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THE 'NEOLITHIC' CULTURE OF THE PADAH-LIN CAVES†

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Introductory

Although Burma possesses a potential wealth of stone-age materials prehistoric research was done very spasmodically. Polished stone implements of different sizes are often found on the ground surface in many parts of the country but they usually fall into the hands of those collectors who believe in the superstitions attached to the so-called 'thunderbolts.' The first to draw their attention in Burma as prehistoric implements appears to be W. Theobold of the Geological Survey of India, who, in 1873, recognized certain remarkable peculiarities of the polished stone implements from Burma.[1] Among the few persons who later took interest in such stone implements was T.O. Morris who made an intensive study of the neolithic tools in Upper Burma. However, the first systematic exploration of prehistoric sites was made only in 1937-38 by the American South-East Asiatic Expedition for Early Man led by Dr. Hellmut de Terra and Prof. Hallam L. Movius.[2] They collected materials from Palaeolithic and Neolithic sites on the terraces along the middle course of the Irrawaddy and explored some caves in the Shan States. As a result of the study of those materials the palaeolithic culture of the region was properly recognized and was named the Anyathian culture. The caves in the Shan States, however, were superficially investigated and on finding traces of neolithic occupation only the expedition did not excavate in them as their object was to study the early, i.e. palaeolithic man in Burma.

Appreciating the need for systematic exploration and excavation the Archaeological Department has chalked out a programme for the exploration of river terraces and open sites. However, the unveiling of ancient city sites comes to the forefront and still claims the all-out efforts of the few available hands on its staff. Fortunately, the first prehistoric expedition could be launched at the instigation and support of the Central Organization Committee Headquarters of the Burma Socialist Programme Party. An expedition team composed of research workers drawn from the Archaeological Department, the Burma Historical Commission and the departments of Anthropology, Geology and Zoology of the Rangoon Arts and Science University together with representatives from the Party headquarters was organized by the Party to explore the Padah-lin caves and it was able to set upon its task on the 9th January 1969.

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2 U.P.—I 84—1,000+50+31—28-5-70.

The existence of what look like prehistoric paintings in one of the caves of Padah-lin was first discovered by a geologist, U Khin Maung Kyaw, sometime in 1960. Recently it was brought to the notice of the Party headquarters which felt the need to substantiate the fact for incorporation in the basic political history of Burma being compiled by the Party. A preliminary survey of the caves was conducted by the Party headquarters before the main team commenced work. The Archaeological Department took the responsibility to organize excavation in the caves which is the main function of the expedition.

The Caves

The locality in which the caves are situated is a submontane region west of the Shan Plateau falling within the Panlaung Reserved Forest area classified as a fairly dense jungle with bamboo. They lie close to the north of the packtrack from Nyaunggyat to Yebok village in Ywangan or Yengan Township in Taunggyi district, Southern Shan State, the distance from Nyaunggyat (Latitude 21° 6½′ N; Longitude 96° 18′ E) being 4 miles and from Yebok 1 mile.

To the east of Yebok rises the Nwalabo range with peaks over 4500 feet high. The caves are in the spur of a foothill[5] 1000 feet above sea level. The Yebok stream, a tributary of the Panlaung river passes through Yebok in its southward course and meets the river four miles away. The Panlaung which rises further south turns a westerly direction for about two miles from the confluence and meanders northward. The rocky terrain between Nyaunggyat and Yebok is uninhabited. It is only along the Panlaung river that small villages are found, e.g. Taungbon, Nyaunggyat, Neyaungga, Kyidaing and Maunggwe, reckoning from south to north.

The western margin of the Shan Plateau in which the caves lie is, generally speaking, a broad belt of limestone which is a prominent member of the rocks characterizing the Shan State. This 'plateau limestone' varies from an almost pure calcite to a true dolomite.

The two caves facing south are about 200 yards apart. The western one is very large, containing nine main caverns connected by narrow passages all in a row of north to south axis. The entire length is about 800 feet. With numerous bays, alcoves and tunnels the interior of the whole cave would be pitch dark but for the sink holes or apertures formed in the roofs of four caverns through which sunlight and fresh air penetrate. True to the nature of limestone caves, percolating water drips down from the roof and the process of forming white, glistening stalactites still coutinues here. Stalagmites also keep soaring higher and higher, sometimes almost meeting the hanging stalactites. The eastern cave, on the other hand, is much smaller. It is wide open to daylight and fresh air, and is only thirty to forty feet deep horizontally. Here the calcium carbonate drips down along the walls only. Being a rock shelter rather than a deep cave, this cavern which is numbered 1 by our team, is an ideal place for the prehistoric people to live in. Usually they do not dwell in the deep, dark and damp caves like the huge western cave, numbered 2.

After exploring the two caves the team decided to conduct excavations mainly in the smaller eastern cave, No. 1, and dig test pits near the mouth of the western cave. It is in the former cave that mural paintings exist. This rock shelter is naturally divided into two sectors by the forward projection of the central back wall. A casual visitor would not find the paintings easily for they lie from ten to twelve feet above the floor level and have deteriorated through long exposure to weather. But careful observation would reveal about a dozen figures in red ochre of two human hands, a fish, bulls, bisons, a deer and probably the hind of an elephant. On the high ceiling is seen the figure of the sun between two converging crooked lines probably depicting the scene of the midday sun appearing between the brow of the cave and the far stretched ridge of the mountain range as viewed by the artist from within the cave.

The Excavation

A trench 20 feet by 6 feet was laid perpendicular to the drip line at the mouth of the rock shelter in the eastern part which is numbered 1A. The excavation revealed a homogeneous deposit of cave earth, mainly clayey or powdery matter washed into the cave by infiltrating water and rubble and breccia due to roof falls. As the ground slopes gradually eastward near the mouth of the cave the southern portion of the trench contains bigger particles of stone and compact earth. The soil in the northern portion of the trench is very loose in consistency and in the section looking north the following layers were observed:

Layer 1, 5½ inches thick; brown, fine grain, slightly calcareous soil.

Layer 2, from 5½ in. to 1 ft. 9 in. from surface; brown and light grey, fine grain, highly calcareous soil. In the middle of this layer is a horizontal band of residual lime 6½ in. thick.

Layer 3, 1 ft. 9½ in. to 2 ft. 6½ in. from surface; medium grey, very fine grain, shaly soil or clay.

Layer 4, 2 ft. 6½ in. to 3 ft. 4½ in. from surface; brown fine grain, calcareous soil.

Layer 5, 3 ft. 4½ in. from surface to 4 ft. and below; natural soil, yellowish brown, compact, gritty and very calcareous.

It was observed that the deposit layers in which stone tools occur are not disturbed by later intruders or modern treasure hunters. The rest of the cave floor was further divided into four sectors leaving 2 ft.—wide baulks between one another. (These baulks were left unexcavated owing to limited time). In the northern part of the cave the natural soil was reached at 4 feet from the surface. Here the soil is so loose and powdery that it is impossible to maintain clear cut sections and even levels from stage to stage. In the excavated areas as well as in the sections of earth deposit below fairly big boulders fallen from the roof no sterile layers were observed and all types of tools occurred throughout the levels, thus indicating the homogeneous character of the deposit.

Excavation in the western sector of this rock shelter (cave 1B) was confined to the northern portion as the presence of a small stupa with a wide square plinth prevents digging in the southern part. The stupa was erected just a few years ago and it is learnt that the stones on the surface of the cave were utilized in its construction. However, the disturbance of soil does not appear to have reached any considerable depth especially in the two alcoves where the roof is very low and the long tunnels with a little more than crouching space. The excavated earth was sieved properly before disposal, thus retrieving numerous fragmentary bones and pieces of charcoal from all deposit layers.

In the large western cave, No. 2, test pitting in the interior revealed no indication of human habitation. Digging in an alcove near the cave mouth yielded some tools and bone fragments, while surface collection was made of a few others outside the cave where rubble cleared from the entrance was accumulated.

The Tools

The excavation yielded over 1600 stone artifacts apart from unworked nodules and fragments. Of these only 422 were sorted out and brought to headquarters for detailed examination. Many others including entire and split pebbles and very poor specimens were left buried near the camp.

The tools are largely made on pebbles. They are crude and without marks of secondary flaking or retouching, resembling the palaeolithic tools. Most of them may be regarded as unfinished implements. Those made on pebbles generally retain the cortex or natural surface on one or both sides or on the lateral sides. These may be classified as unifacial choppers, bifacial chopping tools, hand adzes and scrapers. Flakes struck from pebbles or cores with prepared striking platforms are also found.

Though the crudely flaked chopper-chopping tools are predominant there is a tendency towards producing comparatively fine tools. Four specimens of bifacially flaked cores of medium size with double ends, pointed or rounded, are among the finer implements. When ground down these would make good hand-axes. The technique of grinding had begun to be employed in this industry as evidenced by the occurrence of an edge ground flake adze and two small core implements which are almost completely ground. One of the latter has a sharp cutting edge. A small flake scraper also has a ground bevelled edge. In a few other specimens of small tools patches of ground surface are observed.

