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A JUMPING MOUSE (*ZAPUS INSIGNIS* MILLER), NEW TO THE UNITED STATES.

BY GERRIT S. MILLER, JR.

Zapus insignis, hitherto known only from New Brunswick and Nova Scotia,* is locally common in the eastern United States, and will probably be found to be very generally distributed in the eastern part of the Canadian fauna. The specimens that have thus far come to my notice number forty-two. Of these, the type and two others were collected by E. A. Bangs on the Restigouche river, New Brunswick, in September, 1880; one was taken in Northumberland county, N. B., in June, 1892, by Gerrit S. Miller, and two (Nos. 4061 and 5785, collection of Dr. C. Hart Merriam) were collected at Godbout, P. Q., Canada, by Napoleon A. Comeau. The remainder were taken in the United States, as follows: Eleven by Mr. Frank Bolles at Chocorua, N. H., in September, 1892; two by Mr. C. F. Batchelder at Keene, Essex county, N. Y., in August, 1890; four at Elizabethtown, Essex county, N. Y., and nineteen at Peterboro, Madison county, N. Y., by the writer during the spring and summer of 1892.

With the possible exception of Mr. Comeau's specimens, of whose history I am ignorant, these were all taken in the woods, and generally close to water. The banks of running streams are

*See American Naturalist, xxv, August, 1891, 472.

especially attractive to these animals; many that I have caught actually sprang into the water in their death struggles. In such places they may be taken without difficulty in traps baited with rolled oatmeal, after these have been left in one place long enough to thin out the white-footed mice and short-tailed shrews. In my experience *Zapus insignis* is wholly a dweller in deep woods, never venturing out into grass fields and damp pastures, such as *Z. hudsonius* delights in, and avoiding thinly wooded places in general. *Zapus hudsonius*, on the other hand, seldom penetrates far into the woods, and the two species are not often found together, though I have several times taken both in the same traps on successive days, near the edge of some meadow or clearing. Dawson states that both kinds of jumping mice are found in grain fields near Halifax and Pictou, N. S. He adds, however, that the smaller species (*i. e.*, *Z. hudsonius*) is in such places much the more common and easily observed.

The original description of this species, based on three specimens somewhat faded by grease and age, was necessarily incomplete, and in some respects misleading. Hence it seems advisable to redescribe the animal, that there may be no future difficulty in recognizing it.

Zapus insignis Miller.

Meriones labradorius Dawson. Edinburgh New Phil. Journ., iii, 1856, 2.

Zapus insignis Miller. American Naturalist, xxv, August, 1891, 472.

Sp. Ch. Larger than *Zapus hudsonius* Zimmerman, with longer ears and paler, more fulvous coloration; tail when uninjured always tipped with white; teeth, i. $\frac{1-1}{1-1}$, pm. $\frac{0-0}{0-0}$, m. $\frac{3-3}{3-3}$ = 16.

Adult male (No. $\frac{1}{1}\frac{6}{4}\frac{5}{5}\frac{6}{2}$, collection of G. S. Miller, Jr., Peterboro, N. Y., August 22, 1892); length, 250; tail vertebræ, 154; hind foot, 31.6; ear from notch, 18.6. Tip of tail for 23 mm., dorsum of manus and pes, and entire ventral surface pure white to base of hairs; sides buff-yellow, tinged with clay color, except on cheeks, fore neck, and a narrow line bordering white of belly, where the yellow is noticeably purer; the fur plumbeous gray at base and a trifle sprinkled with blackish bristly hairs. These blackish hairs predominate on the back, where they form a sharply defined dorsal stripe slightly mixed with the color of the sides, broadest just back of the shoulders, tapering gradually

to base of tail, and becoming indistinct on the head after passing between the ears. Ears externally concolor with back, internally buff-yellow; muzzle grayish brown; whiskers mixed brownish and whitish, the longest hairs reaching beyond shoulders; tail thinly haired, so that the annulation shows distinctly, sharply bicolor, dark brown, except ventrally and at tip.

Among the specimens of *Zapus insignis* that I have examined I find but little individual variation in color. That which occurs seems to be due chiefly to season, spring specimens having the sides brighter fulvous than those taken in the autumn and late summer. The dorsal stripe is darker and more sharply defined in some specimens than in others, the variation being caused by the relative quantities of blackish and fulvous hairs. In specimens with perfect tails the extent of the white tip varies from 30 mm. down to a mere trace; but the latter condition is rare, occurring only twice in the series before me, most tails showing from 10 mm. to 20 mm. of white.

