of cases sewing was done without them. Flint awls had a very sharp tip broadening out towards the base, which made them suitable for piercing a hole in the skin for the passage of the thread. However, work with an awl had its snags. A broad awl might not only pierce but also with the pressure cut the skin, while the projecting point was liable to break in use on thick skin, if there was a careless sideways movement of the hand. So to widen the hole to the necessary diameter a bone awl was required. The flint awl merely began the hole; a bone point of circular section opened it and stretched the elastic fibres of the skin, so that after the passage of the thread (with or without needle), the hole closed up and gripped it. Such would be the process of work with a piercer awl, bone point and needle in sewing skin and fur clothing in upper palaeolithic times.

We have studied flint awls from different palaeolithic sites. In Kostenki I, as remarked above, awls were made after the fashion of shouldered points. Small flint blades were subjected to steep retouch at the base where the notch was made, and then the tip was sharpened by fine retouch, whose facets can only be examined with a magnifying glass (fig. 40.1–5). Sometimes the sharp edge of the awl was retouched to blunt it or make it narrower. At Kostenki I in certain cases small elongated flakes with narrow sharp ends were used as awls. They were employed without trimming and their purpose can only be recognized by the traces of use on them.

Examples of the use of flakes or irregular blades as awls have been recognized on material from the Siberian site of Malta. The flakes varied in form; sometimes the tip was trimmed with fine retouch, sometimes not.

The awls from Kostenki IV are of great interest in research. At this site in the complex of a long house a large quantity of flint objects of microlithic appearance were discovered. Small fine bladelets, struck off with burin blows from larger blades, had been carefully treated with fine retouch on one or both edges, and a substantial number of them had a sharp tip bearing traces of use in piercing. Probably such awls were used for sewing together the skins of small animals without a bone needle. This supposition is based on the presence in the site of a large number of hare bones, about 100 individuals. Besides awls little blades were found whose ends did not come to a straight tip, but were bent over at angle of 120°–30° to their axes. In one instance the blade was blunted by retouch, and study of the end of the point showed that it had been used for cutting. In all probability the initial cutting of the hare skins (removal of paws and straightening the edge) was done with these tools before sewing them together. This suggestion will require further study for verification.

Study of flint awls under the binocular microscope has led to the identification of traces of wear of two types.

(1) Striations in the form of fine lines always on the very tip and parallel to the axis of the awl, that is along the line of the working movement. Sometimes they take the form of sharp lines produced by hard sand grains that had found their way into the pores of the skin, but this is a rare, not a characteristic trait.

(2) Polishing of the tip is often detectable with the unaided eye. Under the microscope the unevenness of the polishing can be seen covering the whole tip surface with an irregular lustre. The strongest lustre is on the projecting parts which during use encountered the greatest resistance from the material being pierced (fig. 40.2). This occurs above all on the facet arrises facing forwards, structural lumps in the flint or projecting pieces of impurities in it. On the reverse side the projections often have no polishing on them.

In rare cases attempts to sharpen the point by grinding can be recognized. An example of this is an awl from Kostenki I with a notch at its base (fig. 40.4). On both retouched edges on its underside there are definite traces of grinding the edges of the tip.

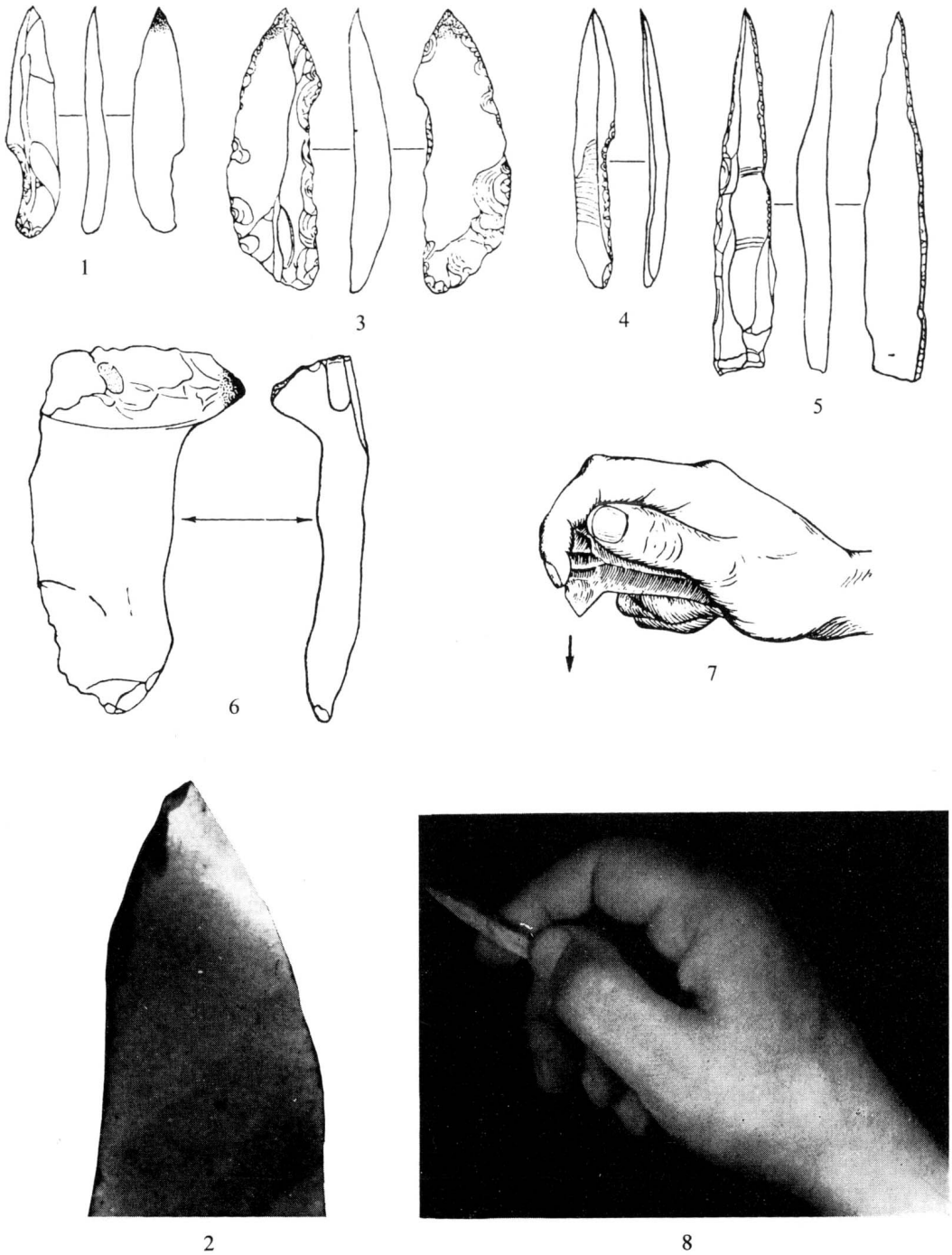
In Kostenki I besides normal awls on blades and flakes a completely individual type was identified. This was a beak-shaped tool made on a retouched flake. 'The beak' or chisel-shaped tool bore traces of strong polishing and striations indicating that it had been driven into some material, which might well have been skin (fig. 40.6, 7).