Some of the flake scrapers bear flat striking platforms and a few of them have ripple marks and bulbs of percussion. There is even a single specimen of a thin small scraper struck from a "tortoise core", i. e. one flaked in the Levalloisian technique so that the flake scars converge centrally towards an end of the core.

A remarkable implement recovered from the eastern part of the rock shelter, 1A, is a crude or unfinished shouldered adze. As it is not ground the vertically

notched lines directly below the tang are clearly visible on the upper surface. The tool has a crooked body so that the cutting edge, splayed on one side, is not at right angles to the long axis.

Among the tools are many pebbles pitted in the centre on both sides and a number of complete as well as broken ringstones. Probably the pitted pebbles are unfinished ringstones because the perforations they bore indicate the different stages in their manufacture. The perforations are of hour-glass shape having flaring ends in cross-sections.

A large percentage of the pebbles had probably served as hammerstones and anvils while others were collected as raw materials for making tools. A few long pebbles seem to have been used as polishers. A collection of small round pebbles probably utilized as sling balls was obtained from the test pit in cave 2. Flat grinding stones with smooth surfaces witnessing their use were also excavated. In all probability they were also used in grinding the red ochre as surely as they served as whet stones to sharpen the tools.

A wide range of rock types is found among the tools but limestone is predominant. Out of 276 tools from cave 1A limestone accounts for 34%, sandstone 26%, quartzite 13%, siltstone 7%, basic igneous rocks 8%, micro-granite 5% and granite 1.4%. There are very small percentages of milky quartz, calcite and intermediate igneous rocks. One specimen each of agate and fossil wood was also found, but the latter is an unworked piece. An abundant supply of raw materials in the form of pebbles is available in the streams flowing into the Yebok chaung and the Panlaung river as well as in the shallows of the river. Yet materials not available locally seem to have been transported from far off places.

The occurrence of a large number of pebbles, innumerable flakes, crude chopper-chopping tools and scrapers, partly ground tools, a crude shouldered adze, ringstones and pebbles in different stages of perforation indicates that the rock shelter was not simply a habitation site but a tool-making workshop.

Other Finds

The siftings contained hundreds of bone fragments and molar and canine teeth of mammalian animals; a large quantity of charcoal pieces; shells of land molluscs; a skull of probably a deer; a few fragments of tortoise shells; pieces of soft haematite (red ochre); and a few cord-impressed sherds. The bulk of the animal bones and a few human bones are being identified and charcoal samples have been sent abroad for C14 analysis. A piece of red ochre with a smooth surface indicates that it was ground down to obtain pigment powder which, in all probability, was used in painting the figures on the rock wall. The occurrence of potsherds characterizes the neolithic pattern of culture.

The Rock Paintings

The mural paintings are seen in the eastern cave or rock shelter, No. 1. They are on the middle section of the wall which divides the rock shelter into

two sectors by its forward projection. They are above the ordinary reach of human hands. Some of them are in outline and some are flat wash or silhouette paintings in red ochre. About a dozen of the figures are still to be seen distinctly but originally there seem to have been painted some more which are now obscured by weathering and the deposition of calcium carbonate on the rugged wall. The first two figures on the west are human hands, one with concentric circles in the open palm and the other with what looks like a human skull. On a smooth spot of the ceiling is the drawing of the sun between two converging irregular lines. It is most likely that the arti t had captured the scenery viewed from within the cave, i.e. the sun appearing between the brow of the cave and the distant ridge of mountain range. The rest are animal figures–bulls, bisons, a deer, hinds of elephants, a huge fish. Each of the two bulls is followed at the heels by a calf. They are depicted in the most natural and vivid manner, full of life and energy.

Naturally, one would feel sceptical about the antiquity of these monochrome paintings since traces of modern intrusion are visible especially in the western cave where enthralled visitors had indelibly subscribed their names on the walls. However, such modern inscriptions in yellow or white are not seen above the normal reach of man. The choice of subject, the style of painting and the manner of superposition of the drawings strikingly conform to prehistoric art in the caves of Southern France and Northern Spain where depiction of animals is the main theme and representation of human hands is also made. The deposits of stalactite have partially covered some of the figures while they have mutilated many others. Considering the slow formation and the lesser quantity of calcium carbonate in the rock shelter compared to that of the western cave the deposits overlying the paintings could not have taken less than a century or so to accumulate to such a degree. Above all we have the partially ground piece of red ochre and many unground pieces which had obviously served as pigment materials. Since these are coeval with the stone tools as evidenced by the stratigraphy the paintings may safely be assumed to pertain to the neolithic culture of the cave dwellers.

Chronology

Owing to the homogenous cultural deposit of the excavated rock shelter the palaeolithic tool types are considered to be coeval with the other tools, however small in quantity, characterizing the neolithic technique. Therefore, the older culture is found to have persisted till the neolithic period. But the paucity of partially ground tools is indicative of the transition stage to the new technique. This stage is to be regarded as early neolithic and has a parallel in the Hoabinhian and Bacsonian cultures of Indo-China. The time span of the neolithic period in Burma has yet to be determined after further exploration of such caves and correlation with the polished stone-tool industry which prevailed in other parts of the country. The radio-carbon analysis will possibly provide an absolute date for the Padah-lin culture.

General Observations

The results of the excavation may be recapitulated as follows:

(i) An early neolithic culture comparable to the Hoabinhian and Bacsonian cultures of Indo-China is brought to light for the first time in Burma;

(ii) The tool-making industry of the caves sheds light on the transition from the flaking and chipping technique to the grinding and polishing method:

(iii) The discovery of evidences to confirm the rock paintings as neolithic.

In his valuable study on the Prehistoric Stone Implements of Burma, T. O. Morris remarked that none of the Burma chipped stone implements could be compared at all closely with the palaeolithic survivals from the "Bacsonian" of Indo-China and Malaya.[4] Now that a tool-making workshop which had produced a considerable quantity of crude implements with palaeolithic affinities has been discovered the earlier finding recorded by Morris can be appropriately revised. Implements which are bifacially flaked all over but ground at edge only are classed as "protoneoliths". Such tools also occur at Padah-lin so that Morris's statement regarding the absence of protoneoliths in Burma is now superseded.

The perforated pebbles and crudely flaked shouldered adze with a perfect tang clearly exhibit the successive stages of manufacturing the tools. Though highly finished shouldered adzes pertain to late neolithic the crude specimen from the present excavation cannot definitely be placed in the same category, as it belongs to the homogeneous industry of an earlier stage. T.O. Morris conceived that the ends of linear notches remaining at the intersection of shoulders and tang are due to the use of sharp-edged ringstones mounted on a lathe and that it would be extremely difficult and laborious to produce the perfect angular form without some such rotary abrasive assistance.[5] A.H. Dani, on the other hand, rejected the aforesaid theory and emphatically contended that in order to get right angles at the corners and perfectly straight sides, one must use a sawing technique, using at least a wire and an abrasive.[6] We now have a specimen belonging to the early neolithic stage when sharp-edged ringstones were not produced and metal wire was definitely unknown. Though it is hard to make out the exact technique of fashioning such an implement it would have been possible to employ only stone tools in making shouldered adzes when perforations could be bored or drilled to produce pebble ringstones without any metallic tool.

A.H. Dani is also of the opinion that the completely ground tools have nothing in common with the chipped class and asserts that "these two classes of tools belong to different traditions: the chipped tools continuing the local tradition from the palaeolithic period, and the completely ground tools appearing suddenly in this region from outside".[7] Since, in the Padah-lin industry, edge-ground tools as well as completely ground tools are definitely associated with

chipped implements we can observe the gradual stages in evolving the techniques of manufacture. It is therefore apparent that the finished ground tools are not introduced suddenly from outside.

Though the excavation is of limited extent it has made an important advance in prehistoric research in Burma, especially regarding the cave culture. In the light of the present discoveries it is now possible to modify such ambiguous statements in this regard as the following conclusion drawn by M.R. Sanhi:

"No stone implements or other handicraft of man has so far been discovered in the Shan States region of Upper Burma. However, remains of edible shells and what appears to be fragments of Neolithic pottery occur in certain caves as, for example, those near Mong Pawn, Yawnghwe and Tongta. This has been taken as evidence that man existed at least on the Southern Shan plateau during Neolithic times and he may have occupied the region even earlier, during the Mesolithic. But the complete absence of stone implements makes any positive assertion on this point impossible".[6]

As the predominant chopper-chopping tools are essentially wood-cutting implements it may be inferred that they were used by wood-working people. That the industry of Padah-lin is neolithic in age is attested not only by the tool types but also the associated fauna remains. A large quantity of bones broken into fragments probably for the extraction of marrow still await detailed identification. As far as they are examined they are found to be the remains of wild varieties of existing local species From the available materials it is hard to establish definitely whether domestication of animals and cultivation of plants were practised. The paucity of cultivable tracts owing to the rocky terrain might have impeded agriculture, but indirect evidences in the occurrence of crude sherds and ringstones which were probably used as digging weights suggest that food-production was in vogue to a certain extent. Thus we can observe the beginning of the change from the food-collecting economy towards a food-producing economy concurrently with the transition from the use of crude tools to finer tools suited to the mode of occupation.

