Patu, a New Stone Age Site of a Jungle Habitat in Nepal

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Abstract: The recently discovered site of Patu in the Siwalik hills of eastern Nepal yielded a rich, hitherto in Nepal unknown stone age culture in the form of stone implements of great variety, wich is called here the Patu industry.

The industry is mainly a pebble-tool complex of various forms of corescrapers and choppers in association with an equally great variety of adzes and adze-like tools and scrapers. They are made in a particular technique from quartzite cobbles, characteristic for Patu.

The site and environment is described, the tool types analysed and their technique described. No fauna nor any other datable material has so far been found and no age could be given yet to the site of Patu, though it is suggested here that it may be of mesolithic origin.

Introduction

During geological-palaeontological work in the Kamla Rato Khola*) area in the Siwaliks in eastern Nepal (fig. 1) a very rich site of a yet unknown culture and period was found by the writer in April 1985.

Other prehistoric sites, the first of its kind in Nepal, had been found a year earlier, and a preliminary report about these sites have been published (Corvinus 1985).

The site Patu, which is described here, is particularly rich and was obviously a factory site. It has been selected, therefore, for a detailed study in the field.

Nothing was known about any prehistoric cultures in Nepal up to now. The discovered cultural material was the first of its kind in Nepal and was of a very particular nature and made in a special technique with a number of new tool types hitherto not described. It was therefore decided to carry out this study with completely unbiased observations, and no comparisons were initially sought.

The work aimed at determining not only the typology of the obviously very special tool types, but also at determining the nature and environment of the site and — if possible — to identify the period and the cultural background which was responsible for the setting of the site.

It was apparent from the beginning that the tool kit from the Patu sites do not fit into any of the known cultural complexes of the Indian subcontinent, nor into those of the African and European sites. There seems to exist, however, some resemblances to materials from sites of western Thailand. But as was just said, comparisons will be sought at a later stage after the Nepal sites have been described independantly and according to their own particular features.

This report is meant to present the new cultural material from Patu in Nepal and to open it for discussion and comparison.

*) Khola = stream

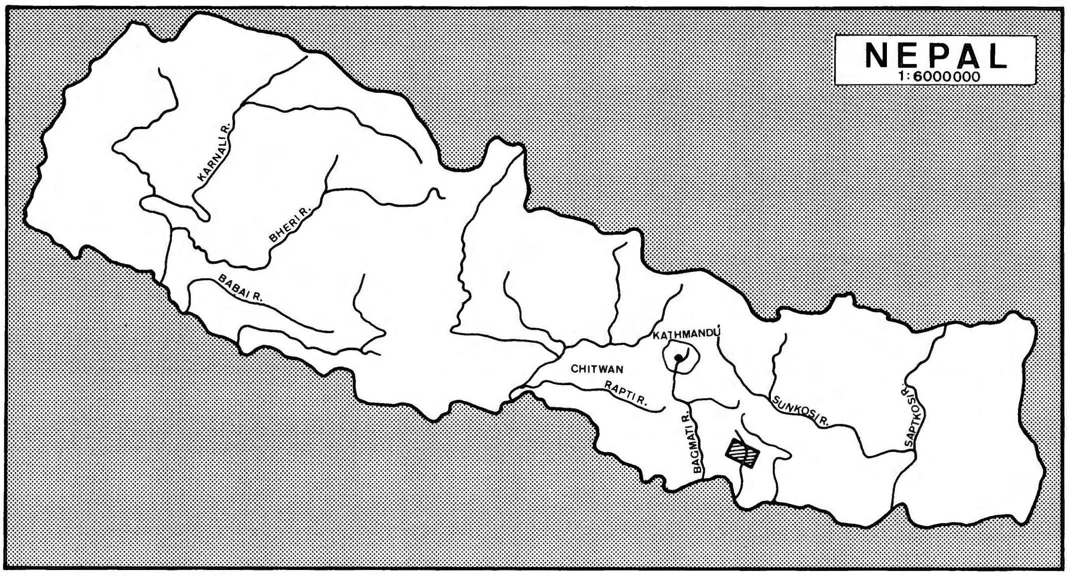


Fig. 1. Map of Nepal. The hatched part in the map is the investigated area.

Geology and Environment

The sites of Patu 2 and Patu 2a lie at the southern margin of the foot hills of the Himalayas on the southern slopes of the Siwalik mountains (fig. 2). It is situated on one of the last hill ranges of the here low Siwalik hills, occupying a small knoll in the jungle on an ancient river terrace remnant, from where one can overlook the plains in the south and the adjoining Siwalik hills in the west.

It slopes down to the north, west and south into deeply dissecting nallah[4] beds, but continues on the same level towards east. It is situated right in the jungle and must have been at the time of occupation also located deep in the jungle.

Since about 20 years, after the eradication of Malaria, people have encroached upon the hills from the Terai (the big plains towards the Ganges River) and have partly occupied also the banks of the rivers in the foothills, wherever there was some flat place for cultivating fields.

The flatness of the floor of the jungle at this place is due to it having been a river terrace once. In fact, it is the uppermost terrace between the Rato and the Bawshi streams. The Rato valley lies to the south-west and the Bawshi dry stream bed lies to the north-west of the site, emerging from the mountains.

Five pronounced terraces have developed here where the streams emerge from the hills (fig. 3).

The youngest terrace is a recent 10 m grey, sandy terrace in the angle between the joining streams of the Rato and the Sunjhari which is cultivated with rice fields. On the eastern side, further downstream along the Rato, a 15 m terrace is developed unconformably over northerly dipping uppermost Siwalik sandstones and gravels. The terrace deposits consist of ca. 5 m cobble gravel, overlain by a thin grey-black soil.

On the western side a very pronounced 40 – 45 m river terrace is developed all along the river from Gauridanda village down to Bardibas village (fig. 4.1). It is a flat, wide expanse of fields with no jungle. It consists of 5 – 7 m of horizontal cobble-boulder gravel in a grey sandy-gravelly matrix with boulders of

*) nallah = dry gully or small stream bed, carrying water only in the rainy season.

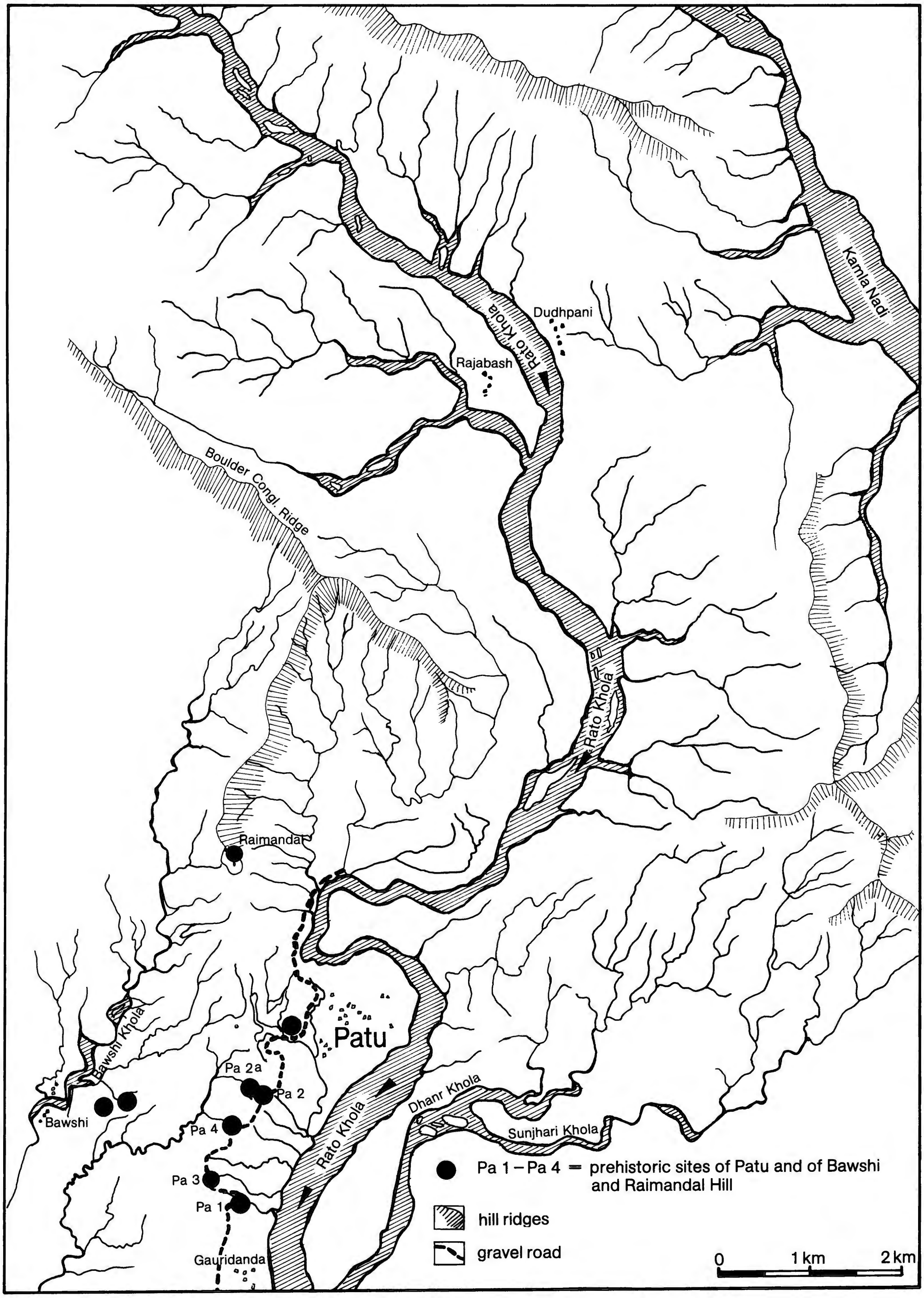


Fig. 2. Map of the Rato Khola area with prehistoric localities.

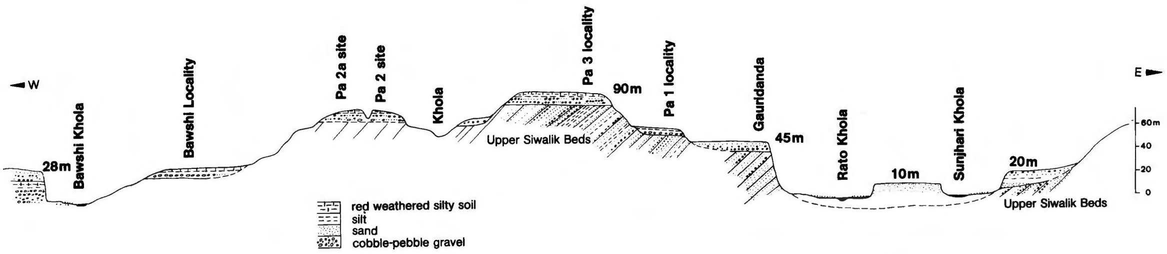


Fig. 3. Composite section across the terraces at Bawshi and Rato Khola. Vertical exaggeration.

up to 1 m in size at the base. The thick, lose cobble gravel is overlain by about 1 m grey silty soil with a dark grey top horizon of the wheatfields.

The cobbles and boulders are probably derived from the Boulder Conglomerate of the Upper Siwaliks. These 40 – 45 m terrace deposits overly unconformably uppermost Siwalik deposits of yellow-beige, coarse sandstones, grey claybeds and cobble beds, which have a southwesterly to northwesterly dip, forming a gentle anticline in the north. Further north these sterile uppermost yellow Siwalik deposits are thrusted upon by thick beds of Middle and lower Upper Siwalik whitish-grey, micacious, fossiliferous sandstones. About these fossil-bearing Siwalik deposits another report will be appearing soon.

The jungle starts beyond the fertile soils of this terrace and covers all the higher grounds and higher terraces. The next higher terrace is present only in remnants on the western side, above the 40 – 45 m terrace. It is of a height of 55 m above river level and shows a fluvial red-stained cobble-gravel overlying northwesterly dipping Siwalik Boulder Conglomerate and sandstone beds (fig. 4.2). A deep-red, hard, silty soil is developed on the fluviatile gravel, which at places is again overlain by a red weathered cobble gravel. Along the road there is a good exposure of this terrace. At the road bend, a little to the north, at locality Pa. 1 (fig. 4.3), the 55 m terrace exposes at the top the deep red silty soil of varying thickness of 1 – 3 m, overlying a 4,50 to 5 m red fluviatile, horizontal cobble gravel at the edge to the lower lying 40 – 45 m terrace. Here, within the red soil a few artefacts had been found *in situ* in the upper part of the red soil, as well as in the eroded surface of the red soil. (Locality Pa. 1).

The highest and oldest jungle-covered terrace is a terrace of ca. 90 m above river level and consists again of basal cobble -boulder gravel in lenses, in a red sand-gravel matrix, overlain mostly, but partly also replaced, by a deep red weathered hard silt deposit, similar to the red silt of the 55 m terrace (fig. 4.4.) However, it is here much thicker developed. From within the red silt, in the uppermost part at locality Pa. 3, (fig. 5.1), a few artefacts could be recovered at a depth of 0.20 m below the red silt surface, which is here already partly eroded away. A little further north, at Loc. Pa. 4, the 90 m terrace is again well exposed on the road and in the jungle in a deep Khola cutting.

Following the road through the jungle we come to a large expanse of exposure of the deep red soil at a slightly lower level than the 90 m terrace, beyond a small stream. The red soil gets exposed here due to the cutting of the trees and the rapid erosion on the bare red soil in the heavy rainy season. One of these exposed red horizons contains the locality Pa. 2 and Pa. 2a, which is so extremely rich in artefacts.

These 55 m and 90 m terraces form the ridge and watershed between the Rato Khola and the Bawshi Khola (fig. 3). Crossing this ridge to the northwest, one reaches the valley of the Bawshi Khola, which again has developed a heavily weathered red silty soil horizon above fluvial gravels forming a 30 m terrace at both sides of the Bawshi Khola (fig. 5.2).

Again the artefacts, though few, are connected with the red soil. Interesting here is, that the cliff of the western 30 m terrace of the Bawshi Khola exposes this same deep red silt soil above fluvial coarse

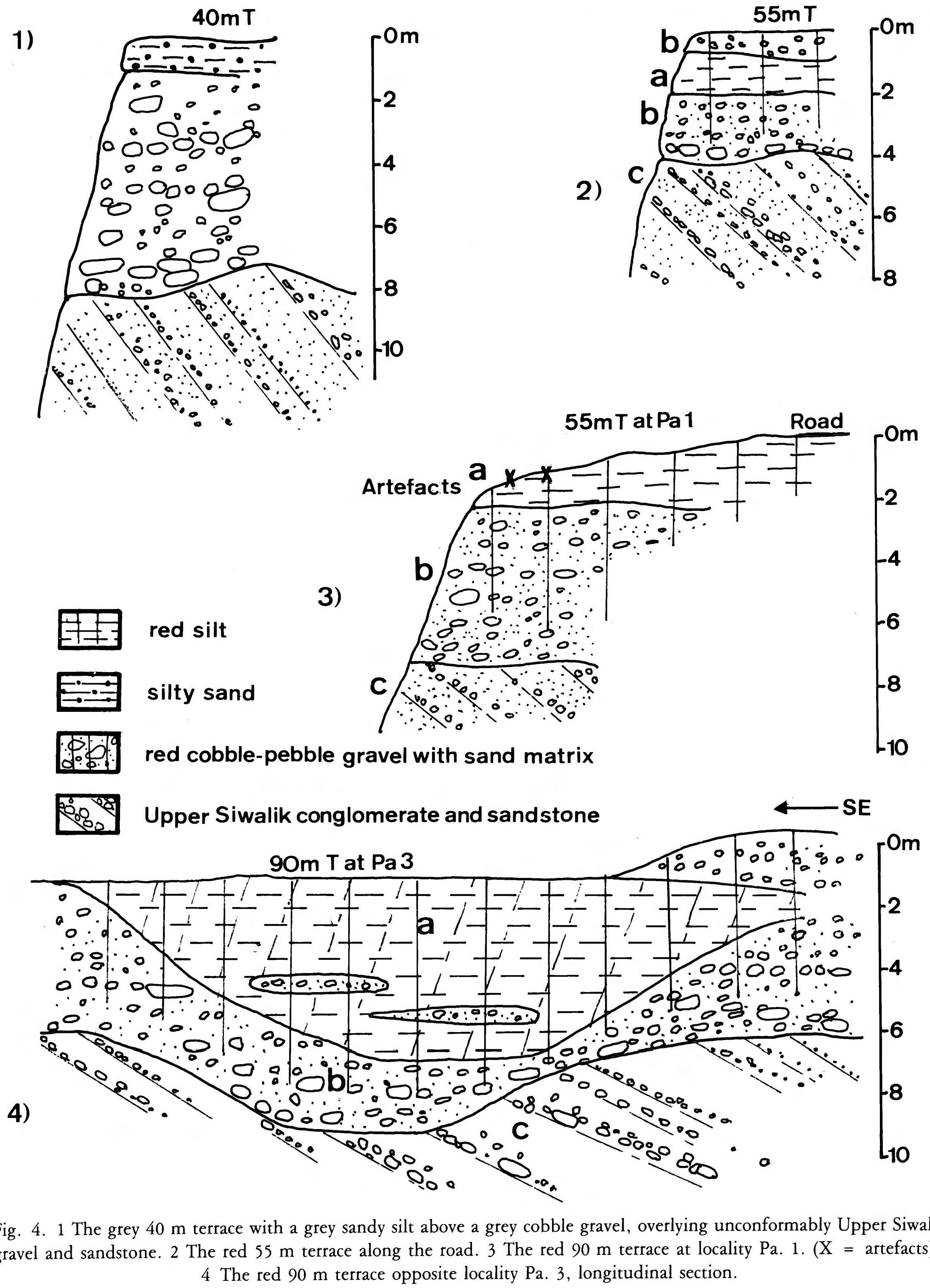


Fig. 4. 1 The grey 40 m terrace with a grey sandy silt above a grey cobble gravel, overlying unconformably Upper Siwalik gravel and sandstone. 2 The red 55 m terrace along the road. 3 The red 90 m terrace at locality Pa. 1. (X = artefacts). 4 The red 90 m terrace opposite locality Pa. 3, longitudinal section.

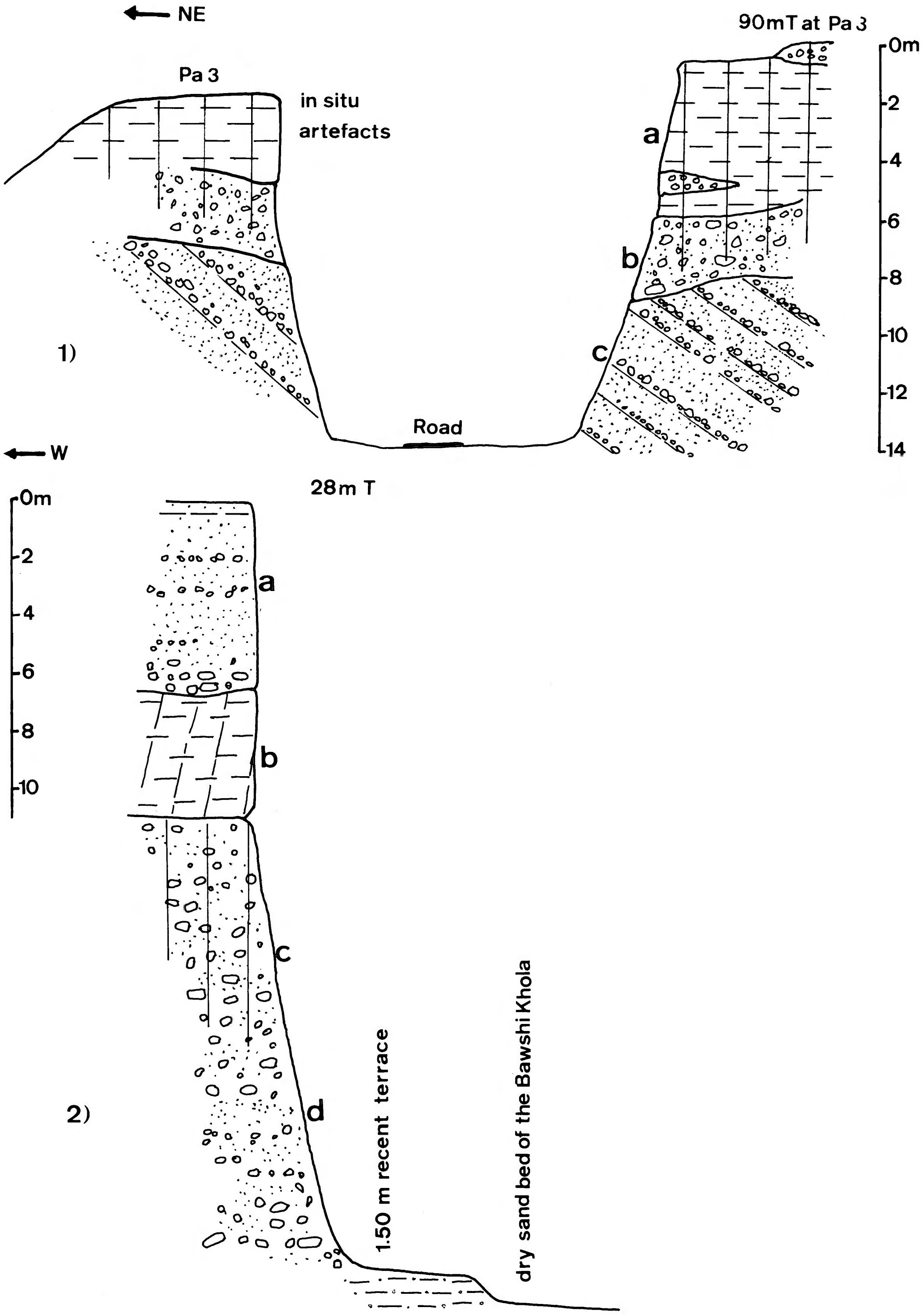


Fig. 5.1 The 90 m terrace cliff at locality Pa. 3. 2 The section of the river cliff at Bawshi Khola West. (Legend for 1 as in Fig. 4. Legend for 2: a: yellow-grey gravel and sand, on the top some silt, b: deep-red silt, c: red cobble gravel, d: yellow to reddish cobble gravel).

cobble gravel, but here the red soil is buried and overlain by a younger fluvial cycle of not red but yellowish – grey stratified sands and gravels. This buried red soil certainly is an interesting feature, because I have seen it nowhere else in the area.

The nature, origin and chemical properties of this red, unstratified, hard silty soil is yet unknown, but is under examination in the Institut für Urgeschichte, Erlangen, and at the Geography Department, Kiel (A. Bronger). It is however, apparent, that only the older terraces have this red soil developed and not the younger ones. It is probable, that the red horizons form weathered soils and are of considerable antiquity, but it is yet not certain of what age they really are. Complete profile samples have been taken from the excavated trenches for soil- and chemical analysis.

It is, however, remarkable, that all the stone artefact-bearing localities in this area (and there are quite a number of them) are only connected with this weathered red horizon, and everywhere they are lying on the eroded surface or are just eroding out from the red soil. Most of the artefacts are very fresh.

These artefact-bearing horizons are prone to severe erosion due to the fact that they have been partly deforested. Wherever deforestation has taken place, erosion and gullying sets in rapidly and exposes and erodes the red soils. It is only where erosion exposes the red soils that these artefacts are found. Where the forest is still intact and a thin yellowish forest soil is still existent, no artefacts are encountered.

