

Neoaschizomys, a New Genus of Microtinae from Sikotan, a South Kurile Island

By

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With Plate XIII and 6 Text-figures

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By the kindness of the Department of Forestry of the Hokkaido Government Office I obtained two specimens of a vole from Sikotan Island, one of the Southern Kuriles. The vole has a very characteristic appearance with long lemming-like hair. By close study it was found that the vole is a representative of a new genus. Further, it seems likely that the genus is one of the direct descendants of the primitive *Clethrionomys*-like vole as are *Aschizomys* and *Alticola*.

Genus *Neoaschizomys* TOKUDA, n. gen.

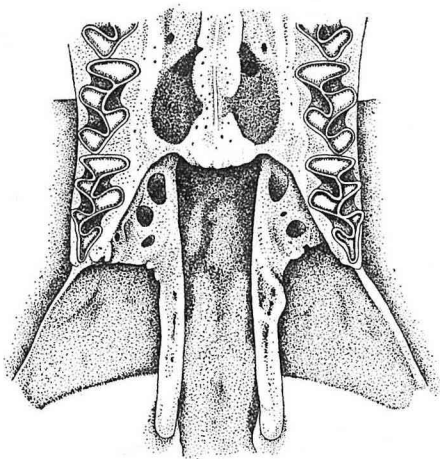


Fig. 1. Palate of the type $\times 6$.

Description: Lower incisor passes from lingual to labial side of tooth-row as in typical voles. Groove between lower molars and ascending ramus open posteriorly, not "pocketed" by alveolus of lower incisor as in *Microtus*. External form robust and furnished with long lemming-like hair. Eyes situated nearer to muzzle than to the base of ears, and rather large as in primitive voles. Skull large, massive and heavily built,

attaining a marked degree of angularity in adult, with strongly developed posterior processes and well divergent and flaring zygomatic arches. Interorbital rather narrow and temporal ridges tending to fuse. Posterior palate as in true *Clethrionomys*. Cheek-teeth rather weak, hypsodont and rooted in adult, with patterns almost like those of *Clethrionomys*. Mandible without peculiarities; $\overline{M3}$ slightly displaced by the shaft of incisor. Palmar pads five, plantar pads six. Mammae four pairs: two pectoral and two pelvic.

Neoschizomys sikotanensis n. sp.

Type: Adult female; co-type: subadult male. (Preserved in the Museum of the Zoological Institute of the Kyoto Imperial University.)

Type locality: Sikotan island. (Collected October 1933.)

Specimens examined: Type and co-type.

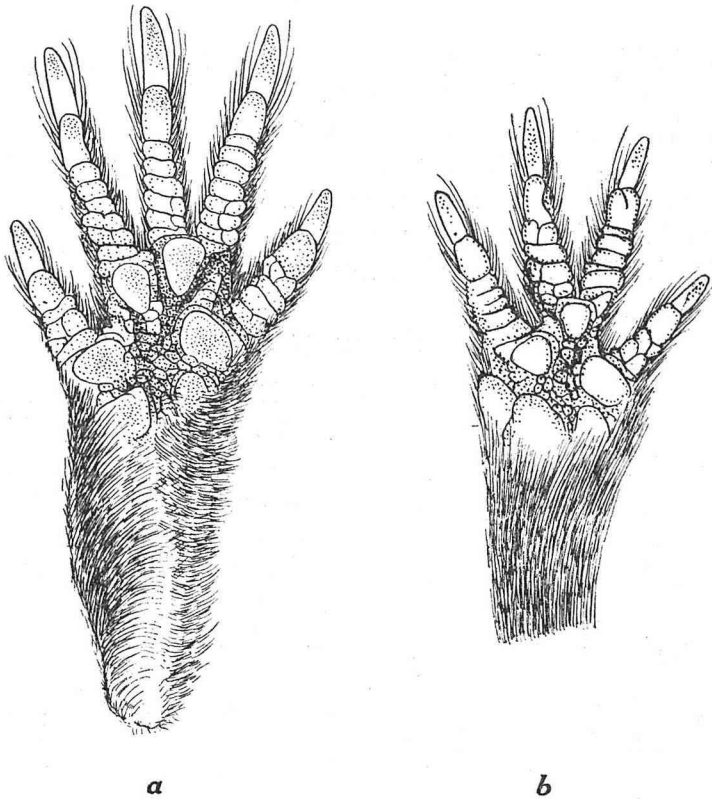


Fig. 2. *a*: Sole of the left hind foot of *Neoschizomys sikotanensis* $\times 4$. *b*: Palm of the left fore foot of the same. (enlarged)

