CULTURAL TRANSFORMATIONS DURING THE PLEISTOCENE-HOLOCENE TRANSITION IN THE RUSSIAN FAR EAST

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INTRODUCTION

In the context of the prehistoric cultures of East Asia, the southern part of the Russian Far East is characterized by a number of common problems. These coincide with the appearance of the earliest human populations, as well as changes in their subsistence patterns. Discoveries made during joint Russian-Japanese-American expeditions in the Primorye region have yielded new insights into culture history and subsistence strategies employed during the Pleistocene to Holocene transition. However, it is essential that these historical events also be understood within their ecological context. Only through a consideration of the relationship between natural and cultural landscape can we hope to begin to understand some of the dynamic processes at work (Jochim 1998:27)

A geographic region of interest in applying this approach is the Zerkalnaya River basin in Primorye. In this region there are more then 25 open-air sites of the Ustinovka Paleolithic Complex (Map 1). These sites have yielded a sequence of three successive lithic traditions spanning the period from 25,000 to 9,000 years before present (Vasilievsky and Gladushev 1989:100-102; Kononenko 1997:59-60; Kajiwara et al. 1997:105-106)

ECOLOGY OF THE ZERKALNAYA RIVER BASIN

The coast of Primorye is mountainous with a relatively narrow coastal plain. Numerous rivers from 10 to 100 kilometers in length transect this mountain range. The climate of this region is characterized by a monsoon pattern, caused by contact between marine and continental air masses (Korotky 1998). Plant communities of the coastal zone are highly diverse, consisting of coniferous-broad leaved forest. The faunal community includes a wide variety of land and marine mammals, birds, marine and river fish, and molluscs.

The Zerkalnaya River system is within 30 kilometers of the coast of the Sea of Japan and is located about 500 km north of the modern city of Vladivostok. The river flows along the eastern slope of the Sikhote-Alin coastal mountain range and includes a number of tributaries. The length of this river, from west to east, is 52 kilometers. It has an upstream width of 2 to 8 meters and extends 10 to 70 meters near the mouth. The river depth is from 0.4-0.8 meters in the winter to 2.5 meters during the spring and summer run-off. From November until April the river is frozen over. The valley bottom averages between 1 to 3 meters in elevation and is bounded by steeper flanks. The topography of the river basin includes well-developed terraces at the foothills, valley lowlands and coastal plains with meadows and marshes.

Analysis of the geomorphology and pollen data from the Zerkalnaya River basin and the coastal zone of Primorye indicates that dramatic environmental changes took place from the Middle Pleistocene through the Early Holocene periods (Figure 1). During the Karginsky Interglacial (50-20 thousand years ago) the level of the Sea of Japan was 20 meters below it's present level and the climate was relatively warm and humid. The land was covered by broad leaved and dark-coniferous forest (Korotky et al. 1988:137-139).

. At the beginning of the Sartan Glacial period (18-20,000 years ago) the coastal area was covered by scant vegetation with cold and dry winters and high winds. The level of the Sea of Japan was between 130 and 140 meters below present. Along the coastal shelf was a low plain approximately 20 kilometers in width that was transected by steep and rapidly flowing river valleys. Erosional ingression of the Zerkalnaya River occurred periodically during inter-stadial periods and resulted in the formation of terraces along its steep and narrow course. The vegetation belt of the foothills was covered with tundra in the upper elevations and marshes along the flanks of the river. The lower reaches of the river and coastal plains were covered by forest-tundra and light birch-larch forests.

Over the next few thousand years temperatures began to rise and forest formation gradually spread in an episodic manner. The subsequent alternation of warm and cool phases from the Early Dryas to the Boreal periods, during the Late Pleistocene to the Early Holocene, is evident in the highly localized differential expansion of floral species and forest succession. The net result of these changes was a progressive increase in botanical diversity. According to the pollen records derived from cultural layers in the sites, the number of plant species increased dramatically and had the effect of an increase in the diversity of potential foods for both animal and human populations.

