Report of the Okayama University of Science – Mongolian Institute of Paleontology Joint Expedition in 2019

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Field crews of the OUS and IP, Mongolian Academy of Sciences Joint Expedition conducted geological and paleontological surveys in the Gobi Desert of Mongolia from August 20th to September 2nd and September 5th to 12th, 2019. We collected 229 fossil specimens, including 29 plaster jacketed specimens and 63 geological samples this year, which will be useful to examine the paleobiology of the fossil remains and the stratigraphy in the Gobi Desert.

Abbreviations: OUS, Okayama University of Science; IP, Institute of Paleontology, Mongolian Academy of Sciences

1. Participants

The following seven people participated in the western Gobi expedition from OUS.

1) Hidetsugu TSUJIGIWA (Professor, OUS)
2) Akio TAKAHASHI (Associate Professor, OUS)
3) Mototaka SANEYOSHI (Associate Professor, OUS)
4) Shoji HAYASHI (Lecturer, OUS)
5) Kentaro CHIBA (Assistant Professor, OUS)
6) Shota KODAIRA (Graduate student, OUS)
7) Mana AMIMOTO (Graduate student, OUS)

The following eight people participated in the western Gobi expedition from IP.

1) TSOGTBAATAR Khishigjav (Director of IP)
2) MAINBAYAR Buuvei (Researcher / Car [Land Cruiser] driver, IP)
3) BUYANTEGSH Batsaikhan (Researcher / Car [Rental Car] driver, IP)
4) PUREVSUREN Byambaa (Researcher, IP)
5) BAYARDORJ Chagnaa (preparator / Car [Pajero] driver, IP)
6) OTGONBAT Balgan (Preparator, IP)
7) GANTSETESG Jamgan (Cook)
8) BYMBASUREN Dashdorj (Kamaz truck driver)

The following four people participated in the western Gobi expedition from OUS.

1) Mototaka SANEYOSHI (Associate Professor, OUS)
2) Kazumasa AOKI (Associate Professor, OUS)
3) Shogo AOKI (Postdoctoral Researcher, OUS)
4) Yuto KURUMADA (Undergraduate student, OUS)

The following two people participated in the western Gobi expedition from IP.

1) MAINBAYAR Buuvei (Researcher / Car [Land Cruiser] driver, IP)
2) BUYANTEGSH Batsaikhan (Researcher / Car [Rental Car] driver, IP)

2. Localities visited

The eastern Gobi expedition was conducted from August 20th to September 2nd (total 14 days). The following localities were visited and surveyed by the joint expedition party (Fig. 1). The crew also prospected for fossils in the adjacent localities.

1) Bayn Tsav Oboo (Ergilin Dzo Formation, Eocene–Oligocene)
2) Ardyn Oboo (Ergilin Dzo Formation, Eocene–Oligocene)
3) Shavag (Ergilin Dzo Formation, Eocene–Oligocene)
4) Bayn Shire (Bayn Shire Formation, Late Cretaceous)
5) Khongil Tsav (Bayn Shire Formation, Late Cretaceous)
6) Tsagan Teg (Bayn Shire Formation, Late Cretaceous)
7) Burkhant (Bayn Shire Formation, Late Cretaceous)

The western Gobi expedition was conducted from September 5th to 12th (total 8days). The following localities visited and surveyed by the joint expedition party (Fig. 1).

1) Nemegt (Barun Goyot and Nemegt formations, Late Cretaceous)
2) Altan Ula II (Nemegt Formation, Late Cretaceous)
3) Naran Bulak (Nemegt Formation / Paleogene sediments, Late Cretaceous / Paleogene).
4) Tsagaan Khushuu (Nemegt Formation, Late Cretaceous)

3. Results

We collected 229 fossil specimens, including 29 plaster jacketed specimens and 25 rock samples during the whole expedition this year. The detailed lists and the associated GPS coordinates of each recovered specimen and sample are reposited in the IPG and OUS databases. The following sections summarise the paleontological and geological results of the eastern and western Gobi expeditions separately.

