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Andrzej PRADEL

Cricetus cricetus (LINNAEUS 1758) (*Rodentia, Mammalia*) from the Pleistocene-Holocene Deposits of Sąspowska Cave (Ojców, Southern Poland)

[Pls. XVI—XVIII, 3 figs]

Cricetus cricetus* (LINNAEUS 1758) (*Rodentia, Mammalia*) z plejstoceńsko-holoceńskich osadów Jaskini Sąspowskiej (Ojców, Południowa Polska)

Abstract. Biometric data concerning, for the most part, the dentition and some characters of the skull are given in the aspect of individual and population variation against the data on present-day and Pleistocene hamsters from some of the European localities.

I. INTRODUCTION

Both the skeleton and dentition of hamsters show conspicuous individual variation as regards shape and size. This is, among other things, one of the reasons why the close relationships between particular taxa are not quite clear and are still a matter of dispute. The problems of subspecies which are being distinguished at present, among other genera, in *Cricetus* (LESKE 1779), also call for comparisons and discussion. For this reason it is desirable to collect and discuss as many-sided biometric data as possible for particular populations.

The purpose of the present study is to present the biometric data of the skulls (chiefly dentition) of *Cricetus cricetus* (LINNAEUS 1758) from the final phase of the Würm glaciation and to compare them with European materials.

II. MATERIAL

The material of *Cricetus cricetus* from the western Sąspowska Cave, discussed in this paper, is stored in the collection of the Polish Academy of Sciences in Cracow, Call No. MF/1284/74 (Pl. XVI). It consists of 162 well-preserved molars, mostly set in mandibles and maxillae. It contains 32 complete toothrows: 8 M^{1-3} (3 right and 5 left) and 24 M_{1-3} (13 right and 11 left). Eight ma-

* Praca wykonana w ramach problemu MR. II. 3.

xillae and 22 mandibles bear one or two teeth. There are only 17 detached teeth. The numbers of particular sorts of teeth are as follows:

M^1		M^2		M^3		M_1		M_2		M_3	
Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left
8	5	9	8	9	7	17	15	23	21	21	19
13		17		16		32		44		40	

Situation of the western Sąspowska Cave („Pod Kościołem") and its stratigraphy

The cave has been described by KOWALSKI (1951, No. 358, p. 349). It is situated on the left bank of the upper section of the stream Sąspówka, close

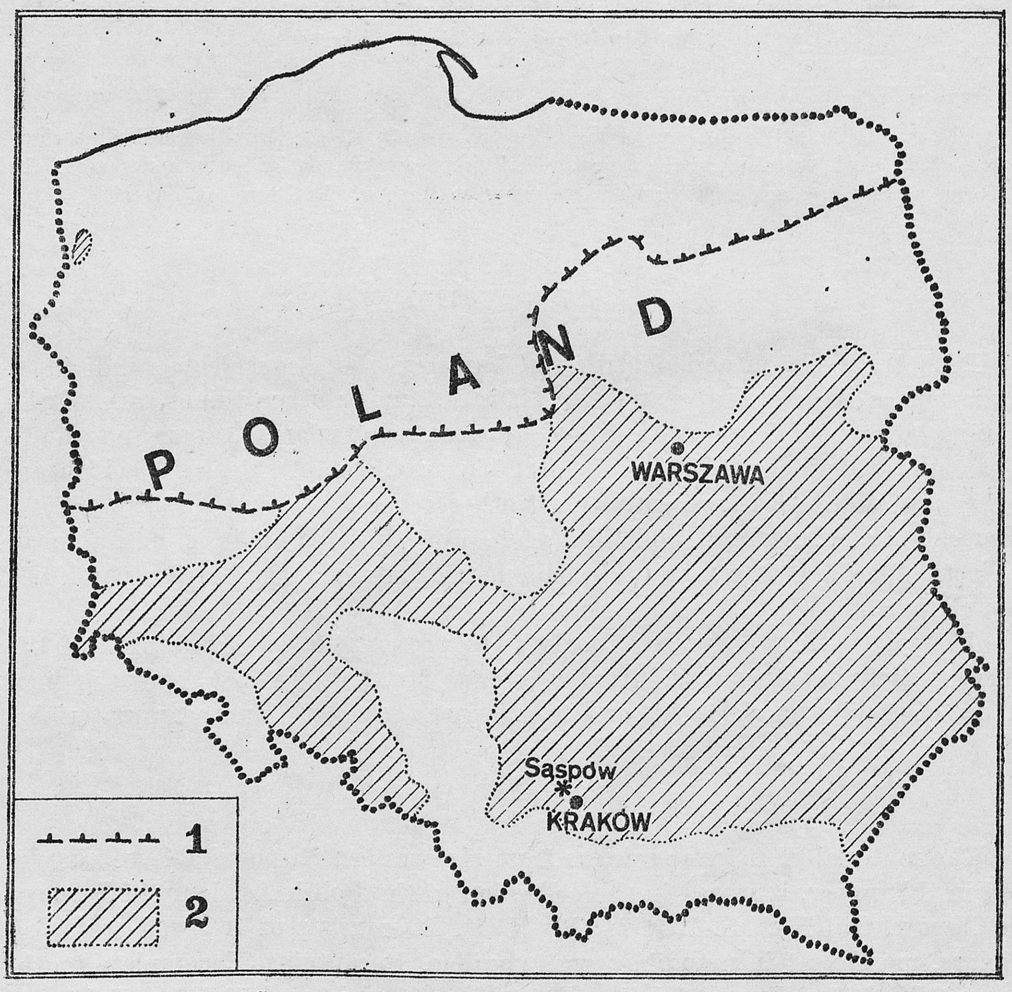

Fig. 1. The situation of Sąspowska Cave against the background of 1 — the range of ice-sheet in the last glaciation (Würm) and 2 — the present distribution of *C. cricetus* in Poland (after SURDACKI, 1973, modified)

to the boundary of the Ojców National Park, in the area of the village of Sąspów (50° 13'N, 19° 46'E) (Fig. 2). In literature it was mentioned for the first time by ZAWISZA (1874), who however gave no results of his exploration.

