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The Pliocene and Pleistocene *Insectivora* (*Mammalia*) of Poland IV. *Soricidae: Neomysorex* n. gen. and *Episoriculus* ELLERMAN et MORRISON-SCOTT 1951

[With 6 text-figs.]

Plioceńskie i plejstoceńskie owadożerne (*Insectivora*, *Mammalia*) Polski IV. *Soricidae: Neomysorex* n. gen. i *Episoriculus* ELLERMAN et MORRISON-SCOTT, 1951*

Abstract. A new genus, *Neomysorex* n. g. *(Soricinae, Neomyini)*, from the Middle Pliocene locality at Podlesice and two species, *Episoriculus borsodensis* JÁNOSSY 1973 also from Podlesice and *Episoriculus gibberodon* (PETENYI 1864) from the Upper Pliocene of Węże I are described.

The material used for the description of the new genus was previously examined by KOWALSKI in 1956 and identified as *Sorex alpinoides*. Some new material has now made it possible to find that this form has distinctly intermediate characters between those of the soricoidal and neomyidal forms and considering the structure of its mandibular processes should rather be included in the tribe *Neomyini*.

A discussion of the systematic position of all these forms, their occurrence, measurements and drawings are added to the description.

INTRODUCTION

This work is fourth in the series on the remains of insectivores from the Neogene and Pleistocene of Poland. The preceding papers were given to the *Erinaceidae* and *Desmaninae* (RZEBIK-KOWALSKA, 1971), *Paranourosorex* and *Amblycopotus (Soricinae)* (RZEBIK-KOWALSKA, 1975) and *Beremendia* and *Blarinoides (Soricinae)* (RZEBIK-KOWALSKA, 1976). The present paper contains a description of two genera, *Neomysorex* n. g. and *Episoriculus*. These forms are here treated together not only in view of their common systematic position *(Soricinae, Neomyini)*, but also because in spite of differences in the structure of the upper dentition and rostrum *Neomysorex alpinoides* and *Episoriculus borsodensis* from Podlesice resemble each other in measurements and their mandibles differ only in slight details. The finding of these details helps much in identification. On the other hand, if we have at our disposal only

* Praca wykonana w ramach problemu MR. II. 3 „Współczesne i Kopalne Fauny Polski".

fragments of mandibles, it is often impossible to divide them between particular species.

A short characterization of the localities from which the material for this study has been obtained is given in the previous papers of this cycle (RZEBIK-KOWALSKA, 1971, 1975). Measurements were taken as shown in the diagram in Fig. 1 in RZEBIK-KOWALSKA'S (1975) paper, partly on the basis of the paper by H. de BRUIJN and C. G. RÜMKE (1974). The materials described are stored in the collection of the Institute of Systematic and Experimental Zoology, Polish Academy of Sciences, in Cracow.

I thank Prof. D. JÁNOSSY for valuable remarks and access to the Hungarian comparative materials. I am also indebted to Mr K. MALCZEWSKI for drawing the illustrations.

MATERIAL

Family — *Soricidae* GRAY, 1821
Subfamily — *Soricinae* FISCHER von WALDHEIM, 1817
Tribe — *Neomyini* REPENNING, 1967

Typus generis: *Sorex alpinoides* KOWALSKI, 1956
Derivatio nominis: *Neomysorex* — having features characteristic of both genera, *Neomys* and *Sorex*.

Generic characters: as in the only species numbered in it: *Neomysorex alpinoides* (KOWALSKI, 1956).

Holotype: The rostral part of a skull with the I^1—A^5 alveoli, the teeth P^4—M^3 on the right side and P^4—M^2 on the left and both mandibular rami, the right one with its angular process broken off and A_1, P_4 and M_3 missing and the left with the angular process and anterior part with I_1 and A_1 broken off, MF/3/60/1 (see KOWALSKI, 1956).

Material: Podlesice. 11 cranial fragments, of which 5 nearly complete rostral parts and 3 left and 3 right fragments of the rostrum. KOWALSKI writes in his paper of 1956 that the upper dentition is represented by all teeth except I^1, whereas now only the teeth from A^3 to M^3 have been found. The lower jaws are represented by 72 left and 81 right halves or fragments and all lower teeth from I_1 to M_3 (MF/3/60). The minimum number of individuals has been estimated at 58 on the basis of the greatest number of right M_1 (the most numerously preserved element).

Description of holotype and individual variation within remaining material. Dental formula: $\frac{1-6-3}{1-2-3} = 32$. The rostrum is broad and shortened. On its external side there is a shallow depression which extends above I^1—A^4, its deepest part occurring above A^2—A^3. The small roundish infraorbital foramen begins above the metastyle of P^4 and ends above the mesostyle of M^1.

The oval lacrimal foramen lies at the level of the upper half of the infraorbital foramen. The only preserved postacetabular process has a *Neomys*-type structure. The anterior palatine foramina lie on the line connecting the anterior halves of the first unicuspids A^1—A^1, the smaller posterior ones at the height of the hypocones of M^1. The zygomatic process, slightly curved to the middle, can be seen on the line of extension of the metastyle of M^2.

Upper dentition. Teeth pigmented weakly, light-brown. Pigment present chiefly on metacone of P^4 and paracone and metacone of M^1. I^1—A^5 not preserved. Their alveoli arranged in diminishing order, more or less round in shape, last two, i. e. A^4 and A^5, fused. Narrow P^4 (relatively small external length) has its protocone moved away from the parastyle for a maximum distance or to the anterolingual corner of the tooth. Distinct hypocone placed to paracone, cingular cusp lacking; M^1 and M^2 morphologically identical, although M^2 slightly smaller than M^1. These teeth are subsquare, with well-developed

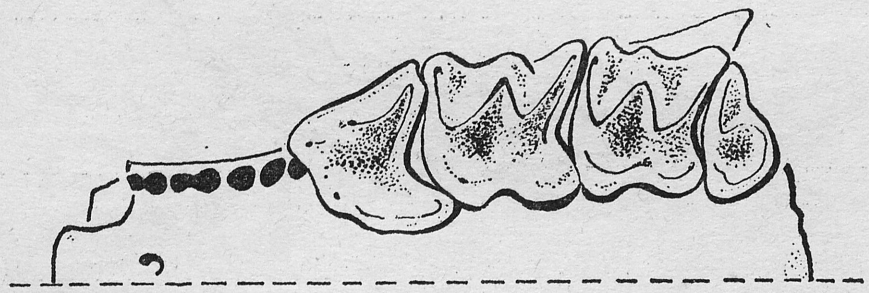

Fig. 1. *Neomysorex alpinoides* from Podlesice. Left maxillary fragment with P^4—M^3 (MF/3/2)

heels, but their hypocones are not large. Nor is there any connection between the cutting edge extending between the protocone and metacone and, in this connection, the trigonid valley is open. Emargination on P^4 and molars noticeable. M^3 characterized by its short paracone and little reduced mesostyle, owing to which the tooth seems broad and robust. Cingulum of posterior edge of P^4 and M^1—M^2 weakly marked but well developed on the external side of these teeth.

A morphological analysis of the remaining jaws of *Neomysorex* showed that they do not differ in structure from the holotype. The only difference observed was the presence of a low edge between the protocone and metacone on M^1 and M^2, in consequence of which the valley on the trigonid of these was shallowly closed.

In the *Neomysorex* material examined there were also specimens, with the unicuspids A^3—A^5 preserved. These teeth are short and broad, compressed antero-posteriorly, which is connected with the fact that they are many (5) placed on the much shortened rostrum. A^3 is reniform and its apex is in the middle of the frontal wall. The cingulum surrounds the tooth all round except the place below the apex. A^4 and A^5 are similar in shape only that A^5 is very small and more or less emerges from under the parastyle of P^4.

