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A Comprehensive Study of Neolithic Stone Tools from Dwelling D on Suchu Island, the Lower Amur (1974, Excavation Area I)

We have analyzed stone tools unearthed in 1974 from the Neolithic dwelling D (excavation area I) on Suchu Island, the Lower Amur. The assemblage includes 1518 artifacts attributed to the Malyshevo, Kondon, and Voznesenovskoye cultures, to the Belkachi complex, and to the Final Neolithic. To identify the raw material, a microscopically guided petrographic analysis was carried out. The most frequently used rocks were sedimentary (siltstone, mudstone, and sandstone) and siliceous (flint, quartzite, chalcedony, and jasper). Also, typological and functional analyses were conducted. The distribution of artifacts on the floor of the dwelling was evaluated by planigraphic analysis, and the functional analysis has allowed us to reconstruct household activities relating to the procurement, processing, and consumption of food resources. A database concerning subsistence activities was generated in order to reconstruct various aspects of the prehistoric economy of the region.

Keywords: *Amur Basin, Neolithic, Suchu Island, stone tools, petrographic analysis, typology, planigraphy, use-wear analysis.*

Introduction

In 1974, archaeological research* was conducted on Suchu Island in its southeastern part, in excavation pit I (Fig. 1). These works became a continuation of the excavations made over the previous two years (Okladnikov, Medvedev, Filatova, 2015; Medvedev, Filatova, 2016) with the main focus on dwelling D, the study of which started in 1973 when its northwestern segment was uncovered (Medvedev, Filatova, 2016: 48–49). In 1974, the dwelling was completely unearthed (Fig. 2, *A*, *B*); it occupied almost the entire southern half of the excavation pit. Excavations of dwelling D were expected to yield very interesting results, primarily due to the fact that among the dugouts and semi-dugouts made on the high places of the island this was the outermost one. The dwelling pit was covered by a thick layer (over 2 m) of humified soil (Okladnikov, 1974: fol. 2); its outer contour was visible on average at a depth of 60–65 cm. The maximum depth of the dwelling pit was 2.2 m from the present-day surface; the outer diameter along the line N–S was 10.2 m, and along the line E–W, the diameter

*The excavations were made by the employees of the Institute of History, Philology, and Philosophy of the Siberian Branch of the Academy of Sciences of the USSR: V.E. Medvedev (the Head of the Unit), A.F. Felinger, N.I. Spiridonov, A.I. Loginov, and five students of the Khabarovsk Pedagogical Institute. General supervision of the work was carried out by A.P. Okladnikov.

Fig. 1. View of excavation I from the southwest (1974). Excavation in dwelling D.

was 12.8 m; the total area inside the outer contour was 130.56 m^2. A representative assemblage of artifacts was obtained from studying this dwelling.

Materials and methods

The materials for the analysis were lithic objects from dwelling D and the space immediately adjacent to the dwelling. Information was obtained from studying the collection kept in the funds of the Institute of Archaeology and Ethnography of SB RAS and from field reports. The lithic inventory was analyzed, relating to the Malyshevo, Kondon, and Voznesenovskoye cultures, as well as the Belkachi cultural and chronological complex of the final Neolithic type.

Archaeological materials were studied using a comprehensive interdisciplinary approach. For determining the lithic raw materials from which the tools were made, petrographic analysis of 42 samples was made in the Laboratory of Physical and Chemical Methods of Research at the Khabarovsk Innovation and Analytical Center (KhIAC) of the Institute of Tectonics and Geophysics of the Far-Eastern Branch of the Russian Academy of Sciences. Transparent sections were made of four samples out of 42, and were investigated using the method of optical microscopy*, with the Imager A2m polarization optical microscope. The type and function of the lithic objects were determined using morpho-typological and functional analysis. Planigraphic analysis was performed to identify the areas of human activity within the boundaries of the dwelling (Volkov, 1999: 105–124; Medvedev, Volkov, 2015).

*Petrographic analysis was performed by Dr. N.V. Berdnikov, the Head of the Laboratory of Physical and Chemical Methods of Research and Director of the KhIAC.

Research results

One thousand five hundred and eighteen lithic artifacts were found both in the filling of the dwelling pit (Fig. 2, *A*) and on the floor of the dwelling (Fig. 2, *B*). All finds can be divided into two groups: the first group includes the artifacts of primary reduction, laminar assemblage, and debitage; the second group includes tools, their fragments, and blanks (Table 1). More than half of the artifacts were concentrated in the lower part of the filling in the dwelling pit, which was quite natural given its depth. The largest part of the finds was debitage (flakes and spalls). The second largest group consisted of tools, including their blanks and debris. In the third place was the laminar assemblage (knife-like blades, laminar flakes, and spalls). The artifacts of primary reduction (cores, core-shaped objects and spalls, pebbles and tablets with flaking scars, split pebbles, and pebbles without the traces of processing) were the least numerous.

Raw materials. Petrographic analysis has shown that different types of rocks were used as raw materials (Table 2). Depending on their origin, all of them can be divided into three groups: 1) sedimentary rocks—sandstone, siltstone (including silicified siltstone), and mudstone (Fig. 3, *1*); 2) siliceous rocks—flint (Fig. 3, *2*, *3*), quartzite, chalcedony, and jasper; 3) igneous rocks—granite (including strongly silicified granite) and gabbro-basalt. Petrified wood also occurred (Fig. 3, *4*).

The selection criteria were the size, shape, color, and nature of the stone's surface. The dominant types of raw materials were siltstone and mudstone, mainly of medium gray, but also of light gray and dark gray colors. Judging by the size of the tools, large-sized pebbles (15–10 cm) and small-sized boulders (25–15 cm) were used (Kulik, Postnov, 2009: 14). Siliceous rocks occur in smaller quantities, mostly in the form of small-sized