In spite of the scant data available for fauna during the Late Pleistocene and Early Holocene periods in Primorye, it is clear that changes in vegetation were accompanied by changes in the faunal communities. On the basis of faunal evidence collected from the Late Paleolithic Geographical Society cave (Ovodov 1977:176-178) it is evident that a mammoth-fauna complex existed on the coast of Primorye. This included animals such as mammoth, bison, horse, roe deer, Manchurian deer, and goral. According to radiocarbon dates from Bliznets Cave, this complex continued in existence until the onset of Early Holocene conditions (Korotky et al. 1988:144).

Within the closed deciduous forests that formed at the end of the Pleistocene period some of the megafauna either became extinct or declined in abundance. However, faunal evidence from an Early Neolithic cave site dating to about 7,000 RCYBP indicates that some of these large mammals, such as Manchurian deer, elk and red deer persisted within the new deciduous forest conditions. Bones of woodland mammals found in this cave indicate that such species as black bear, boar, wolf, rabbits and rodents were present in the postglacial landscape as well.

Transgression of the Sea of Japan during postglacial warming caused significant changes in the Zerkalnaya River system and this created a favorable environment for a wide variety of fish such as salmon, as well as diverse avifauna, including waterfowl.

Topographic features of the Zerkalnaya River basin would have provided a highly diverse and spatially structured floral and faunal communities, making the region highly productive and attractive for human habitation. Evident from the density of sites, the middle length of the river appears to have been especially attractive. This part of the river had a relatively narrow valley floor, and during the Late Pleistocene-Early Holocene period may have served as a transition zone between the coastal plains and the continental interior.

The Ustinovka complex of sites are located on the 40 and 15-20 meter terraces overlooking the river. Such locations provided easy access to resources from both the forested heights and the valley floor. Large mammals, such as the Manchurian deer, elk, red dear, roe deer, migrate into higher elevations during the warm months and down to lower elevations during colder months. This patterned behavior facilitated efficient and productive hunting strategies and provided a degree of predictability. Additionally, the configuration of the riverbed favored the potential exploitation of seasonal salmon as well as other fish. It is important to emphasize that an abundance of high quality lithic raw material, including volcanic tuff and flinty tuff, occur in this section of the river. The availability of these resources, in a region containing relatively few good quality cryptocrystalline lithic materials, acted as a pull for human habitation of this area, and they

were intensively exploited during all periods of occupation.

THE KARGINSKY INTERSTADIAL

The initial stage of occupation in the Zerkalnaya River basin is represented by the two sites of Ustinovka 7 (lower layer) and Ustinovka 1 (lower layer). Ustinovka 7 is located on the fourth terrace, approximately 40 meters above the present level of the river. The clay- based silty soils of the lower layer in the site were formed during the last interstadial. This is evident by the yellowish soil and the overlying frost cracks. Pollen from the fill in the frost cracks corresponds with the cold and dry climate that existed at the beginning of the Sartan glaciation, between 20 to 17 thousand years ago. An optical luminescence date, produced by Professor Nagotomo, indicated that the fourth out of six layers of soil deposition is dated to 18,600 years B.P. The stone assemblage in the lowest layer is associated with the sixth layer and is assumed to be significantly older than this date (Kajiwara et al. 1997:105-108).

Lithic artifacts from level six include large subprismatic cores, macro-blades with retouch and elongated flakes. It is significant that the largest blade-like blank possessed a heavily retouched platform and exhibits similarities with Mousterian blades of the Kara-Bom tradition of Siberia. This may reflect an initial stage of the Upper Paleolithic, between 34,000 and 27,000 years ago (Vasiliyev 1996:185-205).

A more diverse stone assemblage for this phase has been identified in the lower layer of Ustinovka 1. This includes sub-prismatic epi-Levallois points, discoidal cores, boat-shaped cores, end scrapers, backed knives and tanged points. Similar types of knives and points dating between 23,000 and 24,000 years ago are recognized in both Japan and Korea (Vasilievsky and Gladushev 1989:73-75). These analogous assemblages between these widely separated regions suggest that the first peopling of the area may have appeared at the Zerkalnaya River basin during the final phase of the Karginsky Interstadial approximately 25,000 years ago.

An analysis of lithic materials has identified two habitation patterns in these sites. Ustinovka 1 appears to have been a lithic workshop with a complete inventory of lithic processing debitage and partial processing of blanks and tools. At Ustinovka 7 lithic debitage and debris were absent and it appears that the primary reduction of lithic material was conducted elsewhere. Preliminarily, this site may be classified as a short-term hunting camp.