Mandible and lower dentition. The mandible is short and slender. Its horizontal ramus narrows below M_2, the mental foramen lies somewhat in front of the line that halves M_1 and the mandibular commissure terminates under the valley between the paraconid and metaconid of M_1. The horizontal and vertical mandibular rami join at a lightly obtuse angle. The rather narrow coronoid process is inclined somewhat to the front and to the outside in relation to the plane of the mandible bone. There is a shallow depression on the internal side of this process. The distinct pterygoid spicule is semilunar in shape.

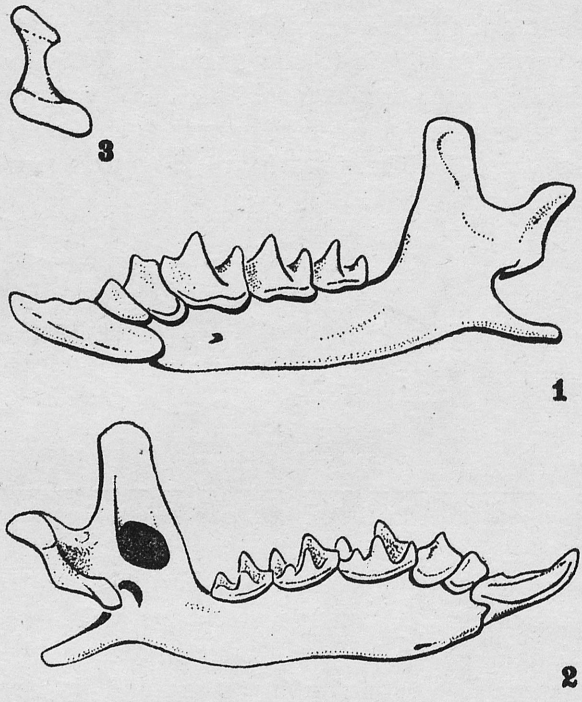

Fig. 2. *Neomysorex alpinoides* from Podlesice. 1-2 — left half of mandible with I_1—M_1 (MF/3/4) 3 — processus condyloideus of the same mandible

The relatively deep external temporal fossa descends below the superior sigmoid notch and the internal temporal fossa is high and has the shape of an isosceles triangle. The condyloid process is characterized by its narrow interarticular surface and elongated lower articular surface, which lies further to the front and bends ventrally in relation to the lower surface in the *Soricini*. The superior pterygoid fossa is deep and the pterygoid spicule small.

I_1 has two cusps on its cutting surface, the cusp situated nearer the top being very tiny. At the base of the crown of I_1 is the flat but distinct cingulum. An arcuate groove extends on the lingual side of this tooth (Fig. 2/2). A_1 is not preserved. The *Sorex*-type P_4 has however a rather shallow posterolingual basin and is slightly convex on the external side. The flat cingulum surrounds it externally and internally, being broadest in its external corner, where it

most overhangs the mandible bone. The molars are characterized by the fact that the edge of their lower crown on the lingual side does not cling to the horizontal mandibular ramus over the whole length of the tooth but only in its middle part, because the tooth is navicular in shape (Figs. 2/2 and 5 (D-2)). M_1 is distinguished by its pronounced endoconid crest. Its protoconid lies slightly further to the front compared with the metacon, the hypolophid is not connected with the endoconid, the valley between the protoconid and metaconid does not descend as far as the cingulum on the external side of the tooth, and the cingulum is broad and flat, broadest in the posterolabial corner of the tooth. M_2 is a somewhat diminished copy of M_1. The talonid of M_3, which is not reduced, bears no traces of the division into the hypoconid and endoconid. Pigment is visible on the top of I_1, P_4, on the paraconid of M_1 and the metaconid of M_1 and M_2.

The individual variation of the mandible within this species is small. It includes, among other characters, the structure of the external (excepting the top) cusp of I_1, which may be more or less pronounced; besides, some specimens of M_1 are characterized by the wavy line of the lower external edge of the crown, whereas in other specimens this line is straight as in the holotype, and some M_3 have the small but distinct hypoconid and endoconid separated by a shallow groove (hypolophid always missing). There happen also very slight changes in the situation of the mental foramen and the size of the superior pterygoid spicule.

A_1, absent from the holotype, is well represented in the remaining material. This long tooth lies utterly on I_1 and is characterized by its shallow posterolingual basin. As a result, an unworn tooth clearly shows its bicuspid structure. As in P_4, the cingulum of this tooth is flat and broad.

Measurements. See Tables I and II.

Systematic Position

Neomysorex alpinoides belongs to the subfamily *Soricinae*. Its membership in this subfamily can be determined on the basis of the structure of P_4 with the posterolingual basin present and the cingulum overhanging the root and the lateral surface of the mandible in the posterolabial corner of the tooth more than in the other subfamilies, the structure of the condyloid process, whose articular surfaces join each other on the labial side of the condyles, the structural details of M_1, the presence of pigmentation, etc.

However, it is not easy to determine which tribe within the subfamily *Soricinae* the genus *Neomysorex* belongs to. KOWALSKI (1956) included the material under study in the genus *Sorex* on account of the presence of five upper unicuspids and the structure of the condyloid process, which, according to him, is marked by its broad interarticular surface, and in the species *Sorex alpinoides* on the basis of the presence of two cusps on A_1. Indeed, the small size of the remains, 5 unicuspids in the maxilla and the presence of more than one cusps on I_1 suggest that we are concerned here with a member of the tribe *Soricini*, but the structure of the condyloid process differs distinctly from that

Table I

Neomysorex alpinoides (KOWALSKI) — dimensions of rostrum and upper dentition

Locality Specimen		PODLESICE													
		1	2	3	4	5	6	7	8	9	10	min.	avg.	max.	N
A^3	L	—	0.36	—	—	—	—	—	—	—	—	0.36	0.36	0.36	1
	W	—	0.53	—	—	—	—	—	—	—	—	0.53	0.53	0.53	1
A^4	L	—	—	0.35	—	—	—	—	—	—	—	0.35	0.35	0.35	1
	W	—	—	0.53	—	—	—	—	—	—	—	0.53	0.53	0.53	1
A^5	L	—	0.34	0.30	0.29	—	—	—	0.20	—	—	0.20	0.28	0.34	4
	W	—	0.34	0.35	0.36	—	—	—	0.35	—	—	0.34	0.35	0.36	4
P^4	L_1	1.33	1.33	1.36	1.35	1.35	1.38	1.33	1.38	1.39	1.39	1.33	1.36	1.39	10
	L_2	0.74	0.75	0.74	0.71	0.77	0.76	0.70	0.74	0.75	0.80	0.70	0.75	0.80	10
M^1	L_1	1.37	1.33	1.34	1.32	1.33	1.31	1.32	1.38	—	1.36	1.31	1.34	1.38	9
	L_2	1.09	1.10	1.03	0.98	1.07	1.05	0.18	1.05	—	1.10	0.98	1.05	1.10	9
	W_2	1.43	1.42	1.49	1.47	1.42	1.49	1.49	1.46	—	1.49	1.42	1.46	1.49	9
M^2	L_1	1.20	1.14	1.15	1.14	1.17	—	1.20	—	—	—	1.14	1.17	1.20	6
	L_2	1.02	1.00	0.99	0.94	0.95	0.95	0.96	—	—	—	0.94	0.97	1.02	7
	W_1	1.41	1.39	1.49	1.38	1.36	1.31	1.38	—	—	—	1.31	1.39	1.41	7
	W_2	1.26	1.33	1.37	1.31	1.28	—	1.35	—	—	—	1.26	1.32	1.37	6
M^3	L	0.67	0.63	0.74	0.70	0.63	—	0.70	—	—	—	0.36	0.68	0.74	6
	W	1.21	1.14	1.14	1.11	1.09	—	1.12	—	—	—	1.09	1.13	1.21	6
M^1—M^2	L	2.53	2.47	2.53	2.43	2.47	—	2.49	—	—	—	2.43	2.49	2.53	6
M^1—M^3	L	3.00	3.02	2.99	2.95	3.01	—	3.03	—	—	—	2.95	3.00	3.03	6
Width of rostrum on zygomatic processes		4.71	5.04	—	4.73	4.72	—	—	—	—	—	4.71	4.80	5.04	4

in the genus *Sorex*, even in *Sorex alpinus*, the interarticular surface of which is really rather narrow.

