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RESEARCH PAPER

Establishing a neotype for *Crocidura obtusa* Kretzoi, 1938 (Mammalia, Soricidae): an emended description of this Pleistocene white-toothed shrew species

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Abstract
We establish a neotype in the collection of the Hungarian Natural History Museum, Budapest (Hungary) for *Crocidura obtusa* (Mammalia, Soricidae). The species was originally described by M. Kretzoi as a new species from the Early Pleistocene locality of Gombaszög (now Gombasek, Slovakia) in 1938, but the holotype was lost in 1956. The neotype is a complete left mandible from the Osztramos 8 site (Hungary, Early Pleistocene). Due to the incomplete original description given by Kretzoi, a new definition of this species also had to be composed. Kretzoi's distinctive characteristics between *C. obtusa* and the recent *Crocidura* species are accepted here, but further differences were discovered in comparison with the contemporary *C. kornfeldi*. According to our taxonomic results, *C. obtusa* was present in Central Europe, mainly in the Carpathian Basin, from the Early Pleistocene (ca. 1.2 Ma) to the earliest Late Pleistocene (ca. 130–115 ka).

Keywords *Crocidura obtusa* · Early Pleistocene · Lost holotype · Neotype · Soricidae

Introduction

Crocidura obtusa was described by Kretzoi (1938) from the Early Pleistocene locality of Gombaszög (now Gombasek, Slovakia). To date, the species has been reported from several sites in Central Europe (Fig. 1), and these occurrences delineate a stratigraphic range from the Early Pleistocene (ca. 1.2 Ma) to the earliest Late Pleistocene (ca. 130–115 ka) (Botka and Mészáros 2015).

As the original diagnosis given by Kretzoi (1938) was not detailed enough, the classification of these forms was made on the basis of teeth measurements. Botka and Mészáros (2015) elaborated a rich *Crocidura* material from the late Early Pleistocene Somssich Hill 2 locality (Hungary). Their morphometric studies revealed that differentiation of isolated teeth of *C. kornfeldi* and *C. obtusa* is not realistic on the basis of measurements only. They emended the original diagnosis according to the observations of Rzebik-Kowalska (2000: fig. 13B) and their studies on the Somssich Hill 2 material with some morphological characters. The taxonomic difficulties caused by the incomplete original diagnosis are enhanced by the fact that the type material was not available for morphological study.

Designating a neotype for *C. obtusa* Kretzoi, 1938 was necessary because the original holotype described by Kretzoi in 1938 has been lost, and it was just a single specimen without any paratypes or any other kind of type specimens.

Historical background

The original holotype was deposited and marked with inventory number HNHM Fa. 16. in the Department of Palaeontology and Geology of the Hungarian Natural History Museum (at that time, part of the Hungarian National Museum). This specimen is mentioned as missing in the department's type catalogue from 2008 (Pálfy et al. 2008). In another earlier type catalogue (Boda 1964), the specimen is not even mentioned. It must thus be supposed that the holotype was lost before the 1960s, because it is missing from

