THE TRANSFORMATION OF LITHIC TECHNOLOGY IN RIVERINE ADAPTATIONS FROM THE LATE PLEISTOCENE TO THE EARLY HOLOCENE IN THE RUSSIAN FAR EAST

Nina A. Kononenko
Institute of History, Archaeology and Ethnography
of the Peoples of the Russian Far East
Far Eastern Division of the Russian Academy of Sciences
89 Pushkinskaya St., Vladivostok, 690600, Russia

ABSTRACT

The Pleistocene-Holocene transition was associated with major ecological changes. The instability of the climatic situation caused alterations in the richness and diversity of regional fauna. This induced a pre-crisis situation for paleolithic hunters. The pressures on paleolithic populations within riverine environments forced a choice of either adaptational change or migration. Within the Primorye region of the Russian Far East, the archaeological evidence reflects a choice of gradual transformation from that of large game hunting to that of more intensive exploitation of small game and seasonal salmon fishing within specific river valleys. This transition is reflected in the lithic assemblages recently excavated at the sites of Ustinovka 3 and 6. It is felt that these processes of adaptive change parallel those in North America.

Introduction

It is well known that in the southern part of the Russian Far East at the end of the Pleistocene, there was a widespread microblade tradition, including large subprismatic and wedge-shaped cores, leaf-shaped bifaces, and burins. However, after 13,000 BP there occurred changes involving the appearance of small arrowheads, edge-polished adzes, and a gradual transition from microblade to bifacial techniques. During the same period early ceramics also became widespread in the Amur River Basin and Japan, and later in Primorye and on the islands of Sakhalin and Hokkaido.

Regional Variation

From the archaeological evidence it is clear that the first traces of change in the lithic technology were associated with the beginning of warming in the Late Glacial Period, which took place at about 13,000 BP (Derevyanko 1983:8-24; Derevyanko and Petrin 1995:7-9; Golubev and Lavrov 1988:25-54; Kajiwara 1995:2-4; Keally 1990:143; Kononenko 1993:5-7; Korotky et al. 1988:140-194; Kuzmin 1992:146-149; Sakaguchi 1987:1-19; Sugiura 1990:159; Suzuki 1990:162; Vasil'evsky and Gladyshev 1989:18-29; Verkhovskaya 1993:29-34). Based upon available archaeological and paleogeographical data it is possible to reconstruct the paleolandscape of three local regions within the southern part of the Russian Far East. The first is the Amur River Basin. The second region unites the greater part of Primorye, Sakhalin, and Hokkaido. The third region includes Honshu, Kyushu, and the southern parts of Hokkaido and Primorye. At the end of the Pleistocene and the beginning of the Holocene, this area was forested, at first with conifers and later with deciduous trees.

In all three regions similar tendencies may be distinguished in the development of stone processing from microblade traditions to bifacial technology. These correspond with paleoeconomic changes from big game hunting to fishing and small game hunting. It may be stated that generally the changes in technology and the paleoeconomic conditions are the end result of the population's reaction to the changes in climate at the end of the Pleistocene and the beginning of the Holocene. However, the various manifestations of these tendencies

in local regions had their own peculiarities. The rate of adaptation was more dynamic on the Japanese archipelago. Its particular geographical placement allowed for an early transition to the exploitation of marine resources.

The Amur River Basin created favorable conditions for productive river fishing in combination with hunting and gathering. The wealth of aquatic life, with the seasonal passage of salmon, and the variety of forest resources led to permanent settlements and specialization within the economy.

The landscape and climatic conditions on Sakhalin favored the development of multi-faceted economies, with a late orientation toward exploitation of marine resources.

Primorye Region

The lithic industry of the Late Pleistocene sites in Primorye was characterized by the microblade tradition, with wedge-shaped cores, bifaces, and burins. Within the framework of this tradition can be singled out complexes of the southwestern part of Primorye, in which usage of obsidian pebbles as a raw material is characteristic, as well as complexes of the eastern coast of the province, where tuff and siliceous shale were used for tools. The different types of raw materials resulted in a few special characteristics of the industries.

Sites in southwestern Primorye are dated 11,000 to 8,000 B.P. At this time small arrowheads appeared (Kuznetson 1992:44-73). In addition, early ceramics, which are thought to date from around 8,000 B.P., were found at the Chernigovka site. According to Alla Garkovik (1995) these ceramics are possibly accompanied by microcores and burins.

Sites in southwestern Primorye are dated from 11,000 to 9,000 B.P. (Vasil'evsky and Gladyshev 1989:99-106; Tabarev 1994:28-34). More than 20 sites are concentrated in the Zerkalnaya River Valley, some 30 kilometers from the western margin of the Sea of Japan. Among them are workshops for the extraction of minerals (Ustinovka 1) and seasonal hunting sites (Suvorovo 3, 4, 6, and Ustinovka 4). It is thought that the inhabitants of these sites were already involved in river fishing (Vasil'evsky and Gladyshev 1989:106-107).

The replacement of microblade technology by the bifacial traditions in Primorye took place in the Early Holocene and correlates well with changes in climate and landscape during the Boreal period (Garkovik and Kononenko 1989:70-74; Kononenko 1993:5-7; Kononenko 1994:134-138). Materials from the Ustinovka 3 site serve as an important basis for this conclusion.

Ustinovka 3

Mrs. Alla Garkovik has been excavating the site since 1971. The principal portion of the site consists of 260 square meters, which has already been excavated. The cultural remains are situated in delluvial sandy loams resting on the surface of an alluvial pebble terrace. Materials from two other eras have been uncovered, including a few articles of medieval origin and approximately 1,000 bronze-age artifacts. Stratigraphically these finds are for the most part from humus and the upper section of a grayish loam. The lower stratigraphic horizon is a yellowish-brown loam that contained more than 25,000 artifacts associated with the period of transition from the Paleolithic to the Neolithic. As a result of excavations at the site, several zones with concentrations of artifacts connected with various endeavors have been noted.

Analysis of the collection allowed us to make the judgement that the Ustinovka 3 site represents the final stage of development of the Ustinovka Paleolithic Culture and typifies the basis of the formation of the Neolithic Rudninskaya Culture. Palynological evidence from the site reflects the existence of birch forests with a mix of deciduous trees associated with the temperate and decidedly dry climate of the Boreal.

