

# Excavations at Avdalai Khyasaa Site: The Fourth Report on Joint Mongolian–Japanese Excavations in Outer Mongolia

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# Zooarchaeological analysis on the Animal bones excavated from Avdalai khyasaa Site in Zavkhan Province, Mongolia

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## 1. Introduction

In 2019 and 2022, the Mongolian Academy of Sciences and Kyushu University jointly conducted excavations at the Avdalai khyasaa site in the Tosontsengel sum of the Zavkhan province, where animal remains were excavated from a Bronze Age tomb and the circular satellite stone stack of Khirigsuur Graves. In this chapter, we report the results of an introductory analysis on excavated animal remains.

## 2. Overview of excavated animal bones

At the Avdalai khyasaa site, a total of seven grave burials and two the circular satellite stone stack of Khirigsuur Graves were excavated. Animal remains were excavated from graves No. 8, No. 12, and No. 15, and from the circular satellite stone stack of Khirigsuur Grave No. 4 and No. 18. A total of 24 animal bones were excavated from burials and stone stacks as well as within the grave sites, and 10 animal bones were identified. However, since most of the bones are fragments with indistinct surfaces and there are no comparative extant skeletal specimens of the local endemic species, so identification was limited to the family or genus using Kato (1976), Matsui (2008), France (2009), and 3D Bone Atlas Databases (<https://www.nabunken.go.jp/english/environmental-gaiyo.html>) as support. Each of these features is described below.

### Table 1: Species List

Vertebrate
Mammalia
Perissodactyla
Equidae
Artiodactyla
Cervidae
Bovidae
<i>Ovis</i> sp.

## 3. Result

### Grave No. 8:

One small mammal femur (L) and one large mammal limb bone diaphysis fragment were excavated from the grave site. Small mammals are considered juveniles because the femur's distal end is unfused.

### Grave No. 12:

Fourteen animal bones were excavated from the gravesites and burial soil (Fig. 146, 1-6). There is one cranium, one mandible (L) and one thoracic vertebra of the Cervidae, and one mandible (R) and one humerus (L) of the Ovis. In addition, one femur (L), two limb diaphysis, and one possible sternal fragment of a medium-sized mammal, one tibia (L) of a small mammal, and four unknown fragments. Cervidae is thought to be juvenile individuals around 20 months old from mandibular molar eruption (Ohtaishi 1980). Ovis are estimated to be approximately 3 years old based on the stage of mandibular molar eruption (Sebastian 1973). The minimum number of individuals in both the Cervidae and Ovis is counted as one. The tibia (L) of the small mammal was similar in shape to the Mustelidae but could not be identified. Cervidae thoracic vertebrae, the diaphysis of limb bone and sternal fragments of medium-sized mammals were excavated within the grave site, but all others were excavated from the burial soil above the grave site.

### Grave No. 15:

One lumbar vertebra thought to belong to a large Cervidae, and one large mammalian atlas were excavated from the burial soil. (Fig. 146,8,10). The atlas of large mammals was first assumed to be that of a horse. If this is a horse atlas, it would be the oldest horse burial in the area. On the other hand, the morphological characteristics suggested that it might belong to the family Cervidae, so we attempted collagen peptide fingerprinting identification (Zooarchaeology by Mass Spectrometry (ZooMS)) (Buckley et al 2010). Collagen peptide was extracted

referring to Buckley et al. (2010), and digested with trypsin. Then, digested collagen peptide was analyzed using a time-of-flight mass spectrometry (UltrafleXtreme, Bruker) at the Isotope Research Center in the Hokkaido University, and a good peak profile was obtained. Comparing the peaks with a database from the BioArCh, University of York (<https://docs.google.com/spreadsheets/d/1ipm9FFyha8IEzRO2F5zVXIk0ldwYiWgX5pGqETzBco/edit#gid=1005946405>), it was concluded that the atlas was not from a horse, but rather from a cervid or bovid. In order to identify the bone, it is necessary to accumulate data of collagen peptide peak lists of modern cervids and bovids around the site. The lumbar vertebrae which are assumed to belong to the Cervidae are severely damaged and the surface is not clear, but the joints are unfused, so we consider it a juvenile.

#### **The circular satellite stone stack of Khirigsuur Grave No. 4:**

Two animal bones were excavated from the circular satellite stone stack of Grave No. 4 (Fig. 146, 11). One is thought to be the distal phalanx of an Equidae (anterior and posterior limbs and left and right sides unknown), and the other is thought to be the diaphysis of a large mammal limb bone.

#### **The circular satellite stone stack of Khirigsuur Grave No. 18:**

One skull, one atlas and one vertebral fossa of the Equidae, and one fragment of unknown species were unearthed from the circular satellite stone stack of Grave No. 18 (Fig. 146, 7, 9). The minimum number of individuals in the Equidae is counted as one. The skull is identified as a cranium, cranial base, and a part of jugular process. The cranial and basal parts of the skull are in the process of fusion, so it is presumed to be a juvenile individual. The occipital and atlas joints were observed in detail, but no cut marks were identified.

## **4. Discussion and Conclusion**

We analyzed the animal bones excavated from the grave sites and the circular satellite stone stack of graves. Although the number of bones excavated is limited, examining Grave No. 8 and No. 12 based on the conditions of excavation and the parts of the bones excavated, it is difficult to consider the animal bones excavated from within the burial soil as animal sacrifices associated with the graves, because only a few fragmentary bones or parts of small mammals were found in the grave site. Therefore, it is possible that the animal bones were mixed in with the burial

soil at the time of burial. For this reason, the discussion here will focus on trends in animal species for each grave.

The animals identified in this study were Equidae, Cervidae, and Ovis. Cervidae and Ovis were excavated from the burial soil of older dated Grave No. 12 and No. 15. On the other hand, the Equidae were excavated from the circular satellite stone stacks of Grave No. 4 and No. 18, and the two satellite stone stacks are dated to around 900 B.C. (Fig. 37 on pp. 26 of this report.). Horse sacrifices expanded rapidly in this area around 1200 BC (Taylor et al. 2017), and the horse sacrifices at the Avdalai khyasaa site can be positioned to the same period. In addition, only the skull and hoof of the horse were unearthed from the satellite stone stacks, so there are no inconsistencies. In this report, discussion was limited due to the small number of animal bone points. However, it is expected that the actual situation of livestock husbandry management and ritual activities at that time will be discussed in more detail by combining isotope analysis and ancient DNA analysis as the number of animal bone samples increases in the future.

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Grave No.12 (1-6), Grave No.15 (8, 10), The circular satellite stone stack of Khirigsuur Grave No.4 (11)  
The circular satellite stone stack of Khirigsuur Grave No.18 (7, 9)

- 1.Cervidae (cranium) 2.Cervidae (mandible) 3.Ovis (mandible) 4.Cervidae (thoracic vertebra)  
5.Ovis (humerus) 6.Mustelidae? (tibia) 7.Equidae (cranial base) 8.Cervidae/Bovidae (atlas)  
9.Equidae (atlas) 10.Cervidae (lumbar vertebra) 11.Equidae (distal phalanx)

**Fig.146 The animal bones excavated from Avdalai Khyusaa site.**