Pollen data from cultural layers of both the Ustinovka 1 and 7 sites indicate the existence of pine-birch-larch forests near the sites. The climate was relatively warm and humid, with a tendency toward cooling. The level of the Sea of Japan was about 20 meters above present and the lowlands of the river valley were adjacent to a coastal plain and covered with grasslands and scattered bushes such as hazel. Associated with the forests were a number of large herbivorous non-gregarious mammals that would have filled primary roles in the diet breadth. However, closed forest hunting of non-gregarious species would have been less productive than earlier strategies as a result of reduced prey visibility and concentrations (Jochim 1998:198-199). Subsistence activities practiced by the earliest populations were probably closely related to the hunting of large game during their seasonal migrations from coastal foothills and the seasonal gathering of newly abundant plant resources.

THE FINAL SARTAN GLACIATION

With the beginning of dramatic changes of environment during the Sartan glaciation, human populations in the region may well have been suppressed further south and temporarily vacated the Zerkalnaya River basin. Reoccupation appears to coincide with the first post-glacial warming epoch, but exhibits some new features in lithic technology and activity adapted to an open and half-open landscape.

At this time a number of sites yield assemblages of the microblade tradition and reflect developments resulting from the macro-blade technology of the Ustinovka 1 and 7 sites and a relationship with microblade assemblages in

the adjacent areas of the Amur River basin, China, Korea and Japan (Kononenko 1996:32). The excavated sites of Ustinovka 4 and Suvorovo 3, 4 and 6 date to between 12,000 and 8,000 years ago on the basis of lithic typologies (Vasilievsky and Gladushev 1989:100-102). Ustinovka 6, however, has yielded two radiocarbon dates of 11,550+240 RYBP (GEO-1412) and 11,750+620 RYBP (SOAN-3538).

Ustinovka 6 exhibits the three main components of microblade technology found in the Late Paleolithic industries of Eastern Asia. These are represented by boat-shaped microblade cores, wedge-shaped microcores analogous to the Horoko and the Yubetsu and Togeshita type cores. These assemblages also include for the first time leaf-shaped bifaces and transverse burins, as well as sub-prismatic cores, end scrapers, drills, and a variety of debris, flakes, and blanks. What is new in this industry are a few small leaf-shaped and tanged arrowheads, along with edge-ground axes and adzes, as well as grinding stone.

Pollen data from Ustinovka 6 indicates that soil deposition on the second terrace (15-20 meters above the present river level) began during Karginsky Interglacial, approximately 30,000 years ago (Korotky 1998). However, the cultural layer associated with the microblade industry is associated with the spread of light birch-larch forests with some conifers corresponding to the warm Allerod period of about 11,500 years ago.

According to pollen spectra obtained from geological sections and excavation sites, the dominant theme during the postglacial period in the Zerkalnaya River basin was a gradual transition to closed deciduous forest environment. The result was a progressive increase in botanical diversity. As one plant communities replaced a previous one, so to did the faunal communities. Such fluctuations in climate, vegetation and animals simultaneously created new opportunities for human populations and resulted in alterations of adaptive strategies.

The appearance of small bifacially flaked and pressure retouched arrowheads, edge-ground axes and grinding tools within the context of the microblade industry may reflect transitions resulting from environmental stress as subsistence practices shifted away from traditional big game hunting practices. Such stress may have resulted from increased forest densities during the warm Allegod climatic interval, but this process was undoubtedly a gradual one. The end result would have been the spread of temperate woodlands in the foothills, river valleys and the wide coastal plain. An increased abundance of botanical resources as well as some prey species created greater resource diversity and increased productivity of the riverine landscape.

