

Cricetulus migratorius (PALLAS 1773)
(Rodentia, Mammalia) population from the Toros
Mountains (Turkey) (With a special reference to the
relation of Cricetulus and Allocricetus genera)*

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ABSTRACT: The results of the metrical and morphological investigations are presented on a Holocene Turkish *Cricetulus migratorius* molar series with the comparison to a recent Syrian *Cricetulus* population and to Hungarian Plio-Pleistocene *Allocricetus* materials.

Introduction

This article is the 3rd one in the row of papers on a subfossil microvertebrate fauna collected by the author in the Bolkar Mountains in 1989. The topography of the locality, the preliminary valuation of the fauna, and the detailed analysis of the *Mesocricetus auratus* (WATERHOUSE 1839) molar series was given by Hír, J. (1992 a, 1992 b).

The present article's aim in the first place is to publish the metrical and morphological description of the *Cricetulus migratorius* molar series. The other aim is to give new data for the taxonomic relation of the recent *Cricetulus* and fossil *Allocricetus* genera, because it is an unsolved problem.

The material

13 maxillae with complete toothrows, 19 maxillae fragments with incomplete toothrows, 15 M1, 9 M2, 5 M3.

18 mandibulae with complete toothrows, 17 mandibulae fragments with incomplete toothrows, 22 m1, 17 m2, 10 m3.

We use the results of the elaboration of the following materials for comparison:

Cricetulus migratorius (PALLAS, 1773)

1. Krak des Chevaliers (Syria), recent (PRADEL, A. 1981). We have not studied this material directly. The data are after the original reference.

Allocricetus bursae SCHAUB, 1930

1. Pongor Hole (Hungary), Younger Middle Pleistocene. The material was collected and studied by HÍR, J. 1989a.
2. Tarkó Rockshelter (Hungary), Older Middle Pleistocene. The fauna was collected and published by JÁNOSSY, D. (1962, 1965, 1979, 1986). The detailed analysis of the *Allocricetus* material of the sequence was effected by Hír J. (1989b). 18 layers were distinguished during the excavation we grouped the *Allocricetus* material of the sequence into 5 part: 1. 1th layer, 2. 2nd-10th layers, 3. 11th-12th layers, 4. 13th-15th layers, 5. 16th-18th layers.

* A tanulmány, az OTKA T014412. számú pályázat támogatásával készült.

Allocricetus éhiki SCHAUB, 1930

1. Tarkő Rocksheter. The presence of this species was verified by HÍR, J. (1989b).
2. Osztramos 3. (Hungary), Uppermost Pliocene. The locality was excavated and elaborated by JÁNOSSY, D. (1970, 1979, 1986); JÁNOSSY, D-MEULEN VAN DER, A. 1975. The *Allocricetus* material was studied by HÍR, J. (1993).
3. Villány 3. (Hungary), Upper Pliocene. This classical locality has been studied for more than hundred years (KORMOS, T. 1937; KRETZOI, M. 1956; JÁNOSSY, D. 1979, 1986). The cricetid finds, elaborated by HÍR, J. (1993), had been collected by Jánosy D. in 1979

Deposition: the faunas from Meydan and from Pongor Hole are stored in the collection of the Municipal Museum of Pásztó. The materials of Tarkő, Osztramos, and Villány are placed in the Paleontological Department of the Hungarian Natural History Museum, Budapest.

Methods

The measurements were taken by the ocularmicrometer of a stereomicroscope to an accuracy of 0,01 mm. The length of the upper toothrowes (L M1–3), the length of the lower toothrowes (L m1–3), and the length (L), anterior width (Wa), posterior width of the distinct teeth were measured. the measurements were worked out by the basic statistic parameters. N: sample size, MIN–MAX: observation range, X: arithmetic mean, SD: standard deviation.

The morphological investigation based on the nomenclature of FAHLBUSH, V. (1964) and MEIN, P:-FREUDENTHAL, M. (1971). The separation of the different morphotypes is after the presence (+), or absence (–) of certain elements of the tooth crown.

The methods were stated in details by PRADEL, A. (1981, 1988) and HÍR, J. (1989b, 1992b, 1993). The complete repetition of the methodological description is not given here.

Description

The complete morphological diescription of the *Cricetulus* and *Allocricetus* molars was written by FAHLBUSCH, V. (1969) and PRADEL, A. (1981). The detailed reinterpretation has not primary importance from the standpoint of us. We can concentrate our attention to the investigated elements of the toothcrown.

M1, m1: PAC (pre-anterocon(-id) cingulum). It is a small enamel conelet on the mesial surface of the molar.

PAST: (parastyle). It is a cingular conulet on the posterolabial side of the anterocone on the M1 (*Fig. 9., 12.*).

M2: MTL Posterior metalophule. It is a crest between the metalophule and posteroloph trimming the metacone on the lingual side. ML (mesolophe) (*Fig. 10.*)

M3: in the studied materials the rare presence of accessoric enamel crests is visible in different location of the toothcrown (*Fig. 11.*).

m2-m3: ALC (antero-lingual cingulum). It is the continuation of the persistent antero-labial cingulum before the metaconid. ML (mesolophid) (*Fig. 7., 8.*).

