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New Findings Relating to Bone Processing from Chernyatino-2, Primorye

The article provides a detailed account of faunal materials from the Chernyatino-2 settlement in Russian Primorye. For the first time, a large series of bone blanks from a Bohai (698–926 AD) site is described, enabling us to reconstruct bone-processing techniques and types of tools used, expanding our knowledge of bone-working craft of that region. A detailed classification of bone and antler artifacts of domestic manufacture is presented. Certain artifacts are quite unusual. There are items relating to winter movement and hitherto unknown musical instruments, extending our knowledge of medieval Far Eastern musical culture. Also, we detail the species composition and proportion of domestic and wild animals. Predominant families and genera of fish are listed. The findings are discussed with reference to the role of environment in medieval subsistence strategy.

Keywords: *Chernyatino-2 settlement, Bohai State, bone and antler processing, hunting, fishing*

Introduction

The settlement of Chernyatino-2 is located on the first above-floodplain terrace on the right bank of the Razdolnaya River, 2 km southwest of the village of Chernyatino, Oktyabrsky District, Primorye Territory (Fig. 1). The river terraces rise to a height of 7.0–7.5 m above the water edge. Chernyatino-2 was discovered in 1997 (Nikitin, 1997: No. 43). In the east, the site is delimited by the abrupt bank of the Orlikha River, which gently bends to the west, and 100 m northwards joins the Razdolnaya River. The western border of the settlement is marked by a shallow ravine; in the south, the site reaches the gentle slope of the hill where the fortification site of Chernyatino-3 (Neolithic – Bronze Age – Early Middle Ages) is located. The Early Medieval cemetery of Chernyatino-5 is situated 1.5 km to the west of Chernyatino-2, and the ancient settlement of Sinelnikovo-1 (Neolithic – Bronze Age – Early Iron Age –

Early Middle Ages) 3 km eastwards from it. On the opposite bank of the Razdolnaya, about a dozen other multi-layered sites are located.

Chernyatino-2 stretches along the left bank of the Orlikha for approximately 150 m from northwest to southeast, and along the edge of the first above-floodplain terrace of the Razdolnaya for 250 m from southwest to northeast. Its area is at least 37,000 m². Stationary excavations of the site were carried out from 1998 to 2008 under the leadership of Y.G. Nikitin. A joint Russian-Korean research project was carried out at Chernyatino-2 in 2007–2008 under the agreement on scientific cooperation between the Institute of History, Archaeology and Ethnography of the Far Eastern Branch of the Russian Academy of Sciences, the Korea National University of Cultural Heritage, and the Far Eastern State Technical University. Professor Jung Sukbae took part in the preparation of analytical materials on the study of heating systems (ducts) (Jung Sukbae, Nikitin, 2012).

V.V. Gasilin (Institute of Plant and Animal Ecology, Ural Branch of the Russian Academy of Sciences), Cho Taesop, and Lee Chungmin (Korea National University of Cultural Heritage) carried out identifications of the recovered osteological collections. Most of the artifacts mentioned in the article have been attributed to the Middle and Late Bohai (800–900 AD).

General stratigraphic position and main established features

The total excavation area at the site exceeds 400 m². The study has shown that Chernyatino-2 is a rather complex archaeological site containing several cultural horizons of various thicknesses and states of preservation, belonging to various historical and cultural periods from the Neolithic to the period of the Bohai State (698–926 AD). The total depth of the cultural layer reached 1.8–2.0 m in some areas. The cultural deposits, comprising gray and brown sandy loams of various shades, are underlain by a virgin layer of the light brown alluvial loam. The excavations revealed traces of digging and reconstructions of the Bohai period, which caused disturbances in the stratigraphic sequence in certain sections of the site, showing redeposited layers and artifacts shifted over the cultural layer (Nikitin, 1999: No. 291; *Arkheologicheskkiye issledovaniya...*, 2008: Vol. 1: 27–51; Nikitin, Jung Sukbae, 2009: Vol. 1: 27–28).