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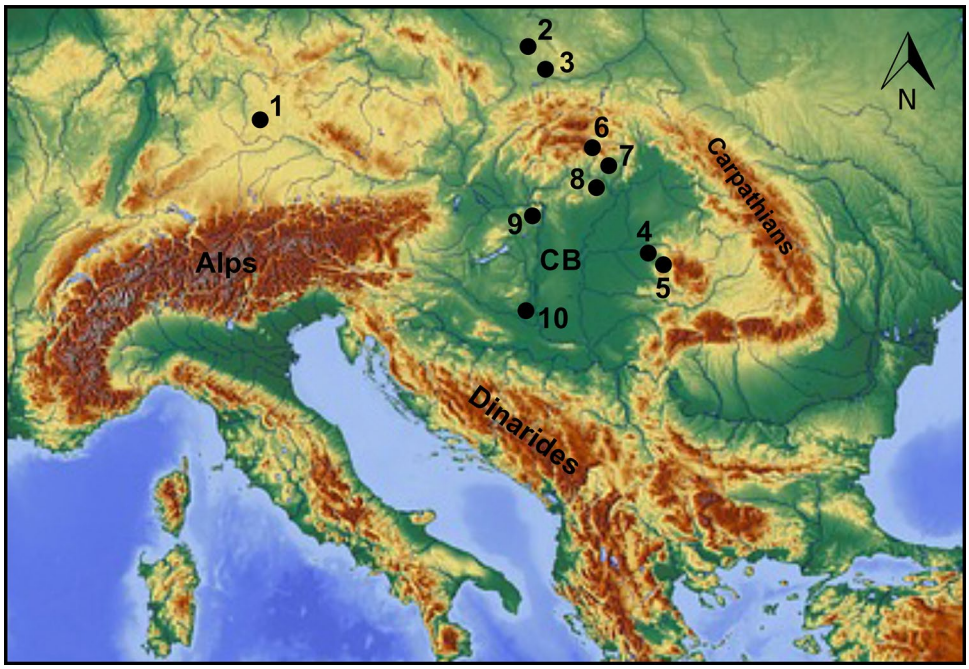

Fig. 1 Pleistocene *Crocidura obtusa* occurrences on mainland Europe. **1**—Weißenburg 7, Germany, Early Pleistocene (von Koenigswald 1971); **2**—Przymiłowice 2B, Poland, Early Pleistocene (cf., Rzebik-Kowalska 2013); **3**—Biśnik Cave VI, VIII, IX, Poland, Middle to Late Pleistocene (Stefaniak et al. 2009); **4**—Betfia IX, Romania, Early Pleistocene (cf., Rzebik-Kowalska 2000, 2002); **5**—Urşilor Cave, Romania, Early Pleistocene (cf., Rzebik-Kowalska 2002); **6**—Gombasek, Slovakia, Early Pleistocene (Kretzoi 1938, 1941; Wagner and Gasparik 2014); **7**—Osztramos 8 and 14, Hungary, Early Pleistocene (aff., Jánossy and Kordos 1977); **8**—Pongor Cave (Pazonyi 2011), Kövesvárad (cf., Jánossy 1986), and Tarkő 1, 4, 9-14, Hungary, Middle Pleistocene (cf., Jánossy 1969a, b, 1986); **9**—Újlak Hill, Budapest, Early Pleistocene (Jánossy 1986), Castle Hill, Budapest, (cf., Jánossy 1986), and Ördöglyuk Cave, Hungary, Middle Pleistocene (Pazonyi 2011); **10**—Somssich Hill 2 (Botka and Mészáros 2015), and Beremend 16, Early Pleistocene (Jánossy 1996), Villány 6 (Jánossy 1986), and Nagyharsányhegy 4 (Kretzoi 1956), Hungary, Middle Pleistocene; CB—Carpathian Basin. A table with an overview of the species can be found in Botka and Mészáros (2015)

these catalogues, and some later authors (Jánossy 1962, 1969a, b; von Koenigswald 1971) cited only the original description of the holotype of *C. obtusa* but did not refer to the type specimen itself.

The collections of the Hungarian Natural History Museum were severely damaged twice between 1938 and 1960: in World War II and later during the Hungarian Revolution (October 1956). The department, housed in the Hungarian National Museum's building at that time, was destroyed by fire in both cases (Gasparik 2007; Papp 2016). The latter incident was much more tragic for the Department of Palaeontology and Geology, with almost 75% of the collection being ruined. Hence, very probably, the type specimen of *C. obtusa* was also lost at that time.

Unfortunately, we can preclude the possibility that the specimen has been lent, because no loans of type specimens are allowed by the rules of the museum, and this is confirmed by the archive data of the department, where no loan of *C. obtusa* is registered. Because Kretzoi worked in the Hungarian Geological Institute, it could be supposed that he borrowed the specimen from the museum for his work. However, we can also exclude this, because a detailed revision has been carried out of the collection and registry of both the Department of Palaeontology and Geology of the Hungarian Natural History Museum and the Palaeontological Collection of the Hungarian Geological Institute in the last few years, which did not reveal the type specimen of *C. obtusa*. After his death in 2005, a considerable collection of papers, reprints, and fossils was donated to the Hungarian Natural History Museum from the bequest of Kretzoi, containing some earlier inventoried specimens, but not the *C. obtusa* type specimen. In conclusion, we have to state that the type specimen had been lost and, indeed, very probably destroyed.

