Taxonomic Value of t3 mesio-labial Cone in M^2 of Apodemus Kaup, 1829

Mezo-labialny guzek *t*3 w M^2 u *Apodemus* Kaup, 1829 i jego znaczenie taksonomiczne

Andrzej L. RUPRECHT

Ruprecht A. L., 1978: Taxonomic value of *t*3 mesio-labial cone in M^2 of *Apodemus* Kaup, 1829. Acta theriol., 23, 37: 546—550 [With 1 Table, 1 Fig. & Plate XXVIII].

In the series of skulls of *A. agrarius* from Poland (n=3228) an additional *t*3 in tooth M^2 occurred in 3.9% of the skulls examined, while 0.1% of the skulls from the series of *Sylvaemus* (n=4911) examined had M^2 without *t*3, representing the pattern characteristic of the striped field mouse. The taxonomic value of *t*3 mesio-labial cone in M^2, which has hitherto been in universal use in keys for identifying material, is thus shown to be limited. The following retain their reliable value for distinguishing representatives of the subgenus *Apodemus* and *Sylvaemus* in fossil material or material obtained from owl pellets: supraorbital ridges on frontal bones and the general type of arrangement of cones in M^1 in addition to other descriptive features of the skull of these rodents.

[Mammals Res. Inst., Polish Acad. Sci., 17-230 Białowieża, Poland]

1. INTRODUCTION

The increasingly great interest shown in the genus *Apodemus* by paleontologists, ecologists and fauna specialists has induced systematicians to make an intensive search for more convenient and simultaneously more effective criteria for identification of different species. Until recently it was thought that the number of roots and arrangement of their corresponding alveoles of the molar teeth could serve as suitable diagnostic features in relation to *Apodemus*. The comparative studies made by Zejda (1965), however, have shown that the above structures are sufficiently variable within the four Central European species of *Apodemus* to make absolutely certain identification of parts of the jaws of these rodents obtained from fossil material or owl pellets out of the question. It would appear that the number and arrangement of tooth cones in *Muridae*, which are distinguished by relative constancy, permitting of attributing them to given systematic units at the level of genus and species, continue to be far more reliable features. Here also, however, cases are known of the occurrence in *Muridae* of different variants in arrangement and number of tooth cones (Miyao *et al.*, 1966; Pasquier, 1974; Tvrtković, 1976). The variability of such structures may point to the evolution of the given species in time (Pasquier,

1974). Such variations not infrequently create considerable difficulties of a taxonomic nature, particularly when there are no other criteria available making it possible to differentiate between species. This is the case *inter alia* when segregating parts of the jaws of mice of the genus *Apodemus* and distinguishing among them representatives of the subgenus *Apodemus* Kaup, 1829 and *Sylvaemus* Ognev & Vorobiev, 1923, found in owl pellets or in greatly disintegrated fossil material.

2. MATERIAL AND METHODS

Skulls of the genus *Apodemus* Kaup, 1829, obtained from both owl pellets and captures, and collected in Poland by the Mammals Research Institute, Polish Academy of Sciences at Białowieża, were used for the studies. Examination was made of a series of *A. agrarius* (n=3228) and *Sylvaemus* (n=4911) for either presence or absence of supraorbital ridges on the frontal bones, and also tooth M^2 for absence or presence of the *t*3 mesio-labial cone. Supraorbital ridges (=Supra-orbital-Leisten), defined by Kahmann (1953) and Zimmermann (1962) form the upper margin of *incisura orbitalis* of the frontal bones in the striped field mouse. Definitions of tooth cones were taken after Missone (1969) and Michaux (1971). The frequency of an additional *t*3 mesio-labial cone in M^2 in

Table 1

Frequency of co-occurrence of additional *t*3 mesio-labial cones in *A. agrarius* in M^2 and absence of *t*3 in *A. sylvaticus* in samples from analogical populations obtained from owl pellets found in Poland.

Locality in UTM system	*Apodemus agrarius* Σ	n	%	Angle, °	*Apodemus sylvaticus* Σ	n	%	Angle, °
FE 20 Knyszyn	28	1	3.6	12.9	13	1	7.7	27.7
EC 00 Wsola	63	2	3.2	11.5	19	1	5.3	19.1
EC 21 Brzoza	47	2	4.3	15.5	18	1	5.6	20.2
VT 82 Koło	165	1	0.6	2.2	21	1	4.8	17.3
CB 97 Kamieńsk	10	0	0	0	12	1	8.3	29.9
CB 13 Olesno	89	0	0	0	13	1	7.7	27.7

different populations of *A. agrarius* was entered on a map of Poland, converting values in percentages into degrees. A similar method was used for calculating the percentage formed by individuals in a *Sylvaemus* population which were distinguished by the lack of *t*3 as a subgenus characteristic adding, in order to simplify localization of the spot within Polish territory, the name of the place and its position in a UTM square (Table 1).

3. RESULTS

Supraorbital ridges as a characteristic of the subgenus *Apodemus* occurred in 100% of the skulls of *A. agrarius* examined, but were absent in all the *Sylvaemus* skulls.