The stratigraphic sequence at the settlement included five soil horizons: 1 – turf layer, gray sandy loam; 2 – mixed arable layer below the turf (dark gray and brown loam); 3 – dark brown or dark gray loam; 4 – yellowish-brown, light brown, or grayish-brown loam; 5 – light brown virgin alluvium.

The cultural layers of the Bohai, the Early Iron Age (Krounovka culture), and the Bronze Age have been established at the site. The Bohai has been recorded starting from horizon 2. Many features noted in layers 2–4 have been attributed to the Bohai: dwellings 2 (with kang heating system) and 3, ash pit 3, and all rubbish pits containing Bohai and Mohe ceramics. At the top level of layer 4, the Krounovka cultural horizon was noted; but since the upper part of the layer was significantly destroyed by Bohai pits, the Krounovka features (remains of dwellings, accumulations of plaster, and a pottery kiln) have been clearly recorded only in the lower part of the layer.

Features reliably correlated with the pre-Bohai Mohe were not noted at the site, although typical Mohe ceramics were found in significant quantities, most of them in rubbish pits and ash pits, mixed with fragments of Bohai wheel-made ceramics. Hence, the recovered items belong specifically to the Bohai, the same as all the Mohe vessels found.



Fig. 1. Location of Chernyatino-2.

Over the years of research at the site, an enormous amount of osteological materials has accumulated. The available collections were sorted out and analyzed, which made it possible to move on to systematization and determination of the species and quantitative composition of animals. The classification used was previously developed for the analysis of bone artifacts from the Bohai sites of Primorye (Leshchenko, Boldin, 1990). All available types of blanks were also analyzed. Traceological, photoanalytical, and comparative approaches were used. The digital long-focus USB-microscope Andonstar A1 with $\times 500$ magnification and a 2 MP sensor were used. During the study, the techniques of processing (cuts, saw cuts, holes, underworking angle, and grinding) of working surfaces of blanks or finished products have been traced in detail.

Bone and antler blanks

Four representative series (S) of blanks have been identified.

SI – blanks with a working surface prepared by a one-sided cut at an angle of 45° ($n=74$). This series includes both robust specimens with slightly rounded or slightly pointed working ends, ranging in size from $7.1 \times 0.7 \times 0.2$ to $14.7 \times 3.8 \times 1.0$ cm (Fig. 2, 1, 5–10), and miniature ones, from $4.9 \times 1.8 \times 0.5$ to $6.5 \times 1.6 \times 0.3$ cm (Fig. 2, 2–4). The working edge could be chopped off, sawed off, cut off, but it was always clearly prepared and sharpened.



Fig. 2. Blanks of S I (1–10) and S II (11) categories.

S II – blanks with a working surface cut off at two sides at an angle of 45° – 60° . Specimens with a chopped or trimmed end were identified ($n=31$). Dimensions of the artifacts vary from $4.1 \times 1.8 \times 0.3$ to $12.2 \times 2.2 \times 0.5$ cm (Fig. 2, 11).

S III – plates ($n=46$) with traces of cutting or sawing, varying from $5.4 \times 2.4 \times 0.7$ to $12.8 \times 2.5 \times 2.2$ cm. This series shows a variety of shapes and techniques of surface treatment. It includes straight and long hollow bones, with

traces of cutting; blanks for bow plates, with clear traces of sawing on one of the ends, the upper part was cut obliquely; rectangular plates, evenly sawn at both ends.

S IV – antler blanks ($n=52$). Hunting provided these raw materials for crafts (Fig. 3). The antlers of roe deer, wapiti, and other ungulates were processed. The dimensions of the blanks vary from $6.8 \times 4.8 \times 0.7$ to $15.5 \times 2.3 \times 1.8$ cm. Traces of sawing, knife cutting, and underworking of ends were identified. Many blanks show recesses in the working part of the intended tool.

Each series of blanks is specific both in morphology and manufacturing technique. Semi-finished products are especially important in the identification of bone and antler working techniques (Izyumova, 1949: 16). Preparation of the blank and fashioning it to the finished product are of great importance in the *chaîne opératoire* of manufacturing a bone item. Various operations including chopping, cutting, sawing, drilling, and grinding are carried out at this stage. After that, the product is finished and ornamented (Peters, 1986: 23).