The occurence of these elements is statistical.

The results of the metrical investigations are visible on the figures no. 1.–8., and on the *tables no. 1.–9.* The results of the statistical morphological investigations are presented on the *figures no. 9.–14.*

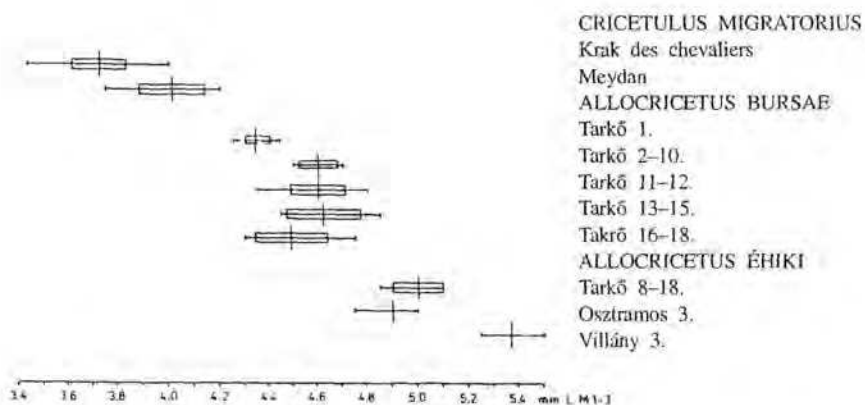


Fig. 1. The range, standard deviation and mean of the length of upper tooththrows (LM 1-3) in the investigated materials.

| N | Min.-Max. | X | SD | Locality |
|-------------------------------|-----------|------|--------|---------------------|
| <i>Cricetulus migratorius</i> | | | | |
| 57 | 3.43-4.00 | 3.72 | 0.115 | Krak des Chevaliers |
| 13 | 3.75-4.20 | 4.01 | 0.129 | Meydan |
| <i>Allocrietus bursae</i> | | | | |
| 6 | 4.25-4.42 | 4.34 | 0.0631 | Tarkő 1. |
| 6 | 4.50-4.70 | 4.60 | 0.0807 | Tarkő 2.-10. |
| 12 | 4.35-4.80 | 4.60 | 0.1136 | Tarkő 11.-12. |
| 11 | 4.35-4.85 | 4.62 | 0.1506 | Tarkő 13.-15. |
| 7 | 4.30-4.75 | 4.49 | 0.1548 | Tarkő 16.-18. |
| <i>Allocrietus ehiki</i> | | | | |
| 4 | 4.85-5.10 | 5.00 | 0.1080 | Tarkő 8.-18. |
| 3 | 4.75-5.00 | 4.90 | - | Osztramos 3. |
| 2 | 5.25-5.50 | 5.37 | - | Villány 3. |

Table 1.
Comparison of the length of upper tooththrows (L M1-3) in the investigated materials

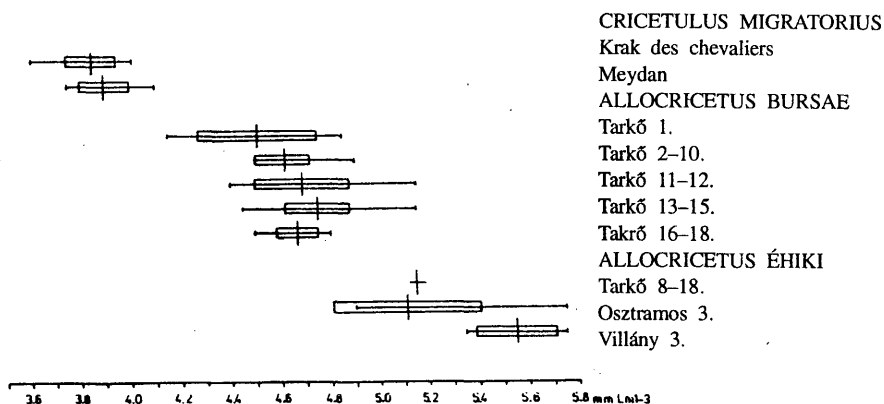


Fig. 2. The range, standard deviation and mean of the length of lower tooththrows (Lm 1-3) in the investigated materials.

| N | Min.-Max. | X | SD | Locality |
|-------------------------------|-----------|------|--------|---------------------|
| <i>Cricetulus migratorius</i> | | | | |
| 98 | 3.61-4.01 | 3.85 | 0.097 | Krak des Chevaliers |
| 18 | 3.75-4.10 | 3.92 | 0.104 | Meydan |
| <i>Allocricetus bursae</i> | | | | |
| 11 | 4.15-4.85 | 4.51 | 0.2431 | Tarkő 1. |
| 9 | 4.45-4.90 | 4.62 | 0.1340 | Tarkő 2.-10. |
| 25 | 4.40-5.15 | 4.69 | 0.1900 | Tarkő 11.-12. |
| 22 | 4.45-5.15 | 4.75 | 0.1364 | Tarkő 13.-15. |
| 12 | 4.50-4.80 | 4.67 | 0.0814 | Tarkő 16.-18 |
| <i>Allocricetus éhiki</i> | | | | |
| 1 | | 5.15 | | Tarkő 14. |
| 6 | 4.90-5.75 | 5.11 | 0.3277 | Osztramos 3. |
| 11 | 5.35-5.75 | 5.55 | 0.1665 | Villány 3. |