3.1. Eastern Gobi Expedition

At the beginning of the expedition, the party set up

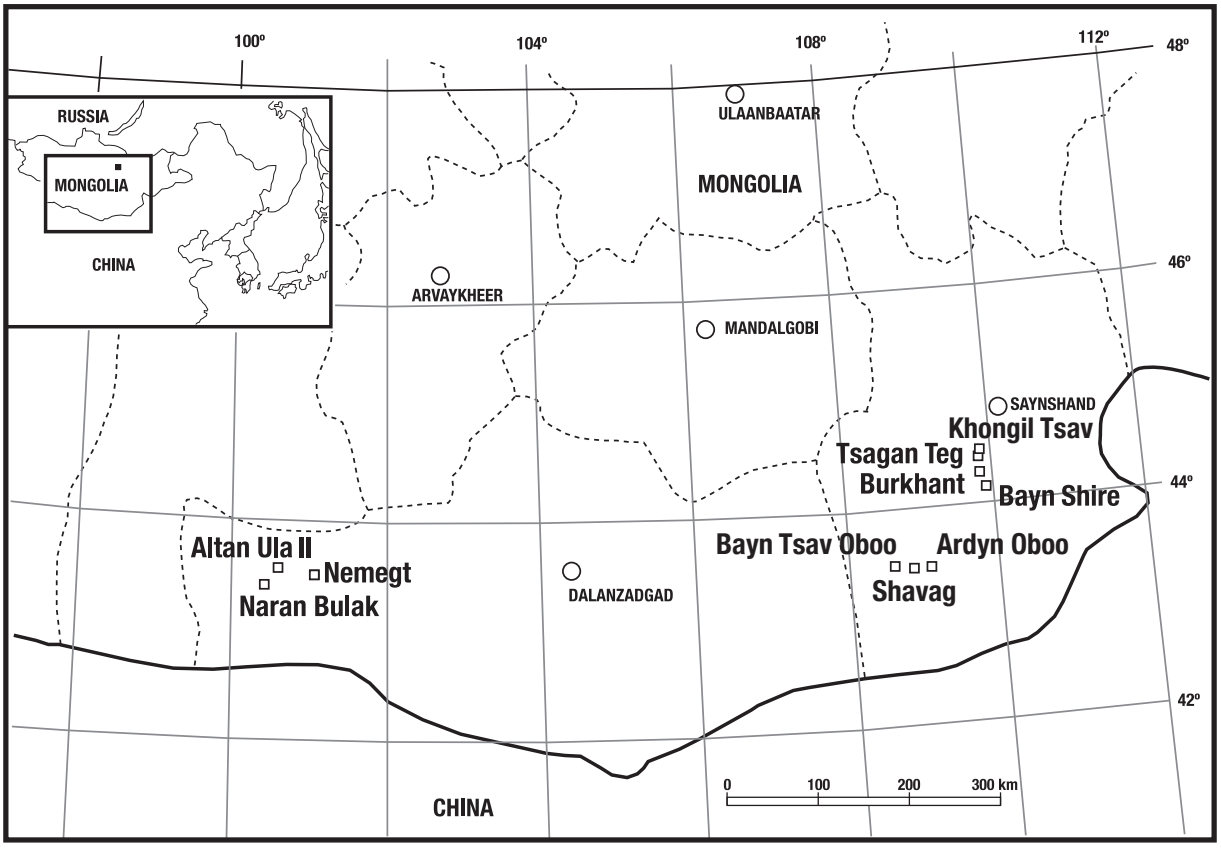

Fig. 1: Map of main localities visited during the Okayama University of Science – Mongolian Institute of Paleontology and Geology Joint Expedition in 2019.

camp at Bayn Tsav Oboo from August 21st to 26th and conducted paleontological and geological surveys at this locality as well as Ardyn Oboo and Shavag. These localities, especially Bayn Tsav Oboo, produces numerous well-preserved fossil specimens of Ergilin Dzo Formation (e.g. Dashzeveg and Hooker, 1997; Tsubamoto et al., 2008; Egi et al., 2009). In total, we collected 125 fossil specimens including 13 specimens in plaster jackets and 21 rock samples. We discovered numerous isolated mammal bones at these localities, but also a very dense bonebed layer (Fig. 2A and B). The fossil specimens collected from the sites includes amynodontid, hyracodontid, and brontotheriid, anthracotheriid, primitive ruminant crania, mandibles and postcrania but also several tortoise specimens including a complete shell of *Ergilemys*. Despite the limited time of the stay at these sites, we collected the majority of taxonomic groups that have been collected from the sites previously (Tsubamoto, 2010). We also collected stratigraphic and sedimentological data from the Ergilin Dzo Formation exposed around Bayn Tsav Oboo, and refined the boundary between the Eocene and the Oligocene in the succession described in Saneyoshi (2010). We collected caliches and sandstone samples throughout the section for geochemical analyses.