At the present stage of our research it is not possible to establish the particular race or stock of man who was responsible for the promotion of this culture. It is hoped that further excavations would reveal more aspects of the neolithic culture of Burma as a whole.

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DESCRIPTION OF ILLUSTRATED SPECIMENS

PEBBLE HAMMERSTONES

Fig. 5; Pl. IV & V

No. 1. Oval, roughly circular section; granite, medium grained, highly weathered; light colour index; 15.2 × 10.7 cm (1A/269).*

2. Oval, roughly circular; microgranite, light colour index; 10.6 × 7.8 cm (1A/76).

3. Roughly cylindrical; microgranite, medium grained, highly weathered; light colour index; 13.1 × 8.1 cm (1B/41).

4. Discoid; sandstone, medium grained, reddish brown; 12.7 × 10.4 cm (1A/259).

5. Round; siltstone, fine grained; purplish red; 9.0 × 8.6 cm (1A/119).

6. Oval, roughly circular; granite, fine grained; light colour index, 11.1 × 8.7 cm (1B/56).

7. Cylindrical, rounded ends; micaceous sandstone, highly weathered; very light brown; 9.8 × 7.3 cm (1A/114).

8. Ovoid, semi-circular; microgranite, medium grained; light colour index, 9.3 × 4.4 cm (1B/10).

9. Semi-circular, oval section; microgranite, medium grained, highly weathered; light colour index, 10.2 × 7.2 cm (1A/51).

10. Cylindrical with one flat and one rounded end; sandstone, calcarious, medium grained; greenish; 10.0 × 8.5 cm (1A/4).

11. Oval; microgranite, medium grained, highly weathered; medium colour index; 11.3 × 7.5 cm (1B/24).

12. Oval; microgranite, coarse grained; light colour index; 5.8 × 3.0 cm (1A/237).

13. Round; quartzite, medium grained, milky white; 4.1 × 3.9 cm (1A/150).

14. Egg-shaped; microgranite, fine grained; very light colour; 4.3 × 3.8 cm (1A/86).

15. Egg-shaped; sandstone, medium grained; brownish; 5.9 × 4.7 cm (1A/149).

16. Spheroid; siltstone; fine grained; brick red; 5.7 × 5.8 cm (1B/74).

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* Cave No and accession No. in brackets.

3 U.P.—I. 84—1,000+50+31—28-5-70.

SPLIT PEBBLES

Fig 6; Pl; VI

No. 17. Oval, truncated at both ends, probably prepared as striking platforms; both end pieces found together with the main pebble; calcarious sandstone, medium grained; light brown; 14.0 × 9.3 cm (1A/256).

18. Ovoid, vertically split half; siltstone, fine grained; reddish brown; 8.8 × 6.2 cm (1A/116).

19. Ovoid, vertically split half; sandstone; coarse grained; reddish brown; 8.1 × 6.8 cm (1A/55).

20. Oval, vertically segmented on two sides, core and only one segment recovered; siltstone, fine grained; brownish, 11.3 × 8.0 cm (1A/110).

21. Oval, vertically split; micaceous sandstone, medium grained; very light brown; 10.7 × 6.8 cm (1A/90).

22. Rectanguloid, vertically split and flaked on one side: sandstone, coarse coarse grained; brownish grey; 10.7 × 6.5 cm (1A/103).

23. Spheroid, split half; sandstone, medium grained; purplish brown; 9.2 × 8.4 cm (1A/143).

24. Pointed oval, split half; sandstone, coarse grained; reddish brown; 7.9 × 5.8 cm (1A/46).

25. Spheroid, split half; limestone with calcite veins; dark grey; 8.8 × 7.2 cm (1A/87).

26. Rectanguloid with rounded ends, both halves recovered; sandstone, medium grained; bluish; 10.7 × 8.1 cm (1A/260).

27. Discoid, oval section, segmented; siltstone, fine grained; brownish, 10.9 × 8.1 cm (1A/77).

28. Discoid, segmented; sandstone, fine grained; reddish, 12.8 × 10.0 cm (2/47).

PEBBLE CHOPPERS (UNIFACIALLY FLAKED AT ONE END)

Fig. 7; Pl. VII

29. Sandstone, coarse grained; dark colour index; 10.4 × 8.2 cm (2/15).

30. Microgranite, medium grained; light colour index, 11.3 × 8.1 cm (1B/25).

31. Siltstone, fine grained; reddish brown, 9.8 × 7.3 cm (1A/115).

32. Sandstone, coarse grained, brown, 9.3 × 5.9 cm (1A/72).

33. Siltstone, very fine grained; reddish brown, 8.5 × 7.0 (1A/124).

34. Sandstone, 7.7 × 6.8 cm (1A/14).

35. Sandstone, coarse grained, brownish, 7.0 × 6.0 cm (1A/69).

No. 36. Sandstone, coarse grained, very light brown, 7.5 × 6.2 cm (1A/82).

37. Sandstone, medium grained; pinkish brown, 8.3 × 8.6 cm (B/54A).

38. Microgranite, fine grained; light colour index, 7.7 × 7.3 cm (1A/27).

39. Limestone, fine grained; dark grey, 6.0 × 6.8 cm (1A/89).

40. Basic igneous rock, medium grained; dark, 8.3 × 6.8 cm (1A/91).

41. Siltstone, medium grained; dark, 11.8 × 7.1 cm (2/46).

42. Siltstone, fine grained; dark brown, 11.0 × 6.4 cm (2/2).

43. Quartzite, medium grained; reddish, 6.2 × 6.4 cm (1A/144).

Choppers (unifacially flaked)

Fig. 8; Pl. VIII

44. Long oval, double ended chopper, quartzitic sandstone, very fine grained; light grey, 17.2 × 6.6 cm (1A/254).

45. Chopper with rounded working edge and pointed butt, showing original surface. The dorsal (upper) face is formed by the original rolled surface, except for a few slight scars. Quartzite, fine grained; greenish grey, 11.3 × 6.2 cm (1B/1).

46. Long oval with one side indented; the dorsal face is almost flat. Quartzite, fine grained, light bluish-green, 11.6 × 4.1 cm (1B/52).

47. Massive rectanguloid with round working edge; basic igneous rock, fine grained, dark colour index, 13.3 × 8.1 cm (1A/192).

48. Oval shape with rectanguloid profile; siltstone, very fine grained, 7.9 × 5.0 cm (1B/29).

49. Discoid; quartzite, very fine grained; bluish, 9.3 × 8.3 cm (1A/193).

50. Pebble chopper, long oval, flat dorsal surface; basic igneous rock, fine grained, dark colour index, 11.1 × 5.6 cm (1A/121).

51. Pebble chopper, rectanguloid, upper end of dorsal side also flaked, highly dolomatised limestone, dark grey; fine grained, 11.7 × 7.0 cm (1A/112).

Chopping Tools (bifacially flaked)

Fig. 9; Pl. IV

52. Pointed oval, Dacite, acid igneous rock with fused glasses of quartz and feldspar, medium grey; medium grained; 11.0 × 8.1 cm (1B/83).

53. Rectanguloid with rounded edge. Rhyolite, greenish, fine grained; 8.5 × 4.5 cm (1B/95).

54. Rectanguloid with rounded edge, basic igneous rock, light colour index, fine grained, 10.4 × 6.2 cm (1B/44).

No. 55. Rectanguloid with rounded ends; Rhyolite with fused glasses of quartz and feldspar, extrusive volcanic rock, greenish, fine grained, 10.5 × 7.0 cm (1B/85).

56. Trianguloid, Rhyolite, greenish, fine grained, 9.6 × 6.8 cm (1B/109).

57. Roughly oval, quartzite, light grey, medium grained, 8.5 × 5.4 cm (1B/49).

58. Oval, basic igneous rock, dark colour index, very fine grained 5.2 × 3.2 cm (B/6).

59. Trianguloid, carbonaceous limestsone, 10.5 × 8.1 cm (1B/104).

Choppers and chopping tools (Core tools)

Fig. 10; Pl. X

60. Chopper, pointed, with flat dorsal surface, micaceous sandstone, greenish, medium grained, 11.1 × 5.2 cm (1A/227).

61. Chopping tool partially chipped on dorsal side, fine-grained, 8.4 × 4.3 cm (1B/98).

62. Chopping tool with flat butt and pointed end, 8.1 × 6.1 cm (1B/84).

63. Chopping tool, trianguloid, elongated; fine grained, quartzite, bluish, 8.9 × 4.3 cm (1A/251).

64. Trianguloid chopper with pointed butt and rounded edge, slight scars on dorsal side, fine grained, quartzite, dark blue, 7.9 × 4.7 cm (1A/171).