In the whole of the skull material of *A. agrarius* examined a well formed *t*3 cone was found in the second molar M^2 in 128 cases (3.9%), while absence of *t*3 was found only in 6 skulls of *Sylvaemus* forming 0.1% (Plate XXVIII). In different populations of *A. agrarius* M^2 with an additional *t*3 occurred in from 0.6—6.3%, and in extreme cases this

sometimes rose to as much as 33% and 40% (Fig. 1). In general the rarer M^2 in *Sylvaemus* without *t*3 cones formed from 4.8—8.3% of the samples examined in certain populations. This frequency is always greater than the percentage of *A. agrarius* skulls with M^2 possessing a well formed *t*3 cone, in collections of skulls from the same localities (Table 1). It is remarkable that in one pellet of a barn owl from Brzoza (EC 21) a skull of a striped field mouse and a wood mouse were found with non-typical M^2 teeth. It may therefore be concluded that co-occurrence of the character of additional presence and also absence of *t*3 cone in M^2 in both these species from the same place is not in fact so great a rarity as it might seem.

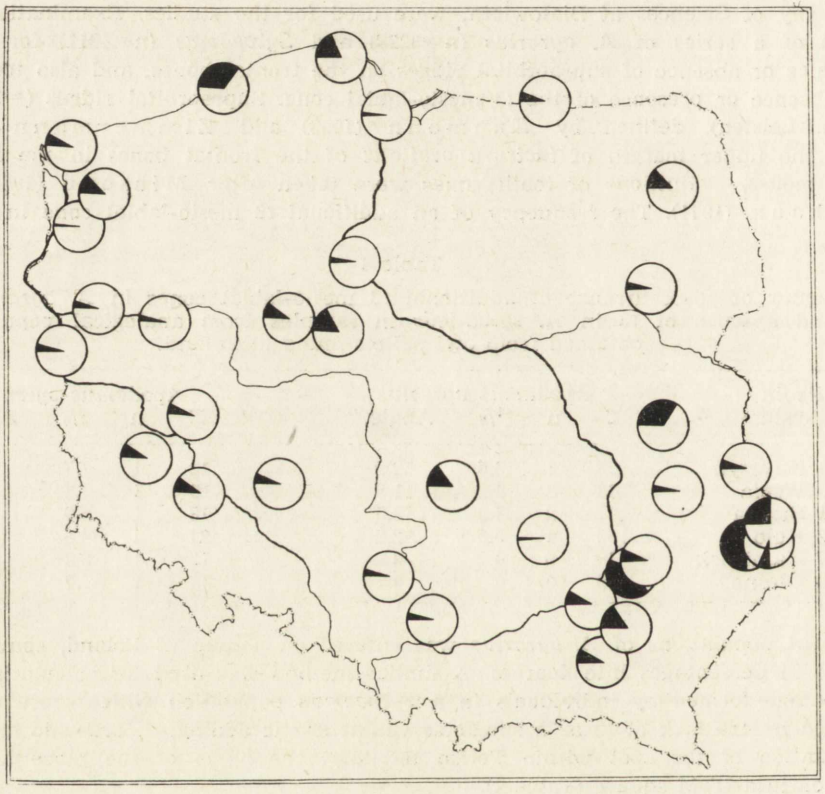

Fig. 1. Occurrence of *t*3 mesio-labial cone in M^2 in *A. agrarius* from the population aspect.

As can be seen from the map the distribution of *t*3 frequencies in different populations of striped field mice in Poland forms a mosaic, except that a distinct aggregation of a high degree of density of this character occurs in the south-eastern part of Poland (Fig. 1).

The results obtained show that in distinguishing the skull fragments of representatives of the genus *Apodemus* into two subgenera: *Apodemus*

and *Sylvaemus*, it is only the supraorbital ridges on *os frontale* and the first upper molar (Plate XXVIII) which possess indisputable taxonomic value. The diagnostic value of M^2 is under such circumstances minimal and can at most be of supplementary significance only.

The following practical conclusions can be reached on the basis of the author's own studies and data from literature:

1. If there are remains of the frontal bones of mice of the genus *Apodemus* in bone material, whether fossil or obtained from owl pellets, it is possible to classify these fragments into one of the subgenera — *Apodemus* or *Sylvaemus* — on the basis of the presence or absence of supraorbital ridges.

2. Fragments of maxilli possessing M^1, with cones not excessively worn and consequently still showing its general configuration, permit of identification of the striped field mouse or *Sylvaemus*. If however the fragment of *Sylvaemus* maxilli is connected with intermaxillare possessing an incisor with sagittal breadth equal to or greater than 1.3 mm, it can be identified as the yellow-necked mouse.

3. Fragments of the maxilli possessing only M^2 or M^3 can be identified as *Apodemus* sp. on the basis of the number of M^1 alveoli.