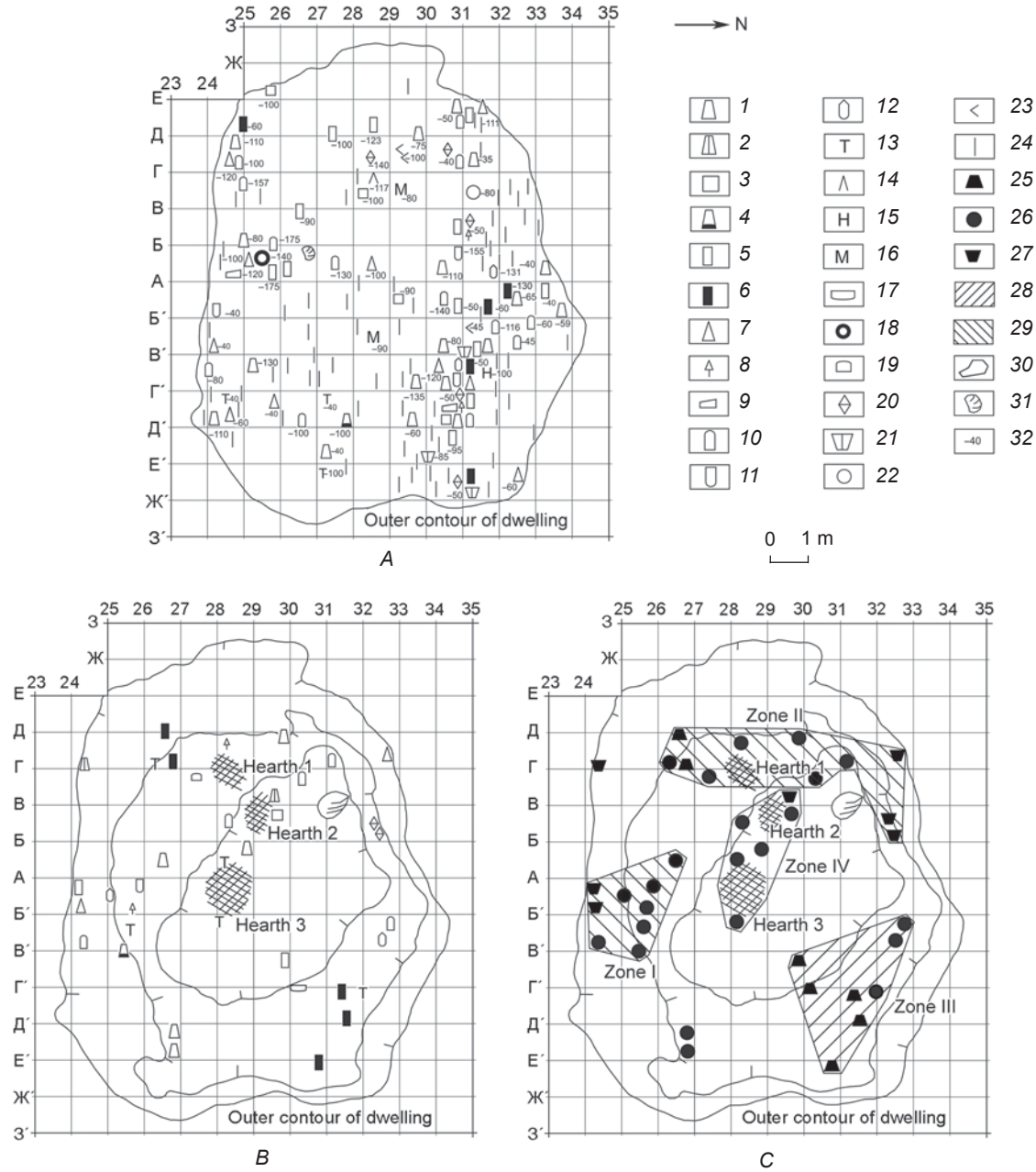

Fig. 2. Plans for the part of excavation I (1974) with finds at the level of the filling (*A*) and floor (*B*) of dwelling D; map showing the distribution of stone tools on the floor of the dwelling and the probable areas of activities carried out by the inhabitants (*C*).

1 – adze; *2* – chopping tool; *3* – axe; *4* – gouge; *5* – knife; *6* – knife-like bladelet; *7* – arrowhead, dart-head; *8* – piercing tool; *9* – saw; *10* – end-scraper; *11* – side-scraper; *12* – end-scraper knife; *13* – whetstone; *14* – polishing tool; *15* – anvil; *16* – hoe; *17* – grinder; *18* – mace; *19* – stone with a cavity; *20* – blank of a tool; *21* – core, core-shaped object; *22* – hammerstone; *23* – core-shaped spall; *24* – flake; *25* – tools for procurement; *26* – tools for processing; *27* – tools for consumption; *28* – area of tools for procurement and processing; *29* – area of tools for processing and consumption; *30* – "hearth" area; *31* – stone; *32* – depth from the present-day surface.

pebbles (10–5 cm) of various colors. Thus, jasper rocks have the shades of red, yellow, brown, and sometimes green; there are also variegated, banded, and spotty rocks. Chalcedony is represented mainly by a colored variety (carnelian). Flint is mostly brown and gray to black; quartzite is white, gray, red, yellow, brown, and their shades. Granite and basalt were used even less frequently (Table 3). Generally, siltstone and mudstone, as well as fine-grained sandstone, were the predominant materials for making tools. Their pebbles as a rule have

Table 1. **Distribution of lithic inventory according to groups and layers (spec.)**

Layer	Artifacts of primary reduction	Debitage	Laminar assemblage	Tools, incl. blanks and fragments	Total
Upper part of the filling	30	368	92	99	589
Lower part of the filling	41	492	127	189	849
Floor	2	35	11	32	80
Total	73	895	230	320	1518

Table 2. **Results of the petrographic analysis of artifacts**

Sample no.	Field record no.	Depth, cm	Rock type	Note
1	2	3	4	5
C-2	Cy-74/1254	50	Flint	
C-3	Cy-74/2610	40	"	Silicified siltstone
C-4	Cy-74/3501	60	Chalcedony	
C-5	Cy-74/4114	60	Flint	"
C-6	Cy-74/4121	60	Quartzite	With biotite
C-7	Cy-74/4311	50	Flint	Silicified siltstone
C-9	Cy-74/5353	50	Chalcedony	Opaline
C-10	Cy-74/5384	50	Flint	
C-11	Cy-74/5387	50	Quartzite	
C-15	Cy-74/6053	50	"	
C-16	Cy-74/6056	50	Chalcedony	
C-17	Cy-74/6993	50	"	
C-18	Cy-74/6995	50	Mudstone	
C-19	Cy-74/6996	50	Flint	
C-20	Cy-74/7009	50	Chalcedony	
C-21	Cy-74/7088	80	Siltstone	
C-23	Cy-74/7170	80	Chalcedony	
C-24	Cy-74/7482	80	"	Carnelian
C-25	Cy-74/7711	80	Quartzite	
C-26	Cy-74/8016	50	Jasper	
C-27	Cy-74/8189	100	Quartzite	
C-28	Cy-74/8352	50	Flint	
C-29	Cy-74/8374	100	Chalcedony	
C-34	Cy-74/9019	100	"	"
C-35	Cy-74/9328	100	Quartzite	
C-37	Cy-74/10178	100	Flint	
C-39	Cy-74/10793	150	Mudstone	
C-40	Cy-74/10833	150	Flint	Crystalline quartz is absent
C-45	Cy-74/11654	140	Jasper	
C-46	Cy-74/12250	140	Flint	Predominantly amorphous iron-stained silica
C-47	Cy-74/12296	140	Chalcedony	
C-48	Cy-74/12439	150	"	
C-49	Cy-74/12532	Floor	Petrified wood	Quartzous layers of wood structure
C-50	Cy-74/12692	175	Mudstone	
C-51	Cy-74/12694	175	Flint	