External characters : Length of head and body attains 110–120 mm. Tail less than half and more than a third as long as head and body, rather thick and well clothed with short hairs ; annulation plainly visible ; provided with a distinct terminal pencil measuring 6–8mm. Ears moderately large, reaching halfway to the eyes when laid forwards, but usually hidden in the long hair. Fur dense, soft and very long measuring 10–15 mm. on the back. Hands and feet with five digits which are provided with moderate claws. Soles and palms hairy behind tubercles.

Color : Upper surface ochraceous-orange of Ridgway, the color extending from interorbital region backwards through the inner bases of the ears to the rump, becomes paler at muzzle, cheeks and flanks, and gradually changes to the light buff of the under-surface. Through the pelage the hairs have slaty bases. Ears have gray hairs with their apical parts banded with concolor of the back. Hands and feet mouse-gray above and below. Stiff hairs of tail white, tipped with black ; underside of tail covered with yellowish white hairs.

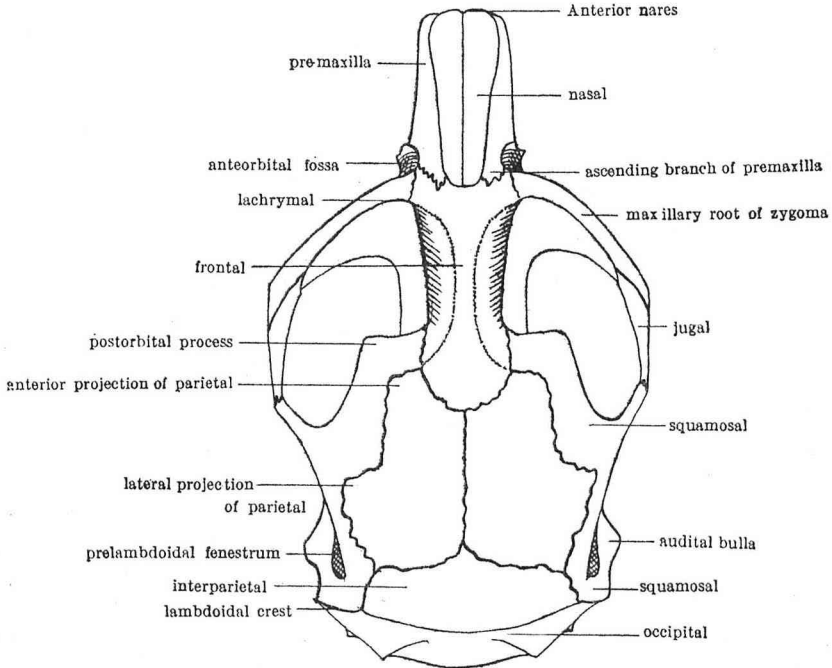


Fig. 3. Diagrammatic dorsal aspect of skull of *Neoschizomys sikotanensis*. (enlarged)

Skull: Large in proportion to the body (see measurements), broad and high, with a slight depression in interorbital region. The squamosals form strong postorbital processes, and the braincase is quadrate, with a break caused by zygomatic root on either side. Rostrum moderately long and slender, but distinctly wider than interorbital width. Nasal broad anteriorly and its posterior termination blunt and situated on the level of zygomatic roots. Temporal ridges of interorbital region well separated in young stage but approximate in adult. Palate nearly the same as in *Clethrionomys*. Zygomatic processes of maxilla well developed and zygomatic arches well expanded and nearly parallel to the main axis of the skull in the jugal portion. Incisive foramina short and narrow, extending from about 2 mm. behind incisor to 1.5 mm. in front of the first molar, and becoming narrower posteriorly. Auditory bullae have smooth surface and little spongy tissue.

