Anthropologie et Préhistoire, 111, 2000, 95–101

Development of Microlithic Projectile Weapons in the Stone Age

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Among possible methods of manufacturing of thrusting-cutting parts of projectile points in the Stone Age were three prime technologies. In the oldest Early Paleolithic technology of "organic material points" it is a pointed tip of wood, bone, or antler baguette (for example Early Paleolithic wood monolithic heavy spears of Clacton-on-Sea, Torralba, Lehringen, etc.). The joining of the separate tool organic and stone raw materials defines a new stage of perfection in the Stone Age technique. This method not only discovers more broad constructive possibilities of improving tools of the Stone Age, but allowed more effective use of mechanical properties of organic and stone raw materials for projectile weapons (Semenov, 1957 : 232–234).

In the later Middle Paleolithic technology of stone "flaked points", these thrusting-cutting parts of the points were made with flat retouch. Using of the projectile tools were connected with powerful loading and harsh blows after collisions with targets. That is why this technology as all others, must not only shape the sharp edges of the points, but makes the stone tips stronger. Optimum outlines of the tips and ridges of flake scars allowed the reduction of the brittle mechanical property of siliceous stone raw materials.

However, in the Upper Paleolithic finally took shape the new progressive and latest technology of manufacturing of stone sharp edges, the blade processing of siliceous raw materials. But usage of these sharp edges in projectile points became possible only due to the invention of abrupt retouch which destroys one edge of the blade for more effective use and strengthening of the other one. This main technological principle laid down the basis of the microlithic technique and stimulated its more or less identical displaying in processing of microliths in the various Upper Paleolithic and Mesolithic blade cultures of the Old World.

The strengthening of insets with abrupt retouch allowedto use more and more microlithic blades with more sharp cutting edges and determined second morphological sign of microliths: the small sizes. It is the need of the microlithic projectile weapons that established the general tendency of size and thickness decrease of blade processing in the cultures with microliths during the Upper Paleolithic and Mesolithic. Size decreasing of stone blades determined by the microlithisation of other stone tools and spreading of the principle of micro-inset technology from its initial sphere (manufacturing of projectile points) to making of the scrapers, burins, drills, etc.

In contrast to these morphological types of stone tools in all assemblages of different cultures, the quality of prismatic blades from which microliths were manufactured always clearly corresponds to the level of the perfection of the blade processing of each culture. This feature distinguishes the microliths from other types of tools with secondary modification, which can be made from any blade even in high quality blade industries. Again, in contrast to other stone tools, in the microliths the use of unworked sharp edges of blade executed the basic thrusting-cutting function (in the projectiles) and were the dominating morphological elements. Such functions in other tools was accomplished by edges with the secondary modification. In the microliths, abrupt retouch enabled to choose the best shape for the insets according to the construction of projectile points (for most effective using of sharp edges) and to enlarge the cohesion with the gluing substances and the shafts. Due to the peculiarities of the combination of the blunted and sharp edges more broad constructive improvement of microlithic weapons became possible, contrary to other technologies.

That is to say that the establishing and development of the microlithic technique in the different cultures of the Old World were connected with the attempts of efficient use of the sharp edges of prismatic blades for thrusting-cutting functions of the hunting projectile weapons. Such use of the microliths as various insets of the projectile points was perfectly well reflected by archaeological and ethnographic materials throughout the world (Vignard, 1935:85–92; Clark, Phillips & Staley, 1976:223–288; 1978:128–145; Nuzhnyj, 1989:88–96; 1992:114–151). The experiments with stone projectile points and recent traceological studies of some microlithic assemblages of the European Upper Paleolithic, Mesolithic and Neolithic sites testify about similar use (Odell, 1978:37–49; Bergman: 236–248; Moss & Newcomer, 1982:282–312; Fischer, Hansen & Rasmusen, 1984:19–44; Nuzhnyj, 1979:35–43; 1990:113–124).

