



## THE LAST EUROPEAN *NEOCOMETES* (RODENTIA: PLATACANTHOMYIDAE) FROM THE EARLY LATE MIOCENE HOMINID LOCALITY OF HAMMERSCHMIEDE (GERMANY)

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Böhme, M., Prieto, J. (2025): The last European *Neocometes* (Rodentia: Platacanthomyidae) from the early Late Miocene hominid locality of Hammerschmiede (Germany). – Fossil Imprint, 81(1-2): 91–98, Praha. ISSN 2533-4050 (print), ISSN 2533-4069 (online).

**Abstract:** Platacanthomyid rodents are rare finds in European Miocene mammalian faunas, but have proved to be useful for biochronology, since the only genus *Neocometes* has a long chronological range in the Early and Middle Miocene of Europe. The chronospecies concept established by Oldřich Fejfar, includes three taxa; the youngest species, *N. brunonis*, is known from only a short stratigraphic period (early Astaracian, middle and late Badenian). Here we describe an upper M3 of *N. brunonis* from the Hammerschmiede level HAM4, magnetostratigraphically dated to 11.58 Ma (late Astaracian, earliest Pannonian), extending the Last Occurrence Date (LOD) for *Neocometes* by 1.7 myrs, into early Late Miocene.

**Key words:** *Neocometes*, Platacanthomyidae, Rodentia, Hammerschmiede, Miocene, Astaracian

Received: March 19, 2025 | Accepted: July 9, 2025 | Issued: December 18, 2025

Zoobank: <http://zoobank.org/pub:04C7A79D-0E04-40D8-88B6-35D832E44EAF>

### Introduction

In his review of the fossil European Platacanthomyidae, Oldřich Fejfar (1999) emphasized the ‘spiny dormice’ as “the most useful and ‘unproblematic’ forms” for biochronology among small mammals. He justified this with their wide geographic distribution across Eurasia, their low diversity of two extant genera (*Platacanthomys*, *Typhlomys*) and the only fossil genus *Neocometes*, and the long chronological range of the latter in Europe – over seven million years.

After the first discovery of fossil platacanthomyids, with the erection of *Neocometes brunonis* by Schaub and Zapfe (1953) and the description of *N. similis* by Fahlbusch (1966), Fejfar (1974) recognized an evolutionary *Neocometes*-lineage in Europe, based on rich materials gathered by him from several Czech (Dolnice, Františkovy Lázně) and Slovak (Devínská Nová Ves – Štokeravská vápenka = ‘Zapfe’s fissures’; Sabol et al. 2021) sites (Fejfar et al. 1959, Fejfar 1961, 1962, Čtyroký and Fejfar 1962, Čtyroký et al. 1964).

Fejfar (1999) characterized this *Neocometes*-lineage mainly by an increase in tooth size. His chronospecies concept includes three taxa: *N. similis* FAHLBUSCH, 1966 from the Early Miocene (middle Orleanian), *N. cf. similis*

from the early Middle Miocene (late Orleanian), and *N. brunonis* SCHAUB et ZAPFE, 1953 from the later Middle Miocene (early Astaracian). This model was followed by all subsequent authors (Fejfar and Kalthoff 1999, Mörs 2006, Lee and Jacobs 2010, Pineker and Mörs 2011, Prieto et al. 2019). The stratigraphically youngest records of *N. brunonis* have been described by Engesser (1972) from Anwil (Switzerland), the former type-locality of MN 8. Here we report the stratigraphically youngest record of *Neocometes brunonis* from the late Astaracian Hammerschmiede locality, extending the range of the lineage for about 1.7 myrs, into the basal Late Miocene (Kirscher et al. 2016).

