

Taxonomic Status of the Least Red-toothed Shrew (Insectivora, Soricidae) from Korea

By

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Abstract A new subspecies of the least red-toothed shrew, *Sorex minutissimus* ZIMMERMANN, 1780, is described from Korea under the name of *S. m. ishikawai*. It is the largest subspecies of the species, and seems closest to the Hokkaido subspecies, *S. m. hawkeri* THOMAS, 1906.

In the summers of 1982 and 1987, five specimens of a least red-toothed shrew were obtained by Dr. Ryôsuke ISHIKAWA on Mt. Sorak-san and Mt. Odae-san in South Korea (Table 1), and were donated to the Mammal Section of the Department of Zoology, National Science Museum, Tokyo. The shrews were captured by plastic cups buried in the ground for collecting beetles.

JONES and JOHNSON (1960) reviewed *Sorex* species of Korea, and recognized three species and subspecies as follows:

Sorex caecutiens annexus THOMAS, 1906 (type locality: Min-gyong, 110 miles SE of Seoul, 1,300 ft., Korea).

S. mirabilis kutscheruki STOROGANOV, 1965 (type locality: Bektan, northern Korea).

S. minutus gracillimus THOMAS, 1907 (type locality: Darine, 25 miles NW of Korsakoff, Saghalien).

So far as I am aware, all these three are the members of *Sorex* hitherto known from Korea. After carefully examining the five specimens and discussing their taxonomic status with Dr. Robert HOFFMAN of the National Museum of Natural History, Smithsonian Institution, Washington D. C., I have come to the conclusion that the shrew is an undescribed subspecies of *Sorex minutissimus* ZIMMERMAN, 1780. This is the first record of the species from Korea, and the new subspecies will be described in the present paper under the name of *S. m. ishikawai*.

I wish to express my hearty thanks to Dr. Ryôsuke ISHIKAWA, Professor of Biology at Tokyo Metropolitan University, who gave me the opportunity of studying the invaluable material of the Korean *Sorex*. My deep appreciation is also due to the curators of many institutions and museums, who gave me permission to study shrew collections under their care, especially to the following persons: J. E. HILL, J. INGLES, P. JENKINS, D. HILL, S. ANGEL, M. PERRY (British Museum (Natural History), London), R. HOFFMANN, C. HANDLEY, D. WILSON, R. FISHER (National Museum of Natural History, Smithsonian Institution, Washington, D. C.), and J. DORST, J. ROCHE, M.

Table 1. Examined materials of *Sorex minutissimus ishikawai* subsp. nov. from South Korea.

Collection No.	Collecting site & Date	Collector
NSMT-M28178 (skull and skin) ♂, adult	Hangye-ryong, Mt. Sorak-san, Sorak National Park, South Korea, alt. 1,100 m, 6 Aug. 1987	Ryôsuke ISHIKAWA
NSMT-M28179 (skull and skin) ♀, old	Ditto	Ditto
NSMT-M28180 (skull and in spirit) ♂, old	Near Sinhaungsa, Mt. Sorak- san, Sorak National Park, South Korea, alt. 400 m, 27 Aug. 1982	Ditto
NSMT-M28181 (skull and in spirit) ♂, juv.	Mt. Odae-san, alt. 1,000 m, 27 Aug. 1982	Ditto
NSMT-M28182 (skull and in spirit) ♂, juv.	Ditto	Ditto

TRANIER (Muséum National d'Histoire Naturelle, Paris). Last but not least, I have to thank Dr. Yoshinori IMAIZUMI, who kindly read the original manuscript of this paper and gave me valuable suggestions.

Sorex minutissimus ishikawai subsp. nov.

[Japanese name: Ishikawa-chibitogarinezumi]

(Figs. 1-5)

Holotype. NSMT-M28178, Adult male, skin and skull, collected from Hangye-ryong, Mt. Sorak-san, Sorak National Park, alt. 1,100 m, South Korea, by Dr. Ryôsuke ISHIKAWA, on 6th August 1987. The holotype is preserved in the Mammal Section, Department of Zoology, National Science Museum, Tokyo.