The period of perfecting of the microlithic projectile weapons in the Stone Age can be divided into five stages illustrated by the types of original composite points used in the different times and the morphological traits of microliths with the diagnostic projectile impact fractures. The development of these tools were according to the Ho Ho Classification of macrofractures on the lithic projectile points (Hayden, 1979:133–135 and supplement Fischer, Hansen & Rasmussen, 1984:22–24) accompanied by corresponding evolution of blade processing in the directions of microlithisation, increasing diminishing of thickness and of quality and standardisation of prismatic blades (Nuzhnyj, 1992:152–175).

The first stage was connected with establishing two morphological signs of the microliths: composition of blunted and sharp edges in each tool, and small sizes of insets. This new technology of manufacturing hunting weapons perhaps was based on the two preceding types of the insets of the hunting projectile points. Points similar to the Chatelperronian ones were spread in many earlier Upper Paleolithic cultures of the Old World (Chatelperronian in Europe, Dabbaen in Northern Africa, Pre-Aurignacian in the Near East, etc.). These points had both the sharp edge and massive curved blunt back, but were of very large size. The massive points with curved backs analogous to the above-mentioned appeared in the oldest microlithic assemblages of Ukrainian's Upper Paleolithic, for example in the Pushkari culture (fig. 2:1–4). According to the diagnostic projectile impact fractures they were used first of all as piercing heads of heavy weapons such as spears or darts (fig. 1:1; 2:3–11).

Other microblade insets of Aurignacian cultures of early Upper Palolithic of Europe and the Near East had small sizes, but were morphologically inexpressive, concerning the combination of blunted and sharp edges. In the later Aurignacian assemblages of Eastern Europe, for example Sagajdak I, Anetovka I, Muralovka, Zolotovka I (fig. 2:12–27) characterised small insets with abrasive wear traces on the sides (Filippov, 1977:177–181). Such methods of sides blunting of the stone insets of the projectile weapons for binding fixation without resin substances was spread in the Stone Age technologies throughout the world (for instance in the tanged part of Clovis, Folsom or Plainview points in America). Aurignacian insets probably were used as scales-like barbs, fixed with sinew or other thread on the points made of organic materials (fig. 1:2). Similar types of scales-like quartz insets hafted with binding on the points of spears were used in Eastern Australia (McBryde, 1985:246).

The second stage was characterised by typical backed microliths of Gravettian-Perigordian cultures, which combine both of these morphological signs of microlithic technique. The assemblages of such cultures (Gravettian of Europe, Kebarian and Baradostian of the Near East, Immeretian of the Caucasus, etc.) usually contain types of backed microliths, various narrow and elongated points with straight backs and rectangles of analogous outlines. Such types of backed microliths after 25 thousand years ago were wide spread in Upper Paleolithic stone assemblages of the Ukraine from the sites: Jamy, Mezin, Mezhirich, Fedorovka, Anetovka II and others. According to the diagnostic impact fractures on the tanged pieces, (fig. 2:33–42, 57–63, 65–67), the Gravettian points sometimes were used as piercing arrowheads (fig. 1:5–6), but the main function of those and especially rectangles was equipping of lateral composite edges of the foreshafts or points made of organic materials (Nuzhnyj, 1990:122–123).

The Gravettian microliths were hafted as contrasted with Aurignacian insets as a vertical edge and were fixed with resin-like substances on the surface of bone points or sometimes in wide and shallow slots (fig. 1:3–4). The