A reflection of the attractiveness of this river basin is the increased number of sites with different associated functional orientations. Among these are two lithic workshops, a hunting camp, a hunting camp with wood-working specialization, a seasonal base camp with pit dwellings and a seasonal base camp with a temporary dwelling (Tabarev 1994:34, Dyakov 1997:20-21). Although the relationship between these sites is not yet clear, it does appear that a wide range of foraging and collecting strategies (Binford 1980) were taking place on a seasonal basis over a long period of time. Only some preliminary conclusions may be proposed at this time. First, all of these sites represent one cultural tradition characterized by the use of microblade technology even though some of these site may have been occupied during different in times. Second, the distribution of sites within the river valley is widely dispersed. One group of sites is located on the east bank of the Zerkalnaya River and includes the Ustinovka 4 base camp with pit-dwellings; Ustinovka 6, which is a base camp with light dwellings, and Ustinovka 1, which is a lithic workshop. The second group is located between the Kurchumka and Sadovaya tributaries of the Zerkalnaya River and includes the Suvorovo 3 hunting camp and Suvorovo 4, which is also a hunting camp with an apparent wood-working specialization. A less studied group of three sites is located near the village of Bogopol. Of particular note are two workshops located about 3 km from each other that have somewhat different raw materials represented in their lithic assemblages. Volcanic tuff from the Suvorovo workshop is of a lesser quality and is found in only the Suvorovo sites . The volcanic tuff and flinty-tuff material

found in the Ustinovka 1 workshop assemblage is a better quality raw material. It was used not only in sites of the Zerkalnaya River Valley during the Late Pleistocene-Early Holocene Transition period, but also at the sites of the Rudninskaya Neolithic culture located approximately 50 kilometers to the north. This pattern of raw material procurement and distribution suggests that the quality of the material was an important determinant of use throughout some chronological periods and that access to some raw material sources may have been restricted.

Artifacts made from obsidian are also found in the sites and are of interest. Usually each site includes a few flakes or tools made from obsidian. The source of this raw material is located about 200 kilometers south of Ustinovka site complex. The small quantity of non-local obsidian in reflects the limited nature of social and cultural relationships between the two areas, as well as the high cost of procurement of this high quality raw material.

THE EARLY HOLOCENE

The most rapid period of culture change in the Zerkalnaya River basin appears to have occurred during the occupation of the Ustinovka 3 site. This site is located approximately 800 meters to the east of Ustinovka 6. The stone industry of Ustinovka 3 is characterized by leaf-shaped points and knives, small triangular arrowheads, end scrapers, edge-ground axes, milling slabs and drills. Additionally, about 140 small ceramic sherds that display technological and morphological traits similar to early pottery found in East Asia were recovered from the site (Garkovik and Zhushchikhovskaya 1995:52-53).

The Ustinovka 3 site, dating to approximately 9,500 years ago, represents a transition stage of the Ustinovskaya Paleolithic culture to the onset of the Neolithic period (Kononenko 1994:124-125). Two dates have been obtained for the Ustinovka 3 site. These are an optical luminescence date of 10,500 BP (Kajiwara et al. 1997:105) and an A.M.S. radiocarbon date of 9,305 $\pm$ 31 RCYBP (KSU) obtained from a ceramic sherd. These dates verify an occupation of this site at the Pleistocene to Holocene transition.

As a result of large-scale excavations (more then 300 square meters have been excavated), several zones of activity have been identified at Ustinovka 3 (Kononenko 1996:134). Two large areas, each containing a concentration of tools and ceramics, as well as what appear to be small post holes, are located in one area. This suggests the existence of simple above-ground dwellings. Some specialized areas for the production of flakes and blanks, the rejuvenation of tools and the caching of large flakes were found near the habitation area.

The cache was a concentration of 171 flakes that were reduced from 2 or 3 large cores. This cache reflects the probable storage of raw material. However, high-magnification use-wear analysis has identified some areas of utilization on the flakes and their curation may be related to the heat treatment of raw material for pressure flaking during biface production.

Pollen data from the cultural layer shows the site was occupied during cold and dry climatic conditions when a light birch-larch forest with an admixture of alder existed. This landscape may be associated with the short cold epoch of the Younger Dryas (10,800 BP) or the Preboreal (9700-9300 BP). Forest density in upper elevations as well as diversity of vegetation in the lowlands decreased during these cold periods. With the beginning of Preboreal conditions between 10,500 and 10,200 years B.P. the coastal plain decreased in width and the river systems underwent some substantial alterations.