Measurements of the holotype (in mm). Head and body 48.0, tail 36, tail percent 75%, hind foot cum unguis 10.5, hind foot sine unguis 9.5, ear 6.0, body weight 1.4 g (all measured after removing alcohol from spirit specimen). Greatest length of skull with incisor 14.9, condylobasal length of skull with incisor 14.5, condylobasal length of skull without incisor 14.2, cranial breadth 6.6, maxillary width 4.0, interorbital width 2.8, width across M 2-M 2 3.9, length of upper tooth row 5.8, length of unicuspid tooth row 2.6, width of braincase 6.2, depth of braincase 2.6, length of mandible with incisor 8.3, length of mandible without incisor 7.0.

Specimens examined. See Table 1.

Diagnosis. Belonging to the *minutissimus* group of *Sorex*. Readily discriminated from all the species hitherto recorded from Korea. Largest of all the known subspecies of *S. minutissimus*, that is, tail, hindfoot and condylobasal length longer than in the other subspecies. Fur short on the back and bicoloured. Skull, unicuspid,

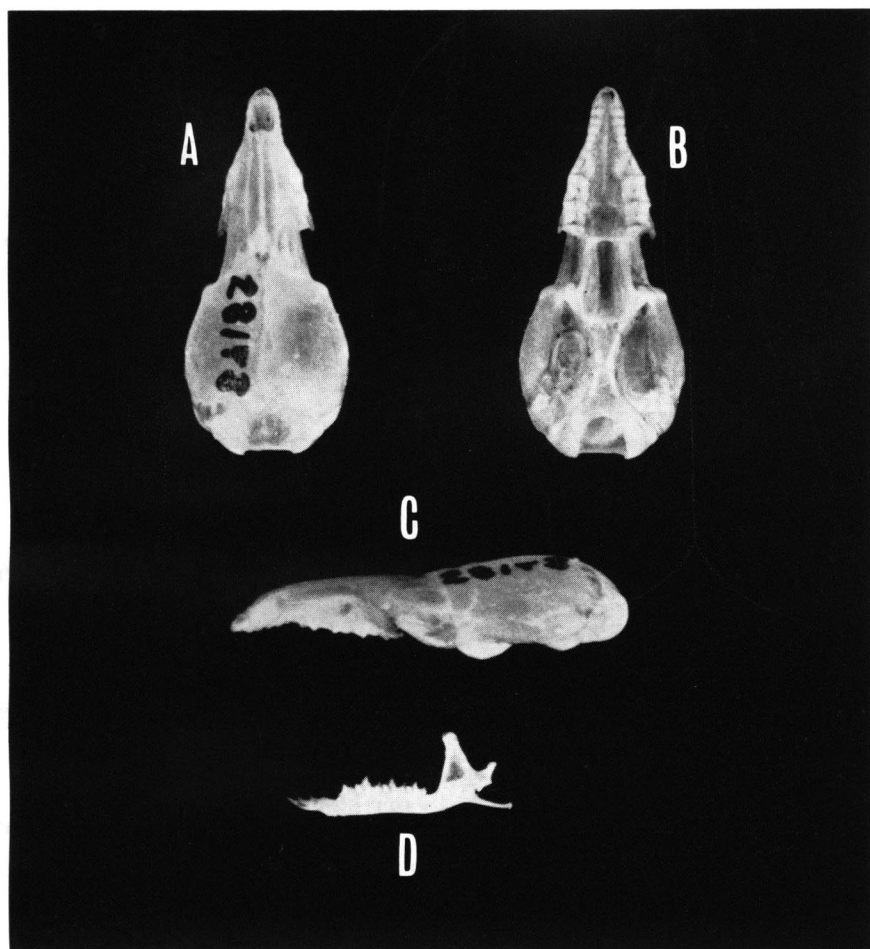


Fig. 1. Skull of *Sorex minutissimus ishikawai* subsp. nov., holotype, NSMT-M28178, adult, male. A, Dorsal aspect of cranium; B, ventral aspect of cranium; C, lateral aspect of cranium; D, lateral aspect of mandible.

and molars massive; braincase narrow and low, hypocones of upper posterior premolar, 1st and 2nd molars well developed (Figs. 1-2).

