

New study reveals competition and replacement between two miocene shovel-tuskers

February 11 2015

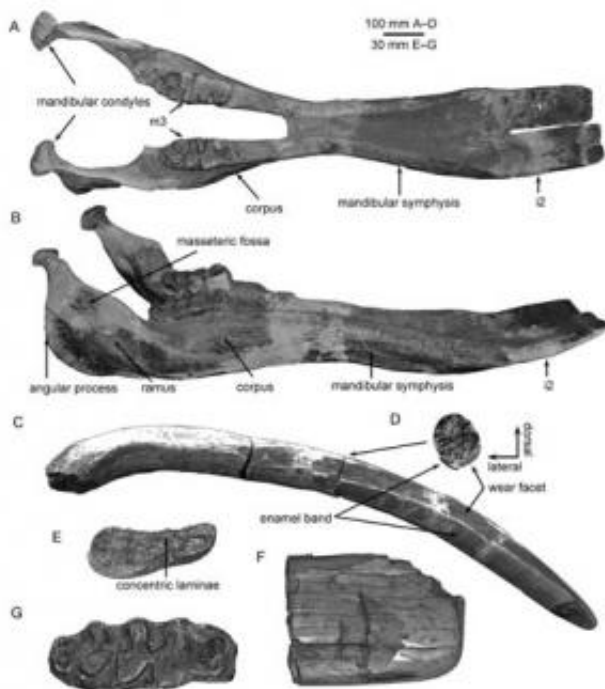


Fig. 1, Mandible and lower tusks of *Protanancus tobieni*. Credit: WANG Shiqi

Dr. Wang Shiqi from the Institute of Vertebrate Paleontology and Paleoanthropology (IVPP), Chinese Academy of Sciences and his colleagues recently studied two relatively primitive species of *Protanancus*, *Protanancus tobieni* and *Protanancus brevirostris*. The former discovered from Tongxin of Ningxia Province and Qin'an of

Gansu Province, about 16 000 000 years ago and the latter from Guanghe of Gansu Province, about 18 000 000 years ago. This study published online in the *Journal of Vertebrate Paleontology* reveals the intensive competition between *Protanancus* and *Platybelodon* based on similarities in their mandibular morphologies and dental microwear patterns, with the former genus disappearing from East Asia by the late middle Miocene.

Protanancus is a shovel-tusked proboscidean with elongated mandibular symphysis and flattened lower tusks, similar to the well-known *Platybelodon* in morphology. Both of them belong to the subfamily Amebeldontinae. Fossil records indicate that the two genera are symbiotic in East Asia for at least 2 000 000 years. *Protanancus* was extinct in East Asia at about 16 000 000 years ago; however, *Platybelodon* was flourish, and tended to extinct in East Asia at about 11 000 000 years ago. For example, in the Dingjiaergou section, *Protanancus* was discovered only from the 3rd layer; whereas *Platybelodon* was discovered from the 6th, 17th, and 20th layers, with a large abundance. On the contrary, in the Siwalik area of the south Himalayas, lacking the presence of *Platybelodon*, *Protanancus* was not extinct until 11 000 000 years ago.

Microwear study shows that the differences of morphology and distribution of microwear on the cheek teeth of the two genera are statistically insignificant. This result, combined with the similar morphology of the mandible, indicates the two genera had similar feeding behaviors in the similar living environment. If they are indeed living in the same space, strong competition for existence should occurred between *Platybelodon* and *Protanancus*.

What is the reason that distinct fates were eventually upon the two similar taxa? The investigation of the [inner structure](#) of the lower tusks of the two genera reveals the answer of the question. The inner structure

of the lower tusks in Protanancus is concentric laminations as usual proboscideans; whereas that of Platybelodon is specialized as tubular structures. Very simple biomechanical models of finite element have been used to imitate the lower tusks in the two genera. The result indicates that tubular structure shows the greater resistance to the adverse effects of both a heavy load and abrasion than those with concentric laminations. Because the lower [tusks](#) are the major feeding apparatus of the two genera. Platybelodon with mechanical advantages of the lower tusk may gradually held ecological space of Protanancus, and eventually led to extinction of the Protanancus, the competitor of Platybelodon.