In the last few years joint Russian and Japanese research has been conducted at

Ustinovka 3, as well as at the new site of Ustinovka 6. Discoveries made at these sites permit a deeper understanding of the mechanism of change in stone processing traditions, allowing us to address a few questions in debate and raise new ones.

Lithic technology of the Ustinovka 3 site is represented by amorphous cores, different types of bifaces such as knives, spear tips, darts, and arrows, as well as endscrapers, adzes with polished edges, drills, borers, and very rarely microcores and burins. A few of these are similar to the tools found in sites with a microblade tradition. More than 80 percent of these items are very small flakes and microflakes.

Ceramics were collected along with the stone tools from the lowest part of the cultural layer overlying the pebble deposits and extending over an area of 5 square meters. The ceramics assemblage consists of about 140 fragments of 2 or 3 vessels. These ceramics display some technological and morphological traits in common with early pottery from other areas of East Asia (Garkovik and Zhushchikhovskaya 1995:52-53).

The analyses of two large complexes at Ustinovka 3 may be singled out. Complex 1 includes a large quantity of tools and two small areas in which the secondary manufacture of bifacial tools and scrapers took place, as well as the repair and refitting of worn out tools. The area of the complex is about 7 square meters in size. Within this area the finds were positioned in one stratigraphic level consisting of a layer of yellowish brown loam.

Complex 2 occupies more than 6 square meters. Within it is a small area for production of flakes and secondary processing of blanks. All of the ceramics, together with tools and lithic debris, are likewise concentrated in this area. Stratigraphically, the complex is in the lower part of the cultural layer, resting on the pebble deposits. Adjacent to the complex at the same level is a small localized area used by the craftsman to split cores.

The technique of production and use of the artifacts and their mutual connection, along with the tools and the spacial concentrations of the tool assemblages, permit us to infer the existence of light surface dwellings in these areas.

Some specialized areas of large size were found to the north of this habitation area. In one of these specialized areas the secondary manufacture of tools, mostly bifacial knives and projectile points, took place. A considerable quantity of artifacts (about 3,000 small flakes and microflakes) were concentrated in an area of about 4 square meters. This encompassed the entire thickness of the layer of yellow brown loam. This kind of displacement of material most likely attests to repeated and protracted use as a specialized work area. A second specialized area is just over 5 square meters in size. The stone artifacts are for the most part cores and lithic debris, large spalls, and flakes. These total more than 3,000 items. Most likely, this area was primarily used for cleaving cores and producing flakes and blanks for tools.

A cache of large flakes was found at Ustinovka 3 which was positioned in proximity to specialized areas mentioned above. Stratigraphically it was situated in the upper portion of the yellowish brown loam. This suggests that it was not contemporary with living areas and rather more likely was buried later.

The cache was an isolated concentration of 171 large flakes, compactly positioned together in an area of 44 cm by 36 cm. The flakes were obtained from 2 or 3 cores and purposefully sorted into groups of roughly the same size. Possibly the hoard served as a reserve of flakes for bifacial tools and scrapers. However, the possibility that the flakes were prepared for heat treatment cannot be ruled out. Philip Wilke (1994) suggested that some of the stone tools from the Ustinovka 3 site have traces of heat treatment.

It is known that heat treatment of stone had a place in those cultures in which the technique of pressure retouching of flakes was developed

and in which high quality, obsidian-like stone materials were absent (Crabtree and Butler 1964:1-2; Hester 1972:63; Mandeville 1973:183; Wilke and Schroth 1989:148; Girya 1994:172-173). The volcanic tuff and flinty slate used at the site as basic raw materials were not distinguished by their high quality. At the same time, many bifacial tools at Ustinovka 3 have been painstakingly pressure retouched. These facts, in combination with the cache of flakes, suggests that heat treatment may have been employed. However, this question will be resolved only through conducting replication experiments.

The positions of the artifacts, their lack of synchronicity, and their functions allow us to conclude that Ustinovka 3 was a seasonal base camp for a particular group of people, who in the course of a protracted period repeatedly occupied this area. The set of tools and general composition of artifacts reflect a complete cycle of the activities that made up the way of life of the inhabitants, including hunting, fishing, gathering, processing of hides and wood, and production of tools, clothing, and domestic articles (Kononenko 1994:133).

In light of the above evidence, it is difficult to agree with A. Krupyanko, A. Tabarev, and H. Kajiwara, who consider the Ustinovka 3 site to be a workshop for preparation of bifaces. Against the background of known sites in the Zerkal'naya River Valley, Ustinovka 3 is distinguished by large quantities and varieties of bifaces. However, the typological, technological, and functional peculiarities, as well as the size of the bifacial artifacts of this site, do not correspond to the attributes of blanks intended for subsequent utilization.

Ustinovka 6

Excavations at Ustinovka 6 have only begun, but it is already clear that this is a typical site representing a microblade tradition (Kononenko et al. 1995:1-5). A radiocarbon sample processed by Dr. T. Soda from the small leveled square yielded a date of 11,550 ± 240 B.P. (GEO-1412). Atypical of the lithic technology predominant at Ustinovka 6 was the discovery of two small arrowheads. A tanged arrowhead is similar to those present with early ceramics in the industry of the Mikoshiba Culture in Japan dating 12,000 to 11,000 B.P., but they are not generally associated with a microblade tradition (Serizawa 1979:340-343). The second arrowhead discovered is an untanged willow leaf-shaped point which is also similar to points of the Mikoshiba Culture. Dr. H. Kajiwara and Y. Yokoyama (1994) advance the hypothesis that there existed two stone processing traditions at the site: a microblade tradition and a bifacial tradition similar to that found in Mikoshiba Culture. However, the stratigraphic positioning of the projectile points, as well as the general context of the Ustinovka 6 industry, in our view does not yet give us a solid basis to propose the existence of two successive traditions. It seems more reasonable that similar types of tools penetrated the area from Honshu as a result of contact between Japan's developing marine adaptation and Primorye's hunting-gathering and fishing economy.