Table 2.
Comparison of the length of lower tooththrows (L m1-3) in the investigated materials

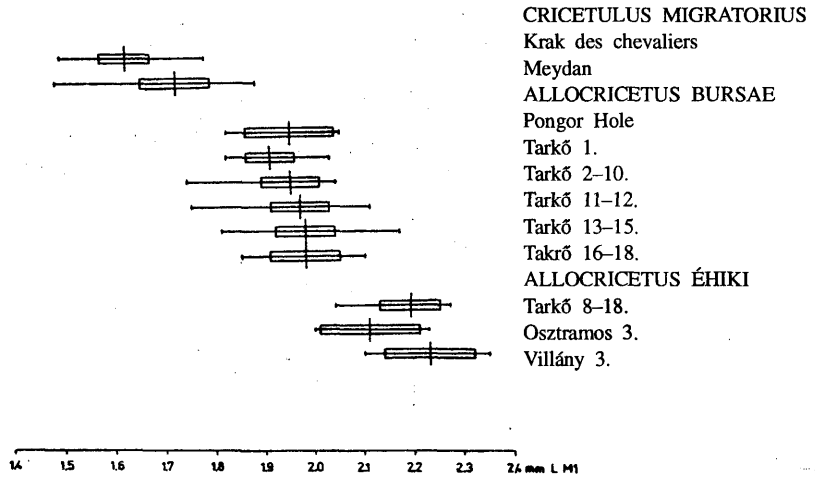


Fig. 3. The range, standard deviation and mean of the length of M1 molars in the investigated materials.

| N | Min.-Max. | X | SD | Locality |
|-------------------------------|-----------|------|--------|---------------------|
| <i>Cricetulus migratorius</i> | | | | |
| 97 | 1.49-1.78 | 1.62 | 0.0550 | Krak des Chevaliers |
| 68 | 1.48-1.88 | 1.72 | 0.0730 | Meydan |
| <i>Allocricetus bursae</i> | | | | |
| 14 | 1.82-2.05 | 1.95 | 0.0864 | Pongor. |
| 46 | 1.74-2.03 | 1.91 | 0.0529 | Tarkő 1. |
| 52 | 1.74-2.04 | 1.95 | 0.0674 | Tarkő 2.-10. |
| 52 | 1.75-2.11 | 1.97 | 0.0651 | Tarkő 11.-12. |
| 49 | 1.81-2.17 | 1.98 | 0.0585 | Tarkő 13.-15. |
| 38 | 1.85-2.10 | 1.98 | 0.0663 | Tarkő 16.-18. |
| <i>Allocricetus éhiki</i> | | | | |
| 18 | 2.04-2.27 | 2.19 | 0.0558 | Tarkő 8.-18. |
| 17 | 2.00-2.23 | 2.11 | 0.1068 | Osztramos 3. |
| 11 | 2.10-2.35 | 2.23 | 0.0942 | Villány 3. |

Table 3.
Comparison of the length of M1 molars in the investigated materials

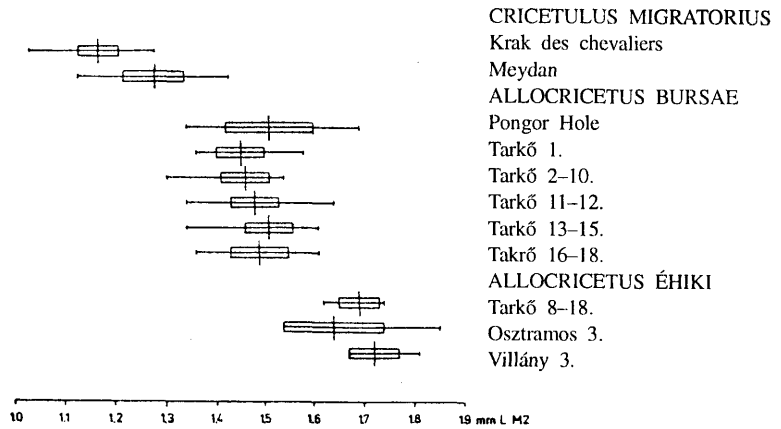


Fig. 4. The range, standard deviation and mean of the length of M2 molars in the investigated materials.

| N | Min.-Max. | X | SD | Locality |
|-------------------------------|-----------|-------|--------|---------------------|
| <i>Cricetulus migratorius</i> | | | | |
| 87 | 1.03-1.28 | 1.168 | 0.044 | Krak des Chevaliers |
| 37 | 1.13-1.43 | 1.28 | 0.064 | Meydan |
| <i>Allocricetus bursae</i> | | | | |
| 6 | 1.29-1.69 | 1.51 | 0.1319 | Pongor |
| 32 | 1.36-1.58 | 1.45 | 0.0531 | Tarkő 1. |
| 37 | 1.30-1.54 | 1.46 | 0.0536 | Tarkő 2.-10. |
| 52 | 1.34-1.64 | 1.48 | 0.0524 | Tarkő 11.-12. |
| 41 | 1.34-1.61 | 1.51 | 0.0567 | Takrő 13.-15. |
| 19 | 1.36-1.61 | 1.49 | 0.0608 | Tarkő 16.-18. |
| <i>Allocricetus éhiki</i> | | | | |
| 10 | 1.62-1.74 | 1.69 | 0.0367 | Tarkő 8.-18. |
| 11 | 1.54-1.85 | 1.64 | 0.1051 | Osztramos 3. |
| 7. | 1.67-1.81 | 1.72 | 0.0534 | Villány 3 |