The condyloid process of *Neomysorex* is characterized by its lower articular process, placed further to the front, and lower articular surface, more elongated and bent labially than in members of the tribe *Soricini*. The lingual emargination of the articular process is open and in this connection the interarticular surface is narrow, although not so narrow as in members of the genus *Neomys*. In addition, the superior pterygoid fossa is deep, the pterygoid spicule present and the external temporal fossa reaches below the superior sigmoid notch. All these characters as well as the structure of P^4, the protocone of which is moved away from the parastyle as far as the anterolingual corner of the tooth, incline us to include *Neomysorex alpinoides* in the tribe *Neomyini*.

Since the form under description differs to much to be numbered in the genus *Sorex* or in any genus of the tribe *Neomyini* and has some characters typical of members of both these tribes, it was given a new generic name, *Neomysorex*. At first sight it seems that perhaps *Neomysorex* is ancestral form to the genus *Neomys*, it still has five upper unicuspids but already the *Neomys*-type structure of the articular process. If we, however, have a close look at the structure of the rostrum and mandible in forms of the genus *Neomys*, we shall see that it is entirely different from that in *Neomysorex*. Although the number of the upper unicuspids in forms belonging to the genus *Neomys* has been reduced, the rostrum remains strongly elongated. In this connection the unicuspids have also been elongated and are at least twice as long as broad. The horizontal ramus of mandible is lengthened as well, which is indicated by the fact that I_1 does not extend further than the end of A_1, whereas in *Neomysorex alpinoides* it extends to the end of P_1 and, as the rostrum is markedly shortened, the upper unicuspids are transversely compressed so that they are broader than long. There are no such transversely compressed upper unicuspids in any members of the tribe *Neomyini*.

If by good luck the rostral part of the skull and both mandibular halves had not been found in their anatomical relation, the maxillae with five unicuspids would probably never have been referred to the mandibles with the neomyidal-type structure of condyloid process. These mandibles would rather have been associated with the skulls belonging to small members of the genus *Episoriculus*, also occurring at Podlesice. The size and morphology of the mandibles belonging to *Neomysorex* and *Episoriculus* do not differ much from each other and, if we have at our disposal only fragments of mandibles, it is very hard to determine to which of these genera they belong. It is only when we have whole mandibles with unworn teeth that we can observe minor features in which these forms differ. *N. alpinoides* differs from the small forms of *Episoriculus* in its, on the average, smaller size, one more little cusp on I_1, somewhat different position of the mental foramen (rather in front of the line which divides M_1 into halves), more navicular molars and slightly larger and higher internal temporal fossa (Fig. 5).

Neomysorex alpinoides (KOWALSKI) — dimensions of mandibles and lower dentition

Locality / Specimen		PODLESICE																		
		1	1*	2	3	4	5	6	7	8	9	10	11	12	13	14	15	min.	avg.	max.	N
I_1	L	2.67	—	2.79	2.64	2.62	2.62	2.66	2.78	2.70	2.72	2.71	—	2.92	—	2.70	2.90	2.62	2.72	2.92	13
	W	0.80	—	0.82	0.80	0.83	0.79	0.85	0.80	0.85	0.83	0.85	—	0.83	—	0.79	0.83	0.79	0.82	0.85	13
A_1	L	—	—	—	—	0.85	—	0.75	—	—	—	—	—	—	—	—	—	0.75	0.80	0.85	2
	W	—	—	—	—	0.66	—	0.68	—	—	—	—	—	—	—	—	—	0.66	0.67	0.68	2
P_4	L	—	1.03	—	—	1.02	0.97	0.91	0.96	—	—	—	0.91	0.97	—	—	—	0.91	0.97	1.03	7
	W	—	0.75	—	—	0.70	0.64	0.67	0.65	—	—	—	0.62	0.63	0.66	—	—	0.62	0.66	0.75	8
M_1	L	1.47	—	1.45	1.43	1.41	1.45	1.35	1.47	1.37	1.48	1.41	1.43	1.48	1.48	1.45	1.43	1.35	1.44	1.48	15
	W	0.78	—	0.75	0.78	0.78	0.78	0.75	0.77	0.82	0.77	0.75	0.77	0.78	0.81	0.76	0.80	0.75	0.78	0.82	15
M_2	L	1.26	—	1.28	—	1.29	1.29	1.17	1.33	1.30	—	1.22	1.24	—	1.32	1.33	1.30	1.17	1.28	1.33	12
	W	0.74	—	0.71	—	0.74	0.72	0.69	0.73	0.74	—	0.73	0.69	—	0.75	0.72	0.73	0.69	0.72	0.75	12
M_3	L	—	0.98	—	—	1.06	0.98	—	1.06	1.05	—	—	—	—	1.05	—	—	0.98	1.03	1.06	6
	W	—	0.58	—	—	0.58	0.53	—	0.60	0.58	—	—	—	—	0.59	—	—	0.53	0.58	0.60	6
Heigth of proc. condyloideus		1.74	—	1.62	1.68	1.78	1.83	1.64	1.70	1.75	1.84	1.71	1.81	—	1.71	—	—	1.62	1.73	1.84	12
Length of its lower art. facet		1.37	—	1.20	1.33	1.35	1.35	1.30	1.40	1.42	1.37	1.28	1.27	—	1.36	—	—	1.20	1.33	1.42	12
Width of inter-articular area		0.52	—	0.49	0.53	0.54	0.46	0.49	0.58	0.53	0.59	0.54	0.57	—	0.45	—	—	0.45	0.52	0.59	12
M_1—M_3	L	—	3.44	—	—	3.52	3.45	—	3.64	3.58	—	—	—	—	3.64	—	—	3.44	3.54	3.64	6
Height of mandible below M_1 (ext.)		1.26	—	1.19	1.24	1.32	1.26	1.27	1.26	1.24	1.20	1.24	—	1.18	1.28	1.12	1.08	1.08	1.21	1.32	14
Height of mandible below M_3 (int.)		1.25	—	1.15	1.18	1.25	1.27	1.20	1.25	1.37	1.27	1.21	1.22	1.27	1.15	1.21	1.19	1.15	1.23	1.37	15
Length of mandible with I_1		9.34	—	8.87	8.90	9.31	9.32	9.08	9.68	9.41	9.45	9.12	—	—	—	—	—	8.87	9.25	9.68	10

Length of mandible without I_1	7.67	—	7.34	7.31	7.84	—	7.46	8.12	7.80	7.92	7.57	—	—	—	—	—	7.31	7.67	8.12	9
I_1—M_3 | L	—	—	—	—	6.03	6.05	—	6.21	—	—	—	—	—	—	—	—	6.03	6.10	6.21	3
Height of ascending ramus	3.75	—	3.51	3.48	3.50	3.70	3.70	3.71	3.82	3.83	3.58	3.71	—	3.48	—	—	3.48	3.65	3.83	12
A_1—P_4 | L	—	—	—	—	1.30	—	1.25	—	—	—	—	—	—	—	—	—	1.25	1.27	3.30	2

1 — right half of mandible,
1* — left half of mandible (holotype)

Family *Soricidae* GRAY, 1821
Subfamily *Soricinae* FISCHER von WALDHEIM, 1817
Tribe *Neomyini* REPENNING, 1967
Genus *Episoriculus* ELLERMAN et MORRISON-SCOTT, 1951
Episoriculus borsodensis JÁNOSSY, 1973

Material: Podlesice. 5 maxillary fragments, of which 4 are left, with A^1—M^3, and 1 right, with P^4—M^1, 6 right and 14 left detached I^1 and 126 left and 100 right mandibular halves or fragments, with all teeth and processes except the angular process, MF/8/60. The minimum number of individuals has been calculated at 88 on the basis of the most frequently occurring element, i. e. M_1.