During the establishment of the neotype, first, with kind assistance from Jan Wagner, we tried to find a new type specimen from the same locality, i.e., Gombasek (Gombaszög), but were not able to find an appropriate *C. obtusa* specimen, in either earlier or later collected materials stored in different collections in Hungary, Slovakia, and the Czech Republic.

After the studies of Kretzoi (1938, 1941), further excavations were carried out at the Gombasek locality, the material of which represents different stratigraphic levels (Wagner

and Gasparik 2014). Unfortunately, if any specimens of *Crocidura* were yielded by those explorations, they will not certainly be from exactly the same niveau as Kretzoi's type specimen.

The required differential characteristics were well identified on the specimens from the Somssich Hill 2 locality (Botka and Mészáros 2015), but the remains were not complete enough to define them as a neotype. A complete specimen of *C. obtusa* was found in the records of the Osztramos 8 locality (Jánossy 1969a, b). It is a well-preserved complete mandible showing all characteristics described on the original holotype, and its age roughly fits with the old Gombasek material. Although the time difference between the two sites could be ca. 0.5 Ma, these occurrences are included in the stratigraphic range of *C. obtusa* reported by authors from several localities in Europe. The two localities are closely situated geographically, thus meeting the criteria for designation of a neotype.

Materials and methods

The neotype specimen is inventoried in the Department of Palaeontology and Geology of the Hungarian Natural History Museum, Budapest (inventory number: HNHM V.73.93.). Further mandibles from Somssich Hill 2, Beremend 16/9, Osztramos 8, and Tarkő sites, stored in the same collection, were also used in the morphometric analysis (see the captions of Fig. 4).

Morphological terms are used after Reumer (1984). No scanning electron microscopy (SEM) images of the neotype specimen could be taken because it was covered with a special lacquer during the former conservation procedure. Therefore, the investigation was carried out with a Delta Smart 5MP Pro digital USB microscope, using Delta Optical Smart Analysis Pro 1.0.0 software for measurements (given in mm). Morphometric analysis was carried out with the help of MS Excel software, using which three scatter plots were drawn for each molar (m1, m2, and m3).

Abbreviations. HNHM = Hungarian Natural History Museum, i = incisor, a = antemolar, m = molar, p = premolar, L = length, W = width, H = height, inv. n. = inventory number.

Systematic paleontology

Class **Mammalia** Linnaeus, 1758
Order **Eulipotyphla** Waddell, Okada and Hasegawa, 1999
Family **Soricidae** Fischer von Waldheim, 1814
Subfamily **Crocidurinae** Milne-Edwards, 1874
Genus ***Crocidura*** Wagler, 1832

Crocidura obtusa Kretzoi, 1938
Figure 2

*1938 *C. obtusa* n. sp.—Kretzoi: p. 92, fig. 1a [original description].
2000 *Crocidura* cf. *obtusa* Kretzoi, 1938—Rzebik-Kowalska: p. 39, figs. 13B and 14 [detailed description].
v 2015 *C. obtusa* Kretzoi, 1938—Botka and Mészáros: p. 72, figs. 3 and 4 [emended diagnosis].

Holotype. The holotype described by Kretzoi (1938) was a right mandible, but it was lost from the collection of the Hungarian Natural History Museum (Pálfy et al. 2008: p. 140). The original inventory number was HNHM Fa. 16.

Original type locality. Gombasek (Gombaszög), Slovakia, Early Pleistocene.