We moved our camp to Bayn Shire and conducted paleontological and geological surveys at this locality and the adjacent localities (Khongil Tsav, Tsagan Teg and Burkhant) from August 26th to September 2nd. The Bayn Shire Formation is exposed around these localities and we collected a total of 104 specimens including 16 specimens in plaster jackets. Among those specimens, 36 specimens including 11 plaster jackets are derived from an ankylosaur bonebed that has been previously excavated by various expedition teams (e.g. Ishii et al., 2000; Fig. 2C). We collected numerous turtle specimens, fossil eggs (Fig. 2D), associated hadrosaur and sauropod remains (Fig. 2E), articulated ornithomimid pelvis and also found a partial dinosaur associated skeleton, putatively large hadrosaur. We also found a relatively abundant microsite that includes sauropod, theropod, hadrosauroid teeth as well as small vertebrates (Fig. 2F). In Tsagan Teg, we discovered a new sauropod footprint. We also collected stratigraphic and sedimentological data from the Bayn Shire Formation exposed around Bayn Shire and collected sandstone samples throughout the sections of the middle and upper successions of the sites for geochemical analyses.

3.2. Western Gobi Expedition

We located our camp at the Nemegt locality and conducted geological surveys from September 7th to 10th. The team collected a total of 38 caliche samples throughout the sections of the upper part of the Barun Goyot Formation at Nemegt, the lower and the upper part of the Nemegt Formation at the Nemegt locality and Altan Ula II, and the Paleogene successions at Naram Bulak for geochemical analyses.

4. Future perspectives

Paleontological and geological data collected during the expeditions this year have the potentials for various research projects in different disciplines. Many of the well-preserved Paleogene mammal fossils collected this year are taxonomically identifiable at least at the family level and suitable for applying cutting-edge chemical analyses to elucidate the paleobiological signals. The ankylosaur bonebed from Bayn Shire is the first record of this kind in the Formation and the further sedimentological and taphonomical studies of this bonebed site with taxonomical and osteohistological analyses of the materials may provide us with unique information on Baynshireenian ankylosaur ontogeny, behaviour, and evolution. The microsite found in Bayn Shire is a quite rare occasion of this type of fossil assemblage although microsites are quite common in fossiliferous formations in North America (e.g. Brinkman, 1990; Peng et al., 2001). The presence of small terrestrial vertebrates from the microsite indicates that the site has the potential to preserve other small terrestrial vertebrates, which are underrepresented in the Bayn Shire Formation. Future findings from the microsite could be a valuable source to reveal terrestrial vertebrate diversity of the Bayn Shire Formation as a whole. The abundant turtle fossils collected from both of the Ergilin Dzo and Bayn Shire formations this year will be quite useful to understand individual morphological variations, which has not been examined in detail for these fossil turtle species. The further examination of these materials will help to revise the taxonomic affinities of turtle species of these ages and elucidate the evolution of this major terrestrial vertebrate group.

The sandstone samples collected from Bayan Tsav Oboo will be analyzed using Electron Spin Resonance and Inductively Coupled Plasma Mass spectrometry. These analyses will elucidate the sedimentary sources of sediments in the Ergilin Dzo Formation, which leads