Dramatic changes in the plant communities as well as an alteration of faunal distribution and abundance resulted in increased cost and risk factors related to the capture of dispersed game. This led to the development of tool manufacturing techniques that were better adapted to a diversified environment. The transition to a bifacial lithic reduction technology was facilitated by the well established strategies employed in microblade wedge-core production and the economization of raw material consumption. This facilitated the wide and rapid spread of bifacial tool production throughout the region.

Based upon functional and use-wear analysis of stone artifacts, the spectrum of tool usage is assumed to reflect essential changes in economic activity. The adoption of milling slabs and probably some uses of the knives reflect an intensified collection and processing of plant materials. Also, the adoption of ceramics was probably associated with the preparation and storage of plant foods and possibly fish.

Indirect of evidence of the importance of fishing is found in the occasional occurrence of lithic effigy of a fish in sites throughout the Russian Far East. However, fish can be consumed in raw, dried or smoked forms and do not necessarily require formal methods of cooking. On the other hand, the complex carbohydrates locked up in plant fiber usually require extensive preparation. The most common methods of plant preparation involve boiling or steaming. The use of ceramics for the preparation of plant materials has proven to be highly efficient and likely formed the basis for the early invention and rapid spread of ceramic vessels as early as 13,700 years ago throughout East Asia..

A comparison of the bifacial stone tool assemblage recovered from Ustinovka 3 with those of the earlier microblade industry illustrates the qualitative transition that took place at the end of the Late Pleistocene. The subsequent Rudninskaya Neolithic tool industry included bifacial points and knives, ceramics and polished stone axes that are typologically related to the Ustinovka traditions. This neolithic cultural phase is defined by the presence of permanent habitation sites and the use of ceramics. Presently, there are two identified sites of that date to this period which are Rudnaya-Prista and Chertova Verota Cave. Both are located in the Rudnaya River Valley just north of the Zerkalnaya River Valley and date to between 7,500 and 6,000 RCYBP. New elements in the artifact inventory such as bone harpoons, fish netting and marine shell suggest a reorientation of subsistence toward marine resources at this time.

CONCLUSION

Evidence collected from the Ustinovka series of sites has provided us with a unique opportunity to outline some of the major cultural developments that took place in the Russian Far East. This record appears to coincide with the original peopling of the region as a result of the onset of the final period of glaciation during the Karginsky Interstadial. We have then been able to trace some of the technological changes that occurred through the final Sartan glaciation and into the warmer Early Holocene periods. These changes correlate with dramatic alterations of the physical landscape and required equally dramatic adjustments on the part of the regional inhabitants.

An emphasis on the hunting of megafauna and lithic procurement practices is reflected in the lower layers of the Ustinovka 1 and 7 sites. These sites appear to have been lithic procurement and reduction loci for macroblade tools. This coincides with a highly mobile hunting strategy adapted to relatively open landscapes and a focus upon relatively gregarious species.

The occupation of Ustinovka 6 reflects the general reduction in lithic tool size that took place during the post-glacial period during which the invention and rapid spread of microblade and arrow point technology throughout the sub-boreal regions of East Asia. These changes coincided with the warming of climatic conditions, the formation of closed deciduous forests, the reduction or demise of megafauna species and their replacement by smaller non-gregarious mammals, a rapid rise in sea levels, the deep ingression of river valleys and the formation of enriched spawning grounds for anadromous fish. Site functions appear to diversify during this period and include lithic reduction sites, an intensive wood processing workshop and a short-term camp with light ground dwellings.

The characteristics of artifact patterns and concentrations at the Early Holocene site of Ustinovka 3 reflect further shifts in adapting to more temperate environmental conditions. The presence of ceramics, simple ground dwellings and lithic caches suggests that the site functioned as a seasonal base camp of a population with a reorientation of the economy from hunting to more intensive fishing and plant collecting. This implies a reduction in mobility patterns to accommodate at

least a seasonally based semi-sedentary way of life with a more complex social organization. The Rudnaya Neolithic sites located just one river valley north of the Zerkalnaya and exhibit close cultural affinity to the Ustinovka Paleolithic cultural tradition. These sites possess pit-house structures and reflect a further shift to the intensification of fishing in coastal environments and the possible onset of maritime adaptations.