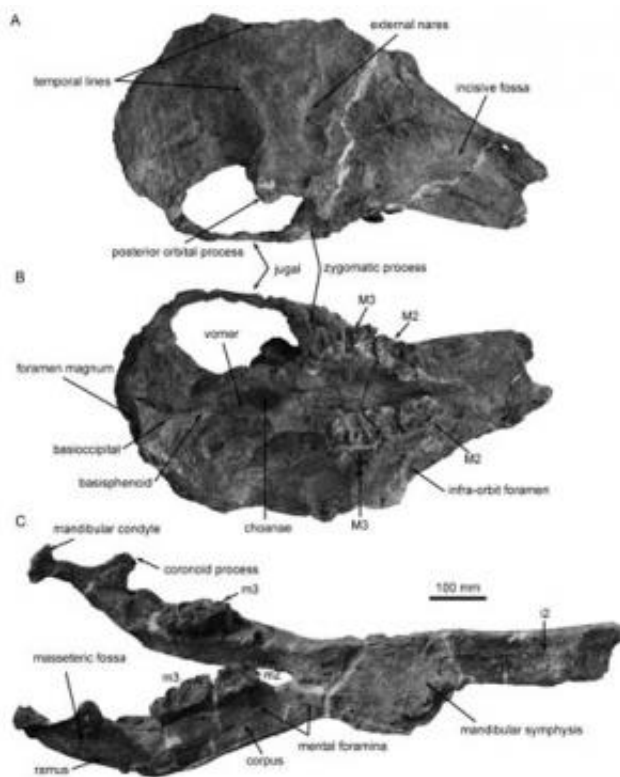


Fig. 2, Cranium and mandible of *Protanancus brevirostris*. Credit: WANG Shiqi

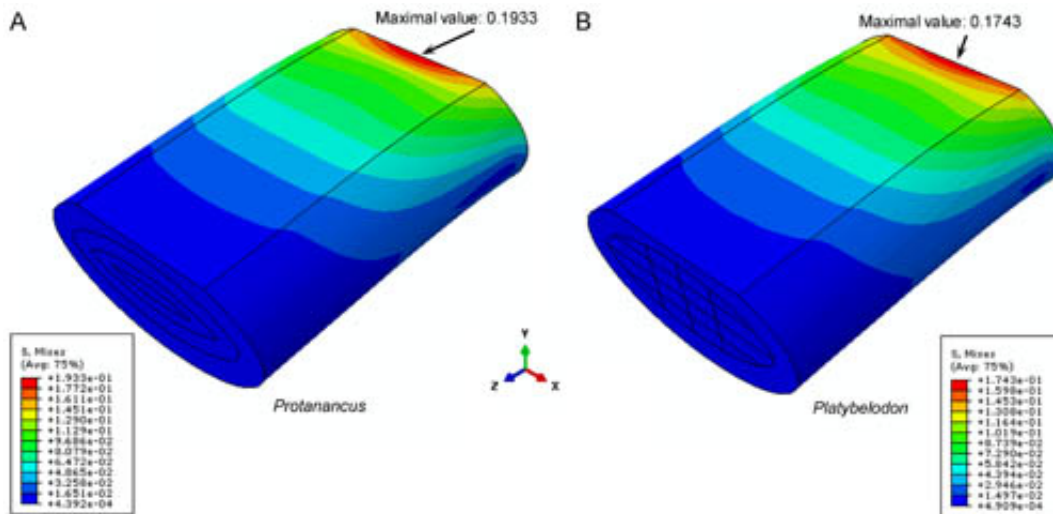


Fig. 3, Finite element models of lower tusks of Protanancus (A) and Platybelodon (B). Credit: WANG Shiqi

More information: "Evolution of Protanancus (Proboscidea, Mammalia) in East Asia" *Journal of Vertebrate Paleontology*, DOI: [10.1080/02724634.2014.881830](https://doi.org/10.1080/02724634.2014.881830)

Provided by Chinese Academy of Sciences

Citation: New study reveals competition and replacement between two miocene shovel-tuskers (2015, February 11) retrieved 11 May 2024 from <https://phys.org/news/2015-02-reveals-competition-miocene-shovel-tuskers.html>

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