Bone and antler artifacts

Three Bohai dwellings were excavated at Chernyatino-2. In the immediate vicinity of the dwellings, three large rubbish pits were identified; each contained a significant number of animal bones (Fig. 4). In addition, many bones of animals, birds, fish, and mollusk shells (Fig. 4), as well



Fig. 3. Antler blanks.

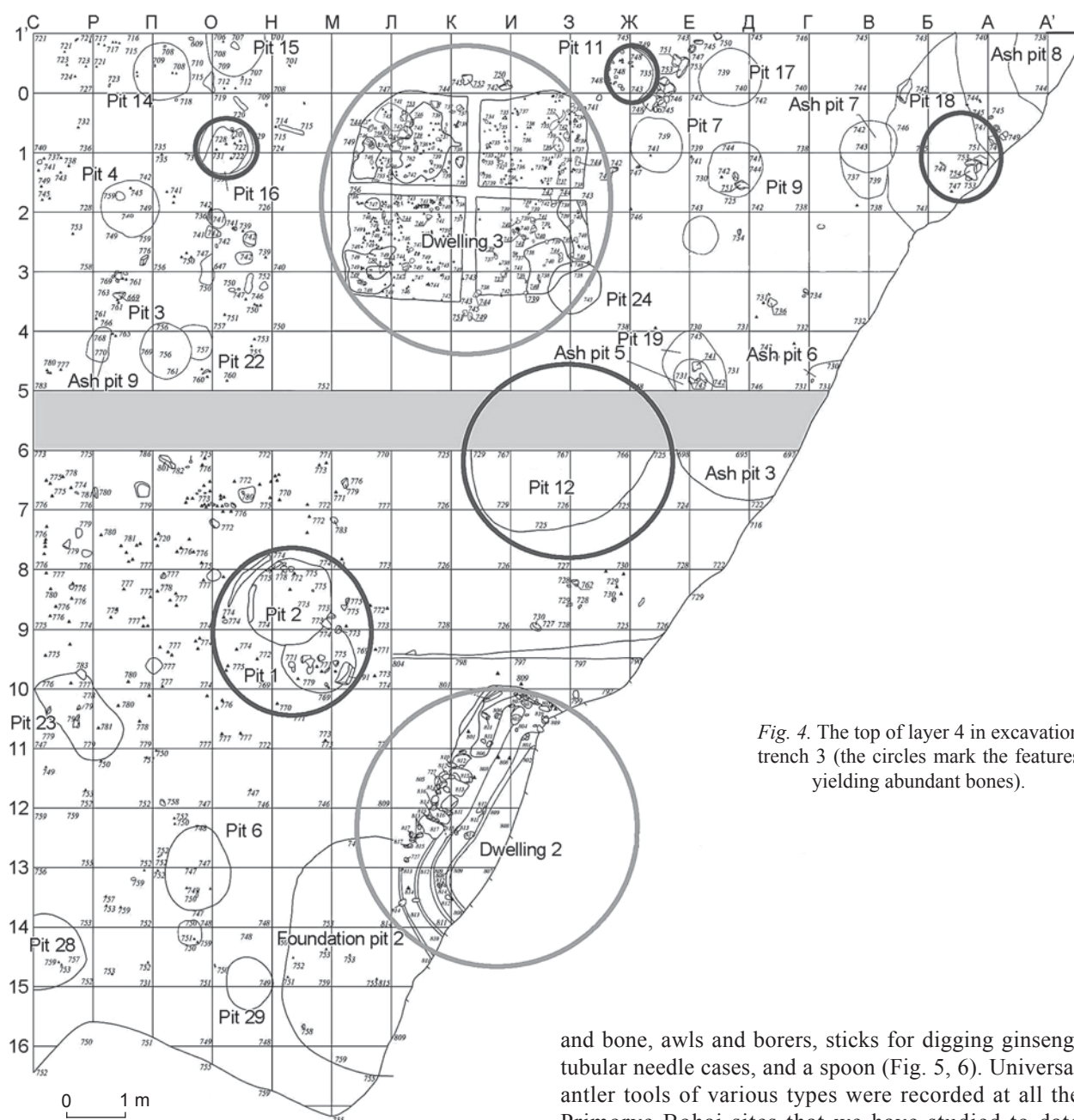


Fig. 4. The top of layer 4 in excavation trench 3 (the circles mark the features yielding abundant bones).