### The Hammerschmiede hominid locality

The active clay-pit Hammerschmiede is situated in the southern part of the North Alpine Foreland Basin (Bavaria, Allgäu-region), five kilometers north of the city of Kaufbeuren in the municipality of Pforzen. The outcropping 27 m of fine-grained sediments belongs to the Upper Series lithostratigraphic unit (Doppler 1989) and has been dated magnetostratigraphically to between 11.67 and 11.42 Ma, encompassing the Middle-to-Late Miocene transition

(Kirscher et al. 2016). The first fossiliferous level (HAM1) has been announced by Mayr and Fahlbusch (1975). Intense excavations by the University of Tübingen since 2011 have increased the number of fossil-bearing horizons to seven. These seven levels (HAM1 to HAM7) cover a short temporal period of about 60 kyrs, from 11.62 to 11.56 Ma in the late Astaracian, at the very base of the Late Miocene (base Tortonian, base Pannonian). They encompass an extremely diverse vertebrate fauna of so far 151 taxa, including 86 mammals (Lechner and Böhme 2025). The most iconic discoveries from the stratigraphic lowest level HAM5 are the two syntopic hominid species *Danuvius guggenmosi* and *Buroni* *manfredschmiedi* (Böhme et al. 2019, 2024). Many other large mammal groups have recently been described from this site, like the carnivores, documented by 28 species (Kargopoulos et al. 2021a, b, 2022a, b, 2024, 2025), the bovids, tragulids, chalicotheres and proboscideans (Fuss et al. 2015, Hartung et al. 2020, Hartung and Böhme 2022, Konidaris et al. 2023, Kampouridis et al. 2024), as well as a number of bird taxa (Mayr et al. 2020a, b, 2023). Among the several thousands of excavated small mammal specimens, only the beaver material has been systematically described so far (Lechner and Böhme 2022, 2024). Especially the diverse carnivore assemblage shows the importance of the site for biochronology. Hammerschmiede provides the LODs of five carnivore genera and eight species (Kargopoulos et al. 2022b).

The here-reported *Neocometes* tooth stems from stratigraphic level HAM4 (11.58 Ma), representing a fluvial channel of a larger (~50 m width) meandering river (Lechner and Böhme 2025). Fossils are concentrated in very fine-grained sediments (silt to medium sand), in lower point-bars and channel-lags. The sedimentology, taphonomy and biostratigraphy of the recovered vertebrates reveal fluctuating discharge conditions and a strong redox-gradient at the sediment-water boundary. The palaeoenvironment of the HAM4 channel is unique among the seven levels. It is characterized by exposed broad sandy riverbanks at times of lower water discharge, which are contrasted by an overbank environment interpreted as a fire-prone and rather open riparian forest (Lechner and Böhme 2025).

## Material and methods

The terminology of the platanomyid molar morphology refers to Qiu and Ni (2019: fig. 1). All fossil materials are stored in the Paleontological Collection of the University of Tübingen, Germany (GPIT).

## Systematic palaeontology

**Order Rodentia BOWDICH, 1821**

**Superfamily Muroidea ILLIGER, 1811**

**Family Platanomyidae ALSTON, 1876**

**Genus *Neocometes* SCHAUB et ZAPFE, 1953**

Type species. *N. brunonis* SCHAUB et ZAPFE, 1953.

Other species included. *N. similis* FAHLBUSCH, 1966. Following Chaimanee et al. (2007), *N. orientalis* MEIN, GINSBURG et RATANASTHIEN, 1990 and *N. cf. orientalis* from Thailand need to be referred to a new genus, which would then, according to Qiu and Ni (2019), also apply for *N. sinensis* QIU et JIN, 2017 and *N. magna* QIU et JIN, 2017 from China.

### ***Neocometes brunonis* SCHAUB et ZAPFE, 1953**

Type locality. Devínská Nová Ves – Štokeravská vápenka, Slovak Republic, Middle Miocene (MN 6, ~14.7 to ~13.8 Ma, according to Sabol et al. 2021).

Material and measurements. 1 left upper third molar (M3 sin.; GPIT/MA/19580) from HAM4: 1.42 × 1.13 mm.