Original diagnosis. Kretzoi (1938) distinguished *C. obtusa* sp. nov. from *C. leucodon* based on its shorter a1 and less pointed a2 in his German description: "Dimensionell stimmen sie mit *Crocidura leucodon* gut überein, welcher Art sie auch morphologisch am nächsten stehen. Doch weichen sie von dieser im mehr in die Länge ausgezogenen C. inf. und stumpferen P^4 gut ab." He demonstrated this distinction also by *C. russula* on a figure drawn for his article (Kretzoi 1938, figs. 1a–c). In the drawing, it can be clearly identified that C inf. = a1 and P4 = a2. Unfortunately, he did not measure the teeth. He also missed listing any true differences between the new species and the contemporary fossil *Crocidura* shrews. ("Die aus dem ungarischen Altquartaer beschriebenen … *Crocidura*-Arten … kommen hier … nicht … in Betracht.").

Neotype (established by the authors herein). Left mandible with complete dentition (HNHM V.73.93.).

New type locality. Osztramos 8 locality, Early Pleistocene, ca. 1.2 Ma (Jánossy and Kordos 1977).

New diagnosis. Crocidura obtusa Kretzoi, 1938 is different from the contemporary *C. kornfeldi* Kormos, 1934, having higher ramus mandibulae, distinct coronoid spicule, tip of the coronoid process leaning more backwards, higher condyle, and longer interarticular area (Fig. 3). It can be distinguished from the Early Pleistocene *Crocidura zorzii* Pasa, 1942 by its smaller dimensions. It differs from the recent *C. leucodon* (Hermann, 1780), *C. russula* (Hermann, 1780),

Fig. 2 *Crocidura obtusa* Kretzoi, 1938, neotype from Osztramos 8 locality, left mandible with complete dentition (HNHM V.73.93.), buccal view (above) and lingual view (below). *Scale bar* 1 mm

C. suaveolens (Pallas, 1811), *C. zimmermanni* Wettstein, 1953, and *C. sicula* Miller, 1901 in its longer first lower antemolar.

Measurements of the neotype. **i1**—L: 4.35, H: 1.00; **a1**—L: 1.40, H: 0.66; **a2**—L: 1.45, H: 0.80; **m1**—L: 1.66, W: 1.19; **m2**—L: 1.66, W: 1.08; **m3**—L: 1.33, W: 0.79.

Description. The coronoid process of the mandible is high; its tip leans strongly backwards. The coronoid spicule is situated high and is distinct. The upper part of the condyle reaches far backwards in buccal view. The condyle is high in posterior view; the interarticular area is long. The internal temporal fossa is large and open, reaching to halfway up the coronoid process. The subfossa is present.

i1—The apex is hardly upturned; the dorsal margin is slightly bicuspulate. The buccal cingulum is pronounced. The incisor reaches back further to the posterior end of a1, underneath the anterior half of a2.

a1—This element is anteroposteriorly quite elongate; only a small part of it is hidden underneath a2. The cingula are well developed on both sides.

a2—The second antemolar is typical for *Crocidura*; It is high and pointed. The cingula are equally strong on both sides.

m1–m2—The lower molars are also typical for *Crocidura*. The entoconid crest is absent. The buccal cingulum is narrow, but well pronounced; it is undulating in all specimens, but it is less undulate on m2 than on m1. The lingual cingulum is weak.

m3—The talonid of m3 is reduced to a single cuspid, which is the hypoconid. The development of the cingula is as in m1 and m2.

No skull or maxilla is present in the neotype material; however, the upper dentition is usually not used in specific identification of *Crocidura* species.

Morphometric analysis. It has always been very difficult to determine isolated teeth of genus *Crocidura*. The significant morphological differences are rather located on their mandibles. In such cases, morphometric analysis may be helpful, but with these statistical methods, morphological observations (on one or more species) can only generally be confirmed or rejected.