Table 4.
Comparison of the length of M2 molars in the investigated materials

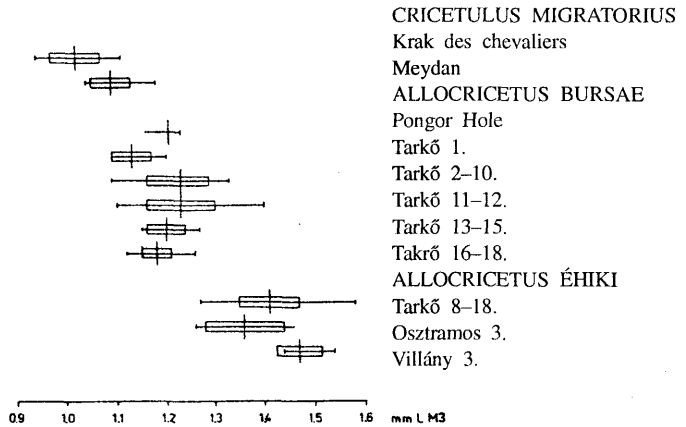


Fig. 5. The range, standard deviation and mean of the length of M3 molars in the investigated materials.

| N | Min.-Max. | X | SD | Locality |
|-------------------------------|-----------|------|--------|---------------------|
| <i>Cricetulus migratorius</i> | | | | |
| 66 | 0.94-1.11 | 1.02 | 0.046 | Krak des Chevaliers |
| 24 | 1.04-1.18 | 1.09 | 0.0407 | Meydan |
| <i>Allocricetetus bursae</i> | | | | |
| 2 | 1.16-1.26 | 1.21 | | Pongor |
| 9 | 1.09-1.20 | 1.13 | 0.0466 | Tarkó 1. |
| 19 | 1.09-1.33 | 1.23 | 0.0653 | Tarkó 2.-10. |
| 30 | 1.10-1.40 | 1.23 | 0.0745 | Tarkó 11.-12. |
| 22 | 1.15-1.27 | 1.20 | 0.0376 | Tarkó 13.-15. |
| 18 | 1.12-1.26 | 1.18 | 0.0365 | Tarkó 16.-18. |
| <i>Allocricetetus ehiki</i> | | | | |
| 8. | 1.39-1.58 | 1.43 | 0.0695 | Tarkó 8.-18. |
| 4 | 1.26-1.46 | 1.36 | 0.0896 | Osztramos 3. |
| 4 | 1.44-1.58 | 1.47 | 0.0486 | Villány 3. |

Table 5.
Comparison of the length of M3 molars in the investigated materials

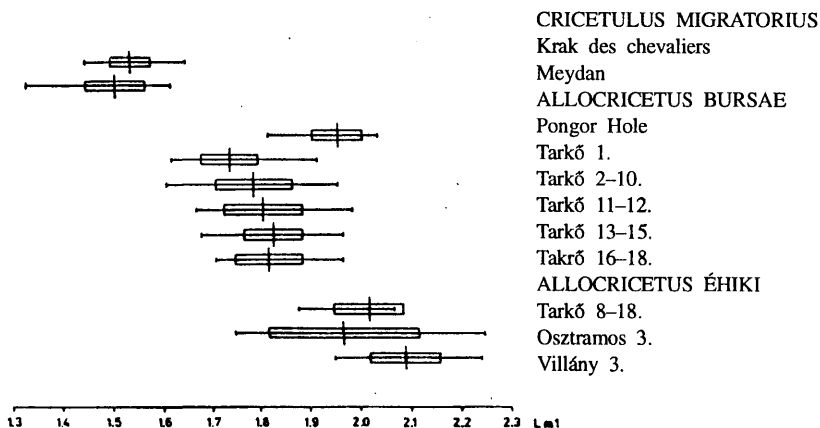


Fig. 6. The range, standard deviation and mean of the length of m1 molars in the investigated materials.