Table 2 (end)

1	2	3	4	5
C-53	Cy-74/13574	175	Mudstone	Fine-grained, predominantly loamy rock
C-54	Cy-74/13637	175	Flint	
C-55	Cy-74/13642	175	Jasper	
C-57	Cy-74/13958	175	Flint	
C-58	Cy-74/14145	160	Mudstone	
C-59	Cy-74/14352	130	Quartzite	
C-60	Cy-74/14445	Floor	"	

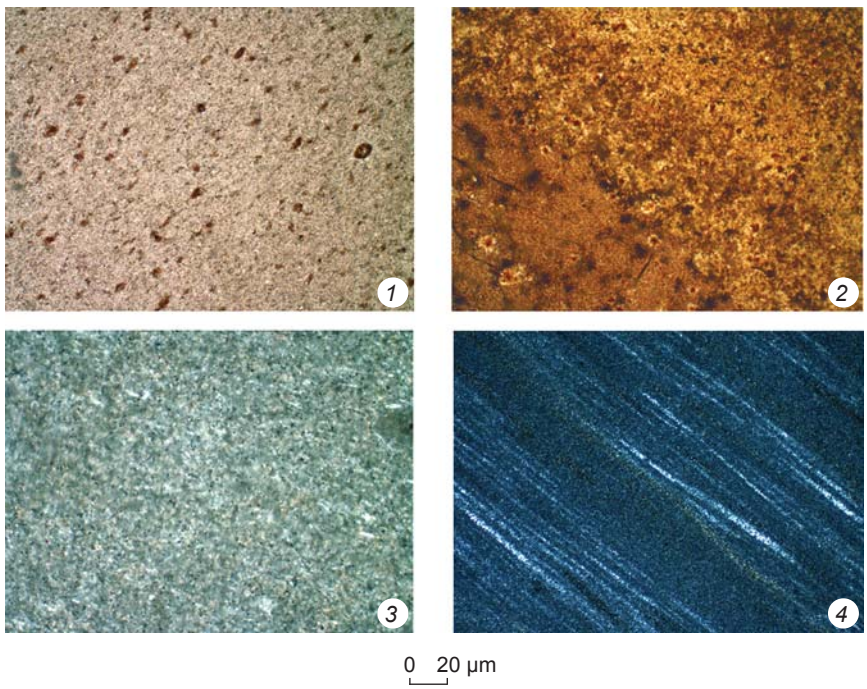

Fig. 3. Photographs of thin sections of lithic artifacts.
1 – mudstone (C-53); *2*, *3* – flint (2 – C-40; 3 – C-46); *4* – petrified wood (P-49).

Table 3. **Correlation between the types of rock and lithic inventory, %**

Name	Artifacts of primary reduction	Debitage	Laminar assemblage	Tools, incl. blanks and fragments	Total
Siltstone	1.4	40.1	9.7	11.9	63.1
Mudstone	0.1	2.2	0.7	0.5	3.5
Basalt	0	0.1	0	0	0.1
Granite	0	0.1	0	0.2	0.3
Quartzite	0.3	3.2	0.5	1.0	5.0
Flint	0.8	7.2	2.8	3.1	13.9
Petrified wood	0	0	0.1	0.1	0.2
Sandstone	0.3	0.9	0.1	1.0	2.3
Chalcedony	0.4	1.2	0.2	0.3	2.1
Jasper	1.5	4.0	1.0	3.0	9.5
Total	4.8	59.0	15.1	21.1	100

a fairly homogeneous structure and bar-like shapes convenient for processing.

The correlation between the petrographic composition of the raw material and the types of tools makes it possible to divide the rocks used for production into three groups: 1) universal raw materials (sedimentary rocks), which were equally often used for making different tools and optimally combined consumer properties and accessibility; 2) specialized (igneous rocks), which were suitable for producing tools only of certain types due to their technical qualities, and 3) highly specialized (siliceous rocks), which were used for producing tools only of a few types, since the production and operation of these tools had increased requirements for consumer properties of the raw materials.

Thus, the results of petrographic analysis of the lithic industry testify to selection of raw materials. The specific nature of the area in terms of procuring raw materials certainly compelled the ancient population of the island to adapt to local conditions. It was necessary to carefully select particular types of rocks that had the set of properties satisfying the technical requirements for producing specific tools and for subsequent performance of the needed functions by the tools.

Primary reduction. The artifacts of primary reduction (cores, core-shaped objects and spalls, pebbles and tablets with flaking scars, split pebbles, and pebbles without the traces of processing), the laminar assemblage (knife-like bladelets, laminar flakes and spalls), and debitage (flakes and spalls) amount to 1198 objects. Sixteen cores (Fig. 4, *1–4*) and four core-shaped objects were identified. Siliceous (including chalcedony and quartz) stones, as well as siltstone pebbles, were used mainly as cores. Cores with single platforms and one core with double platforms have been found. The platforms are even and are usually formed with one strike, sometimes against the natural pebble surface. In terms of shape, most cores are wedge-shaped (12 spec.), less often subprismatic (4 spec.). Their average dimensions are from 3.6 × 2.3 × 1.6 to 6.2 × 3.0 × 1.3 cm (13 spec.); the minimum size is 2.2 × 1.7 × 0.7 cm; the maximum size is 10.2 × 7.3 × 5.8 cm. Some core-shaped spalls (23 spec.), pebbles (18 spec.) and tablets (2 spec.) with flaking scars also occur, as well as split pebbles (2 spec.) and pebbles without the traces of processing (6 spec.).