f. Upper palaeolithic meat knives

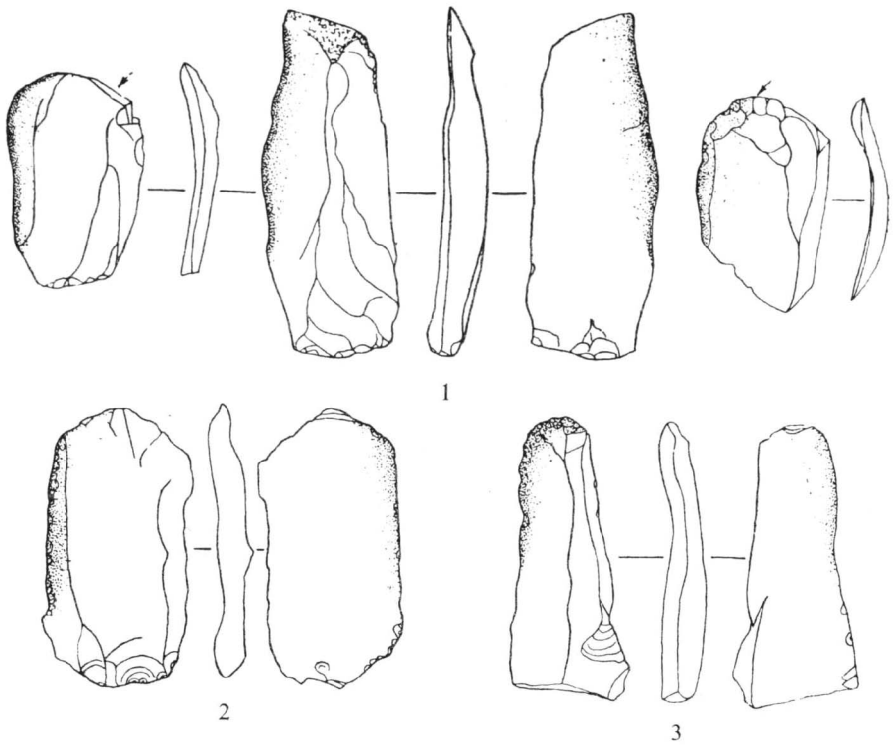
One of the most important functions of stone tools in palaeolithic times was skinning and cutting up the carcasses of game, and also cutting meat during eating. Animal skin, muscular fibre and tendons are very tough material and strongly resistant to cutting. Human teeth and fingernails, in contrast to predatory animals, are not at all suited to even rough and ready dismemberment of large game. A flint blade or flake with sharp edges would be an essential tool therefore in the hands of a palaeolithic hunter.

Since the division of a carcass and the cutting up of meat is not a formal creative act, like making a stone, bone or wooden object, it might appear at first sight that the mere division of a whole body into parts could be done with any kind of flint flake or blade that was to hand. So it might be concluded that to identify any specially prepared knife designed for cutting meat would be impossible. In point of fact this is not so.

It has already been shown that some shouldered points bore traces of use for ripping, disembowelling and cutting up game, which are specifically characteristic of this. Such traces could not be formed by any other kind of use. However, on many other sites in the Soviet Union shouldered points have not been found, although the dismemberment of game was undoubtedly done



40 1, 3 *and* 4 *Shouldered points from Kostenki I;* 2 *traces of use as an awl on one (1);* 5 *awl from Kostenki IV;* 6 *beak-shaped flake from Kostenki I used as a perforator;* 7 *its method of use reconstructed;* 8 *'shouldered point'* (4) *held with the index finger resting in the notch.*

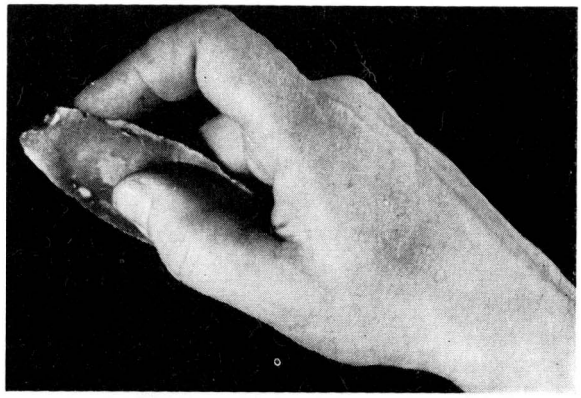


everywhere. Evidently therefore for this purpose there existed implements of another form.

Amongst the material from Malta were a series of short blades, barely retouched except for some relatively insignificant trimming. The largest were up to 80 mm long, the smallest up to 50 mm, and their width varied from 20 to 35 mm. On each of them one sharp edge was polished. The other edge either was not polished or it was too thick to be used for cutting. The polishing extended on to both faces of the blade, ventral and dorsal, which showed that its function had been to cut into a soft material into which it had sunk, probably meat. The polishing, however, did not cover the whole edge. The thick end had remained unpolished as opposed to the thin end (fig. 41.1–3).

Relying on the signs of wear, it can be inferred that the meat knives from Malta were used without separate handles, being held between the thumb, index and second fingers. The thumb and second finger held the sides (ventral and dorsal faces of the blade), while the index finger pressed from on top at the forward end of the blade, where an area had been blunted by retouch (fig. 41.4).