The material used in this study has been obtained during an excavation carried out under the direction of Prof. W. CHMIELEWSKI of the Institute of Archaeology, Warsaw University.

Six layers were uncovered in the excavation. The lowest of them (1) did not contain any bone remains. Some remains of species having distinctly various environmental requirements were found in layer 2. Here there were tundra forms *(Dicrostonyx torquatus, Coelondenta antiquitatis)*, sylvan forms *(Glis glis)*, and even thermophils *(Myotis emarginatus)*. It seems however that only the cold-liking species agree with the deposits in age, whereas the remaining forms got into this layer from the overlying deposits. This is also suggested by the faunistic set of layer 3, in which *Dicrostonyx torquatus* has been found only in one sample, from its lower portion. The other species found in layer 3 form a set characteristic of the decline of the glacial period. Layers 4, 5 and 6 contained sylvan and eurytopic species as well as domestic animals and had been formed in the Holocene in a forest environment and climate which remembered the present one.

The remains of *Cricetus cricetus* (LINNAEUS) under study were found in large numbers in layer 3, where they were even represented by whole skeletons of animals marked by great individual variation. NADACHOWSKI (in press) writes: ... „there is however a conjecture that they date from a later period and come from animals that set up colonies in the cave deposits". Nevertheless, it does not seem possible that the hamster, an animal of open areas, should inhabit caves. The state of preservation of the skulls, among other things, lack of brain cases and the ratio of the number of mandibles to that of maxillae, rather indicate their source in pellets of one of large owls, e. g. the eagle owl *(Bubo bubo)*, whose fossil remains are known from about 30 Quaternary localities, chiefly in Europe, within its present range (BOCHEŃSKI, 1974; BRODKORB, 1971). It should therefore be assumed that the hamsters in layer 3 correspond in age to its remaining fauna and thus come from the final phase of the Würm glaciation.

III. METHOD

The lengths of tooth-rows and the lengths and widths of particular molars were measured to an accuracy of 0.01 mm, using a measuring microscope with a cross platform.

The anterior width of tooth (W_f) was measured at the protocone-paracone height on upper molars and at the protoconid-metaconid height on the lower ones and the posterior width (W_b) at the respective, hypocone-metacone and hypoconid-entoconid heights.

The length of mandibles was measured, using a slide calliper, to an accuracy of 0.1 mm. The measurement was taken between the postero-supero-medial edge of the incisor alveolus and the tip of the condylar process.

The bad state of preservation of the skulls made it impossible to take any measurements on them.

IV. RESULTS

The morphology of the molar crowns of the hamster from Sąspowska Cave does not differ in anything from the description given for *Cricetus cricetus* (see e. g. SCHAUB, 1930; NEWTON, 1909; FAHLBUSCH, 1976; MILLER 1912) (Pl. XVII 1, 2).

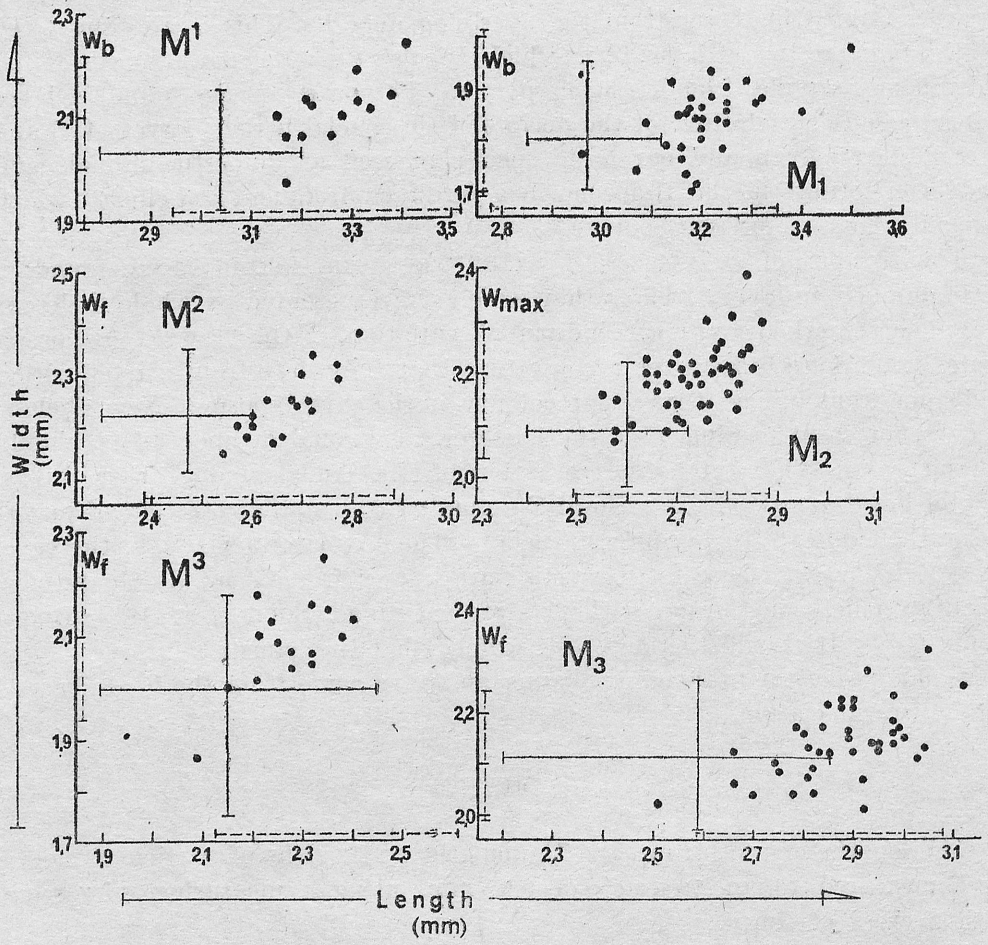

Fig. 2. A length-width graph for molars of *Cricetus cricetus*. The black circlets represent the data for the material from Sąspowska Cave and the continuous lines the observation ranges of L and W in the present population of hamsters from Rheinhessen, N = 59 (after FAHLBUSCH, 1976). The broken lines, along the axes, mark the observation range of these magnitudes found for the present hamster from southern Poland (8 specimens: 15M_1, 15M_2, 13M_3, 16M^1, 16M^2, 13M^3. Author's own data in prep.)