Conclusions

Within the context of the cultures and complexes of the Late Pleistocene and Early Holocene in the southern part of the Russian Far East, development of lithic industries in Primorye conforms to the general tendencies of a transition from microblade technology to bifacial technology. This also implies a mastery of fishing and a shift from a nomadic lifestyle to a semi-sedentary one. However, it becomes clear that in comparison with the Amur River Basin and the Japanese Archipelago, all of these processes lagged behind a bit in Primorye. This is probably explained by differences in natural conditions. In Primorye, as on Sakhalin and parts of Hokkaido, the half-open landscapes of the foothills and coastal plains, with sparse birch forest and forest-tundra, made it possible for prolonged exploitation of mammoth. A slow change of landscapes in periods of warming and cooling created the possibility of gradual adaptation of the population through the means of exploiting new resources such as fish and small game. This also resulted in successive

multiple stages of migration to customary northern landscapes along the coasts of the Sea of Japan, Okhotsk and on the Sakhalin Islands. Archaeological materials from Primorye and Sakhalin support both models of adaptation and migration within the Early Holocene period (Kononenko 1993:7-8).

Therefore, it may be proposed that the traditional direction of population migration in the Late Pleistocene from the continent to northern coastal regions of the Pacific and Sakhalin was preserved during the Early Holocene. In turn, the processes of migration became more episodic, while the exchange and transmission of new technologies and traditions between different cultures became more indirect.

On the other hand, development in southern regions, first and foremost in Japan with its early marine adaptation, was forging ahead and stimulated contacts in a south to north direction. Possibly, innovations appearing in the Ustinovka industry such as arrowheads, tanged points, edge-polished adzes, and ceramics were in part a result of penetration of ideas and skills from southern regions. In any event, consideration of this hypothesis opens the possibility of exploring the reasons for the resemblance between the Ustinovka 6 and Ustinovka 3 industries existing from 11,500 to 9,500 B.P. and complexes on Honshu with microblade and bifacial technologies dating from 13,000 to 11,000 BP.

In conclusion I would like to direct attention to one interesting item requiring further research. It is known that heat treatment of stone in all cases required control of temperature during the entire process (Collins and Fenwick 1974:135-137; Crabtree and Butler 1964:2; Draper and Flenniken 1984:117-121; Joyce 1985:37; Mandeville and Flenniken 1974:147). Heating stone in a fire under an open sky enabled the accumulation of knowledge and skills in technology of heating various raw materials, including ceramics (Girya 1994:73). If we accept that heat treatment of stone took place at the Ustinovka 3 site, then the question arises: is this process one of the stimulating factors for the emergence of early ceramics in the south of the Russian Far East?

It is known that raw materials used by carriers of the Selemdzhinskaya and Ossipovskaya cultures of the Amur River Basin, the cultures of the Primorye, the Southern Sakhalin, and the Mikoshiba Culture in Japan did not distinguish themselves by their quality (tuff, siliceous schist, chalcedony, jasper, and flint). However, the appearance of microblades from wedge-shaped cores, and bifacially formed points and knives supposes the use of pressure retouching techniques. As a result, prior heat treatment was necessary. It may not be accidental that early ceramics appeared in industries in which the pressure technique, with the proposed heat treatment, played an important role in the working of stone.

Notes

I acknowledge A. V. Garkovik, A. A. Krupyanko, A. V. Tabarev, and N. B. Verkhovskaya for help and fruitful discussion during excavations of the Ustinovka sites. I especially thank H. Kajiwara, Jim Cassidy, and Phil Wilke for their kindness and friendship. This paper was made possible by support from the American Council of Teachers of Russian (ACTR) in 1995.

REFERENCES CITED

Collins, Michael B. and Jason M. Fenwick
1974 Heat Treating of Chert: Methods of Interpretation and Their Application. *Plains Anthropologist* 19(64):134-145.

Crabtree, Donald E. and Robert R. Butler
1964 Notes on Experiments in Flint Knapping: 1 Heat Treatment of Siliceous Materials. *Tebiwa* 7(1):1-6.

Derevyanko, Anatoliy P.
1983 *The Paleolithic of the Far East and Korea.* Nauka, Novosibirsk (in Russian).

Derevyanko, Anatoliy P. and Valeriy T. Petrin

1995 The Neolithic of the Southern Russian Far East: a Division into Periods. In *The Origin of Ceramics in the Far East*, pp.9-11, International Symposium, Tohoku Fukushi University, Sendai, Japan.

Draper, John A. and Jeffrey J. Flenniken
1984 *The Use of the Electron Microscope for the Detection of Heat Treatment of Lithic Artifacts.* Northwest Anthropological Research Notes 18(1).

Garkovik, Alla
1995 Personal communication.

Garkovik, Alla V. and Nina A. Kononenko
1989 The Site of Ustinovka 3 in Primorye. In *The Problems of Technology of Ancient Productions*, pp. 61-80. Nauka, Novosibirsk (in Russian).

Garkovik, Alla V. And Irina S. Zhuschikhovskaya
1995 The Earliest Ceramics Assemblage in the Primorye Region. In *The Origin of Ceramics in the Far East*, pp. 52-53. International Symposium, Tohoku Fukushi University, Sendai, Japan.

Girya, Evgeniy U.
1994 Heat Treatment of Flint and Methods of Identification of it in Archaeological Materials. In *The Experimental and Use-Wear Investigations in Archaeology*, pp. 168-174. Nauka, Saint Petersburg (in Russian).

Golubev, Valeriy A. And Evgeniy L. Lavrov
1988 *Sakhalin in the Stone Age.* Nauka, Novosibirsk (in Russian).

Hester, Thomas R.
1972 Ethnographic Evidence for the Thermal Alteration of Siliceous Stone. *Tebiwa* 15(2):63-65.

Joyce, Daniel J.
1985 Heat Treatment of Alibates Chalcedony. *Lithic Technology* 14(1):36-40.

Kajiwara, Hiroshi
1995 *New Perspectives on the Origin of Pottery in the Southern Part of the Russian Far East.* Tohoku Fukushi University Press, Sendai, Japan.

Kajiwara, Hiroshi and Yuhei Yokoyama
1994 On the Cultural Tradition During the Transitional Period Between the Closing Stage of the Pleistocene and the Opening Stage of the Holocene at the Seaboards of the Japan Sea. In *Peoples and Cultures of the Boreal Period*, pp. 35-58. Proceedings of the 8th International Abashiri Symposium.