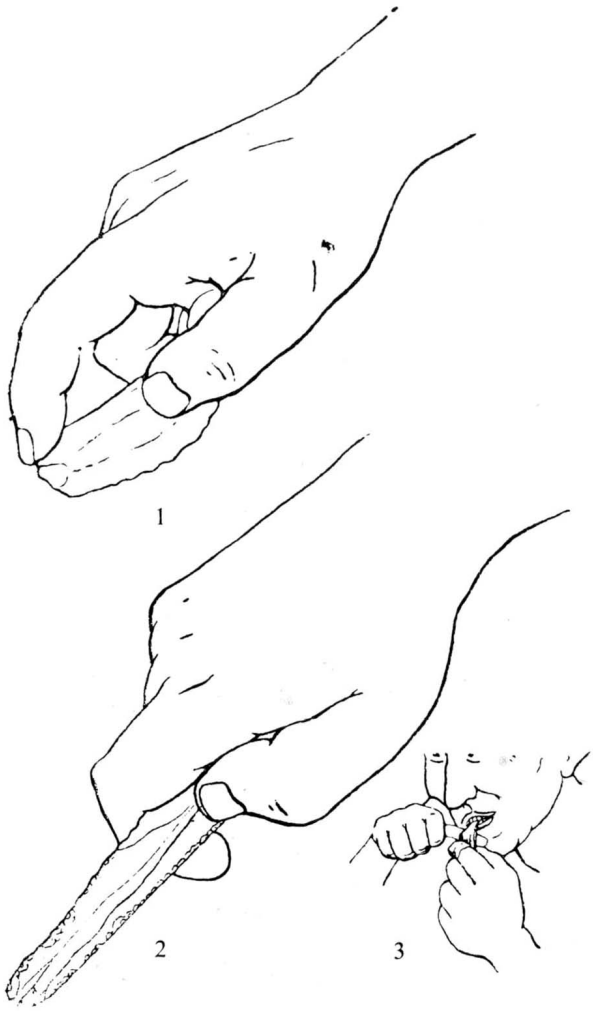
In palaeolithic times meat was the basic kind of



4

41 *Upper palaeolithic meat knives from Malta (Siberia): 1–3 one-sided knives on short blades; 4 how such a knife was held.*

food and was eaten either badly roasted, cured or raw. Generally pastoral or hunting people (like the nomads of Mongolia, Tibet, Abysinnia and other countries) eat such meat with a knife in one hand. Meat is normally cut into strips, and baked or cured in this form. Then each person takes a piece and, holding one end in his teeth, cuts it free with a quick movement of the knife at his mouth, repeating the operation until the whole strip has been consumed. The cutting is done upwards from below. We have seen this done among Nenetz reindeer herdsmen in the Kanin peninsula in 1928. With raw reindeer meat and fat this method is uniformly practised among practically all northerners. It is due not to custom or habit but to primitive conditions of life, where it appears the most rational method.



42 *Two types of upper palaeolithic meat knife in the material at Malta and Kostenki I: short knife* (1) *and long knife* (2) *as held in the hand.* 3 *cutting raw meat at the mouth while eating* (*a reconstruction*).

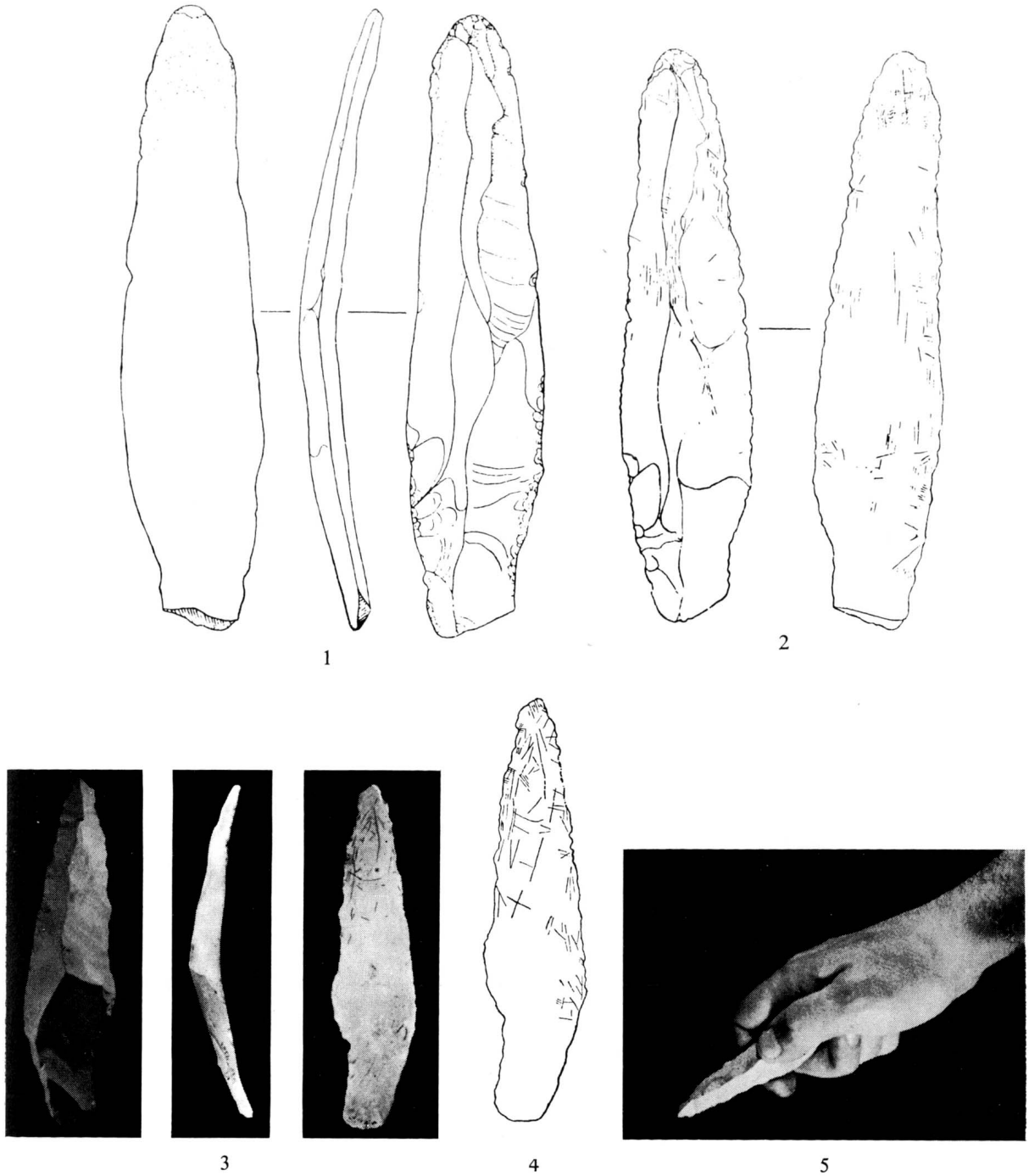
In Kostenki I besides shouldered points a special type of knife had been used, the blunt-ended knife (fig. 43.1, 2). It consisted of a flint blade up to 150 mm long, neither side retouched, if we leave out of account the retouch on the very end. At the lower end, which was held in the hand, both edges were blunted by retouch.

