

Taxonomic Status of *Desmana* (Insectivora) and *Spermophilus* (Rodentia) specimens from Danish Late Weichselian deposits

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Abstract. A tooth assemblage of the genera *Desmana* GÜLDENSTAEDT, 1777 and *Spermophilus* CUVIER, 1825, retrieved from Late Weichselian freshwater deposits in Nørre Lyngby, Denmark, has been measured in order to determine the taxonomic relationships. The assemblage consists of three desman and two suslik specimens ascribed respectively to *Desmana moschata* (LINNAEUS, 1758) and *Spermophilus major* (PALLAS, 1779) on the basis of the length and width measurements of various teeth. Taxonomic problems concerning the fossil Late Pleistocene *Spermophilus superciliosus* KAUP, 1839 are discussed.

Key words: Taxonomic status, *Desmana moschata*, *Spermophilus major/superciliosus*, Late Weichselian, Denmark.

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I. INTRODUCTION

In 1993-1994 three excavations were carried out at the Late Weichselian freshwater deposits in Nørre Lyngby in the northern part of Jutland, Denmark. The primary aim was to recover small mammal fossils, and a variable amount of faunal material was obtained (for information concerning excavation procedure and a complete faunal list: see AARIS-SØRENSEN 1995).

The site has been of interest to zoologists ever since the discovery of a left mandible of *Spermophilus* sp. CUVIER, 1825 in 1877 (STEENSTRUP 1880; WINGE 1899). Additional finds of *Lepus timidus* LINNAEUS, 1758, *Microtus agrestis* (LINNAEUS, 1761) (recently re-identified as *Microtus gregalis* (PALLAS, 1779) (JESSEN & NORDMANN 1915; AARIS-SØRENSEN 1995)) and *Desmana* cf. *moschata* (LINNAEUS, 1758) (BONDESEN & LYKKE-ANDERSEN 1978; ENGHOFF 1984) increased the interest, and led to a thorough investigation carried out in 1993-94. The excavations were limited to a specific area in the northern part of the freshwater formation, and concentrated on the Allerød layers (dated to 11.100–11.600 BP) (IVERSEN 1942; KROG 1978; AARIS-SØRENSEN 1995).

Since the presence of specimens belonging to *Spermophilus* and *Desmana* in the Nørre Lyngby layers is considered important in a reconstruction of the past environment, an analysis of the taxonomic status of these specimens is considered expedient. Such an examination has been carried out on the material of *Spermophilus* and *Desmana* excavated in 1993-94, and the previously recovered finds belonging to the two genera from these layers have been included.

The teeth have been examined and measurements taken using a Wild Heerbrugg microscope with magnification of 12 and 25 times. The Danish subfossil *Spermophilus* assemblage has been compared with one recent specimen of *Spermophilus major* (PALLAS, 1779) and several subfossil specimens of *Spermophilus superciliosus* KAUP, 1839, all from Forschungsinstitut Senckenberg in Frankfurt. Identification of the Danish subfossil *Desmana* remains is based on a basic monographic work by RÜMKE (1985).

The data showing the length and width measurements of the teeth are presented in Tables I, II & III.

I wish to thank Dr. K. AARIS-SØRENSEN for introducing me to the field of small mammal palaeontology and for help and inspiration during my study and Dr. G. STORCH for placing the Senckenberg collection at my disposal and for hospitality and fruitful discussions during my stay at the institute. Thanks are also due to Dr. A. NADACHOWSKI, Dr. A. REDSTED-RASMUSSEN, Mr. K. ROSENLUND, Dr. B. RZEBIK-KOWALSKA and Dr. A. TURNER for critical reading of the manuscript and to Naturhistorisk Museum in Aarhus for kindly lending me parts of the desman material.

II. SYSTEMATIC SECTION

INSECTIVORA

Family Talpidae GRAY, 1825

Genus *Desmana* GUELLENSTAEDT, 1777

Desmana moschata (LINNAEUS, 1758)

M a t e r i a l. One almost complete skull and both mandibles (ZMK 23/1975) with full dentition except for the missing right I^2 , I^3 , left I^2 and lower right canine (Table I & II) (Fig. 1), one right P_4 (ZMK 17/1993-1) (Table I), one fragment of a left maxilla with I^2 and P^2 *in situ* (ZMK 142/1980) (Table II).

D e s c r i p t i o n. The skull is slightly fractured in the left posterior part and I^2 of the maxilla fragment shows obvious signs of wear by being oblique.