Description. The skull has not been preserved whole, there being only a small number of fragments of the rostral part. The infraorbital foramen, observed there, is large, oval and begins above the mesostyle of P^4 and ends above that of M^1. The fairly large lacrimal foramen lies at the level of the upper half of the infraorbital foramen, above the metastyle of M^1. The anterior palatal foramina lie on the line connecting the first unicuspids (A^1—A^1). The zygomatic process can be seen in the extension of the metastyle of M^2, it is lightly bent mediad and protruding beyond the paracone of M^3. Upper dentition: The teeth are weakly pigmented, light orange in colour. In the specimens preserved pigment is present only at the top of the metacone of P^4, paracone and metacone of M^1, at the top of I_1 and P_4 and on the metaconid of M_1.

Dental formula: $\frac{1—5—3}{1—2—3} = 30$.

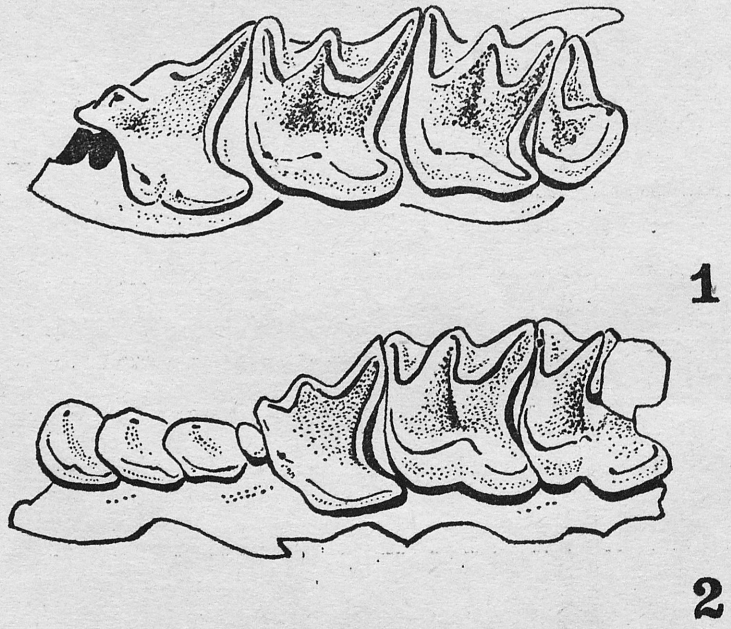

Fig. 3. *Episoriculus borsodensis* from Podlesice. 1 — left maxillary fragment with P^4—M^3 (MF/8/3), 2 — left maxillary fragment with A^1—M^3 (MF/8/1)

I^1 is bifid, with its talon fairly broad and cingulum pronounced and running all along the external edge at the contact of the crown and the root, and sometimes even higher. Four unicuspids are arranged in diminishing order, the second of them being only slightly smaller than the first, the third somewhat smaller than the preceding two and the fourth tiny, hidden behind the parastyle of P^4 and only partly seen from the outside. Seen from above, the unicuspids are subsquare. The breadth: length ratio is a sa 85:0.90. A^1 and A^2 have a sharp and high cusp on the external half of the tooth, while the internal half is low and its lingual edge fairly markedly bent upwards. The tops of unworn teeth are slightly medially (lingually) bent. The cingulum is clearly seen on the external side of the unicuspids. P^4 has the shape of a trapezium with its anterior side very short, because the protocone is situated near the well-developed parastyle and the well-developed hypocone does not lie under the protocone but is moved to the back, on to the internal edge of the tooth. M^1 and M^2 are morphologically identical. Their hypocone is distinct and the

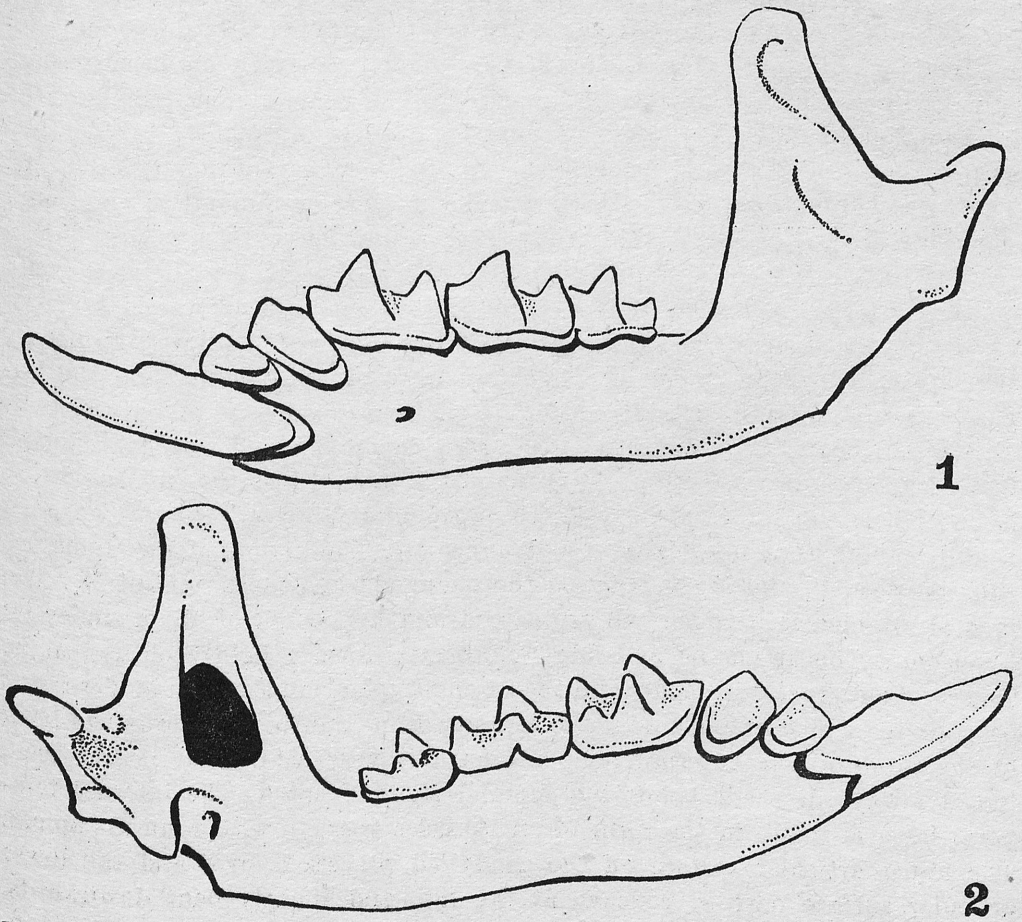

Fig. 4. *Episoriculus borsodensis* from Podlesice. 1-2 — left half of mandible with I_1—M_1 (MF/8/1)

ridge connecting the metacone and protocone very low. The external part of M^3 is rather strongly reduced. Its protocone (acc. to STROGONOV's nomenclature) is very low and the subdued mesostyle worn out. The emargination of P^4 and molars is very strong, all these teeth have their posterior upper edge bent upwards.