It is curious to observe that sometimes bigger man-brought cobbles and larger artefacts are lying on 10 – 15 cm high soil stilts, proving that erosion is quick and that the stones were originally lying on that level in the silt.

The red soils do not seem to be good for agriculture because nowhere have they been cultivated but lie just bare.

Up to very recent times the whole area was thickly forested and unoccupied, not only the Siwalik foothills, but also the flat foreland, the so-called Terai. The Terai, in fact, had been so thickly forested, that it was an almost impenetrable forest belt. Besides, it was so malaria infested, that it was for centuries up to recent times a severe barrier between Nepal and India, occupied only by a once fabulously rich fauna.

The newly discovered sites however, proved that the forests in the foothills had been occupied by a prehistoric people in earlier times, who preferred to live in the jungle, away from the plains of the Terai.

Malaria had been eradicated about 20 years ago and since then people from the Nepal Himalayas have come down to settle in the Terai plains, cutting the forests and cultivating fields on the fertile soils of the flat lands. It is since that time that the heaviest deforestation has set in. But even before the recent arrival of these various hill people, it is said, that other people had occasionally lived here: Majis and Rais. The Rais are hill people who now occupy forested areas in the middle Himalayas in the east and they seem to have come down sometimes for hunting to the lower Siwalik hills, in the cold season. The Majis, a small, stocky, dark hill people, lived in the jungles of the foothills even during the previous malaria periods. They lived mainly on fish, it is said, and occupied only a few fields which they took possession of after cutting the forest. But they were few and they lived for the main part on higher grounds, away from the malaria infested low river valleys. The forest was very thick then and the population thin.

The Majis still live here as fishing people and are now integrated with the later, very recent arrivals but, as it seems, without intermarrying with them.

Who lived here in the jungle before the Majis? There are no written records about earlier populations, as far as we know.

That it was possible to live here in the previously thick jungles in the foothills is proved by the Majis. It seems that the malaria mosquitoes did not infest the actual foothill areas, but only the plains and valleys, and even the slightly elevated areas above the actual river valleys seem to have been fairly safe. Such elevated areas, slightly above and away from the rivers, of which the described Patu 2a site is an example, seemed to have been also preferred areas for the prehistoric people, who are responsible for the stone artefacts of the Patu sites.

The climate today is rather rigorous in its contrasts. The winters are cold, especially at night, reaching degrees below zero, though the days are sunny and quite warm. But from March through to June it becomes increasingly hot with really hot months from mid April to mid June, where the temperatures go up to 48° in the shade, while the monsoon period from mid June to the beginning of October is very humid and warm and disagreeable with plenty of leeches. October is very hot and November and February are the best months. The forests now consist almost entirely of Saal trees *(Shorea robusta)* in the Terai plains as well as on the hill slopes.

The Site

The site is situated on a small knoll in the jungle, on an ancient river terrace, dissected by deeply cutting nallahs on 3 sides (south, west and north-west), towards which the ground gently slopes down (fig. 7, 8 and 9). The forest on the knoll is open and partly cut away. Only few trees are left, so that erosion has set in and has dissected partly the deep-red weathered soil, underneath the thin yellow forest soil.

The red soil, as seen in the nallah cuttings in the south, is ca. 2 m thick and is hard, homogeneous and unstratified in the upper part. It is silty with a high clay content and is particularly hard by the continuous termite activity. It is sometimes intercalated with thin beds or lenses of pebbly gravel in the middle part and becomes more sandy in the lower part (fig. 6). It is underlain by a fluvial gravel which is pebbly at Trench IV, but becomes cobbly where it is exposed in the steep gullies. It is a fluvial terrace channel bed deposit with pebbles, cobbles and boulders of quartzite of about 10 – 15 m thickness. This is, however, only approximate, as all the gullies are filled with these cobbles, washed out from the deposits, and nowhere the underlying Siwalik beds are exposed. At the roadcutting at Pa. 3, these gravels do not exceed 10 m, but on the Bawshi Khola they reach a thickness of 15 m (fig. 5.2)

These cobble-boulder exposures in the deeply cut gullies must have been the source from where man of the Patu 2 sites has brought up cobbles to his occupation place on the surface.

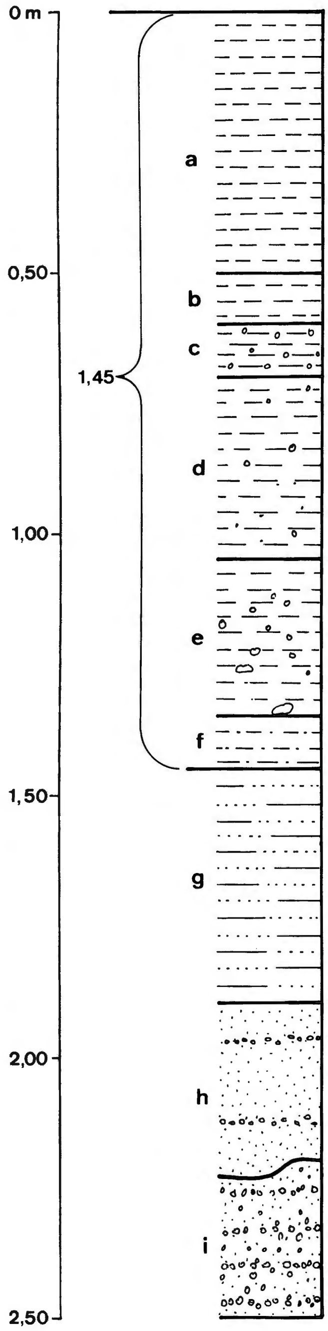
The site has a gentle slope to the west, from the sterile forest soil at the camp down to where gravel starts being exposed in the west (fig. 7), where it underlies the red soil. On the slope on the eroding red soil and partly within it or just eroding out from it, is the site with its extremely rich scatter of artefacts and stone manuports (see site profiles fig. 7, 8, 9). All stones of the sites have been brought in by man.

The scatter of the artefacts and stones is surficial, as it seems on first sight, but the observation is that it must have been derived from the upper part of the termite-activated red soil and that it was once covered and embedded in the upper part of the red soil (fig. 10, 11. Fig. 11 shows a panorama view of the site from the west, on the left, to the north).

The site can not be very recent. It is at present in the process of getting exposed by erosion, so that most artefacts are very fresh. An interesting observation is that many of the big stones and artefacts lie on soil stilts, meaning that their original position was at that level and that with the washing and eroding away of the red soil, they sink down to the level of the eroded surface, where they get concentrated. Erosion must have been quite quick and quite recent, after the cutting of the trees at this place.

Another observation is that the stones and artefacts, which lie on soil stilts have the same level as the big stones, which just begin to erode out from the soil in the higher slope levels where the scatter is thinner (fig. 7.1 + 3). The scatter of artefacts is only to be seen from that level onwards, downwards.

The Patu site consists of two concentration areas, Pa. 2a and Pa. 2. They are divided by a deeply cut



a. Homogenuous red silty soil (termite activated), with black roots and root casts, and a few tiny 1-mm-sized specks of white minerals.

b. Red silty soil, with slightly more black specks and white minerals and with occasional pebbles (0.3 cm).

c. Red gravelly silt, with angular small pebbles (not more than 0.5 cm in size).

more clayey

d. Less homogenuous red silt than a and b, and fine sandy silt, with occasional pebbles of sizes up to 1 cm. Much black staining.

e. Same sandy silt as d, but with occasional pebbles of sizes up to 5 cm, mostly of quartz and quartzite, not of Siwalik rocks. Not continuous; the pebble lenses are thinning out towards West.

f. Red sandy silt, transitional to the more sandy deposit below.

g. Reddish to yellow silty sand, but still silty and sticky; very few pebbles.

h. Reddish to yellow sand with some fine gravel lenses.

i. Pebble gravel, with pebbles sizes up to 5 cm. Matrix of reddish to yellow loose sand.

The whole succession shows a slow transition from loose pebbly gravel and sand at the bottom towards rather sticky reddish to yellow silty sands and sandy silts in the middle to hard, lumpy silty red soil at the top.

Fig. 6. Section of the red soil of Tr. IV at site Patu 2a.

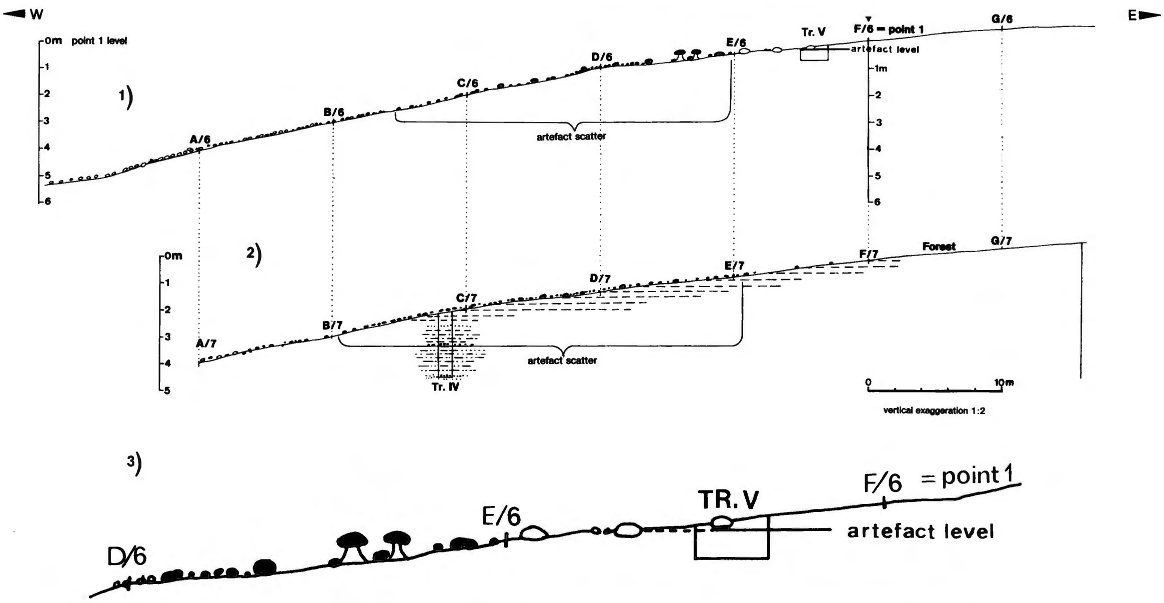


Fig. 7. East-West profiles over site Patu,2a. East of point E/6 and F/7 is the sterile forest level with no artefacts. 1 is the profile along the line A/6 to F/6 (compare fig. 12). 2 is the profile along the line A/7 to F/7. Fig. 7.3 shows the enlargement of fig. 7.1 to show the artefact level in the trench and the cobbles and artefacts eroding out from this level slope downwards.

gully, and it is probable that both areas belonged together and constituted one large occupation site. Heavy erosion after the time of occupation has dissected the area from the west, and the backward cutting of the gullies has divided the original site, thus leaving two parts, i.e. two concentrations of recently exposed artefact scatters.

Maps have been prepared for both concentration areas of Pa. 2 and Pa. 2a. (fig. 12, 13, 14). Site 2a lies to the north of site 2, and the two maps join up and show the gullying between them. The gully is about 10 m deep at point D/12 and deepens to about 15 m near point B/11. After measuring all levels of the site profiles have been drawn along the east-west and the north-south axis, (fig. 7, 8, 9) to show the extent of the scatter also on a vertical scale.

The site has been sectioned into 10 m squares and the plotting areas of Tr. I — V in Pa. 2a and Tr. 1 in Pa. 2 are indicated. From these plotting areas all artefacts as well as all stones have been lifted and collected and plotted (fig. 15, 1 – 4). The waste and the stones were counted, typologized and tabellarized in the field, for understanding the technique of the stone breaking. The artefacts were numbered and collected.

A few of the 10 m squares were also subjected to a more detailed analysis. Artefacts were plotted and collected in Pa. 2a in the 10 m square B/7 (c and d), and in B/8 (a, b, c, d) (fig. 16). Here only the artefacts and not the stones and waste were plotted, as this area had some fine and special tools. In Pa. 2 the 10 m square of E/13 was analysed in detail and the artefacts were plotted in the quadrants a, b, c, d (fig. 17, compare fig. 13).

A complete plotting was done here with all artefacts, waste and stones in the 1 m squares of E/13 d (fig. 18.1) and in E/13 c (fig. 18.2) and in four 1 m squares in E/14 a (fig. 18.3) (compare fig. 13).

The artefact concentration shows that these sites must have been factory- or flaking sites, where man has made his tools from cobbles and boulders of quartzite which he has brought up in quite some quantity from the gullies, where they are available plentifully. All stones have been carried up by man.

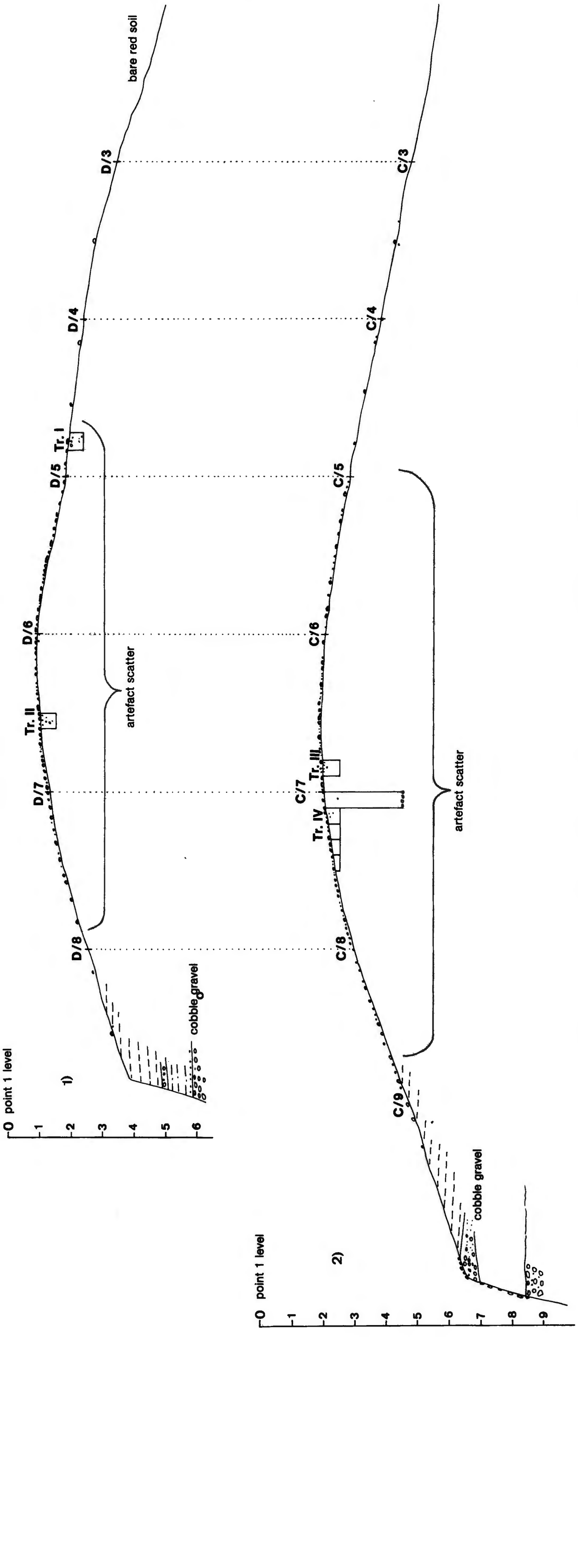


Fig. 8. North-South profiles over site Patu 2a, with the artefact scatter on the knoll; 1 along the D-line; 2 along the C-line (compare fig. 12). From one point to the next is always 10 m.

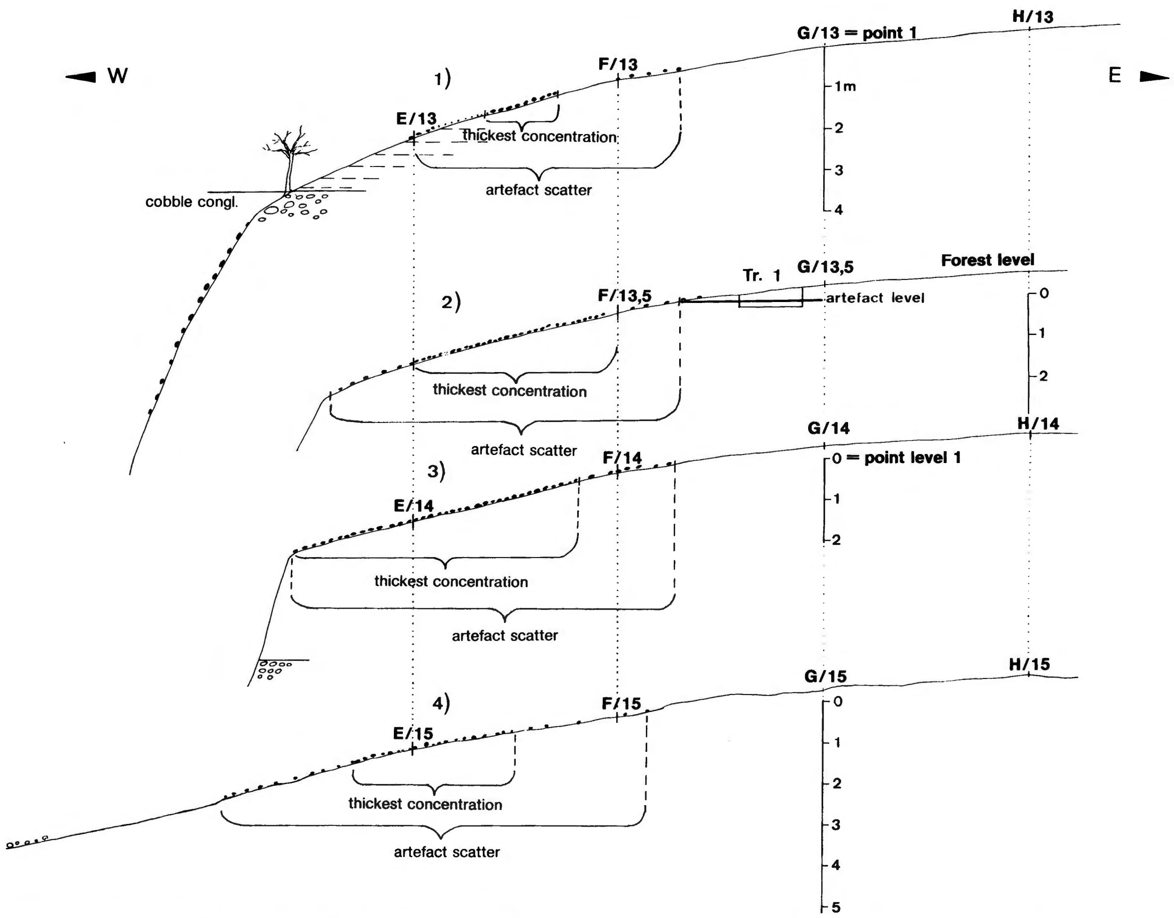


Fig. 9. East-West profiles over site Patu 2 along several lines, showing the artefact scatter slope downwards from the eroded artefact level.

None come from the red soil itself. The concentration shows a very great variety not only of tools and waste and flakes, but also of the manuport cobbles and boulders, which show all stages of work and preparation.

About the technique of working the cobbles by splitting them and producing half and quarter split cobbles as well as slices and 'Schnitzen' and flakes, we will talk later. Certain areas are especially rich in small flakes and chips, while others have a richer concentration of split and further worked cobbles and cobble waste, and a smaller percentage of small debris. It seems that different activities or stages of stone working and tool manufacture have been carried out at different spots. Many flakes are scattered, for example in the northern area, especially around C-5/c south and center. Also in D-5/c south and D-6/a north, where there are, besides many flakes, especially many small chips.

Quite a number of flakes and smaller chips are also scattered in C-6/d south and C-7/6 north, as well as in the concentration north of T. II in D-6/a and at C-6/b south-west.

The thickest overall concentration is in C-6/d center and the south-west corner. But here there are, in comparison, less flakes and tools but plenty of split cobbles and cobble waste.

Besides flakes and tools and waste there are many cobbles on the site, (fig. 14) brought in from the gullies. Most of them are flat or round or oval. Some of them may have been used as hammerstones,

Fig. 10. Site Patu 2a., looking north, with the Siwalik hills in the background. A few large, split cobbles are seen in the foreground.

some may have been brought in for making choppers, while it is not clear for what use the very perfectly round and oval flat cobbles may have been used, with an average diameter of 7 – 10 cm. There is an accumulation of such round stones in D-5 (fig. 19).

Most of the brought-in cobbles are, however, broken and split in some way or other and these cobble waste pieces have the biggest percentage everywhere (fig. 20).

Interesting is also the fact that quite a number of very big cobbles and boulders of an average diameter of 0,25 – 0,30 m, some slightly smaller, some slightly larger, have been brought in (fig. 10, 11). They are all of a good hard quality of quartzite, many of them of the banded type, which splits well. Some of

Fig. 11. The artefact scatter at site Patu 2a, looking NW.

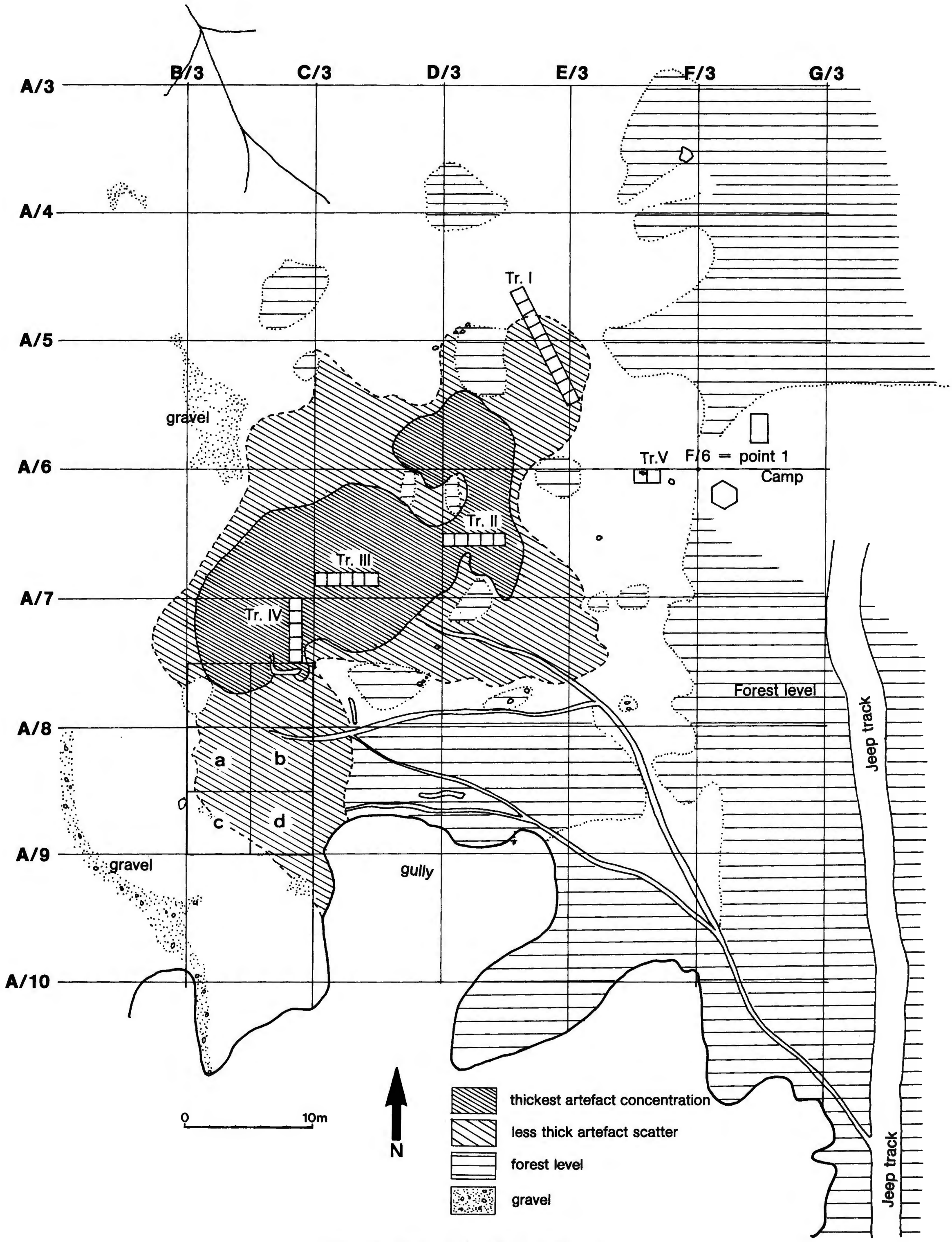


Fig. 12. Map of site Patu 2a (Pa. 2a).