| N | Min.-Max. | X | SD | Locality |
|-------------------------------|-----------|-------|--------|---------------------|
| <i>Cricetulus migratorius</i> | | | | |
| 150 | 1.45-1.65 | 1.537 | 0.046 | Krak des Chevaliers |
| 48 | 1.33-1.62 | 1.516 | 0.0639 | Meydan |
| <i>Allocricetus bursae</i> | | | | |
| 13 | 1.71-1.85 | 1.78 | 0.0529 | Pongor |
| 51 | 1.62-1.92 | 1.74 | 0.0628 | Tarkő 1. |
| 54 | 1.61-1.96 | 1.79 | 0.0795 | Tarkő 2.-10. |
| 71 | 1.67-1.99 | 1.81 | 0.0773 | Tarkő 11.-12. |
| 43 | 1.68-1.97 | 1.83 | 0.0638 | Tarkő 13.-15. |
| 37 | 1.71-1.97 | 1.82 | 0.0726 | Tarkő 16.-18. |
| <i>Allocricetus éhiki</i> | | | | |
| 5 | 1.88-2.07 | 2.02 | 0.0779 | Tarkő 8.-18. |
| 19 | 1.75-2.25 | 1.97 | 0.1577 | Osztramos 3. |
| 23 | 1.95-2.24 | 2.09 | 0.0717 | Villány 3. |

Table 6.
Comparison of the length of m1 molars in the investigated materials

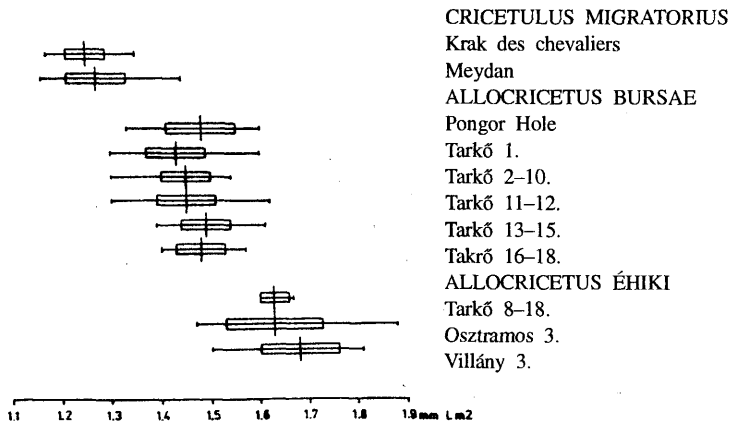


Fig. 7. The range, standard deviation and mean of the length of m2 molars in the investigated materials.

| N | Min.-Max. | X | SD | Locality |
|-------------------------------|-----------|-------|--------|---------------------|
| <i>Cricetulus migratorius</i> | | | | |
| 138 | 1.17-1.35 | 1.254 | 0.040 | Krak des Chevaliers |
| 39 | 1.16-1.44 | 1.27 | 0.0547 | Meydan |
| <i>Allocrietus bursae</i> | | | | |
| 9 | 1.33-1.60 | 1.48 | 0.0730 | Pongor |
| 30 | 1.30-1.60 | 1.43 | 0.0609 | Tarkó 1. |
| 58 | 1.30-1.54 | 1.45 | 0.0536 | Tarkó 2.-10. |
| 78 | 1.30-1.62 | 1.45 | 0.0660 | Tarkó 11.-12. |
| 45 | 1.39-1.61 | 1.49 | 0.0465 | Tarkó 13.-15. |
| 41 | 1.40-1.57 | 1.48 | 0.0555 | Tarkó 16.-18. |
| <i>Allocrietus éhiki</i> | | | | |
| 11. | 1.60-1.67 | 1.63 | 0.0259 | Tarkó 8.-18. |
| 23 | 1.47-1.88 | 1.63 | 0.1145 | Osztramos 3. |
| 31 | 1.50-1.81 | 1.68 | 0.0789 | Villány 3. |

Table 7.
Comparison of the length of m2 molars in the investigated materials

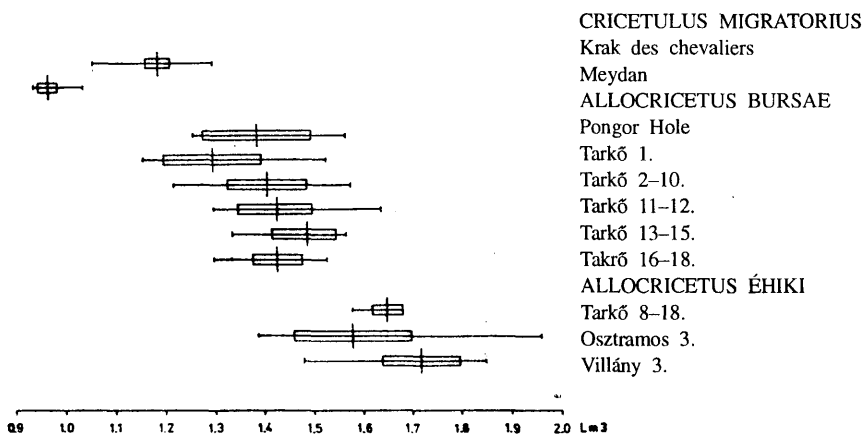


Fig. 8. The range, standard deviation and mean of the length of m3 molars in the investigated materials.