The four males taken at Elizabethtown, N. Y., in April are brighter colored than the type and have apparently longer ears. These discrepancies are probably due entirely to the different condition of the specimens. Skins taken at Peterboro, N. Y., late in August and early in September are nearly as dull as the three from Restigouche, while the June specimen from Northumberland county, N. B., less than one hundred miles from the type locality, is fully as bright as any that I have seen. This specimen (No. 1438) is alcoholic, but the comparison was made a few days after its capture. The ear of No. 1438 is somewhat longer than that of an alcoholic specimen (No. 2000) from Peterboro, while the ears of Mr. Batchelder's specimens from Keene, N. Y., measure dry only a trifle more than the ears of the Restigouche skins.

On comparing thirty-eight skins of *Zapus insignis* with about one hundred specimens of *Z. hudsonius* from various parts of New Brunswick and the eastern United States, the paler, more fulvous coloration of the former at once strikes the eye. The ground color of the lateral stripe in *hudsonius* is more strongly tinged with clay color and is much more plentifully interspersed with black bristly hairs. There is no tendency in *hudsonius* to form the clear yellow area on the sides of the head and fore neck so conspicuous in *Z. insignis*. In the former, however, the clear yellow line separating the lateral stripe from the white of the

belly is apt to be more strongly defined and of a somewhat darker shade. *Z. insignis* is always pure white beneath, never showing a trace of the buffy suffusion commonly seen in *Z. hudsonius.* Yellow is the prevailing color on the head of *insignis*, while in *hudsonius* the black hairs are the more numerous on the head and face. The gray muzzle is much paler in *insignis* than in *hudsonius.* The ears of the two species differ notably in color as well as in size, those of *Z. hudsonius* being more thickly haired and blackish throughout, except for a sprinkling of yellowish hairs on the outside and a narrow, pale—sometimes white—border, while in *Z. insignis* the ears are lined with yellow and clothed outside with dusky and yellow hairs in about equal proportions, the latter forming a pale though never white edging.

Two young examples of *Z. hudsonius* (♂ *juv.* No. $\frac{1635}{1432}$ and ♂ *juv.* No. $\frac{1636}{1433}$, Peterboro, N. Y., August 1, 1892), otherwise perfectly typical, have 8 mm. of the distal end of the tail white. These are the only specimens of the species in which I have seen the slightest indication of this character, but it is to be expected since most of our small mammals occasionally have white-tipped tails. I have repeatedly noticed it in two races of *Sitomys americanus*; also occasionally in *Mus musculus*, *Arvicola riparius*, and *Blarina brevicauda.* It is thus especially noteworthy that in *Zapus insignis* this character, elsewhere merely accidental, should have become so fixed as to be practically diagnostic.

The skull of *Zapus insignis* closely resembles that of *Z. hudsonius*, but is throughout slightly broader and heavier, with a less highly arched brain case. Except for its somewhat larger size, the mandible shows no points of difference.

The teeth are all somewhat heavier than in *Z. hudsonius* and the crown of the middle upper molar appears in some specimens slightly longer proportionally.

In the original description of *Z. insignis* it was suggested that the absence of the premolar might be due to the age of the specimens at hand and consequent shedding of the tooth. That this view is incorrect is conclusively shown by the material now available. Specimens of *Z. hudsonius* with teeth excessively worn still retain the premolar, while in *Z. insignis* I have never found a trace of this tooth, even in individuals so young that the posterior molar has not cut through the gums. I have seen

but one specimen of *Z. hudsonius* in which the premolar is absent. This I suppose to be the skull from Pennsylvania referred to, on the authority of Mr. F. W. True, in the original description of *Z. insignis*. The specimen (No. $\frac{1}{5}\frac{6}{5}\frac{8}{8}\frac{4}{}$, United States National Museum, Upper Darby, Pa.) is in a very fragmentary condition, but one tooth row remaining *in situ*, and the maxilla being broken off close to the roots of the first molar. Under these circumstances no weight can be placed on the fact that the premolar is not to be found.

Measurements of Forty Specimens of Zapus insignis.

