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Taxonomic Value of Anteroconid Measurements of M_1 in Common and Field Voles

TAKSONOMICZNA WARTOŚĆ POMIARÓW ANTEROKONIDU M_1 U POLNIKA ZWYCZAJNEGO I POLNIKA BUREGO

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Nadachowski A., 1984: Taxonomic value of anteroconid measurements of M_1 in common and field voles. Acta theriol., 29, 10: 123—127 [With 2 Tables 2 Figs.]

Studies of variations in some anteroconid measurements of M_1 were made on three pairs of populations of *Microtus arvalis* (Pallas, 1779) (N=90) and *M. agrestis* (Linnaeus, 1761) (N=90). The LT4/LT5 index, is of little value as an independent taxonomic feature. However, the relationship between the length of M_1 and the LT4/LT5 index on a correlation diagram, makes it possible to distinguish these species with high probability.

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In some groups of mammals there occur pairs of species very similar morphologically. Among rodents, the best-known example are the species of the subgenus *Sylvaemus* (cf. Ruprecht, 1979). The two species of voles *Microtus arvalis* (Pallas, 1779) and *Microtus agrestis* (Linnaeus, 1761) differ in several of their morphological characters and certain skull dimensions; these, however, overlap to a greater or lesser degree. A correct diagnosis can only be made if a whole complex of characters is taken into consideration (cf. Dienske, 1969). Nevertheless, in some cases (damaged skulls obtained from owl pellets or paleontological material) taxonomic differentiation must be based on a few features only. In paleontological practice, for example, the species determination is based on the structure of the dental pattern of M_1, though specimens with features common for two different species are often noted (cf. Nadachowski, 1982). Fedyk & Ruprecht (1971) found in their studies of recent populations that the molars of *M. arvalis* are smaller and lighter than those of *M. agrestis* and that about 50% of the specimens studied could be specifically determined on the basis of some M_1 measurements.

The purpose of the present study was to verify the usefulness of the distinguishing feature in the structure of M_1 proposed by Chaline (1972). According to this author, the external and internal enamel triangles of M_1 in *M. arvalis* are approximately the same size, while in *M. agrestis* they are distinctly assimetric, the external (buccal) triangles being smaller than the internal (lingual) ones. This feature has sometimes been used for diagnostic purposes, e.g. in specific determi-

nations of bone materials from owl pellets (Chaline *et al.*, 1974) or as a supplementary character in studies of complete skulls (Le Louarn & Saint Girons, 1977).

Three pairs of populations of *M. arvalis* and *M. agrestis* from Poland were compared (Table 1). In two cases (Iława and the Świętokrzyski National Park), the studied skulls originated from sympatric populations and juveniles of both sexes, their proportions being different in partic- of *M. arvalis*, those from Smardzowice and the sample of *M. agrestis* from Wymiarki, were collected far away from each other, in different years. Among the specimens measured (N=30) there occurred adults and juveniles of both sexes, their proportions being different in particular populations [1]. The age of the specimens was roughly determined on the basis of the activity of their reproductive organs. The lengths of M_1 (L) were measured according to the system proposed by Van

Table 1

Localization and size of samples of the compared materials.

Locality, UTM 10×10 km grid system	Date	*M. arvalis*, N (juv.)	*M. agrestis*, N (juv.)
1 Iława DE 03, DE 04, CE 93, CE 94	July, 1963	30 (10)	30 (7)
2 Świętokrzyski N.P. DB 93, EB 03, DB 94	Aug./Sept., 1963	—	30 (6)
3 Smardzowice DA 26	Sept./Oct., 1966	30 (5)	—
4 Wymiarki WT OO	August, 1968	30 (13)	30 (10)

der Meulen (1973); the lengths of the fourth (LT4) and the fifth (LT5) enamel triangle of this molar were taken in the way shown in Fig. 1. The two last measurements were used to calculate the index LT4/LT5 (LT4 : LT5×100). The significance of the differences between the average values of the measurements from particular populations were checked with Duncan's test.

The measurements of M_1 indicate that the teeth of *M. agrestis* are distinctly longer than those of *M. arvalis* (Table 2), the differences being statistically significant ($p<0.01$). The ranges of variation, however, overlap to a high degree (between 37% to 70%) especially if specimens of different age are compared. The correlation between the age of a specimen and the length of its tooth is also observed (the teeth of juveniles are mostly shorter). The populations of *M. agrestis* do not differ significantly from each other in the length of the tooth. Differences between the samples of *M. arvalis* are much greater in particular, the population from the Świętokrzyski National Park differing from the others, this probably being connected with the nonhomogeneity of the materials compared. In the mentioned sample the exceedingly large number of juveniles (1/3 of the specimens studied) markedly lowered the average value of L.

A comparison of the mean values of the LT4/LT5 index gave similar results. The value of this index is greater in *M. arvalis*, but a complete

[1] Materials matched in this way were similar to paleontological samples containing specimens of different age.

separation of the two species could not be obtained. The ranges of variation tend to overlap to a lesser degree (between 27% to 50%) than was observed in L. Most of the specimens belonging to *M. arvalis* (88%) show LT4/LT5 values higher than 65.0, while with *M. agrestis* 81% of results fall below this level. In only three cases were the differences between the average values not statistically significant. No correlation between the age of the specimen and the value of the index was observed.