| N | Min.-Max. | X | SD | Locality |
|-------------------------------|-----------|-------|--------|---------------------|
| <i>Cricetulus nigratorius</i> | | | | |
| 110 | 1.06-1.30 | 1.186 | 0.054 | Krak des Chevaliers |
| 30 | 1.12-1.36 | 1.24 | 0.0593 | Meydan |
| <i>Allocricetus bursae</i> | | | | |
| 5 | 1.26-1.57 | 1.39 | 0.1154 | Pongor |
| 26 | 1.16-1.53 | 1.30 | 0.1072 | Tarkó 1. |
| 29 | 1.22-1.58 | 1.41 | 0.0849 | Tarkó 2.-10. |
| 57 | 1.30-1.64 | 1.43 | 0.0752 | Tarkó 11.-12. |
| 36 | 1.34-1.57 | 1.49 | 0.0661 | Tarkó 13.-15. |
| 27 | 1.30-1.53 | 1.43 | 0.0520 | Tarkó 16.-18. |
| <i>Allocricetus éhiki</i> | | | | |
| 4 | 1.58-1.61 | 1.65 | 0.0337 | Tarkó 8.-18. |
| 20 | 1.39-1.96 | 1.58 | 0.1269 | Osztramos 3. |
| 28 | 1.48-1.85 | 1.72 | 0.0790 | Villány 3. |

Table 8.
Comparison of the length of m3 molars in the investigated materials.

| N | Min.-Max. | X | SD | |
|----|-----------|------|--------|-------|
| 39 | 0.78-1.05 | 0.92 | 0.0547 | Wa M1 |
| 39 | 0.99-1.25 | 1.12 | 0.0617 | Wp M1 |
| 38 | 0.91-1.16 | 1.07 | 0.0667 | Wa M2 |
| 38 | 0.83-1.12 | 1.00 | 0.0645 | Wp M2 |
| 24 | 0.88-1.04 | 0.97 | 0.0442 | Wa M3 |
| 48 | 0.49-0.70 | 0.59 | 0.0541 | Wa m1 |
| 48 | 0.91-1.06 | 0.97 | 0.0315 | Wp m1 |
| 46 | 0.94-1.09 | 1.02 | 0.0344 | Wa m2 |
| 46 | 0.94-1.06 | 1.02 | 0.0350 | Wp m2 |
| 35 | 0.88-1.04 | 0.97 | 0.0413 | Wa m3 |

Table 9.
Basic statistical parameters of the transversal measurements (anterior and posterior width) of the *Cricetulus migratorius* molars from Meydan.

| sympl. | compl. | Locality |
|-------------------------------|--------|------------------------|
| <i>Cricetulus migratorius</i> | | |
| 72 | 28% | Meydan |
| <i>Allocricetus bursae</i> | | |
| 59 | 41% | Tarkó 1. |
| 64 | 36% | Tarkó 2.-10. |
| 62 | 38% | Tarkó 11.-18. |
| <i>Allocricetus éhiki</i> | | |
| 41 | 60% | Tarkó 8.-18. |
| 22 | 78% | Villány 3.-Osztamos 3. |

Table 10.
Distribution of the complex and symple type molars in the investigated materials.

Discussion

In the recent fauna of Hungary small sized hamster does not exist. But in the fossil materials it is frequent and had been represented by numerous taxa from the Middle Miocene up to the Pleistocene-Holocene border (JÁNOSSY, D 1979, 1986; KORDOS, L. 1987). The *Allocricetus éhiki* and *Allocricetus bursae* are common in the Upper Pliocene and Pleistocene faunas all over in Europe MAUL, L. (1990).

SCHAUB, S. (1930) based the diagnosis of the two species on the build of the skull. He remarked the lack of differences in the toothmorphology from the living genus *Cri-*

cetulus. KURTÉN, B: (1968) used the name *Cricetulus bursae* for *Allocricetus bursae*. MAYHEW, D. (1977) disputed the validity of the *Allocricetus* genus as well and underlined the morphological identity of the *Allocricetus* and *Cricetulus* genera.

After the investigations of us we can state: the recent *Cricetulus migratorius* from the Near East and the fossil *Allocricetus* from Hungary are distinguishable on the basis of the longitudinal measurements of the teeth and tooththrows, and on the basis of the statistical morphological differences as well. The disparities are significant only in the case of the tooththrows. (*Fig. 2., 2., Tab. 1., 2.*). Among the lengths of the teeth the differences are considerable, and related to the averages (*Fig. 3-8., Tab. 3.-8.*).

After the investigation of us we can see a process of simplification of the toothcrowns from the Pliocene up to the recent species on the whole. But the trends are very different of the different kind of teeth. It is most unambiguous at the M1, M2 molars (*Fig. 3., 4.,; Tab. 3., 4.*).

The process of simplification is clear if we merge the teeth into two groups:

1. teeth with simple morphology;
those are the M1:d, M2:d, M3:a, m1:b, m2:d, m3:a, g-types. The teeth of this group had not any accessory elements.
2. teeth with complex morphology:
M1: a, b, c, M2: a, b, c, M3: a, m1: a, m2: a, b, c, m3: a, g-types Those are the teeth bearing accessory elements.

Among the teeth of the *Allocricetus éhiki* the complex molars are more typical. The frequency of the simple molars is slightly higher in *Allocricetus bursae* materials. In the *Cricetulus migratorius* sample the simple group is in absolute majority (*Tab. 10.*).

We can draw a distinction between the *Cricetulus* and *Allocricetus* genera with the above presented methods only if we have a large number of teeth.