Number.		Locality.	Date.	Sex.	Total length.	Tail vertebræ.	Hind foot.	Ear from notch.	Measured.
Skin.	Skull.								
464	387	Restigouche river, N. B.	Sept. 10, '80	♀	225	126	30	12.8	Dry.*
1	.....	" "	" 8, '80	♂♂♂	224	141	30.8	13	" †
4	.....	" "	" 10, '80	♂♂♂	235	140	30.4	14	"
1438	.....	Northumberland Co., N. B.	June 2, '92	♂♂♂	218	125	30	16.4	In alcohol.
4061	.....	Godbout, P. Q., Canada.	Aug. 27, '85	♀	240	158	32	.....	" ‡
5785	.....	" "	June 10, '85	♂♂	250	160	32.5	.....	"
2	.....	Keene, Essex Co., N. Y.	Aug. 8, '90	♂♂	.....	.....	29.6	14.6	Dry.§
8	.....	" "	" 10, '90	♂♂	.....	.....	31	14.2	"
1376	1192	Elizabethtown, Essex Co., N. Y.	April 3, '92	♂♂	242	147	30.5	18	Fresh.
1377	1193	" "	" 9, '92	♂♂♂	238	146	30.8	18	"
1378	1194	" "	" 10, '92	♂♂♂♂	....	157	32.4	18	"
1379	1195	" "	" 13, '92	♂♂♂	253	157.5	32	17.5	"
1647	1443	Peterboro, Madison Co., N. Y.	Aug. 17, '92	♂♂	235	146	31.4	17	"
1656	1452	" "	" 22, '92	♂♂♂♂	250	157	31.6	18.6	"
1657	1453	" "	" 23, '92	♂♂♂♂♂♀♀	253	158	32	17.8	"
1658	1454	" "	" 23, '92	♂♂♂♂♂♀♀	240	146	31	17.8	"
1659	1455	" "	" 23, '92	♂♂♂♂♂♀♀	243	150	31	17.6	"
1660	1456	" "	" 23, '92	♂♂♂♂♀♀♀	234	146	30.8	17	"
1664	1460	" "	" 25, '92	♂♂♂♀♀♀♀	239	145	29.8	17.2	"
1665	1461	" "	" 25, '92	♂♂♂♀♀♀♀	235	144	32	17	"
1666	1462	" "	" 25, '92	♂♂♂♂♀♀♀	225	148	32.2	18	"
1667	1463	" "	" 25, '92	♂♂♂♂♀♀♀	235	142	30	17	"
1673	1468	" "	" 29, '92	♂♂♂♀♀♀♀	240	148	30	16.6	"
1674	1469	" "	" 29, '92	♂♂♂♀♀♀♀	237	142	30	17.2	"
1675	1470	" "	" 29, '92	♂♂♂♀♀♀♀	228	133	30	17	"
1676	1471	" "	" 29, '92	♂♂♂♂♀♀♀	245	152	31.6	18	"
1677	1472	" "	" 29, '92	♂♂♂♂♀♀♀	230	142	30	17	"
1682	1477	" "	Sept. 9, '92	♂♂♀♀♀♀♀	231	143	29	16.6	"
1713	1504	" "	" 23, '92	♂♂♂♀♀♀♀	235	141	31	17.4	"
2000	.....	" "	Oct. 18, '92	♀♀♀	225	138	30	15.8	In alcohol.
1972	.....	Chocorua, Carroll Co., N. H.	Sept., 1892	....	.....	144	29.4	15	Dry.
1973	.....	" "	" "	....	...	147	31	15.6	"
1974	.....	" "	" "	....	.....	134	29.8	14	"
1975	.....	" "	" "	....	.....	138	29.8	15	"
1976	.....	" "	" "	....	.....	138	30	16	"
1977	.....	" "	" "	....	.....	138	28	15	"
1978	.....	" "	" "	....	.....	157	31	16	"
1979	.....	" "	" "	....	....	146	30.4	15.4	"
1980	.....	" "	" "	....	.....	143	30.4	16.4	"
1981	.....	" "	" "	....	.....	150	30.4	16	"

* Type.
† Collection of E. A. and O. Bangs.
‡ Collection of Dr. C. Hart Merriam.
§ Collection of Chas. F. Batchelder.

Measurements of Forty Specimens of Zapus hudsonius.