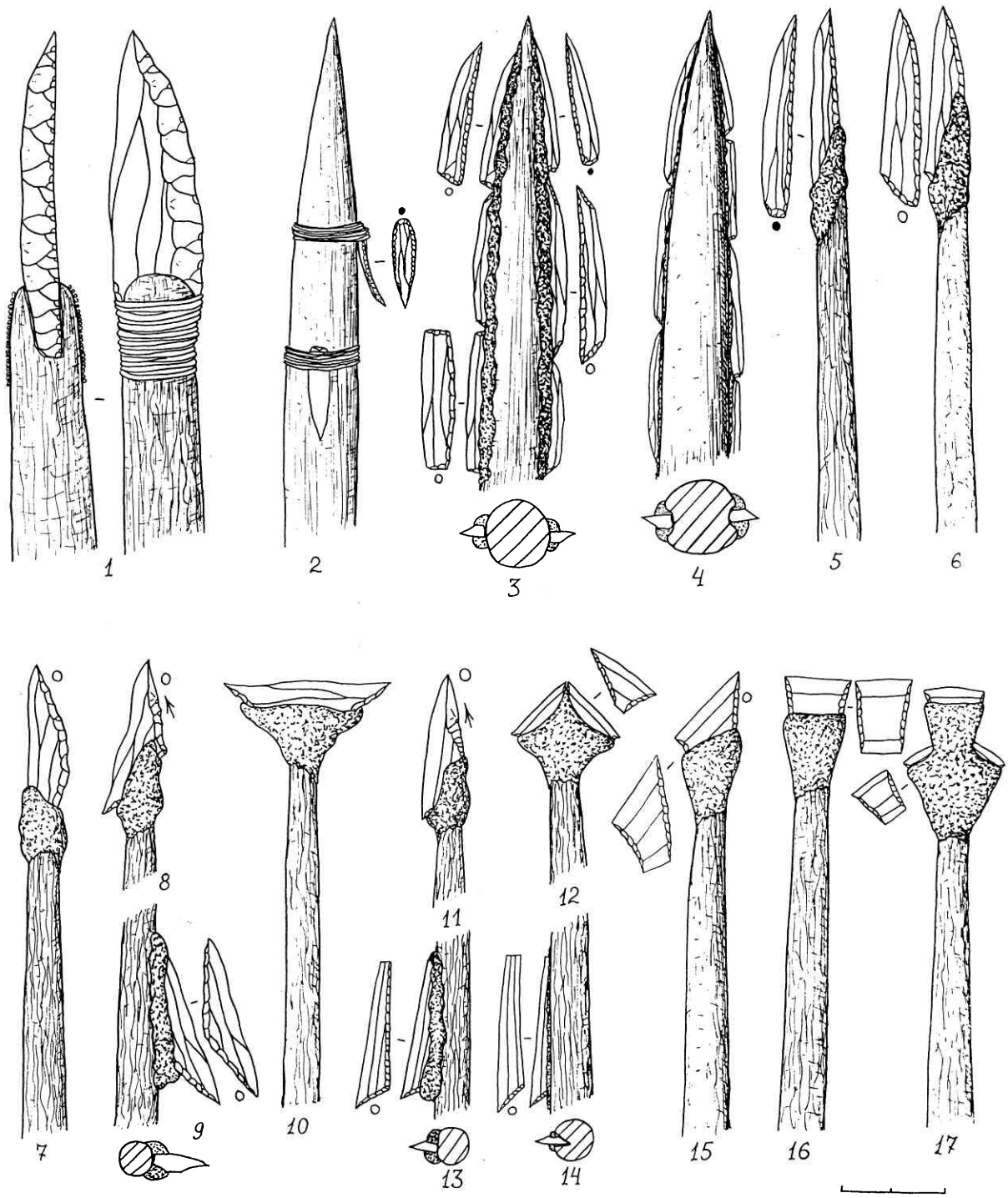

Fig. 1 — Reconstruction of the methods of hafting and using microliths in the projectile weapons. **1**: Pushkari Culture; **2**: Aurignacian Culture; **3–6**: Gravettian Culture; **7–10**: Early Mesolithic Shan-Koba Culture; **11–17**: Late Mesolithic and Neolithic Cultures of Ukraine.

invention of the slot technology by Gravettian peoples created reason to establish a new specialised microblade direction of manufacturing of the projectile points. Unworked fragments of microblades of high quality which were fixed in a lateral composite edge in the narrow and deep slots of points, were widely spread in Eastern Europe and Siberia with the special microblade cores (Paleolit USSR, 1984; Mezolit USSR, 1989).