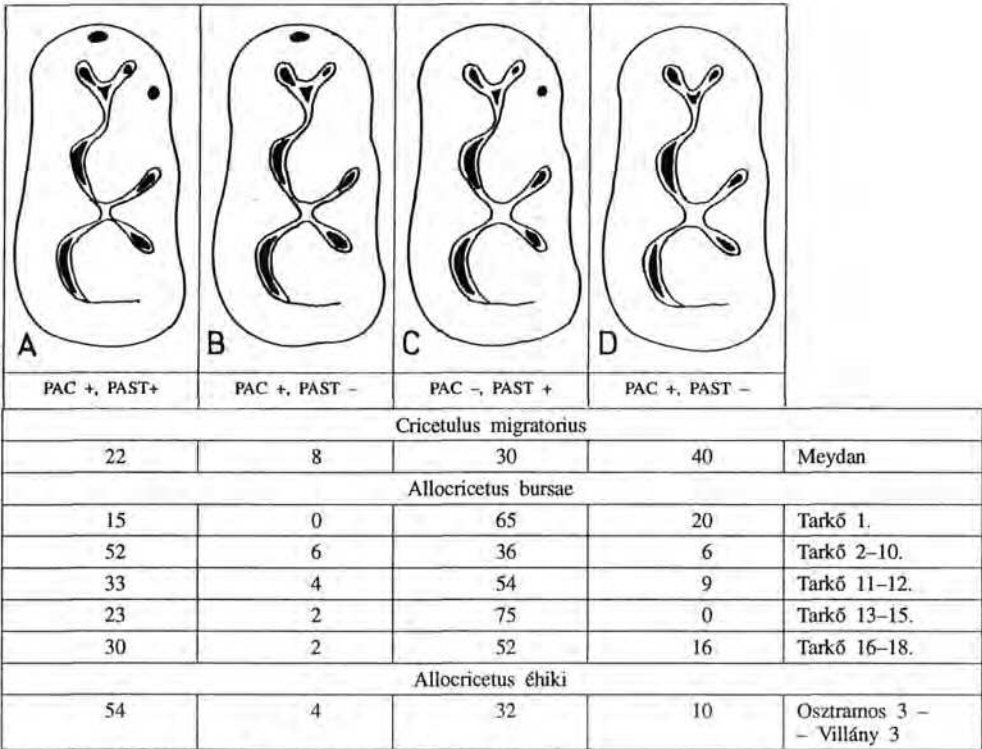


Fig 9. The distribution of the morphotypes on M1 molars (%)

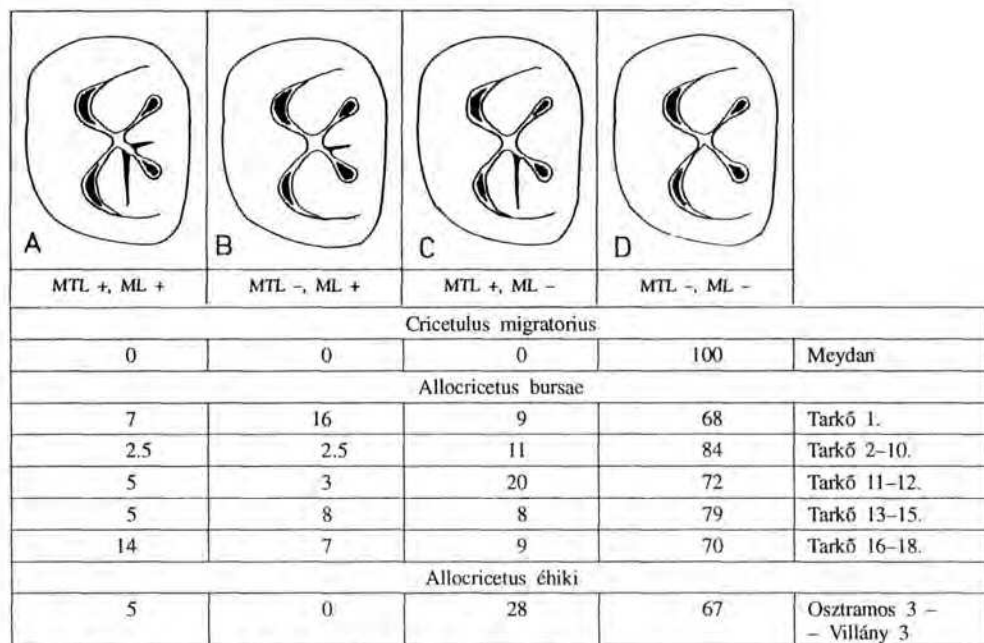


Fig 10. The distribution of the morphotypes on M2 molars (%)

