

# Zitteliana

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51



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**Cover illustration:** The ammonite *Dorsetensia liostraca* Buckman from the Lower Bajocian (Middle Jurassic) Giganteuston Member of Öschingen, Middle Swabian Alb, Germany. For details, see Dietze, V. et al.: The Giganteuston Member of Öschingen (Humphriesianum Zone, Lower Bajocian, Swabian Alb), with comments on the genera *Dorsetensia* Buckman, 1892 and *Nannina* Buckman, 1927, pp. 209–236 in this issue.

**Back cover:** Atrium of the Munich Palaeontological Museum, view from the main entrance.

**Umschlagbild:** *Dorsetensia liostraca* Buckman, ein Ammonit aus dem Giganteuston des Unter-Bajociums (Mittlerer Jura) von Öschingen, Mittlere Schwäbische Alb, Deutschland. Für weitere Informationen siehe Dietze, V. et al.: The Giganteuston Member of Öschingen (Humphriesianum Zone, Lower Bajocian, Swabian Alb), with comments on the genera *Dorsetensia* Buckman, 1892 and *Nannina* Buckman, 1927, S. 209–236 in diesem Heft.

**Rückseite:** Lichthof des paläontologischen Museums München, Blick vom Haupteingang.



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## The Miocene small mammals from Münchsmünster (North Alpine Foreland Basin, Bavaria)

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### Abstract

The small mammal fossils (Rodentia, Erinaceidae, Didelphidae and Chiroptera) from the locality Münchsmünster (Bavaria, Germany) are presented. A correlation with the local biostratigraphic unit OSM B (Karpatian, Lower Miocene) is proposed based on the evolutionary level of the cricetid rodent *Megacricetodon bavaricus*. The locality adds important information to our knowledge of the deposits near Neustadt an der Donau, on the northern margin of the North Alpine Foreland Basin.

**Key words:** Germany, biostratigraphy, Rodentia, Lagomorpha, Erinaceomorpha

### Zusammenfassung

Die fossilen Kleinsäugerreste (Rodentia, Erinaceidae, Didelphidae und Chiroptera) aus der Lokalität Münchsmünster (Bayern, Deutschland) werden beschrieben. Das Entwicklungsniveau des Hamsterverwandten *Megacricetodon bavaricus* erlaubt eine Korrelation zur regionalen biostratigraphischen Skala OSM B (Karpätium, Untermiozän). Die Fundstelle ergänzt unser Wissen über die Ablagerungen in der Nähe von Neustadt an der Donau, am nördlichen Rand des Nordalpinen Vorderlandbeckens.

**Schlüsselwörter:** Deutschland, Biostratigraphie, Rodentia, Lagomorpha, Erinaceomorpha

### 1. Introduction

The fossil fauna Münchsmünster comes from a gravel-pit approximately 1.5 km to the South of the town of Münchsmünster (near Neustadt an der Donau, Bavaria, Germany), located on the northern margin of the North Alpine Foreland Basin (NAFB). The small mammals were collected by V. Fahlbusch and M. Barthel in 1963. Black (1966) reports one tooth of *Sciurius* aff. *S. bredai*, and Schleich (1981) described the chelonian remains from that locality (*Clemmydopsis turnauensis* and *Testudo* sp.). In this paper, the small mammals are presented, and the locality is correlated with the local biostratigraphic scale.

### 2. Material and methods

The specimens are deposited in the Bavarian State Collection for Paleontology and Geology at Munich (Bayerische Staatssammlung für Paläontologie und

Geologie, abbreviated BSPG), Germany, under accession number 1963 XXVI. Measurements were taken with an ocular micrometer and are indicated in mm. SEM and digital images have been captured at the Biogeology and Applied Palaeontology laboratory and the Terrestrial Palaeoclimatology Work Group of the Eberhard Karls University at Tübingen, Germany. The measurement method of the erinaceids follows Prieto et al. (2010); for the sciurids, see Prieto et al. (2009), and for the lagomorphs, see Angelone & Sesé (2009: fig. 3). All illustrated specimens are presented in left orientation. Hence, right specimens are reversed.