A peculiarity of this knife was its method of use as indicating by polishing. This covered the working end of the knife on all sides almost at all points of its surface, and then spread from the edge almost to the middle of the blade, where it gradually weakened. On the working edge the shine was mirror-like. From this it is evident that the knife had had long use and was employed without a handle (fig. 43.2).

That this knife was employed in the treatment of carcasses cannot be doubted. The polishing covered all the hollows of the facets, and could have been formed only if the working part of the tool had encountered resistance from a pliable but elastic mass which made contact at all points on its surface. Such material could only have been the muscles, adhesive tissues and internal organs of an animal's body. Probably the knife was used for skinning. If a skin was to be taken off in one piece a knife would be necessary to cut it free at the head, neck, tail and legs of the animal. In taking the skin off fat animals a layer of fat is also peeled off stuck to the pelt, and commonly with the fat are tendons of meat. The skin therefore would have to be cut free underneath to release it from the animal's body, and a blunt-ended knife would be safer to prevent damage to the skin, which is easily pierced or cut through during this operation.

A blunt-ended knife would be unsuitable for ripping open a carcass when the skin has got to be severed, but cutting can be substituted for piercing by pressing the blade down hard on the animal's skin with the fingers of the left hand. Moreover, a palaeolithic hunter was supplied with sharp-ended knives (fig. 43.3, 4) and other suitable tools. There are some grounds for believing that when skinning he made use not only of stone knives but bone ones also, which have not yet been studied.

Microscopic study of the surface of a whole series of blunt-ended knives from Kostenki I has shown that these specimens, which had a specially long duration of use, have not only marks of polishing but also a close web of linear marks in the form of scratches and lines. The latter were not oriented in one direction, and on the working end, which was the most intensively polished,



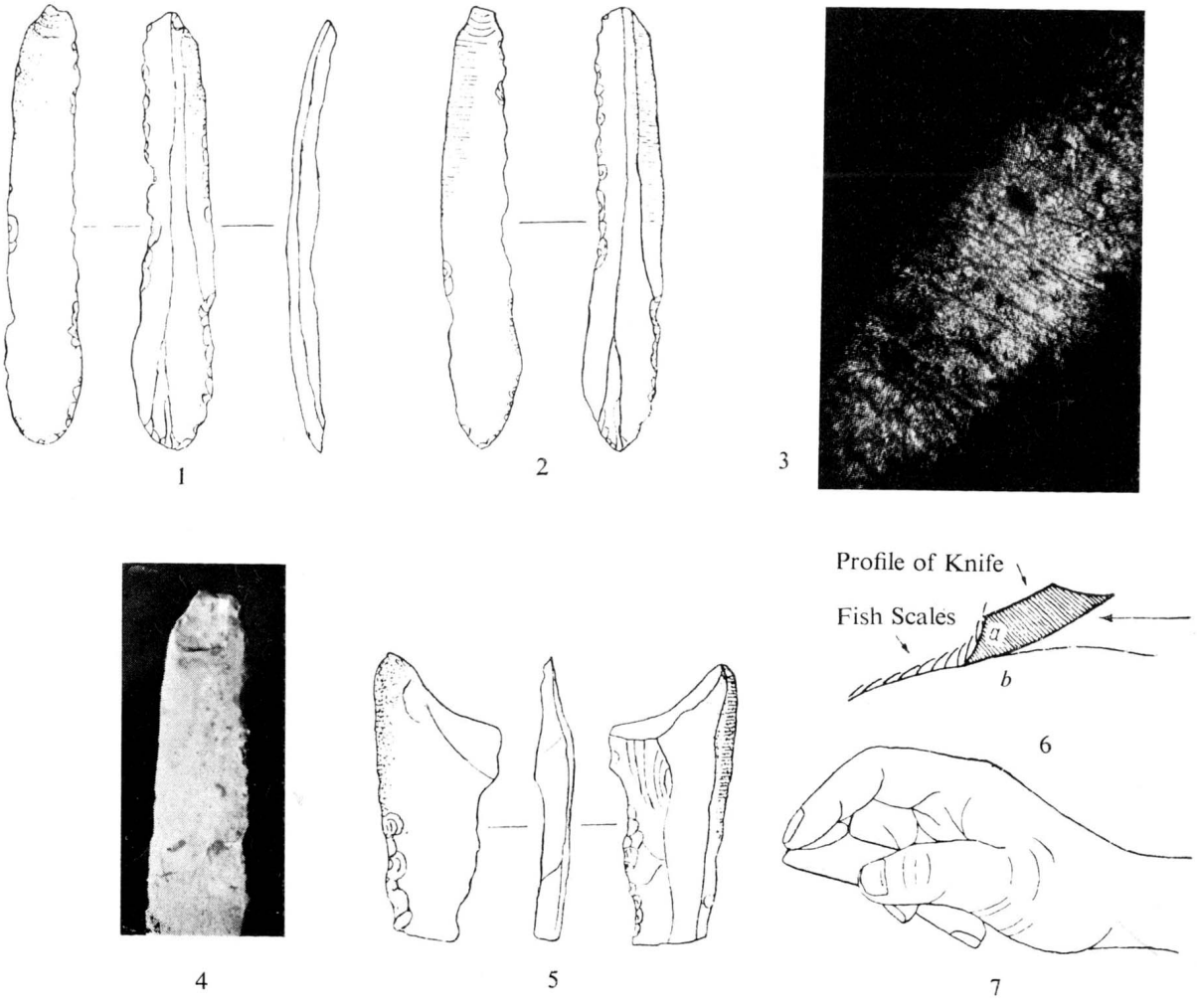
43 *Upper palaeolithic meat knives from Kostenki I:* 1 *and* 2 *blunt-ended* (1 *polishing on surface at working end on both faces;* 2 *striations showing direction of movement);* 3 *and* 4 *pointed knife* (4 *striations on ventral face);* 5 *working position of pointed knife reconstructed.*

