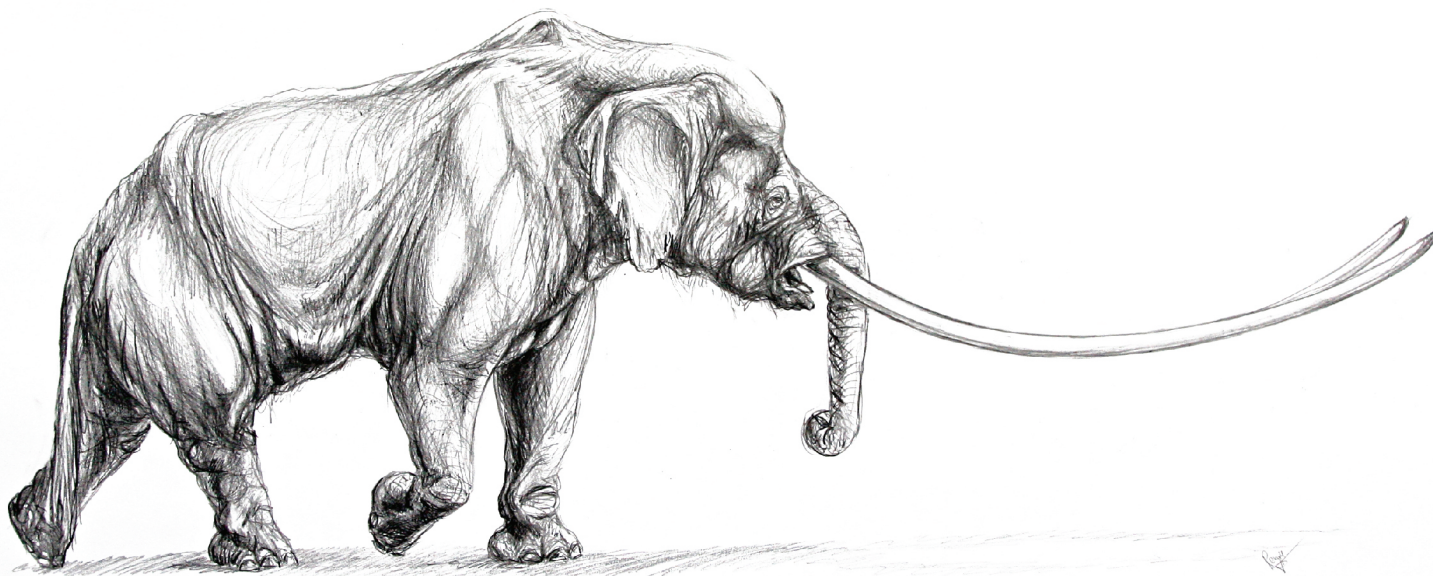




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## **ABSTRACT BOOK**

**Editors:**

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## A cranium of a mammoth calf [*Mammuthus primigenius* (BLUMENBACH, 1799)] from the Eurogully, North Sea

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During a special fishing expedition in search of Pleistocene mammal remains, a fragmented skull of a woolly mammoth calf was dredged up. The trip took place April 22, 2011 on the fishing vessel OD 7 in the Eurogully (Fig. 1A), the North Sea, The Netherlands (coordinates 52° 00' 51.40" latitude; 3° 55' 19.50" longitude') (van der Plicht et al., 2012). Research has shown that the skull belonged to a calf which was only one and a half years old at the time of death. The matching skeleton elements suggest that the mammoth remains were not transported very far from the discovery site.

The maxilla and the right frontal were collected during the fifth trawl of this fishing trip (van der Plicht et al., 2011, Mol and Post, 2010), while the next trawl produced the right tusk and the left frontal as well as the mandible, broken in two parts, amongst other remains. Both trawls yielded a total of 14 skull parts and fragments, while no fragments at all were found in the previous and subsequent trawls at the same location. After cleaning and preservation, ten fragments could be assembled into a coherent reconstruction (Fig. 1B). Unfortunately, because of missing pieces, four fragments of the braincase could not be placed in the reconstruction. The reconstructed skull is stored in the collection of Klaas Post in Urk, The Netherlands and catalogued as NO 4513.

The right premaxilla is completely intact. Only part of the left premaxilla was found. This fragment includes the depression that accommodates the muscle attachments of the trunk. Both depressions together form the facial part of the skull. A large flat surface at the back of the premaxilla towards the top spans the entire width. This enables a seamless articulate connection to the frontal. The largest width of the premaxilla is 94 mm, and the maximum length is 203 mm. The perfectly intact tusk is located in the right premaxilla. It has a maximum length of 213 mm, measured along the outer tusk curvature. The oval cross-section has a maximum diameter of 34 mm at the base. Given the discoloration and abrasion of the tip, at most 15-25 mm of the tusk would have been visible, protruding from the alveolus.

The maxilla is complete and perfectly intact. The relatively robust infraorbital foramen is visible to the left and right. The greatest diameter on the left side is 41 mm. Both lateral protrusions of the maxilla are well preserved up to the articulation surface of the cheekbone. Both dP3 premolars consist of seven lamellae, which all show chewing abrasion. The occlusal surface measures up to 61 x 36 mm, and both surfaces are strikingly alike (the difference between the left and right molar is less than 1 mm). Unfortunately, the dP4 premolars are not preserved, but the robust cavities of the front molar roots can be clearly observed in both left and right alveoli. Furthermore, three lamellae depressions are visible on the right inner side of the alveolus and two on the left side.