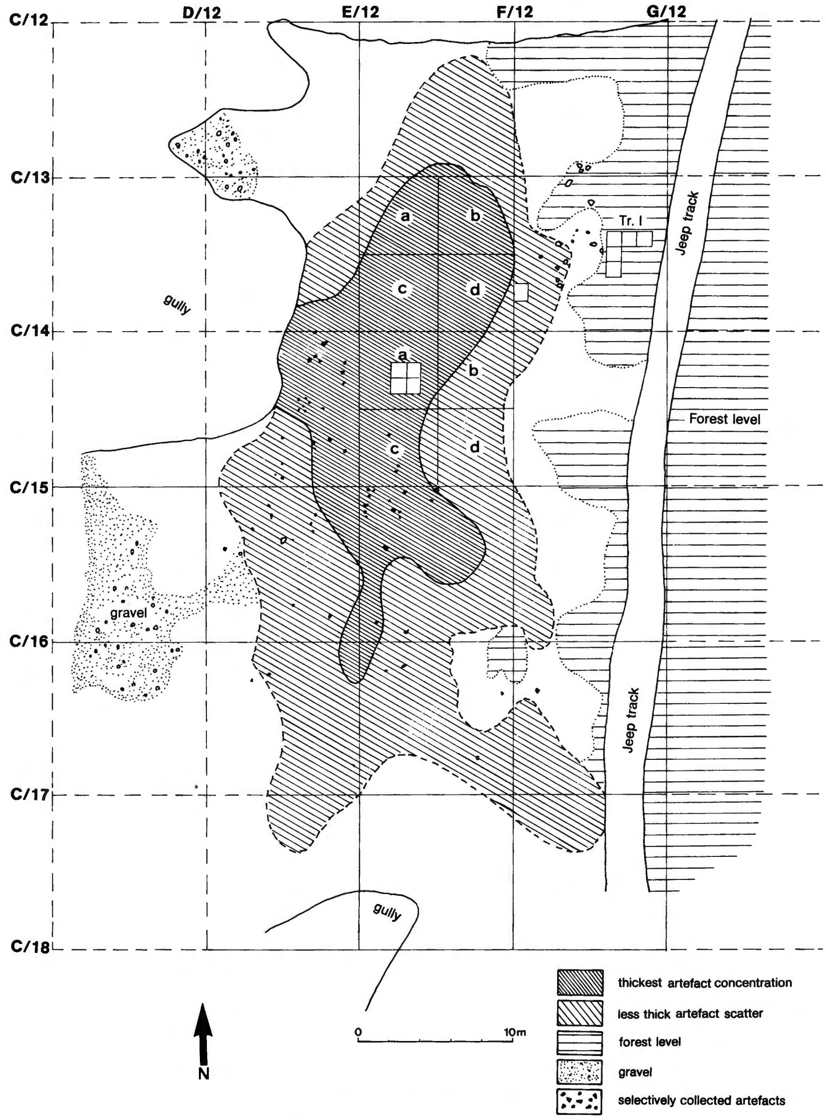


Fig. 13. Map of site Patu 2 (Pa. 2).

them are already split (fig. 19). They seem to have been brought in as raw material for making the corescrapers and heavy choppers. At one place they are placed like in a fire place in C-6/d and D-6/c (fig. 11, right), and one of them is split by fire. (We made our own experiments of how to split these big boulders).

The people have used a great variety of very colourful quartzites: white and pinkish quartzite (many of the adze-type tools), red and pale-red quartzite and banded quartzite and even a variety of grey bluish phyllitic rock. Waste pieces and chips and flakes of the same original cobble or boulder, lie more or less in the same area. But no flakes or waste pieces could be fitted together, (except for one anciently broken core scraper, the two pieces of which were lying 1.50 m apart and which must have been broken by use). This is certainly due to the particular technique of tool manufacture by these people, who did not use any of the known systematic and standardized techniques of the Indian and Western stone tool makers, but had their own specialised methods which fulfilled the requirements of their own stone breaking.

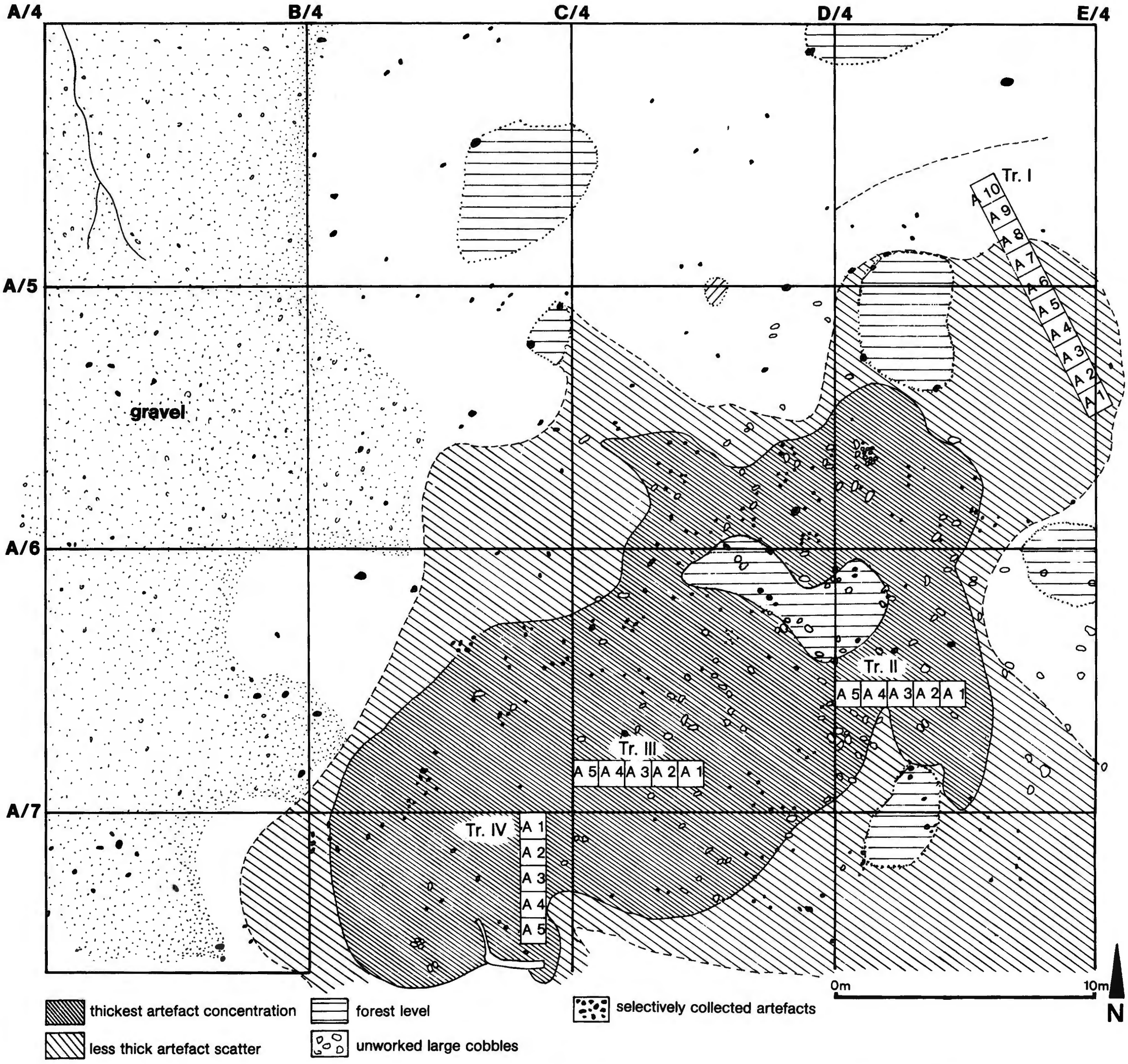


Fig. 14. Enlarged map of site Patu 2a. The black dots are selectively collected artefacts, the white dots are large quartzite cobbles.

The red soil in Tr. I-IV did not yield any stone artefacts nor stones. The artefacts were only concentrated on their surface (fig. 21). In Tr. IV we verified the thickness of the red soil and dug down in 1 m² through the red silt down to the underlying gravel (fig. 6), which was encountered at a depth of 2.25 m. Soil samples were collected at an interval of 5 cm and they are at present under examination to find out the origin and chemical properties of the red horizon.

Only in Tr. V., which was opened through 2 m² on the sterile ground of the forest east of the artefact concentration, a horizon of scattered artefacts could be found (fig. 22). Here no artefacts were lying on the surface itself.

The artefact horizon is not a true floor. It is a horizon of ca. 15 – 20 cm thickness, 0,20 – 0,30 m below trench level and 0,80 – 1 m below the forest floor level which has no artefacts on its surface. From this horizon a number of artefacts and a large split cobble could be collected. The lower lying levels are sterile.

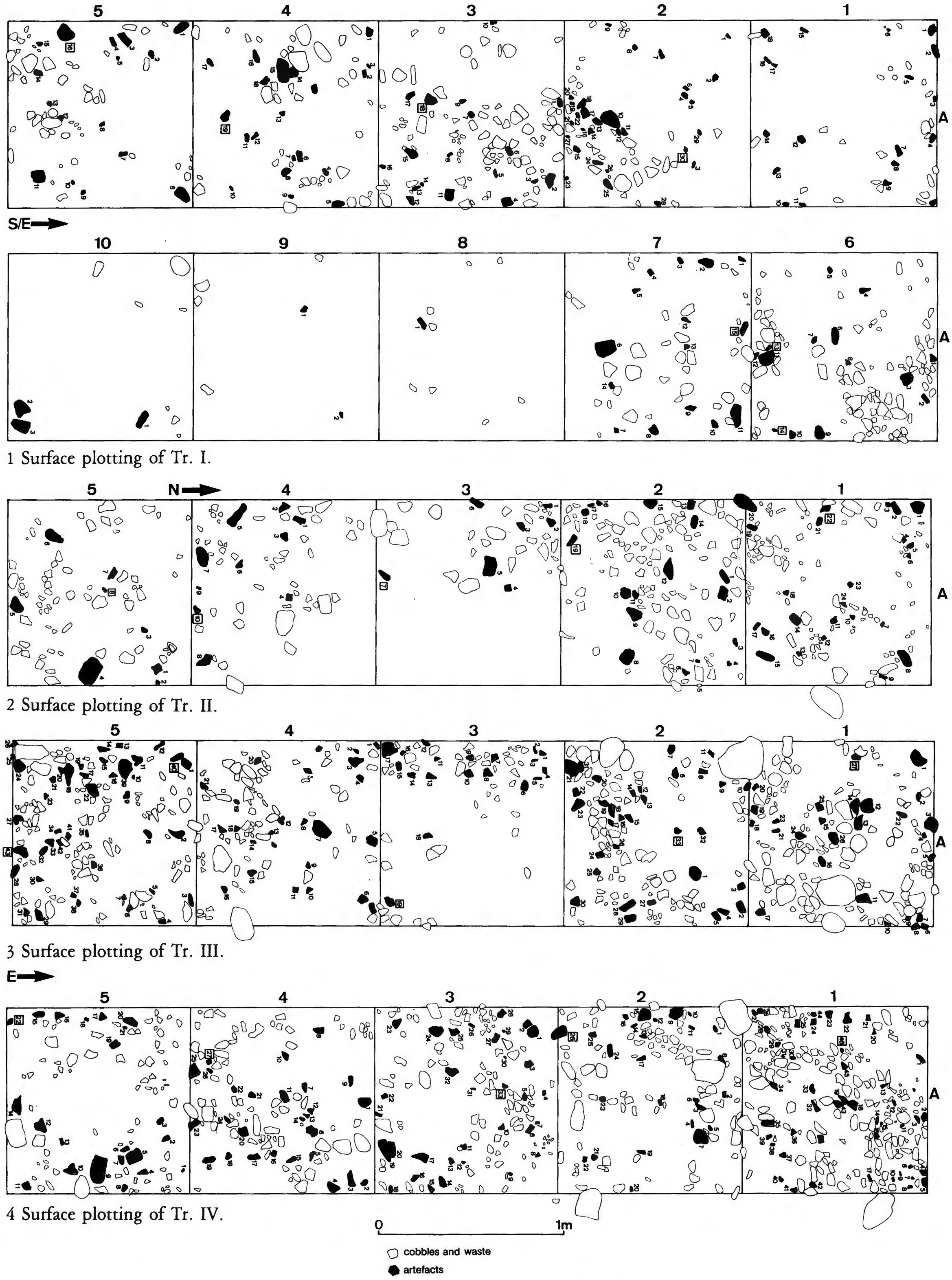


Fig. 15. Plotting of surface finds of Tr. I, II, III, and IV at Patu 2a.

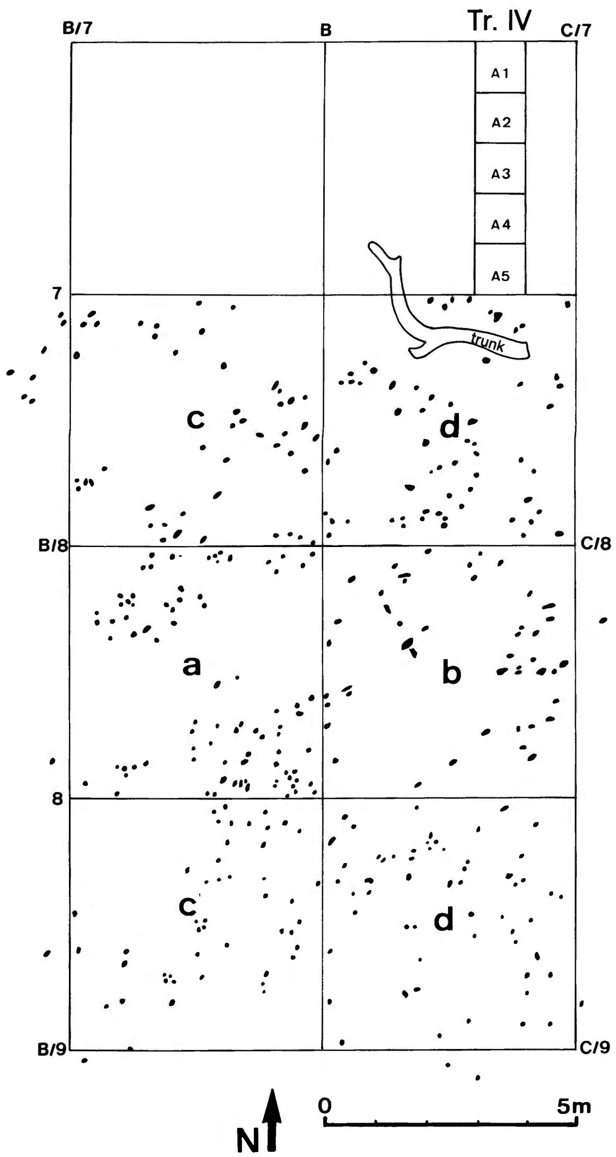


Fig. 16. Artefact plotting within 10-m square B/7 and B/8 at Patu 2a.

Another trench (Tr. 1) was opened at the adjoining site, Pa. 2, with 5 m^2, also at the higher, no artefact-bearing level of the forest surface adjoining the concentration. And here too, the artefact level was encountered as a horizon, not a floor, at a depth of 0,20 – 0,30 m below the trench surface at B-point, and 0,65 – 0,75 m below the forest level.

The situation of the artefact concentration is the same in Pa. 2a and Pa. 2, i.e. the surface scatter of artefacts starts slope downwards from this level. That means, that the artefacts are derived from within the red soil from a level of about 0,60 – 1 m below forest level. Unfortunately, no bones and no charcoal so far was found, which makes it very difficult to date the site. A few more trenches should be opened up in the area.

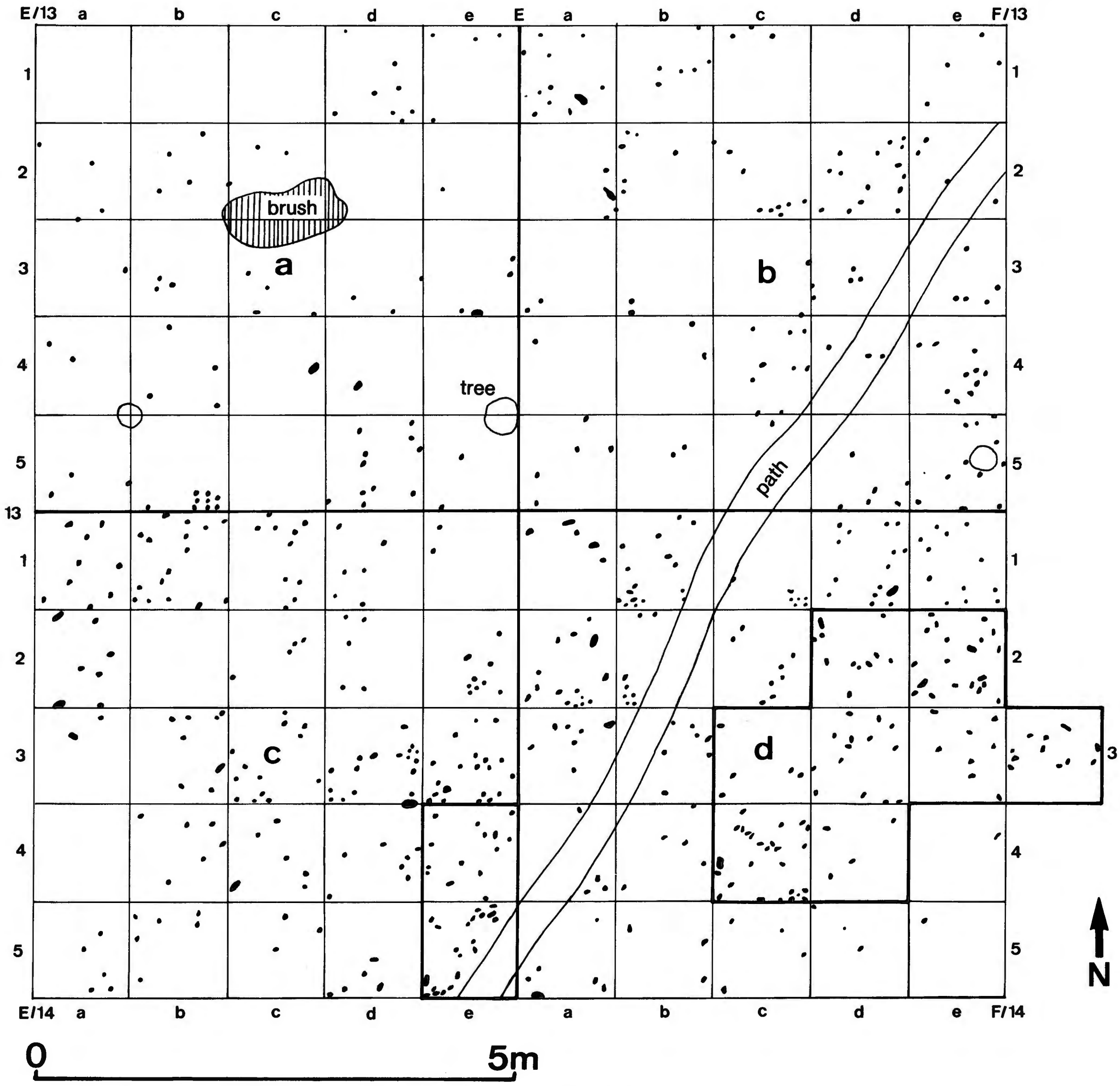


Fig. 17. Artefact plotting of 10-m square E/13 at Patu 2. Heavily bordered squares are separately plotted with all cobbles and waste.

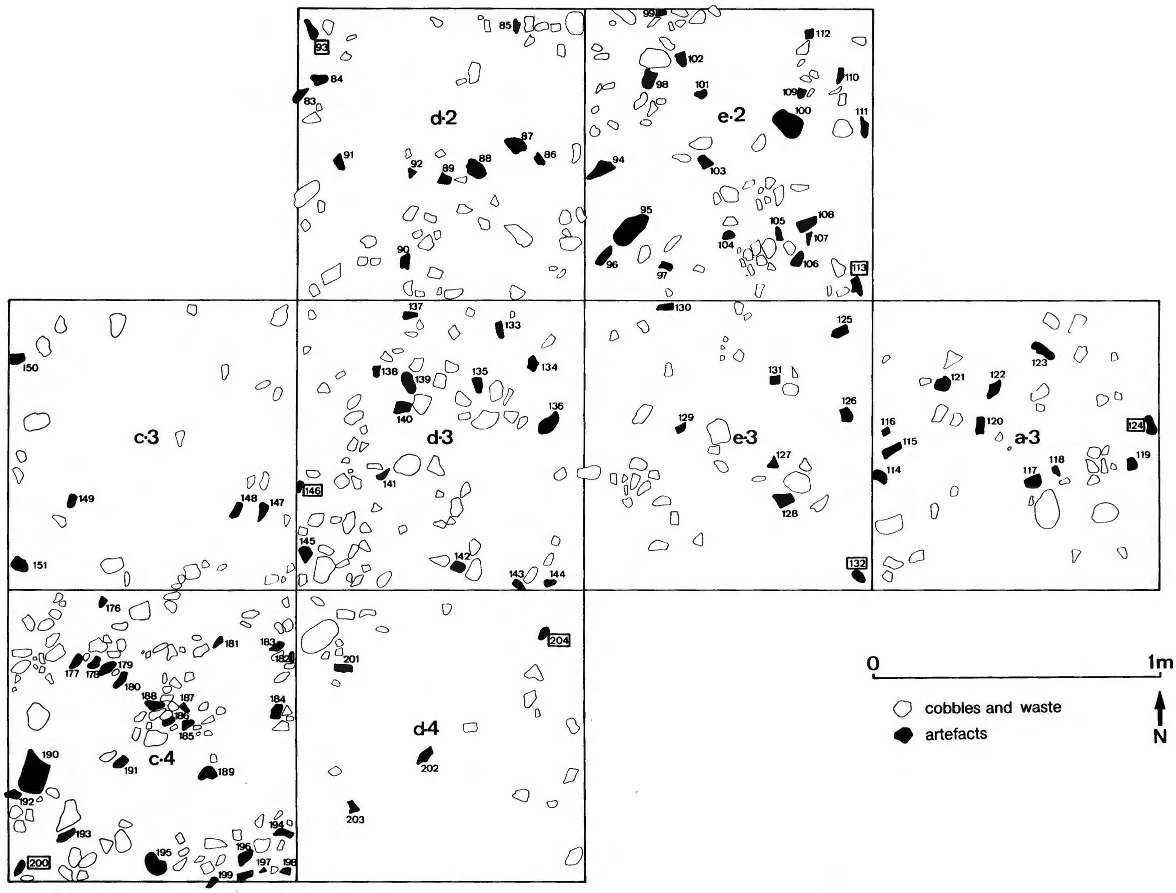
We also do not know yet, how old the red soil and the underlying terrace gravels are. The gravels belong certainly to the oldest phase of river cutting, which can be dated back into the Pleistocene.