Keally, Charles T.
1990 Hokkaido Pleistocene Archaeology and the Earliest Americans: Some Comments. *Current Research in the Pleistocene* 7:143-146.

Kononenko, Nina A.
1993 Ancient Culture of Primorye in the Late Pleistocene and Early Holocene. In *Japanese Proceedings of the Yayoi Society* p. 12, Tokyo.

Kononenko, Nina A.
1994 Preceramic and Neolithic Complexes of Primorye. In *A Review of Prehistoric Archaeology of the Far East* p. 214. Nauka, Moscow.

Kononenko, Nina A., Alexander A. Krupyanko and Andrew V. Tabarev
1995 Ustinovka VI Site: Recent Investigations of the Microblade Industry in the Maritime Region, Russian Far East. *The Wyoming Archaeologist* 39(1-2):1-5.

Korotky, Aleksyi M., Sergey P. Pletnev, Vladimir S. Pushkar, Tatiana A. Grebennikova, Nadezda G. Razhigaeva, Elena D. Sakhebgareeva and Ludmila M. Mokhova
1988 *The Development of the Natural Environment of the U.S.S.R. Far East Southern Part (Late Pleistocene and Holocene.* Nauka, Moscow (in Russian).

Kuzmin, Yaroslav V.
1992 *Paleoecology of the Paleolithic of the Russian Far East.* Sunsa Munhwa Bulletin of the Institute of Prehistory 1:143-159, Chungbuk

National University. Ceongju, Korea.
Kuznetson, Anatolyi M.
1992 *The Late Paleolithic of Primorye.* Far Eastern State University, Vladivostok.

Mandeville, M. D.
1973 A Consideration of the Thermal Pretreatment of Chert. *Plains Anthropologist* 18(61):177-202.

Mandeville, M. D. and Jeffery J. Flenniken
1974 Newhaka Chert Before and After Thermal Pretreatment. *Plains Anthropologist* 19(64):146-148.

Sakaguchi, Y.
1987 *Japanese Prehistoric Culture Flourished in Forest-Grassland Mixed Areas.* Bulletin of Department of Geography N19:1-19. University of Tokyo Press, Tokyo.

Serizawa, Chosuke
1979 Cave Sites in Japan. *World Archaeology* 10(3):340-349.

Sugiura, Shigenobu
1990 Higashi Rokugo 1 and 2: Stemmed and Foliate Point Sites in Central Hokkaido, Japan. *Current Research in the Pleistocene* 7:159-161.

Suzuki, Kuniteru
1990 Sakuragaoka and Nisshin 2: Excavated Microlithic Sites in North Hokkaido, Japan. *Current Research in the Pleistocene* 7:162-163.

Tabarev, Andrew V.
1994 The Ustinovka Industry in the Stone Age of the Russian Far East: 40 Years of Discoveries. *Lithic Technology* 19(1):21-34.

Vasil'evsky, Ruslan S. and Sergei A. Gladyshev
1989 *The Upper Paleolithic of the Southern Primorye.* Nauka, Novosibirsk (in Russian).

Verkhovskaya, Natalia B.
1993 The Result of Study of Pollen at the Ustinovka 3 Site. In *Study of Preceramic Site of Ustinovka 3 in Primorye*, N. A. Kononenko, A. V. Garkovik, and H. Kajiwara eds. Dalnauka, Vladivostok.

Wilke, Philip
1994 Personal communication.

Wilke, Philip J. and Adella B. Schroth
1989 Lithic Raw Materials Prospect in the Mojave Desert, California. *Journal of California and Great Basin Anthropology* 11(2):146-173.