Mandible and lower dentition. The relatively short lower incisor (I_1) has one distinct lobe on its cutting surface. The end of the incisor is gently bent upwards. The cingulum is visible on its external side, at the base; at the bottom it terminates level with the end of the mandible and at the top with the beginning of A_1. On the internal side there is a distinct groove, which extends along the lower edge of the tooth and passes upwards to end in the region of the upper root of I_1. There is a very shallow posterolingual basin on A_1 and when this tooth is not worn, it gives an impression of being bifid only that the posterior top is very low. It is also marked by the fact that, seen from the outside, it looks long and low. It lies utterly on I_1 and its posteroexternal corner overhangs the mandible. The flat cingulum is visible on the overhanging part. P_4 is also of *Sorex*-type, i. e. it has a distinct posterolingual basin, being consequently a bifid tooth. The distinct flat cingulum occurs also on its posteroexternal corner, which overhangs the mandible. The cingulum is present on the internal side of both these teeth (A_1 and P_4) as well. M_1 and M_2 are identical as regards morphology, M_2 being however usually somewhat smaller than M_1. They are characterized by the distinct endoconid crest, pronounced endoconid separated from the hypolophid, the anterior position of the protoconid in relation to the metaconid, and the junction of the hypoconid with the trigonid on the posterior wall of the latter, externally to the valley between the protoconid and metaconid. The valley on the external side of M_1, however, oftener than not reaches the cingulum. The lower edge of the cingulum on the lingual side of the teeth, notably on M_1, is gently wavy in the manner characteristic of the neomyidal forms. M_3 is relatively large and weakly reduced. Only on quite unworn teeth the division of the talonid into the endoconid and hypoconid is sometimes visible. The hypolophid is always lacking. The horizontal mandibular ramus is narrowed under M_2. The mandibular commissure ends between P_4 and M_1 or between the paraconid and metaconid of M_1. The mental foramen is between the protoconid and hypoconid of M_1 or under its hypoconid. The ascending and horizontal rami form a lightly obtuse angle. The coronoid process is slender and the coronoid spicule in the form of a crescent or a groove which extends arching obliquely from the front towards the back of the process. The external temporal fossa is very shallow or poorly seen, but it always descends below the superior sigmoid notch. The internal temporal fossa is small, in the form of an isosceles triangle with rounded apices. The upper articular surface on the condyloid process is oval and the lower articular surface narrow, concave at the top, and slightly bent downwards. The interarticular surface is narrow and of *Neomys*-type. The superior pterygoid fossa is deep and the superior pterygoid spicule small or poorly seen.

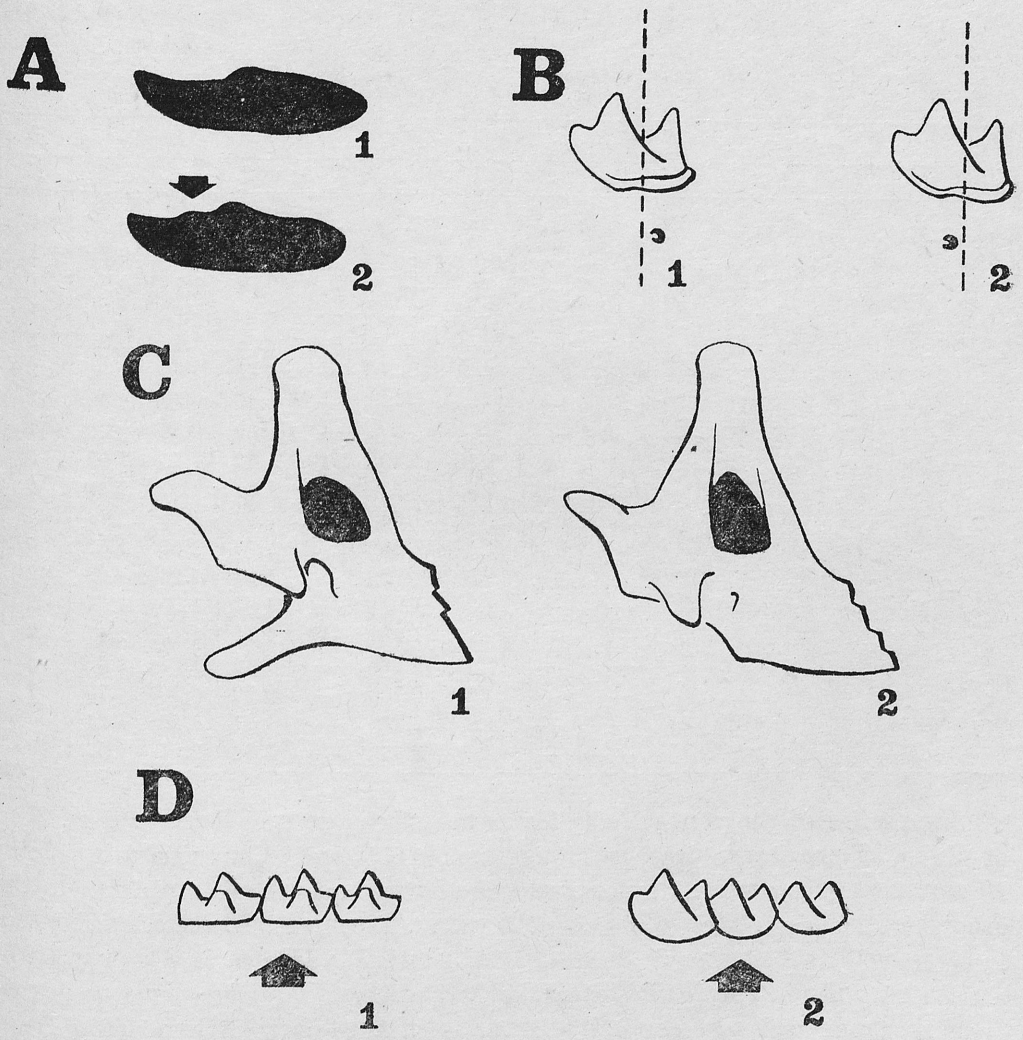

Fig. 5. Differences in morphology of lower teeth (A, B, D) and internal temporal fossa (C) between 1 — *Episoriculus borsodensis* and 2 — *Neomysorex alpinoides* from Podlesice

Measurements. See Tables III, IV and V.

Systematic position and occurrence. On the basis of the structure of P_4, the presence of pigmentation, the build of the articular process, the structural details of M_1, and the mental foramen, situated further to the back, *Episoriculus* may undoubtedly be referred to the subfamily *Soricinae*, whereas such characters as the presence of the rectangular M^2, the presence of the endoconid crest on M_1, the condyloid process shifted further ventrally than in members of the tribe *Soricini*, which makes it less visible from the external side, the very small width of the interarticular surface, the elongated lower articular surface, the deep superior pterygoid fossa etc. indicate the membership of this genus in the tribe *Neomyini* (for details see *Neomysorex*).

Table III

Episoriculus borsodensis JÁNOSSY — dimensions of upper dentition

Locality		PODLESICE								
Specimen		1	2	3	4	5	min.	avg.	max.	N
A^1	L	0.74	—	—	—	—	0.74	0.74	0.74	1
	W	0.65	—	—	—	—	0.65	0.65	0.65	1
A^3	L	0.74	—	—	—	—	0.74	0.74	0.74	1
	W	0.63	—	—	—	—	0.63	0.63	0.63	1
A^3	L	0.68	0.72	—	—	—	0.68	0.70	0.72	2
	W	0.62	0.65	—	—	—	0.62	0.63	0.65	2
A^4	L	0.20	—	—	—	—	0.20	0.20	0.20	1
	W	0.39	—	—	—	—	0.39	0.39	0.39	1
P^4	L	1.38	1.47	1.58	1.40	1.40	1.38	1.45	1.58	5
	L_1	1.31	1.37	1.36	1.42	1.39	1.31	1.37	1.42	5
M^1	L_2	1.10	1.10	1.12	1.05	1.14	1.05	1.10	1.14	5
	W_2	1.54	1.54	1.57	1.56	1.53	1.53	1.55	1.57	5
	L_1	—	—	1.24	1.29	—	1.24	1.26	1.29	2
M^2	L^2	—	—	1.03	1.03	—	1.03	1.03	1.03	2
	W_1	—	—	1.47	1.43	—	1.43	1.45	1.47	2
	W	—	—	1.50	1.46	—	1.46	1.48	1.50	2
	L	—	—	0.70	0.70	—	0.70	0.70	0.70	1
M^3	W	—	—	1.24	1.21	—	1.21	1.22	1.24	
M^2—M^3	L	—	—	2.64	2.67	—	2.64	2.65	2.67	