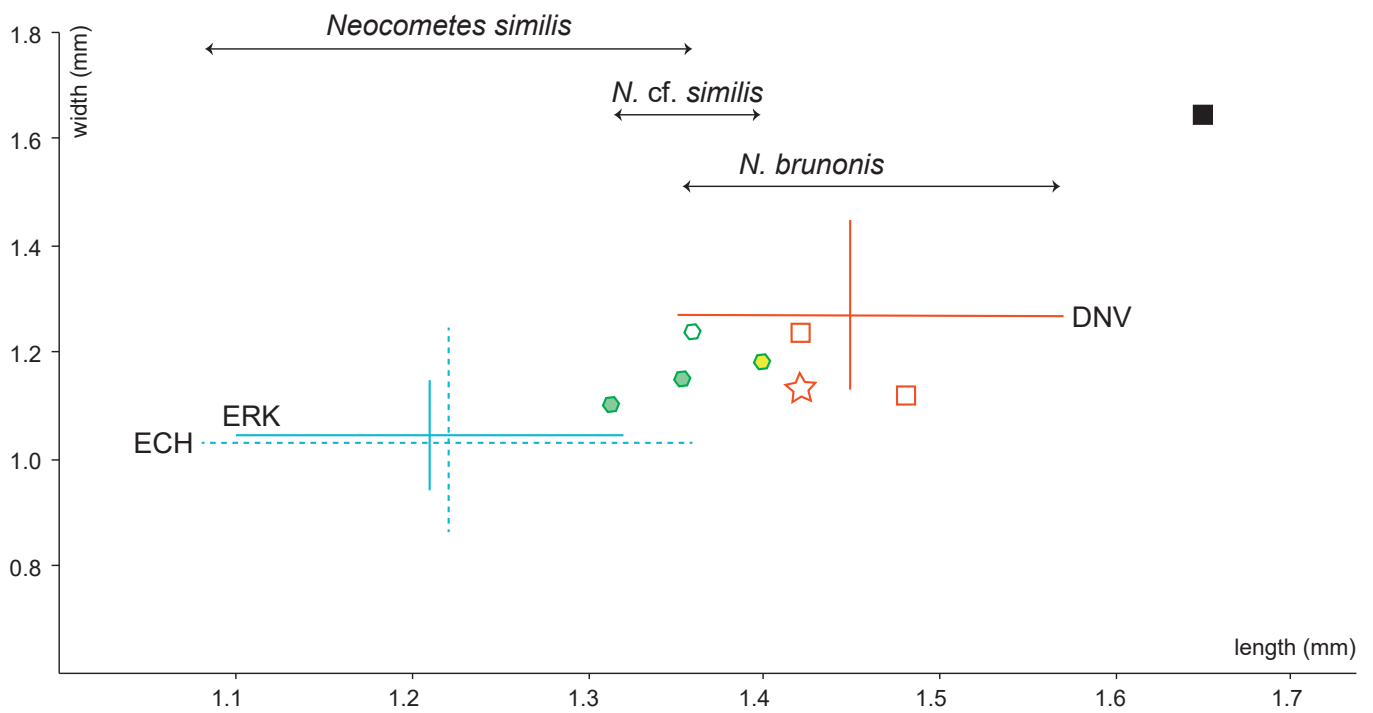
Description. The M3 does not show any trace of wear and lacks the roots, indicating it stems from a juvenile. The occlusal surface is only slightly concave, but the lingual crown side is distinctly higher than the buccal one. All transversal ridges are long and reach both sides of the molar, with the exception of the mesoloph and metaloph, which are fused before reaching the lingual border. The endoloph is continuous. On the buccal side, all crests except the anteroloph and the anterior extra ridge end free. A superficial notch is observed at the lingual end of the posteroloph.