Description. Hind foot and tail shorter than those of *Sorex minutus* LINNAEUS, 1766 and *S. gracillimus* THOMAS, 1907, *S. hosonoi* IMAIZUMI, 1954, and *S. caecutiens annexus* THOMAS, 1907, but longer than that of *S. m. minutissimus* ZIMMERMANN, 1780, *S. m. hawkeri* THOMAS, 1906, *S. m. tscherskii* OGNEV, 1913, *S. m. tschuktschorum* STROGANOV, 1949, *S. m. barabensis* STROGANOV, 1956, *S. m. stroganovi* JUDIN 1964, and *S. m. caudata* JUDIN, 1964 (Figs. 3-5, Tables 2-3).

Fur of back about 2 mm in summer pelage. General colour of the dorsal surface brown, near "Prout's brown" except in greyish basal portion of each hair, lateral

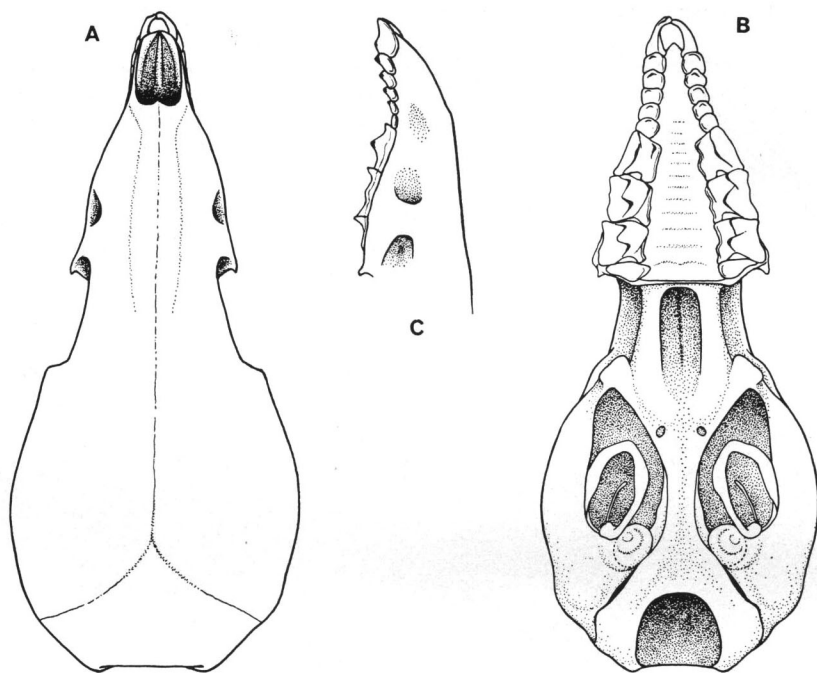


Fig. 2. Skull of *Sorex minutissimus ishikawai* subsp. nov., holotype, NSMT-M28178, adult, male. A, Dorsal aspect of cranium; B, ventral aspect of cranium; C, lateral aspect of anterior portion of cranium.

surface similar in colour to dorsal surface though slightly paler, ventral surface similar to lateral surfaces. Pelage nearly bicoloured, though the demarcation of dorsal and lateral surfaces is not clear. Back of front and hind feet pale brown or beige. Tail bicoloured, with dark brown dorsal and whitish ventral surfaces, with a blackish brown pencil of about 6 mm in young specimens.