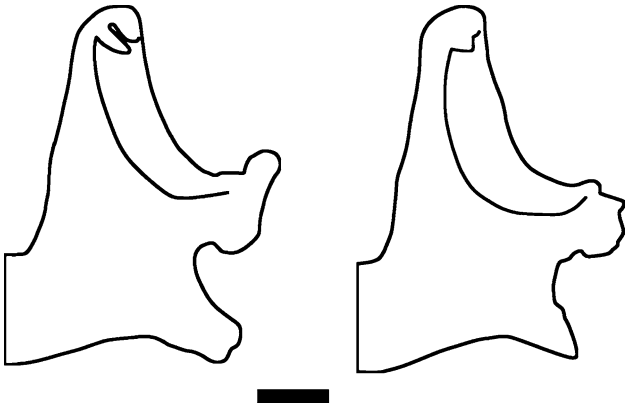

Fig. 3 Difference between the coronoid spicule of *Crocidura obtusa* (left, neotype, Osztramos 8 locality, HNHM V.73.93.) and *Crocidura kornfeldi* (right, Somssich Hill 2 locality, HNHM VER 2015. 251.). *Scale bar* 1 mm. For further comparison see Rzebik-Kowalska (2000: fig. 13)

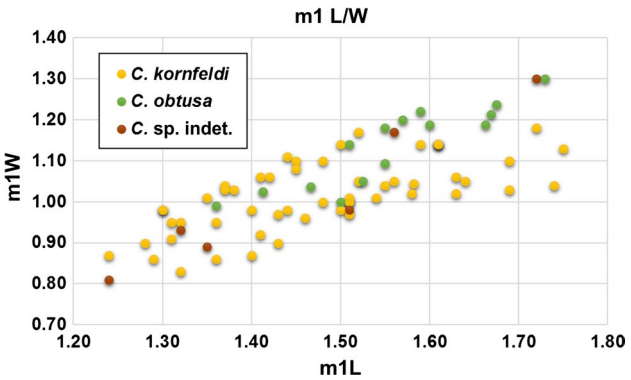

Fig. 4 Scatter plot of measurements of the lower first molars (m1) of the available *Crocidura* specimens. The measurements of the three taxa overlap, but it is visible that the dimensions of *C. obtusa* are slightly bigger than those of *C. kornfeldi* specimens. Different colors indicate different species, as shown in the legend; yellow = *C. kornfeldi*, green = *C. obtusa*, and brown = *Crocidura* sp. indet. (*kornfeldi* or *obtusa*). For input values see Tables 1, 2, 3, and 4

The Early Pleistocene material of the Somssich Hill 2 locality provided a great number of isolated *Crocidura* teeth. These were very hard to identify, so we made three scatter plots based on the lower molars (m1, m2, and m3) (Figs. 4, 5, 6). There were some teeth in situ in the mandibles, which could be certainly determined (*C. kornfeldi* and *C. obtusa* from Somssich Hill 2 locality on the scatter plots). All available measurements from literature were collected too (Tables 1, 2, 3, 4). Further mandibles with lower molars were used from the Beremend 16/9, Osztramos 8, and Tarkő sites (Table 3). Unfortunately, the measurements of the studied species almost totally overlap, meaning that they cannot be distinguished based on their measurements only. The average dimensions of the teeth of *C. obtusa* are slightly larger than

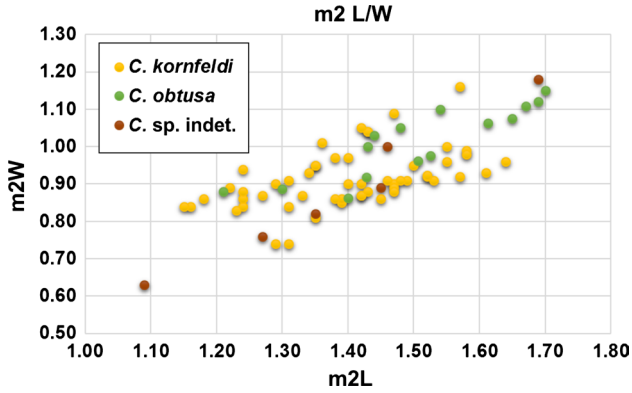

Fig. 5 Scatter plot of measurements of lower second molars (m2) of available *Crocidura* specimens. The measurements of the three taxa overlap, but it is visible that the dimensions of *C. obtusa* are slightly bigger than those of *C. kornfeldi* specimens. Different colors indicate different species, as shown in the legend; yellow = *C. kornfeldi*, green = *C. obtusa*, and brown = *Crocidura* sp. indet. (*kornfeldi* or *obtusa*). For input values see Tables 1, 2, 3, and 4