65. Chopping tool similar to specimen No. 62, flaked at end only on dorsal side, basic igneous rock, dark colour index, fine grained, 6.7 × 4.8 cm (1B/42).

66. Rectanguloid chopper with straight cutting edge, sandstone, bluish green, medium grained, 6.0×5.0 cm (1B/5).

Hand Axes

Fig 11; Pl. XI

67. Roughly oval, elongated, with slightly pointed working end, quartzite, blue, very fine grained, 13.4×5.9 cm (1A/131).

68. Long, pointed hand axe, quartzite, greenish grey, fine grained, 10.5×4.3 cm (1B/33).

69. Rectanguloid with rounded working edge, 11.4×6.0 cm (1B/93).

70. Long, pointed hand axe, quartzite, dark green, very fine grained, 11.8×5.1 cm (1B/2).

71. Trianguloid with rounded working edge, rhyodacite, extrusive igneous rock, fine grained, with coloured glasses, reddish brown, 12.2×7.5 cm (1A/2).

72. Triangular, with slightly splayed working end, limestone, dark grey, 9.7× 7.5 cm (1A/191).

Scrapers

Fig. 12; Pl. XII

No. 73. Flake scraper with pointed edge, basic igneous rock, dark colour index, very fine grained, 4.7×4.0 cm (1B/73).

74. Flake scraper with convex edge, very fine grained, quartzite, bluish grey, 5.2×3.1 cm (1B/7).

75. Flake scraper, trianguloid, quartzite, bluish grey, very fine grained, 6 2×4.3 cm (1A/274).

76. Flake scraper, rectanguloid, limestone, light grey, 6.5×5.0 cm (1A/36).

77. Flake scraper, convex edge, dolomite, light grey, very fine grained, 5.3× 3.5 cm (1B/36).

78. Large scraper (or small chopper) made on an oval pebble, with original surface on butt and lateral sides, siltstone, purplish brown, 7.5×5.3 cm (1A/22).

79. Scraper similar to No.78, quartzite, greenish blue, fine grained, 5.1×5.1 cm (1A/197).

80. Scraper similar to No. 78, quartzite, reddish, fine grained, 5.2×5.0 cm (1A/207).

81. Large scraper (or small chopping tool) similar to No. 78, igneous rock, dark colour index, very fine grained, 7.4×5.7 cm (1B/62).

Fig. 13; Pl. XIII

82. Flake scraper, triangular, with striking platform and convex edge, quartzite, bluish grey, very fine grained, 6.0×5.4 cm (1A/244).

83. Flake scraper, rectanguloid, with striking platform, obliquely rounded edge, basic igneous rock, 5.4×5.0 cm (1A/45).

84. Hollow scraper, crescent shaped, concave side also serves as working edge, siltstone, greenish blue, very fine grained, 7.5×6.3 cm (1B/17).

85. Scraper on pebble flake, round butt and convex edge, sandstone, reddish brown, medium grained, 4.7×3.9 cm (1A/233).

86. Pebble scraper with truncated butt and pointed edge, quartzite. dark green, medium grained, 5.9×4.7 cm (1B/20).

87. Rectangular scraper with slightly oblique edge, fossil wood with layers of milky white, brown and light grey minerals, 5.0×4.2 cm (1B/31).

88. Scraper with irregular edge, (chert ?), 6.2×5.2 cm (1A/249).

89. U-shaped scraper with striking platform, limestone, light grey, fine grained, 5.2×4.1 cm (1A/180).

Fig. 14; Pl. XIV

No. 90. U-shaped scraper, flaked by Levallois technique, with bulbar scar on ventra side, quartzite, greenish blue, fine grained, 5.0×4.0 cm (1A/234).

91. Trianguloid scraper-cum-point, quartzite, dark grey, very fine grained, (polished?), 4.0×4.3 cm (1A/229).

92. U-shaped scraper, basic igneous rock, dark colour index, porphyritic texture, fine grained, 5.7×4.1 cm (1A/232).

93. Flake scraper with straight ground edge, quartzite with mica flakes, bluish grey, medium grained, 3.7×2.5 cm (1A/273).

94. Scraper with convex edge, tapering butt and striking platform, sandstone, greyish, 5.5×6.2 cm (1A/7).

95. Scraper flaked on pebble, quartzite, dark grey, very fine grained, 5.2×3.0 cm (1B/37).

96. Side and end scraper with striking platform, quartzite, bluish grey, very fine grained, 6.1×5.6 cm (1A/276).

97. Scraper flaked on pebble, micaceous, quartzite, greenish blue, fine grained, 5.8×3.0 cm (1A/235).

98. Triangular scraper, limestone, greyish, medium grained, 5.0×5.0 cm (1A/8).

SCRAPERS AND ADZE

Fig. 15; Pl. XV

99. Large scraper on flake (or small hand axe) with ground edge; the dorsal side is slightly fluted; basic igneous rock (basalt?) fine grained, dark colour index, 6.8×5.0 cm (1B/71).

100. Small scraper, partly ground on obverse side and almost completely ground on the reverse, dolomite (?), bluish grey, very fine grained, 5.0×4.3 cm (1B/30).

101. Edge-ground quadranguloid scraper, quartzite sandstone, dark green, medium grained, 4.1×3.8 cm (1A/275).

102. Edge-ground scraper, rectanguloid, siltstone, purplish red, very fine grained, 4.5×2.7 cm (1B/13).

103. Scraper or tiny celt almost completely polished with sharp convex working edge, quartzite, very fine grained, 4.7×4.5 cm (2/27).

104. Cylindrical pebble scraper with slightly polished body, fine grained, 4.4×2.0 cm (2/48),

105. Shouldered adze; the tang is prominent but projects obliquely from the body, limestone, with tiny veins of calcite, 13.9×7.2 cm (1A/39).

PITTED AND PERFORATED PEBBLES

Fig. 16; Pl. XVI

No. 106. Flattish oval pebble, centrally pitted on both sides, (unfinished ringstone?), weathered sandstone, medium grained, light brown, 8.0×5.7 cm (1A/258).

107. Circular pebble, oval section, centrally pitted on both sides (unfinished ringstone?), medium grained, 6.2×6.0 cm (1A/24).

108. Oval pebble similar to No. 107, siltstone, reddish brown, fine grained, 8.1×7.5 cm (1A/255).

109. Oval pebble pitted centrally on both sides, broken half, siltstone, reddish, medium grained, 9.8×6.5 cm (1B/65).

110. Elliptical pebble with perforation in hour-glass shape; siltstone, pinkish, medium grained, 7.1×5.3 cm (1B/70).

111. Oval pebble with hour-glass perforation, broken half; siltstone, reddish brown, very fine grained, 8.0×2.8 cm (1A/248).

112. Elliptical pebble with hour-glass perforation; broken half; siltstone; fine grained, highly weathered, reddish, 5.5×4.4 cm (1A/201).

113. Oval pebble with hour-glass perforation, broken into two halves, (mace-head or weight for digging stick?), sandstone, coarse grained, 13.5×9.5 cm (1A/13 & 243).

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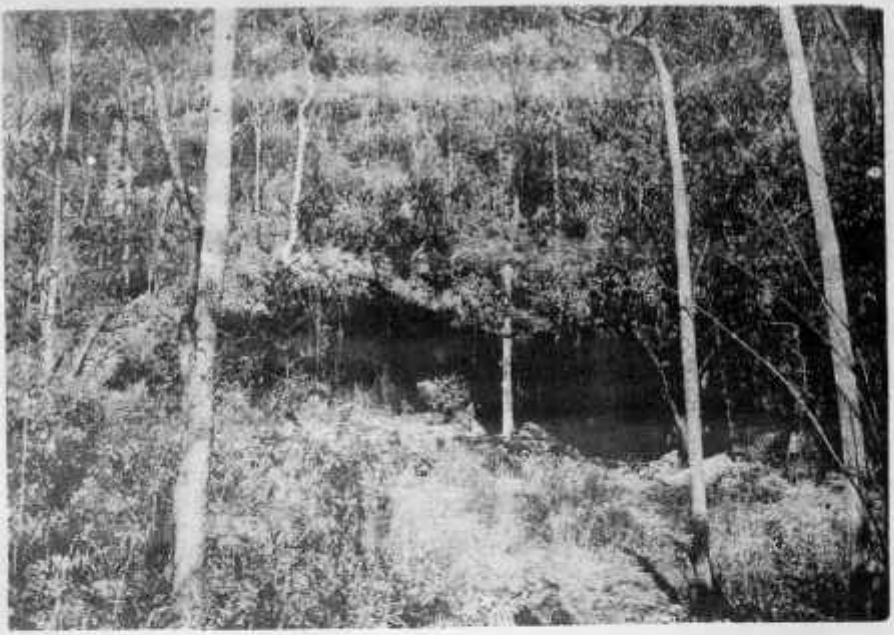
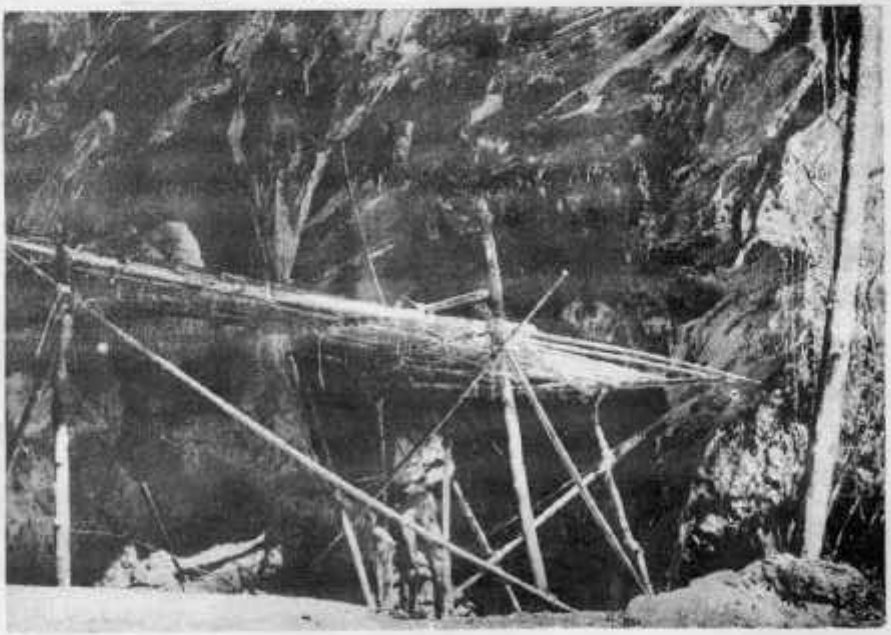