The measurements of particular teeth are represented in a length-width graph (Fig. 2), in which the data for the modern *C. cricetus* from Western Germany (after FAHLBUSCH, 1976, p. 75) and modern hamster from southern Poland are also plotted.

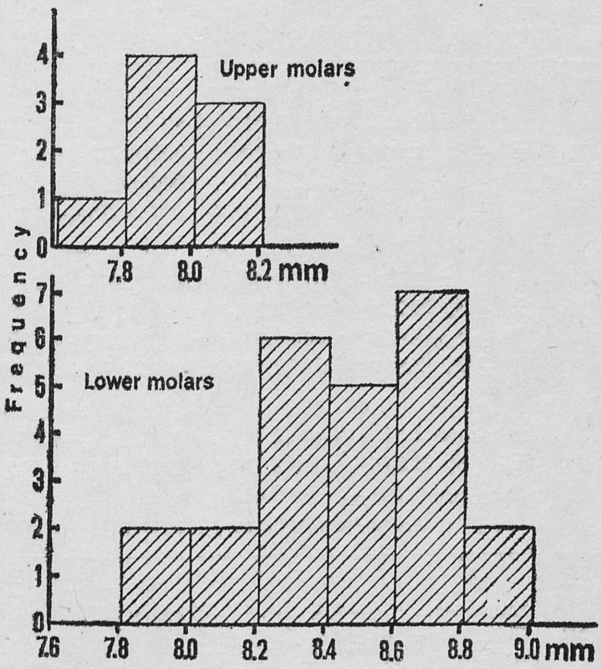

Fig. 3. Lengths of tooth-rows in the population of *C. cricetus* from Sąspowska Cave

The graph in Fig. 3 shows the distribution of tooth-row lengths in particular length groups (interval — 0.2 mm).

Worked-out measurements are given in Table I. Parts A and B of this table present measurements of single teeth and part C those of tooth-rows.

As in the case of *C. migratorius* from Syria (PRADEL, 1981), too, difficulties were encountered in determining the greatest width of M_2. This problem is additionally presented in Table II, which shows differences between W_f and W_b within one tooth. As can be seen from it, a similar problem (i. e. whether W_f or W_b is greater) appears also in M^1.

In part A of Table I measurements are divided into W_f and W_b, and its part B gives the greatest width of M_2, in calculation of which the greater measurement, whichever it was W_f or W_b, was used. As the comparison of part B of this table with the appropriate segment of its part A (i. e. W_b for M_2) shows, the differences are not very great. The lower boundary of the range of observation has risen a little (from 1.99 to 2.08 or by about 4.5%). A decrease is observed in SD (from 0.080 to 0.065) and V (from 3.67 to 2.89) and

Table I

Measurements of molars of the hamster *C. cricetus* from Sąspowska Cave, in mm. A — measurements of particular teeth, B — greatest widths of M_2 (the greater of the pair W_f and W_b), C — lengths of tooth-rows

A		L	W_f	W_b
M_1	n	32	32	32
	min-max	2.96 —3.50	1.61 —1.80	1.70 —1.97
	$\bar{x} \pm S_{\bar{x}}$	3.208 ± 0.017	1.706 ± 0.009	1.833 ± 0.011
	$SD \pm S_{SD}$	0.095 ± 0.012	0.051 ± 0.006	0.064 ± 0.008
	$V \pm S_V$	2.949 ± 0.369	3.013 ± 0.377	3.476 ± 0.435
M_2	n	44	44	44
	min-max	2.55 —2.87	2.05 —2.25	1.99 —2.39
	$\bar{x} \pm S_{\bar{x}}$	2.729 ± 0.012	2.165 ± 0.007	2.174 ± 0.012
	$SD \pm S_{SD}$	0.081 ± 0.009	0.047 ± 0.005	0.080 ± 0.008
	$V \pm S_V$	2.969 ± 0.316	2.149 ± 0.229	3.670 ± 0.391
M_3	n	40	40	39
	min-max	2.51 —3.12	2.01 —2.32	1.73 —2.14
	$\bar{x} \pm S_{\bar{x}}$	2.875 ± 0.019	2.141 ± 0.011	1.931 ± 0.015
	$SD \pm S_{SD}$	0.121 ± 0.013	0.070 ± 0.008	0.096 ± 0.011
	$V \pm S_V$	4.199 ± 0.470	3.285 ± 0.367	4.988 ± 0.565
M^1	n	13	13	13
	min-max	3.15 —3.41	1.91 —2.14	1.97 —2.24
	$\bar{x} \pm S_{\bar{x}}$	3.262 ± 0.023	2.057 ± 0.019	2.108 ± 0.018
	$SD \pm S_{SD}$	0.084 ± 0.016	0.067 ± 0.013	0.066 ± 0.013
	$V \pm S_V$	2.574 ± 0.505	3.275 ± 0.642	3.133 ± 0.614
M^2	n	17	17	17
	min-max	2.54 —2.81	2.15 —2.38	1.98 —2.26
	$\bar{x} \pm S_{\bar{x}}$	2.671 ± 0.019	2.244 ± 0.016	2.076 ± 0.016
	$SD \pm S_{SD}$	0.076 ± 0.013	0.064 ± 0.011	0.066 ± 0.011
	$V \pm S_V$	2.859 ± 0.490	2.862 ± 0.491	3.181 ± 0.545
M^3	n	16	16	
	min-max	2.09 —2.40	1.86 —2.25	
	$\bar{x} \pm S_{\bar{x}}$	2.272 ± 0.021	2.088 ± 0.022	
	$SD \pm S_{SD}$	0.084 ± 0.015	0.088 ± 0.016	
	$V \pm S_V$	3.715 ± 0.657	4.218 ± 0.746	