The blade assemblage includes knife-like bladelets (35 spec.) and their fragments (5 spec.), as well as laminar flakes (80 spec.) and spalls (110 spec.). Dihedral and trihedral blades (Fig. 4, *5–12*) were found with even edges, with uneven edges, and with the irregular faceting of very large (over 5 cm), large (up to 5 cm), and medium (up to 4 cm) size. The maximum size is 6.5 × 2.4 × × 0.4 cm; the minimum size is 2.0 × 0.6 × 0.1 cm. Retouched knife-like bladelets (3 spec.) also occurred. Laminar flakes and blanks are mostly of irregular shape. Notches occur on many of them (45 spec.); some show traces of use (7 spec.) and retouching (8 spec.). Grouping according to size includes massive (over 10 cm), very large (up to 10 cm), large (up to 5 cm), medium (up to 4 cm), and small (less than 2 cm) objects.

Flakes (196 spec.) are mostly of medium size (not more than 4 cm), but there are also large, very large, and massive flakes. The minimum sizes are 1.7 × 2.1 × × 0.3 cm; the maximum sizes are 12.2 × 8.0 × 1.4 cm. A fairly large number of flakes have notches (38 spec.); some show traces of use (3 spec.) and retouching (3 spec.). Secondary frontal spalls dominate among the

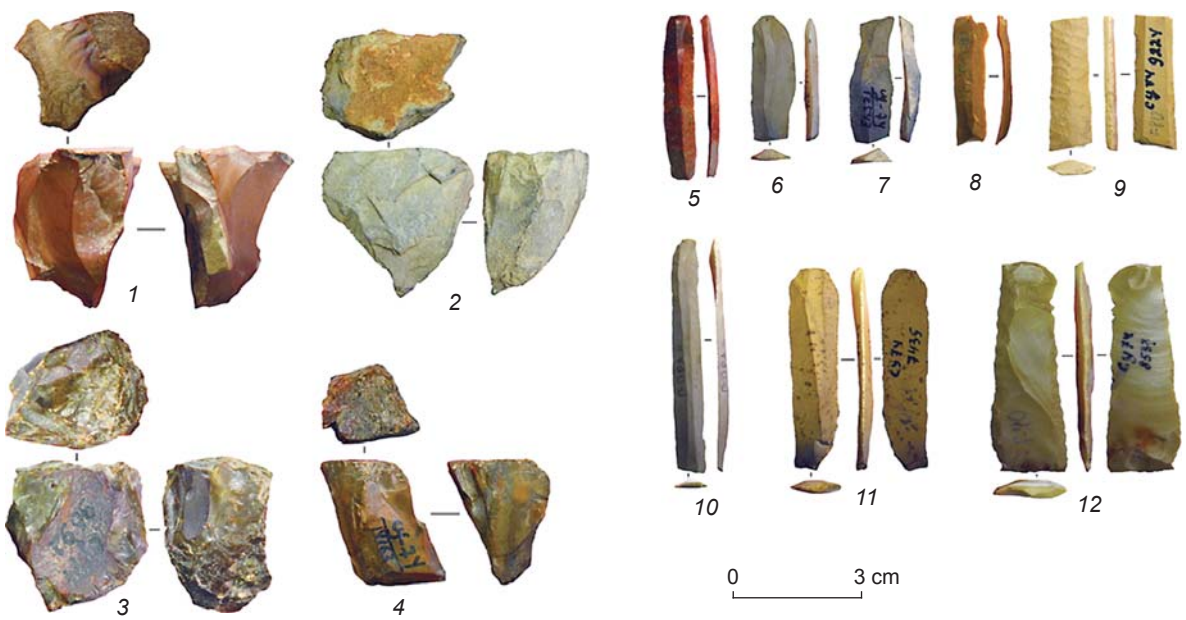

Fig. 4. Cores (*1–4*) and knife-like bladelets (*5–12*).

entire assemblage of spalls (699 spec.), but there are some primary technical spalls (173 spec.) preserving the areas of the natural surface. The presence of notches (51 spec.), traces of use (4 spec.) and retouching (11 spec.) have been observed. The size range varies from very large and large to medium and small; there are also quite massive spalls. The maximum sizes are 12.3 × 3.8 × 1.5 cm; the minimum sizes are 1.5 × 1.3 × 0.2 cm.

Thus, as we have already noted above, debitage makes up the largest group, and the blade assemblage is the third largest. This makes it possible to conclude that the pebble tradition dominated.

Tools. According to the results of the morpho-typological and functional analyses, stone tools (223 spec.), their fragments (78 spec.), and blanks (19 spec.) have been combined into three polymorphic groups on the basis of their assumed functional purpose (Table 4). The first category includes tools for procurement; the second category includes tools for processing, and the third category includes tools used for food consumption (Volkov, 1999: 80–81). Stone tools of the first category, associated with procurement of wild animals, fowl, fish, and various materials, were divided into five groups.

Table 4. **Typological list of stone tools (spec.)**

Category	Group	Functional type	Number
I. Tools for procurement and harvesting	1. Hunting tools	Arrowheads	24
		Dart-heads	10
		Specialized butcher-knives	10
	2. Fishing tools	“Fish” butcher-knives	9
		Mace head (weight for a fishing net?)	1
	3. Tools for procuring stone	Hammerstone	1
		Percussion tools	3
	4. Tools for harvesting wood	Chopping tools	16
	5. Tools for digging	Hoes	2
II. Tools for processing	1. Tools for processing stone	Retoucher	1
		Hammerstone-anvil	1
		Percussion tools-anvils	2
		Abraders	12
		Stand for bow-drilling (stone with a cavity)	1
	2. Woodworking tools	Axes	16
		Adzes	52
		Chisels	4
		Gouges	3
		Cutter	1
		Burin-drill	1
		Planing-knives	2
		Saws	4
	3. Skin/leather processing tools	Side-scrapers	12
		End-scrapers	67
		Scrapers-knives	10
		Scrapers-piercing tools	7
		Piercing tools	16
		Polishing tools	4
	4. Tools for processing grains	Pestles	2
		Grinder	1
III. Tools for consumption	1. Tools for meat and fish consumption	Knives for eating meat and fish	17
		All-purpose “meat” knives	8

Hunting tools (44 spec.) include arrowheads (19 intact, 4 fragments, and a blank), dart-heads (5 intact and 5 fragments), and specialized butcher-knives (5 intact and 5 fragments), made of siliceous rocks and siltstone. Arrowheads (Fig. 5, *1–5*) belong to three types. The first type is a leaf-shaped object with a straight base (subtype 1) or a base slightly protruding in the form of a tang (subtype 2); the second type is an elongated triangular object with a straight (subtype 1) or notched (subtype 2) base; the third type is an elongated diamond-shaped object with a slightly protruding tang. Bifaced tools were formed with continuous two-sided wavy retouching over the entire surface, and edge retouching for sharpening around the perimeter. Lateral edges and the tips on the points made on laminar blanks and flakes, and knife-like bladelets underwent marginal retouching for sharpening. The length of the objects varies from 2 to 5 cm and on average is 2.5–4.5 cm.