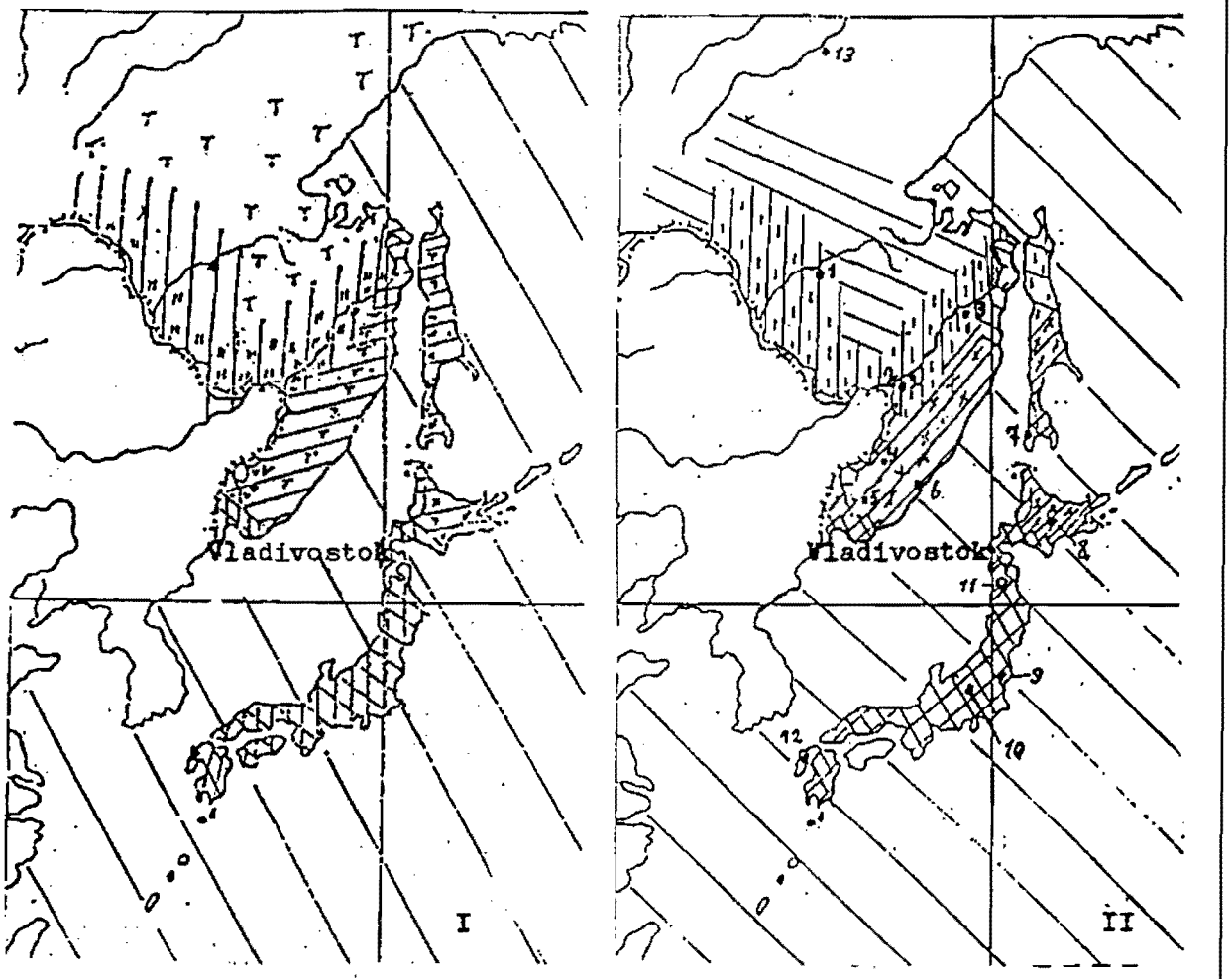

Figure 1. The paleolandscapes of Far East.

Chart I - the paleolandscapes of Late Upper Paleolithic.
-light birch-larch forests and mari; -light birch-larch forests; -dark-coniferous forests; -mari and meadows -bogs; -coniferous; -tundra and forest-tandra.

Chart II - the paleolandscapes of Early Holocene.
-dark-coniferous forests; -coniferous-broad-leaved forests; -berch-broadleaved forests; -broadleaved forests; -coniferous; -birch

The sites: 1- Ust-Ul'ma, 2- Gas'a, 3- Khummi, 4- Vasil'kovka 1 and Ruga 1, 5- Chernigovka 1, 6- Ustinovka 3 and 6, 7- Sadovniki 2, 8- Higashirokugo 1,2, 9- Terao, 10- Mikoshiba, 11- Oodaiyamamoto 1, 12- Fukui Cave, 13- Dyuktai Cave.

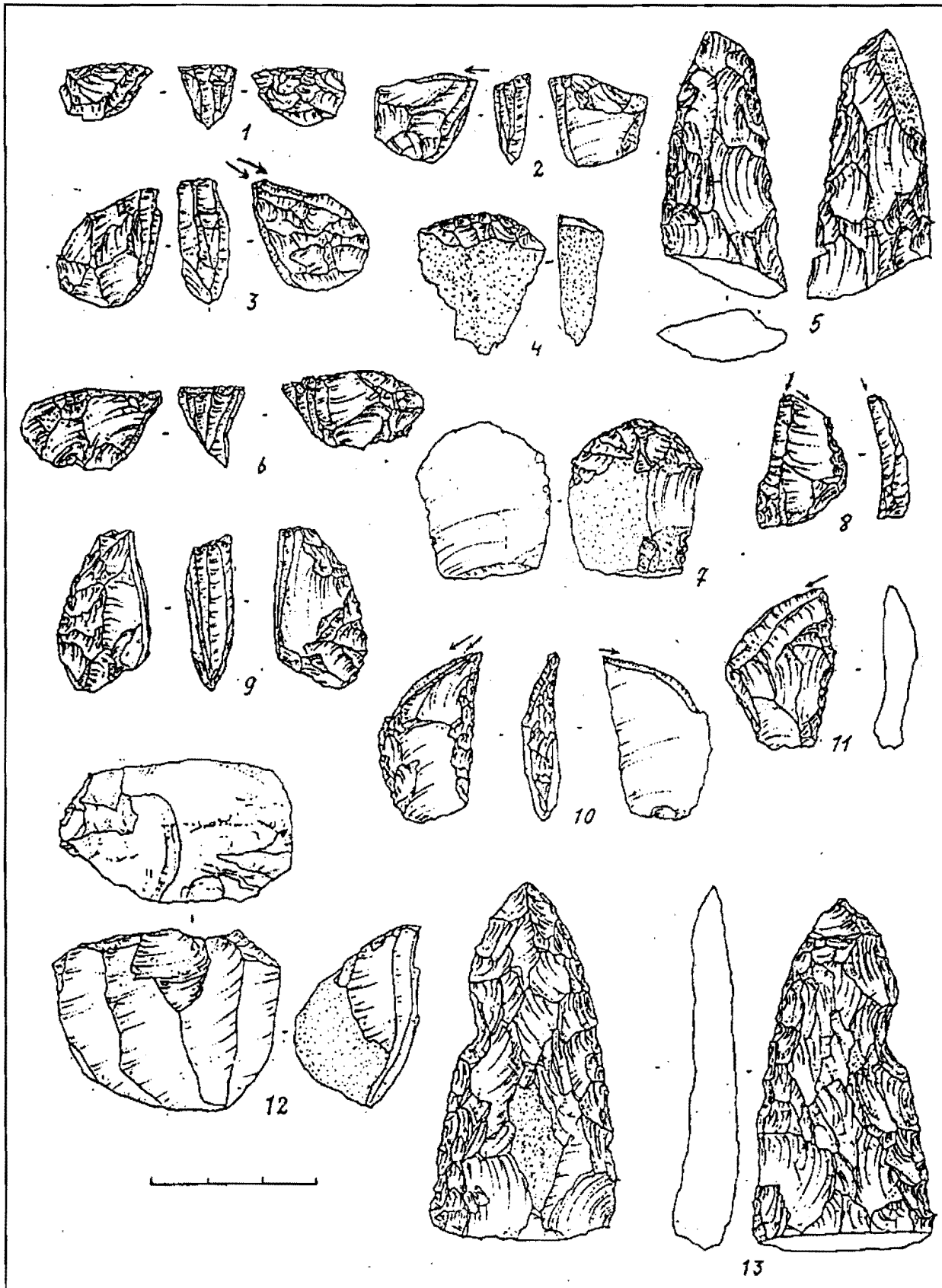

Figure 2. Typical Artifacts from Ruga 1-site.