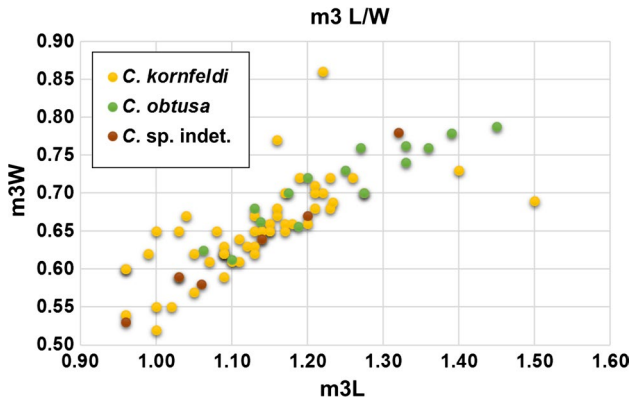

Fig. 6 Scatter plot of measurements of lower third molars (m3) of available *Crocidura* specimens. The measurements of the three taxa overlap, but it is visible that the dimensions of *C. obtusa* are slightly bigger than those of *C. kornfeldi* specimens. Different colors indicate different species, as shown in the legend; yellow = *C. kornfeldi*, green = *C. obtusa*, and brown = *Crocidura* sp. indet. (*kornfeldi* or *obtusa*). For input values see Tables 1, 2, 3, and 4

those of *C. kornfeldi*, in the case of all teeth by ~0.1 mm, but this is not very significant, and does not allow precise distinction between the two species (Figs. 4, 5, 6).

Discussion

Kretzoi (1938) mentioned and figured the shape and position of the lower antemolars as differentiating characteristics between *C. obtusa* and the recent white-toothed shrew species *C. leucodon* and *C. russula*. This distinction (mainly regarding the length of a1) is acceptable for both aforementioned species, and also for *C. zimmermanni*, *C. sicula*, and

Table 1 Input data for scatter plots (Figs. 4, 5, 6) of lower molars of studied *Crocidura kornfeldi* specimens—1, localities and references (L&R): A—Plešivec (Fejfar and Horáček 1983), B—Včeláre 3 (Fejfar and Horáček 1983), C—Villány 3 (Reumer 1984), D—Osztramos 3/2 (Reumer 1984), E—Betfia (Rzebik-Kowalska 2000), F—Marathoussa (Koufos et al. 2001)

L&R	m1 L	m1 W	m2 L	m2 W	m3 L	m3 W
A	1.32	0.83	1.16	0.84	0.96	0.60
A	1.41	0.92	1.22	0.89	1.04	0.67
A	1.52	1.05	1.36	1.01	1.16	0.77
B	1.24	0.87	1.15	0.84	0.96	0.60
B	1.31	0.91	1.18	0.86	0.99	0.62
B	1.36	0.95	1.24	0.88	1.00	0.65
C	1.29	0.86	1.31	0.74	1.00	0.55
C	1.51	0.97	1.43	0.88	1.11	0.64
C	1.75	1.13	1.58	0.99	1.22	0.70
D	1.63	1.02	1.40	0.90	1.13	0.63
D	1.69	1.03	1.49	0.91	1.15	0.65
D	1.74	1.04	1.57	0.92	1.17	0.66
E	1.30	0.98	1.24	0.84	0.96	0.54
E	1.38	1.03	1.31	0.91	1.10	0.61
E	1.45	1.08	1.40	0.97	1.18	0.66
E	1.32	0.95	1.24	0.86	1.05	0.57
E	1.37	1.04	1.29	0.90	1.14	0.64
E	1.44	1.11	1.35	0.95	1.21	0.68
E	1.30	0.98	1.23	0.83	1.11	0.61
E	1.42	1.06	1.35	0.95	1.15	0.66
E	1.50	1.14	1.43	1.04	1.21	0.70
E	1.35	1.01	1.27	0.87	1.07	0.61
E	1.41	1.06	1.34	0.93	1.12	0.63
E	1.48	1.10	1.42	1.05	1.20	0.66
E	1.37	1.03	1.31	0.84	1.09	0.62
E	1.45	1.10	1.38	0.97	1.16	0.67
E	1.52	1.17	1.47	1.09	1.23	0.72
F	1.43	0.90	1.45	0.86	1.16	0.68
F	1.54	1.01	1.47	0.90	1.17	0.70
F	1.64	1.05	1.50	0.95	1.19	0.72