Pl. I. View of Padah-lin Cave 1.



Pl. II. Interior view of Cave 1: man on scaffolding copies the paintings on the wall.

Pl. III. Interior view of Padah-lin Cave 2.

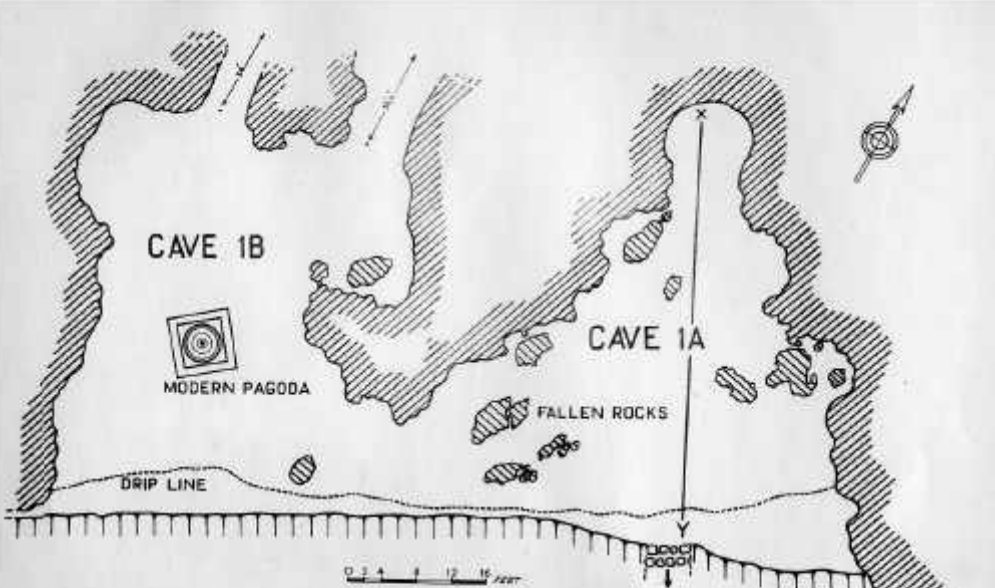


Fig. 2. Ground plan of Cave 1.

Fig. 3. Section across Cave 1A (from X to Y on plan), looking east.

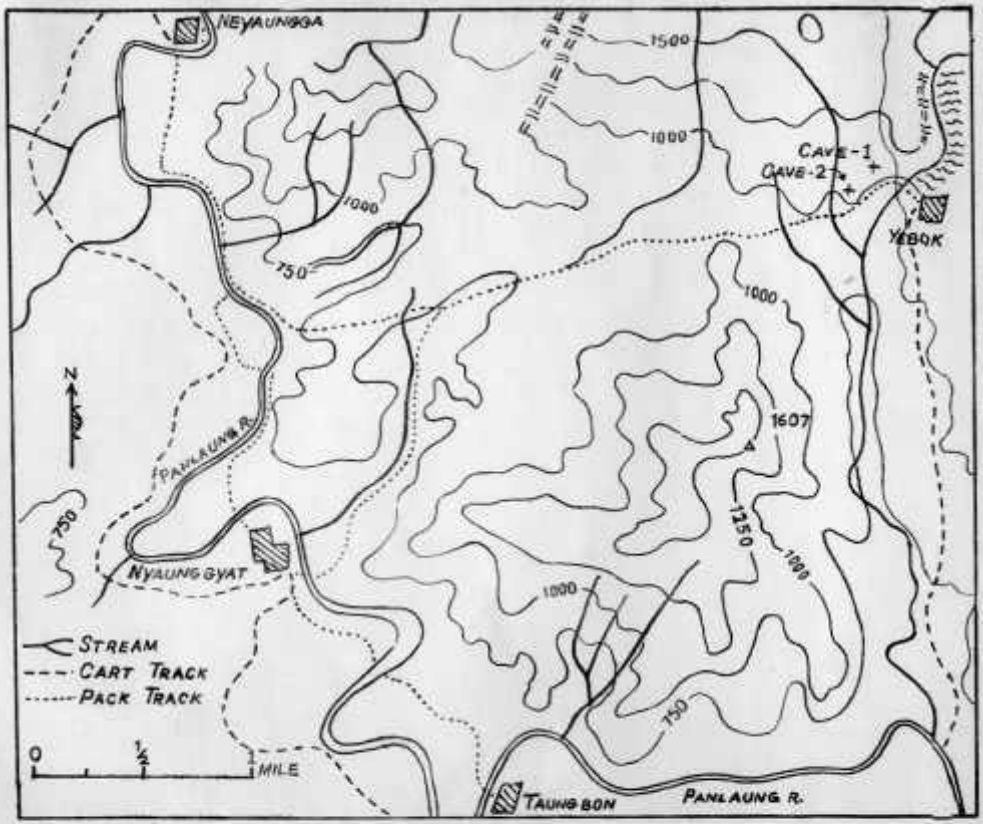


Fig. 1. Location map of Padah-lin caves in Ywangan Township, Taunggyi District.