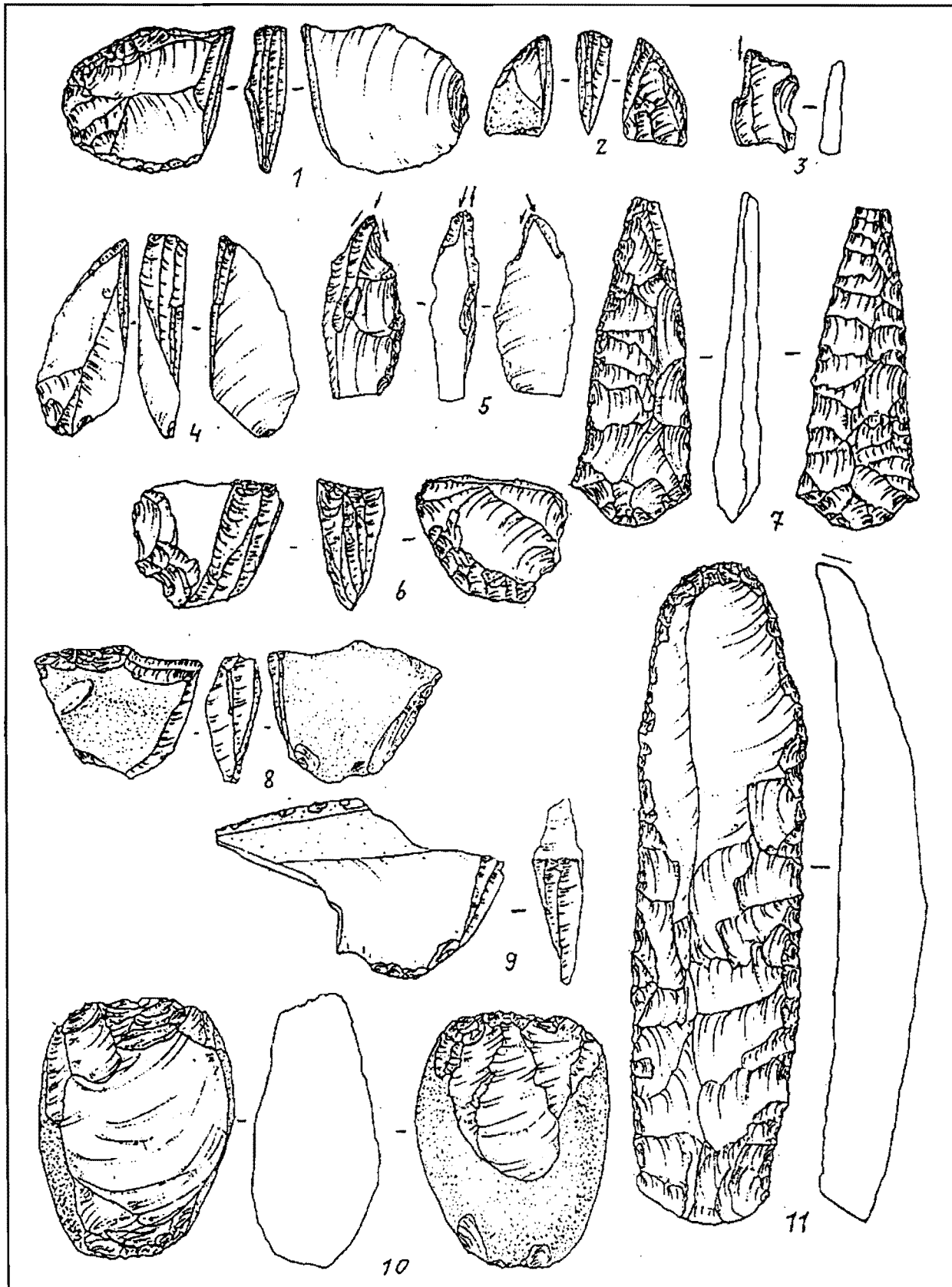

Figure 3. Typical Artifacts from Vasilkovka 1-site.

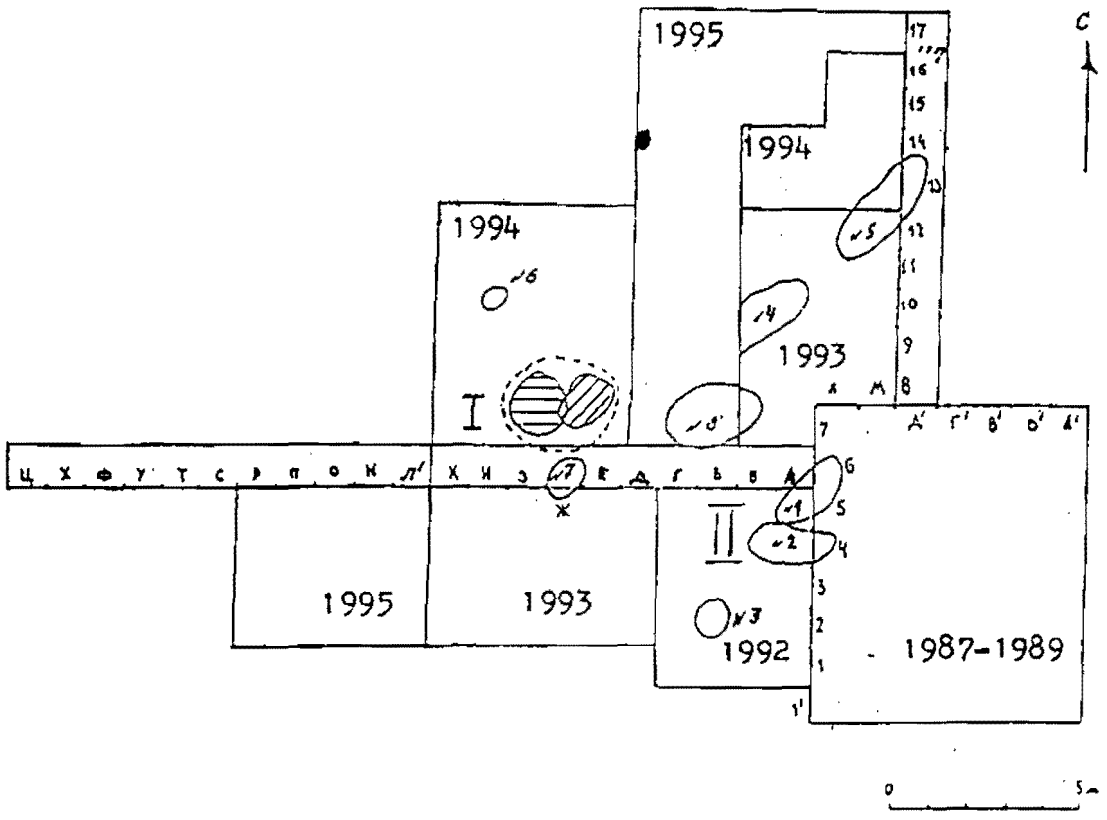

Figure 4. Scheme of disposition the zones with concentrations of artifacts (Ustinovka 3-site)

