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## Mesolithic bone arrowheads from Ivanovskoye 7 (central Russia): Technology of the manufacture and use-wear traces

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### ABSTRACT

A multilayer peat bog site Ivanovskoye 7 is situated in Central Russia, 120 km to the north from Moscow. Early, middle and late Mesolithic cultural layers with rich bone industry were excavated. Various arrowheads were discovered in Mesolithic layers. Most of them were made from elk long bones. All arrowheads including fragments preforms and blanks were studied with the help of a stereomicroscope with magnifications from 3.6 to 119 times. The following chain of operations was established in the manufacture of bone arrowheads from Mesolithic layers of Ivanovskoye 7 site. Elk long bones were soaked in water for softening, after it long narrow splinters were removed with the use of the “groove and splinter” technique. Then splinters were turned into preforms with the help of crude scraping or whittling. Fine whittling and scraping was used for shaping the preform into arrowhead. At this stage various details such as barbs, grooves, slots for inserts were made with the help of grooving, sawing, carving, whittling and scraping. Some arrowheads were decorated with engraved ornamentation. Final treatment included grinding with fine grained abrasive slabs and bright polishing with hide. Slots of composite arrowheads were filled with glue and heated. When the glue became soft, inserts were put inside these slots. Of special interest is the final treatment of one long needle shaped arrowhead with the help of the turning lathe. Use-wear traces include rounding or smashing of the tip of the point and polishing running from the point gradually disappearing accompanied by fine linear traces running from the tip along the axis of the arrowhead or at acute angles to it, indicating hitting rather soft slightly dirty material. Coarse linear traces in the shape of grooves running from the point, resembling traces on soil digging tools indicate hitting the ground when the arrow missed the target. This research showed the skill of Mesolithic inhabitants of Ivanovskoye 7 site in the manufacture of bone arrowheads, which they used for hunting various animals. Numerous bones of the latter from Mesolithic layers confirm this.

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### 1. Introduction

Bow and arrows were the main hunting weapon during the Mesolithic in many parts of Northern Eurasia, and Central Russia is one of them. More than 500 Mesolithic sites are known nowadays in the region, and about a hundred of them were excavated, but most of these sites are situated on dry land where organic remains are not preserved. Field surveys and excavations, carried out by the author in 1988–2000, revealed about 60 wetland sites with good preservation of organic remains, reliable stratification and perfect opportunities for the application of scientific methods. Twelve of them were excavated, with a very good sequence of cultural layers from the very beginning until the very end of the Mesolithic. The

lower layer of Stanovoye 4 is dated to the transition from the Younger Dryas to the Preboreal period by pollen and about 10060–9800 BP (uncal.) by  $^{14}\text{C}$ ; bottom layers of Ivanovskoye 7 and Sakhtysh 14 – to the first half of the Preboreal period by pollen and about 9700–9500 BP; layer III in cut 3 of Stanovoye 4 and layer III of Sakhtysh 14 – to the second half of Preboreal by pollen and about 9400–8900 BP; lower layer of Ozerki 17 and 16 sites – to the first quarter of the Boreal period by pollen and about 8900–8800 BP; layer III in cut 2 of Stanovoye 4, bottom layer of Nushpoli 11 and layer III of Ivanovskoye 7 – to the first half of the Boreal period by pollen and about 8700–8500 BP; layer II of Saktysh 14 – to the second half of the Boreal period by pollen and about 8400–8200 BP; the bottom layer of Okajomovo 5 – to the end of the Boreal by pollen and about 8000–7800 BP; layer IIa of Ivanovskoye 7, bottom layers of Okayomovo 4, 18a and Ozerki 5 – to early Atlantic period by pollen and about 7400–7000 BP (Zhilin,

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2003a, 2003b, 2006a, 2007, 2009; Hartz et al., 2010). These sites produced extensive series of bone arrowheads, which are usually several times more numerous and various than lithic ones from the same sites. Good preservation of bone arrowheads and presence of blanks, preforms and unfinished arrowheads abandoned at different stages of their production gives good opportunity for the study of their manufacture (Zhilin, 1998) and use. Ivanovskoye 7 is one such site. Typological analysis of arrowheads from this site was carried out and results were published (Zhilin, 2001; Zhilin et al., 2002), but results of technological and use-wear analyses with the exception of one arrowhead (Skakun et al., 2014) are not published yet.