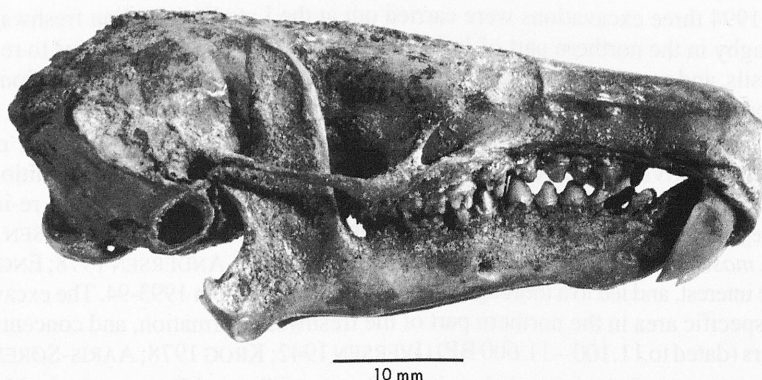


Fig. 1. An almost complete skull and mandibles of *Desmana moschata* (ZMK 23/1975) retrieved from Late Weichselian freshwater deposits in Nørre Lyngby, Denmark (BONDESEN & LYKKE-ANDERSEN 1978) (Photo: G. BROVAD).

Table I

Measurements of the lower dentition of subfossil and recent *Desmana moschata*. The recent data are based on 7 specimens. The measurements (in mm) include lengths (L) and widths (W) and are taken according to RÜMKE (1985). The widths of M₁ and M₂, measured across the talonid, are given as W₂

Specimen	Morph.							
	C	P ₁	P ₂	P ₃	P ₄	M ₁	M ₂	M ₃
ZMK 23/1975 LxW ₍₂₎ Sin	2.19×1.70	1.83×1.67	2.28×1.83	2.19×1.83	2.92×1.95	3.88×3.13	3.75×2.88	3.20×2.44
ZMK 23/1975 W ₍₂₎ /L Sin	0.78	0.91	0.80	0.84	0.67	0.81	0.77	0.76
ZMK 23/1975 LxW ₍₂₎ Dex	—	1.77×1.64	2.31×1.80	2.16×1.80	2.86×1.98	3.81×3.00	3.69×2.81	3.26×2.38
ZMK 23/1975 W ₍₂₎ /L Dex	—	0.93	0.78	0.83	0.69	0.79	0.76	0.73
ZMK 17/1993-1 LxW ₍₂₎ Sin	—	—	—	—	3.01×1.86	—	—	—
ZMK 17/1993-1 W ₍₂₎ /L Sin	—	—	—	—	0.62	—	—	—
L range*	2.00-2.20	1.69-1.89	2.14-2.38	1.95-2.23	2.53-2.84	3.58-3.98	3.43-3.98	3.09-3.36
L mean*	2.09	1.82	2.24	2.12	2.71	3.79	3.75	3.23
W ₍₂₎ range*	1.53-1.77	1.50-1.68	1.64-1.76	1.68-1.85	1.77-2.05	2.71-3.10	2.57-2.96	1.96-2.23
W ₍₂₎ mean*	1.65	1.61	1.69	1.75	1.92	2.98	2.84	2.04
W ₍₂₎ /L range*	0.74-0.83	0.86-0.94	0.71-0.78	0.78-0.88	0.64-0.78	0.74-0.84	0.72-0.79	0.59-0.68
W ₍₂₎ /L mean*	0.79	0.89	0.76	0.83	0.71	0.79	0.76	0.63

* RÜMKE (1985).

Table II

Measurements of the upper dentition of subfossil and recent *Desmana moschata*. The data concerning the recent form are based on 7 specimens. The measurements are given in mm and taken according to RÜMKE (1985)