Skull and teeth: Size very small, braincase remarkably narrow and low. Cranial breadth only 45.3 percent of condylobasal length with incisor (in average). Profile nearly straight from anterior nare to occipital portion; braincase not swollen, very flat; its depth only 2.1 mm at middle in average; supraoccipital bone small, its sagittal length much shorter than width, about 37% of the latter instead of about 60% in *minutus*, and 53% in *gracillimus*. Viewed dorsally, a part of foramen magnum visible; braincase hexagonal in outline instead of being circular in *S. gracillimus*. Posterior margin of nare extending to the mid-level of 4th unicuspid. Palatoincisor length about 42 percent of condylobasal length with incisor; tympanic bone delicate, ovate in outline, its anterior border not semicircular, but distinctly angulated. Angular process of mandible long and inclined postero-ventrally, angle between coronoid and angular process rather sharp; coronoid fossa deep, antero-lower corner angular, mandibular fossa deep, posterior and anterior mandibular canals open in relatively

Table 2. External measurements (in mm) of *Sorex minutissimus ishiikawai* subsp. nov. from South Korea.

No.	Sex	TL	T	HB	HFcu	HFsu	E	BW
NSMT-M28178	♂ adult	84.0	36.0	48.0	10.5	9.5	6.0	1.4 g
NSMT-M28179	♂ old	84.5	35.0	49.0	10.5	9.5	6.0	2.8
NSMT-M28180	♂ old	86.0	36.5	49.5	11.0	10.0	5.2	2.2
NSMT-M28181	♂ juv.	65.0	30.5	34.5	10.0	9.0	4.7	1.1
NSMT-M28182	♂ juv.	75.0	33.0	42.0	10.0	9.0	5.0	1.1

Abbreviations: NSMT-M=Mammal Section, Department of Zoology, National Science Museum, Tokyo; TL=total length; T=tail length; HB=length of head and body; HFcu=length of cumunguis of hind foot; HFsu=length of sine unguis of hind foot; E=ear length; BW=body weight.

Table 3. Cranial and dental measurements (in mm) of *Sorex minutissimus ishiikawai* subsp. nov. from South Korea.

No.	Sex	CBL +i	CBL -i	PIL	CB	MB	IOB	M2-M2	I1-I1	UTRL	MAND +i
NSMT-M28178	♂ adult	14.5	14.2	6.0	6.6	4.0	2.8	3.9	0.8	5.8	8.3
NSMT-M28179	♂ old	—	14.5	—	6.3	3.8	2.7	3.9	1.0	—	8.3
NSMT-M28180	♂ old	14.7	14.1	6.2	6.4	3.8	2.7	3.8	0.7	5.9	8.2
NSMT-M28181	♂ juv.	—	—	—	—	—	—	—	—	—	7.8
NSMT-M28182	♂ juv.	14.1	13.9	6.0	6.6	3.7	2.8	3.9	0.7	5.9	7.8

Abbreviations: NSMT-M=Mammal Section, Department of Zoology, National Science Museum, Tokyo; CBL=condylobasal length of skull; PIL=palatoincisors length; CB=cranial breadth; MB=maxillary breadth; IOB=interorbital breadth; M2-M2=M2 to M2 breadth; I1-I1=I1 to I1 breadth; UTRL=upper tooth row length; MAND=mandible.

deep portion, the posterior one linking mandibular and coronoid fossae.

Teeth: Pigmentation of teeth light, pigment not extending to basins of molari-form teeth. First 4 unicuspid not in pairs, the points forming a straight line; 5th the lowest, but visible in lateral view, its tip lower than anterior cusp of large premolar. Viewed ventrally, crowns of unicuspid quadrate in outline, much broader than long, each crown area gradually reduced from 1st to 4th, 4th and 5th subequal to each other or the latter being slightly larger. Upper 4th premolar with a shallow posterior concavity, hypocones of upper posterior premolar, 1st and 2nd molars well developed; last molar very small, lacking hypocone and metacone, its crown area only one-third of that of second molar.

Etymology. This new subspecies is named after Dr. Ryôsuke ISHIKAWA for his contribution to the Mammal Section of the Department of Zoology, National Science Museum, by collecting many small shrews, which cannot be easily captured by conventional traps.