Mandible: Robust and strong; coronoid process comparatively weak, condyle and angular processes strong. Masticentric ridge conspicuous.

Cheek-teeth: Rather weak but moderately long; dental spaces of molars perfectly alternating as in higher Microtinae; the salient angles become noticeably rounded, and the triangles eventually fully closed in adult stage of wear. M1, M2, M2 and M3 are reduced as in *Microtus* and *Clethrionomys*. M3 consists of an anterior crescentic loop, two external and one internal closed triangles, and a terminal loop which is variable with age. In the young stage the terminal loop subtends a distinct notch internally and two rudimentary notches externally, while in the senile animal these notches entirely disappear. M1 of the young animal is essentially the same as in common voles; however, in the old individual this tooth is a little more reduced and its antero-external angles become much obsolete.

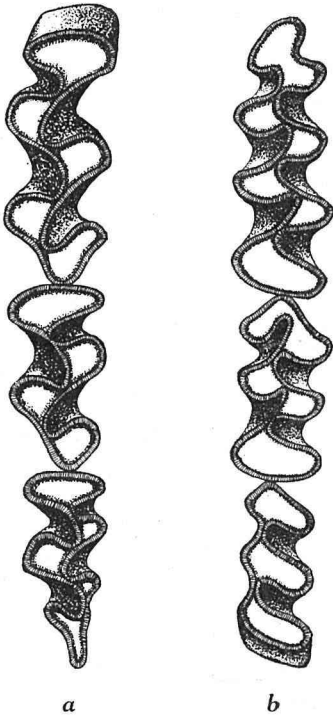


Fig. 4. *a*: Upper molars of the type $\times 12$. *b*: lower molars of the type $\times 12$.

Remarks : The palate of the co-type lacks the right and left lateral bridges so that the lateral grooves are confluent directly with the lateral pits. In other respects the co-type has the same characteristics as the type. This difference between the palates of the two specimens seems to be of no great importance, since in other features of the skull the two coincide very minutely. At any rate, *Neoschizomys* has many characteristics of generic value and is sharply differentiated from the known genera, as will appear in later discussion.

Measurements (mm)

External measurements	Type (Adult female)	Co-type (Subadult male)
Head and body	120	107
Tail	55	44
Hind foot	21	21
Ear	13	12
Cranial measurements		
Greatest length	20	18.8
Condyllo-basal length	18	16.2
Palatal length	14.8	13.6
Distema	9	7.8
Length of upper molar series (alveolar)	7.7	7.7
Interorbital constriction	4	3.7
Nasal length	8.5	8.3
From alveolar ridge of <u>M2</u> to supraorbital ridge	9.8	9

Relationship to other Genera

Neoschizomys belongs to the Microti group and differs from the Lemmi group in its mandibular structure. In the Lemmi group, the lower incisor is remarkably short and wholly lingual to the molar in position ; while in the Microti group, there is a moderately long incisor which passes from the lingual to the buccal side of the tooth-row in its backward course.

Among the Microti group *Phaiomys*, *Lagurus* and *Aschizomys* have remarkably long and soft hair. *Neoschizomys* is like these voles in this respect. But this character seems to be due merely to analogous modification caused by boreal life and has no systematic significance. But *Neoschizomys* differs from *Phaiomys* and *Lagurus* in more fundamental structures. These genera show close relation-

ship with *Arvicola* and *Microtus* respectively, having the palate not terminating behind as a transverse shelf, whereas *Neoschizomys* has a simple palate essentially like that of the *Clethrionomys* group.