Specimen	Morph.							
	C	P ¹	P ²	P ³	P ⁴	M ¹	M ²	M ³
ZMK, 23/1975 LxW Sin	2.34×1.89	1.98×1.64	2.50×1.95	2.37×2.04	3.13×3.10	4.56×4.31	3.44×4.44	3.23×3.25
ZMK, 23/1975 W/L Sin	0.81	0.83	0.78	0.86	0.99	0.95	1.29	1.01
ZMK, 23/1975 LxW Dex	2.37×1.83	2.01×1.64	2.50×1.92	2.43×2.04	3.07×3.13	4.31×4.31	3.50×4.50	3.20×3.31
ZMK, 23/1975 W/L Dex	0.77	0.82	0.77	0.84	1.02	1.00	1.29	1.03
ZMK, 142/1980 LxW Sin	—	—	2.59×1.89	—	—	—	—	—
ZMK, 142/1980 W/L Sin	—	—	0.73	—	—	—	—	—
L range*	1.86-2.67	1.62-1.92	2.18-2.48	1.74-2.14	3.12-3.53	4.18-4.74	3.35-3.69	2.31-2.63
L mean*	2.33	1.81	2.35	1.96	3.36	4.54	3.56	2.42
W range*	1.64-1.86	1.54-1.79	1.70-1.97	1.81-2.11	2.79-3.05	3.95-4.50	4.48-5.04	3.37-3.85
W mean*	1.75	1.64	1.85	1.99	2.91	4.19	4.68	3.58
W/L range*	0.62-0.92	0.85-0.99	0.77-0.81	0.93-1.12	0.84-0.96	0.86-0.98	1.22-1.38	1.39-1.58
W/L mean*	0.75	0.91	0.79	1.02	0.87	0.92	1.31	1.48

* (RÜMKE 1985).

Since all the length and width measurements of the teeth of desman specimens ZMK 23/1975, ZMK 142/1980 and ZMK 17/1993-1 exceed the range of *Galemys pyrenaicus* (GEOFFROY, 1811) (see Table I, II and RÜMKE 1985), these specimens must be ascribed to the genus *Desmana*. A comparison of these measurements with the data from a sample of 7 specimens of *D. moschata* (RÜMKE 1985, also listed in Table I & II), shows that all the measurements of the Danish assemblage either fall within or exceed the range of *D. moschata*, except for four measurements of P^4 , M^2 and M^3 which fall below the lower range (Table II).

Furthermore, a long P_3 , P_4 and upper C are considered by RÜMKE (1985) to distinguish *D. moschata* from extinct *Desmana* species, and it is notable that both the length and the width of P_3 and upper C in the assemblage from Nørre Lyngby are larger than the average values for *D. moschata*. In addition, the lengths of all P_4 (ZMK 23/1975; ZMK 17/1993-1) exceed the range given for *D. moschata*.

However, it should also be mentioned that the W/L values of the Danish material generally correspond to the mean values stated by RÜMKE (1985) to within 0,1 mm except for P^3 , P^4 , M^3 and M_3 . These generally insignificant differences indicate that despite their overall increase in size, the teeth measured do not differ from the comparative material of *D. moschata*.

The conclusion is that the desman specimens from Nørre Lyngby should be ascribed to *D. moschata*, although to a large form, most likely an expression of geographical or chronological variation.

RODENTIA

Family Sciuridae GRAY, 1821

Genus *Spermophilus* CUVIER, 1825

Spermophilus major (PALLAS, 1778)

M a t e r i a l. One left mandible including M_1 (ZMK 1/1877) (Table III) (Fig. 2, 3 & 4), One right P^4 (ZMK 17/1993-2) (Table III) (Fig. 5).

D e s c r i p t i o n. The left mandible contains a large P_4 -alveolus indicating a juvenile individual developing permanent dentition. This interpretation is supported by the fact that the alveolar row is long relative to the length and height of the mandible. The right P^4 shows slight wear and has a clearly marked posterior cingulum.

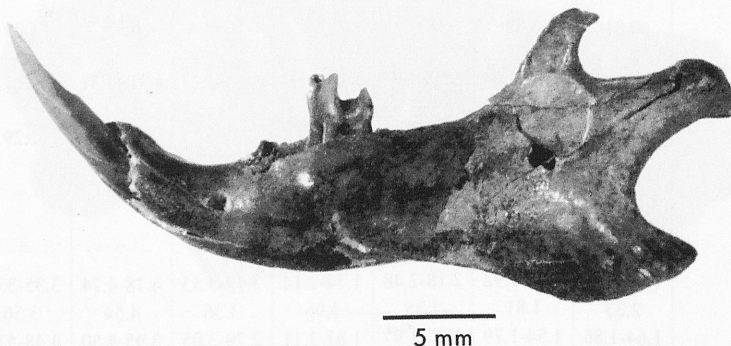


Fig. 2. Lingual view of a left mandible of *Spermophilus major* (ZMK 1/1877) retrieved from the Late Weichselian freshwater deposits in Nørre Lyngby, Denmark. The find was made by Prof. Japetus STEENSTRUP in 1877 (Photo: G. BROVAD).