River terrace formation started after the end of the Siwalik folding by Mid-Pleistocene, and it is possible that these terraces therefore date back into the later Middle or early Upper Pleistocene.

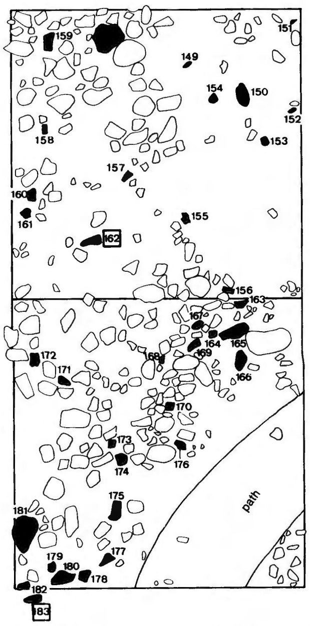
The red soil is originally a fluvial silt of lateral accretion, – as could be seen by the terrace profiles, – which later on got weathered red, and which shows much bioturbation by termite activity.

There are two possibilities as to the age of the occupation:

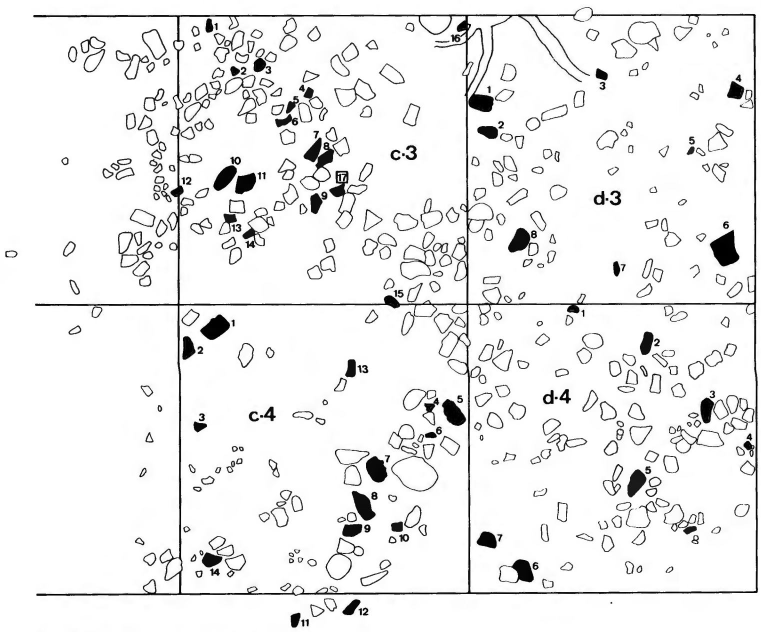
1) The site is post-terrace formation, but antedates the weathering processes of the red soil. This means that it is certainly Pleistocene and then probably of later Pleistocene age.



1 within 5-m square E/13d;



2 within 5-m square E/13c;



3 within 5-m square E/14a.

Fig. 18. Plotting of all surface finds (artefacts and waste) within a number of 1-m squares at Patu 2 (compare fig. 17).

Fig. 19. A large cobble split in two pieces and an accumulation of smaller round cobbles at Patu 2a.

2) The occupation postdates the red weathering processes of the old terrace. The site then was occupied probably in post-Pleistocene time by people living in the forest on the red soil, and was later on reworked into the red soil, maybe by termite building activities.

Nowadays, – and that must have been so in the past, – termites build everywhere high 'termite-towers' (fig. 23) of heights up to 2 m and as deep down into the ground. (We encountered a termite-path at the depth of 2.50 m in the yellow gravel in Tr. IV.A1). The termites bring quantities of fine red silt particles up from the depth and form a new, homogeneous soil which, after the death of the termite hill, breaks up and spreads over the near ground. The soil becomes very hard by the termite activity, as the termite hills are formed by the adding of great amounts of saliva from the ants that hardens the soil extremely. The texture and probably the chemical properties of the red soil is changed by the termites. And in the longer course of time, objects on the surface get buried within the red soil. This is what has probably happened here. The former occupation surface, whether of post- or ante-weathering age, became buried by the tower-building activities of the termites.

At the moment, no clearer answer can be offered to the question of age and the time of occupation. We should know more about the weathering processes and the effects of termite activities in this area.

Fig. 20. Close-up of artefact scatter at site Patu 2a.

Fig. 21. Patu 2a, looking west, with Tr. II in the foreground and Tr. III in the background.

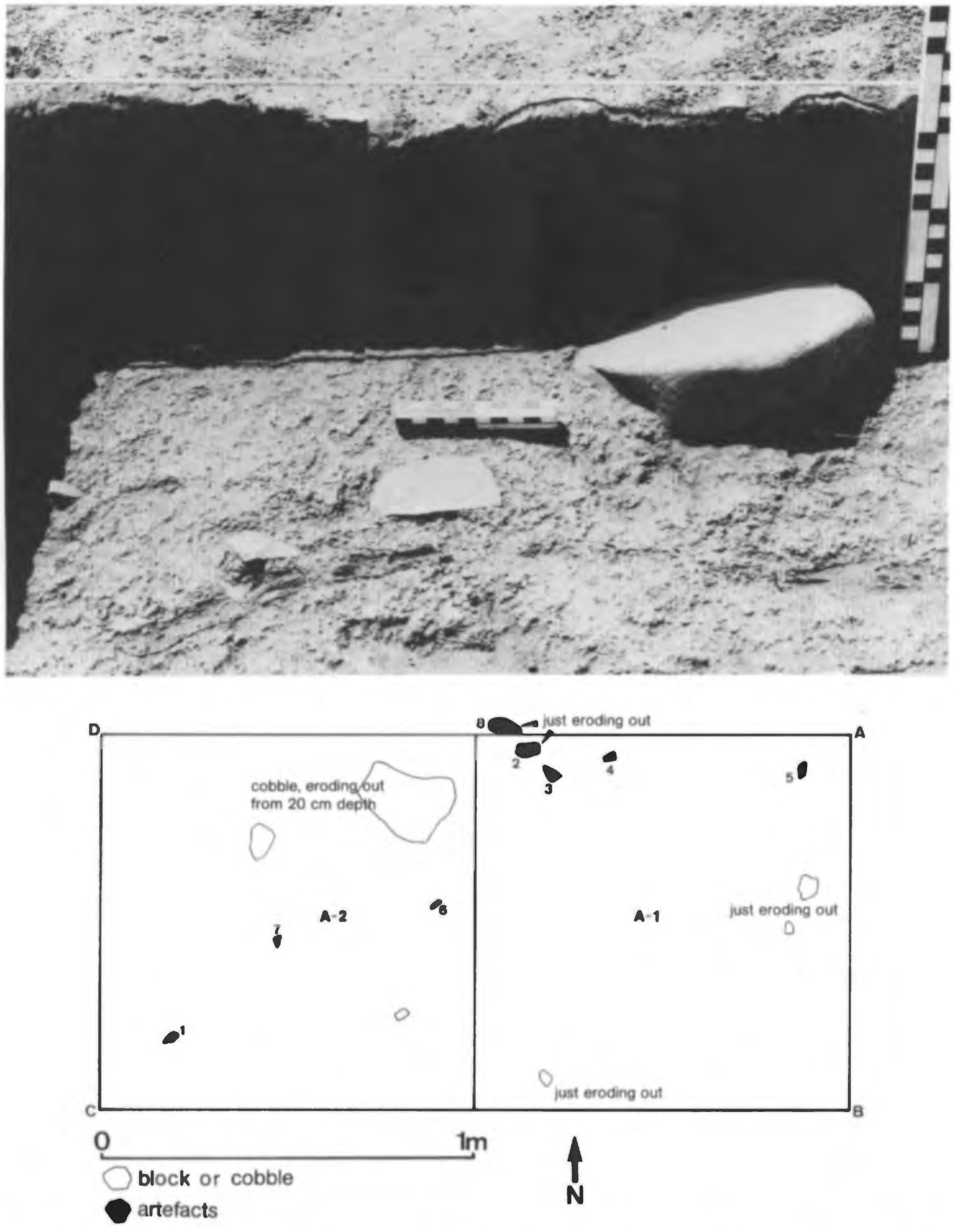


Fig. 22. Trench V at site Patu 2a, with artefacts *in situ* (above). Plotting of Tr. V at Patu 2a (below).

The artefacts themselves also can give, at the moment, no answer to age and cultural provenance, as it is a new industry and has so far no equivalent in the neighbouring areas of India. After the comprehensive study of the tool-types and techniques, comparisons will be sought of this new complex from Patu with those from east and southeast Asia, preferably Burma and Thailand.

Fig. 23. A 2 m high termite hill near site Patu 2a.

The artefacts, their typology and their manufacturing techniques

Typology

The Patu industry is predominantly a cobble (pebble) industry with heavy choppers and corescrapers for heavy duty (very probably for woodcutting). Choppers have been found in many places in Asia and are therefore described only cursorily. Less abundant but very prominent at Patu are adze-like tools and scrapers and other very well trimmed types of tools which will be described here in more detail. These tools comprise rare and new types and seem to signal a new, hitherto unknown industrial complex in South Asia, i.e. in the Indian sub-continent.

The preliminary classification is as follows:

I. Choppers (unifacial and bifacial)

The choppers are all made from large quartzite cobbles, which have a natural flat surface, or from split cobbles, where the split flat surface is used as a base for the shaping of a unifacial chopping edge. The angles of the working edges of the choppers are generally ca. 70° and can be placed at the end of the cobble or along one or two lateral sides or all around the periphery.

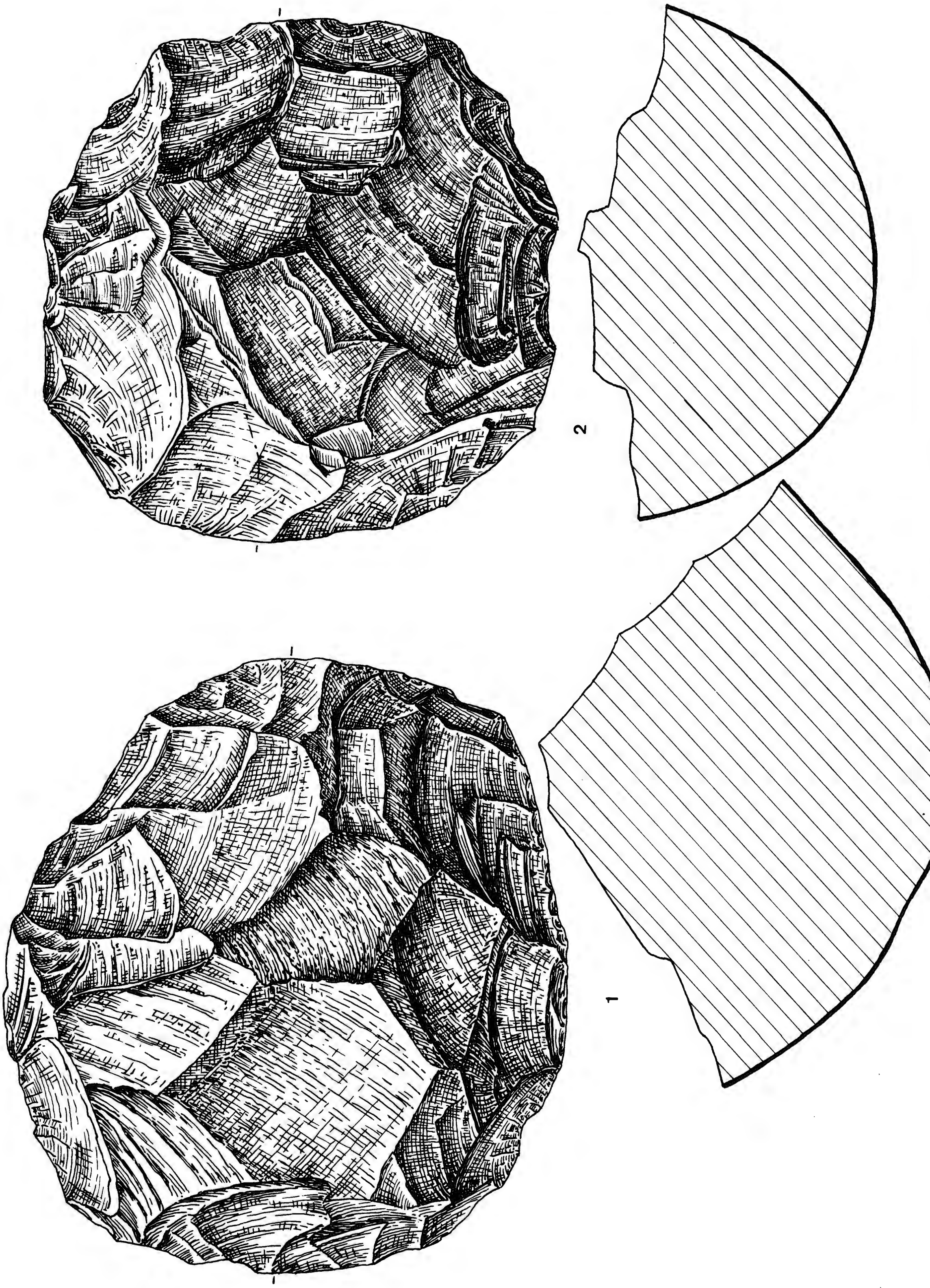


Fig. 24. 1–2 Two unifacial round choppers. 1:1.

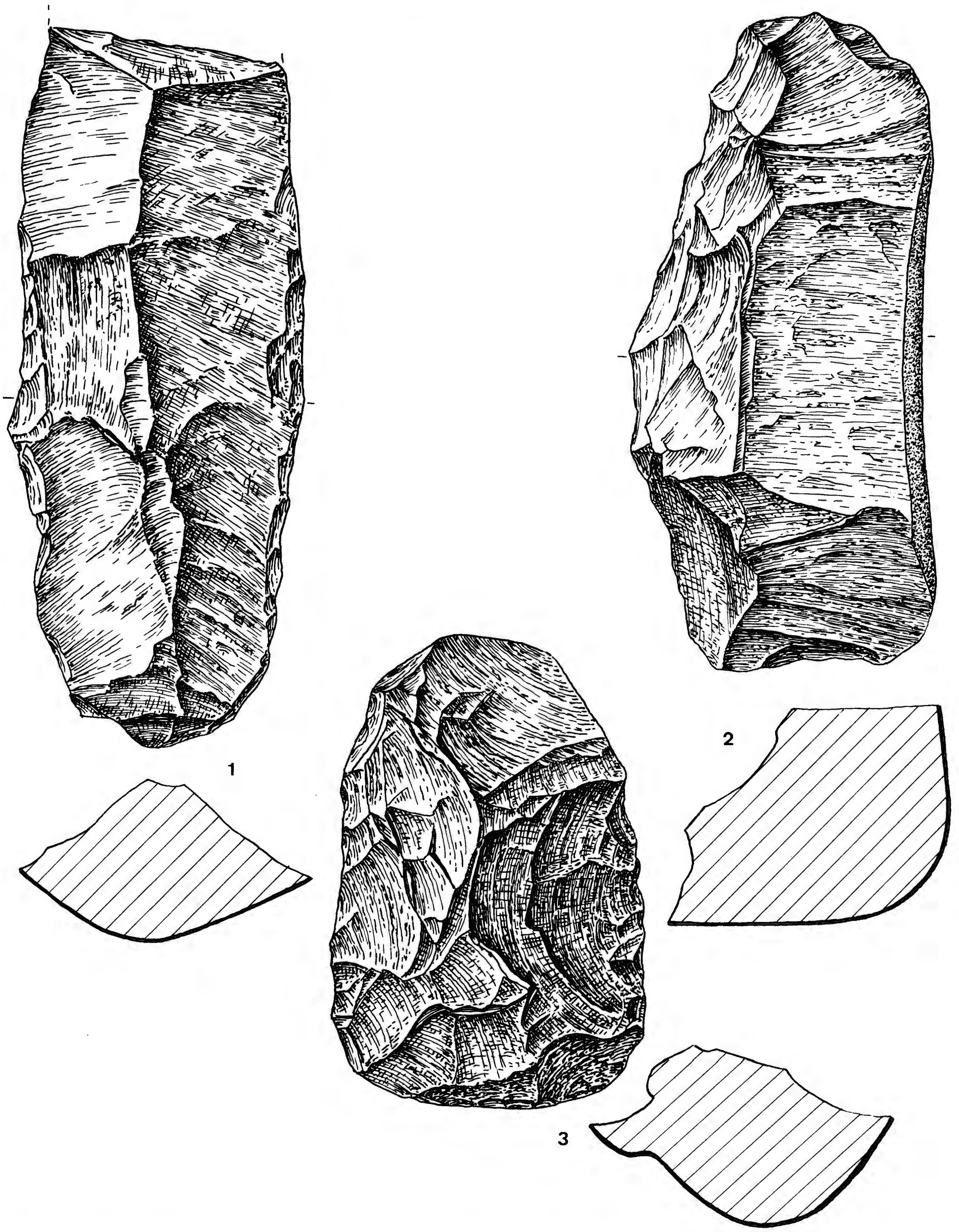


Fig. 25. 1 Unifacial elongate chopper with two lateral edges, 2 Unifacial chopper with one lateral edge, 3 Small oval unifacial chopper with edge allround. 1:1.

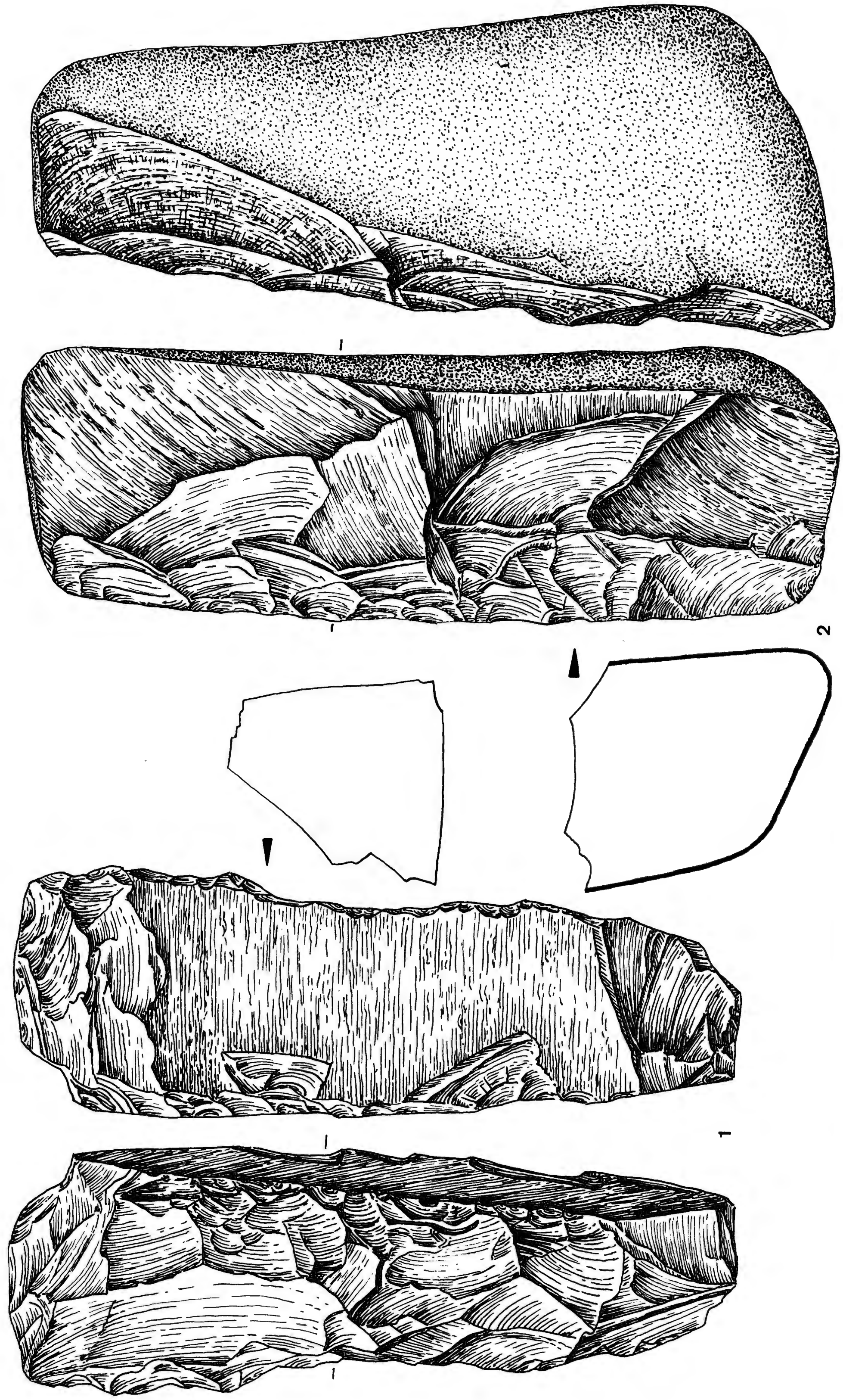


Fig. 26. 1 Elongate, triangular triple corescraper, with three lateral edges, 2 Elongate unifacial corescraper, 1:1.