### 3. The fauna from Münchsmünster

In spite of the low number of specimens discovered from the Münchsmünster locality, the fauna is relatively diverse; for a synopsis, see Table 1. Among the rodents, two cricetids (Cricetidae Rochebrune, 1883) have been recorded. The teeth of *Megacricete-*

**Table 1:** The small mammals from Münchsmünster: material and measurements.

			Material	Measurements	BSPG 1963 XXVI	Figure
Rodentia	Cricetidae	<i>Megacricetodon bavaricus</i>	2 m1, 1 M1	M1: 1.80x1.23; m1: 1.66x1.05	4-6	1 A-C
		<i>Democricetodon mutilus</i>	1 m1, 2 M1	M1: 1.96x1.40	7-9	1 D & E
	Gliridae	<i>Miodiromys biradiculus</i>	1 m1, 1 m2	m1: 1.20x1.21; m2: 1.18x1.21	20-21	1 F & G
		<i>Muscardinus</i> aff. <i>sansaniensis</i>	1 M1	1.09x1.15	22	1 H
		Sciuridae <i>Spermophilinus besanus</i>	1 m3	1.95-1.93x2.01-1.95	1	1 I
Lagomorpha	Ochotonidae	" <i>Amphilagus</i> " sp.	1 m2	3.01(L)-1.34(ltrig) x3.22(Wtrig)-2.58(Wtal)	23	2
		<i>Prolagus</i> sp.	1 P4		12	
Erinaceomorpha	Erinaceidae	<i>Galerix</i> sp.	1 c, 2 p2/3, 1 p4, 1 m1/2	p2/3: 1.65x0.89	13-16, 24	1 J
		Erinaceinae gen. et sp. indet.	1 m1	m1: 4.05x2.5-2.53	11	
Didelphimorpha	Didelphidae	<i>Amphiperatherium frequens</i> ssp.	2 lower molars		17, 19	
Chiroptera		Chiroptera indet.	1 (?) P	0.91x0.80	18	

*todon bavaricus* Fahlbusch, 1964: fig. 1A–C) do not principally differ in morphology and size from the type sample of the species (Langenmoosen, see Fahlbusch 1964, OSM B). *Democricetodon mutilus* Fahlbusch, 1964 (Fig. 1D, E) is a widespread species with high variability regarding the size of the molars (Heissig 1995; Prieto & Rummel 2009). The single complete M1 ranges between the sizes of the corresponding teeth from Sandelzhausen (Wessels & Reumer 2009, OSM C+D; for details, see section 4, Biostratigraphical background, of this paper) and Unterreichen-Altenstadt 565m (Prieto et al. 2009, OSM E).

The two lower molars of the dormouse (Gliridae Thomas, 1897) *Miodiromys Kretzoi*, 1943 are characterized by the presence of both anterotripid and posterotripid, as well as by the presence of two roots (only observed in the m2), and thus do not differ from *M. biradiculus* Mayr, 1979 (Fig. 1F, G). According to Heissig (2006), the species slowly evolved into *M. hamadryas* (Major, 1899) in the NAFB. The second dormouse recorded for Münchsmünster is *Muscardinus* aff. *sansaniensis* (Lartet, 1851) (Fig. 1H). The record is confirmed by the presence of four labial extra crests in the M1. The ground squirrel (Sciuridae Fischer von Waldheim, 1817) *Spermophilinus besanus* Cuenca, 1988 (Fig. 1I) is a widespread species (Ziegler 2005).