Comparison. Morphologically, the upper third molar is relatively variable in European *Neocometes* (Fahlbusch 1966, Fejfar 1974, Pineker and Mörs 2011), but the arrangement of the crevices of the specimen studied here agrees with what is expected for this genus. The M3 from HAM4 is larger than the *N. similis* from Erkerthofen 1 and Echzell (Text-fig. 1; Fahlbusch 1966, Pineker and Mörs 2011) and *N. cf. similis* from Puttenham, Maßendorf, and Hambach 6C (Schötz 1981, Wu 1982, Mörs 2006). It falls within the range of metrical variation of *N. brunonis* from Devínská Nová Ves – Štokeravská vápenka (Fejfar 1974), close to the two M3's from Anwil (Text-fig. 1; Engesser 1972).

The few known upper third molars from Asian *Neocometes* or *Neocometes*-like taxa differ more clearly from the Hammerschmiede tooth. The M3 of *N. cf. orientalis* (Chaimanee et al. 2007) is shorter and more compact (L/W ratio = 0.99; 1.26 for HAM4), whereas this tooth position from *Neocometes* sp. from Leilao (Qiu and Ni 2019) is substantially larger (Text-fig. 1) and very different in morphology (e.g., the metaloph is interrupted and close to the syncline IV buccally).

## Discussion

*Neocometes brunonis* is so far known from seven localities only; four of them are fissure-fillings. Next to its type locality Devínská Nová Ves – Štokeravská vápenka (Schaub and Zapfe 1953, Fejfar 1974), it is recovered from the nearby and slightly younger site Devínská Nová Ves – Bonanza (Sabol 2005, Jovells-Vaqué et al. 2023), from three French karstic fissures La Grive M, La Grive PBA (Mein



- a**
- *N. sp.*, Leilao
  - ERK *N. similis*, Erkertzhofen 1
  - ECH *N. similis*, Echzell
  - *N. cf. similis*, Maßendorf
  - *N. cf. similis*, Puttenhamen
  - *N. cf. similis*, Hambach 6C
  - DNV *N. brunonis*, Devinská N. V. Fissure
  - *N. brunonis*, Anwil
  - ☆ *N. brunonis*, HAM4



**Text-fig. 1. a:** Scatter diagram showing the size of upper third molar of European and Asian *Neocometes* species (data from Fahlbusch 1966, Engesser 1972, Fejfar 1974, Schötz 1981, Wu 1982, Mörs 2006, Pineker and Mörs 2011, Qiu and Ni 2019). Note that the M3 from HAM4 belongs to *N. brunonis*. **b:** *N. brunonis*, left upper third molar (GPIT/MA/19580) from HAM4.

and Ginsburg 2002), and Four (Maridet et al. 2000), and from two stratified sites from Switzerland, Anwil (Engesser 1972) and Greuterschberg (Kälin 2003). The material from the latter locality and from the French fissures remained undescribed.

Chronologically, all these sites cover a relatively short interval, between ~14.7 and 13.3 Ma. The oldest one, Devinská Nová Ves – Štokerauská vápenka, correlates to the middle Badenian (Sabol and Kováč 2006, Sabol et al. 2021), and is thus older than the Langhian-Serravallian transition at 13.82 Ma (e.g., Harzhauser et al. 2018). The youngest records are those from Anwil and Greuterschberg. Both sites show a very similar rodent fauna, and are biostratigraphically correlated to the Hörnli-fan magnetostratigraphy with an age of 13.3 Ma (Kälin and Kempf 2009). The Hammerschmiede record of *Neocometes brunonis* thus extends the chronology of the species by 1.7 myrs, which can now be specified to