as bone and antler artifacts, were found in the filling of the foundation pit in dwelling 3, with a central hearth and holes from surrounding posts. We have classified the recovered materials into four groups: tools and household utensils; items of combat and hunting equipment; toiletries and ornaments; and items for games and cult. The products were made from various skeletal bones and antlers of domestic and wild animals: cows, sika deer, roe deer, and pig. Antlers, ribs, pelvic and tubular bones were mainly used.

At the site, in dwellings, utility structures, and in the neighborhood area, there were composite and on-laid handles, various universal tools made of antler

and bone, awls and borers, sticks for digging ginseng, tubular needle cases, and a spoon (Fig. 5, 6). Universal antler tools of various types were recorded at all the Primorye Bohai sites that we have studied to date (Fig. 6, 12, 13). One surface of these tools is flat and smoothed, especially at the base, the opposite surface is convex. On the flat surface, there is always a specially made or natural depression with a diameter of 0.9–1.7 cm. The edge of the handle is prepared by a cut; some items have a hanging hole. Particularly carefully made specimens show serrated ends. The lengths of such tools vary in the range of 8.2–22.0 cm. Such tools could have been used to untie knots and to weave rough products. The depression on the flat side made it possible to push something through with a blow from above, and the serrated end, to pull it through. Some tools of this category could also have been used as “flint drills” (Medvedev, 1986: 60, fig. 33, 17).



Fig. 5. Bone and antler items.

1 – handle; 2 – ornamented onlays; 3–5 – awls, borers; 6, 10, 11 – tools; 7, 8 – bow onlays; 9 – sticks for digging ginseng; 12 – pipe.

The collection of bone artifacts from Chernyatino-2 is very typical of Bohai sites in Primorye (Leshchenko, 2010, 2012, 2018). Items of combat and hunting equipment include arrowheads and bow onlays. Residents of the settlement wore various personal ornaments and amulets made of bone and antler. Elements of clothing, belt sets, and household goods were often decorated with ornamented plates and sewn-on discs. Bone was used as a raw material in decorative and applied arts. Chernyatino-2 dwellers produced tools, household utensils, jewelry, musical instruments and even “skates”. The latter are not much different from ordinary winter skates, in terms of use, but are made from a cattle shoulder bone (Fig. 7). The glenoid cavity of the left scapula connecting to the humerus is crushed, and a round hole is cut out on the split part of this bone; the laces could be threaded through this hole to secure the skate to the shoe. The collection

of musical instruments found at medieval sites in Primorye (Leshchenko, Prokopets, 2015) was supplemented by a pipe blank (see Fig. 5, 12). The polished product had recesses for holes, marked and cut with a knife, which subsequently had to be drilled.

Bone-processing techniques

We have collected together all the currently available material related to the processing of bones from Chernyatino-2. The use of a digital long-focus USB microscope with $\times 500$ magnification has made it possible to trace the process of blanks and products manufacture in great detail. The angles of underworking, cutting, sawing, making holes, grinding—all these operations were recorded (Fig. 8). The surface treatment process and sharpening techniques have been identified in detail. For example, S I blanks showed a one-sided sharpening, sawing, cutting, and a rounded or pointed working end; and S II had