B		W_{max} (W_f or W_b)
M_2	n	44
	min-max	2.08 —2.39
	$\bar{x} \pm S_{\bar{x}}$	2.192 ± 0.010
	$SD \pm S_{SD}$	0.063 ± 0.006
	$V \pm S_V$	2.886 ± 0.308

C	LM_{1-3}	LM^{1-3}
n	24	8
min-max	7.95 —8.94	7.67 —8.16
$\bar{x} \pm S_{\bar{x}}$	8.479 ± 0.052	7.963 ± 0.051
$SD \pm S_{SD}$	0.256 ± 0.377	0.146 ± 0.036
$V \pm S_V$	3.021 ± 0.436	1.828 ± 0.457

Table II

A comparison showing differences in widths W_f and W_b in particular teeth of *C. cricetus* from Sąspowska Cave

	W_f—W_b (mm)	FREQUENCY					
	0.32						
	0.31	X					
	0.30						
	0.29	XXXX					
	0.28	X					
	0.27	XXX					
	0.26	XXXX					
	0.25	XX				X	
	0.24	XX				X	
	0.23	X	M_3			X	
	0.22	XXX				X	
	0.21	XXX					M^2
	0.20	XXXX				XXXX	
$W_f > W_b$	0.19	X				X	
	0.18	X				X	
	0.17						
	0.16	XX				X	
	0.15	X					
	0.14	XX					
	0.13	XX					
	0.12					X	
	0.11	XX				X	
	0.10	X		XX		X	
	0.09					X	
	0.08	X		X		XX	
	0.07			XX			
	0.06				M_2		
	0.05			X			
	0.04			XXXX			
	0.03			XX			
	0.02			XXX		X	
	0.01			XX			
$W_f = W_b$	0.00			XXXX			
	—0.01			XXXXX			
	—0.02			XXXX		X	
	—0.03	X		XX		XX	M^1
	—0.04			XX		XXX	
	—0.05			XX			
	—0.06	XX		X		XX	
	—0.07	X	M_1	X			
	—0.08	X				XX	
	—0.09	X		XX			
	—0.10	XXXX		X		X	
	—0.11	XX		XX		X	
	—0.12	XX					

Table II

W_f—W_b (mm)		FREQUENCY	
	—0.13	XXX	
	—0.14	XXXX	
	—0.15	XX	X
	—0.16	XXXX	
	—0.17	XX	
$W_f < W_b$	—0.18		
	—0.19	XX	
	—0.20		
	—0.21	X	
	—0.22		
	—0.23		

a small increase in $\bar{x}$ (from 2.174 to 2.192, i. e. by 0.0175 or $\pm 0.8\%$) but this last change is not significant, for the value obtained for t from STUDENT'S t test is 1.1402 for 86 degrees of freedom. Thus, it is quite sufficient for the value of W_b to be given as the width of M_2.

Length of mandibles

The results obtained are given below in column „A", with which the results of calculations made with the data from a paper by MILLER (1912, p. 604) on *C. c. cricetus* from Germany („B") are juxtaposed for comparison

	„A"	„B"
N	21	13
min-max	24.6—31.3	30.2—33.2
$\bar{x}$	27.77	32.17
SD	2.02	0.89
V	7.28	2.76

Proportions of particular lengths of teeth in row

The ratios calculated on the basis of the mean lengths of molars are:

$$LM_1 : LM_2 : LM_3 = 1.17 : 1 : 1.05 \qquad LM^1 : LM^2 : LM^3 = 1.22 : 1 : 0.85$$

These values were, in addition, calculated by the method given in another. paper (PRADEL, 1981). The results obtained do not differ much from the foregoing values, but they can be used in comparisons and inform about changes which may occur fortuitously in this index:

x	$LM_1 : LM_2 : LM_3$ 1.17 : 1 : 1.05		$LM^1 : LM^2 : LM^3$ 1.21 : 1 : 0.84	
N	23	23	8	14
min-max	1.104—1.268	0.929—1.106	1.144—1.241	0.793—0.898
$\bar{x}$	1.1735	1.0494	1.2105	0.8434
SD	0.0390	0.0406	0.0323	0.0325
V	3.325	3.866	2.667	3.850

V. DISCUSSION

Analysis of tooth wear degree. As has been mentioned in the description of the locality, the remains of *C. cricetus* from Sąspowska Cave come from pellets of big owls. On the basis of the degree of molar crown wear it is possible to analyse the frequency with which hamsters of various age groups were caught by these birds of prey. Six working degrees of tooth wear has been adopted. Group 1 includes teeth with crowns bearing no traces of wear at all and group 6 those with the upper surface of crowns quite flat, thoroughly worn down, without or with only very slight traces of enamel, left after the deepest depressions. Groups 2—5 are composed of teeth of intermediate stages.

Tooth wear degree	Percentage of particular groups in material	
1	9.20	44.17
2	34.97	
3	5.52	17.18
4	11.66	
5	23.93	38.65
6	14.72	
	100.0	100.0

These results may be interpreted in the following way: group 1 consists of very young specimens, which leave their burrows very rarely, if ever. In the period when the juveniles begin to leave the burrows regularly, they are still not very dexterous and little experienced, and so they readily fall victims to birds of prey and are taken by them in large numbers (group 2). The specimens which have survived the hard period of youth are in their prime, the most dexterous and careful. They belong to group 3 and are captured least. As the animals grow older, the numbers of specimens caught are larger again (groups 4 and 5). The old specimens (group 6) are certainly easy preys, but their number in the material decreases; only few hamsters reach a very old age. Similar conclusions can be drawn with the specimens divided into three groups in respect of tooth wear: young animals with slightly worn tooth crowns, those of medium age with distinctly but not heavily worn teeth, and old specimens showing very heavy wear. The first and third groups together contain as many as 82.82% of the teeth found in the material. The group of medium age forms 17.18%.