Six species of the genus *Episoriculus* have been described up to now. Two of them, *Episoriculus leucops* HORSFIELD, 1855 and *Episoriculus caudatus* HORSFIELD, 1851, are contemporary species living in south-eastern Asia. On the other hand, *Episoriculus gibberodon* (PETENYI, 1864) and *E. castellarini* PASA, 1947 as well as *E. tornensis* JÁNOSSY, 1973 and *E. borsodensis* JÁNOSSY, 1973 are known only in the fossil state. The first of them, *E. gibberodon* was described as *„Crocidura" gibberodon* by PETENYI in 1864 from Beremend in Hungary, the locality dated at the Lower Cromerian, and later KORMOS (1911) reported it under the same name from another Hungarian locality, Csarnota (Middle Pliocene). In 1934 KORMOS described a form, which he named *Soriculus kubinyii*, from the Lower Cromerian locality of Villany also in Hungary. KOWALSKI (1956) also records the presence of this last species in the Pliocene fauna of Podlesice. KRETZOI (1936) demonstrated the identity of these two forms, *„Crocidura" gibberodon* and *Soriculus kubinyii*. Later, this species, now under the name of *Soriculus gibberoni*, was mentioned by KRETZOI (1956) from Beremend and Villany, by the same author (1959) from Plesivec in Czechoslovakia and Csarnota, the locality dated by FEJFAR (1961) at the Villafranchian, and by TERZEA et al. (1969) from Betfia X in Romania (boundary between the Villafranchian and Biharian or the Middle Pleistocene).

In his work on Csarnota KRETZOI (1959) proposes to erect a new subgenus for the genus *Soriculus*, namely, *„Soriculus* (*Asoriculus* n. g.) *gibberodon* (PE-

TENYI)". This form is given as *Asoriculus gibberodon* from the Middle Pliocene of Ivanovce in Czechoslovakia by FEJFAR (1966) and Csarnota by KRETZOI (1962), from the Villafranchian locality at Arondelli in Italy by BERZI et al. (1970) and the Cromerian one at Hohensülzen in Western Germany by STORCH et al. (1973). REPENNING (1967) repudiates the subgenus *Asoriculus* and includes this species in the genus *Episoriculus*. As *E. gibberodon* this form has been described from the Villafranchian locality Layna in Spain (CRUSAFONT et al., 1969), from the Upper Pliocene of Rhodes (BRUIJN et al., 1970), the Villafranchian of Osztramos 7 in Hungary (JÁNOSSY, 1973), the Lower Pleistocene of Montousse in France (CLOT et al., 1976), the Pliocene of Deutsch-Altenburg 20 in Austria (MAIS et al., 1977) and as *Episoriculus* sp. from Calta in Turkey (Upper Pliocene — SEN, 1977). Some authors however suggest that the genera *Episoriculus* and *Chodsigoa* should be regarded as subgenera of the genus *Soriculus*. REPENNING does not agree with this opinion either, claiming that the differences between *Soriculus*, *Episoriculus* and *Chodsigoa* are as great as those, e. g. between *Soriculus* and *Neomys*. In fact, *Episoriculus* differs from the members of the genus *Soriculus*, e. g. contemporary *S. nigriscens* (which I was in a position to see in the Topal collection from India) in the reduction of the labial cingulum on the lower molars and endoconid crest on M_1 (very low), the marked reduction of whole M_3, the spade-shaped coronoid process, etc.

In comparison with *Chodsigoa* it has one more upper unicuspid, more extensive pigmentation, smaller emargination of P^4 and upper molars, a smaller forward bend of the top of the coronoid process, etc. *Episoriculus* differs from *Neomys* in the structure and mutual proportions of the upper unicuspids, the structure of P^4, less reduced M_3, shorter I_1, weaker pigmentation, etc. Neither can the genus *Episoriculus* be confused with other members of the tribe *Neomyini*.

In 1947 PASA described a new species, *Neomys castellarini*, from Soave, of Cromerian age, in Italy. The description is not very detailed, but this form seems to belong to the genus *Episoriculus*. VAN der MEULEN (1973) shares this opinion and enters this species as *Episoriculus*? cf. *castellarini* in the list of the fauna from Ponte Peglia Cave in Italy (PASA, 1947). This locality is somewhat older than that investigated by PASA.

Finally, in 1973 JÁNOSSY described two other species of the genus *Episoriculus* from Hungary, *E. tornensis* from the lower Middle Pliocene of Osztramos 13 and *E. borsodensis* from the Middle Pliocene of Osztramos 1.

All these species most certainly belong to the genus *Episoriculus*, because they show characters given by ELLERMAN and MORRISON-SCOTT (1951), i. e. the typical dental formula $\frac{1—5—3}{1—2—3}$, bifid I^1, tiny A^4, P^4 with its protocone situated near the parastyle, short I_1 with one small lobe on the cutting surface, reduced light-orange pigmentation seen only on unworn teeth — I^1, the metacone of P^4, sometimes the metacone and paracone of M^1, the top of I_1

Table IV

Episoriculus borsodensis (JÁNOSSY) — dimensions of mandibles and lower dentition

Locality		PODLESICE																
Specimen		1	2	3	4	5	6	7	8	9	10	11	12	13	14	min.	avg.	max.	N
I_1	L	3.05	3.08	3.17	3.22	3.28	3.10	3.45	3.20	3.05	3.13	3.29	—	3.19	—	3.05	3.19	3.45	12
	W	0.90	0.86	0.87	0.83	0.85	0.84	0.87	0.84	0.88	0.80	0.85	—	0.87	—	0.80	0.85	0.90	12
A_1	L	0.86	1.04	—	0.88	0.94	0.89	1.10	—	0.87	0.94	0.87	0.82	—	—	0.82	0.92	1.10	10
	W	0.66	0.72	—	0.70	0.70	0.72	0.70	—	0.66	0.68	0.72	0.71	—	—	0.66	0.70	0.72	10
P_4	L	1.03	1.12	—	1.12	1.14	1.13	1.29	—	1.03	1.10	1.20	1.08	1.20	—	1.03	1.13	1.29	11
	W	0.72	0.75	—	0.76	0.74	0.73	0.74	—	0.72	0.74	0.77	0.74	0.70	—	0.70	0.74	0.77	11
M_1	L	1.58	1.62	—	1.58	1.58	1.60	1.55	1.57	1.60	1.57	1.50	1.60	1.52	1.53	1.50	1.57	1.62	13
	W	0.83	0.84	—	0.82	0.84	0.85	0.90	0.85	0.83	0.83	0.84	0.83	0.86	0.78	0.78	0.84	0.90	13
M_2	L	1.43	1.43	1.42	1.46	1.40	1.43	1.38	1.40	1.43	1.37	—	1.30	1.34	1.39	1.34	1.40	1.46	13
	W	—	0.76	0.76	0.74	0.77	0.78	0.82	0.75	0.78	0.76	—	0.77	0.71	0.69	0.69	1.76	0.82	12
M_3	L	1.02	1.05	1.08	—	1.03	—	—	1.07	—	—	—	1.09	1.01	1.07	1.01	1.05	1.09	8
	W	0.58	0.58	0.57	—	0.58	—	—	0.59	—	—	—	0.58	0.58	0.55	0.55	0.58	0.59	8
M_1—M_3	L	3.70	3.80	—	—	3.78	—	—	3.67	—	—	—	3.74	3.63	3.60	3.60	3.70	3.80	7
Height of mandible below (int.) M_2		1.42	1.34	1.36	1.41	1.40	1.27	1.37	1.36	1.23	1.23	—	1.31	1.26	1.22	1.22	1.32	1.42	13
Length of mandible with I_1		10.15	—	10.15	—	—	—	—	—	—	—	—	—	—	—	10.05	10.10	10.15	2
Length of mandible without I_1		8.56	—	8.43	—	—	—	—	—	—	—	—	—	—	—	8.43	8.49	8.50	2
I_1—M_3	W	6.57	6.77	6.72	—	6.67	—	—	6.64	—	—	—	—	6.51	—	6.51	6.65	6.77	6
Height of ascending ramus		—	—	4.01	—	—	—	—	—	—	—	—	—	—	3.82	3.82	3.90	4.01	2