1995 - the years of excavations

N 1-8 - zones of concentrations

● - the cashe

▨ - the area of spreading of ceramics

I-II -large complexes

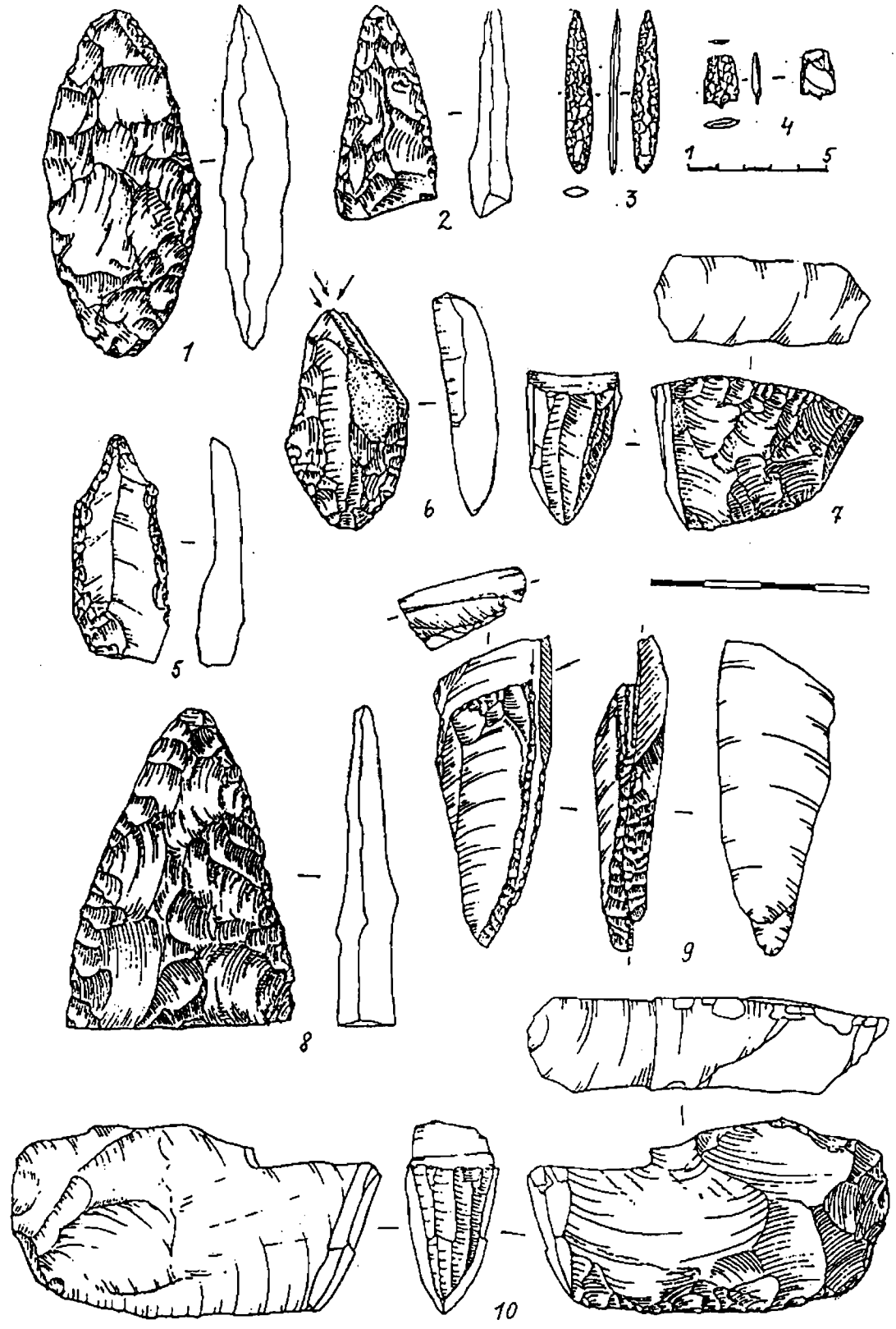

Figure 5. The Artifacts from Ustinovka 6-site.