Thus, in spite of a variety of problems yet to be resolved, it appears that the Late Pleistocene to Early Holocene sites of Zerkalnaya River basin demonstrate a transition in the cultural landscape involving both the natural environment and subsistence patterns of a highly flexible human population. This pattern of relationship between natural and cultural landscape reflects a common strategy of adaptation of human populations throughout East Asia, but with unique cultural expressions resulting from regional differences in the environment.

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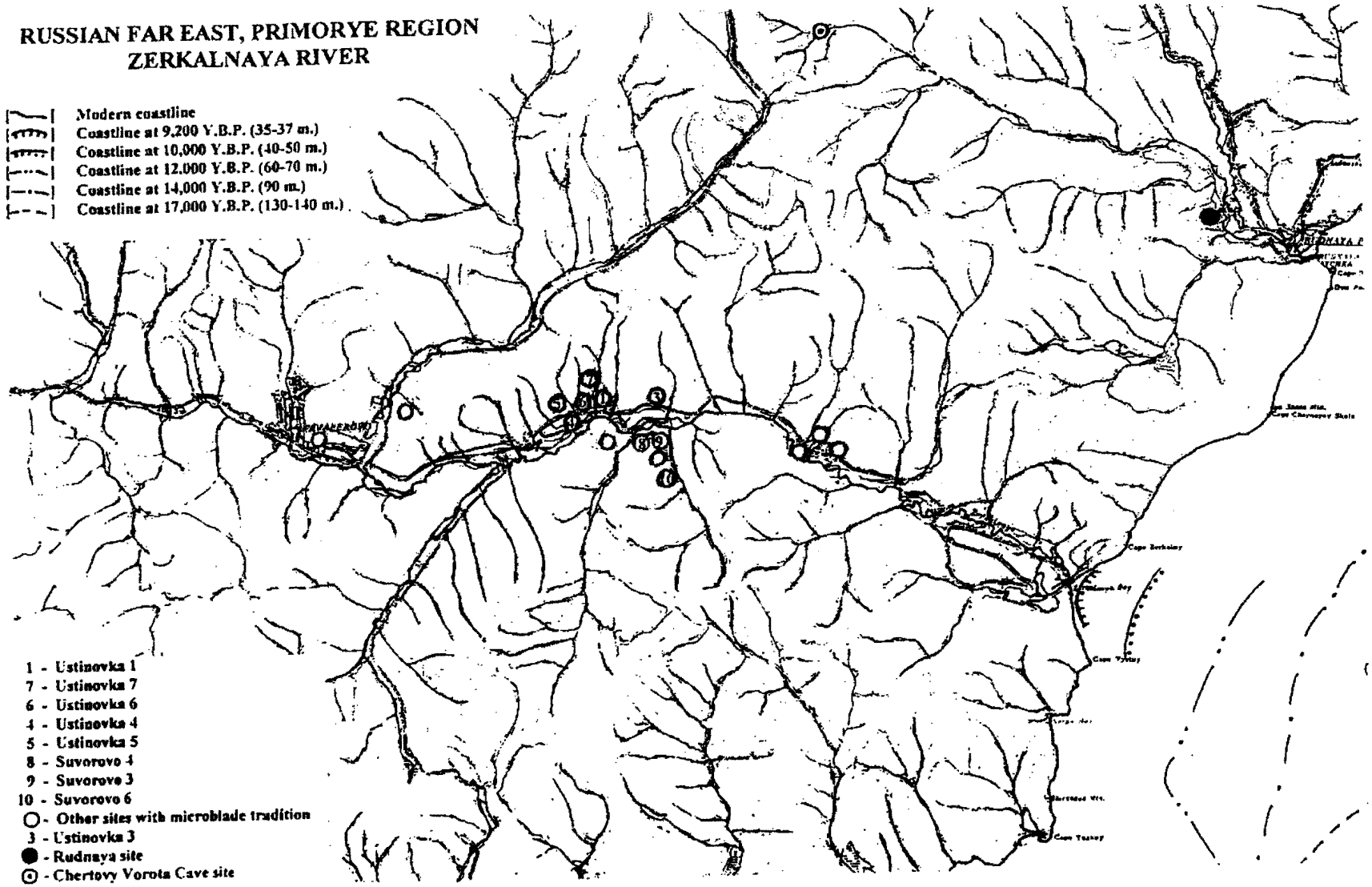

Map 1. Ustinovka site complex on the Zerkalnaya River of the Russian Far East.