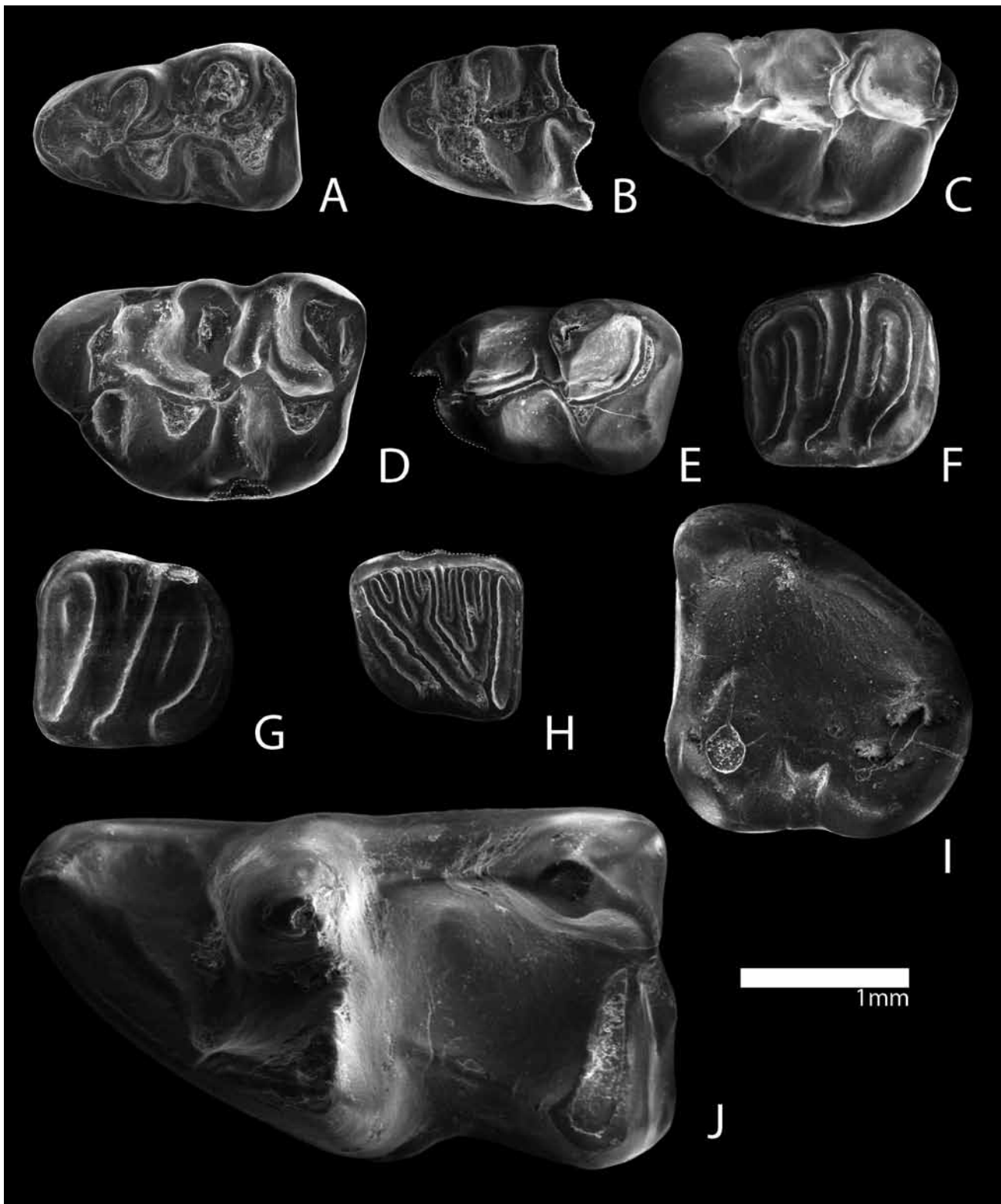
The large semi-hypsodont pika (Lagomorpha Brandt, 1855) "*Amphilagus*" Pomel, 1853 sp. (Fig. 2) is recorded following the taxonomical proposal of Angelone (2009). "*Amphilagus*" is relatively rare in the Older and Middle Series, especially when

compared to the record and abundance of *Prolagus* Pomel, 1853. Paradoxically the latest genus is only represented by a single damaged P4 in our sample.