Neoschizomys finds its nearest relatives among the living voles in *Aschizomys*, *Alticola* and *Clethrionomys*. Of all these *Clethrionomys* is the most primitive in every respect. *Neoschizomys* is

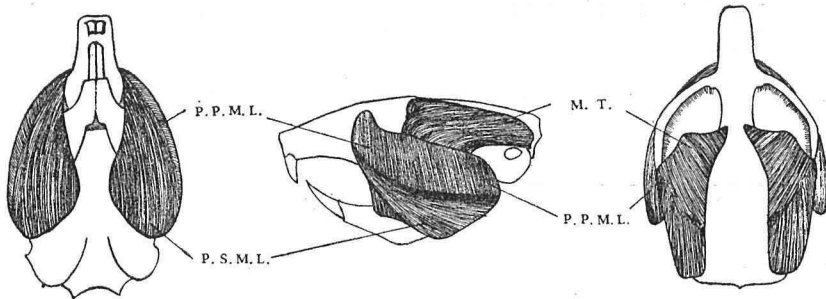


Fig. 5. Facial muscles of *Neoschizomys sikotanensis* (enlarged). M. T. : musculus temporalis; P. P. M. L. : portio profunda masseteris lateralis; P. S. M. L. : portio superficialis masseteris lateralis.

more specialized than: *Clethrionomys*, because : (1) Its body is furnished with remarkably thick and soft fur. (2) It has a massive and robust external body well adapted for fossorial life. (3) It has marked angularity of the skull with well developed facial muscles, suggesting the thoroughgoing digging habit of the animal. The three genera, *Neoschizomys*, *Alticola* and *Aschizomys* may be compared in detail as follows :

Genus <i>Aschizomys</i>	Genus <i>Alticola</i>	Genus <i>Neoschizomys</i>
1. Fur very long, lemming-like.	1. Fur never very long.	1. Fur lemming-like.
2. Tail shorter than hind foot, provided with a noticeably long bushy pencil.	2. Tail sometimes longer, sometimes shorter than hind foot, provided with the terminal pencil of variable length.	2. Tail always longer than hind foot, provided with a moderate pencil.
3. Tail bicolored.	3. Tail sometimes bicolored, sometimes unicolor.	3. Tail bicolored.
4. Skull smooth, round and lightly built.	4. Skull lightly and delicately built, never shows much angularity.	4. Skull heavily built, shows much angularity in adult.
5. Palate as in typical <i>Clethrionomys</i> .	5. Palate as in <i>Clethrionomys</i> .	5. Palate usually as in <i>Clethrionomys</i> .

Genus <i>Aschizomys</i>	Genus <i>Alticola</i>	Genus <i>Neoschizomys</i>
6. Interorbital region broad and temporal ridges widely separated throughout.	6. Interorbital region moderately broad, temporal ridges never fused.	6. Interorbital region considerably constricted and temporal ridges nearly fused.
7. Zygomatic arch moderately built.	7. Zygomatic arch moderate.	7. Zygomatic arch strong, well expanded and flaring.
8. Cheek-teeth never show drawnout appearance.	8. Cheek-teeth with characteristic long-drawnout appearance.	8. Cheek-teeth without drawnout appearance.
9. Pattern of molars nearly like that of <i>Clethrionomys</i> .	9. Pattern of molars nearly like that of <i>Clethrionomys</i> with the exception of very variable M3.	9. Pattern of molars nearly like that of <i>Clethrionomys</i> .
10. $\overline{M3}$ noticeably displaced by the shaft of incisor.	10. $\overline{M3}$ displaced by the shaft of incisor.	10. $\overline{M3}$ not displaced by the shaft of incisor.
11. Cheek-teeth rootless even in adult.	11. Cheek-teeth rootless.	11. Cheek-teeth developing root in adult.
12. Number of mammae uncertain.	12. Mammae 2-2=8.	12. Mammae 2-2=8.

In the above table, some characters are found common to the three genera, but the difference is so much as to warrant the establishment of an independent genus for each. It is also probable that *Neoschizomys* has some affinity to *Eothenomys* and *Antelionomys*, the other descendants of the *Clethrionomys*-like vole which occur in China. However, the difference between *Neoschizomys* and these two genera is quite sharp, as the former genus has normal mammae 2-2=8; while the latter genera both have reduced mammae 0-2=4.