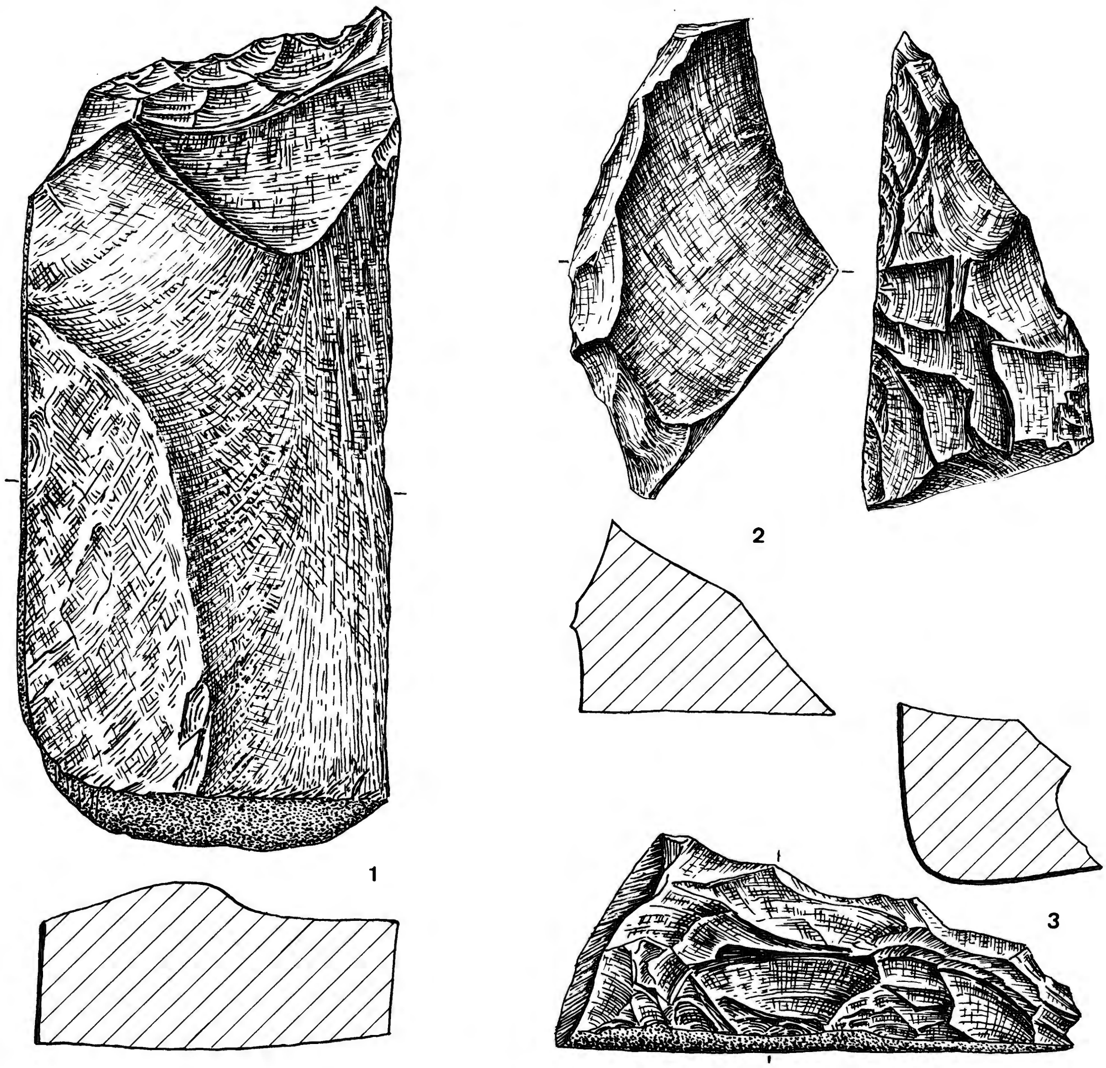


Fig. 27. 1 Unifacial endscraper or endchopper, 2 Corescraper on debitage, 3 Unifacial corescraper on debitage. 1:1.

There are many large and rough choppers which will not be depicted here. Only a few special choppers will be shown here.

Round unifacial choppers (fig. 24), are very common. Their lower surface consists usually entirely of cortex, while the upper surface is flaked all over with larger central flake negatives, and smaller step-flakes at the edge. Heavy usemarks along the edge are common. Some have a very flat trimmed face (C-7/1, fig. 24.2), others have a high convex upper surface (B-7d/17, fig. 24.1).

Elongate choppers can have one or two trimmed edges. B-7c/12 (fig. 25.2), is a small chopper made from a squarish cobble with flat surfaces. Another interesting small elongate chopper is B-8b/31 (fig. 25.1), which has one lower cortical face, and the upper face is trimmed from both sides; both rather shallow, sharp edges have fine retouch or usemarks.

A lovely tool is also the oval shaped chopper D-5/14 (fig. 25.3), which like the other choppers, have an entire face of cortex and an entirely trimmed upper surface. It has an edge around the whole circumference, but has fine usemarks and retouch at one distal and on one lateral edge.

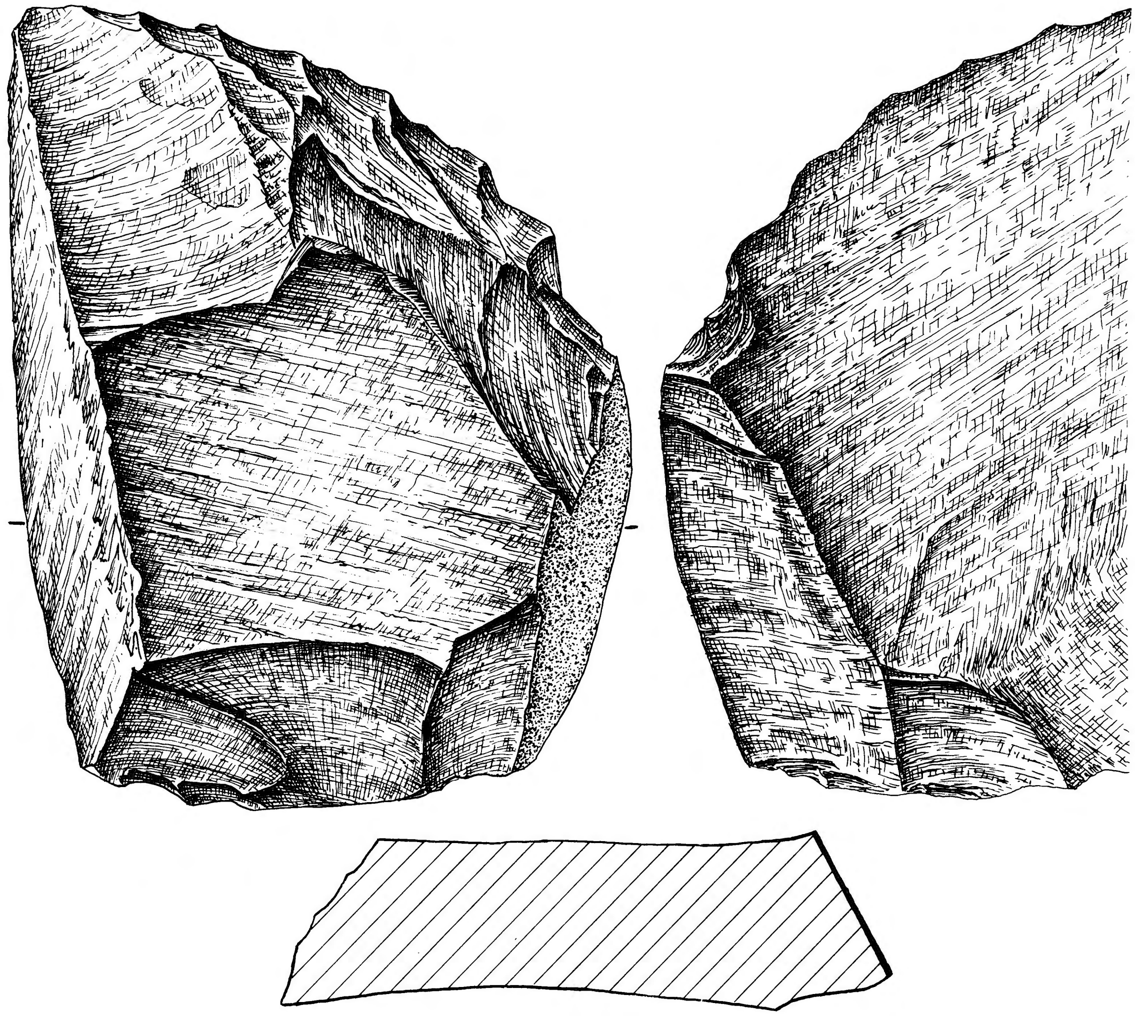


Fig. 28. Unifacial convex scraper on slice. 1:1.

End Choppers are not so common. They are usually made on oblong cobbles, where one end has been unifacially trimmed into an edge. The depicted end-chopper-like piece, is curious (B-8d/42, fig. 27.1). It is not made on a cobble, but on a thick cobble slice, and is entirely untrimmed except for some unifacial retouch at one end.

The choppers seem to have been used for heavy wood- and tree-cutting, especially the large, heavy choppers.

II. Corescrapers

Corescrapers are tools made on cobbles or split cobbles, where one or sometimes two edges were produced by unifacial flaking from a flat cobble surface. The resulting edge is very steep to vertical.

The most common corescraper type is elongate with a straight, steep edge (E-14c/1, fig. 26.2). There are other forms with convex and even concave edges or with two or even three lateral edges. A specially

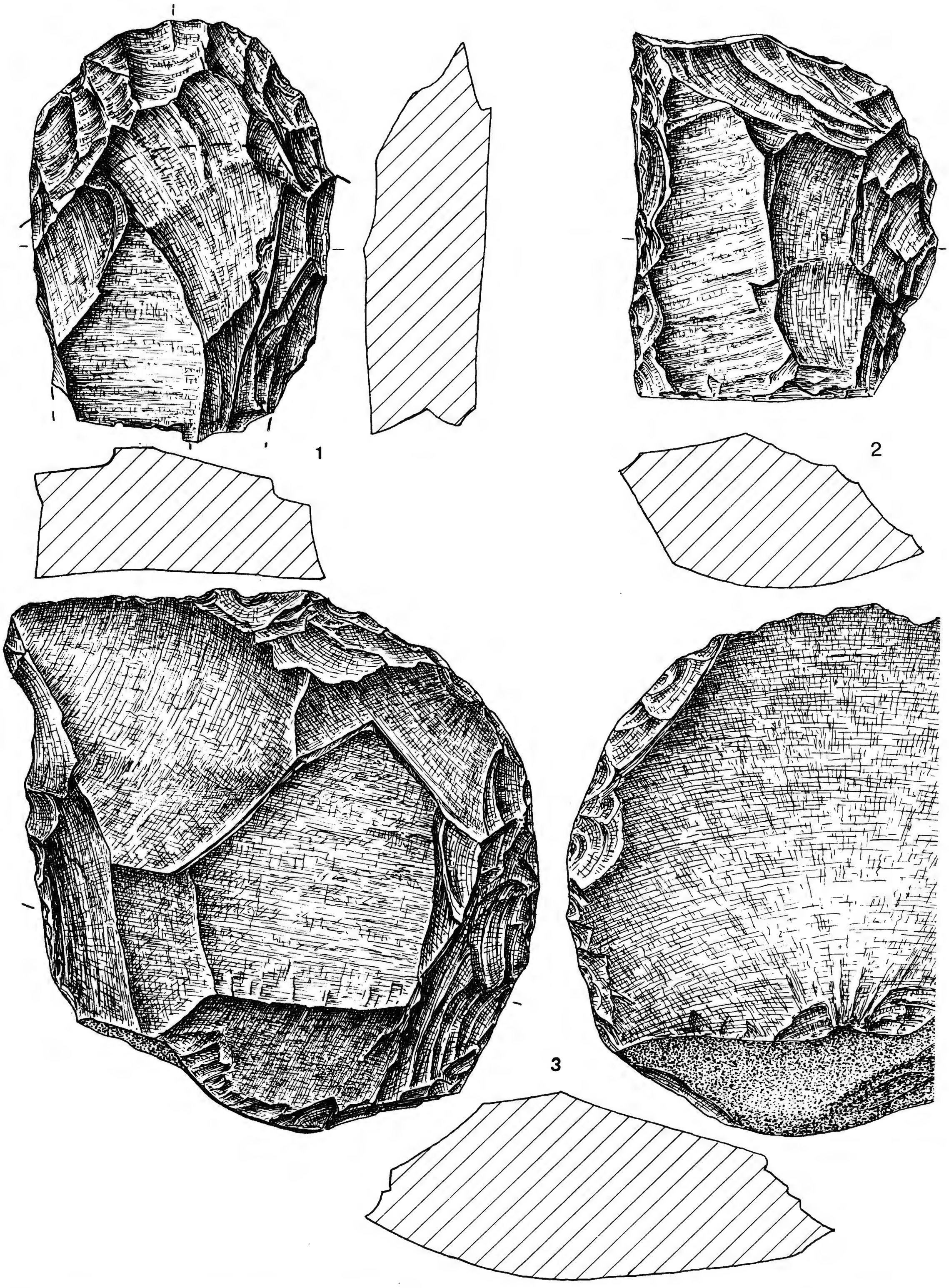


Fig. 29. Three unifacial scrapers. Nr. 1 has a gloss at the round edge, Nr. 3 has heavy usemarks at the right edge. 1:1.

interesting tool is A-8 west/2 (fig. 26.1) without any cortex but with two flat, split cobble faces at right angle to each other, which enclose a trimmed egde. The other two edges are steeply, unifacially trimmed so that the section is triangular and there are three lateral working edges and an additional bifacially trimmed working edge at the distal end which shows heavy usemarks, and a slight gloss on the lower face, as if it was used for considerable rubbing on bamboo.

Other corescraper-type tools are made on cobble waste pieces and have short but steep edges, either convex or straight, rarely concave (E-13d/219, fig. 27.2, and E-14 b/114, fig. 27.3). Corescrapers may have also been used for woodwork, but maybe for wood scraping and bamboo cutting rather than for heavy wood cutting.

III. Scrapers

Scrapers are of a great variety, made from flakes, from slices and from cobble debris pieces and small cobbles. They are generally unifacial, rarely bifacial, and can be quite thick in section, sometimes also very thin. They have rather steeply trimmed edges along the sides or/and the ends, the edges being straight or convex or, rarely, concave. Their shapes show a great variety of oval, pointed and irregular forms.

E-14c/3 (fig. 28) is an interesting large scraper made on a slice with some unifacial retouch along a convex edge. Rather uncommon scrapers are those on figure 29. The large scraper of fig. 29.3 is made on a thick flake and has unifacial retouch along most of the periphery but has also very heavy battering marks on the right, such as could be expected after heavy wood work. B-7c/43 (fig. 29.1) is a round scraper, made probably from a very flat slice, as the ventral face is almost concave. The convex unifacially retouched edge has a strong gloss over almost half the tool. The scraper of figure 29.2 has rather steep retouch on both lateral sides and is made on a thick flake.

Figure 30 shows two fine pointed scrapers which are rare. The ventral faces have no bulbs and the tools have probably not been made from flakes. Figure 30.3 is an end-scraper, made on a flat debris piece. All scrapers are unifacially retouched.

IV. Knives or knife-like tools

These are implements with a lateral sharp cutting edge, bifacially but usually unifacially trimmed, made on flakes or slices. B-9/1 (fig. 31.2) is a thick piece on a large white quartzite slab, with a used (rather blunt) unifacial edge at one side, while the other is unworked and blunt. At the distal and proximal ends some cortex is left from the cobble slice. B-8d/55 (fig. 31.1) is a rather curious piece, which for the want of classification is described here as a flat knife with a saw-like edge. It is made from an extremely flat slice of white quartzite, is unworked at both ends, has a steeply retouched, almost backed right side and is unifacially trimmed into a serrated edge at the left side. The lower completely flat face is untrimmed.

V. Ovates (Unifacial and bifacial Ovates)

These are ovate or elongate ovate forms, some almost hand-axe like, which also show a great variety of form and manufacture.

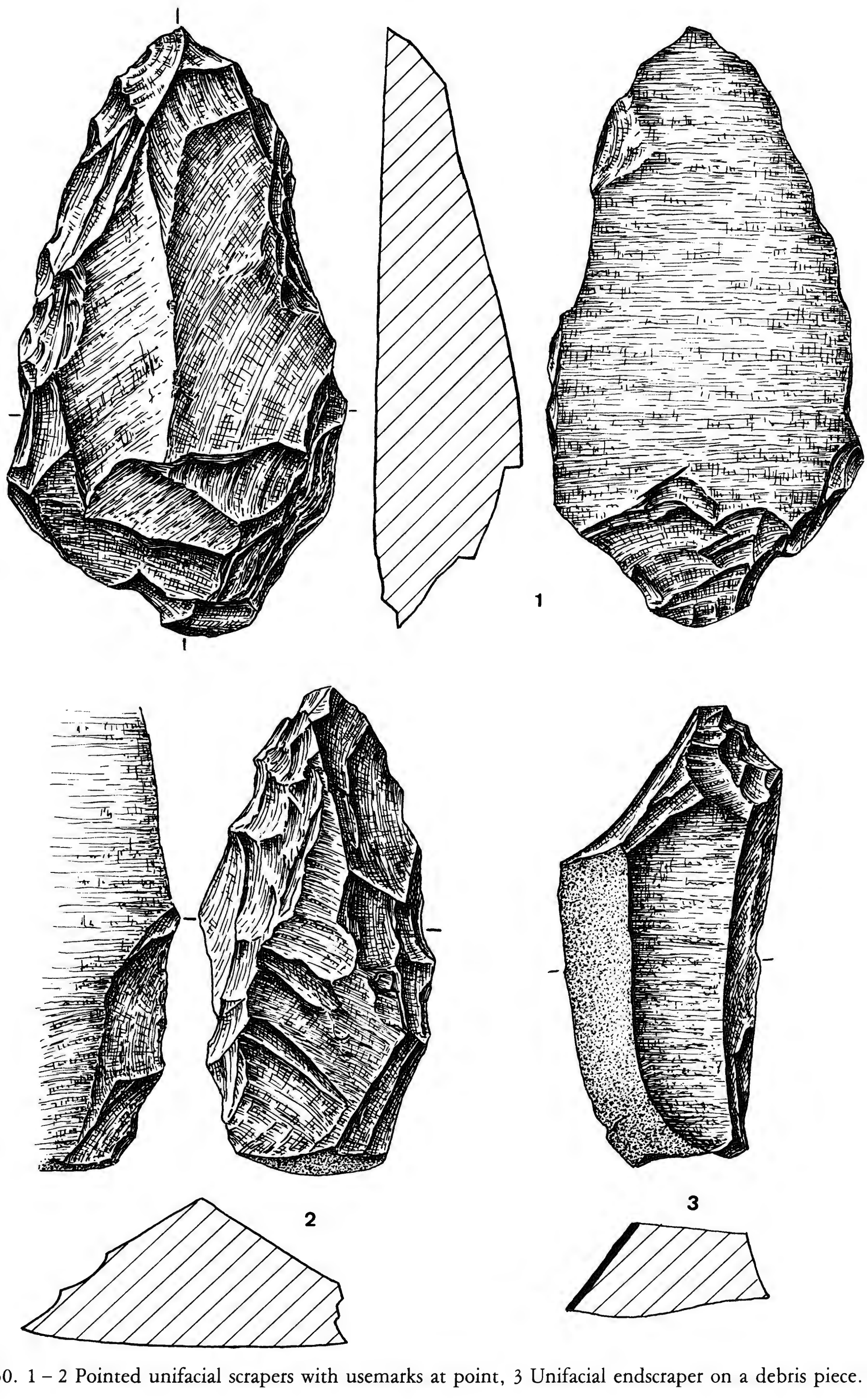


Fig. 30. 1 – 2 Pointed unifacial scrapers with usemarks at point, 3 Unifacial endscraper on a debris piece. 1:1.

There are fully bifacial forms and fully unifacial forms and others with partly bifacial trimming. They usually have a uni-or bifacial edge around the whole circumference, with the exception sometimes of the butt-end.

They can be made from extemely thin slices of quartzite (as in A-9/1 or C-2/1, fig. 32.1 and 34) or from flakes (as in E-14a/10, fig. 32.2) or directly from a cobble. Sometimes the original element from which it was made cannot be identified any more, especially in pieces which have been trimmed extensively on both faces (like in the piece from the west-gully/1 (fig. 33). This last one is a perfect bifacial ovate with stepflakes all around the periphery. It is extremely thin on the distal edge, is steeply trimmed on the right edge and has a used, rather battered edge on the left side.

C-2/1 (fig. 34) is a curious piece. It is also bifacially trimmed but is made from an extremely thin slab of quartzite. It has very used, shallow lateral edges and an equally very used and very shallow chisellike distal edge.

A very curious but lovely tool is A-9/1 (fig. 32.1), an extremely thin piece, perfectly flat on the lower face and minutely trimmed all around the periphery into very used scraper-like edges.

E-14a/10 (fig. 32.2) is a uniface, completely unworked on the lower flake surface which shows a prominent bulb of percussion. It is a side-flake, flaked off a cobble, the platform being of cortex. The round apex is wellshaped and used. Such a piece, if regarded by itself, would fit perfectly into any early palaeolithic industry from Africa or India.

VI. Cleaver-like tools

These are cutting tools, made primarily on flakes, with a cleaver-like tranchet edge at the apex, which is untrimmed but used, and which is made, exactly like the genuine cleaver edge, by the intersection of the flake surface with a flat negative of the dorsal face of the flake without any further work. The cleaver edge was the used part of the tool, the lateral sides being generally unused. B-8b/15 (fig. 35) has a broad straigth cleaver-edge, while the proximal end is trimmed to flatten and narrow the tool, maybe for hafting.

Bawshi S/14 (fig. 36.1), too, has a broad, used cleaver edge and is proximally trimmed to flatten the tool at the butt. The tool is very flat on both sides.

D-4/6 (fig. 36.2), is a very narrow tool with a straight, used cleaver edge and has not much secondary flaking. The left side is a natural cleavage plane of the rock. A few small retouch scars narrow the tool near its proximal end (maybe for hafting, too).

VII. Adzes and adze-like tools

This is the most complex tool category of the Patu site, and has a very wide range of forms. They are made from flakes or from cobble slices or split cobble pieces. They all have a more or less regular distal edge, and are sometimes in association with lateral edges as well, though those seem to be of secondary importance. The distal edge can be straight like a cleaver edge or a tranchet or it can be rounded or rather irregularly shaped, and is generally unifacially but sometimes also bifacially trimmed.

The straight-edged adzes are usually thicker at the apex, i.e. the adze edge is steeper. The rounded adzes have a considerably thinner distal edge. An interesting observation is that the last mentioned adzes show a very characteristic lustre or gloss at their distal edges, which seem to be a typical feature of these tools.

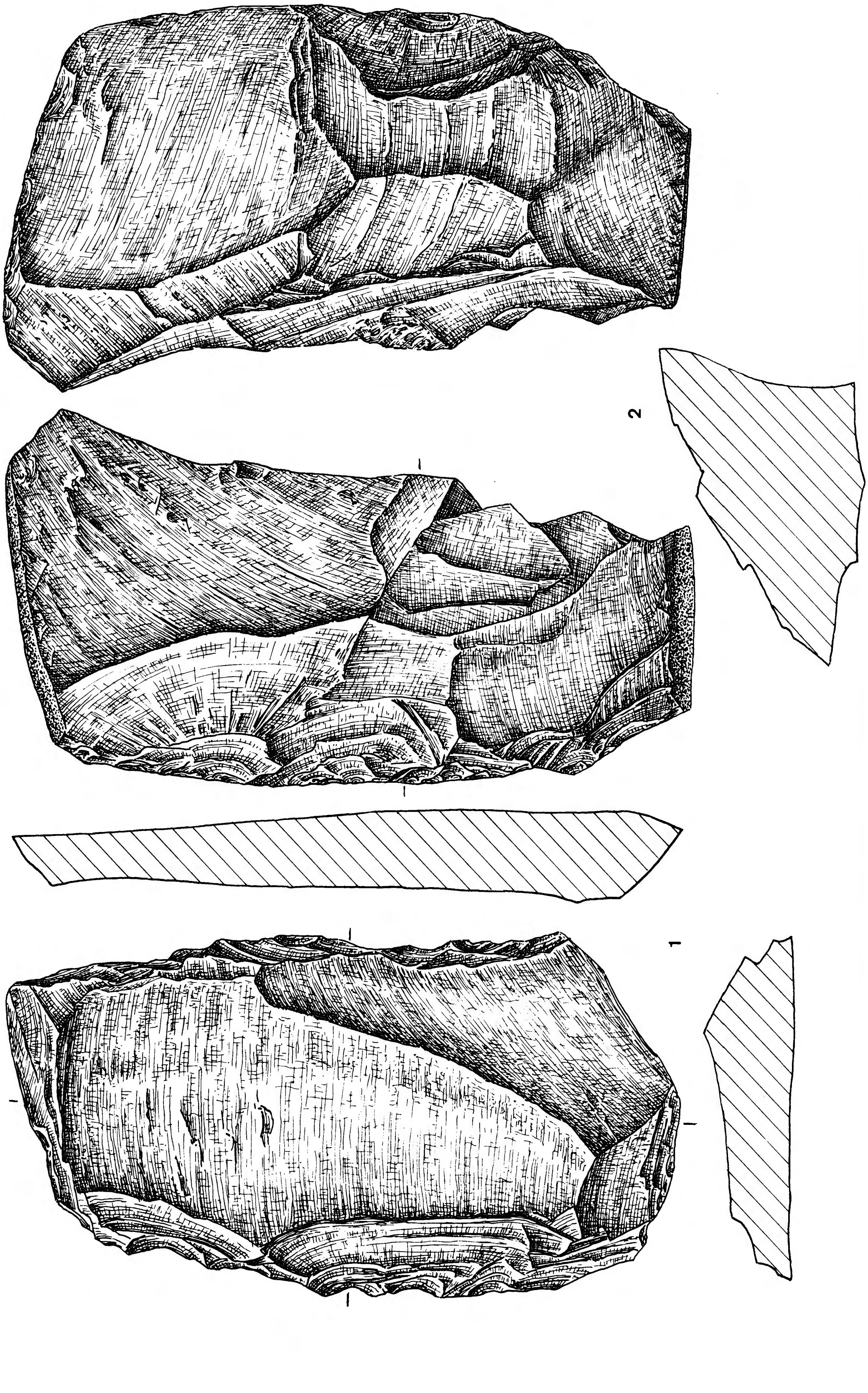


Fig. 31. 1 Flat unifacial knife, steeply backed at right; serrated edge at left, 2 Thick knife, both ends retain cortex. 1:1.