This is a simplified reasoning. In order to make a throughly correct analysis of this type, one should know the percentage composition of particular groups of animals in the free-living population (this composition, besides, undergoes changes also in the course of the year).

Length of mandibles. The divergencies between the lengths of mandibles of today's hamsters, calculated on the basis of the data given by MILLER (1912), and those of the Sąspowska Cave specimens (see the comparison on p. 300) may reflect the actual differences between these populations or they may have arisen from different methods of measuring (MILLER may, for instance, have measured the length from the foremost part of the mandible and not from the upper posterior edge of the incisor alveolus, as in the measurements of the material from Sąspów). These differences are however too marked to be ascribed exclusively to the use of a different measuring method. For this reason, it is worth emphasizing that the mandibles of the hamster from Sąspowska Cave are smaller than those of the now living hamsters described by MILLER, but they have longer tooth-rows (Table III). This may be due, in some measure, to the fact that most mandibles from Sąspowska Cave belonged to relatively young specimens.

We can also obtain another index which allows the tracing of evolutionary tendencies in the *Cricetidae*. In addition to the morphology of tooth crowns,

Table III

A comparison of four measurements of *Cricetus cricetus* from Sąspowska Cave with the data given by MILLER and RADULESCO. The data, in mm, are arranged acc. to the scheme: (N) min-mean-max

	Condylobasal length	Maxillary tooth-row	Length of mandible	Mandibular tooth-row
C. c. cricetus L. present, Central Europa (MILLER, 1912)	(11) 47.0—50.0—51.4	(13) 7.8—7.95—8.2	(13) 30.2—32.2—33.2	(13) 7.6—7.89—8.2
C. cricetus (L.) present, Rumania (RADULESCO, 1972)	(3) 45.7—48.9—53.2	(4) 7.6—7.7—7.8	(4) 29.0—31.3—34.2	(4) 7.8— 8.0—8.2
C. cricetus (L.) Würm/Holocen, Poland Sąspowska Cave	— — —	(8) 7.7— 8.0—8.2	(21) 24.6—27.8—31.3	(24) 8.0— 8.5—8.9

such absolute values as the lengths of skulls, mandibles, particular teeth and tooth-rows and relative magnitudes as the length ratios of teeth in a row, applied in the present paper, we can also use the length ratio of mandible to tooth-row set in it. A similar index, expressing the ratio of the condylobasal length of skull to that of the upper row of molars, is probably significant, as well.

It should be added marginally that MILLER had not at his disposal 13 mandibular rami but 13 skulls (26 rami). If possible, the lengths of both rami should be measured, for skulls are not quite symmetric, e. g. in one specimen of the present-day hamsters from southern Poland, whose skull I measured, the right part of the mandible was 24.2 mm long and the left one 23.2 mm (about 5% difference in length in one specimen).

Plate XVIII shows examples of variation in the size of mandibles in the material described as compared with the biggest mandible of the present-day hamster from southern Poland ever found. Proportions of particular teeth in row compared with the data from FAHLBUSCH'S (1976) paper:

Relative length of teeth in row

	$M_1 : M_2 : M_3$	$M^1 : M^2 : M^3$
C. major from Petersbuch 1 (Middle Pleistocene)	1.16 : 1 : 1.10	1.21 : 1 : 0.89
C. cricetus from Rheinhessen (present)	1.14 : 1 : 0.99	1.23 : 1 : 0.87
C. cricetus from Sąspowska Cave (final phase of Würm)	1.17 : 1 : 1.05	1.22 : 1 : 0.85

All the three indices for the upper teeth are similar, M^3 being perhaps relatively somewhat shorter in *C. cricetus* from Sąspowska Cave. The length ratios of the mandibular molars of the hamster from Sąspowska Cave come closer to those for *C. major* from the Middle Pleistocene than to the ratios for the present-day *C. cricetus* from Theinhessen.

In FAHLBUSCH'S paper these indices were calculated on the basis of the mean lengths of molars and for this reason it is impossible to carry out a statistical estimation to what extent the differences are significant.

All the tooth measurements of the hamsters from Sąspowska Cave are greater than the corresponding measurements in the present-day hamster from Rheinhessen in the GFR (see the L/W graph in this paper and Table 1 in FAHLBUSCH'S (1976) paper). The application of STUDENT'S t test reveals in most cases that these differences are statistically significant (except for the values of W_t on M^2 and M_1). The hamsters from Sąspowska Cave differ less in measurements from the present-day *C. cricetus* from southern Poland (author's own data, in prep., see also Pl. XVIII and Fig. 2).

Three subspecies of the hamster are now described from Europe (BREHM, 1963): *Cricetus cricetus cricetus* (LINNAEUS 1758), occurring in central Germany and Poland, *Cricetus cricetus canescens* NEHRING 1899, occurring in Europe, west of the Rhine, and *Cricetus cricetus nehringi* MATSCHIE 1901, occurring in the Ukrainian SSR, Roumania and Czechoslovakia.

The population of the present-day hamster described by FAHLBUSCH (1976) only as *C. cricetus* from Rheinhessen (Raum-Alzey-Mainz) or from the left bank of the Rhine, probably belongs to the subspecies *C. c. canescens* in its eastern range of distribution. This probability is the greater because the exact boundaries of the distribution of these subspecies has not, as yet, been determined. Even MILLER (1912) makes such a remark in his description of the geographic distribution of *Cricetus cricetus cricetus*: „exact limits of distribution not known, and apparently undergoing rapid change".

The derivation of the hamster material from Hesse from the subspecies *C. c. canescens* may also be evidenced by the fact that the measurements given for particular teeth lie rather in the middle and lower region of the observation range of the present-day *C. c. cricetus* from southern Poland (cf. Fig. 2; author's own unpublished data), and it is well known (MILLER, 1912; LUBICZ-NIEZABITOWSKI, 1933) that the subspecies *C. c. canescens* is a somewhat smaller form than the nominative subspecies.