they intersected at various angles. This kind of web of lines (fig. 46.1) indicates that during use the knife did not have one definite cutting plane, nor a constant angle at which it was held; the working position of the knife varied as one or the other edge was used on the material being cut. The hand could have such freedom of movement only in cutting muscular and other fibrous body parts.

As regards the striations on the blades themselves, they usually run almost parallel to the blade edge or slightly inclined to it, and occur on both faces almost over the whole surface (fig. 43.2, 4). This indicates that the knife was deeply embedded in the material being worked, and operated with a one-way or two-way 'sawing' movement necessary for the cross-cutting of muscular fibre, tendons and sinews.

g. Mesolithic flint knives from Crimean caves

Study of flint knives made on blades reveals the very varied uses to which they were put in daily life in the Stone Age. Those dug up by Bonch-Osmolovsky and Bibikov in the Crimean caves of Kara-Kush-Koba,



44 1–4 *Mesolithic flint blade from Kara-Kush-Koba used as a knife:* 1 *general view showing wear on both faces on one edge;* 2 *general view showing striations from wear;* 3 *striations on ventral face enlarged 50 ×;* 4 *working part of knife with left edge blunted and right edge toothed;* 5 *mesolithic flint knife from Fatma-Koba with wear traces on both faces;* 6 *method of work reconstructed (ab suffers friction)* 7 *method of holding the tool.*

Fatma-Koba, Shan-Koba, and Murzak-Koba must be put into a special categeory.

The first specimen came to light in Vekilova's excavation in Kara-Kush-Koba in 1949. It is a small flint blade (75 mm long, 10–12 mm broad) toothed along one edge and with intense wear on its surface (fig. 44.1), showing itself as gloss on top and bottom faces of the blade. In addition the arrises and the working edge are strongly blunted from the loss of large particles in the material itself. Such wear could only have arisen as the result of very prolonged use. It must be emphasized that taking all the facts into consideration (size of the blade, its section, the disposition and micro-structure of the traces) the evidence points to the use of the flint upon a resistant material with the elastic toughness of animal matter. We can quite exclude therefore stone, bone and wood.

The striations occur as very fine lines on the ventral face and on both facets of the dorsal face of the blade, and lie at right-angles to its working edge (fig. 44.2). The micro-photograph shows that they deviate markedly from a true right-angle and intersect with each other, indicating merely the variable position of the axis of the instrument, which is a common occurrence in work with the hand (fig. 44.3). In every case the texture of these traces differs from those on meat knives. Moreover, such strong blunting of the edge could not take place on meat knives (fig. 44.4).

Further examination of other material from Fatma-Koba, Murzak-Koba, and Shan-Koba revealed that blades with analogous traces occurred there (fig. 44.5). These blades differed in shape, size and section, but the marks of wear were identical. In all cases the polishing occurred on both faces of the blade, upper and lower, while there was a variable degree of blunting on the edge. In each case the striations were at right-angles to the working edge (fig. 44.5).

The decipherment of these traces gave rise to great difficulties. It was quite obvious that they were not used for cutting, but for some kind of scraping, and yet the material worked had affected both faces of the blade. It was also clear that the tool's movement was 'on himself' and the tool was undoubtedly used without a handle, as indicated by the weak polishing on the surface of the non-working parts. All that was known about methods of working on stone, bone, wood, skin, or cutting meat, or sawing different hard materials, had no relevance to the wear traces on the mesolithic blades from the Crimea.

The only possible use at that period which could have been responsible for such traces would be the scaling of fish.

In this operation a sliding movement is used with the blade held at a slight angle to the surface being cleansed. The blade edge encounters resistance on both faces; below it is in contact with the skin of the fish, while above friction arises between knife and scales, as the former sinks beneath them, tearing them off the skin (fig. 44.6).

Did the mesolithic inhabitants of the Crimean caves clean the fish for eating? Remains of fish bones have been found in the caves. Climatic conditions of the period gave rise to a primitive fishing economy accompanied by collecting. The fish were probably eaten both cooked and raw; they could be baked on a fire without removing the scales, but scaling was necessary if the fish were eaten raw, as is commonly done by northern fishermen, Oceanians, natives of the Australian coast and other peoples.