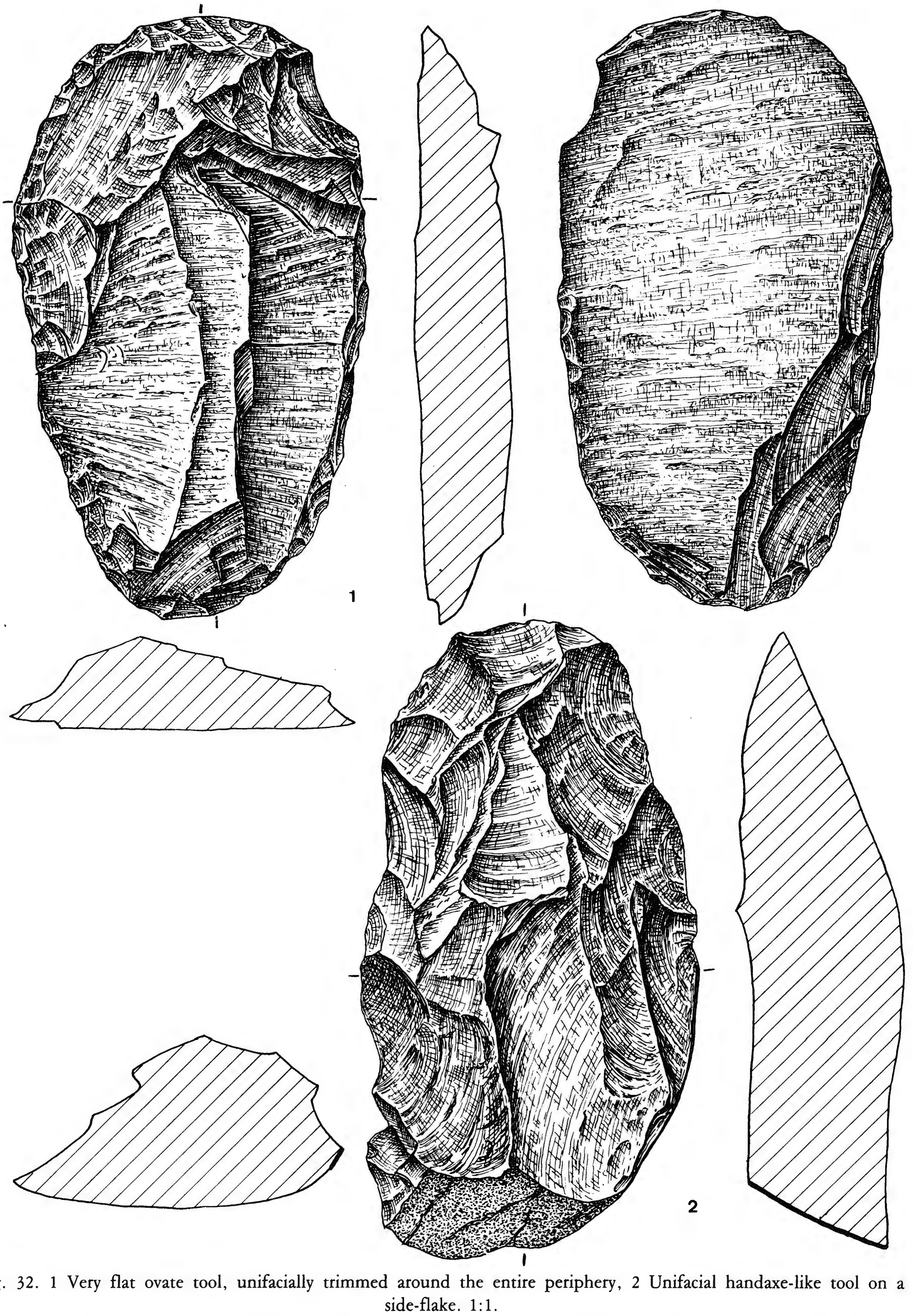


Fig. 32. 1 Very flat ovate tool, unifacially trimmed around the entire periphery, 2 Unifacial handaxe-like tool on a side-flake. 1:1.

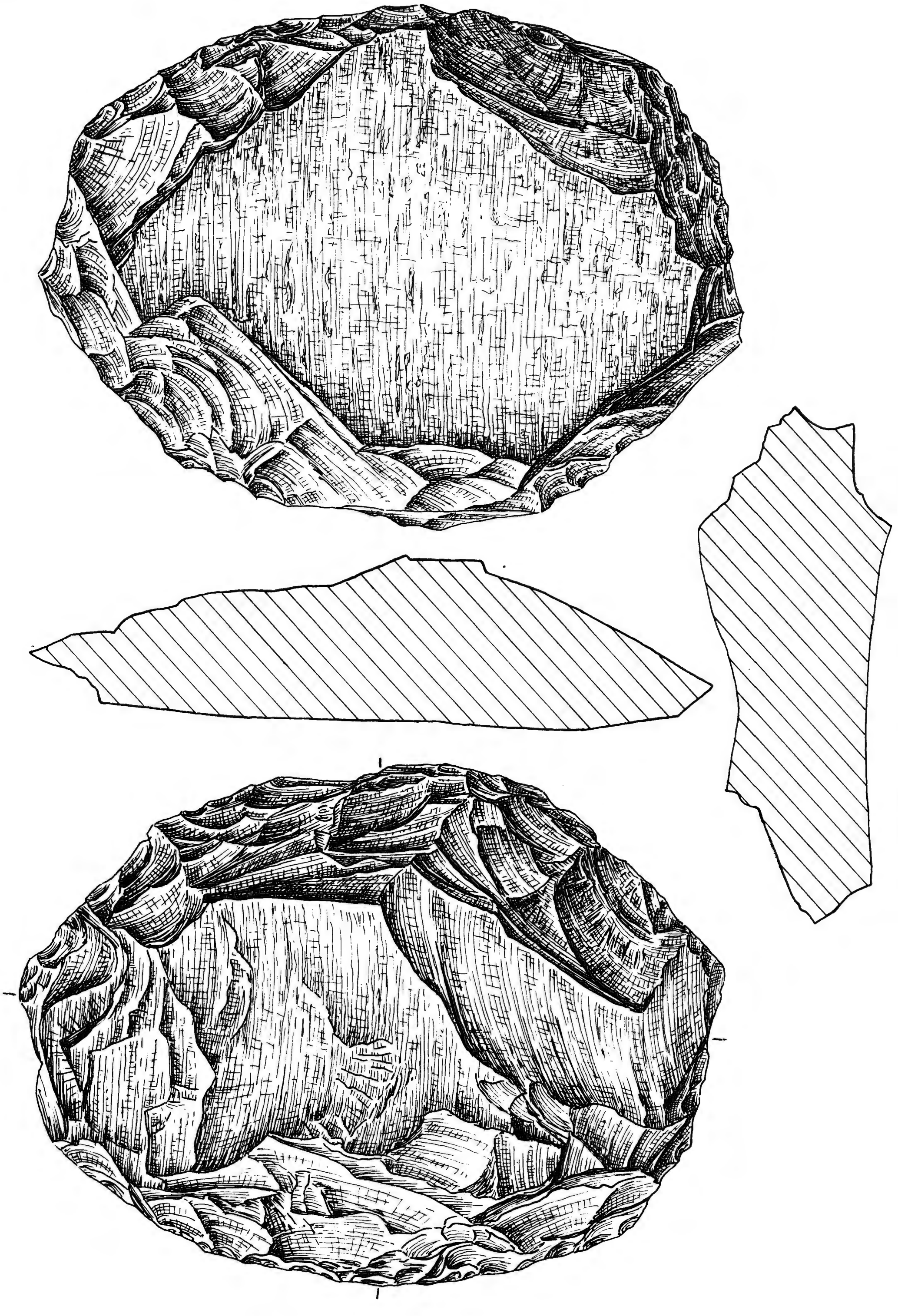


Fig. 33. Ovate handaxe-like tool, bifacially trimmed with very used left edge. 1:1.

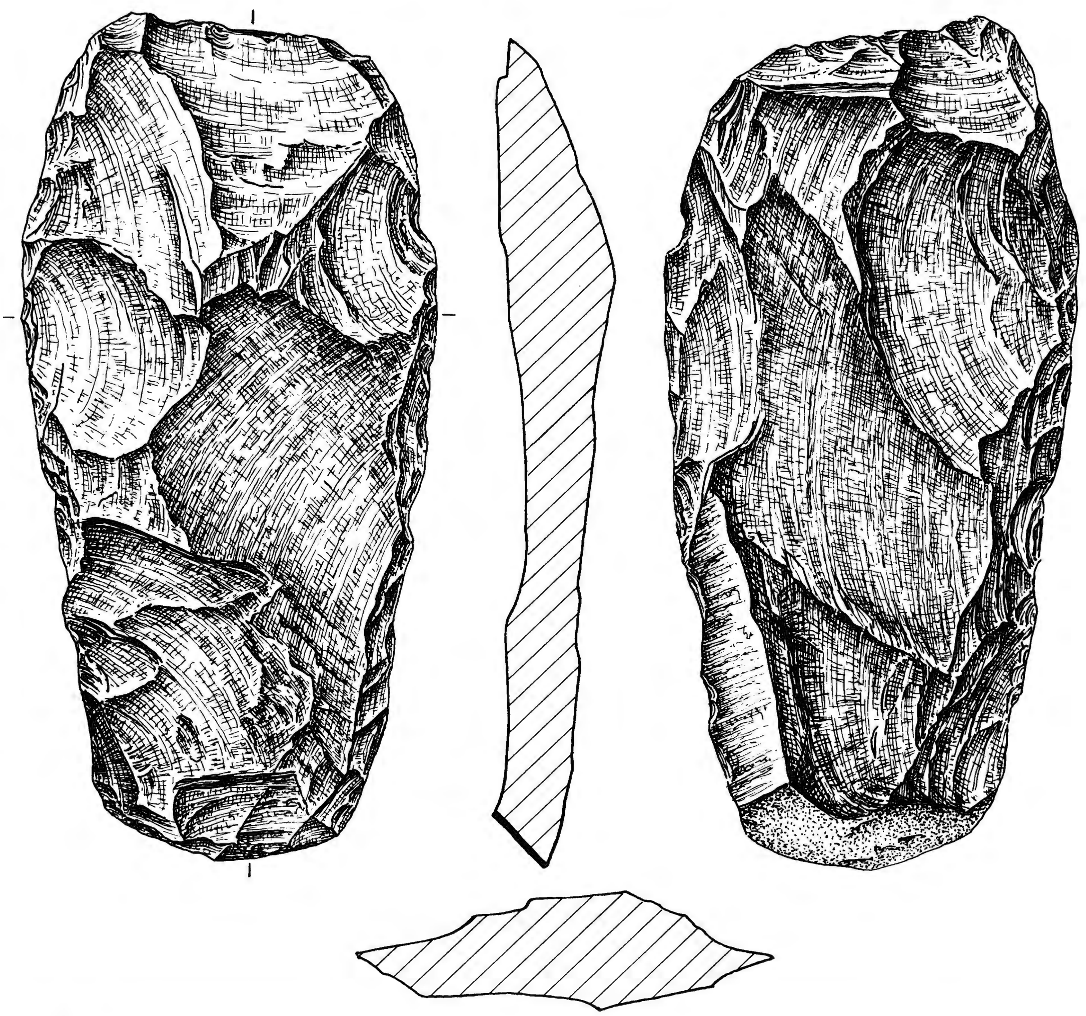


Fig. 34. Very flat adze, with used straight distal edge and partly bifacial, used, shallow lateral edges. 1:1.

It is therefore probable that the straight-edged steep adzes and the round-edged shallow adzes have entirely different functions.

Adzes with straight chisel-like edges. So far no specimen of this type has been found with a gloss at its edge. Instead, considerable usemarks are seen along the straight edge. Interesting too, is that the edges are rather short and abrupt, and sometimes steeply trimmed (C-5/20, fig. 37.1). Butts are usually trimmed extensively in order to flatten the proximal end (maybe for hafting). Some have a very pointed triangular butt (C-5/20, fig. 37.1), others a narrow, but more rounded, flat butt (B-7/10, fig. 37.2) and others a narrow squarish butt (W. of A-7/1, fig. 38), and others have broader and trimmed or untrimmed butts. Shapes are triangular, trapezoid, rectangular etc., i. e. rather geometrical.

Adzes with rounded or squarish-rounded or irregular distal edge. Their forms vary from oval and elongate oval to more geometrical shapes with pointed or round or square butts. The lateral edges are trimmed, too, by step-flakes and smaller retouch scars. Some of these edges are bifacial and sharp so that they can be used, too. Some are blunted and some are retouched by small steep scars to form a scraper-like edge (see below). The distal working edges which seem to be of prominent importance

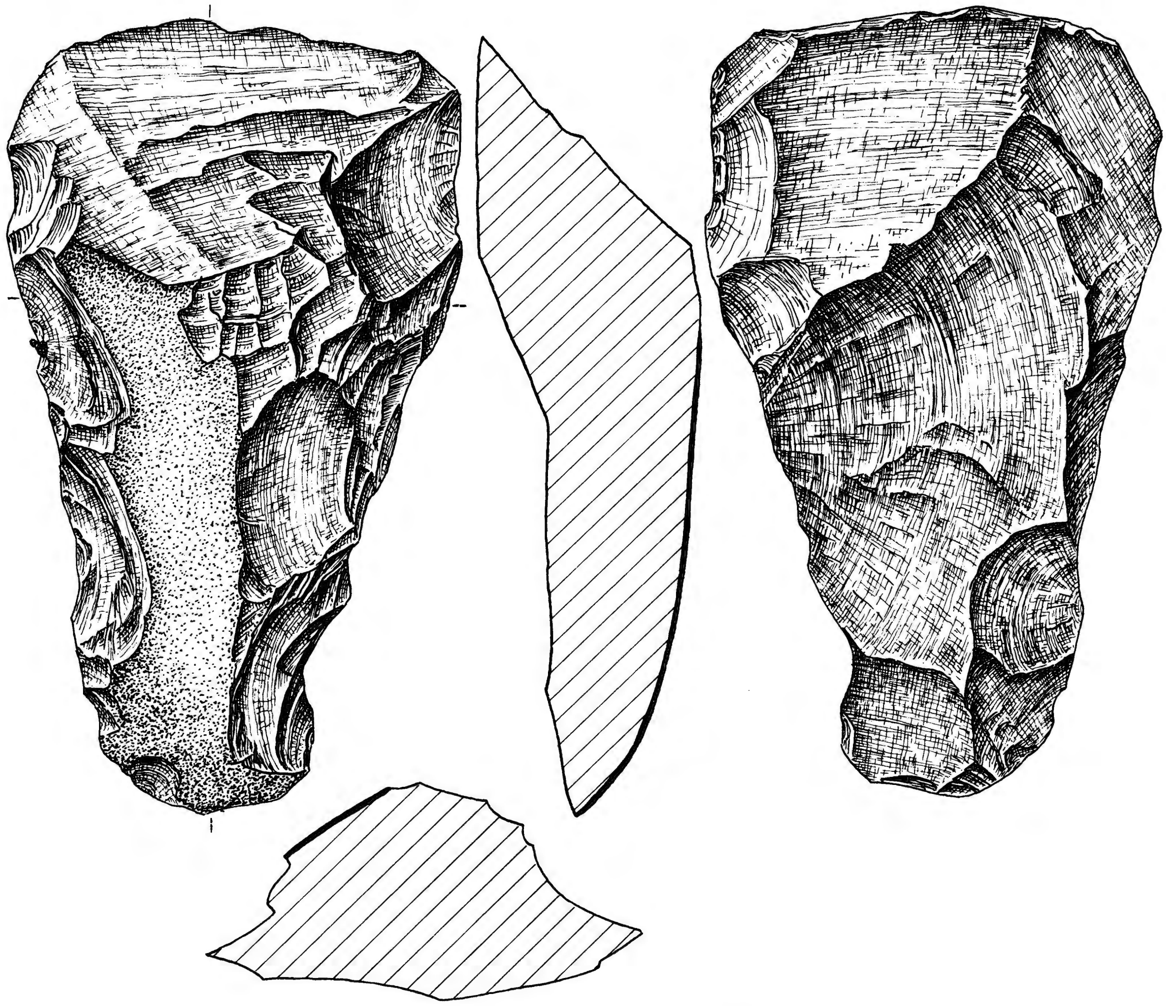


Fig. 35. Cleaver-like tool, with untrimmed distal edge. 1:1.

show often considerable usemarks, apart from a glossy sheen which varies from a strong extensive glossy polish to a very slight gloss. The gloss extends partly over the use-scars, partly not.

The gloss is certainly the effect of special wood work over a long period of time and has been recorded on stone tools having been used on wood (Keeley L.H. et al. 1977) and also on corn, grasses and bamboo (Witthoft J. 1967).

The gloss on the Patu tools seems to be the result of cutting and scraping work over a long period of time on opaline containing grasses and bamboo. B/-2/1 (fig. 39) is a fine adze with round, used apex which shows a very extensive gloss on both faces. It has a pointed trimmed butt end, maybe for hafting.

Pa. 2 b/1 (fig. 40,1) has a rounded squarish adze edge, very flat and used, possessing a gloss on both faces, too, but not so extensive as the last tool. It has a round trimmed butt.

Bawshi N/2 (fig. 40.2) is a rectangular adze with cortex at the flattened butt. There is extensive gloss on the distal edge on the dorsal face, while on the ventral face the gloss is only slight and does not extend into the scars of the usemarks. Evidently polishing work was carried out with this tool for a long time with

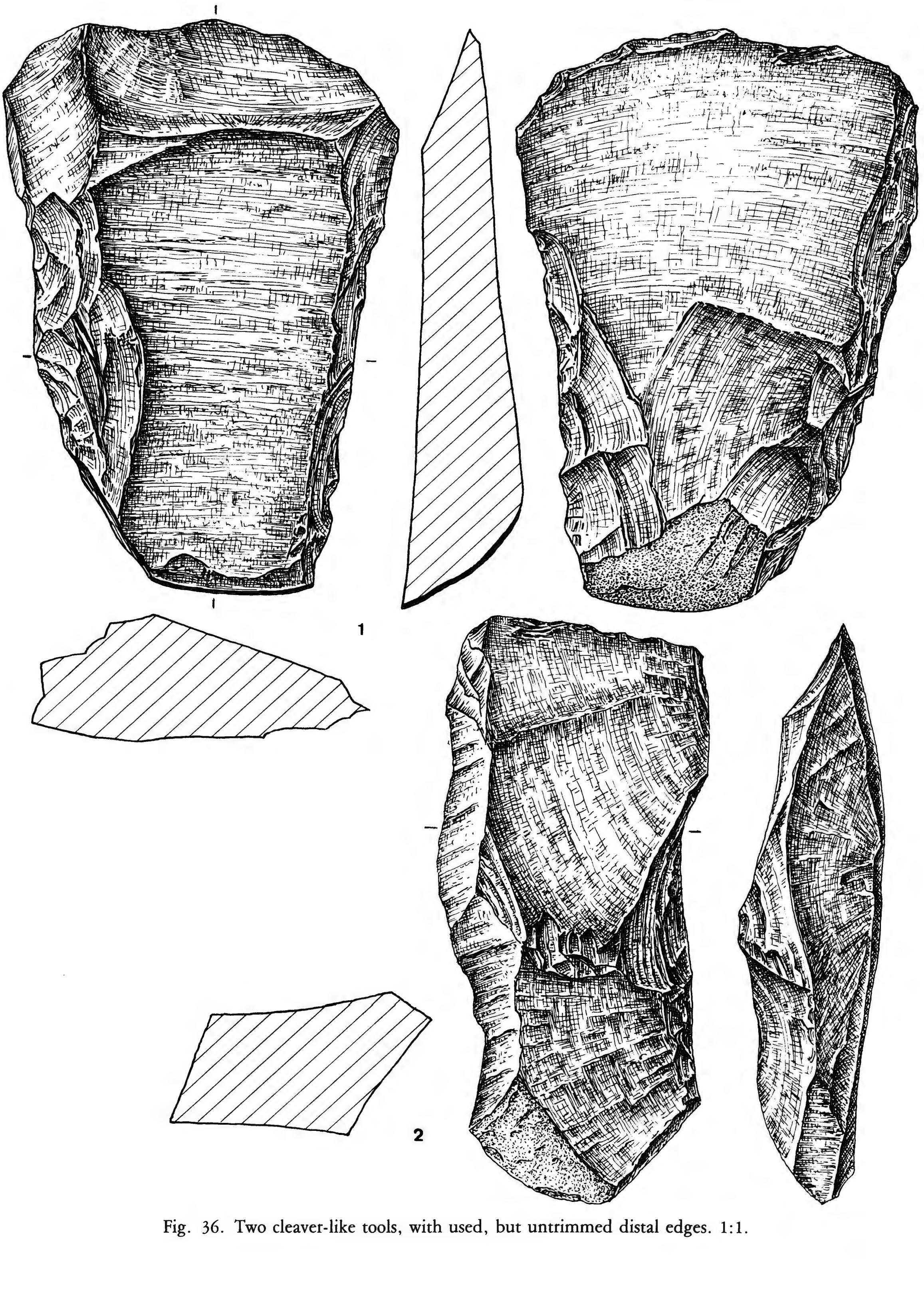


Fig. 36. Two cleaver-like tools, with used, but untrimmed distal edges. 1:1.