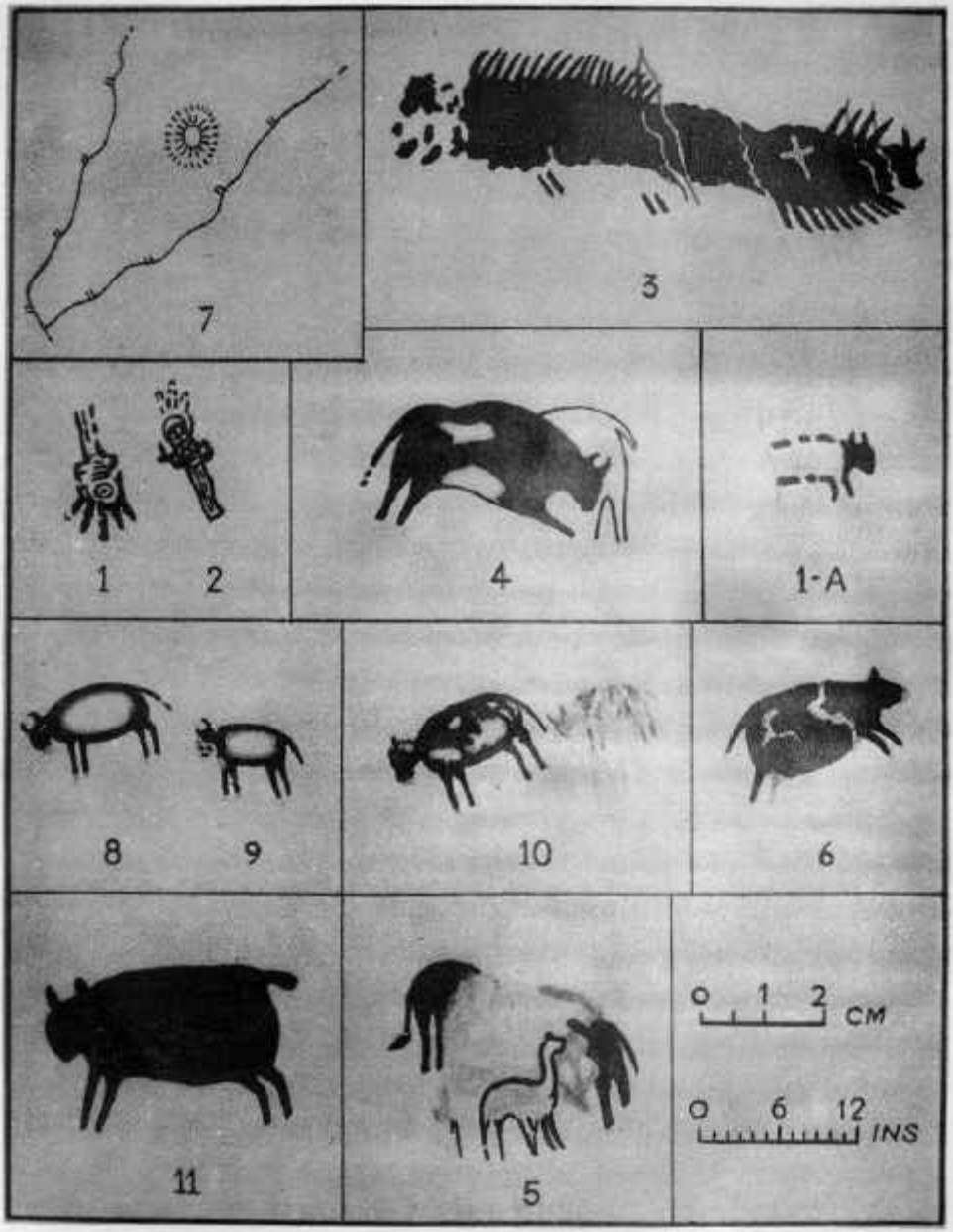


Fig. 4. Reproduction of paintings in Cave 1.

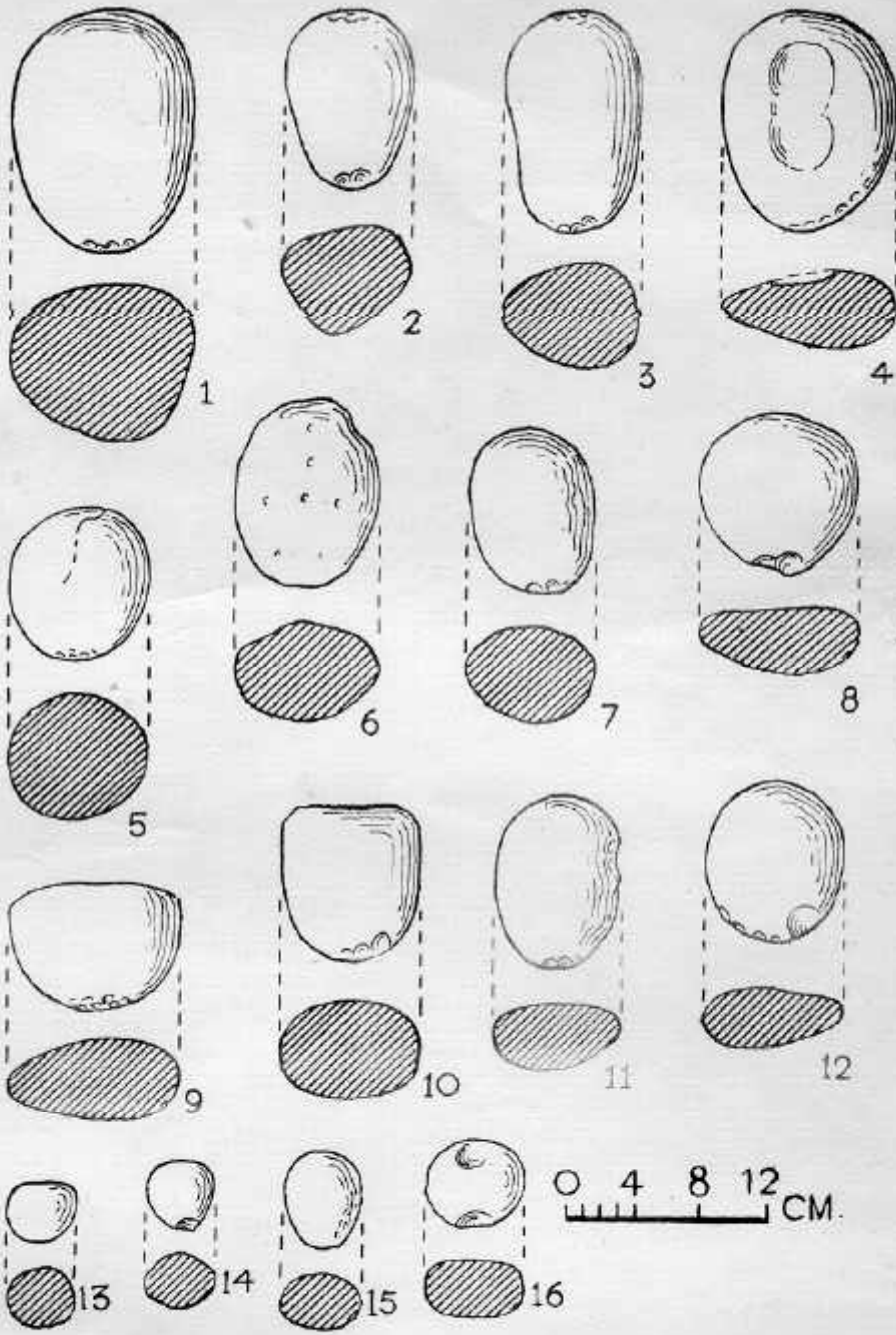
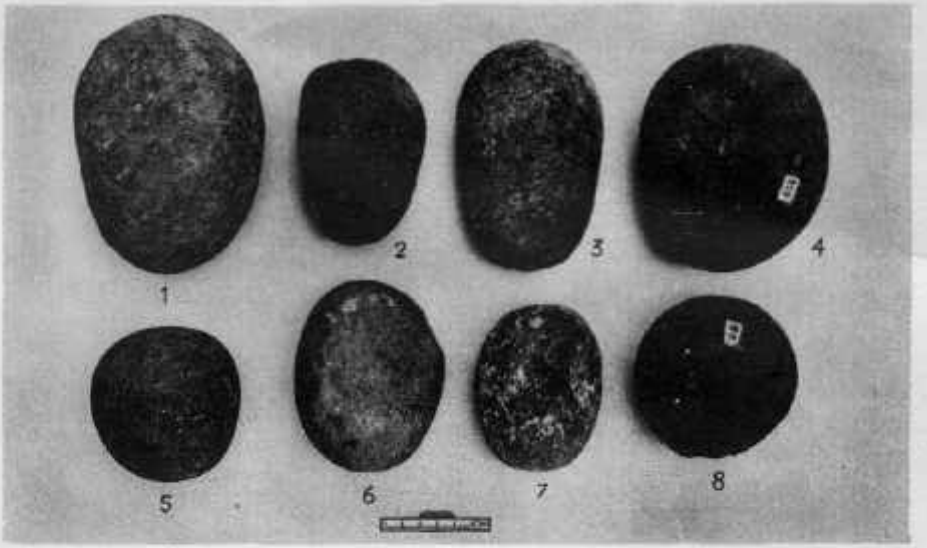
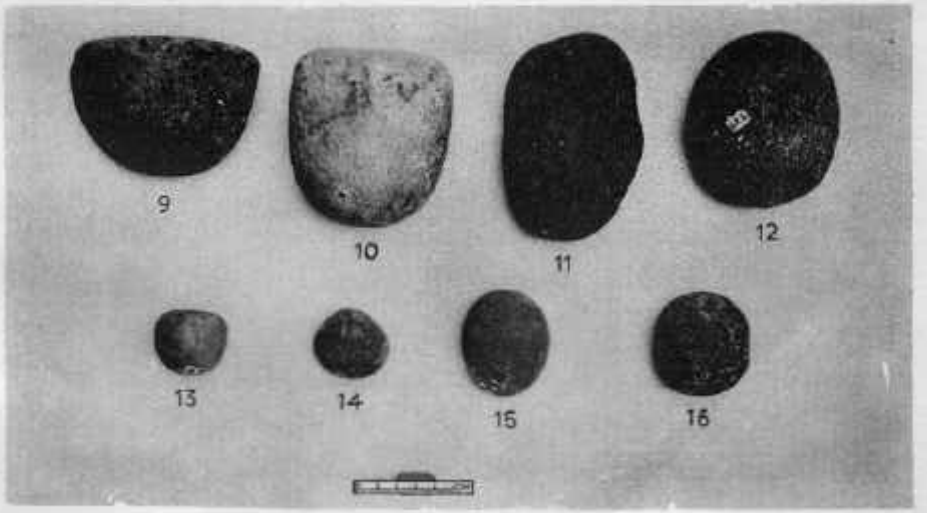


Fig. 5. Hammerstones and pebbles.



Pl. IV. Hammerstones.



Pl. V. Hammerstones and pebbles.