Dart-heads (Fig. 5, *6*) also belong to three types. The first type consists of leaf-shaped objects with a straight base (subtype 1) or a base slightly protruding in the form of a tang (subtype 2); the second type consists of elongated-triangular objects with a straight base; the third type consists of elongated-diamond-shaped objects with a slightly protruding tang. The surfaces of bifaces are treated by flattening retouching; the tip and edges along the perimeter are treated by bilateral edge retouching for sharpening. The lateral edges and tips of the objects made on knife-like bladelets were also sharpened by edge retouching. The length of the dart-heads varies from 5.5 to 9.5 cm.

Knives (Fig. 5, *7*) belong to two types. The first type was made of pebbles (bifaces); the second type—of flakes, laminar flakes, and spalls. Knives of both types are of asymmetric semilunar, leaf-shaped or elongated-subtriangular shape in plan view with a pronounced handle. Double-sided retouching for flattening fully covers the bifaced tools; around the perimeter they were additionally sharpened by double-sided edge retouching. The blade and tip, and more rarely the lateral sides of the knives made of flakes and spalls, were sharpened with edge retouching; the ventral surface shows traces of the shock wave. The length of the objects varies from 7.5 to 13.0 cm.

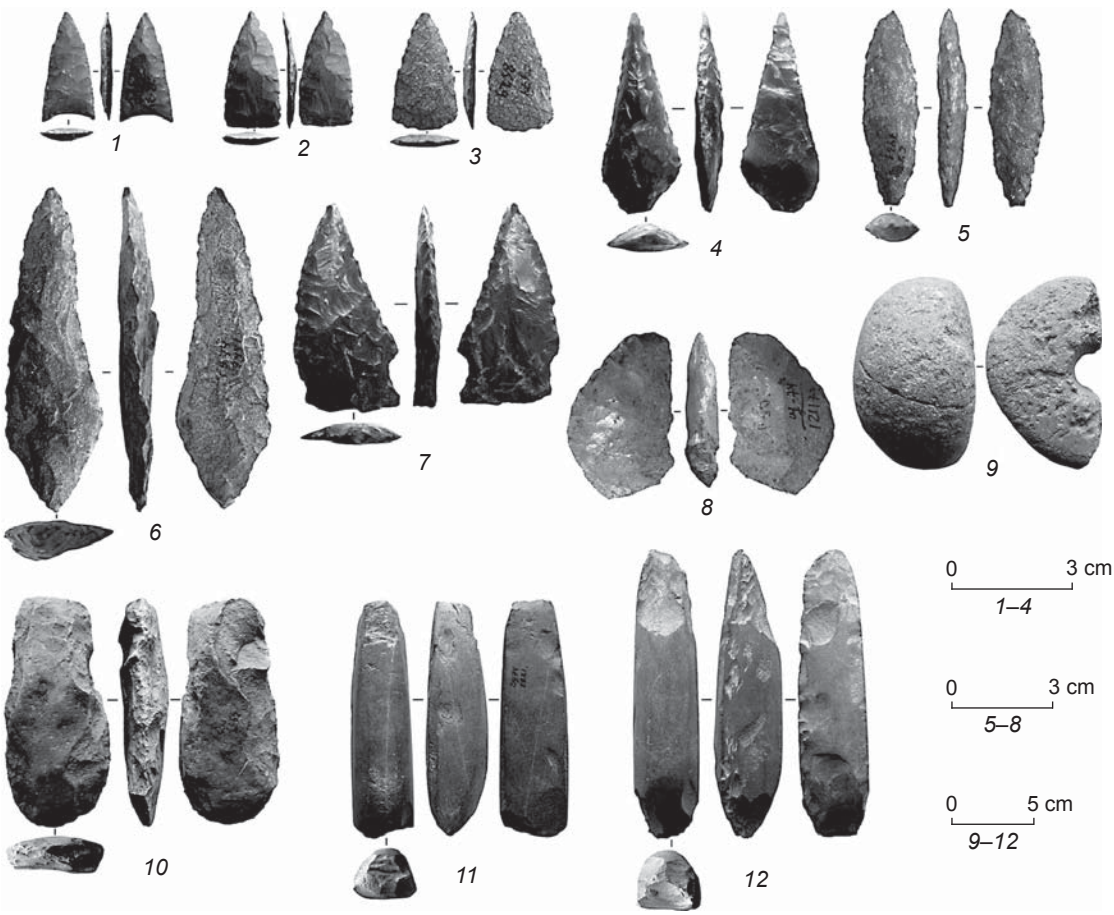

Fig. 5. Tools for procurement.
1–6 – arrowheads (*1–5*) and a dart-head (*6*); *7*, *8* – specialized butcher-knives for meat (*7*) and fish (*8*); *9* – fragment of mace head; *10* – hoe; *11* – percussion tool; *12* – chopping tool.

Fishing tools (10 spec.) include fish butcher-knives (6 intact, a fragment, and two blanks), mace head (weight for a fishing net?). "Fish" knives are of distinctive asymmetric elongated subtriangular or sub-trapezoidal ("curved") shape in plan (Fig. 5, *8*); they were made of siliceous and siltstone flakes and blanks, including laminar blanks. The blanks were additionally treated on the dorsal surface and the cutting edge, sometimes by a wavy retouching for flattening on the dorsal surface. Along the perimeter, the blade was sharpened by edge retouching. The length of the objects varies from 3.0 to 7.5 cm; the average length is 5.0–5.5 cm. The mace head (the weight for the fishing net?) was made of a granite stone. One half of an object of round shape in plan view has been preserved measuring 12.2 × 6.5 × 5.2 cm (Fig. 5, *9*). Its original measurements presumably were 12.3 × 11.0 × 6.5 cm; the size of the hole is 2 × 6 cm. The surfaces are smoothened and polished. Dents are present on one wide side of the object.