Number.		Locality.	Date.	Sex.	Total length.	Head and body.	Tail vertebræ.	Hind foot.	Ear from notch.
Skin.	Skull.								
787	.....	Oak Bay, N. B.....	Sept. 19, '91	....	241	.....	148	33	13 *
1414	.....	" "	Oct. 7, '91	....	190	.....	114	28	11
1836	1614	" "	.....	♀	215	.....	134	31.4	12.4
1840	1618	" "	.....	♀	203	.....	132	31	11
1841	1619	" "	.....	♂	215	.....	138	30.6	11.6
1842	1620	" "	.....	♂	215	.....	135	31	11
1846	1624	" "	.....	♂	225	.....	140	32	11
583	517	Peterboro, Madison Co., N. Y.	July 17, '91	♂	217	.....	134	30	12
584	518	" "	" 17, '91	♀	198	.....	143	31.2	12.8
585	519	" "	" 17, '91	♀	217	.....	132	30	11.8
586	520	" "	" 17, '91	♀	214	.....	135	31.6	13
587	521	" "	" 17, '91	♀	221	.....	142	31.5	12.8
588	522	" "	" 17, '91	♀	216	.....	139	30	13.4
620	538	" "	" 20, '91	♀	208	.....	128	29.6	12.2
622	539	" "	" 21, '91	♂	185	.....	116	29.5	10.5
623	540	" "	" 21, '91	♀	217	.....	127	28.8	13
624	541	" "	" 21, '91	♀	215	.....	137	30.4	12.4
625	542	" "	" 21, '91	♀	231	.....	152	31.4	13
626	543	" "	" 21, '91	♀	214	.....	129	30	12
627	544	" "	" 21, '91	♀	219	.....	132	30.6	11.4
628	545	" "	" 21, '91	♂	194	.....	122	27.5	12
630	546	" "	" 21, '91	♂	209	.....	128	29	11.4
631	547	" "	" 21, '91	♂	200	.....	122	28	11
1622	1419	" "	" 30, '92	♂	215	.....	124	31	14.6
1635	1432	" "	Aug. 1, '92	♂	205	.....	131	30.4	13
1636	1433	" "	" 1, '92	♂	200	.....	128	30	12.8
1646	1442	" "	" 9, '92	♀	202	.....	120	29	13.8
1650	1446	" "	" 18, '92	♀	203	.....	125	28	13
1663	1459	" "	" 25, '92	♂	203	.....	124	28	13
1669	1464	" "	" 26, '92	♀	198	.....	121	28	12.8
1679	1474	" "	Sept. 7, '92	♂	198	.....	118	29.6	13.8
1703	1495	" "	" 17, '92	♂	229	.....	129	30.8	14.4
1704	1496	" "	" 17, '92	♂	205	.....	120	29.6	14
1705	.....	" "	" 17, '92	♂	208	.....	125	30	14
1427	1239	Wareham, Plymouth Co., Mass.	May 28, '92	♂	.....	88	128	29	10 †
1944	1718	" "	July 13, '92	♀	.....	65	123.5	28	10.5
1945	1719	" "	Aug. 18, '92	♀	.....	89	131	29.5	8.5
1946	1720	" "	July 7, '92	♂	.....	86	148	29.5	12.5
1947	1721	" "	" 13, '92	♂	.....	63.5	117	27	10
1948	1722	" "	Aug. 12, '92	♂	.....	83	137	30.5	14

*Collected by H. H. McAdam. †Collected by Outram Bangs.

Cranial Measurements of Six Specimens of Zapus insignis.

Number	387 464	1*	1194 1378	1195 1379	1452 1656	1469 1674
Sex	♀	♂	♂	♂	♂	♀
Basilar length	18.5	19	19	19.8	20	19.8
Basilar length of Hensel	16.8	16.8	17.4	17.8	17.8	17.4
Zygomatic breadth	12.4	12.2	12.8	13	13	12.8
Mastoid breadth	10.2	10.3	10.6	11	11	10.6
Interorbital constriction	4.8	5	5	5	5	5
Greatest length of nasals	9.2	9	9.8	10	10.6	9.4
Incisor to molar	6	6.5	6	6	6.4	6
Incisor to post-palatal notch	8.8	8.8	9	9	9	9
Foramen magnum to post-palatal notch	7.8	7.8	8.4	8.8	8.8	8.6
Upper molar series along crowns.	3.7	3.7	4	4	3.8	3.8
Basioccipital to middle of parietal	7.6	8.5	7.4	7.8	7.4	8
Fronto-palatal depth at middle of molar series	12	6	6	6	6.4	6.2
Greatest length of mandible	12	11.8	12	12.4	12.8	12.2
Lower molar series along crowns.	4	4	4	4	4	4

*Collection of E. A. and O. Bangs.

Cranial Measurements of Six Specimens of Zapus hudsonius.

Number	519 585	540 623	541 624	542 625	543 626	547 631
Sex	♀	♀	♀	♀	♀	♂
Basilar length	18.2	18.2	17.4	17	17	17
Basilar length of Hensel	16.2	16.4	15.4	15	16.2	15.8
Zygomatic breadth	11.2	11.8	11.2	10.8	11	11.2
Mastoid breadth	10	10	10	9.8	10	10
Interorbital constriction	4	4.2	4	4.2	4.2	4.4
Greatest length of nasals	8.6	9.2	8.6	8.2	8.6	8.6
Incisor to molar	6	5.4	6	5.2	6	5.2
Incisor to post-palatal notch	8.4	8.2	8.4	7.8	8.2	8
Foramen magnum to post-palatal notch	7.4	8.2	7.4	8	8	8
Upper molar series along crowns.	3	3.2	3	3	3	3
Basioccipital to middle of parietal	8.2	8	8	8.2	7.4	8
Fronto-parietal depth at middle of molar series	5.6	5.8	6	5.8	6	5.8
Greatest length of mandible	11.4	11.8	11	11.4	11	10.4
Length of lower molar series along crowns	3.4	3.2	3.2	3.4	3.2	3.4