A_1—P_4 L	1.51	1.55	—	1.52	1.49	1.53	1.67	—	1.35	1.48	1.50	1.48	—	—	1.35	1.51	1.67	10
Length of lower side of f. pterygoidea	0.74	—	0.84	—	—	—	—	—	—	—	—	0.64	—	0.77	0.64	0.75	0.84	4
Height of proc. coronoideus	1.82	—	2.02	—	—	—	—	—	—	—	—	1.89	—	1.80	1.82	1.90	2.02	4
Length of its lower art. facet	1.52	—	1.50	—	—	—	—	—	—	—	—	1.53	—	1.52	1.50	1.52	1.53	4
Withdt of interarticular area	0.38	—	0.44	—	—	—	—	—	—	—	—	0.45	—	0.50	0.38	1.44	0.50	4

Table V

Episoriculus borsodensis JÁNOSSY — dimensions of isolated I^1

Locality		PODLESICE													
specimen		1	2	3	4	5	6	7	8	9	10	min.	avg.	max.	N
I^1	L_1	1.65	1.70	1.60	1.71	1.61	1.55	1.65	1.68	1.50	1.50	1.50	1.61	1.71	10
	L_2	0.60	0.68	0.61	0.68	0.69	0.65	0.59	0.61	0.67	0.57	0.57	0.63	0.69	10
	H	1.17	1.22	1.22	1.21	1.21	1.12	1.17	1.14	1.14	1.12	1.12	1.17	1.22	10

and P_4, and the metaconid of M_1 — and the articular processes of mandible placed wide apart. The specimens from Podlesice have all these characters and are therefore included in the genus *Episoriculus*.

On the other hand, the determination of the specific membership of the specimens from Podlesice is not easy. *Neomys castellarini* PASA, 1949, commonly regarded as *Episoriculus castellarini*, is described from very scanty and, as the author writes himself, heterogenous material. In the description he omits many characters which in the light of the present-day systematics could explain its generic and specific membership. *Episoriculus* cf. *castellarini* described from the Middle Pleistocene of Monte Peglia in Italy seems larger (much higher coronoid process and longer M^1) and its I_1 has one more lobe on the cutting surface. Out of the 8 measurements which JÁNOSSY gave as helpful in distinguishing the species (he gave 9 measurements, but it was possible to take only 8 on the specimens from Podlesice — see Table VI), 3 refer the form from Podlesice to *E. gibberodon*, 3 to *E. tornensis* and 5 to *E. borsodensis*. In general, however, the measurements given by the authors show that *E. gibberodon* is a larger form, at least at Pleistocene localities, whereas this species recorded from the Pliocene of Greece, from Rhodes by de BRUIJN (1970), resembles in measurements the specimens from Podlesice or is even smaller. It seems, therefore, that a smaller form lived in the Pliocene and increased its size evolving with time. This phenomenon is known in many evolutionary lines.

Thus, being smaller, the form from Podlesice should be included in the smaller species described from the Pliocene, i. e. in *E. tornensis* or *E. borsodensis*. *E. tornensis* is described on the basis of only one specimen. Its most distinctive characters are tiny A^4 and the very short external side of P^4. One specimen of the material from Podlesice has its last upper unicuspid nearly as small as that in *E. tornensis*. The other three specimens, judging by the preserved alveoli, had this tooth somewhat larger, as large as that in *E. borsodensis*. Since, however, the external length of P^4 of *Episoriculus* from Podlesice is considerably greater than that of *E. tornensis* (and in this connection the P^4: (M^1—M^2) ratio is different) and other measurement resemble rather those of *E. borsodensis*, *Episoriculus* from Podlesice has been numbered in this last species. Perhaps the form from Rhodes should also be included in the group of smaller species or it may possibly be accepted that the whole group of these European forms, nearly identical as regards morphology, belongs

Table VI

Comparison of more important measurements of *Episoriculus tornensis*, *E. borsodensis*, *E. gibberodon* from Hungary with *E. borsodensis* and *E. gibberodon* from Poland

	Episoriculus tornensis (JÁNOSSY 1973) Osztramos 13	*Episoriculus borsodensis* (JÁNOSSY 1973) Osztramos	*Episoriculus gibberodon* (PETENYI) (JÁNOSSY 1973) Osztramos	*Episoriculus borsodensis* (JÁNOSSY) Podlesice 7	*Episoriculus gibberodon* (PETENYI) Węże I
Height of mandible below M_1 (ext.)	1.33	0.94—1.18	1.18—1.46	1.20—1.40	1.26—1.36
Height of ascending ramus	4.05	3.85—3.90	4.05—4.40	3.82—4.01	—
Length of P^4 (ext.)	1.15	1.27	1.4— 1.5	1.38—1.58	—
P^4 (L) / M^1—M^2 (L)	0.43	0.50	0.50	0.56	—
Length of I	1.80	1.48—1.72	1.75—2.07	1.40—1.61	—
Length of I_1	2.96	2.65—3.07	3.38—3.85	3.05—3.45	3.46—3.53
W of I_1	0.83	0.82—1.00	0.90—1.01	0.80—0.90	0.85—0.88
Length of A_1—P_4	1.45	1.32—1.48	1.70—2.00	1.35—1.67	—

to one species, *E. gibberodon*. For if we have a look at the scatter diagram made by JÁNOSSY to illustrate the length and width of I_1 in different species of *Episoriculus*, we shall see that the specimens from Podlesice fill the gap between *E. tornensis* and *E. borsodensis* on the one side and *E. gibberodon* on the other. Only a close analysis of the whole of European material could elucidate the question.

Episoriculus gibberodon (PETENYI, 1864)

Material. Węże I. Right mandibular fragment with I_1 and P_4—M_3 and a left fragment with I_1 and M_1—M_3, both without processes, MF/ 1648/79.

Description. I_1 relatively short, with two lobes on its cutting surface, one very pronounced and the other very weak, seen only on an unworn tooth. The end of the incisor is bent upwards and the fairly broad flat external cingulum embraces the whole basal part of the tooth, on one specimen extending beyond the contact with A_1. On the lingual side the basal part of the tooth is deep indented. A groove runs along the lower internal edge of I_1 to ascend next above the indentation of the base. Both specimens lack A_1. High P_4 is bifid, of *Sorex*-type i. e. with a posterolingual basin. On the external side

its posterolabial corner overhangs the horizontal mandibular ramus. This is where the flat cingulum is rather broad. On the lingual side the equally flat and broad cingulum ascends to reach the region of the posterolingual basin. The entoconid crest of M_1 is distinct. Its endoconid is already separated from the hypolophid, the protoconid is somewhat anterior to the metaconid and