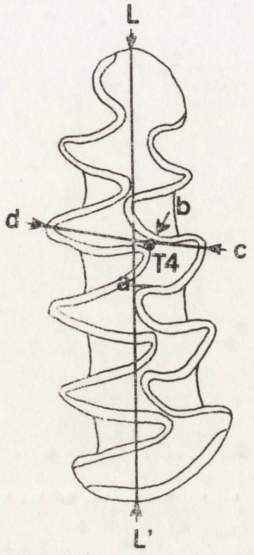

Fig. 1. Measurement methods of M_1: L=L—a—L', LT4=b—c, LT5=b—d.

Table 2

Measurements of M_1 of *M. arvalis* and *M. agrestis* in the populations studied.

Microtus arvalis (N=30)				*Microtus agrestis* (N=30)			
Locality	Range	$\bar{x}\pm SD$	CV	Locality	Range	$\bar{x}\pm SD$	CV
L							
1	2.50—2.89	2.69±0.11	4.2	1	2.63—3.20	2.95±0.14	4.7
2	2.36—2.94	2.57±0.16	6.2	2	2.50—3.30	2.94±0.21	7.2
3	2.32—2.90	2.65±0.14	5.3	3	2.68—3.37	2.98±0.16	5.4
LT4/LT5							
1	65.0—78.0	71.2±3.7	5.3	1	52.1—69.1	61.3±4.8	7.8
2	62.5—75.9	68.4±4.1	6.0	2	50.8—67.6	59.6±4.0	6.6
3	62.3—77.8	71.7±4.2	5.9	4	54.2—69.6	62.0±4.0	6.5

Presentation of the obtained results on a correlation diagram independently for each pair of populations gave more satisfactory results (Fig. 2). A complete separation of the species mentioned above was obtained for sympatric samples from Iława and particularly for allopatric populations from Smardzowice (*M. arvalis*) and Wymiarki (*M. agrestis*).

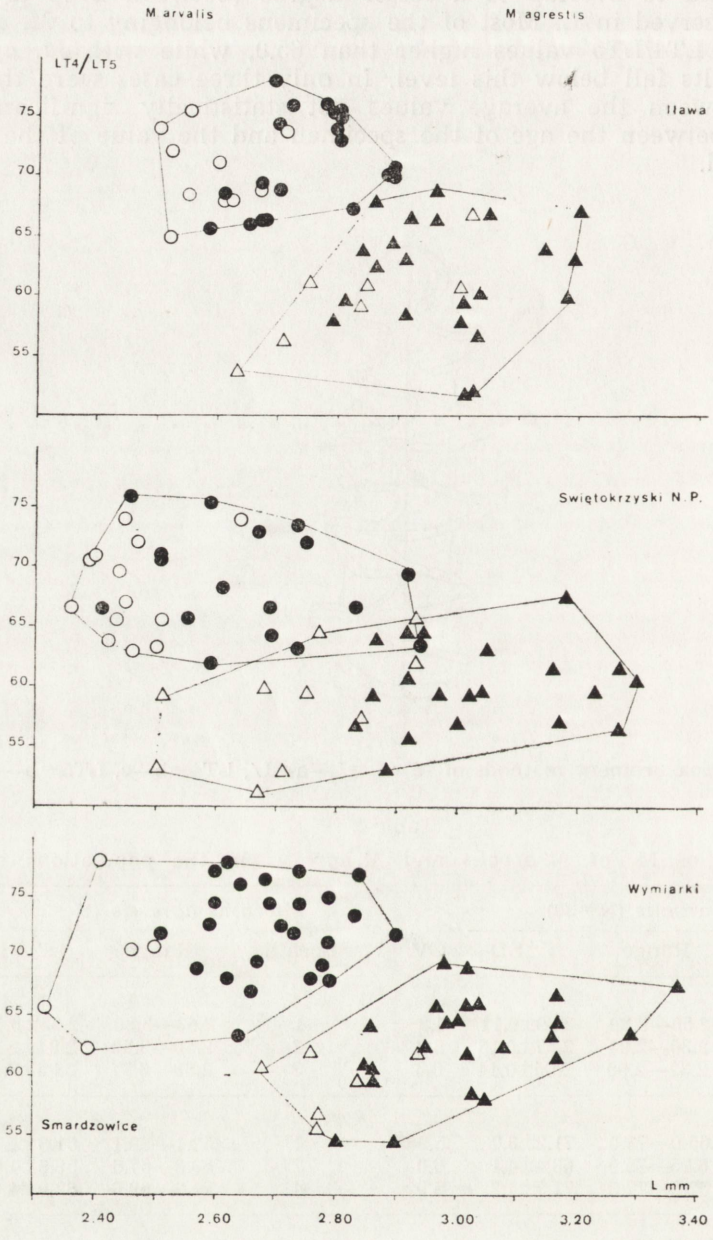

Fig. 2. Correlation diagram of M_1 length (L) and LT4/LT5 index for three pairs of populations of *M. arvalis* (circles) and *M. agrestis* (triangles). Light circles and triangles denote juveniles.

On the other hand, sympatric samples from the Świętokrzyski National Park showed a small degree of overlapping of the correlation fields (15%).

These results indicate that the value of the LT4/LT5 index, corresponding approximately to the distinguishing criterion proposed by Chaline, is of little taxonomic value as an independent feature. However, presentation of the results in the form of a correlation table or a diagram provides a fairly satisfactory basis for distinguishing between the two species of voles.

The importance of the method of distinction presented in this paper should not be overestimated. In the studies of recent material it has only a supplementary taxonomic value. For paleontological purposes, however, the LT4/LT5 index can be useful in carrying out a correct determination of species in view of the lack of other good diagnostic features in the structure of M_1.

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