Biogeographic Remarks

Sikotan Island is located at latitude 43° 35' to 53' N., very near to Hanasaki Peninsula in Hokkaido. It is a small island not exceeding 140 square miles. Geologically, the chain from Sikotan to Hanasaki Peninsula is called the Sikotan Archipelago. It is composed of Tertiary foldings and differs from the zone of the Kuriles proper consisting of Kunasiri, Etorohu, Uruppu, etc. which is of rather new volcanic formation.

The mammals of Sikotan Island have never been investigated by a specialist, although the mammalian fauna of surrounding territories is rather well known. *Neoschizomys sikotanensis* has no close relative throughout the region from Hokkaido to Kamchatka.

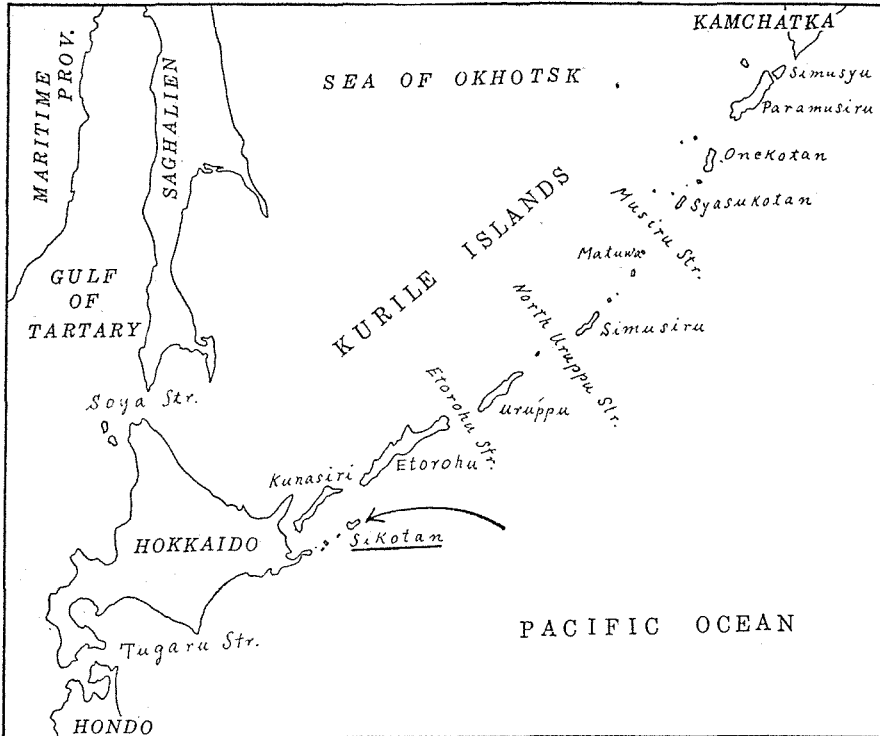


Fig. 6. Map of the Kurile Islands and the surrounding territories showing location of Sikotan Island.