As FAHLBUSCH (1976) gives no other measurements (e. g. lengths of tooth-rows, mandibles and skulls) for his very rich material of the present-day hamster, I have been unable to carry out other comparisons of the population of the hamster from Sąspowska Cave with that from Hesse. Table II has been constructed to make their comparison possible also in respect of other measurements than the length and width of particular teeth; in this table values calculated from the data given by MILLER (1912) and RADULESCO (1972) are placed beside the data on the hamster from Sąspowska Cave. RADULESCO, too, uses only the specific name *Cricetus cricetus* in his study, though it may well be that he is concerned with *C. c. nehringi*.

This comparison shows that

1. the upper row is for the most part shorter than the lower. This difference is distinct even with such a small number of specimens as RADULESCO had at his disposal ($N = 4$) and particularly well seen on single skulls (RADULESCO, 1972; Tables 3 and 4). In the hamster population from Sąspowska Cave the length of the upper row is 93.9% of that of the lower tooth-row, which difference is statistically significant (STUDENT'S t test: $t = 5.249$ for 30 degrees of freedom). In view of the foregoing, the result obtained by MILLER (1912), according to which the length ratio of upper to lower tooth-row is reversed, raises doubt. This is emphasized in Table II by presenting mean lengths calculated for the lower and upper tooth-rows to an accuracy of 0.01 mm on the basis of MILLER'S (1912) data. In the list on p. 604 of MILLER'S work in five of the 13 specimens the length of the upper is greater than LM_{1-3}, in five they are equal and in three the lower tooth-rows are longer. Although I have never found a specimen with the upper tooth-row longer than the lower one, it is a striking fact that five skulls of hamsters in which the relation of the

lengths of the upper and lower tooth-rows is reversed come from other regions than the remaining ones do. They are hamsters captured at Lotzen (Saxony — 1 specimen) and in the Magdeburg region (4 specimens). The other specimens come from Ingelheim (Rheinhessen — 6), Strassburg (1) and an unknown locality (1). Thus, the differences observed may suggest some dissimilarities between populations;

2. the hamster from Sąspowska Cave has shorter mandibles than both the present-day *C. cricetus* from Germany and that from Roumania, but this notwithstanding the length of the lower tooth-row in it is distinctly greater than it is in the two groups being compared with it. On the other hand, the difference in the lengths of the upper teeth are clearly marked only between *C. cricetus* from Sąspowska Cave and the present-day hamster from Roumania.

Before the acquisition of data, exactly describing the variation ranges that occur in the now living populations of large hamsters it will not be possible to solve the problem whether the differences, revealed in this discussion, between the measurements of the hamster from the final phase of the Würm glaciation and the present-day hamsters should be attributed to the changes this species underwent during the Holocene or whether, as they seem to be, they are only a reflection of the differences occurring between the three subspecies (*C. c. cricetus*, *C. c. canescens* and *C. c. nehringi*), with changes dependent on the area of their occurrence imposed on them additionally.

The map in Fig. 1 shows the situation of Sąspowska Cave against the background of the present-day distribution of the hamster in Poland and the boundary of the range of ice-sheet in the Würm glaciation. It will be seem it that it was postible for hamsters to survive the last glaciation in southern Poland and relatively quickly to colonize the now inhabited area, as the ice-sheet was shrinking. Their further expansion to the north was however stopped by the post-glacial sandy soils, which prevented them from constructing lasting burrows. This requirement from habitat (cf. SURDACKI, 1973) will perhaps permit some conclusions in the reconstruction of changes in the distribution (refuges) of hamsters in Europe in the Pleistocene, as the ranges of successive glaciations changed and the soils left by them varied.

Translated into English
by Jerzy ZAWADZKI

Institute of Systematic and Experimental
Zoology, Polish Academy of Sciences
Sławkowska 17
31-016 Kraków, Poland

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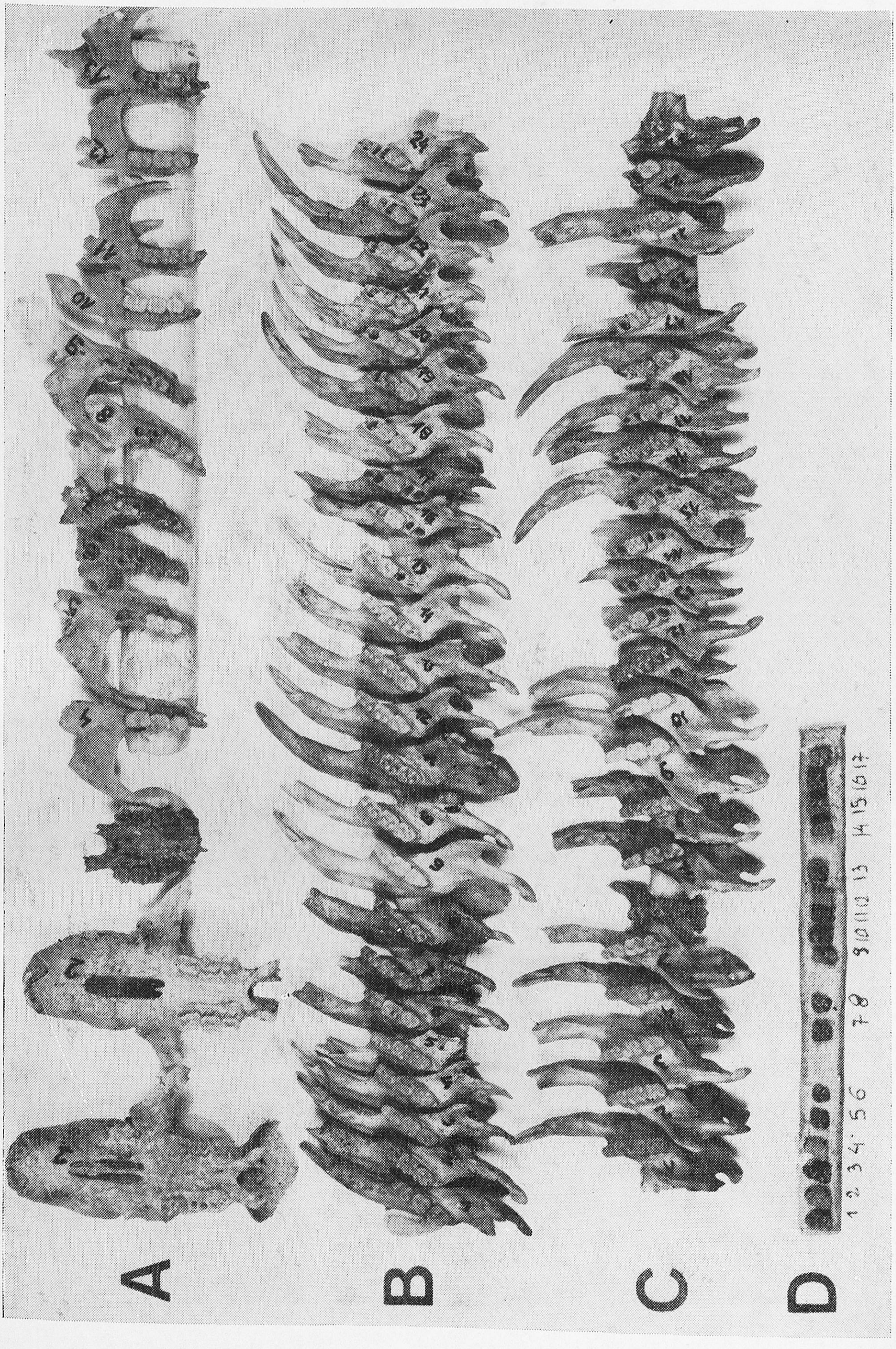
STRESZCZENIE