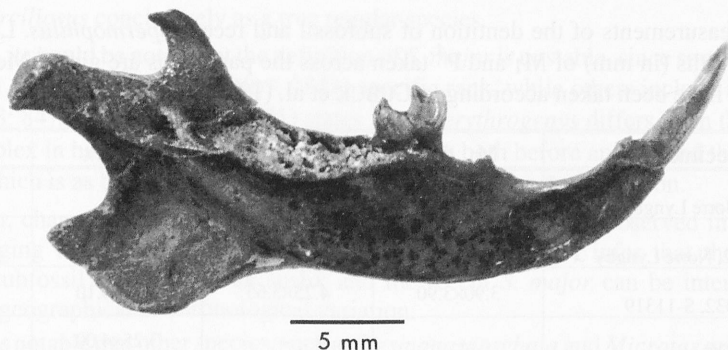


Fig. 3. Buccal view of the mandible of *Spermophilus major* (ZMK 1/1877). The specimen includes the incisor and M₁ (Photo: G. BROVAD).

A preliminary classification of the two suslik specimens (ZMK 1/1877; ZMK 17/1993-2) within the genus *Spermophilus* was verified by their comparison with the recent collection at Forchungsinstitut Senckenberg and as a result the two specimens were identified morphologically as *S. major*.

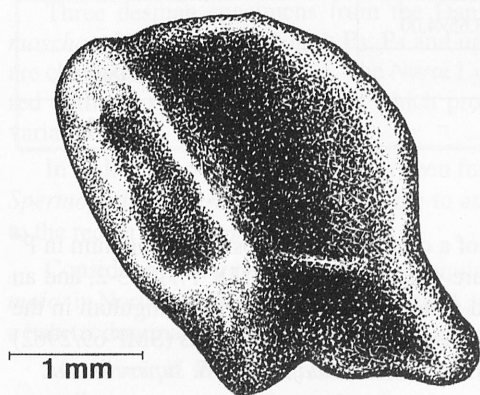


Fig. 4. Occlusal view of the left M₁ of *Spermophilus major* (ZMK 1/1877) (Drawing: B. RUBÆK).

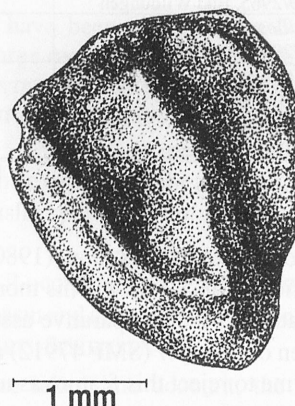


Fig. 5. Occlusal view of a right P⁴ of *Spermophilus major* (ZMK 17/1993-2) retrieved from Late Weichselian freshwater deposits in Northern Jutland, Denmark (Drawing: B. RUBÆK).

Further analyses of *S. major* and the subfossil species *S. superciliosus* provided the data listed in Table III. Considering the measurements of the Danish specimens in relation to *S. major* and *S. superciliosus*, one might classify the Danish assemblage as *S. superciliosus* since the lengths of both P⁴ and M₁ correspond to the range of *S. superciliosus* in contrast with *S. major*. However, the widths do not confirm this classification. Moreover, the comparative material of *S. major* consists of a single specimen making the identification highly uncertain since it may simply represent a large individual.

Table III

Measurements of the dentition of subfossil and recent *Spermophilus*. Lengths and widths (in mm) of M_1 and P^4 taken across the paraconus are given. Measurements have been taken according to CUBUK et al. (1980)

Specimen	M_1 , dex	M_1 , sin	P^4 , dex	P^4 , sin
<i>S. major</i> ZMK 1/1877, Nørre Lyngby	—	3.60×3.90	—	—
<i>S. major</i> ZMK 17/1993-2, Nørre Lyngby	—	—	3.10×3.50	—
<i>S. major</i> , recent nr. 47912, M 3032, S-11319	3.90×3.90	4.25×3.65	3.25×4.10	3.25×4.10
<i>S. superciliosus</i> 76/2635, Rockenberg	—	—	3.25×4.00	—
<i>S. superciliosus</i> 73/102 nr M5012, Amoeneburg	3.35×3.90	—	—	—
<i>S. superciliosus</i> 74/5060, Reinhess	—	3.50×3.90	—	—
<i>S. superciliosus</i> Bi17, 69/2961, Bad Wildungen	—	—	3.40×3.85	3.35×3.90
<i>S. superciliosus</i> 69/2962, Bad Wildungen	—	—	3.50×3.90	3.40×3.85
<i>S. superciliosus</i> Bi277, 69/2963, Bad Wildungen	—	3.85×3.90	—	—
<i>S. superciliosus</i> Bi18, 69/2964, Bad Wildungen	3.75×3.85	—	—	—
<i>S. superciliosus</i> Bi298, 69/2965, Bad Wildungen	3.65×3.60	—	—	—
<i>S. superciliosus</i> Bi26, 69/2967, Bad Wildungen	—	3.65×4.00	—	—
<i>S. superciliosus</i> 69/2985, Bad Wildungen	—	—	—	3.15×3.90
<i>S. superciliosus</i> 69/2986, Bad Wildungen	—	—	—	2.90×3.65