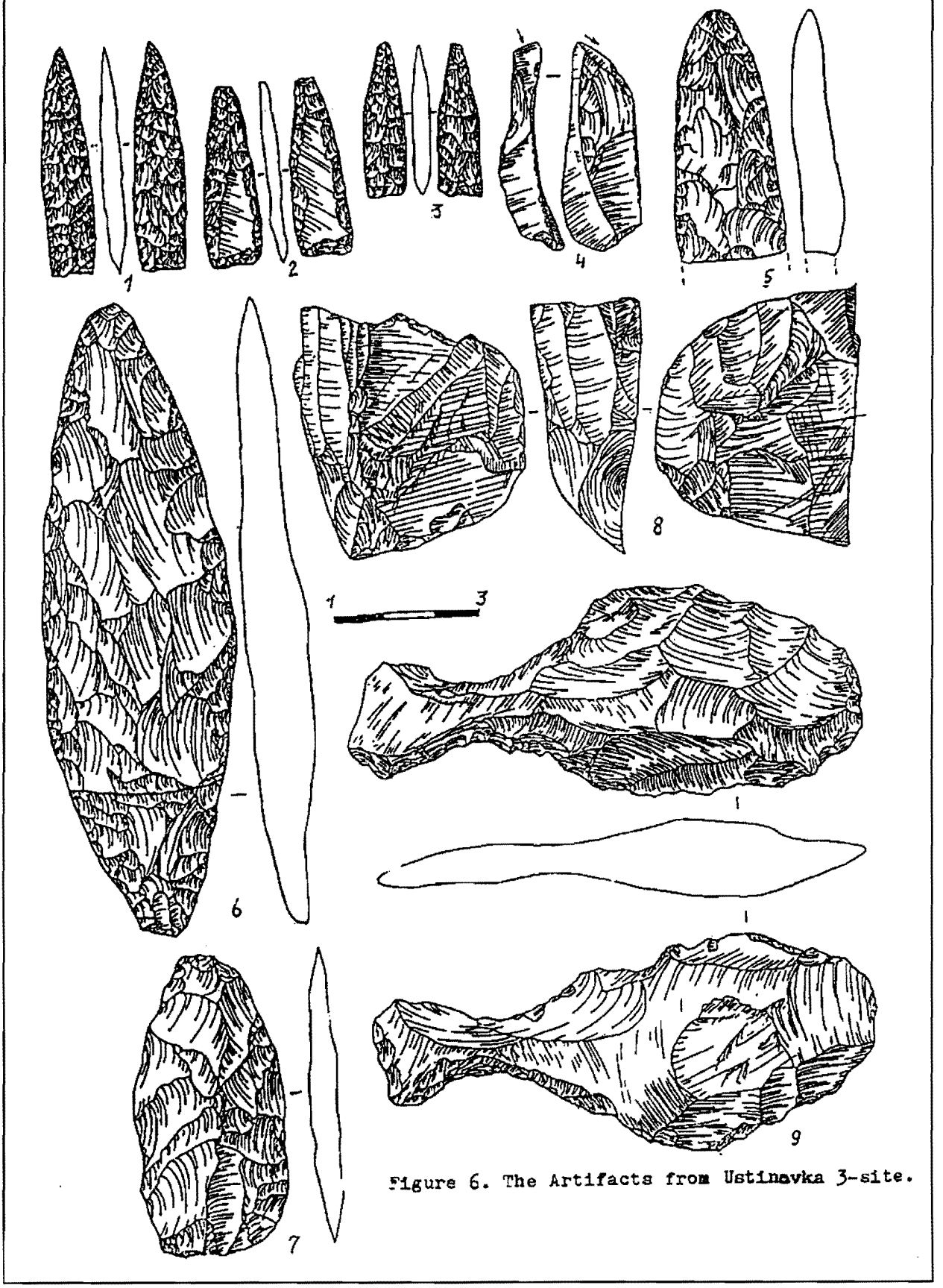

Figure 6. The Artifacts from Ustinovka 3-site.

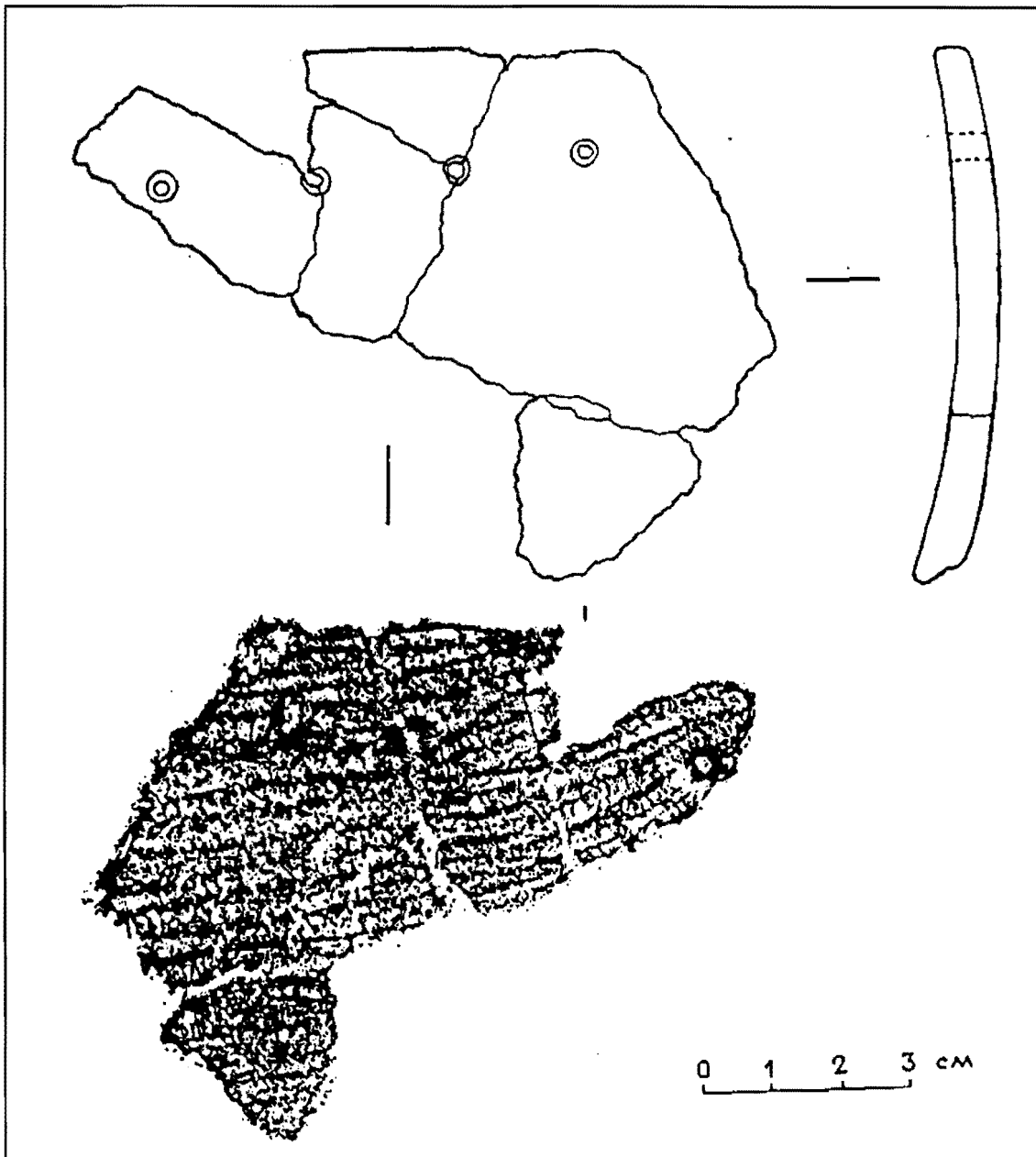

Figure 7. Early Ceramic from Ustinovka 3-site.