Remarks. *Sorex minutissimus*, to which belongs the present subspecies, forms the smallest-sized group of the genus in East Asia, together with *S. gracillimus* and

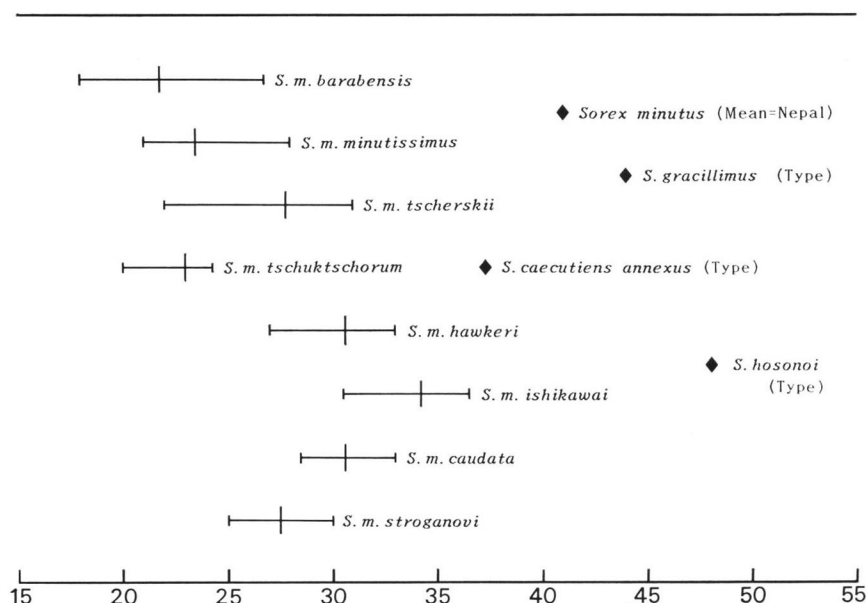


Fig. 3. Comparison of the subspecies of *Sorex minutissimus* and its relatives in the measurements (in mm) of tail length. Horizontal lines indicate the range; vertical lines indicates the mean values.

S. hosonoi.

In the external and cranial measurements, there are wide differences between *S. m. ishikawai* and *S. gracillimus*, moreover the latter is readily distinguished from the former by the following points; Braincase circular when viewed from above, supra-occipital bone large, rostrum slender, upper unicuspid teeth lower, longer than wide, well spaced, and hypocones of posterior premolar, 1st and 2nd molars weak. In the shape of the braincase and relatively short unicuspid, *S. m. ishikawai* resembles *S. hosonoi*, but differs from the latter in much shorter tail and smaller 5th unicuspid.

Eight subspecies of *S. minutissimus* have hitherto been recognized (CORBET, 1978).

S. m. minutissimus ZIMMERMANN, 1780 (type loc. Yenisei River, Siberia).

S. m. hawkeri THOMAS, 1906 (type loc. Inukawa, Edo, in the original description, but the skull of the type specimen preserved in the British Museum (Natural History) bears a label inscribed 'Mukawa' which seems to be a locality in Hokkaido).