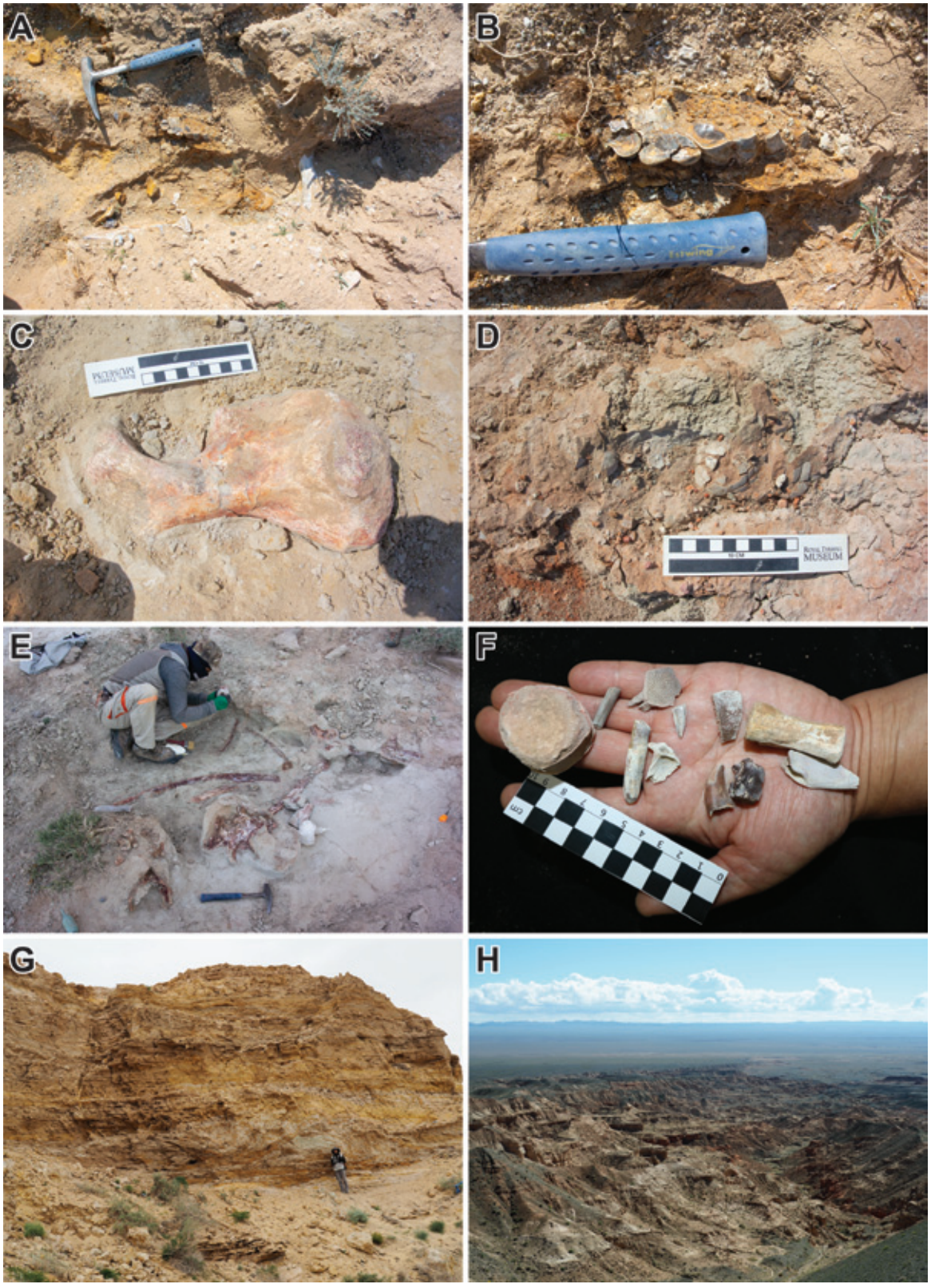

Fig. 2: Photographs during the fieldwork. A: dense bone layer with mammal fossils at Bayn Tsav Oboo; B: close-up of mammal specimen in the dense bone layer; C: humerus from the ankylosaur bonebed at Bayn Shire; D: fossil eggs at Bayn Shire; E: associated sauropod skeleton at Burkhant; vertebrate remains from the microsite at Bayn Shire; F: microvertebrate fossils at Bayn Shire; G: outcrop of the upper part of the Ergilin Dzo Fromation at Ardyn Oboo; H: outcrop of the Nemegt Formation at Altan Ula II.

us to understand the paleoenvironment of the Ergilin Dzo Formation and the stratigraphic correlations between different localities that yields this formation. The caliche samples collected from Bayan Tsav Oboo, Nemegt, Altan Ula II, and Naran Bulak will be used for age determinations by laser ablation-inductively coupled plasma-mass spectrometry calcite U–Pb analyses.

Acknowledgements

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