4. DISCUSSION

It is still difficult to draw conclusions of a more general nature on the basis of variations found in the number and arrangement of tooth cones in *Apodemus*, and further systematic studies are essential. It is however known that representatives of the subgenus *Sylvaemus* made their appearance as long ago as the early Pleistocene in Europe (Zimmermann, 1962; Pasquier, 1974) and *Apodemus* in the postglacial period. Generally speaking the M^2 in *Sylvaemus* (chiefly the wood mouse) is far more constant in the occurrence of the *t*3 mesio-labial cone than the analogical tooth in the striped field mouse in the case of additional *t*3. Polish populations of *Sylvaemus* occur in the centre of the palaearctic range of this subgenus, while analogical populations of *Apodemus* are located, as far as Polish territory is concerned, on the western extreme limits of the range of this subgeneric form (Zimmermann, 1962). It is not therefore impossible that the feature of the supernumerary *t*3 in Polish field mice inhabiting the limits of this range may be intensified in them. Confirmation of this assumption is provided by the high frequencies of this feature in striped field mice from the south-eastern part of Poland. It would appear interesting to examine the occurrence of this feature in other populations of *A. agrarius* originating from a more extensive area and also to trace inheritance of this feature under laboratory conditions.

An attempt may be made at indirect interpretation of the genesis of additional *t*3 cones in the M^2 of striped field mice. The genesis of the absence of *t*3 in its M^2 in the wood mice can be explained by the fusion of this cone with cone *t*5. This process began in European *A. sylvaticus* in the middle Pleistocene and has lasted up to the present, being expressed in the differing frequency of fusion of *t*3 with *t*5 in different local populations (Pasquier, 1974).

The occurrence of additional cones *t*3 in M^2 in the striped field mouse and their absence in the wood mouse is undoubtedly a polymorphic feature, since it may occur in a considerable percentage of the individuals in some local populations of striped field mice as in the case of additional cones from the aboral side of M^1 and M^2 in wood mice from Yugoslavia (Tvrtković, 1976) and also buccal cones in M_1 and M_2 in Japanese representatives of the genus *Rattus* (Miyao *et al.*, 1966).

When polymorphic features are encountered in the teeth of mammals it becomes necessary to convey such information in the first place to authors of keys to identification of different species, in order that they may in revised issues of such keys take into account of the results of current studies, this applying chiefly to paleontologists. The devaluation of the taxonomic value of a given feature of tooth pattern does not mean that it cannot form a suitable object of future studies on polymorphism in a given species constituting evidence of its variations both in time and in space.

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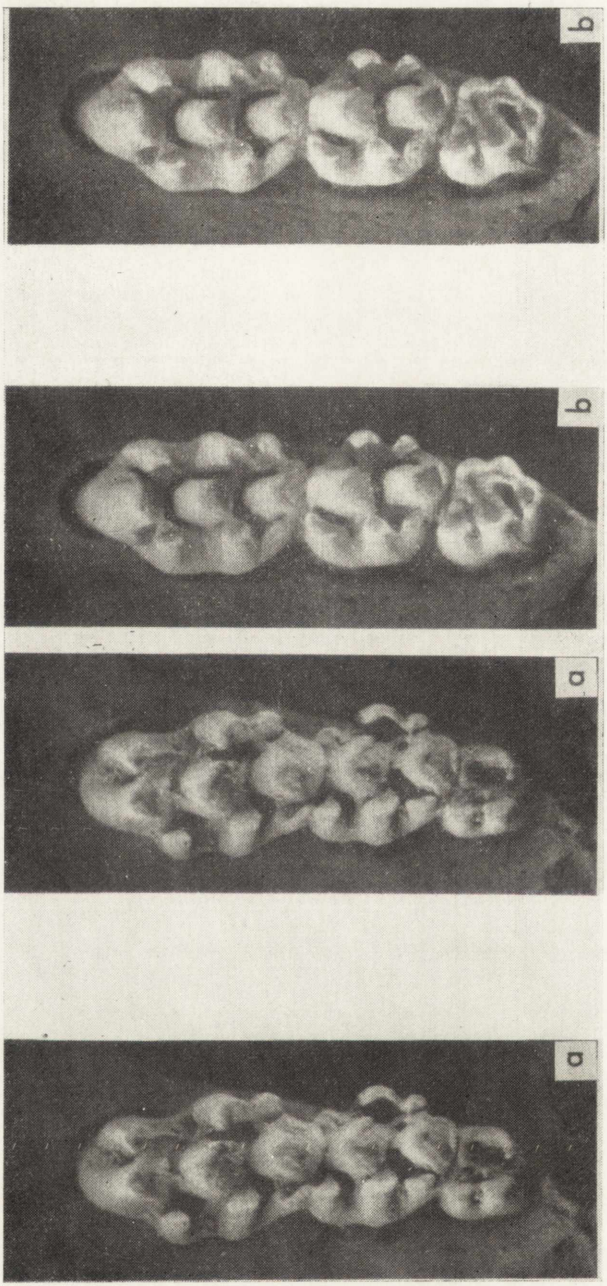
Accepted, May 2, 1978.

EXPLANATION OF PLATE XXVIII

Fig. 1. Additional *t*3 mesio-labial cone in the striped field mouse (a). Absence of *t*3 in the wood mouse (b).



A. L. Ruprecht L. Sych *phot.*