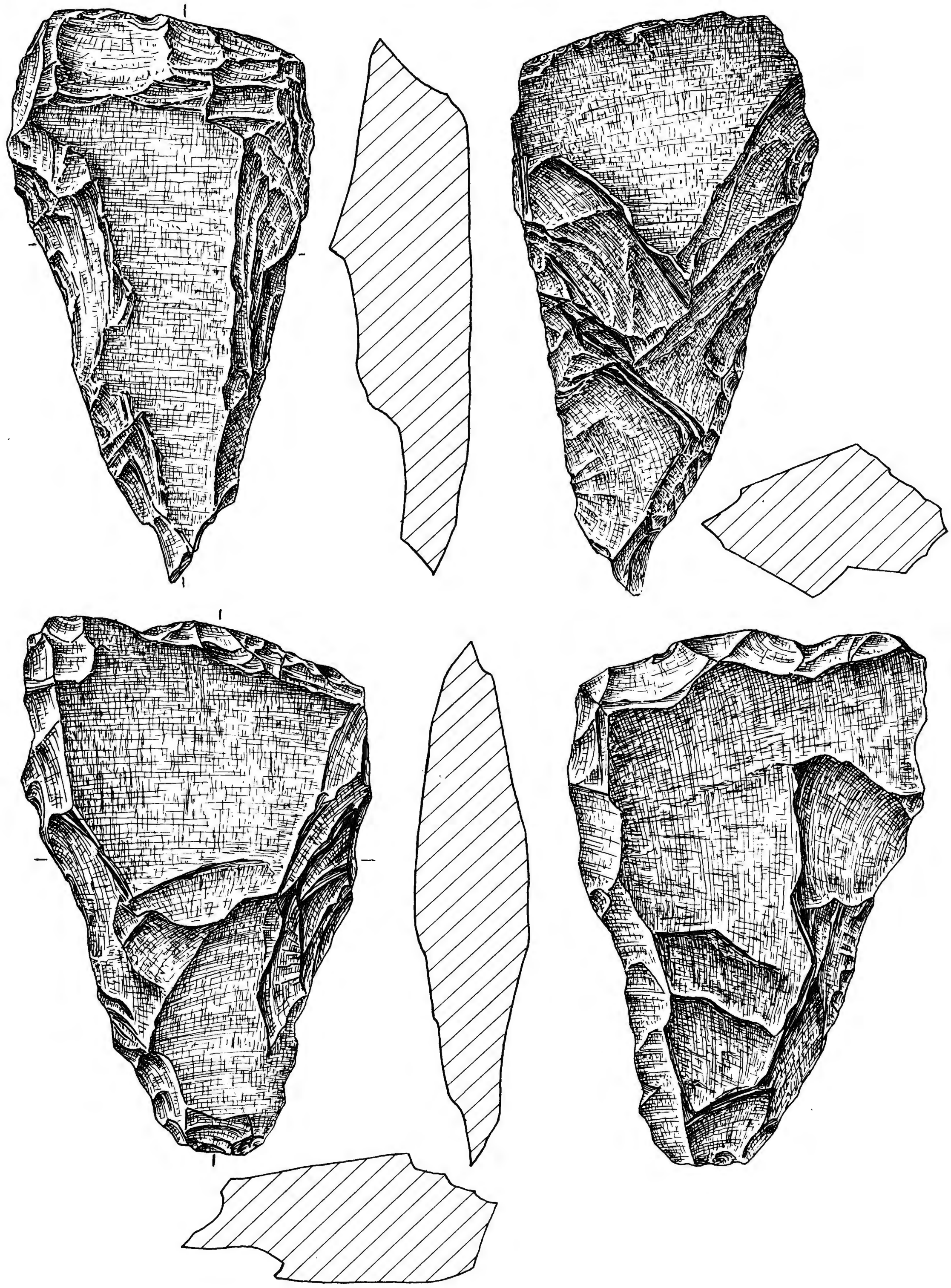


Fig. 37. Two adzes with steep, trimmed straight distal edges and triangular butt; the distal edges show considerable usemarks. 1:1.

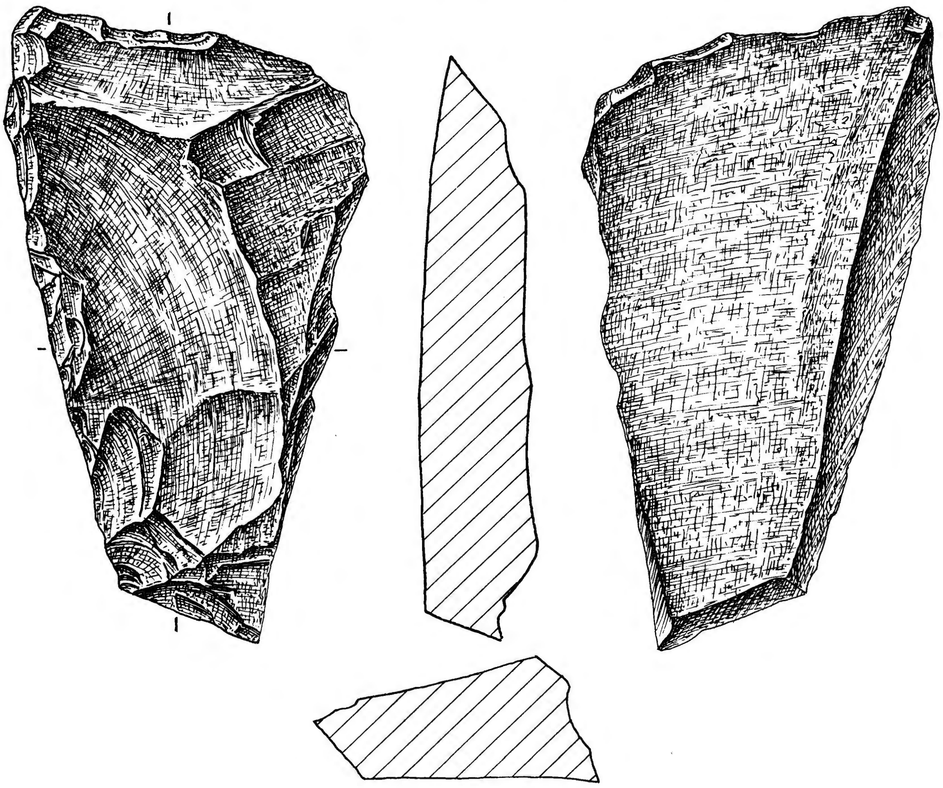


Fig. 38. Adze-like tool with steep, straight distal edge, showing usemarks. 1:1.

the dorsal face mainly. The extent of the gloss is indicated on the drawings of the tools as an interrupted line.

Adzes with additional lateral working edges. These adzes have similar features, but they have, besides their shallow and usually round or irregular-round adze-edges, another pronounced edge laterally, either in form of a unifacially, steeply retouched scraper edge as in B-7/5 (fig. 41) or in form of a rather sharp bifacial or unifacial knife-like edge as in A-8 west/1, (fig. 42). Even these tools can have a gloss at their distal edge, as is the case in A-8 west/1 (fig. 42). This interesting tool has a broad, round, rather shallow adze-edge, and on the left side is an additional bifacial, sharp knife-like edge, while the right side is steeply retouched, almost backed. B-7/5 (fig. 41), seems to be a steep scraper or corescraper, as both lateral sides are vertically retouched from the completely flat ventral faces. The distal end, however, is shaped into a rather flat adze-edge; a lovely tool, for scraping and chiselling.

Split adze-like tools. There are quite a number of split implements*) which have been split either by accident or intentionally. They show a transversal (or part of a transversal) edge at the distal end and sometimes, as in E-17/1 (fig. 43), also a small, but sharp chisel-like edge at the proximal end. This is an interesting tool as it shows usemarks on both transversal edges as well as on the upper part of the lateral edge, while the lower part laterally has a natural back with fine retouch towards the dorsal and ventral face, as if to blunt the back. This tool may have broken during work. The tool D-5/15 (fig. 44.2) looks as if it has been intentionally split, as there is a blow mark and radial breakage lines on the broken face.

*) Split piece = longitudinally broken (intentionally or unintentionally) along the axis of the tool.
Snapped piece = transversally broken piece, perpendicular to the long axis.

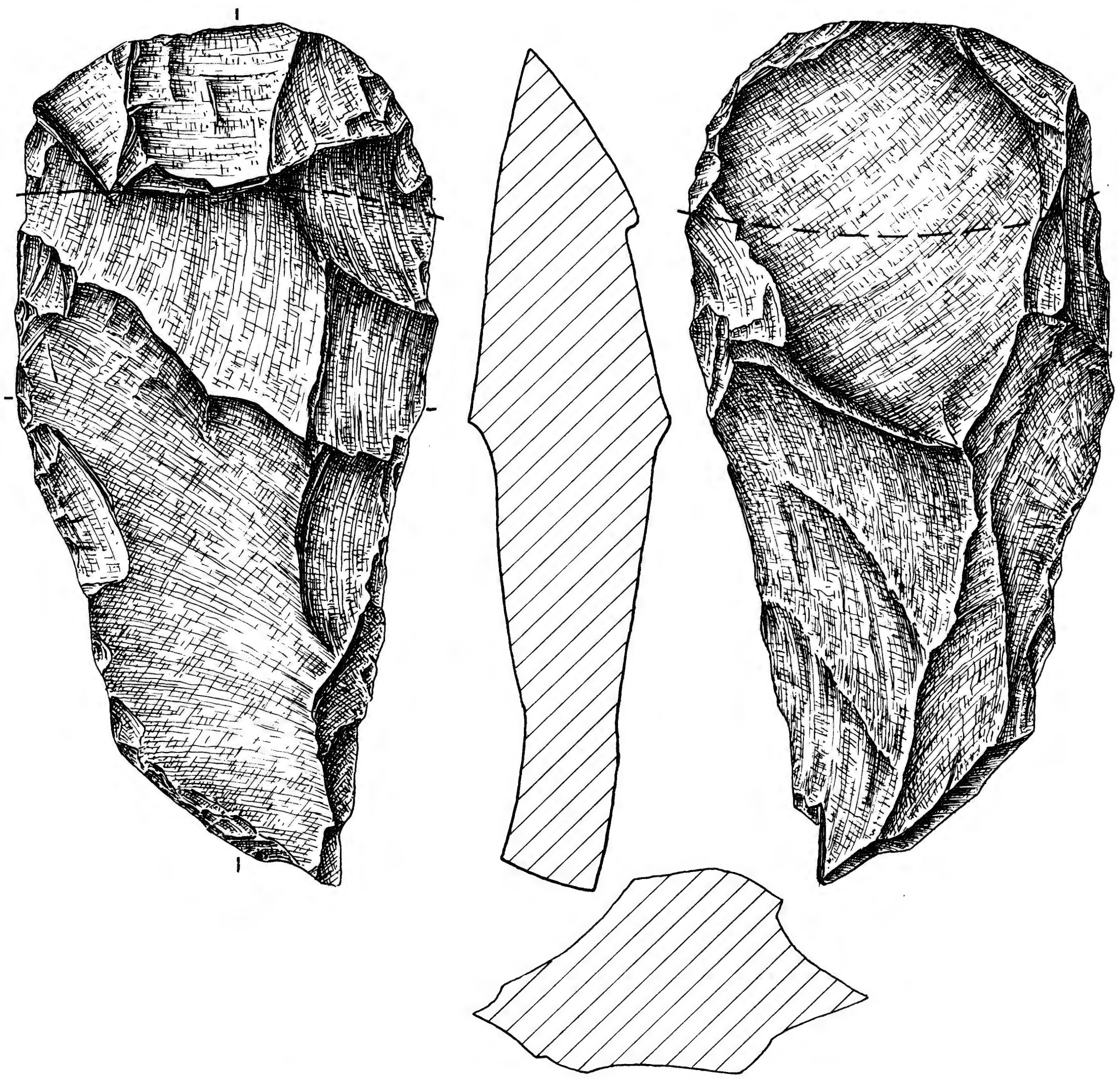


Fig. 39. Flat adze-like tool with glossy polish at distal edge. 1:1.

Other forms, too, seem to have been intentionally broken, so as to produce a back, as in B-7 c/34 (fig. 44.1).

VIII. Light duty tools of small size

There are actually very few small tools, and those which have been found seem to be of a rather haphazard type. A few small flakes show some retouch and/or use (E-13d/179 (fig. 45,1) E-13a/14 (fig. 45,2). There are also some retouched or used waste pieces, such as chips (E-13d/193 (fig. 45.3) and flake-like pieces and some split and broken debris pieces of undistinguishable shape with either some retouch or usemarks. They are difficult to categorize.

One thin flake-like piece has a tranchet at the distal edge with slight usemarks at this edge and at the lateral side (fig. 45,4).

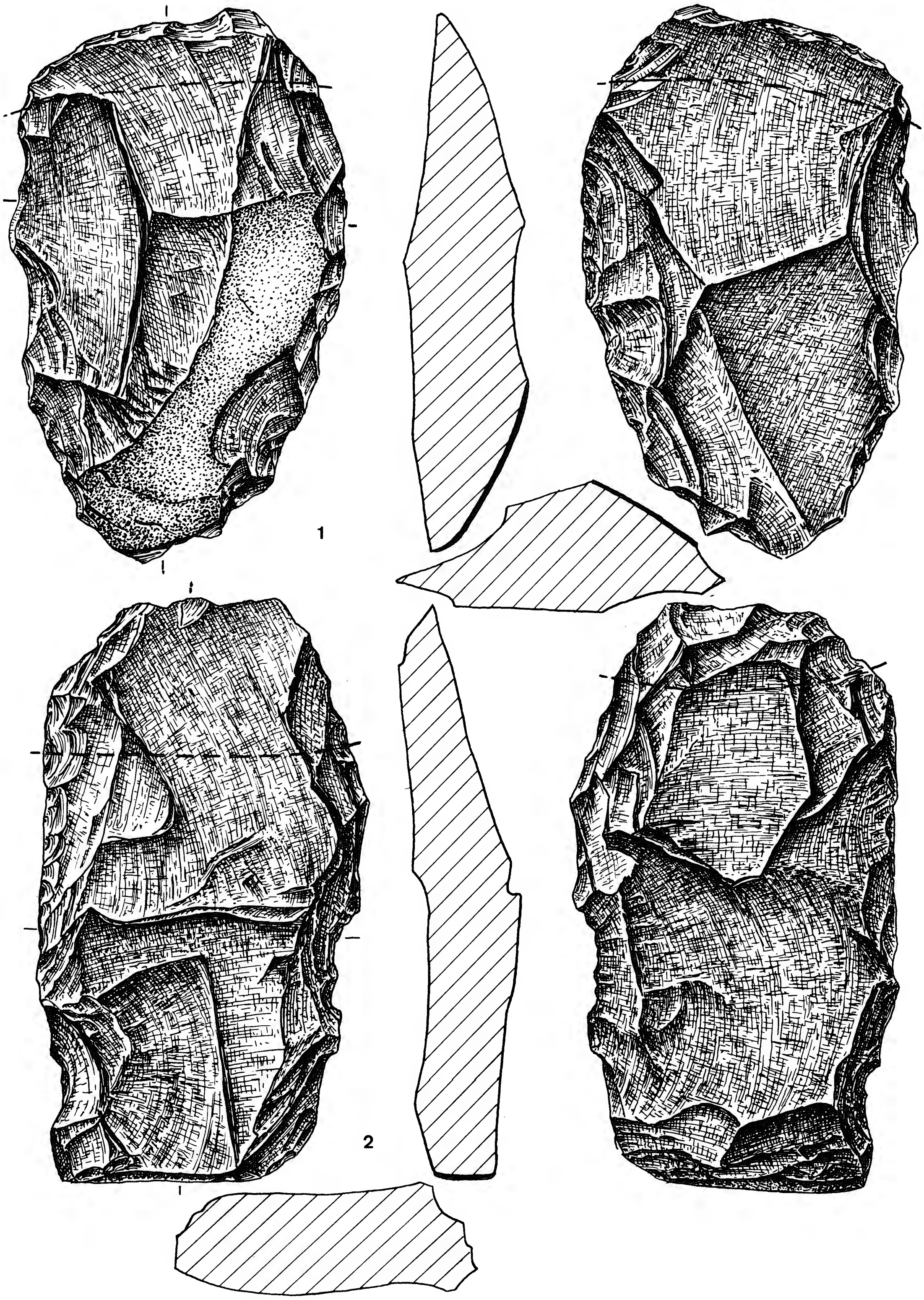


Fig. 40. Two flat adzes with gloss and usemarks at distal edge. 1:1.

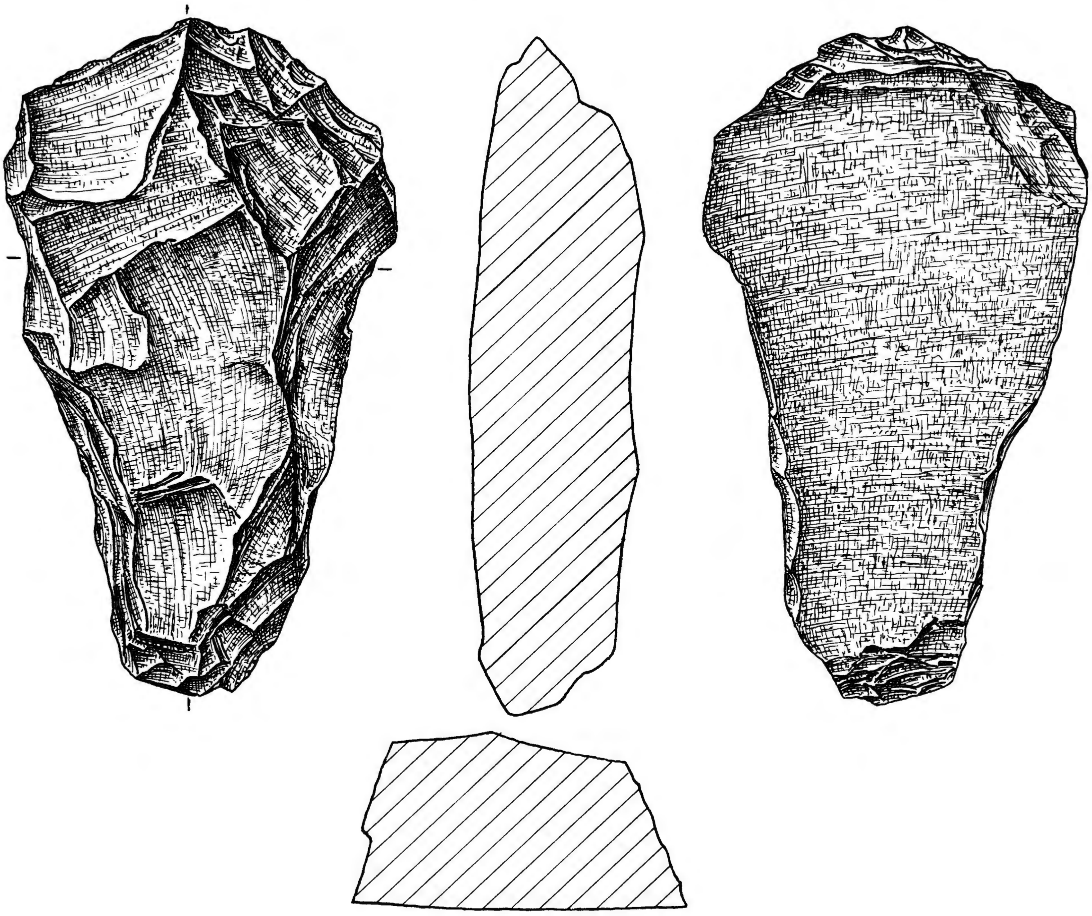


Fig. 41. Thick adze-like tool with broad used distal edge and two lateral steep scraper-like edges. 1:1.

Altogether there are very few flakes on the site and it seems that small flake production and small flake tools were not required and played a minor part in the tool kit of these people. The flakes which are present show quite often a characteristic fine trimming on the dorsal face at the platform edge, and platforms are usually of cortex (E-13c/47 fig. 45,5). Some of the flakes are derived from very small cobbles as they show cortex at the distal and proximal end (E-13a/14, fig. 45,2).

IX. Hammerstones and anvils

These are quite abundant on the site. Hammerstones are of hard quartzite cobbles and are of round to oval shape but also of any suitable other shape. They often have very heavy battering marks as well as negatives of chips. The anvils are rather large, flat quartzite stones or slabs. They possess a variety of indentured marks in the form of point-like and lined notches (fig. 46).

One isolated tool must be mentioned, still. It is a very corroded small axe, with a broad, round distal edge. It may have been a polished axe once, though the surface is so weathered that nothing of any polish can be distinguished. It is a single tool and is not made of the local quartzite. It is uncertain whether it belongs to the same period, as no other similar tool has been found amongst the thousands of artefacts.

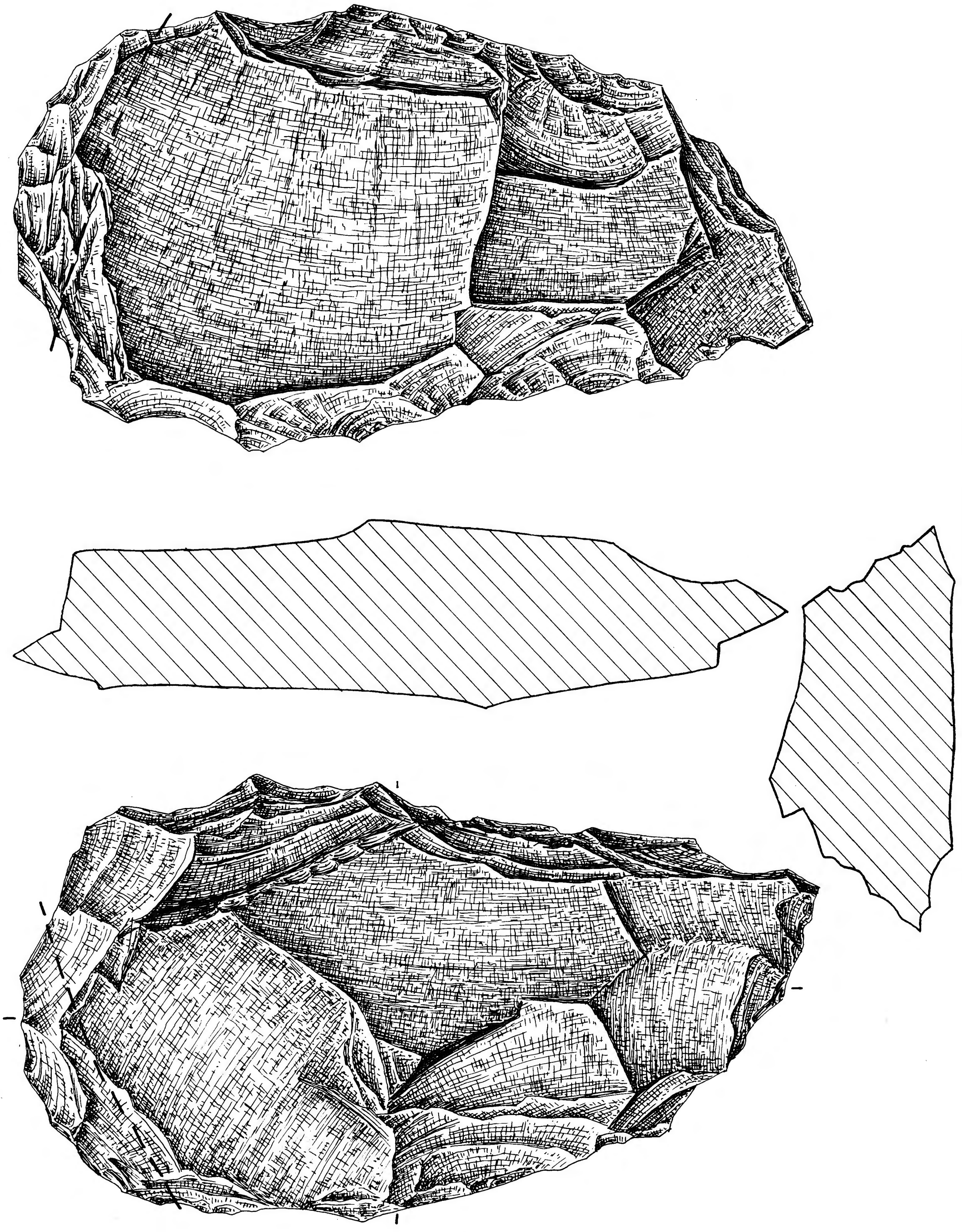


Fig. 42. Bifacial adze-cum-knife with slight gloss at the distal edge. 1:1.

