Report of Okayama University of Science – Institute of Paleontology, Mongolian Academy of Sciences Joint Expeditions in 2022.

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Okayama University of Science and the Institute of Paleontology, Mongolian Academy of Sciences (IP-MAS) conducted joint expeditions in 2022 for the first time after the COVID-19 pandemic. The crew visited Shar Tsav, Arts Bogd area, and Bayn Shire in the Gobi Desert of Mongolia. They discovered numerous dinosaur trackways in Shar Tsav and Arts Bogd and two microfossil assemblages in Bayn Shire. The microfossil remains include mammals, lizards, frogs and fishes, which are quite rare in the Baynshire Formation. The crew also gathered stratigraphic data and sediment samples in Bayn Shire, which are for constructing a temporal framework of the Upper Cretaceous Mongolian strata based on U-Pb geochronological and magnetostratigraphic studies.

Keywords: Mongolia; Late Cretaceous; Vertebrate Paleontology; Dinosauria; footprints; microfossils

1. Introduction

The research group from the Okayama University of Science (OUS) has regularly conducted joint expeditions with the Institute of Paleontology, Mongolian Academy of Sciences (IP-MAS) from 2015 to 2019[1)–5)], but the field program had to be temporally ceased due to the COVID-19 pandemic. We resumed the joint fieldwork program in 2022 and conducted two expeditions.

The first expedition was carried out in Shar Tsav and Arts Bogd area from June 1st–14th, 2022 (Fig. 1). The members of the expeditions were Shinobu Ishigaki from OUS and Khishigjav Tsogtbaatar (director of IP-MAS), Buuvei Mainbayar (researcher/driver), and

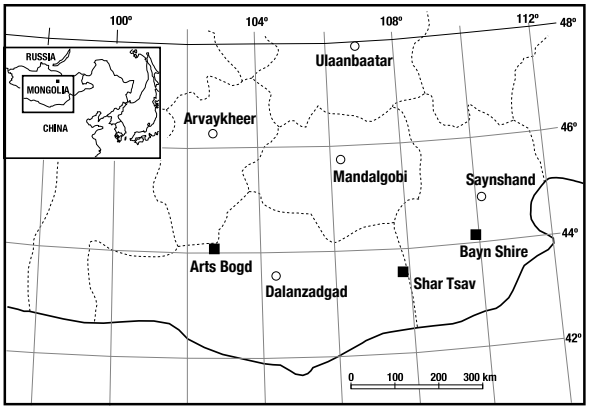

Fig. 1. Map of main localities visited during the joint expeditions in 2022.

Fig. 2. Fieldwork photographs. A and B: newly found sauropod trackways with manus prints in Arts Bogd area; C: microfossil sampling at Bayn Shire; D: screen washing of microfossil samples at Bayn Shire; E: articulated partial fish skeleton at Bayn Shire; F: caliche layer at Bayn Shire.

Bayasgaa Ganzorig (researcher) from IP-MAS.

The second expedition was undertaken in Bayn Shire from August 5th–14th (Fig. 1). The members of the expedition were Akio Takahashi, Mototaka Saneyoshi, Kentaro Chiba, Ryuji Takasaki, and Kota Sakamoto from OUS, and Khishigjav Tsogtbaatar (director of IP-MAS), Buuvei Mainbayar (researcher/driver), Batsaikhan Buyantegsh (researcher/driver), Purevsuren Byambaa (researcher), Battulga Bilguunbold (researcher), Enkhbat Ochirjantsan (preparator/driver), Jamgan Gantsetesg (cook) from IP-MAS.

2. Localities visited

The localities visited during the June expedition were Shar Tsav in the eastern part and Arts Bogd area in the central part of the Gobi Desert (Fig. 1). The detailed ages of the Upper Cretaceous horizons exposed in both localities are currently uncertain. Bayn Shire, where the expedition team visited in August, is located in the eastern part of the Gobi Desert and is the type locality of the Baynshire Formation (Fig. 1). The U-Pb age determined by OUS researchers in an adjacent locality, Khongil Tsav, is approximately 95 to 90 Ma[6]. To protect locality information, the detailed lists and the associated GPS coordinates of each recovered specimen and sample are reposited in the IP-MAS and OUS databases

3. Results

The first expedition team conducted ichnological fieldwork of dinosaur trackways and footprints. The team discovered 20 dinosaur trackways, including a sauropod trackway and a turning trackway of an ankylosaur. The team also found hadrosaurid, sauropod, and small theropod isolated footprints in Shar Tsav. In the Arts Bogd area, the team found six well-preserved sauropod trackways, four of which are with manus prints (Fig. 2A and B). The sauropod, theropod, hadrosaur, and ankylosaur isolated footprints were also discovered in this area.

The second expedition team prospected and collected a total of 38 specimens. The specimens were mainly derived from the two microfossil sites found during our 2019 fieldwork (Fig. 2C and D). The microfossil assemblages are mainly composed of dinosaur (hadrosauroid, ankylosaurid, tyrannosauroid, dromaeosaurid) bone fragments and teeth and crocodilian teeth and osteoderms, turtle shell fragments, and fish scales and vertebrae. Notably, the assemblages include mammal, fish, lizard, and frog remains, which are quite rare (mammal and fish) and are the first reports from the Baynshire Formation (Fig. 2E)[7)–8)]. The team also found some ankylosaur bones, including a relatively large partial pelvis and small fused sacral vertebrae and humerus in proximity. Due to the different estimated sizes of the ankylosaur remains, it is potentially the second ankylosaur bonebed at Bayn Shire. The stratigraphic position of this site is located lower than the previously known ankylosaur bonebed at Bayn Shire[5), 9)]. They also collected stratigraphic and sedimentological data of the Baynshire Formation exposed around Bayn Shire. 44 sandstone, mudstone, and caliche samples were also collected throughout the sections at this locality for further analyses (Fig. 2F).

4. Future perspectives

The small vertebrate fauna of the Baynshire Formation is poorly understood compared to faunal assemblages of the other Upper Cretaceous strata in Mongolia. The microfossil remains found in the 2022 expeditions likely include several new species. Also, turtle specimens collected this year will be useful for the ongoing taxonomic studies of Baynshirenian turtles. The specimens collected this year will provide vital clues for the poorly known small vertebrate fauna of the Baynshire Formation. Parts of some specimens will also be used as pilot samples for fossil protein extraction.

The sandstone samples collected at Bayn Shire will be analyzed using Electron Spin Resonance and Inductively Coupled Plasma Mass spectrometry (ICP-MS). These analyses will elucidate the origin of sediments in the formation, which leads to an understanding of the paleoenvironment of the formation and the stratigraphic correlation between different localities with exposure of the formation. The caliche and tooth samples collected at Bayn Shire will be used for U-Pb dating by ICP-MS. Additionally, mudstone samples will be used for magnetostratigraphic analyses to further constrain the depositional age of the Baynshire Formation. These samples will provide us with important data to construct the temporal framework of the Baynshire Formation, which remains poorly known.

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