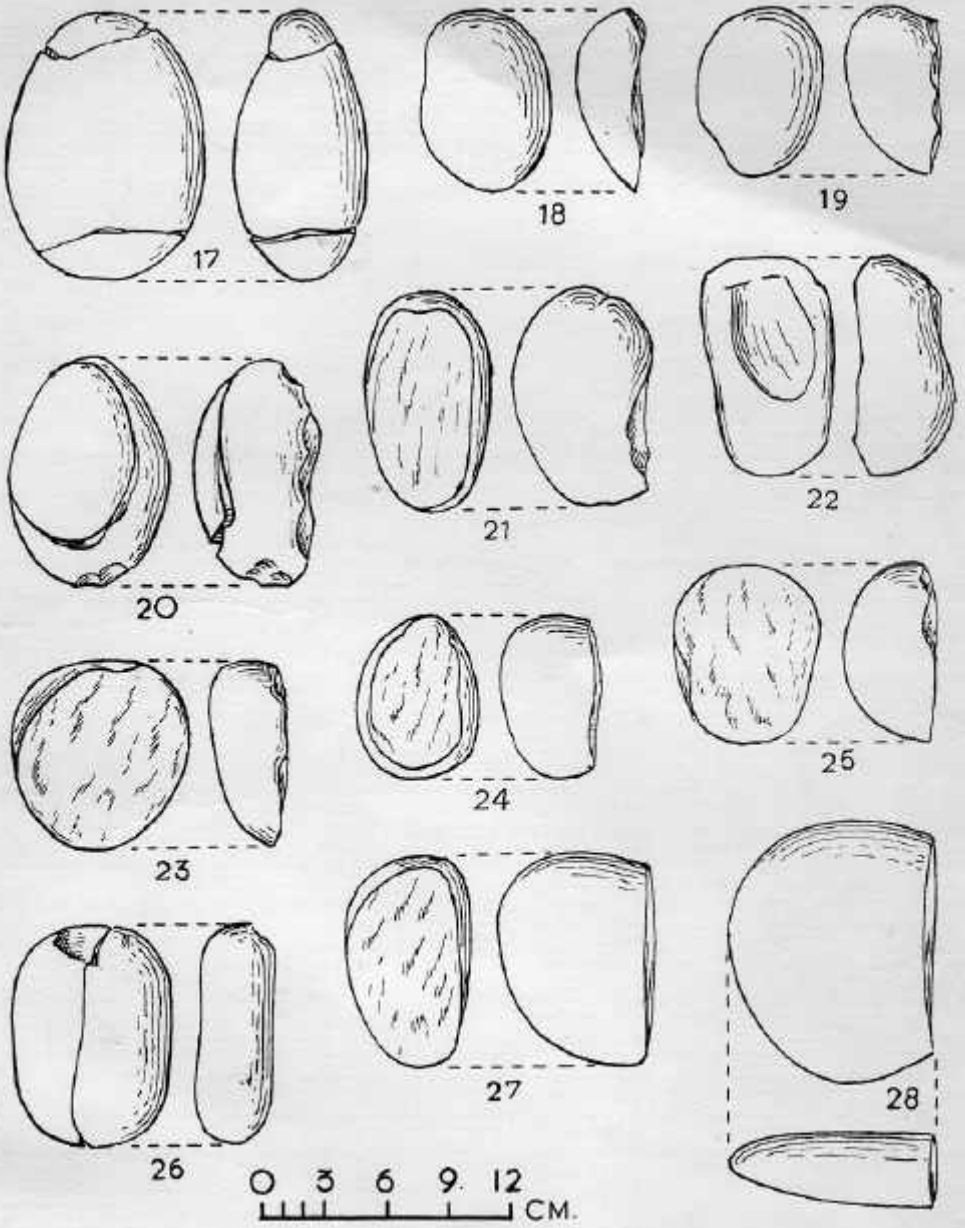
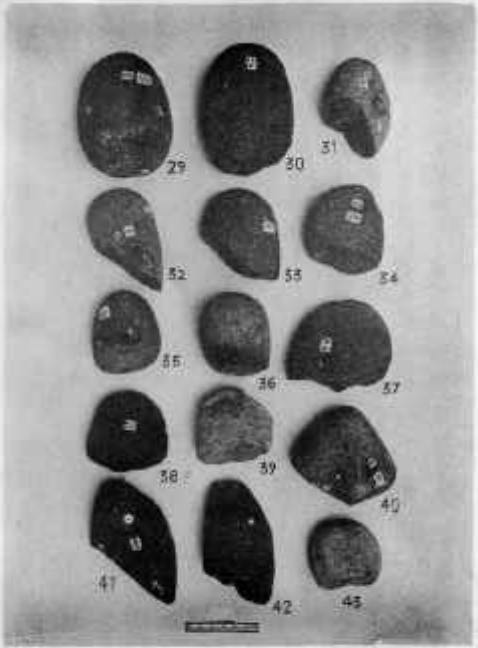
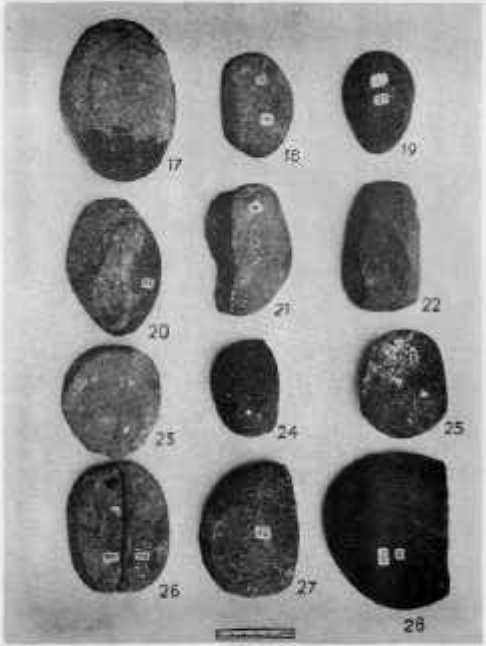


Fig. 6. Split pebbles.



Pl. VII. Pebble choppers.



Pl. VI. Split pebbles.

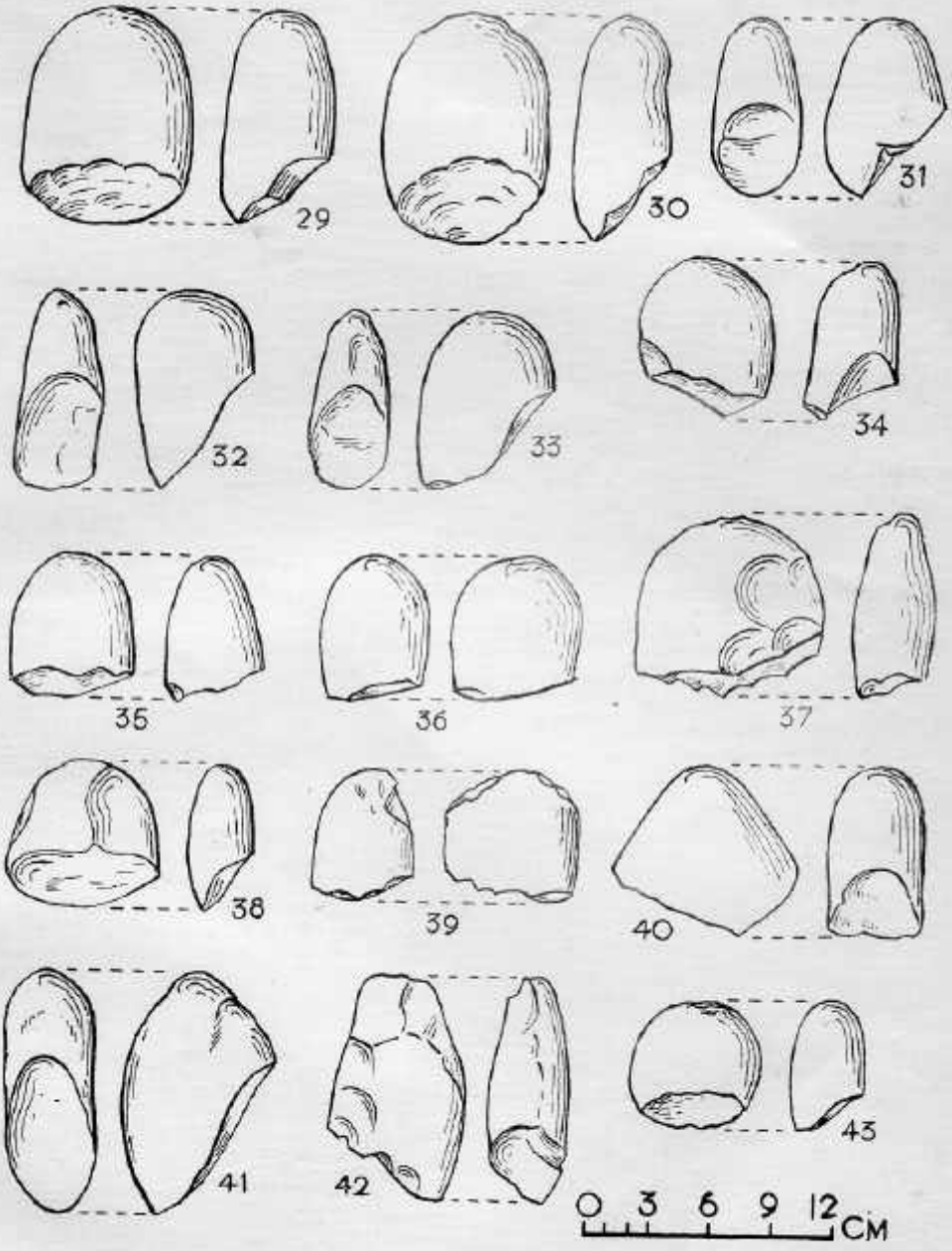


Fig. 7. Pebble choppers.