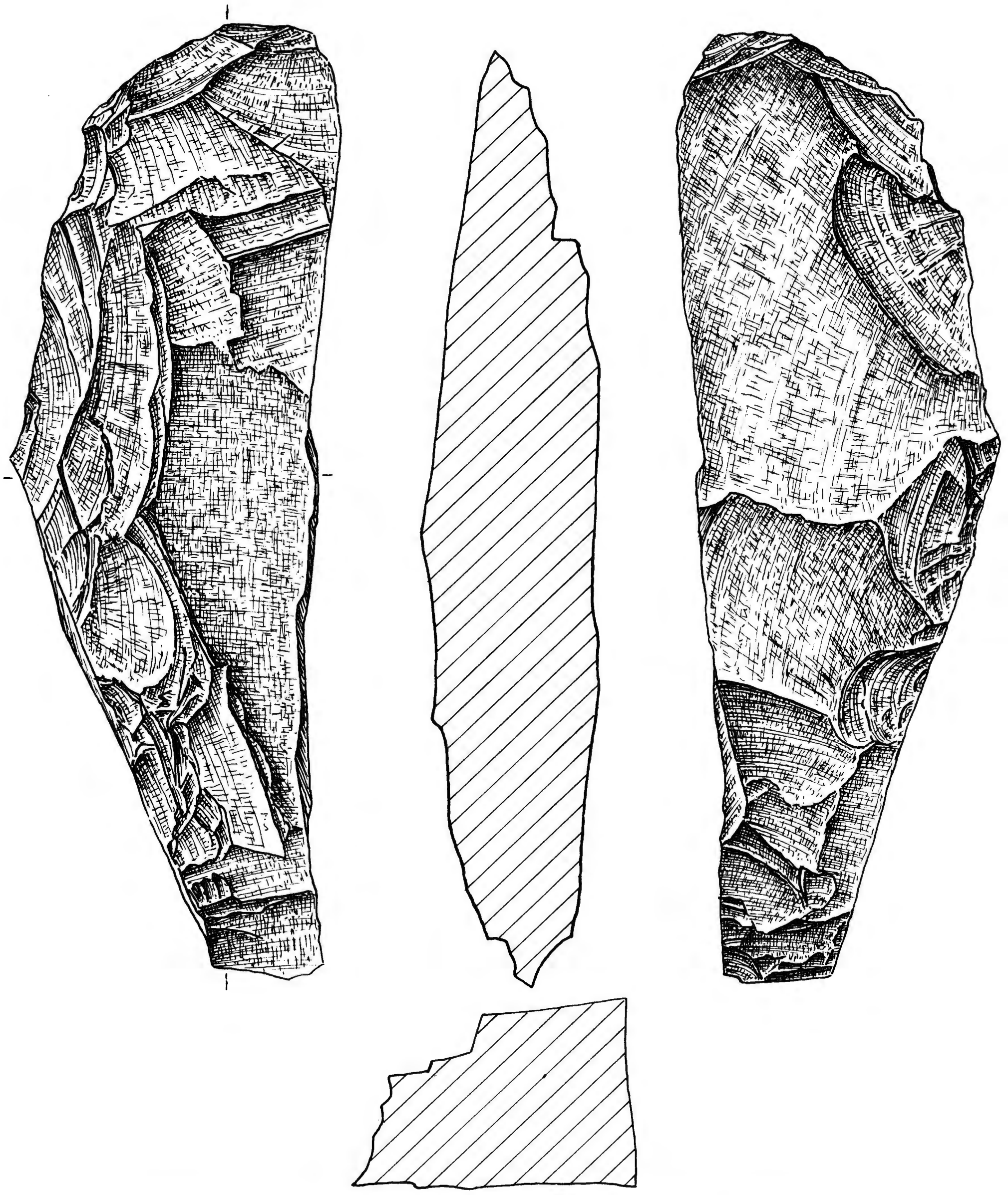


Fig. 43. Split adze-like tool with a sharp chisel edge at the proximal end. 1:1.

The technique was understood not only by studying the artefacts and the waste, but was primarily understood by own experiments of stone breaking and splitting in the field at the site, on cobbles and boulders of the same variety, which early man used and also fetched from the same source.

Studying the tools and waste at the site, we tried to work the stone in the same fashion. We saw that most of the cobbles had been split along the natural cleavage planes of the quartzites wherever these cleavage planes existed in the quartzite varieties.

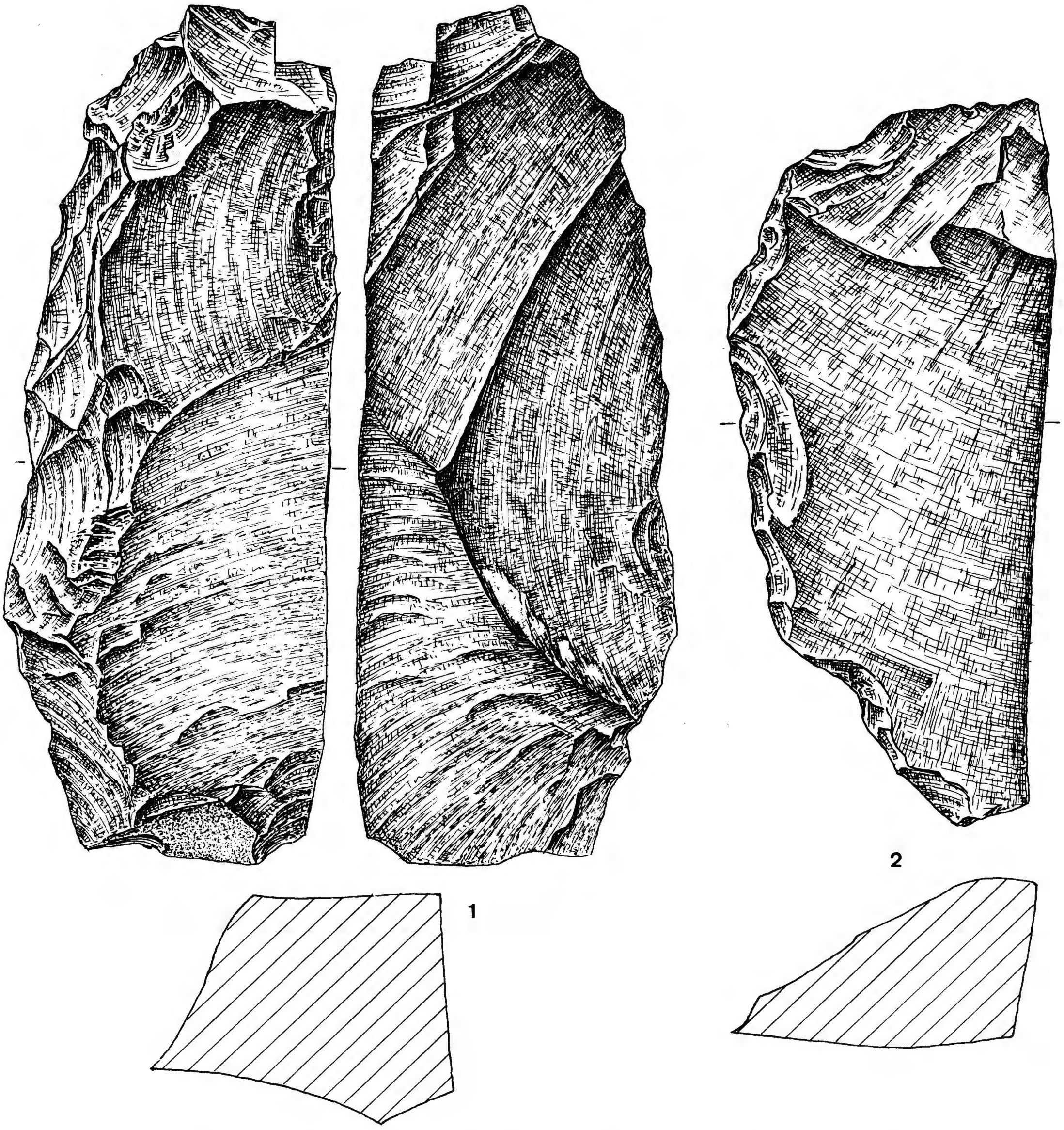


Fig. 44. 1 Split adze-like tool with used lateral edge. 2 Split trimmed flake. 1:1.

We split them in fire, which was unsatisfactory as the stones split irregularly and the hardness of the stones was impaired. We split them by the block-en-block method, which was not very successful, as it was not forceful enough. We split them best by throwing the large cobbles against very large boulders on the ground which is a rather hazardous but successful operation.

The split cobble parts could then be worked further into corescrapers or choppers by using a strong hammerstone and flaking a steep edge from the flat split surface. But choppers and corescrapers could also be made directly from flat shaped cobbles.

We worked by several methods either on the split cobbles or on natural cobbles (fig. 47).

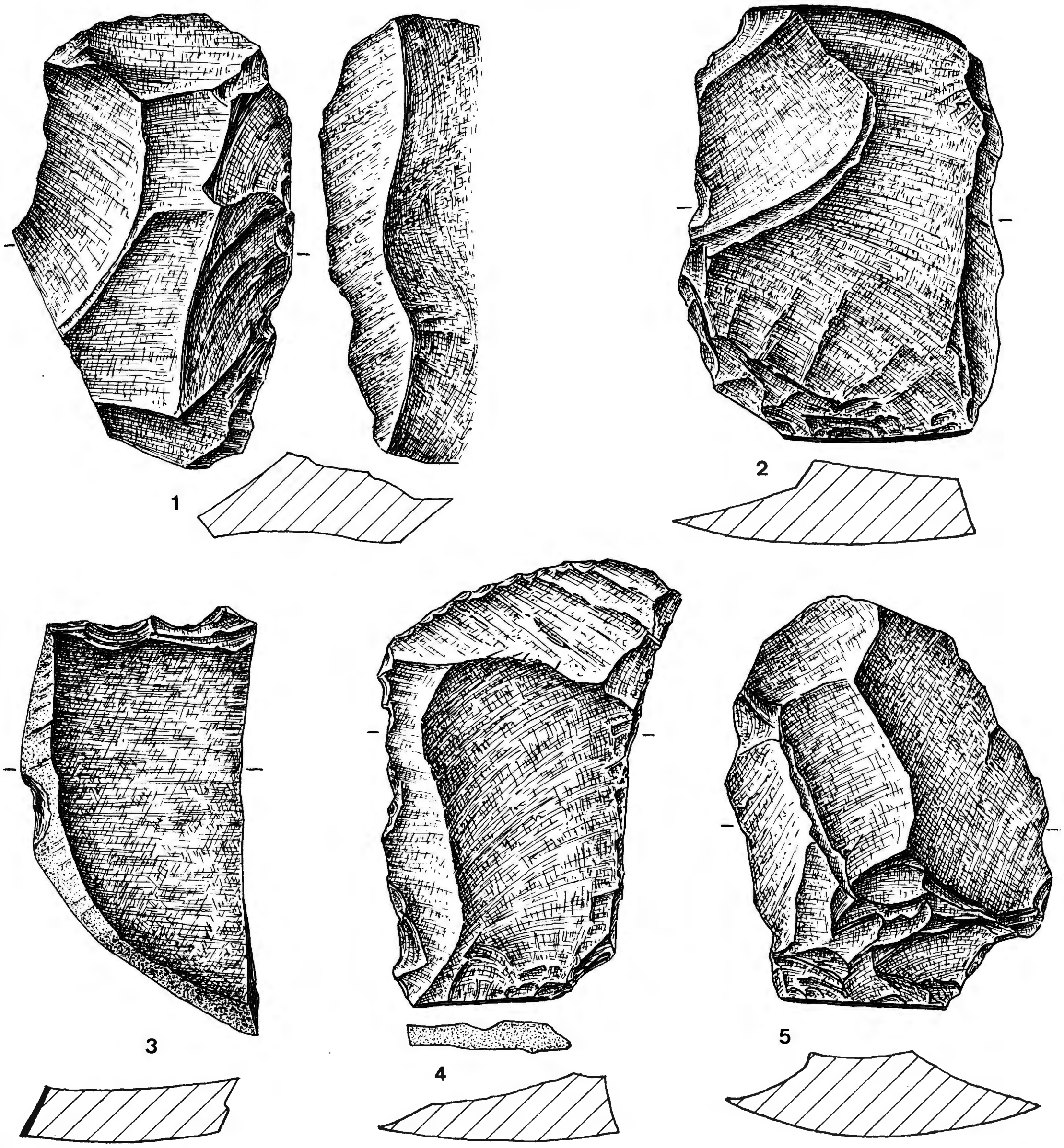


Fig. 45. 1 Side-flake, used but untrimmed, 2 Untrimmed but used flake with cortex platform, 3 Split, trimmed flake fragment, 4 Small, used tranchet with cortex platform, 5 Flake with cortex platform and step retouch at the platform edge. 1:1.

1. Block-en-block method: to produce large flakes or slices or to reduce a large cobble to a required smaller size. A large, handy oval cobble of a size of at least 15 cm or slightly more (which is a common size amongst the cobbles of the source), is held in the hand and hit against the rounded edge of a large boulder on the ground: large flakes fly off, all with a cortex platform. Some of the flakes have good shapes and edges and may be used further. The reduced cobble then can be worked further by stone-hammer method. This block-en-block method produces blow marks on the anvil itself.

2. Heavy stone-hammer/anvil method: to produce the large choppers. A good strong hammerstone, preferably of oval shape, is used for striking the split or natural cobble on its flat base to take off

Fig. 46. Two anvils with battering marks.

Fig. 47. Own experiments with stone work.

unifacially larger and then smaller flakes from this base to produce the required chopper or corescraper. As a platform for such hard work a large flat boulder on the ground is useful as an anvil. Most of the waste flakes which come off, thus have cortex platforms, and this is the prevailing case, too, on the flakes at the site.

3. *Free stone-hammer method:* to produce the required edge on the corescraper or on any other cutting- or scraping tool, or to re-sharpen blunted edges. The tool is held in the left hand, and a smaller

hard hammerstone with a rounded end is used to strike off small flakes or stepflakes along the edge (by holding the left fingers pressed on the underside of the tool).

4. *Fine stonehammer/anvil work:* for the production of small flakes and for finer stone working. A flat smaller anvil is used on the ground and a smaller round-edged hammerstone is used to flake off controlled flakes from the small cobble or split-cobble or flake-tool which is placed on the anvil. The method is similar to the second one which is however used with larger hammers for large tools, while the fine stonehammer method is used with smaller hammers for fine stone working. It produces a more controlled flaking than the free-holding hammerstone technique of 3). Instead of the anvil on the ground one can use also one's own thighs as an anvil.

To sharpen the edge of a big corescraper or chopper, after heavy work (like tree-cutting) has blunted the edges, a new edge is made with a big hammerstone on the tool by method 3).

The hammerstones usually show blow-marks from the work, but when the hammerstone is strong, the blow marks are small. During heavy stonehammer work, sometimes bigger chips fly off from the hammerstone at the hammering point. Quite a number of such hammerstones could be found on the site. Our own hammerstones showed the same marks and blow-chips. Perfect hammerstones were not easy to be found. Only after some experience, our eyes were trained to find the right hammerstones which should have the right handyness and shape, the right weight and especially must be extremely hard with no cleavage planes.

My first porter, Man Bahadur Magar, was the best man for doing these experiments. He intuitively knew what method to use, and what rock should be used for the required tools.

He was of immense help and without him I would not have been able to do these experiments, therefore I want to thank him at this place.

There are also a number of anvils at the site, which show markings: either as point-like markings or as lines and rills (fig. 46).

Many of the hammerstones show not only signs of breakage at the hammering point, as well as battering marks but also heavy blunting marks on the natural edges (one such hammerstone was found in the Tr. V at the depth of 0,35 m).

Other small hammerstones are perfectly rounded and show slight hammering marks for finer retouch work. It is also remarkable to notice the great amount of perfectly round, flat and oval stones. At one place, at D-5c (fig. 19) is a whole 'collection' of such stones. In B-7c we found a big stone of white quartzite with heavy blow marks of ca. 1 – 2 cm in diameter. Those must have been caused by big hammers used with both hands.

In order to understand for what purpose the tools were used, presuming it was mostly woodwork in a forest habitat, we experimented also on such work. To begin with, we felled a medium-size tree with a steep-edged heavy chopper, as we find them so plentifully at the site. It was easy and took not more than 1/2 hour to fell a treetrunk of a size of about 13 – 15 cm in diameter. But the edge of the stone tool quickly blunted and had to be resharpened.

Then we were cutting wooden pieces or branches of sizes of 3 cm in diameter with the idea of making a fence of palisades around our camp. We were cutting the branches with sharp flake edges or sharp knife edges on a flat anvil stone. This work produced elongate cutting marks on the anvil and heavy blunting marks on the cutting edges of the stone tools. Such heavily blunted edges of this particular kind is very commonly found on the cutting tools of the site, with tiny chips having broken off the edge when it hits the stone anvil through the wood.

A dull blunted appearance is seen at the edge by the wood itself. Then we pointed the wooden sticks with sharp cutting tools by holding the stick vertically on the anvil. This did not leave any marks on the stone tool and only little marks on the anvil. Then we carried out bark-scraping work on the branches with a small sharp flake edge. There were no distinguishable marks on the flake even after the work of one hour. But maybe a gloss of the edge will result after longer use. At last Man Bahadur tried bamboo stripping with a sharp small adze edge. He cut narrow thin strips from the bamboo, and then scraped and softened them by continuous soft scraping with a somehow blunter edge, (we used one of the finely retouched endscrapers). The idea was to make these strips so soft that they are pliable like cloth and can be used to make watertight vessels and baskets and mats, and even clothing. This is done even now by some forest living people in Nepal, but with modern tools. Such similar work could have been responsible to produce a gloss on the edges after long use.

All these our experiments showed us that indeed the people of this site were doing predominently woodwork with their tool kit, though naturally other work too. Strangely enough though, there are very few tools for piercing, that means very few pointed tools. And often, if a point is present, it is blunt and useless. The peoples' main requirements were tools for heavy, medium and fine woodwork, for which they used the choppers, corescrapers and the finer knives and adze-type tools respectively, as well as the scrapers.

An interesting observation is also, that most of the fine, flat bifacial cutting and scraping tools and adzes, especially those with the polish on the edges, were not found at the site itself, but in the near surroundings and also at Bawshi, which is not a rich occupation or factory site, but rather a place where people went with their tools to work.

The industry is predominently a cobble industry. Flakes for use were scarcely produced, as they did not seem to need them. Therefore, we find scarcely any cores. Most of the flakes seem to be wasteflakes, derived from the production of the heavy duty tools, and from the resharpening of the edges of these tools, as most flakes have cortex platforms. This is to be expected considering the unifacial type of flaking from cortex planes for the chopper-corescraper complex. For this reason we also find quite a number of flakes with cortex on the platform as well as on the distal end, as these are the reduction flakes during the production of the choppers and corescrapers.

Many of the flakes also show small step retouch at the edge of the dorsal faces to the cortical platform. Such flakes seem to be resharpening flakes of the step-retouched edge of the chopper and corescraper tools.

Much other, very irregular waste is found, ranging from small chips and flake-like pieces to larger angular waste with or without cortical surfaces. Such debris is certainly the result of heavy stone working for the production of heavy cobble tools. Our own experiments resulted in the production of similar debris.

Since no flake production was apparently required and no cores are found at the site, there is no systematical flake technique.

Apart from the heavy cobble tool complex there are the shallow fine adzes and knives which rarely have been made from large flakes but rather from large slices or 'orange-slice'-like pieces of cobbles. They are also part and parcel of the cobble tool complex, as these slices are derived from the flat middle parts of the cobbles while splitting them. The production of such slices is facilitated by the particular planar-bedded type of many of the quartzites from the source deposit. This particular kind of quartzite splits easily into discs. We ourselves produced them with perfectly flat under- and upper surfaces. The people knew their raw material. The straight splitting of the cobbles for the choppers and the production of 'slices' needed a quartzite with good but not too good cleavage possibilities, whereas the production of flake tools needs a quartzite which breaks conchoidally.

Conclusions

The new lithic industry from Patu in Nepal is certainly of considerable interest as it constitutes the first stone age material of one cultural complex from an occupation site in this country. Together with the earlier found sites (Corvinus 1985) there is now ample evidence that early man did occupy the foothills of the Nepal Himalayas in prehistoric times.

These localities occurred at different environmental settings. One setting of sites was connected with the intermontane basins and their lacustrine and fluviatile fillings, another such setting was connected with river terraces, either at the exit of the Himalayan streams into the plains, or on terraces within the Siwaliks or at the exit into the intermontane valleys. Patu belongs to the sites connected with river terraces in the Siwaliks before the streams emerge into the plains.

Of all the localities so far discovered in the Dang and Deokhuri valleys in western Nepal as well as at Patu in eastern Nepal, Patu was the richest site and therefore chosen for detailed study. The industry of Patu is of macrolithic character. There is no microlithic tool element in the Patu tool kit. It is an industry predominantly made up of heavy duty implements of corescrapers and choppers which were presumably meant for heavy wood work. A class of medium heavy duty tools, such as adzes, adze-like tools, scrapers and knife-like tools make up the rest of the kit and points apparently at wood- and bamboo work as well. A smaller flake-tool component is almost non-existent.

Choppers are found in many industries in Asia, in the Soan in neighbouring northwest India and in other industries in southeast Asia, from earlier palaeolithic times right into the Holocene. The choppers and corescrapers from Patu, however, do not well compare with palaeolithic choppers from elsewhere; they are well-made tools with fine unifacial step-trimming along the edges. The type of steep, welltrimmed corescrapers from Patu are also not found in the Indian Soan. But they are found, almost in the same fashion, in the Kanchanaburi Province in Thailand, for example at Say Yok (van Heekeren and Knuth 1967; S. Sangvichien and S. Pramankij, Museum of Prehistory, Siriraj Hosp., Bangkok, pers. comm.). Such steeply edged tools, unifacially retouched from the lower cortex surface, just as they are found at Patu, too, are called here provisionally mesolithic. S. Pookajorn, who found similar tools in cave sites in western Thailand, calls them lower Hoabinhian and has some dates for these tools pointing to the transition from the Pleistocene to the Holocene (S. Pookajorn, 1979). But nowhere are these steep corescraper/choppers found in association with similar flat adzes and adze-type tools as they are found at Patu.

Many different industries with chopper/chopping tools in southeast Asia, ranging from the late palaeolithic to the neolithic, are called Hoabinhian. They may have, if compared systematically, little similarity to the original Hoabinhian from Vietnam. Redefinition of the loosely conceived 'Hoabinhian' is quite urgently called for.

The industry from Patu/Nepal, though similar in some aspects to some of the 'Hoabinhian' sites in Thailand, will be regarded as a seperate industrial complex, called here the Patu-industry, (or techno-complex) which is specific for Nepal. The studies, however, are not finished and work at Patu and at the other sites in Nepal will be continued.

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