

3D model related to the publication: Interacting with the inaccessible: utilization of multimedia-based visual contents of Japan's National Monument, the *Taniwhasaurus mikasaensis* (Mosasauridae) holotype for educational workshops at Mikasa City Museum.

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Abstract

The present 3D Dataset contains the 3D model used in in the following publication: Interacting with the inaccessible: utilization of multimedia-based visual contents of Japan's National Monument, the *Taniwhasaurus mikasaensis* (Mosasauridae) holotype for educational workshops at Mikasa City Museum.

Keywords: Mosasauridae, Photogrammetry-based 3D data, surface scanner, *Taniwhasaurus*, Tylosaurinae

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INTRODUCTION

The specimen of the holotype *Taniwhasaurus mikasaensis* MCM.M0009 was described by Caldwell et al. (2008). In June 1976, MCM.M0009 was recovered from a bank of the Ikushumbetsu River in Hokkaido, Japan (Muramoto, 1977). This specimen was discovered in a floating concretion, but its occurrence formation was identified to Kashima Formation because the locality was the exposed area of Kashima Formation. Many macro-invertebrate fossils were discovered from Kashima Formation and the age was identified to the Santonian-Campanian boundary (Muramoto, 1977b; Toshimitsu et al., 1995; Takahashima et al., 2004).

This specimen was informally named “*Yezosaurus mikasaensis*”. The Paleobiology Database identifies Muramoto (1977b), published in December 1977, as the original description of “*Y. mikasaensis*”; however, Muramoto (1977a) used this name for the first time during a press release, in collaboration with Dr. Ikuwo Obata, at the National Museum of Nature and Science (Tokyo), on November 30, 1976. While both of these citations cannot be considered valid on the basis of the International Code of Zoological Nomenclature (ICZN), Obata and Muramoto were effectively perceived to be authors of the original description of “*Y. mikasaensis*.” These researchers identified this specimen as a tyrannosauroid specimen (Muramoto, 1977a, 1977b). Following this discovery, the Japanese Ministry of Education designated the specimen as a Japanese National Monument in July 1977 (National Printing Bureau, 1977). Thirty years after, Caldwell et al. (2008) reassigned this specimen to a new species of Tylosaurinae: *Taniwhasaurus mikasaensis*. The distribution area of *Taniwhasaurus* seems restricted to the Pacific and their first remains were found in the South Pacific. This specimen further

Inv. nr	Taxon	Description
MCM.M0009	<i>Taniwhasaurus mikasaensis</i>	Partial skull

Table 1. Related specimen. Collection: the Mikasa City Museum (MCM), Japan.

indicated that *T. mikasaensis* was not restricted to the Antarctic and had a very large distribution area. In addition to that, *T. mikasaensis* was the first Tylosaurinae in their evolutionary history, so the existence of this specimen was very important for the study of mosasaurid evolution (Caldwell et al., 2008). In 2019, Jiménez-Huidobro and Caldwell (2019) summarized that MCM.M0009 does not have sufficient diagnostic characters to be recognized as a distinct species. Therefore, they identified this specimen to *Taniwhasaurus* species. For this reason, specimen MCM.M0009 is not currently assigned to a particular species. Although the identification of the specimen has changed significantly from the time of discovery, but the specimen is still a Japanese National Monument. The skull on which the model is difficult to move from the museum exhibition hall because such operations would require the permission of the Ministry of Education, Culture, Sports, Science and Technology, Japan. Only two replicas of the specimen were made, therefore opportunities are very restricted to use this specimen for social education despite being a Japanese National Monument. To change this situation, we made 3D models of this unattachable specimen (see Fig. ?? and table ??). We used it in AR Web application and verified its educational effect.

METHODS

We made 3D data by using two types of methods, the photogrammetry method and the 3D scanner. The photogrammetry-based