C. suaveolens (Vogel 1988; Vogel et al. 1989). Distinction from *Crocidura zorzii* by measurements seems feasible.

Several authors distinguished *C. obtusa* from *C. kornfeldi* based on different dimensions, while Botka and Mészáros (2015) elaborated a rich *Crocidura* material containing the remains of both species from the late Early Pleistocene Somssich Hill 2 locality, finding that the measurements of molars of the two forms largely overlap. The morphometric investigations of the recent studies supported the hypothesis that distinction of the two species by measurements is not realistic (Figs. 4, 5, 6).

Morphological study of the mandible is essential for correct taxonomic determination. The two Early Pleistocene *Crocidura* species can be distinguished morphologically mainly by the characteristics of the coronoid process. The tip of the coronoid process of *C. obtusa* leans more backwards than that of *C. kornfeldi*. The process of the upper margin of the external temporal fossa (the coronoid spicule) is distinct in *C. obtusa* but indistinct in *C. kornfeldi* (Fig. 3). The morphological difference between the coronoid processes could be suggestive of different feeding habits of the two white-toothed shrews.

Considering the above-mentioned reasons, we offer the taxonomic name *Crocidura* sp. (*kornfeldi-obtusa* group) as the most correct classification for researchers elaborating only isolated teeth remains of these forms.

Conclusions

Purpose of clarifying the taxonomic status—The holotype was lost, and the original description was incomplete.

Main specific morphological characters—Distinct coronoid spicule and long first antemolar.

Crocidura obtusa Kretzoi, 1938—Differs from (A) *C. kornfeldi* Kormos, 1934 in having higher ramus mandibulae, distinct coronoid spicule, tip of the coronoid process leaning more backwards, higher condyle, and longer

Table 2 Input data for scatter plots (Figs. 4, 5, 6) of lower molars of studied *Crocidura kornfeldi* specimens—2, localities and references (L&R): A—Sima del Elefante (Rofes and Cuenca-Bescós 2011), B—Somssich Hill 2 (Botka and Mészáros 2015), C—Beremend 14 (Pazonyi et al. 2016)

L&R	m1 L	m1 W	m2 L	m2 W	m3 L	m3 W
A	1.46	0.96	1.39	0.85	1.09	0.59
A	1.51	1.00	1.48	0.91	1.17	0.65
A	1.55	1.04	1.55	0.96	1.26	0.72
A	1.28	0.90	1.35	0.81	1.02	0.55
A	1.51	1.00	1.46	0.91	1.13	0.65
A	1.69	1.10	1.58	0.98	1.22	0.86
A	1.36	0.86	1.29	0.74	1.00	0.52
A	1.44	0.98	1.42	0.87	1.09	0.62
A	1.59	1.14	1.55	1.00	1.50	0.69
A	1.31	0.95	1.33	0.87	1.03	0.59
A	1.48	1.00	1.42	0.90	1.09	0.63
A	1.63	1.06	1.53	0.91	1.14	0.65
A	1.43	0.97	1.42	0.87	1.05	0.62
A	1.51	1.01	1.47	0.89	1.09	0.62
A	1.56	1.05	1.52	0.92	1.13	0.62
A	1.40	0.87	1.39	0.86	1.08	0.65
A	1.50	0.98	1.47	0.88	1.13	0.67
A	1.58	1.02	1.61	0.93	1.21	0.71
B	1.61	1.14	1.24	0.94	1.03	0.65
B	1.61	1.14	1.43	1.04	1.23	0.68
B	1.61	1.14	1.57	1.16	1.40	0.73
C	1.40	0.98	1.38	0.86	1.15	0.65
C	1.58	1.04	1.52	0.92	1.23	0.69
C	1.72	1.18	1.64	0.96	1.28	0.70