The third stage was connected with "geometrisation" of the backed microliths which were used as arrow points in the Later Paleolithic (fig. 1 : 6; 2 : 57–58, 62, 65) and Early Mesolithic (fig. 1 : 7–8). This process had a more rapid extension in the Southern cultures of the Old World,

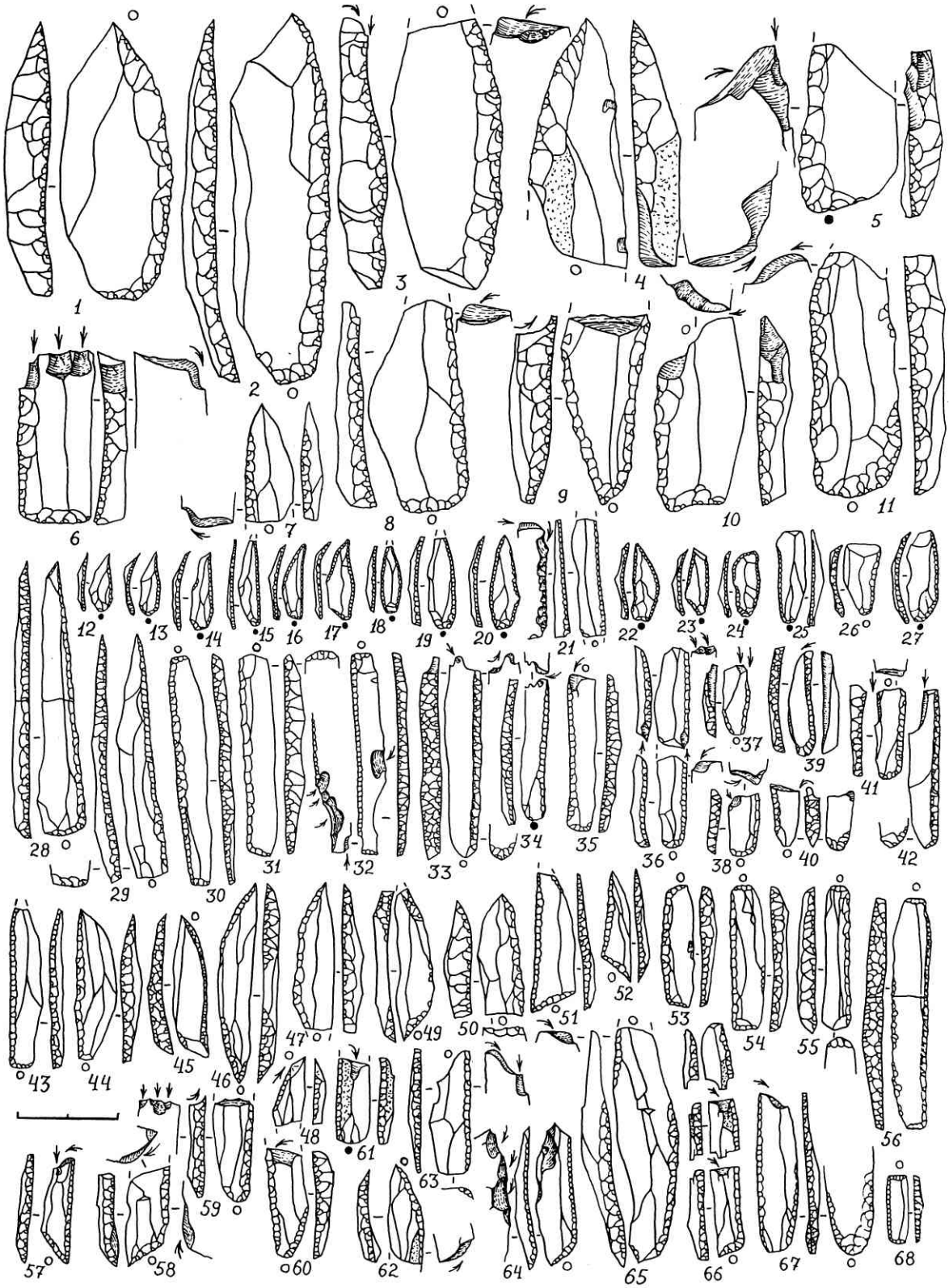

Fig. 2 — Microlithics from Upper Paleolithic sites. **1-11**: Pushkari I; **12–27**: Zolotovka I; **28–42**: Yamy; **43–68**: first and second layers of Fedorovka. The arrows and the hatching indicate the direction of the diagnostic projectile fractures.