Tools for procuring stone (4 spec.), including percussion tools (3 spec.) and a hammerstone (a fragment) were made of siltstone and sandstone pebbles and tablets. Percussion tools (Fig. 5, *11*) are of elongated subrectangular shape in plan view; they were made by direct percussion and polishing; the butts were sharpened by knapping. Side surfaces in one object (10.5 × 7.8 × × 3.9 cm) were trimmed by knapping for attachment; the cutting edge on the dorsal surface was sharpened asymmetrically. Two other tools (12.5 × 6.5 × 2.5 and 15.8 × 4.5 × 4.1 cm) have rounded cutting edges; the working edges were removed by knapping. The hammerstone is rectangular in shape and is suboval in cross-section. Both of its ends were broken off; dents are present on the sides. Its size is 6.1 × 2.4 × 2.0 cm.

Tools for harvesting wood (15 spec.) include chopping tools (3 intact, 12 fragments, and a blank) of two types (Fig. 5, *12*). The first type consists of elongated, suboval objects in plan view, which are semicircular in cross-section. The second type consists of rectangular objects in plan view which are rectangular (subtype 1), semicircular (subtype 2), or triangular (subtype 3) in cross-section. They were made by direct percussion and polishing. The butts were treated by knapping; the cutting edges are symmetrically sharpened and often show traces of wear. The raw material was siltstone and mudstone, in rare cases siliceous rock. The length of the tools varies from 11 to 20 cm, and on average is 12.5–15.5 cm.

Tools for digging (2 spec.) are hoes (Fig. 5, *10*) made by direct percussion of flat siltstone and argillaceous pebbles of oval and elongated sub-trapezoidal shape in plan view, which are of flattened lenticular shape in cross-section. All surfaces show spalling originated from modeling the form, and negative scars; the sides have recesses for attachment. The cutting edges are asymmetrically sharpened and show traces of wear. The sizes of the tools are 6.7 × 4.6 × 1.7 and 14.2 × 5.5 × 3.9 cm.

Thus, most of the tools for procurement are associated with economical activities intended for life support. Fishing tools are few in number. In addition, there were almost no weights, which may probably be explained by keeping the weights directly at the places of fishing on the riverbank.

Tools of the second category, associated with processing of various materials, were divided into four groups.

Tools for processing stone (17 spec.) include a retoucher, a hammerstone-anvil, percussion tools-anvils (2 spec.), abraders (9 intact and 3 fragments), and a stand for bow-drilling (a stone with a cavity). The retoucher (Fig. 6, *1*) of siltstone pebble has a rectangular shape with rounded corners in both plan view and cross-section. The working end shows the traces of wear and is abraded. Its size is 6.8 × 1.8 × 1.8 cm. Hammerstone-anvil is a sandstone pebble measuring 8.4 × 5.8 × 3.8 cm. Anvils-percussion tools (Fig. 6, *16*) are siltstone pebbles of sub-rectangular shape in plan view and cross-section. Dents, holes, and traces of repeated striking appear on their surfaces. Their sizes are 7.0 × 5.0 × 3.8 and 11.0 × 4.9 × × 2.9 cm. Grindstones (Fig. 6, *17*) of sandstone tablets from 5.7 to 35.0 cm long have traces of honing and sharpening of tools in the form of grooves on the flat surfaces and polishing on the side. A stand for bow-drilling is a spherical boulder with a diameter of 19.9 cm with three holes (in the center) on the top and a flat underside.

Woodworking tools (83 spec.) include axes (5 intact, 10 fragments, and a blank), adzes (28 intact, 22 fragments, and two blanks), chisels (4 spec.), gouges (one intact and two fragments), a cutter, burin-drill, planing-knives (2 spec.), and saws (3 intact and a fragment). The axes (Fig. 6, *19*) are similar in their characteristics to the tools for harvesting wood, but differ in length, measuring on average 8–10 cm. According to the processing technique, adzes (Fig. 6, *20*) can be divided into tools formed only by direct percussion or direct percussion with the subsequent polishing of the entire surface. Two types can be distinguished in terms of shape. The first type includes tools, elongated sub-rectangular in plan view, including sub-rectangular (subtype 1), sub-trapezoid (subtype 2), and semicircular (subtype 3) in cross-section, and elongated sub-trapezoid in plan view, including sub-rectangular (subtype 1) and lenticular (subtype 2) in cross-section. The cutting edges are rounded or straight, with asymmetrical sharpening. The length of the adzes varies from 5.5 to 11.5 cm; the average length is 9–10 cm. The adzes were made of siltstone, mudstone, and siliceous rocks.

Chisels (Fig. 6, *7*) and gouges (Fig. 6, *2*) are elongated sub-trapezoid in plan view, with carefully polished surfaces and sharpened lateral facets. The cutting edges are sharpened asymmetrically and can show notches and indentations; gouges may have a distinctive notch. The