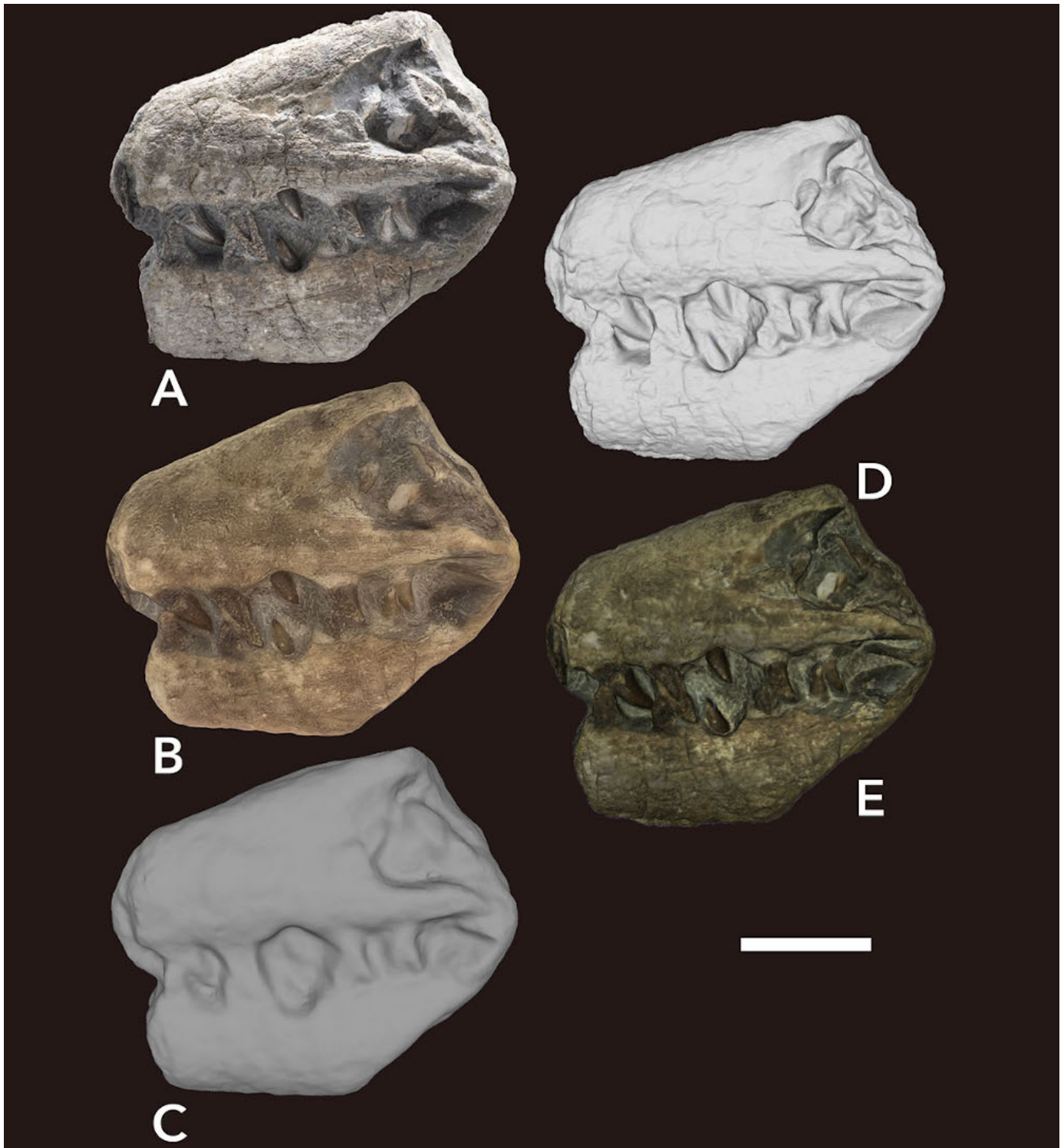


Figure 1. Skull of *Taniwhasaurus mikasaensis*. A: Photograph of the left lateral view; B: The photogrammetry-based 3D model of the left lateral view with texture data; C: The photogrammetry-based 3D model of the left lateral view; D: The 3D scanner-based model of the left lateral view with texture data; E: The 3D scanner-based model of the left lateral view. Scale bar: 10cm.

3D model was created using the Agisoft Metashape Professional Edition v1.5.4 (Agisoft, 2018), based on a total of 600 images and 599 were used for making this model. These images were obtained by converting a movie file taken by iPhone 6 (Apple Inc.). To model each side of the skull we used 300 pictures and then aligned 599 pictures for making dense clouds of the skull model. The 3D scanner-based 3D model was created using Artec Eva and Artec Studio 11 (Artec 3D). These 3D models were originally provided in the obj. format (with a.mtl file and a.png texture), which can be opened using various freeware (e.g., MeshLab; Cignoni et al. 2008).

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