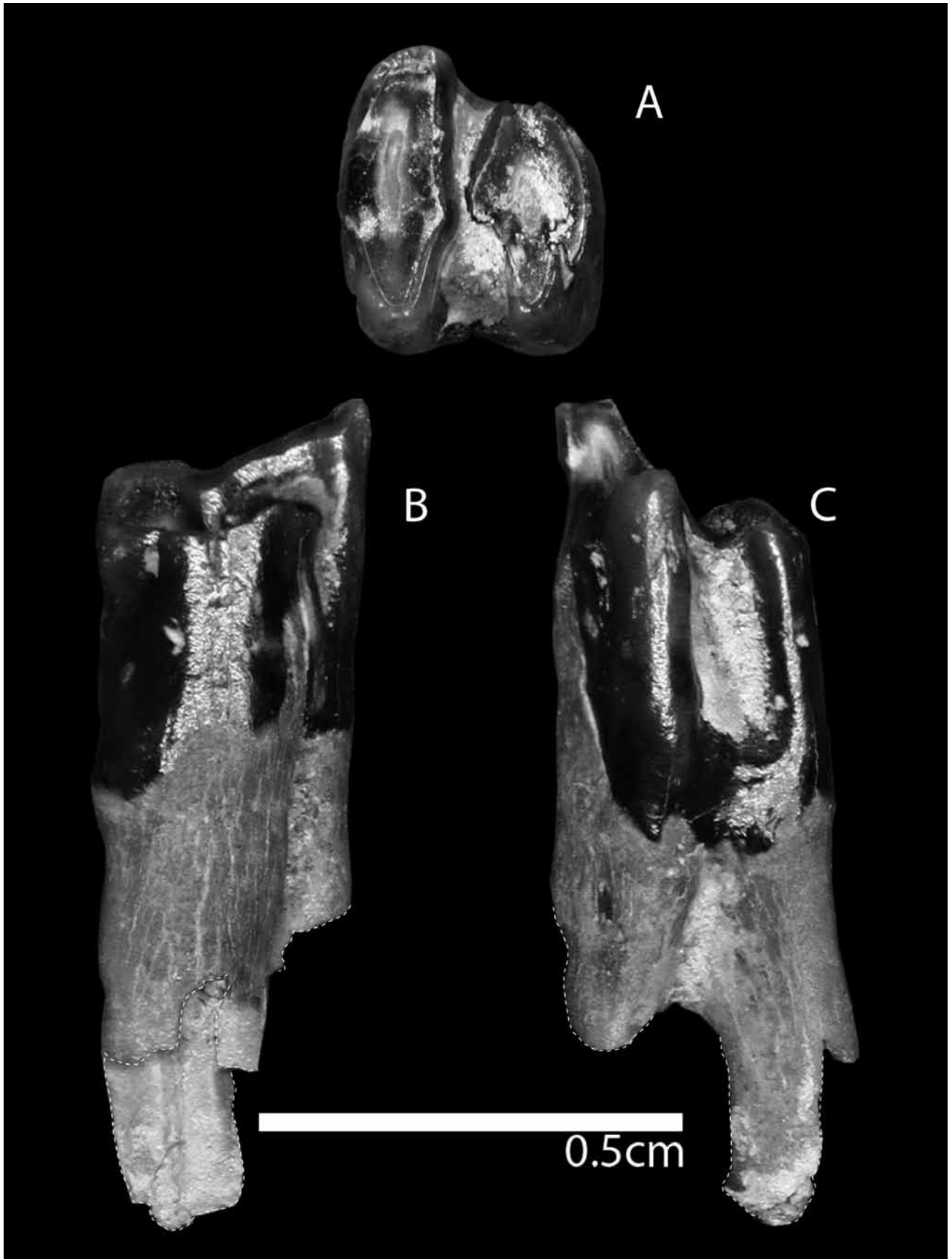
A broken p4 from Münchsmünster can be assigned with confidence to the gymnure (Erinaceidae Fischer von Waldheim, 1817) genus *Galerix* Pomel, 1848. However, the material is too fragmentary to allow for species identification. Based on the evolutionary proposal of Ziegler (2006), *Galerix symeonidisi* Doukas, 1986 most likely is the species that occurred at Münchsmünster. A single tooth of a hedgehog (Fig. 1J) cannot be determined confidently, as it is usual for this mammal group when dealing with fragmentary or scanty material (e.g., Ziegler 2003). The m1 corresponds well with an Erinaceinae tooth that has been described and illustrated from Sandelzhausen (Ziegler 2000: pl. 1, fig. 32). Two fragmentary lower molars (one talonid and one trigonid) of a didelphid (Didelphidae Gray, 1821) are referred to *Amphiperatherium frequens* von Meyer, 1846, as it is the only species known in the fossil record of the NAFB around the time of deposition of the fossiliferous sediments at Münchsmünster (Ziegler 1999). Fossil remains of bats are restricted to a single tooth that is tentatively identified as an upper premolar.