## 2. Materials and methods

### 2.1. Excavations and finds

Ivanovskoje peat bog is situated about 150 km north-east of Moscow, in the middle flow of river Nerl, which ran through a large lake during the Stone Age, connecting it with the Klyazma River, the left tributary of the Oka (Fig. 1). Ten sites were discovered there. Ivanovskoje 7 is the most interesting because it produced cultural layers of early, middle and late Mesolithic with good preservation of various organic materials including various bone artifacts in good stratigraphic sequence divided by sterile

peat and gyttja. 106 square meters were excavated there by D.A. Krainov in 1974–1975, and 332 square meters by M.G. Zhilin in 1992–1997 (Zhilin et al., 2002). The site has 3 Mesolithic and 2 Neolithic cultural layers. Mesolithic settlements occupied a low promontory during lake regressions, which was submerged during transgressions.

The lower, early Mesolithic (IV) layer is dated by  $^{14}\text{C}$  to  $9650 \pm 110$  BP (GIN-9520) and  $9640 \pm 60$  BP (GIN-9516). It is dated by pollen to the first half of the Pre-boreal period, before its optimum. During the middle Pre-boreal transgression, the site was submerged. Specialists in scientific methods consider that the phases of water level changes in Central Russia were caused by climatic changes in the early Holocene of Northern Eurasia (Velichko (ed.) 1994). About 300 bone and antler artefacts were found. 24 arrowheads including fragments were found in this layer. Long needle-shaped are the most recurrent (Fig. 2: 2–4, 11–12), some with slots for insets (Fig. 2: 7–8); one with a relief belt near the tang (Fig. 2: 5). A preform of a long needle-shaped arrowhead was found (Fig. 2: 1). Other types include long with regular biconical ornamented head (Fig. 2: 6); narrow tanged slotted with microblades preserved in slots at both sides, fixed by a sort of glue (a composite resin which is discussed in more detail in Section 3.3) (Fig. 2: 14); asymmetric one-winged with a slot for insets opposing the wing (Fig. 2: 9–10), and a small barbed unilateral arrowhead (Fig. 2: 13).

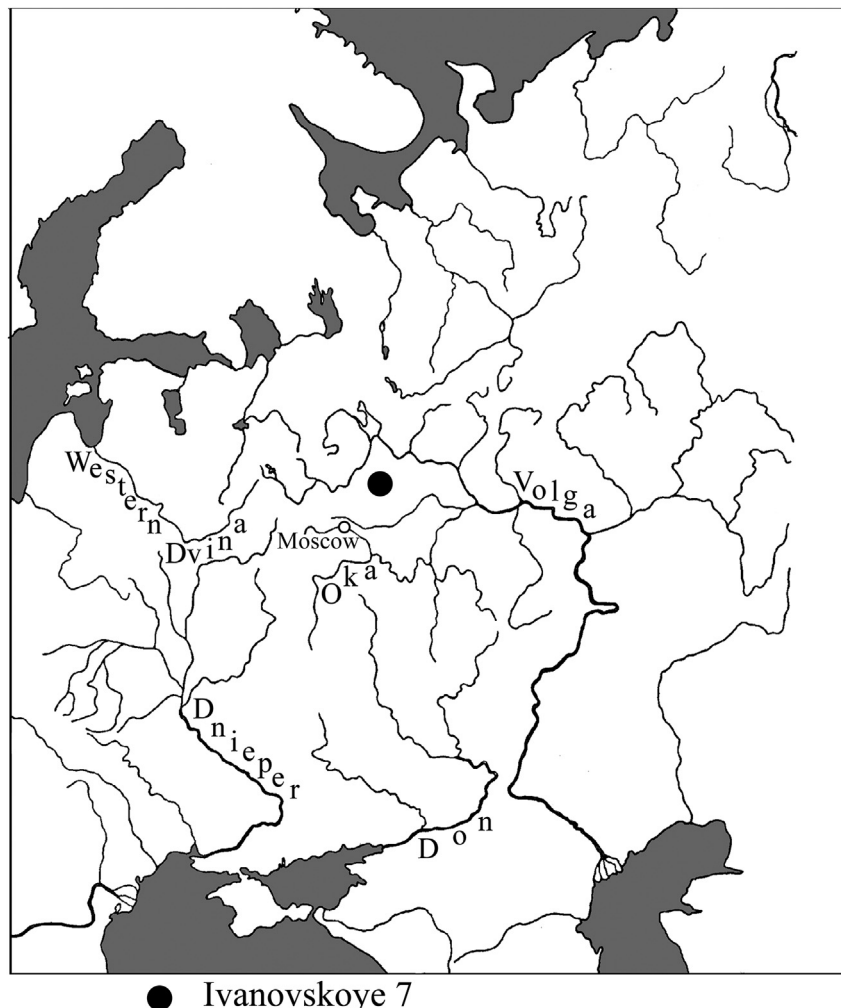


Fig. 1. Situation of Ivanovskoye 7 site.

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