~14.7 to 11.58 Ma. *N. brunonis* thus covers nearly the entire Astaracian (MN 6 – MN 7/8), but remains rare, except on its type locality. However, fossil platanthomyids are in general very rare in many European samples (Fahlbusch 1966: 127), and frequently encountered by few or even single teeth (Engesser 1972, de Bruijn and Moltzer 1974, Schötz 1981, Wu 1982, Hünermann 1984, Boon 1991, Kowalski 1993, Rummel 1993, Bolliger and Rummel 1994, Ziegler 1995, Daxner-Höck 1998, Mörs 2006, Abdul-Aziz et al. 2008, Kälin and Kempf 2009, Rosina and Rummel 2012, Rasser et al. 2013, Seehuber 2018, Prieto et al. 2019, Jovells-Vaqué et al. 2023). The most abundant *Neocometes* populations are those of *N. similis* from Echzell, with 239 teeth (Pikener and Mörs 2011), and Erkerstshofen 1, with 180 teeth (Fahlbusch 1966), as well as *N. brunonis* from Devinská Nová Ves – Štokerauská vápenka, with 131 teeth (Fejfar 1974).

**Table 1. Rodent composition (excluding Castoridae) from the two Hammerschmiede excavation sites HAM5 and HAM4, and their supposedly preferred environmental conditions. The composition includes the test-samples provided by Lechner and Böhme (2025), including further screen-washed materials. The environmental preferences are cited according following publications: 1 – Prieto et al. 2014, 2 – Kälén and Engesser 2001, 3 – Hir 2005, 4 – Kretzoi and Fejfar 2005, 5 – Sinitisa et al. 2021, 6 – Bolliger 1999, 7 – Fejfar 1999, 8 – Engesser 1999.**

family	species	HAM5		HAM4		environment
Cricetidae	<i>Megacricetodon minutus</i>	54	1.9%	4	0.9%	ubiquist? <sup>1</sup>
	<i>Eumyarion latior</i>	351	12.1%	21	4.7%	humid and forest? <sup>1</sup>
	<i>Democricetodon</i> nov. sp. 2	138	4.7%	19	4.3%	forest dweller? <sup>1</sup>
	<i>Collimys hiri</i>	290	10.0%	19	4.3%	unknown <sup>3</sup>
	<i>Microtocricetus molassicus</i>	771	26.5%	133	30.0%	moist riparian or paludal environments <sup>4</sup>
	<i>Cricetodon</i> sp.	0	0	2	0.5%	open habitat <sup>1</sup>
Sciuridae	<i>Albanensia grimmi</i>	57	2.0%	21	4.7%	forest dweller <sup>1</sup>
	<i>Miopetaurista</i> sp.	1	<0.1%	0	0	forest dweller
	<i>Blackia miocaenica</i>	38	1.3%	5	1.1%	forest dweller? <sup>1</sup>
	<i>Csakvaromys bredai</i>	339	11.7%	110	24.8%	open habitat <sup>1</sup> , arboreal to semi-arboreal <sup>5</sup>
Anomalomyidae	<i>Anomalomys gaudryi</i>	634	21.8%	68	15.3%	fossorial <sup>6</sup>
Platacanthomyidae	<i>Neocometes brunonis</i>	0	0	1	0.2%	arboreal <sup>7</sup>
Gliridae	Gliridae div. (7 sp.)	209	7.2%	38	8.6%	forest dweller <sup>1</sup>
Eomyidae	<i>Keramidomys</i> sp.	9	0.3%	0	0	humid forest <sup>8</sup> , unclear <sup>1</sup>
	<i>Eomyops catalaunicus</i>	16	0.6%	2	0.5%	humid forest <sup>8</sup>
total number of rodent molars (excl. Castoridae)		2,907		443		