Table 3 Input data for scatter plots (Figs. 4, 5, 6) of lower molars of studied *Crocidura obtusa* specimens, localities and references (L&R): A—Betfia IX (cf., Rzebik-Kowalska 2000), B—Somssich Hill 2 (Botka and Mészáros 2015), C—Beremend 16/9, (cf., this paper), D—Osztramos 8 (this paper), E—Tarkő (this paper)

L&R	m1 L	m1 W	m2 L	m2 W	m3 L	m3 W
A	1.55	1.18	1.44	1.03	1.25	0.73
A	1.57	1.20	1.48	1.05	1.33	0.74
A	1.59	1.22	1.54	1.10	1.36	0.76
B	1.36	0.99	1.21	0.88	1.13	0.68
B	1.51	1.14	1.43	1.00	1.20	0.72
B	1.73	1.30	1.69	1.12	1.27	0.76
C	1.41	1.03	1.30	0.89	1.06	0.63
C	1.47	1.04	1.43	0.92	1.14	0.66
C	1.53	1.05	1.53	0.98	1.18	0.70
D	1.66	1.19	1.65	1.08	1.33	0.76
D	1.67	1.21	1.67	1.11	1.39	0.78
D	1.68	1.24	1.70	1.15	1.45	0.79
E	1.50	1.00	1.40	0.86	1.10	0.61
E	1.55	1.09	1.51	0.96	1.19	0.66
E	1.60	1.19	1.61	1.06	1.28	0.70

interarticular area, from (B) *Crocidura zorzii* Pasa, 1942 in its smaller dimensions, and from (C) *C. leucodon* (Hermann, 1780), *C. russula* (Hermann, 1780), *C. suaveolens* (Pallas, 1811), *C. zimmermanni* Wettstein, 1953, and *C. sicula* Miller, 1901 in its longer first lower antemolar.

Reasons for believing the name-bearing type is lost—The collection where the type material was housed has been partially destroyed. We could not find it in either Hungarian or possible foreign collections. This procedure is discussed in detail in "Historical background" section.

Table 4 Input data for scatter plots (Figs. 4, 5, 6) of lower molars of studied *Crocidura* sp. indet. specimens, localities and references (L&R): A—Almenara-Casablanca 3 (Furió et al. 2007), B—Somssich Hill 2 (Botka and Mészáros 2015)

L&R	m1 L	m1 W	m2 L	m2 W	m3 L	m3 W
A	1.24	0.81	1.27	0.76	0.96	0.53
A	1.35	0.89	1.35	0.82	1.06	0.58
A	1.51	0.98	1.45	0.89	1.14	0.64
B	1.32	0.93	1.09	0.63	1.03	0.59
B	1.56	1.17	1.46	1.00	1.20	0.67
B	1.72	1.30	1.69	1.18	1.32	0.78

Evidence that the neotype is consistent with the former name-bearing type—Due to the incomplete description and figures given by Kretzoi (1938), the neotype specimen cannot be clearly identified with the form described by him. However, some facts suggest that they belong to the same species.

Several Early Pleistocene *Crocidura* specimens, identified as *C. obtusa*, have been reported since the publication of the original description. These shrews were clearly distinguishable from the contemporary *C. kornfeldi* Kormos, 1934 and *C. zorzii* Pasa, 1942, although they seem to belong to the same species as the neotype shown in the present paper. This proves that a third white-toothed shrew species was also living at that time. The most likely hypothesis is that Kretzoi discovered this species as well and described it as *C. obtusa*.

Evidence that the neotype came as nearly as practicable from the original type locality and geological horizon—There is no appropriate specimen from the Gombasek record. The Osztramos 8 site is geographically and stratigraphically the nearest locality at which *C. obtusa* shrews occurred (see "Historical background" section).

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