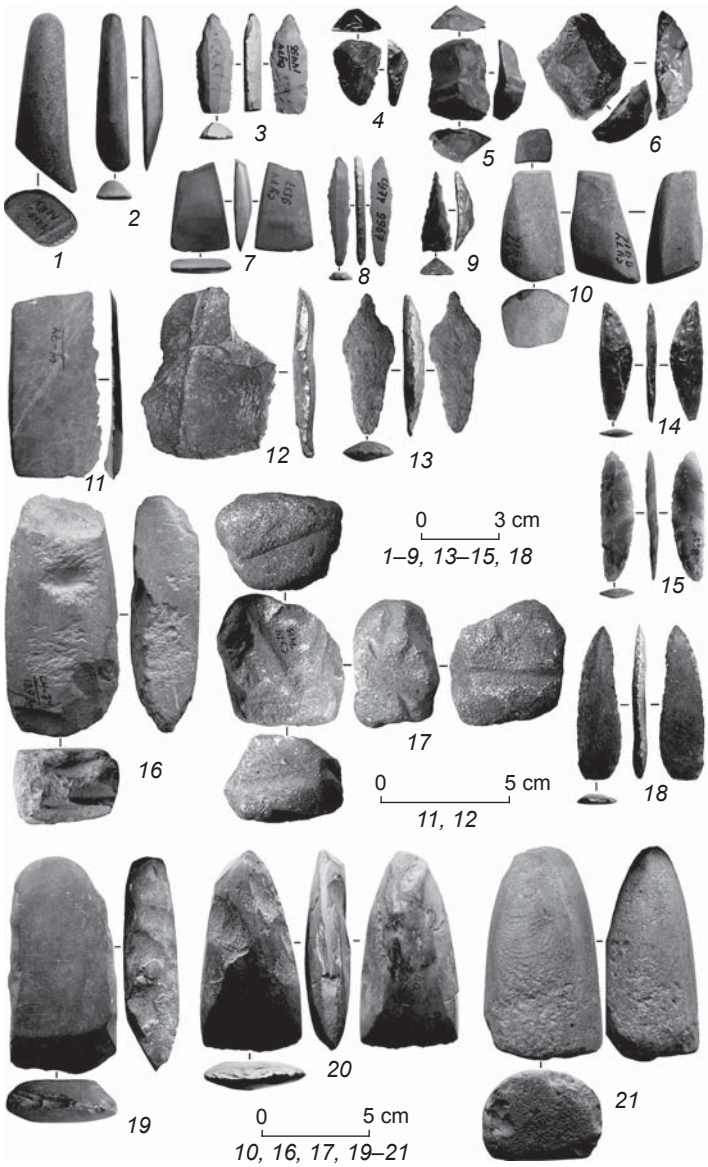

Fig. 6. Tools for processing and consumption.
1 – retoucher; *2* – gouge; *3*, *8*, *9, 13* – piercing tools; *4–6* – end-scrapers; *7* – chisel; *10* – polishing tool; *11* – saw; *12* – side-scraper; *14*, *15* – all-purpose meat knives; *16* – anvil-percussion tool; *17* – abrader; *18* – knife for meat and fish consumption; *19* – axe; *20* – adze; *21* – pestle.

length of the chisels varies from 3 to 5 cm; the length of the gouges reaches 6 cm. The raw material was siltstone and siliceous rocks. The cutter is rectangular in plan view with a sharpened working edge. The burin-drill has a diamond-like shape in plan view, with a distinctive point, and the opposite working edge retouched by discontinuous edge removals. Miniature jasper pebbles 3.4 × 1.6 × 0.5 and 4.6 × 4.2 × 0.8 cm in size served as raw materials for these tools. Saws (Fig. 6, *11*) were made of siltstone laminar flakes and a knife-like blade. They are sub-rectangular in plan view with the length varying from 5.0 to 9.5 cm. The teeth on the blades were formed with special spalls. Planing-knives were made of quartz flake (3.0 × 2.4 × 0.5 cm) and siliceous laminar spall (4.7 × 1.5 × 0.6 cm); they are sub-triangular and sub-rectangular in plan view with recesses on the lateral sides.

It should be noted that the cutter, burin-drill, saws, and planing-knives might have also been associated with the processing of bone and horn. Trace analysis is needed for a more accurate definition.

Skin/leather processing tools (116 spec.) include side-scrapers (12 spec.), end-scrapers (53 intact, 4 fragments, and 10 blanks), scraper-knives (10 spec.), scraper-piercing tools (7 spec.), piercing tools (14 intact, a fragment, and a blank), and polishing tools (4 spec.). The latter were made of sandstone and siltstone; the rest of the tools were made of siltstone and mudstone, as well as siliceous rocks. Side-scrapers (Fig. 6, *12*) were made on very large (5.1–8.8 cm long) flakes and spalls (including laminar flakes) of square, diamond-like, rectangular, and sub-trapezoid shape in plan view. The lateral sides are treated with knapping; the blades are treated with uni- or bilateral continuous or intermittent edge retouching. Scrapers (Fig. 6, *4–6*) are represented by end-scrapers (predominantly), side-scrapers, with one or two terminal and lateral cutting edges, or of various types with two working ends. Most of them were made of pebbles, but there are some made of flakes and spalls, including laminar spalls and a knife-like blade. Virtually all of them are treated at the cutting edge by dorsal edge retouching, sometimes quite steep (45°), and measure from 2.2 × 1.6 × 0.7 to 7.1 × × 2.7 × 0.7 cm; the average length is 2.5–4.5 cm. Combined scraper-piercing tools and scraper-knives also occur. Piercing tools (Fig. 6, *3*, *8*, *9*, *13*) belong to four types, and include those close to angular, angular, shouldered, and objects with a "beak". They were made of pebbles, flakes, laminar spalls, and knife-like bladelets, and vary in size from 2.1 to 6.7 cm, on average from 3 to 5 cm. Polishing tools (Fig. 6, *10*) of square, rectangular, and sub-trapezoid shapes in plan view are rectangular in cross-section. All surfaces could serve as working surfaces; they are brushed, polished, and glossed. The size of the tools varies from 3.5 × 3.2 × 1.7 to 6.8 × 1.8 × 1.8 cm, but there is a relatively large tool (17.8 × 3.4 × 1.3 cm).

Tools for processing grains (3 spec.) include pestles (one intact and a fragment) and a grinder. Pestles (Fig. 6, *21*) were made of siltstone; the grinder was made of fine-grained sandstone. The working edges are flat and show traces of abrading. The intact pestle measures 9.8 × × 5.5 × 3.9 cm; the fragment measures 6.8 × 5.7 × 3.4 cm.

As we can see, the second category is dominated by tools associated with processing of skins / leather, which is not accidental given the general focus of economic activities pursued by the inhabitants of the dwelling on hunting and fishing. It is possible that not only the skins of animals were treated, but also the skins of fish.

The third category includes tools for consumption and consists of one group.

Tools for meat and fish consumption (25 spec.) include knives for eating meat and fish (12 intact and 5 fragments), and all-purpose knives (6 intact, a fragment, and a blank). They differ from the "meat" butcher-knives described above primarily by their sizes. Knives for consumption (Fig. 6, *18*) were made of flakes, laminar flakes, and spalls; their length varies from 3.0 to 5.3 cm. All-purpose "meat" knives (Fig. 6, *14*, *15*) are bifaces ranging from 5.5 to 6.2 cm in length. Cutting tools also include knife-like blades as well as laminar flakes and spalls with typical notches and traces of wear.

Thus, just as the first two categories, the tools are associated with products of hunting and fishing.