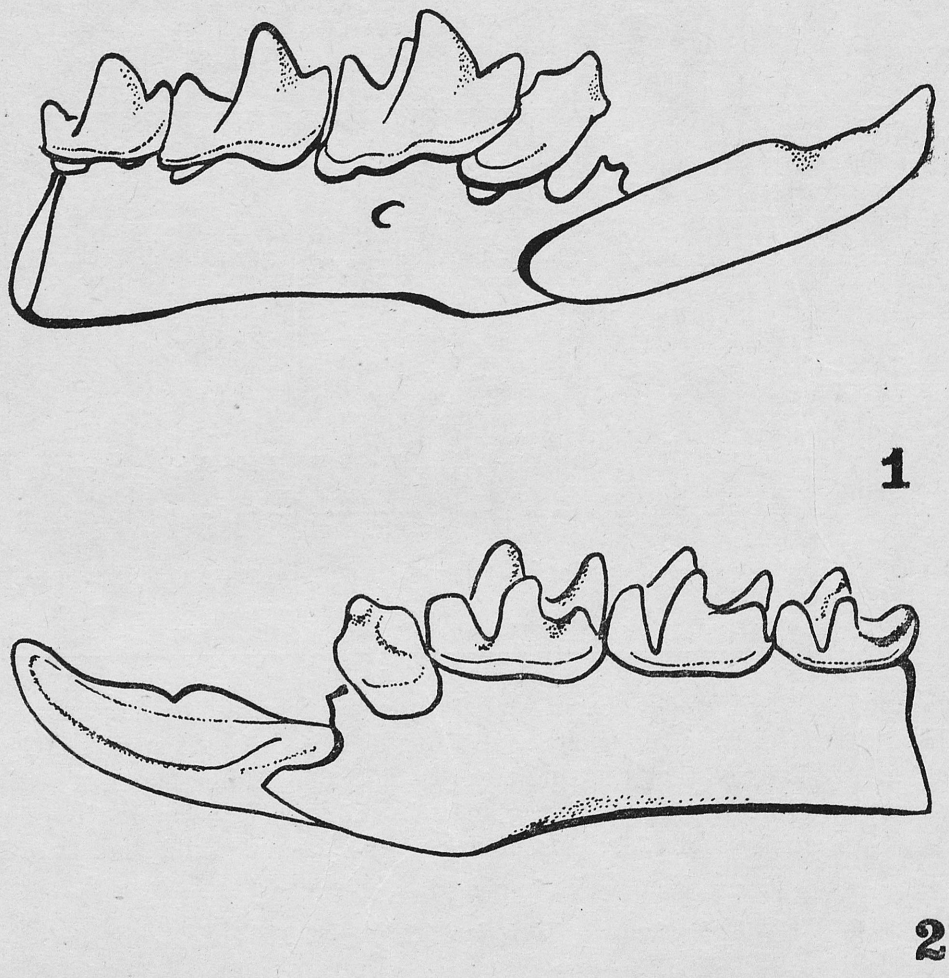

Fig. 6. *Episoriculus gibberodon* from Węże I. 1—2 — right half of mandible with I_1 and P_1—M_1 (MF/1648/1)

the hypoconid joins the trigonid on the posterior wall of this last, more or less half way up the wall under the protoconid. The valley between the protoconid and hypoconid on the external side of the tooth reaches almost as far as the cingulum. The lower line of the cingulum on the external side is characteristically wavy, i. e. it has three eminences — under the protoconid, under the valley between the protoconid and hypoconid and under the hypoconid. M_2 is as usual morphologically identical but smaller. Relatively large

M_3 is weakly reduced. Its talonid is in the form of a heel, i. e. does not divide into the endoconid and hypoconid. The horizontal ramus of the mandible is slender and narrowed under M_2. The mandibular commissure ends between P_4 and M_1 or somewhat farther. The mental foramen lies under the hypoconid of M_1, in the upper half of the mandible body.

Table VII

Episoriculus gibberodon (PETENYI) — dimensions of mandibles and lower dentition

Locality		Węże I	
		1	2
I_1	L	3.46	3.53
	W	0.85	0.88
A_1	L	—	—
	W	—	—
P_4	L	1.17	1.23
	W	0.86	0.87
M_1	L	1.52	1.54
	W	0.92	0.92
M_2	L	1.42	1.38
	W	0.89	0.88
M_3	L	1.12	1.13
	W	0.55	0.65
M_1—M_3	L	4.12	4.12
Height of mandible below M_1 (ext.)		1.26	1.36
Length of lower tooth-row		7.52	7.45

Measurements. See Table VII.

Systematic position. On the basis of the structure of P_4, structural details of M_1, pigmentation and the position of the mental foramen the mandibular fragments from Węże may be placed in the subfamily *Soricinae*.

However, the scanty material and especially lack of the maxillae and articular processes make it difficult to identify these specimens definitively to tribal or generic level. Nevertheless, some characters, e. g. the appearance of the molars and notably the lower wavy line of the cingulum (on the external side of tooth) suggest a neomyidal form, while the appearance of I_1 refers them to the genus *Episoriculus*, belonging to it, for this tooth is shortened and the ratio of its length to the length of its anterior section (from the top to the base of the main lobe) is 3.23 and 3.36 for these two specimens. In the case of the specimens of *Episoriculus* from Podlesice this ratio is 2.94—3.34. In the genus *Neomys* it is much lower, 2.30 for *N. anomalus* and 2.15—2.38 for *N. fodiens*. This indicates quite different proportions of particular fragments of I_1 in the two genera. The main cusp occurs near the top of the tooth in *Episoriculus* and more or less half way along the tooth in *Neomys*. The size of the specimens

and other morphological characters exclude the possibility of their membership in other genera of the tribe *Neomyini*. As the measurements of these specimens are large, larger than in the forms from Podlesice, they have been included in the species *Episoriculus gibberodon* (see Fig. 6).

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STRESZCZENIE

Praca jest czwartą częścią opracowania szczątków *Insectivora* z neogenu i czwartorzędu Polski. Zawiera opis nowego rodzaju — *Neomysorex* n. g. *(Soricinae, Neomyini)* z Podlesic, stanowiska datowanego na środkowy pliocen (opis stanowiska podaje Rzebik-Kowalska, 1971, 1975), oraz opis dwu gatunków: *Episoriculus borsodensis* Jánossy, 1973 również z Podlesic i *Episoriculus gibberodon* (Petenyi, 1864) z Węży, stanowiska datowanego na górny pliocen.

Materiał, który posłużył do opisu nowego rodzaju, był już opracowany przez K. Kowalskiego w 1956 roku i oznaczony jako *Sorex alpinoides* ze względu na obecność w jego szczęce górnej pięciu jednoguzkowców. Nowe materiały i nowa systematyka *Soricinae* opierająca się głównie na budowie wyrostków stawowych żuchwy wskazuje, że forma ta powinna być zaliczona do trybu *Neomyini* raczej, niż *Soricini*. Gdyby nie szczęśliwy zbieg okoliczności, który spowodował, że znaleziono szczątki szczęki i żuchwy tej formy w związku anatomicznym, nigdy nie łączono by prawdopodobnie tych elementów tj. szczęk o pięciu jednoguzkowcach z żuchwą o neomyidalnym typie wyrostków

stawowych razem. Dzięki temu trafowi znaleziono formę, która łączy w sobie cechy form soricidalnych i neomyidalnych, czemu wyraz daje nowa nazwa rodzajowa.

Drugi rodzaj opracowany w niniejszej pracy to *Episoriculus*. Te dwa rodzaje opracowano razem nie tylko ze względu na ich wspólne stanowisko systematyczne *(Soricinae, Neomyini)*, ale i dlatego, że mimo różnic w budowie górnego uzębienia i rostrum budowa ich żuchwy jest prawie identyczna, co nastręcza duże trudności w rozróżnianiu gatunków. Dotyczy to zwłaszcza form z Podlesic, ponieważ mały *Episoriculus borsodensis* ma dodatkowo prawie identyczne wymiary jak *Neomysorex alpinoides*. Szczegółowa analiza morfologiczna żuchw obu gatunków pozwoliła stwierdzić, że żuchwy *N. alpinoides* można odróżnić od żuchw *E. borsodensis* po jednym płacie więcej na tnącej powierzchni I_1, nieco innym położeniu foramen mentale, nieco większej i wyższej fossa temporalis interna i bardziej łódkowatym kształcie molarów. Jeśli jednak dysponujemy fragmentami żuchw o startych zębach, rozróżnienie ich jest niemożliwe. Porównując podane przez autorów wymiary kopalnych form *Episoriculus* można zauważyć, że gatunki starsze były mniejsze, a z końcem pliocenu zaczęły powiększać swoje wymiary. W plejstocenie spotykamy już tylko duże formy.

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