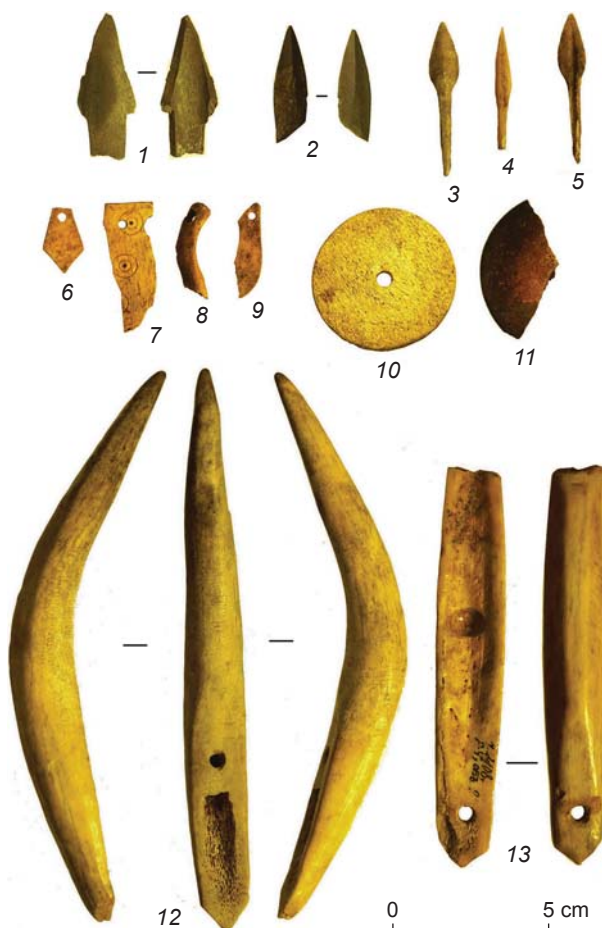


Fig. 6. Bone and antler items.

1–5 – arrowheads; 6–9 – ornamented onlays; 10 – sewn-on disc; 11 – spindle whorl fragment; 12, 13 – universal tools.



Fig. 7. “Skates”.

a double-sided cutting of the working surface, which extended the functions of the intended product. In S III, saw- and knife-cuts of ends at an angle of both 90° and 45° were recorded. In S IV, the working material was ungulate antlers, which were most often used for crafts. In this series, traces of sawing, cutting, making holes and recesses have been recorded. All techniques of surface finishing are confirmed by archaeological finds from the site.

Species and quantitative composition of animals

The assemblage of osteological remains of the site is abundant. In one of the 2007 collections alone, there are 3096 animal bones. This provides reliable grounds to draw conclusions about the species composition of wild and domestic animals. The share of bones of pig, cow, horse and dog exceeds a half of the total amount of bone remains of domestic animals (53.1 %). The highest is the proportion of pig bones (skulls, jaws, vertebrae, ribs, humerus, ulna, radius, femur, ilium, scapula, etc.). The majority of these animals were young, aged 1–2 years. The second-large category is dog bones (skulls, mandibles, fragments of vertebrae,

ribs, etc.); these were found in almost every pit, which suggests a significant role for dogs in the life of the dwellers. A similar situation was noted at the Maiskoye fortified settlement of the Jurchen culture (12th to early 13th century) (Alekseeva, Besednov, Ivliev, 1996; Alekseeva, Gasilin, 2015: 444) in the Khankaisky District of Primorye (ca 115 km northwest of Chernyatino-2). The cow bone remains constitute the third-large category. It includes phalanx bones, fragments of humerus, femur, and vertebrae, including three consecutive cervical vertebrae with obvious marks from an axe or large knife resulting from the head being cut off the body. The smallest share is horse bone remains ($n=7$): tibia, fibula, metacarpal, coronoid bones, teeth, and phalanx bones. The interior surfaces of the phalanx bones show traces of skinning (Cho Taesop, Lee Chungmin, 2008).