h. Whittling knives of palaeolithic and neolithic times

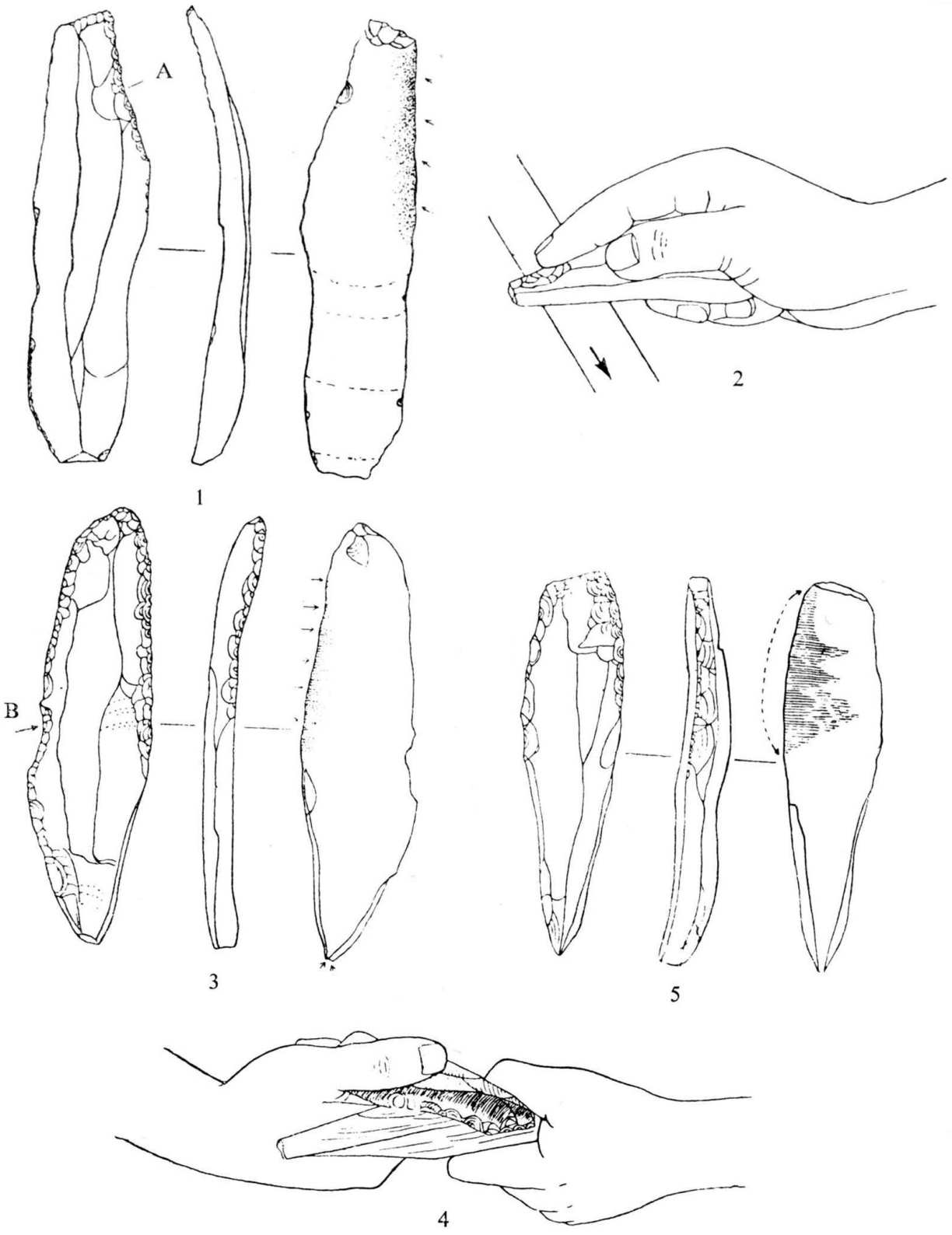
In the existing terminology applied to palaeolithic and neolithic tools a whole series of names are used for knives: 'knife-shaped blades', 'blunted-back points', 'points in the shape of a penknife blade', 'semi-lunate knives', 'elbow-shaped knives', and so on. Such names tell us nothing about the real purpose of the tool. Commonly every conceivable kind of cutting of different materials is attributed to the 'knives' without any explanation of the character and peculiarities of the work done by them.

In the Stone Age it was actually possible for tools to fulfil two or more functions, but divisions of functions between tools arose at an early stage. This division of functions between tools in the Stone Age invites comparison with the position in the early metallic period. Stone tools on account of their brittleness could not be used for different kinds of work requiring different degrees of force or angles of pressure on the edge or point in the same way as metal tools could. For example, a 'point with blunted back' but retouched working edge is very thin in section, and such a blade-edge could not whittle wood or bone although it might cut meat or skin.

For whittling wood and bone a new implement was introduced in upper palaeolithic times, the whittling knife, which we have identified in the material from Kostenki I and IV.

The whittling knife from Kostenki I consisted of a flint blade 120 mm long and 30 mm broad (fig. 45.1), which, as with the majority of prismatic blades, was bow-shaped in section. Both edges were worked by fine retouch. The left side is slightly blunted by retouch in the lower grasping part; the right side bears a slight notch made by pressure retouch at its forward end to accommodate the index finger (A).

The tool bore traces of prolonged use and the grasping part had been slightly polished by the hand. On the ventral face there is an area of intense polishing on the right-hand side, growing stronger as the edge is approached. On the upper surface of the tool there is no



45 1 *Whittling knife from Kostenki I with notch* (A) *for index finger (area of polishing on underface stippled and general direction of striations indicated by arrows);* 2 *reconstruction of how the knife was held;* 3 *whittling knife from Kostenki IV with two burin facets at base and notch* (B) *for middle finger (direction of striations indicated by arrows);* 4 *reconstruction of method of working the knife ('from himself');* 5 *whittling knife from Kostenki IV with broken end, the base worked by burin blows for mounting in handle (polished area shaded).*

intense polishing, but a weak gloss all over the tool caused by the friction of the human hand.

Careful examination of the whole tool showed that the lustre on the grasping part was transected by very fine short lines, running in different directions. This type of wear arose from sand grains in the pores of the skin which from the pressure and sliding of the hand left irregular traces on the flint surface.

The striations on the polished part of the tool were of quite a different kind. Here appreciable scratches and lines were found running at right-angles, diagonally or occasionally parallel to the edge (fig. 47). The blade edge was not only polished but to some extent jagged with tiny scars, mainly on the under-face, which had caused the tool to become unserviceable and be abandoned. During whittling particles of flint had been torn off the edge under the pressure of the hand, which probably also scratched the working surface of the blade. Extraneous abrasive elements might also have fallen on to the blade.[1]

The dorsal surface of the blade was not worn. We have already explained why the upper surface of a whittling knife is hardly ever worn. When we whittle wood with a thin metal knife the blade, as it sinks into the wood, suffers uneven pressure and friction, but even the side facing the paring will bear traces of wear. A flint whittling knife is a good deal thicker with a steeper edge angle, because a thin flint blade would crumble at the first movement. A thick blade produces a thin paring which curls up into a circle and so hardly ever causes friction on the upper side of the blade. This applies particularly to bone from which only a very thin paring can be removed. There are some grounds for supposing that the whittling knife being discussed was used to best advantage on bone; traces of whittling on bone objects from Kostenki I are numerous.