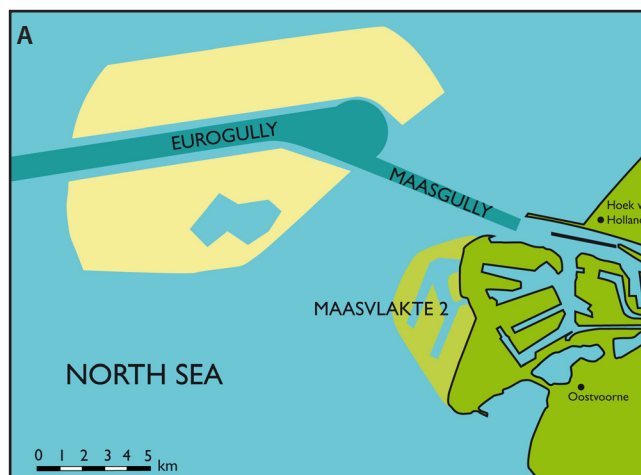


Fig. 1. **A**, The Eurogully, off the coast of The Netherlands; **B**, Damaged cranium of a mammoth calf, Eurogully, North Sea (antero-lateral view). Collection Klaas Post, Urk, NO 4513. Scale bar equals 5 cm.

Both maxillae are not completely fused together, and a clear zigzag structure is visible over the entire length of the palate, the width varying between 1-3 mm. The greatest width of the maxilla, including both zygomatic arches, is 296 mm, the maximum width measured along the outer

edge of both premolars is 112 mm, and the largest length preserved is 168 mm.

The left and right frontals are completely intact and they articulate in the central surface of the cranium over a length of 57 mm. The length of the right frontal is 209 mm, whereas the left frontal is 202 mm. The height of the highest point of the articulation surface between the two frontals and the highest point of the premaxilla is 176 mm. The eye sockets have a maximum diameter of 61 mm. The upper part of the frontals show a weak imprint of the non-fused nasals which were not recovered.

Much more striking are the aforementioned clearly visible large S - shaped curved articulation surfaces of the premaxilla. This also applies to the large triangular articulation surfaces of the rear parietals that are prominently displayed adjacent to the inside pattern of the brain cavity. The bone of the forehead is 102 mm thick at this place, but it still gives a lightweight impression as a result of the typical cavity structures (sinuses) which are so characteristic for the mammoth cranium.

The mandible was broken in two halves in the nets during trawling, but both halves were originally seamlessly fused. The right mandible misses the condyle and both premolars; the alveolus of dp3 is prominent and deep and clearly separated in two parts; the alveolus of dp4 exhibits no lamellae impressions at the interior side. At the front and on the outside of the alveoli of the dp3 are three major foramina; a smaller foramen and three tiny foramina can be seen lingually. The largest measurable length of this mandible is 214 mm. The left ramus remains extend to just behind the dp3; the part behind it is missing. Two major foramina are present on the front and outside, and two smaller foramina and three very small foramina are present on the lingual side. The mandible shows remains of the dp2 alveoli directly in front of the dp3. The dp3 of the left mandible shows eight lamellae, all in use, the grinding surface measuring 54 x 27 mm.

Maschenko (2002) provided numerous measurements of mammoth calves from Russia on which the following analysis is based. It shows that the permanent tusk starts to protrude from the premaxilla at an age of about 12 months. Furthermore, both the rate of abrasion and the length of the tip of the right tusk would limit the age of this mammoth calf to a maximum of two and a half years at time of death. The two upper dp3 are fully in use without substantial reduction of the premolars and it seems likely that the dp4 was hardly in use at all. This would indicate an age of the calf of at least one and a half up to two years. The dp3 in the mandible is completely worn as well, but that stage should likely have been reached just before the death of the calf.

A similar mandible collected from the North Sea (Van der Plicht et al., 2012) shows a similar or slightly increased use of the dp3. Yet it also contains a pristine dp4 and still shows the remainder of an alveolus of a shedded

dp2 premolar. This particular combination indicates an age of 11-16 months. If we compare the mandible and the stage of wear of the premolars of this mammoth calf with the known individual ages of African elephants (*Loxodonta africana*) as published by Laws (1966), then we reach the same individual age, expressed in African Equivalent Years (AEY). The stage of wear of the dp3 of NO 4513 indicates that it falls into age groups Laws III (1 AEY) and IV (2 AEY), which corresponds well with the data provided by Maschenko, 2002.

Summarizing, we conclude that the mammoth calf was 16 to 18 months old at time of death in the Eurogully area. In addition, we conclude that the skeleton elements belonging together must all have been covered by sediments soon afterwards, facilitating preservation. The skull could not have been transported over a large distance.

All hitherto known  $^{14}\text{C}$  dates of mammoth fossils from the Eurogully Area and the adjacent North Sea area are between 33,800  $\pm$  1200 and > 45 ka BP ( $n = 15$ ); (Mol et al., 2008). Given its condition, it seems likely that this skull must be dated within these limits.

Like this cranium, many other fossils from the Eurogully are very well preserved, like craniums of mammoths, bison, rhinoceroses and other megafaunal elements. There are many reports from fishermen about assemblages of perfectly articulated bones coming up in the nets. Articulated skeletons and the pristine undamaged state of thousands of mammoth bones indicate that these fossils were located *in situ* before they were dredged up. It suggests that there are numerous articulated skeletons (or parts thereof) in the layers below the sea floor in the Eurogully. This makes the Eurogully one of the most important and richest deposits of mammoth fossils in the world.

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