#### 4. Biostratigraphical background – Correlation of the fauna with the local biostratigraphic scale

The Upper Freshwater Molasse (UFM) of the German part of the North Alpine Foreland Basin is bi-



**Figure 1:** Small mammals from Münchsmünster. **(A–C)** *Megacricetodon bavaricus* Fahlbusch, 1964. A: left m1 (BSPG 1963 XXVI 4); B: right m1 (reversed, BSPG 1963 XXVI 5); C: left M1 (BSPG 1963 XXVI 6). **(D–E)** *Democricetodon mutilus* Fahlbusch, 1964. D: left M1 (BSPG 1963 XXVI 7); E: right m1 (reversed, BSPG 1963 XXVI 8). **(F, G)** *Miodyromys biradiculus* Mayr, 1979. F: right m1 (reversed, BSPG 1963 XXVI 20); G: right m2 (reversed, BSPG 1963 XXVI 21). **(H)** *Muscardinus* aff. *sansaniensis* (Lartet, 1851). Right M1 (reversed, BSPG 1963 XXVI 22). **(I)** *Spermophilinus besanus* Cuenca, 1988. Left m3 (BSPG 1963 XXVI 1). **(J)** Erinaceinae gen. et sp. indet.. Left m1 (BSPG 1963 XXVI 11).



**Figure 2:** „*Amphilagus*“ sp. from Münchsmünster; Left (?) m2 (BSPG 1963 XXVI 23). (A) Occlusal view. (B) Posterior view. (C) Labial view.

ostratigraphically divided based on the deinotheriid proboscidians (Dehm 1955) into, in chronological order, the Older Series (?latest Ottnangian-Karpatian), Middle Series (Early Badenian), and a Younger Series (Late Badenian to Pannonian). The Brackish Water Molasse (including their freshwater equivalents), the Older and the Middle Series can be subdivided into OSM units mainly based on small mammal remains (Heissig 1997; Abdul Aziz et al. 2008, 2010), for which – at least up to OSM E – the evolutionary level of the cricetid rodent *Megacricetodon* is of prime significance for biostratigraphy.

The *Megacricetodon bavaricus* from Münchsmünster is relatively small-sized. By comparison of the specimens from Münchsmünster with the tooth sample from Langenmoosen, the Münchsmünster locality can be confidently assigned to the OSM B. According to Wu (1993), the oldest record for *Muscardinus* aff. *sansaniensis* in southern Germany comes from the fissure filling Petersbuch 2, but the remains are interpreted as a possible mixture (see details in Prieto & Böhme 2007: 305). As a result, the first indisputable fossil evidence of the taxon is from Eitensheim (OSM A/B, Mayr 1979), a locality situated about 30 km W/NW of Münchsmünster.

## 5. Conclusions

In spite of the low number of specimens collected from Münchsmünster, the  $\alpha$  diversity is relatively high, and allows for a *bona fide* correlation of the fossiliferous strata at Münchsmünster to the OSM B. This biostratigraphical dating of Münchsmünster concurs with the age estimates given for several fossil localities in the vicinity of Neuburg an der Donau, at the northern margin of the NAFB, including Langenmoosen, Eitensheim (both Fahlbusch 1964), Adelschlag and Attenfeld (both Reichenbacher et al. 2004), and thus extends our knowledge on the biostratigraphy and paleontology of deposits in the area of Neustadt an der Donau much more towards the East.

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