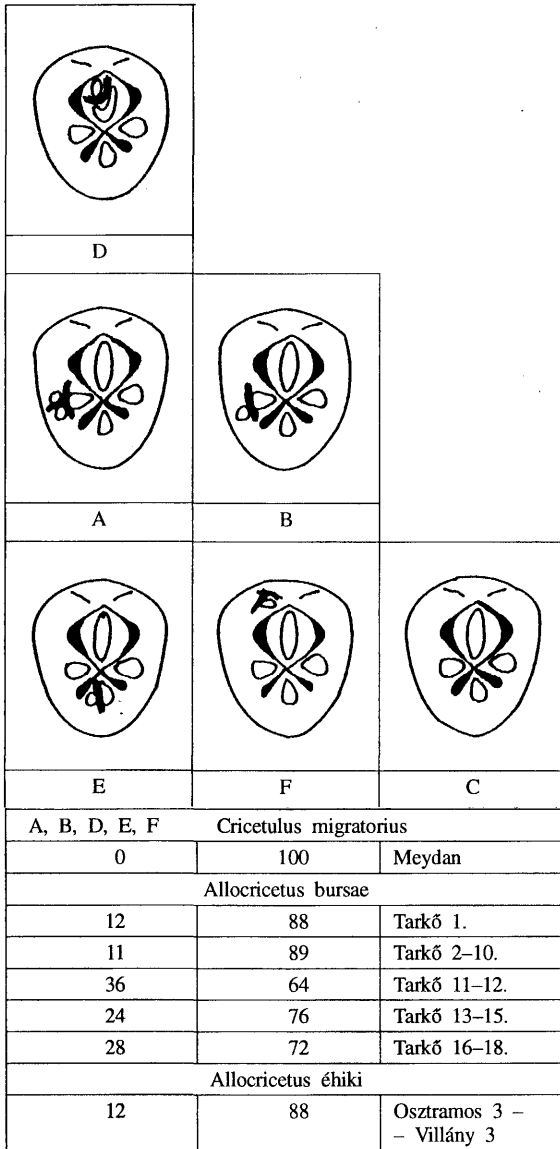


Fig 11. The distribution of the morphotypes on M3 molars (%)

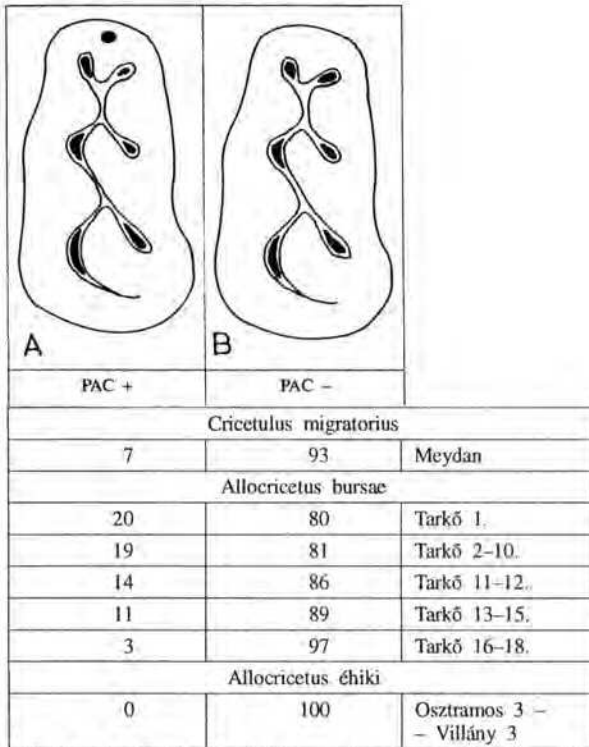


Fig 12. The distribution of the morphotypes on m1 molars (%)

Literature

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| | | | | |
|-------------------------------|-------------|-------------|-------------|-----------------------------|
| | | | | |
| ALC +, ML + | ALC -, ML + | ALC +, ML - | ALC -, ML - | |
| <i>Cricetulus migratorius</i> | | | | |
| 0 | 10 | 30 | 60 | Meydan |
| <i>Allocrietus bursae</i> | | | | |
| 5 | 5 | 25 | 65 | Tarkó 1. |
| 0 | 2 | 26 | 72 | Tarkó 2-10. |
| 5 | 11 | 15 | 69 | Tarkó 11-12. |
| 19 | 9 | 16 | 54 | Tarkó 13-15. |
| 22 | 11 | 29 | 38 | Tarkó 16-18. |
| <i>Allocrietus éhiki</i> | | | | |
| 22 | 30 | 35 | 13 | Osztamos 3 - - Villány 3 |

Fig 13. The distribution of the morphotypes on M2 molars (%)

| | | | | |
|-------------------------------|-------------|-------------|-------------|-----------------------------|
| | | | | |
| ALC +, ML + | ALC -, ML + | ALC +, ML - | ALC -, ML - | |
| <i>Cricetulus migratorius</i> | | | | |
| 63 | 18 | 4 | 15 | Meydan |
| <i>Allocrietus bursae</i> | | | | |
| 23 | 62 | 0 | 15 | Tarkó 1. |
| 7 | 53 | 3 | 37 | Tarkó 2-10. |
| 18 | 66 | 4 | 12 | Tarkó 11-12. |
| 38 | 62 | 0 | 0 | Tarkó 13-15. |
| 38 | 55 | 0 | 7 | Tarkó 16-18. |
| <i>Allocrietus éhiki</i> | | | | |
| 60 | 31 | 2 | 7 | Osztamos 3 - - Villány 3 |

Fig 14. The distribution of the morphotypes on M3 molars (%)

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