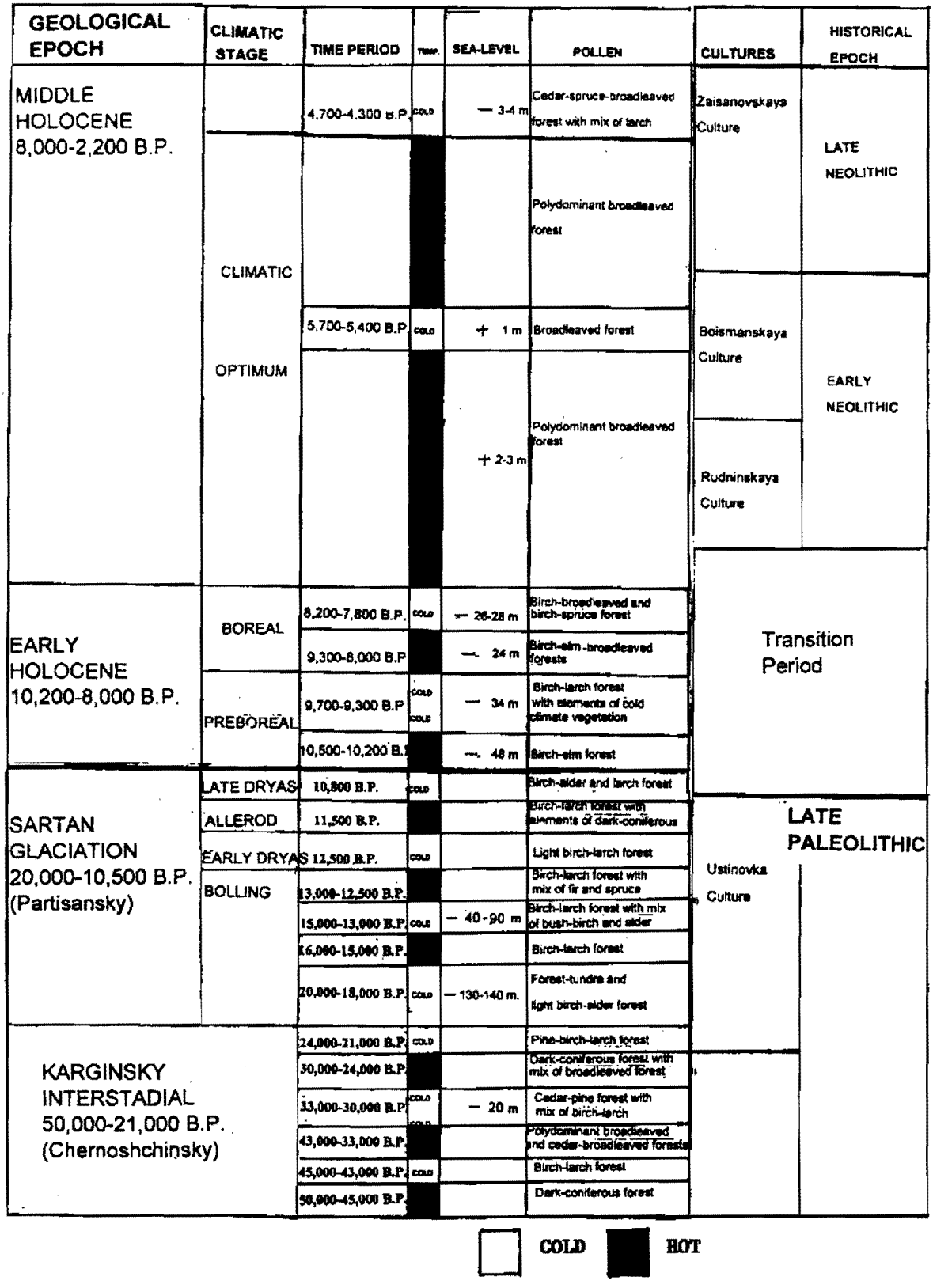

Figure 1. Chronology of the physical and cultural landscape transformation of the Russian Far East from the late Pleistocene to the Middle Holocene periods.