from the limits of open glacier territories, due to the intensive use of bow and arrows for hunting in closed forest and mountain terrain. At first the older geometric microliths were used as piercing arrowheads (fig. 1:7–8) or barbs (fig. 1:9) and later as chisel-ended (fig. 1:10) ones. The use of microliths as transverse arrowheads, which are more effective for the "blood-track" hunting in

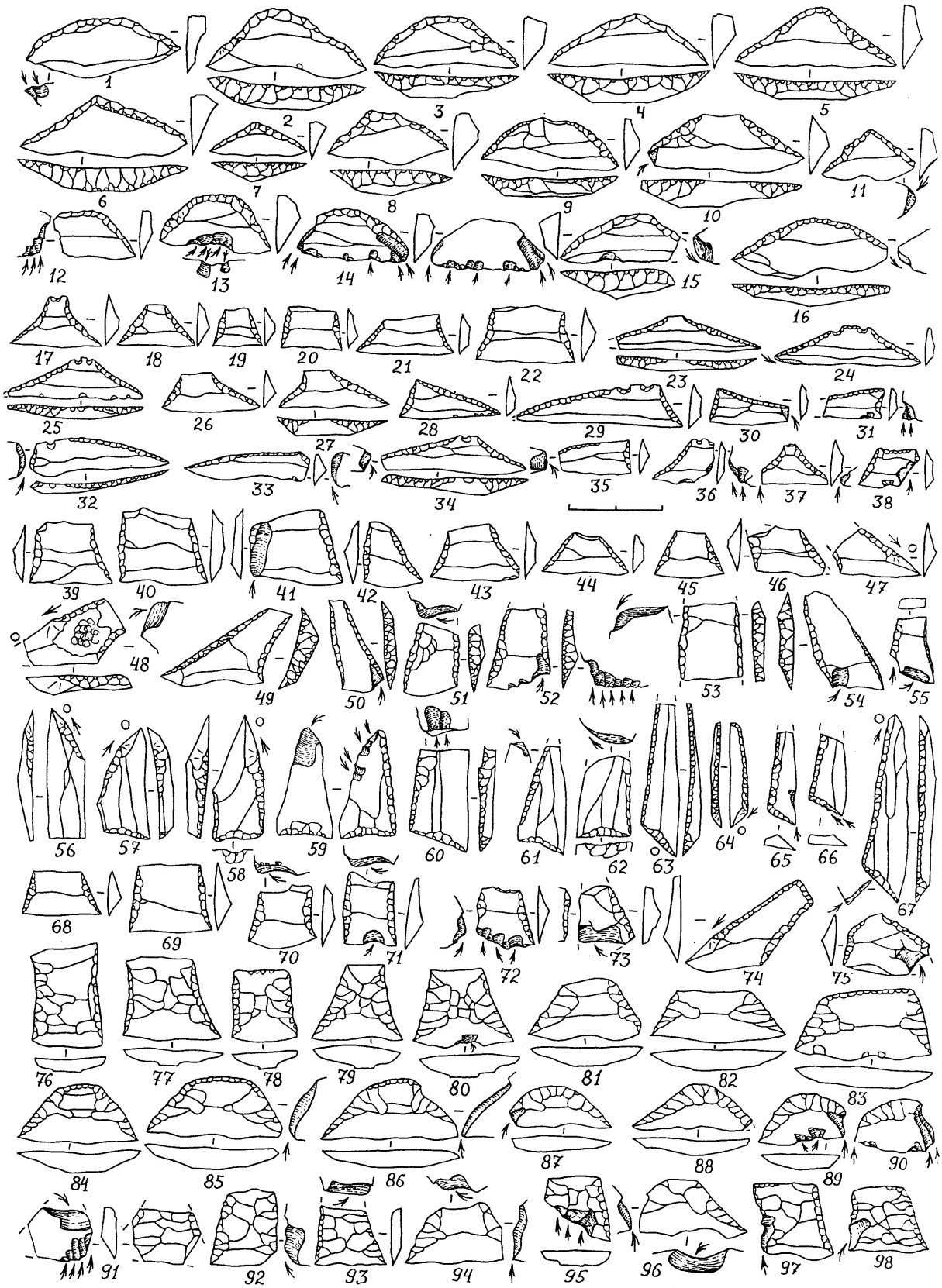

Fig. 3 — 1–16: Early Mesolithic microliths from fifth and sixth layers of Fatma-Koba; **17–75**: Late Mesolithic microliths of Murzakkoba, Grebeniki, Pesochnyj Rov and Janislavica Cultures of Ukraine [third layer of Shan-Koba (17–38), Grebeniki (39–47), Rudnija na Zdvizh (48), Studenok (49–55), Rudnija I (56–75)]; **77–98**: Late Neolithic microliths from first layer of Shan-koba. The arrows and the hatching indicate the direction of the diagnostic projectile impact fractures.

closed terrain, accelerated the process of their "geometrisation". That is why, greater degree of "geometrisation" of the microliths in the final Pleistocene of the Ukraine was attained in the assemblages of the Shan-Koba culture (Paleolit USSR, 1984 : 222). People of this culture occupied the closed terrain of mountain forest of Crimea and widely used geometric microliths not only as piercing arrowheads (fig. 3 : 15–16), but as transverse ones (fig. 3 : 11–14). These earlier geometric microliths had shapes of elongated and symmetrical segments, triangles or trapezoids with as a rule only one unworked sharp edge and blade intensively changed by retouch on three sides (fig. 3 : 1–16).

The fourth stage is distinguished by more typological differentiation and specialisation of microliths of the Late Mesolithic and Early Neolithic cultures used in different composite arrowheads: transverse, oblique or piercing types with or without various barbs and edges. The widespread type of Late Mesolithic microliths were various trapezes with a highly reduced role of retouch in their morphology. This was possible thanks to the high level of perfection of blade processing and manufacturing of straight, standard and geometrically shaped blades. At this time, the lithic assemblages of different cultures of the Ukrainian's later hunters [Murzak-kobinian, Grebenikian, Janislavisian, Pesochnorovian, etc.] (Mezolit