Przedstawiona praca zawiera analizę biometryczno-morfologiczną głównie uzębienia i niektórych cech czaszki *Cricetus cricetus* (Linnaeus 1758). Wykorzystano w niej bogaty materiał pochodzący z plejstoceńskich osadów Jaskini Sąspowskiej. Autor rozważa daleko posuniętą zmienność indywidualną, zarówno co do kształtu jak i wielkości, oraz populacyjną, na tle danych o chomikach współczesnych z niektórych stanowisk w Europie. Na podstawie zbadanych różnic serii pomiarów autor wysnuwa wnioski o odmienności pewnych populacji europejskich. Rozważa również przyczyny zmian, jakim podlegał ten gatunek w przeciągu holocenu i różnice pomiędzy wymiarami obecnych chomików. Wyraża też przypuszczenie, że rozstrzygnięcie tych zagadnień możliwe będzie po uzyskaniu danych dokładnie opisujących zakresy zmienności występujących we współcześnie żyjących populacjach dużych chomików. Na zakończenie autor przedstawia rozsiedlanie się chomika od ostatniego zlodowacenia Würm na terenie południowej Polski oraz wyjaśnia powstrzymanie ekspansji chomików na północ poprzez piaszczystą glebę, uniemożliwiającą im budowę trwałych nor.

Redaktor pracy: dr hab. L. Sych

Plate XVI

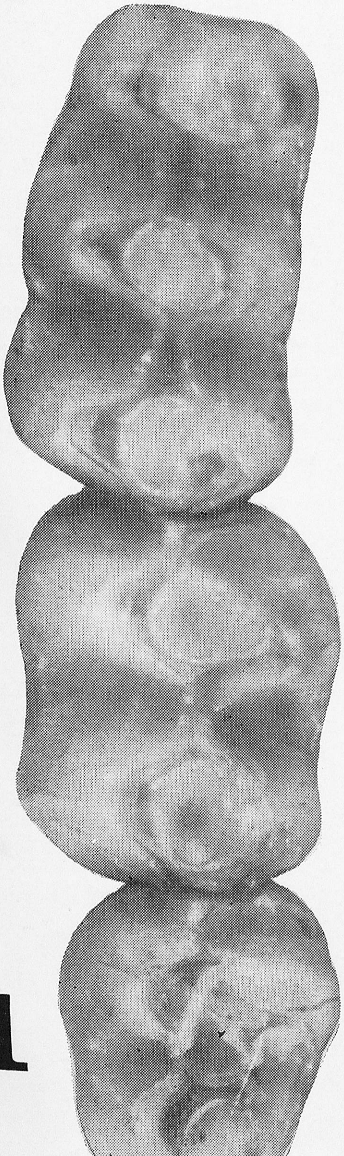
A general view of the material of *Cricetus cricetus* (Linnaeus) from Sąspowska Cave



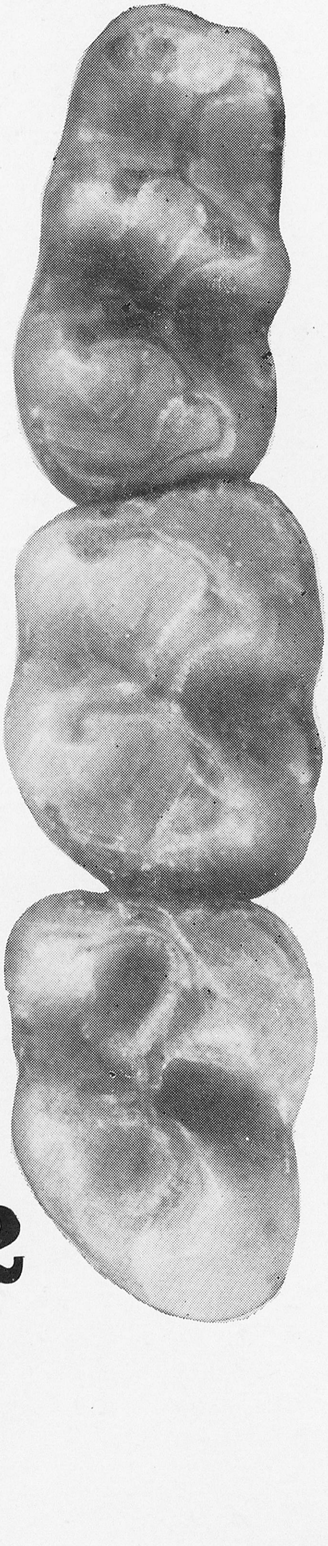
A. Pradel, Cricetus...