According to CUBUK et al. (1980), the presence of a clearly marked posterior cingulum in P^4 is significant for *S. major*. This morphological feature was observed in ZMK 17/1993-2, and an examination of the comparative assemblage showed a clearly marked posterior cingulum in the specimen of *S. major* (SMF 47912) as well as in one specimen of *S. superciliosus* (SMF 69/2962) leading me to reject this feature as unfit for distinction between *S. major* and *S. superciliosus*.

Before ascribing the Danish subfossil specimens to *S. major* or *S. superciliosus*, the status of *superciliosus* as a true species should be discussed.

According to OGNEV (1963: 34-51), there are three features defining the recent *S. major*:

1. The posterior ends of the nasals extend backwards beyond the posterior part of the premaxilla.
2. The interorbital region is narrow in proportion to the skull.
3. The premaxilla is narrow in the frontal region (more so than the posterior parts of the nasals).

CUBUK et al. (1980) argue that *S. superciliosus* should be considered a separate species because it differs from *S. major* in all three characters:

1. The nasals end posteriorly before the premaxilla.
2. The interorbital region is broader compared with that of *S. major*.
3. The premaxilla is extended laterally in the frontal region.

However, despite the differences in the three features mentioned above, it is still difficult to define *S. superciliosus* conclusively as a true regular species.

First of all, it should be noted that the definition of *S. major* is unstable, since some taxonomists give the taxon *S. erythrogenys* (BRANDT, 1841) specific rank, while others include it in *S. major* (CORBET 1978: 84). OGNEV (1963: 34-51) states that *S. erythrogenys* differs from the rest of the *S. major* complex in having a varying nasal length ending both before and behind the edge of the premaxilla, which is as broad as or broader than the nasal in its posterior region.

In addition, changes of the morphological features in question are observed in other recent species belonging to *Spermophilus* (OGNEV 1963: 34-51). Hence I infer that the differences between the subfossil West-European suslik and the recent *S. major* can be interpreted as an expression of geographical or chronological variation.

Finally, it is notable that other species, such as *Desmana moschata* and *Microtus gregalis*, which are found in West-European Late Pleistocene deposits (KRAUSE 1937; RUST 1943; STUART 1982; STORCH 1992 and AARIS-SØRENSEN 1995) have retreated east due to the changing climate and environment of the Holocene and are today present in areas inhabited also by *S. major* (CORBET 1978: 225, 238, 247). It would be reasonable (and surely not impossible) to presume that the susliks have made a similar migration since there seems to have been no barrier preventing it from doing so.

In the light of the foregoing, I do not find sufficient evidence now for recognising a subfossil species *S. superciliosus* and the Nørre Lyngby assemblage should therefore be ascribed to *S. major*.

III. SOME REMARKS

Three desman specimens from the Danish assemblage have been identified as *Desmana moschata* because of their long P₃, P₄ and upper C and the large overall size of the teeth, which are characteristic of the species. The Nørre Lyngby specimens represent large individuals compared with the recent *D. moschata*, which probably is a token of geographical or chronological variation.

In addition, no good evidence has been found indicating the existence of the subfossil species *Spermophilus superciliosus*, leading me to ascribe the two suslik specimens from Nørre Lyngby to the recent *Spermophilus major*.

Considering their recent ecological requirements, the fossil occurrence of *D. moschata* and *S. major* in Northern Jutland indicates that the Late Weichselian basin and its surroundings constituted a habitat dominated by boreal forest and steppe elements (AARIS-SØRENSEN 1995).

Moreover, if the entire faunal remains from the site are taken into account, the species constellation appears unique, that is, no area of sympatry can be found today. Based on the assumption that the ecological requirements of the species found in the layers of Nørre Lyngby are the same regardless of time, we may draw the conclusion that the late glacial Nørre Lyngby area constituted a biome without any modern analogues (for further information on ecological interpretation, see AARIS-SØRENSEN 1995).

Finally, it should be noted that further investigation, based on sufficiently abundant material of *S. major*, is needed in order to precisely determine the relationship between the recent *S. major* and the Late Pleistocene specimens ascribed elsewhere to *S. superciliosus*.

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