In general, the morpho-typological and functional analyses of stone implements have shown both the presence of artifacts resulting from primary splitting, and tools in the settlement complex. Those associated with processing of various materials (219 spec.) dominate among the tools. There were fewer tools intended for procurement (76 spec.) and consumption (25 spec.). Nevertheless, their presence testifies to the comprehensive nature of the economical activities pursued by the inhabitants of the dwelling, who were primarily focused on hunting and fishing.

In terms of cultural and chronological attribution of the lithic inventory, the pebble tradition of tool production is correlated mainly with the Malyshevo and Voznesenovskoye cultures, while the laminar tradition with the Kondon and Belkachi complex. Accordingly, the bifaces most likely belong to the "Malyshevo" population; polished adzes, gouges, and chisels belong to the "Voznesenovskoye" population, while the laminar complex belongs to the "Kondon" and "Belkachi" population.

Planigraphic analysis of the dwelling has made it possible to establish some regularities in the distribution of lithic artifacts (30 tools, including fragments and blanks, and 5 knife-like bladelets on the level of the floor) (see Fig. 2, *B*). The size of the horizontal ground where hearths and assemblages of artifacts were located, that is, the floor of the dwelling, was 6.5 × 5.5 m. The entire remaining internal space from the even part of the floor to the external contours was taken up by wide ledges, which were particularly distinctive in the southwestern and western parts of the dwelling pit.

Four areas of the artifacts clustering have been identified (see Fig. 2, *C*). Three of them are associated with ledges of the dwelling pit and the adjoining parts of the dwelling floor: the southern (I – grid 24–26 / Г′–А), west-northwestern (II – grid 26–32 / Б–Д), and northeastern (III – grid 29–32 / В′–Ж′) areas. One more area can be called "the hearth area" (IV – grid 27–29 / В–В′), since the tools in this area were concentrated around hearths 2 and 3. The west-northwestern area was the largest; it included hearth 1 and was located next to the "hearth area" almost joining it. The southern area was also not very far from hearths 2, 3, while the northeastern area was located at some distance; the distance from its boundary to the nearest hearth 3 was not less than 1.5 m.

Tools for procuring and processing meat (two arrowheads and a blank of an arrowhead, two knife-like blades, a knife, and a blank of a knife), stone processing (a grinding slab and whetstone, a stand for bow-drilling), wood processing (two adzes and a gouge), as well as skin and leather production (a side-scraper, three end-scrapers, a scraper-knife, and two piercing tools), were concentrated in relatively large numbers in the southern and western-northwestern areas. A huge boulder-"seat" was also located in the western-northwestern area (Okladnikov, 1974: fol. 15). Tools for processing stone (whetstone), skins and leather (side-scraper and end-scraper-piercing tool), grains (grinder), and for consuming meat (knife and three knife-like blades) were concentrated in the northeastern area. The area of the hearth contained only tools for processing various materials: stone (two whetstones), wood (two adzes and an axe), and skins (end-scraper). Three more tools associated with wood procuring (grid 24/Г) and processing (grid 26/Е′), were located outside the above mentioned areas.

Thus, the location of the lithic inventory makes it possible to conclude that ledge-beds were most comfortable for working and resting inside the dwelling. The concentration of the tools associated with processing various materials near the hearth is completely justifiable from a functional point of view. A cumulative analysis of tool distribution makes it possible to draw some conclusions regarding the spatial differentiation of internal space in the dwelling. There were two "working" areas (south and west-northwest) and one area (northeastern) primarily associated with food consumption. In conclusion, we should note that our analysis may serve as a basis for comprehensive planigraphic reconstruction of specific activities carried out by the inhabitants of the settlement on Suchu Island.

Discussion and conclusions

This study has established that sedimentary and siliceous rocks were the main raw materials for the inhabitants of dwelling D. The former included siltstone, mudstone, and

sandstone; the latter—flint, quartzite, chalcedony, and jasper. The tool set clearly indicates the comprehensive nature of the economy, primarily oriented at hunting and fishing. Tools for hunting, fishing, and processing the procured animals, fowl, and fish have been found, as were tools for processing stone, wood, bone and horn, skin and leather, and tools which in some way were associated with processing the products of gathering and cultivation of land. All this makes it possible to conclude that by the 4th millennium BC, the Neolithic population of Suchu Island represented the economic and cultural type of hunters of taiga animals, fishermen, and gatherers, typical of the inhabitants of the valleys of large rivers.

The planigraphic analysis has shown that specific areas of activities of ancient inhabitants, associated mainly with processing and consumption of food, can be identified within the boundaries of the dwelling. The number and nature of the lithic inventory, as well as the overall structural features, make it possible to determine that this was a long-term winter dwelling.

We should note that dwelling D is not unique. Our later excavations on the island revealed dwellings (24 and 26) of the Malyshevo culture, somewhat similar in size, structure, and arrangement, but to a greater extent similar in the composition of the lithic inventory (Derevianko et al., 2000: 198–200; 2002: 178–181, 253–254). They also contained tools for hunting and fishing, procuring stone and wood, as well as processing various materials and food consumption (Derevianko et al., 2000: 178–181, 193–198; 2002: 253). The main raw material was siltstone; less frequently, siliceous rocks were used.

Concerning the internal arrangement of the dwellings, we should note the following feature. Although special ledges that could serve as beds were observed in the pit of dwelling 26 only in individual locations, three hearths were found on the floor of this dwelling, just as in dwelling D: two in the center and one on the side. A grinding slab was discovered next to the largest hearth (Derevianko et al., 2002: 253). On the contrary, ledge-beds in dwelling 24 were found practically along the entire inner perimeter of the dwelling pit. The hearth was missing in the center, but it was found directly at the eastern wall, or even on the ledge (Derevianko et al., 2000: 198–200). In dwelling D, one of the hearths (1) was also located on the ledge of the dwelling pit.

A date from the sample of charcoal found in the pit in the floor (5870 ± 45 BP) was obtained for dwelling 26 (Derevianko et al., 2002: 356). This date is close to the date of dwelling D (5830 ± 69 BP) (Medvedev, Filatova, 2016: 58–59). Dwelling 24 is slightly earlier (6070 ± 90 BP) (Derevianko et al., 2000: 203). Thus, the time when the dwelling complexes functioned was the late 5th to early 4th millennium BC.

The main result of the study was the creation of a database for the economic orientation of the ancient Neolithic population living on Suchu Island and in the entire Lower Amur Region for the subsequent reconstruction of the regional paleoeconomy.

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