Plate XVII

Cricetus cricetus from Sąspowska Cave. Morphology of molars. 1 — Left row of molars of maxilla MF/1284/A—11, L = 7.67 mm. 2 — Right row of molars of mandible MF/1284/B—7, L = 8.47 mm



1

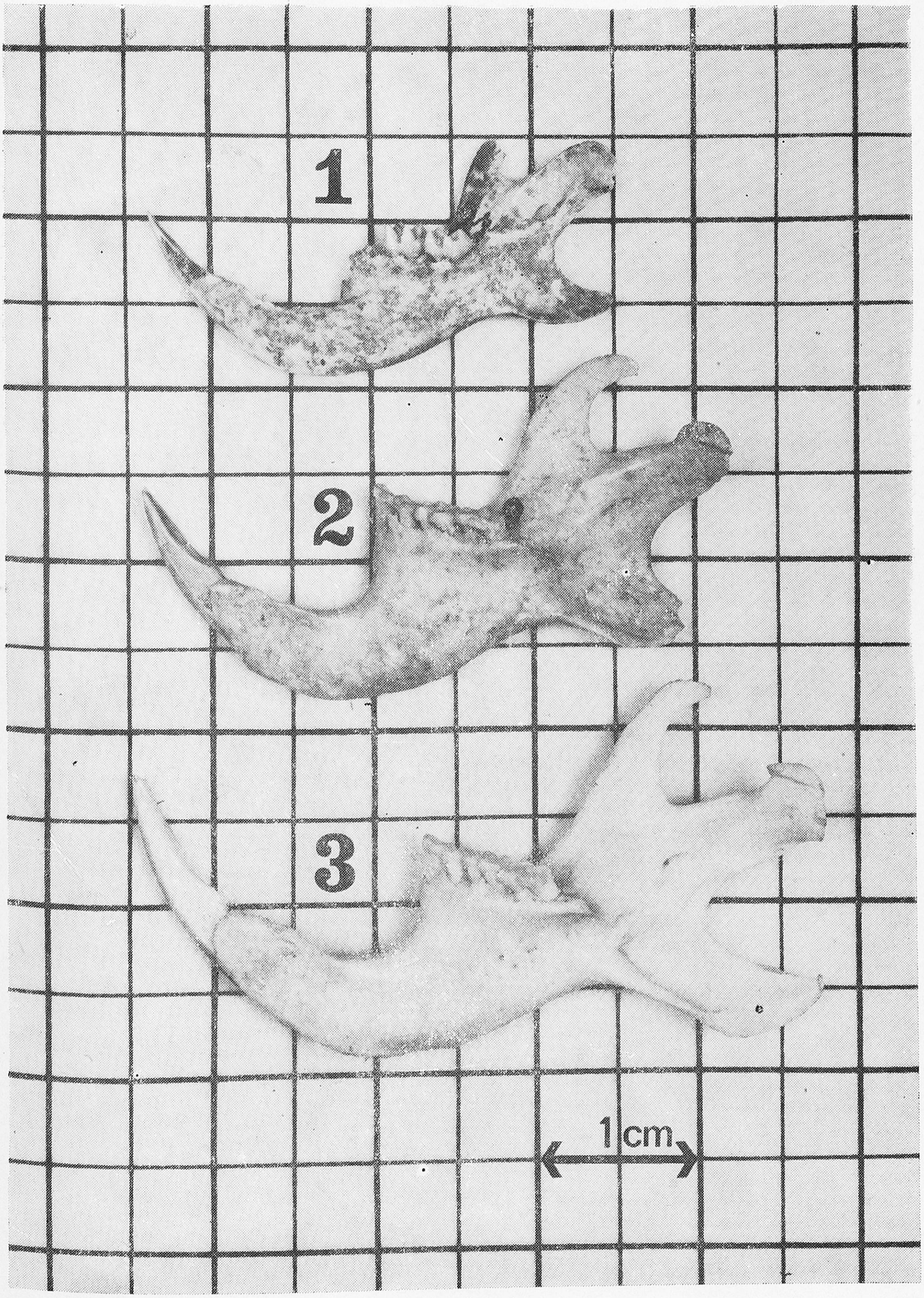


2

A. Pradel, Cricetus...

Plate XVIII

One of the smaller (1) and one of the larger (2) mandibles of *C. cricetus* from Sąspowska Cave. They illustrate the range of individual variation in comparison with one of the larger mandibles of the present-day hamster from Borusowa (3).
1 — MF/1284/B—21, 2 — M/1284/B—9, 3 — MF/5534/79



A. Pradel, Cricetus...

ERRATA

Strona Page	Wiersz Line	Jest Instead of	Ma być Should be
154	4 from top	typografią	topografią
172	opuszczono wiersz 21: woj. katowickiego 1971).		
227	10 from bottom	*Amblycopotus*	*Amblycoptus*
232 (Table I)	16 (in column "min")	0.36	0.63
233	19 from bottom	P_1	P_4
239	Add to the description of Fig. 5:		"(The teeth in Fig. D 2 are by mistake represented from outside. Their lower borders are navicular in shape on both sides).
241	11 from bottom	Ponte	Monte
242—243 (Table IV)	9 (in col. "min")	1.34	1.30
	10 (in col. "avg")	1.76	0.76
	15 (in col. "1")	10.15	10.05
	21 (in col. "Min.")	1.82	1.80
	23 (in col. "avg")	1.44	0.44
248	7 from bottom	Foldtany Kozlony	Földtany Közlony
249	11 from top	Sirv.	Surv.