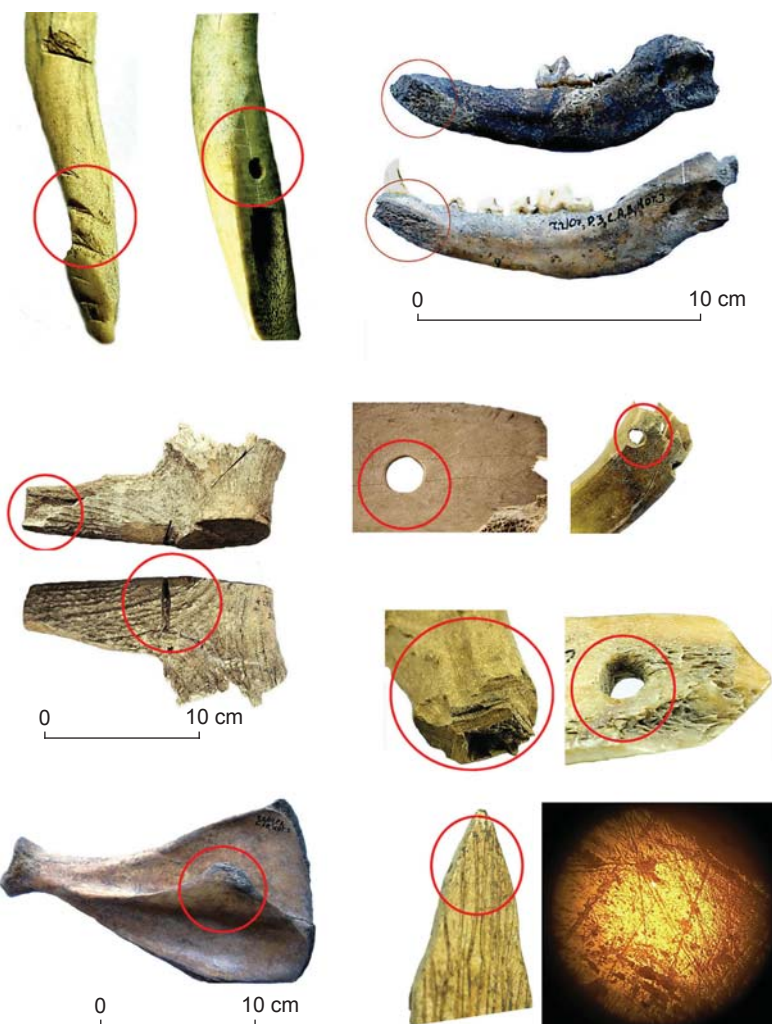


Fig. 8. Traces of processing on artifacts.

Wild animals are represented by 16 species. Such diversity indicates that hunting was one of the leading activities in the subsistence strategy of the settlement's inhabitants. The remains are dominated by bones of red, sika, and roe deer. The category of predators includes bear and weasel; that of the small mammals includes hare. Notably, 11 species of wild animals are classified as land mammals. Four species of birds were identified.

In residential and utility areas, 1403 fish bones were found, which make up 45.3 % of the total amount of bone remains. Typically, the number of fish bones found at Bohai archaeological sites in Primorye is small. This settlement is distinguished not only by their large number, but also by the variety of fish species represented. The location on the Razdolnaya River bank provided excellent opportunities for the development of fishing and shellfish picking (Nikitin, Saenko, Lutaenko, 2016; Nikitin et al., 2019). The most numerous species of fish is skin-carp. In only one pit, the bones belonging to 100 individuals were found.

Conclusions

The settlement of Chernyatino-2 yielded an enormous number of blanks and artifacts made of bone and antler. These were found both in dwellings and in cellars, utility pits, and in courtyard areas. This shows the popularity of bone carving in the settlement. Bone-processing tools found at the site include small files with short serration for longitudinal and transverse dissection of bone, and knives for cutting and scraping. Various whetstones and grinding stones were used for surface refining and sharpening.

The diverse fauna in the vicinity of the settlement created opportunities for the production of various household utensils from hunting waste. Antlers, tubular bones, and animal ribs were used as raw materials. For example, S III blanks are various plates from ribs sawed or cut off in certain places. Such plates could have been used as handles, and smaller ones as onlays. S IV series consists of antler blanks. This fabricating material has a denser structure than bone. Therefore, it was first softened, and then transverse slices were sewn off. Large antler blanks were often used to make universal tools, and smaller round ones to make “whistles”. Among the finished products made of bone and antler, there were a musical instrument and an item relating to the mode of movement in winter time, which are quite rare for the Bohai sites in Primorye.

Osteological collections revealed the composition of domestic and wild animals and the importance of hunting and fishing for the settlement dwellers, who made maximum use of natural resources in their subsistence strategy. Chernyatino-2, along with other early medieval

sites, shows the dependence of the economic activities of population on the location and geographic environment of the settlement.

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