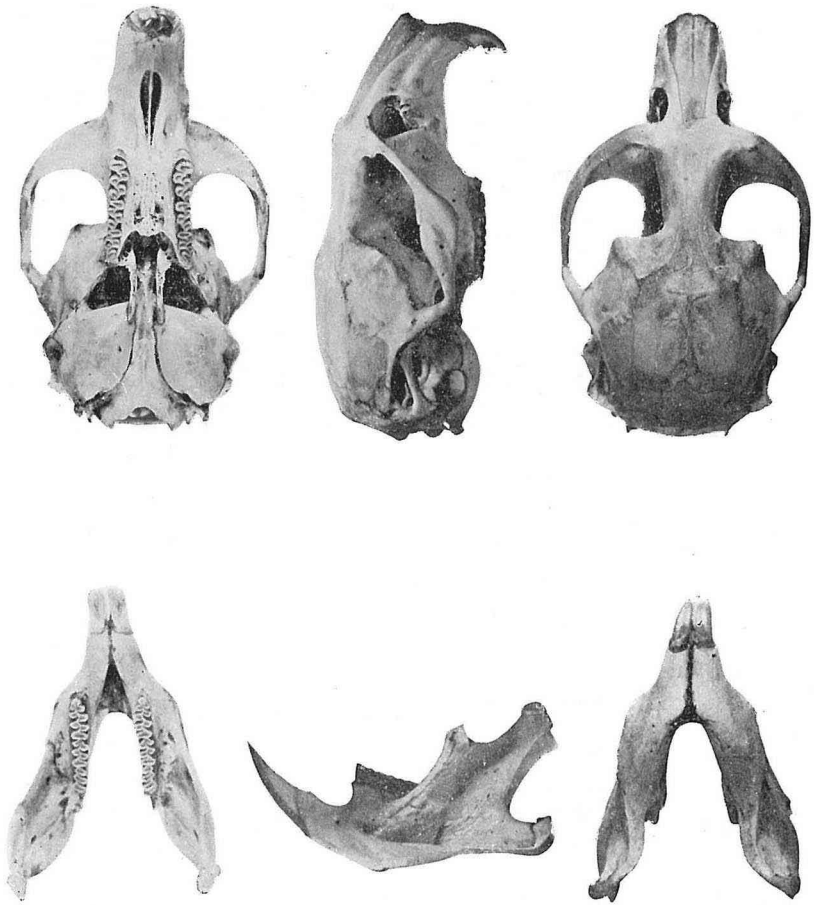
Of Microtine rodents we find *Clethrionomys rufocanus rufocanus* and *Microtus kamtschaticus* in Kamchatka, the former species and *Microtus uchidae* in Paramusiru, *Clethrionomys rufocanus bedfordiae* in Hokkaido and Kunasiri, *Clethrionomys amurensis mikado* in Hokkaido. The mammalian fauna of Etorohu was investigated by the author in 1932, and it seems to have no endemic species of Muridae. The occurrence of such an aberrant form of Microtinae in Sikotan Island is quite remarkable. For all biologists who have ever studied the flora or fauna of the Southern Kuriles admit the biogeographical affinity of these islands to Hokkaido. In fact, there are scarcely any plants or animals peculiar to the Southern Kuriles. Recently, TATEWAKI (1933) who studied the phytogeography of this region, has proposed the name of "Miyabe's Line" for Etorohu strait which lies between Etorohu and Uruppu Islands, as the boundary between the "Subarctic Region" and Engler's "Temperate East Asiatic Region."

Since *Neoaschizomys sikotanensis* is an animal with an entirely underground life, there seems to be no question that it is a species endemic to the locality. The closely related genera are distributed only in a restricted boreal region of the Continent. So I am inclined to think that the existence of this vole in the island has some paleogeographic significance. All the biologists who have studied the flora or fauna of the Japanese Archipelago and the Continent have found that there are many common elements. This fact can be understood only on the assumption that there was a land connection between Japan and the Continent in some past geological period. YABE (1929), on the basis of some geological evidence, has demonstrated that the Japanese Islands were some 720 M. more elevated than they are at present, and that the southern part of the Kuriles was connected with Hokkaido which was confluent with Saghalien and the Maritime Province. If this is true, it is likely that the common ancestor of *Neoaschizomys*, *Aschizomys* and *Alticola*, which was probably a *Clethrionomys*-like vole, had a wide range of distribution before the Pleistocene Period when the depression occurred in the sea floor now encircling the Japanese Islands. And later when land communication became impossible for the land animals on account of sea barriers, there developed two groups of the descendants of the hypothetical ancestral vole isolated from each other. The one group which had remained in the Arctic Region produced *Aschizomys*, *Alticola*, etc.; while the other which had been isolated in the Asiatic Region became the ancestor of *Neoaschizomys*. The latter migrated into the Kurile arc, and found its last habitat in Sikotan Island. Here they escaped the menace of carnivorous animals such as the weasel and bear, which had been very common in Hokkaido and the Kurile Islands, but never occurred in Sikotan. In any case, the occurrence of such a peculiar form of vole in one of the Southern Kuriles is worthy of notice from the standpoint of the biogeographic understanding of the Kurile Islands.

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Skull and mandible of *Neoschizomys sikotanensis* (Type) $\times 2$.