USSR, 1989 : 106–120) always contained morphologically expressive types of more or less symmetrical and asymmetrical shaped microliths (fig. 3 : 17–75). According to the diagnostic impact fractures the first of them were used as transversal (fig. 3 : 36–38, 41, 51–53, 70, 71) or oblique arrowheads (fig. 3 : 50, 54, 73, 75) and the second, as piercing tips (fig. 3 : 24, 30, 34, 35, 48, 59–62) or barbs (fig. 3 : 31–33, 65–67).

The fifth, final stage of development of microlithic projectile weapons begins with the Late Neolithic and is defined by degradation of blade technology. The reducing of importance of hunting weapons in the economies of early farmers gradually led to the change of purpose of blade processing. Necessities of microlithic projectile weapons began to have far less influence on the blade processing and manufacturing of other lithic tools. At first took place increasing of size of blades and rejection of the inset technology of the making of the tool. At the second occurred total degradation of blade technology. As a reaction to this process took place the regeneration of the flat retouch technology, which also appeared on the latest geometric microliths of different Final Neolithic and Eneolithic cultures of the Old World. For example such types of the microliths were used in the Neolithic culture of Crimea (fig. 3 : 76–98) and were more typologically unified as compared with the Late Mesolithic ones. Typological unification of the later microliths was connected with their functional specialisation as projectile points and their use only as chisel-ended and oblique arrowheads (fig. 1 : 15–16). The Late Neolithic microliths from Crimea have diagnostic impact fractures mainly from use in such function (fig. 3 : 5, 86, 89–98). All the piercing points at this time already were made with the biface flat retouch and use of sharp edges of blade in the projectile weapons took place only in the latest microlithic oblique and transverse ones. The total degradation of the blade processing and increase of the role of flat retouch technology in manufacturing of lithic tool interrupted the use of these sharp edges in the hunting weapons and the development of the microlithic projectile points.

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