In Kostenki IV whittling knives of another type were employed (fig. 45.3–5). They were made on blades, but have retouch on both edges except at the grasping end, where both sides have been removed by two strong burin blows, giving the butt the form of a medial burin. It is customary to call such tools burins, but in fact, in spite of the traces of prolonged use found on them, there are no traces of their use as burins. The wear traces on the underneath were not on the right side as at Kostenki I but on the left which is their especial peculiarity. On the micro-photographs the traces emerge as scratches either at right-angles or slightly inclined to the edge (fig. 46.2). There are no notches for the index finger on the knives from Kostenki IV, but on one (fig. 45.3) there is a notch in the middle of the left-hand side (A). In holding it the second finger of the right hand would rest comfortably in this notch. Its presence and the position of the wear traces on the left side are evidence for reconstructing the process of whittling differently from that with the Kostenki I knife. Here the whittling was effected by a movement 'away from himself' (fig. 45.4). This method allowed the application of much greater force by making full use of the shoulder muscles. Even the left hand, which in the 'on-himself' movement merely grasped the object being worked, in the 'from-himself' movement played a full part by exerting pressure in a contrary direction to the right hand.

The whittling knives from Kostenki IV evidently had prolonged use. The intensive polishing, particularly on one of them, the indications of repeated trimming of the blade with secondary retouch, as well as a fair degree of gloss caused by the hand over the whole surface, all testify to this. The possibility cannot be excluded that the opposite side of the blade (right on the underneath) was sometimes used in work, but striations there were scarcely detectable.

A third kind of whittling knife has been identified from the Timonovka material (fig. 48.1). This is a short knife, sometimes trapeze-shaped. The palaeolithic craftsmen whittled with this knife, holding it between the thumb and two fingers, or possibly inserted it in a haft.

Thus the whittling knives which we have identified in upper palaeolithic industries, allowing for their differences and individual peculiarities, are distinguished by the following characteristics:

(1) They are made on blades.
(2) They can be trimmed or even formed by retouch and burin blows, but sometimes they are not shaped and have no retouch.
(3) The most important criteria for functional identification are two types of wear; polishing and striations.
(4) The main wear is, as a rule, confined to one side of the tool, and on the other side the traces are less distinctive.
(5) The worn side must be the ventral side of the blade, as the smooth side always faced the material.
(6) The polishing is along the edge of the tool and gradually weakens away from the edge.
(7) The striations indicating the direction of the hand movement appear as microscopic scratches or lines lying at right-angles to the edge or slightly inclined from this.

The marks just enumerated of palaeolithic whittling knives are general traits for stone whittling knives of all periods. This is confirmed by study of ground neolithic

[1] The micro-photograph of the worn surface (fig. 47) shows a rather intricate picture of striations on a 'ribby' fracture surface.

1

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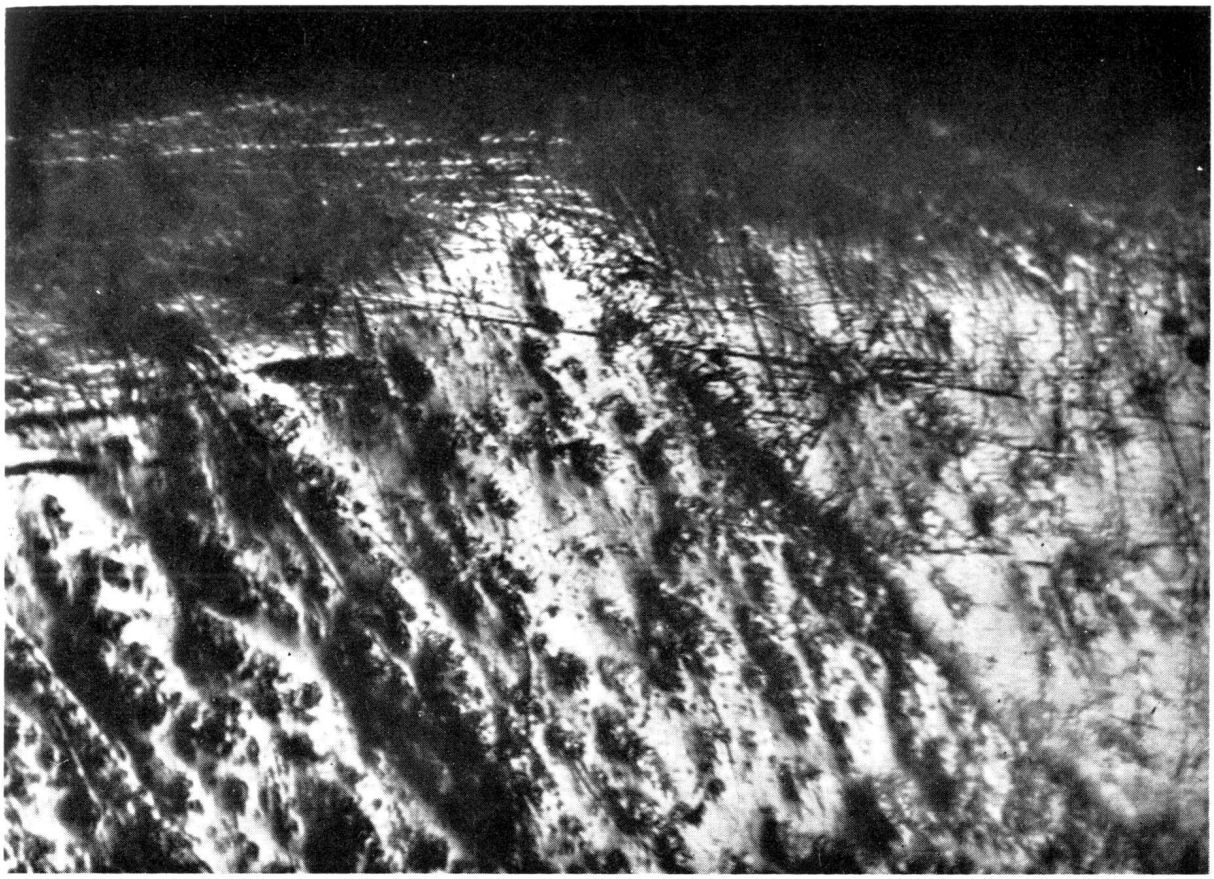
46 1 *Wear on meat knife from Kostenki I in fig.* 43.1 *magnified 75* × 2 *striations on whittling knife from Kostenki IV in fig.* 45.5 *magnified 30* ×.



