alaska.

Transmitted July 8, 1952.

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