The extremely rich small mammal record from HAM5 has so far yielded nearly 3,000 rodent teeth (excluding Castoridae), but no *Neocometes* (Tab. 1). The HAM5 site represents a narrow fluvial channel the size of a rivulet (Böhme et al. 2019, Lechner and Böhme 2025). Next to the two syntopic hominids *Danuvius* and *Buroni* (Böhme et al. 2019, 2024), the thanatocoenosis of HAM5, dominated by *Microtocricetus molassicus* and the fossorial *Anomalomys gaudryi* (Tab. 1), suggests a rather densely vegetated forest (Lechner and Böhme 2025). In contrast, the fossils from the large meandering HAM4 river channel contain, besides a single tooth of *Neocometes brunonis*, less abundant rodents and eulipotyphlans, but more lagomorphs, scincomorphs and charcoal, and have thus been interpreted to reflect a rather open riparian habitat (Lechner and Böhme 2025). Its rodent composition is again dominated by *M. molassicus*, but the semi-arboreal tree squirrel *Csakvaromys bredai* replaces *Anomalomys* as the second most common rodent (Tab. 1). Fejfar (1999) characterized *Neocometes* as an arboreal genus, without further specification. It is possible that the relatively open and disturbed (by fire) environment of HAM4 is more suitable as a habitat for *N. brunonis*, but this remains a speculation.

Extent Platacanthomyids roam tropical and paratropical mountainous forests of southern India (*Platacanthomys*) and southeastern China and northern Vietnam (*Typhlomys*). The ‘blind mouse’ *Typhlomys* is indeed nearly blind, living both fossorial and arboreal lifestyles, where it climbs quickly using ultrasonic echolocation (Panyutina et al. 2017, Youlatos et al. 2020). The high-altitude habitats of extant members (*Platacanthomys* 600 to 2,000 m a.s.l., Molur 2016; *Typhlomys* 400 to 3,250 m a.s.l., Cheng et al. 2017) could provide a potential explanation why *Neocometes* is so rare in stratified localities, because the majority of Miocene

sedimentary basins of Europe should have been deposited at very low palaeo-altitudes. Moreover, the three sites with a rich *Neocometes* record are either fissure fillings (Devínská Nová Ves – Štokeraevská vápenka, Erkerthofen 1) or originate, in the case of Echzell, from the flanks of the huge stratovolcano Vogelsberg (Tobien 1955, Pineker and Mörs 2011). Subsiding basins usually show less drained soils, in contrast to karstic plateaus or flanks of stratovolcanoes. The drainage conditions or the soil water content in turn influence the taxonomic composition of arboreal vegetation, as has been demonstrated by Böhme et al. (2007) for the German Molasse Basin and the southern Frankonian Alb. Thus, an ecological resemblance between *Neocometes* and extant platacanthomyids, as assumed by Kowalski (1993), Daxner-Höck (1998), Fejfar (1999), or Flynn (2003), did not necessarily mean that fossil and living ‘spiny dormice’ live under similar climate, as argued by Pineker and Mörs (2011), but instead could mean that larger platacanthomyid populations prefer forests in well-drained habitats with a rather low groundwater-level.

## Conclusions

In recent years, the early Late Miocene Hammerschmiede locality has yielded an exceptional vertebrate fauna, with spectacular finds, especially as regards the late Astaracian mammalian palaeofauna. Here we report the stratigraphically youngest occurrence of a platacanthomyid rodent from Europe, a left M3 of *Neocometes brunonis*, extending the range of this species over practically the entire Astaracian (~14.7–11.58 Ma). The arboreal *Neocometes* is generally rare in stratified sites from Europe. It is therefore possible that its ecological demands do not fit the vegetation typically occurring in low-elevation sedimentary basins of Europe.

## Acknowledgements

Since 2020, the Hammerschmiede excavations and the associated research have been generously supported by the Bavarian State Parliament, the Bavarian State Ministry of Research and Art and the Bavarian Natural History Collections. Special thanks go to the Freie Wähler parliamentary group and its deputy chairman, Bernhard Pohl, member of the state parliament. I'm furthermore very grateful to numerous volunteers and participants for their help during the excavations at Hammerschmiede. We furthermore want to thank Martin Sabol and Peter Joniak (both Bratislava) for their review.

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