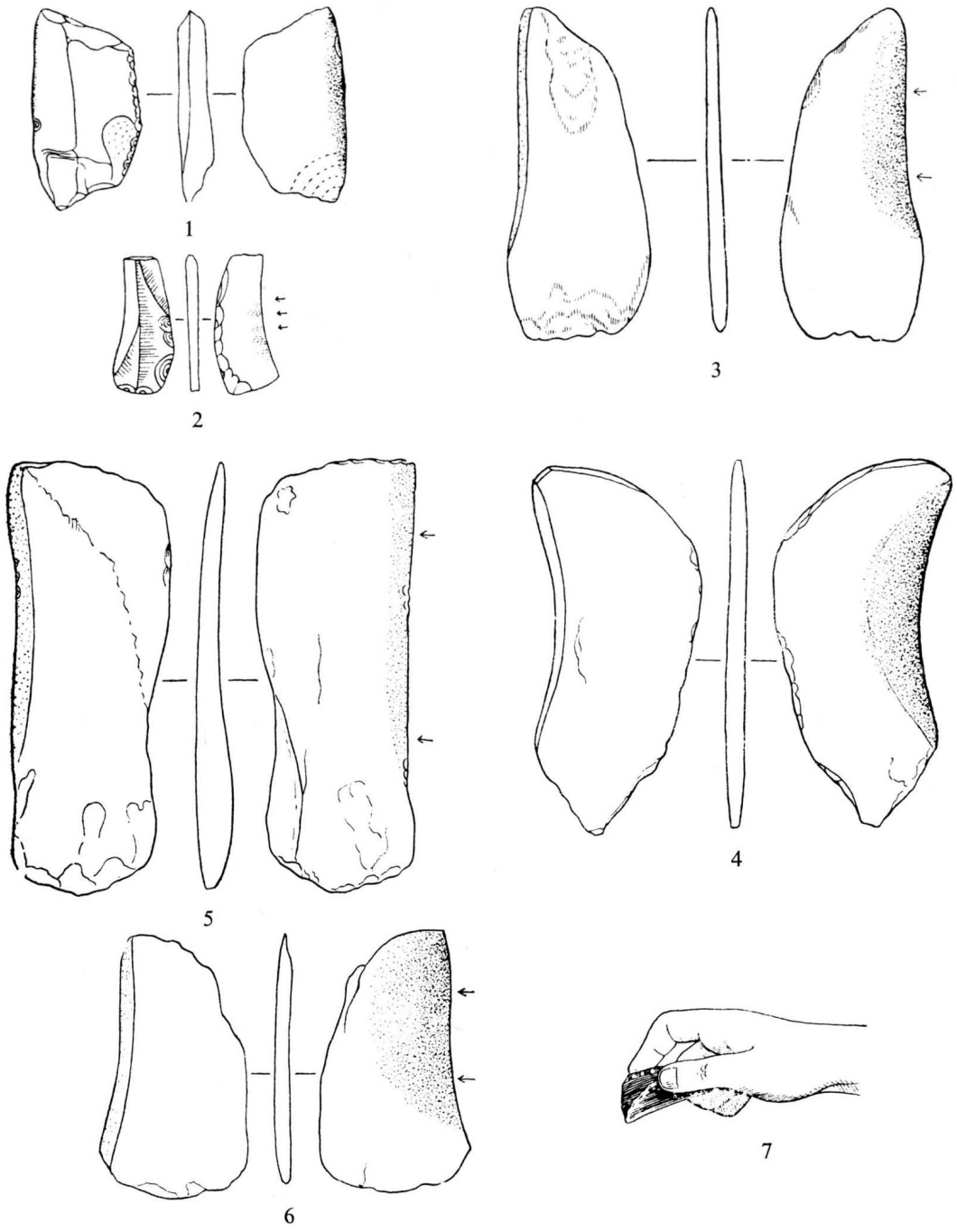
47 *Wear on a whittling knife from Kostenki I in fig.* 45.1 *magnified 300* ×.

knives from the L. Baikal area made on nephrite blades. Generally these knives are semi-circular in shape with either a concave or straight blade. They have had the name 'knife' conferred on them, quite accurately, but without giving any clue to their specific function. In fact, ground nephrite knives were not all-purpose tools for various methods of cutting. For example, in disembowelling game, cutting meat or skin these semi-circular knives would have been quite impractical, because this type of work requires the blade to be either thin edged or denticulated by retouch. In these knives the blade generally has a long narrow facet on one side and no sign of toothing. This facet has been made by grinding to strengthen the cutting angle in an analogous way to the fine retouch on palaeolithic tools. The flat surface would cut the wood away, giving a small thin paring. So these knives must be regarded as cutting tools preferably for wood, but also suitable for bone. Their use on wood is testified by the position of the polishing, which occurs not only on the under-face but also on opposed parts of the facet where it has been caused by the paring. The cutting edge of the blade of these knives is 45°–50°. With such an angle the paring would be thin, but because of its softness thicker with wood than bone.

Neolithic whittling knives from Siberia are of varying size. One from Khakhsyk of miniature size, 30 mm long and 10 mm broad, is made of a cherty rock and has a concave blade (fig. 48.2). Knives from Verkholensk have straight or slightly concave blades (fig. 48.3–6) and distinct wear striations (fig. 49.1, 2), which run as straight lines from the side of the blade inclined towards the butt, and sometimes intersect. These intersections are due to the sharp curve of the axis of the knife in relation to the worked surface (inclination of the tip or butt), which might arise during whittling.

Some nephrite knives have a double facet on the blade (fig. 48.4). One facet is narrow and steep, the other broad and sloping gently. The latter faced the worked material and so suffered severer wear.

Study of the knives from Verkholensk shows that in



48 1 *Short upper palaeolithic flint whittling knife from Timonovka used without handle;* 2 *neolithic ground chert whittling knife from Khakhsyk (Siberia);* 3–6 *neolithic nephrite whittling knives from burials at Verkholensk on R. Angar (facet ground on one edge only except* 4 *which has two facets, broad and narrow, the former facing the material);* 7 *method of holding knife reconstructed.*