S. m. tscherskii OGNEV, 1913 (type loc. Ussuri Region, E. Siberia).

S. m. tschuktschorum STROGANOV, 1949 (type loc. NE. Siberia).

S. m. abnormis STROGANOV, 1949 (type loc. Kazakhstan).

S. m. barabensis STROGANOV, 1956 (type loc. Upper Obi).

S. m. stroganovi JUDIN, 1964 (type loc. SE. Altai).

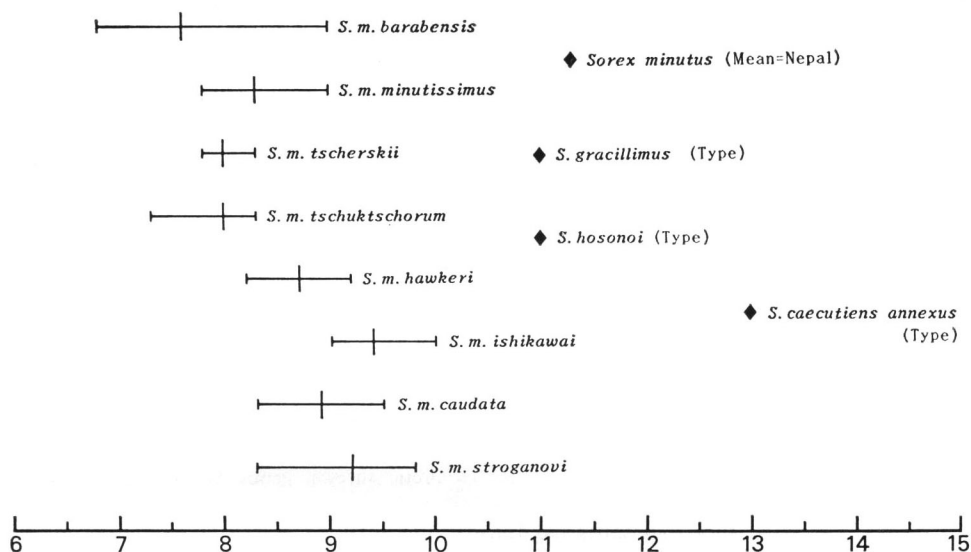


Fig. 4. Comparison of the subspecies of *Sorex minutissimus* and its relatives in the measurements (in mm) of length of hind foot sine unguis. Horizontal lines indicate the range; vertical lines indicate the mean values.

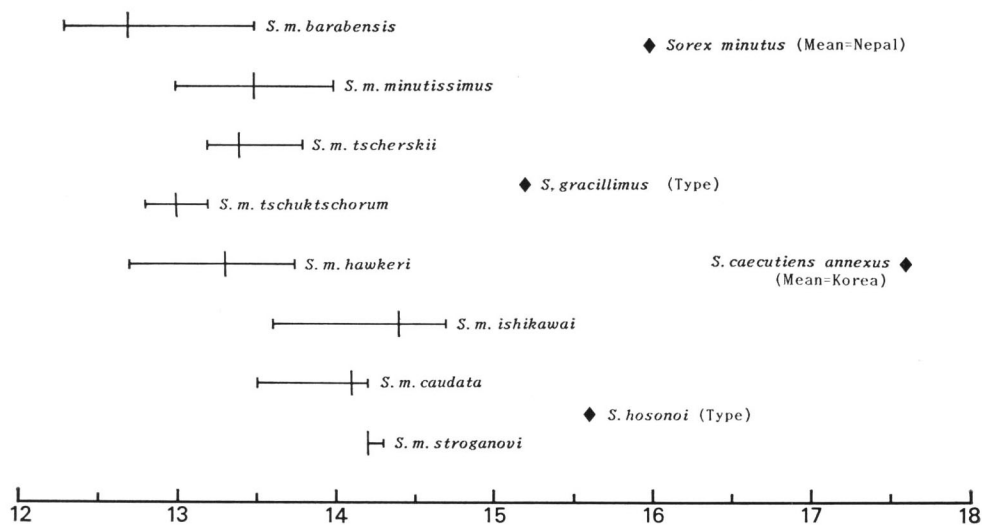


Fig. 5. Comparison of the subspecies of *Sorex minutissimus* and its relatives in the measurements (in mm) of condylobasal length of skull. Horizontal lines indicate range; vertical lines indicate the mean values.

— *S. m. caudatus* JUDIN, 1964 (type loc. NE. Altai).

I have been unable to examine any specimen of the Siberian subspecies. Judging from the data given by OGNEV (1928), STROGANOV (1957) and JUDIN (1964), the measurements of *S. m. ishikawai* are nearer to those of the Altai subspecies and are decisively different from those of the Ussuri subspecies, the latter of which are geographically neighbouring to the Korean one. Since there is a very wide gap between South Korea and Altai, I have regarded the Korean population as representing a new subspecies. Anyway the new subspecies can be recognized by its large size, as was already pointed out under the heading of "Diagnosis".

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