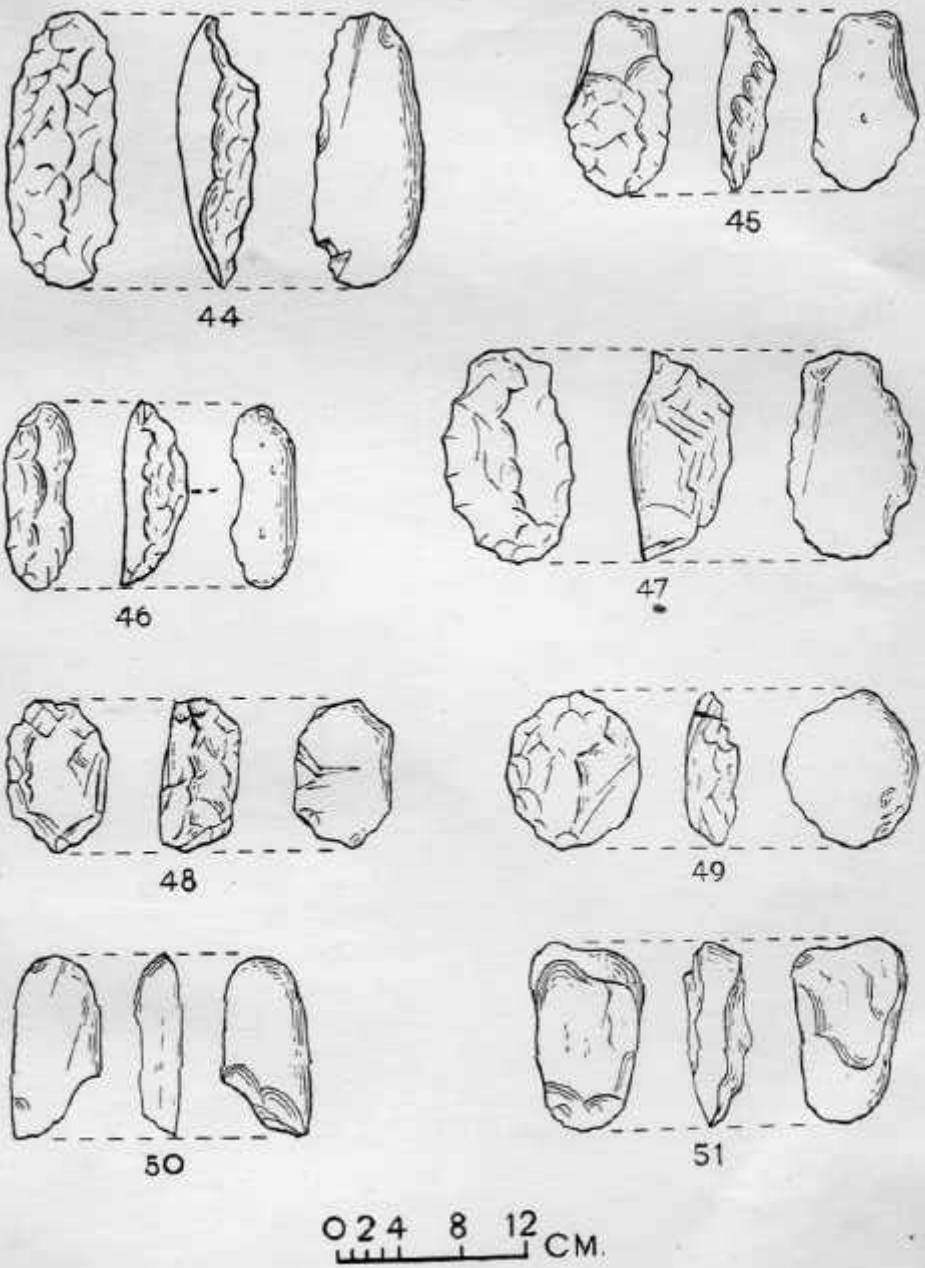


Fig. 8. Choppers, unifacially flaked.

Pl. VIII. Choppers, unifacially flaked.

Pl. IX. Chopping tools, bifacially flaked.

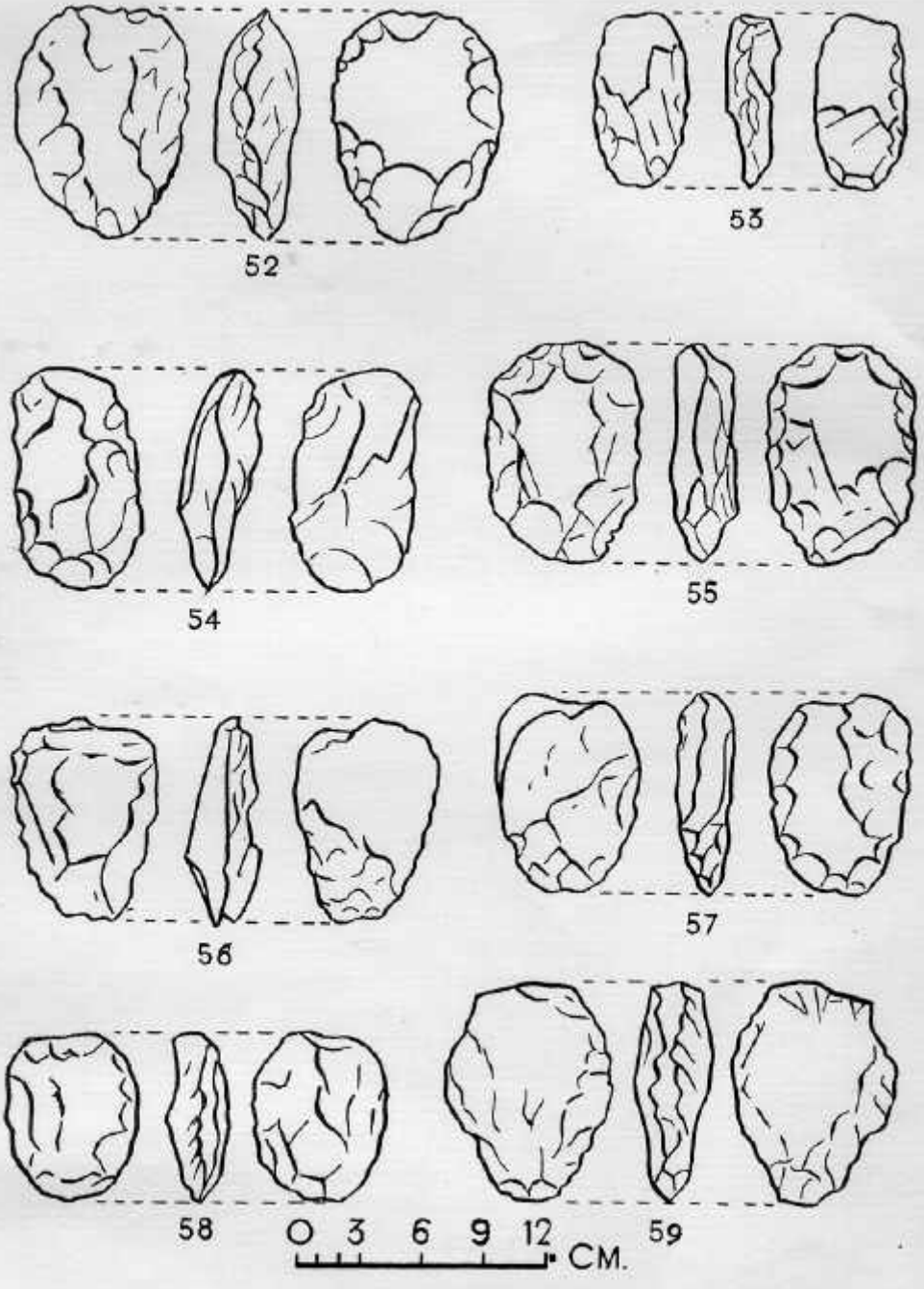


Fig. 9. Chopping tools, bifacially flaked.

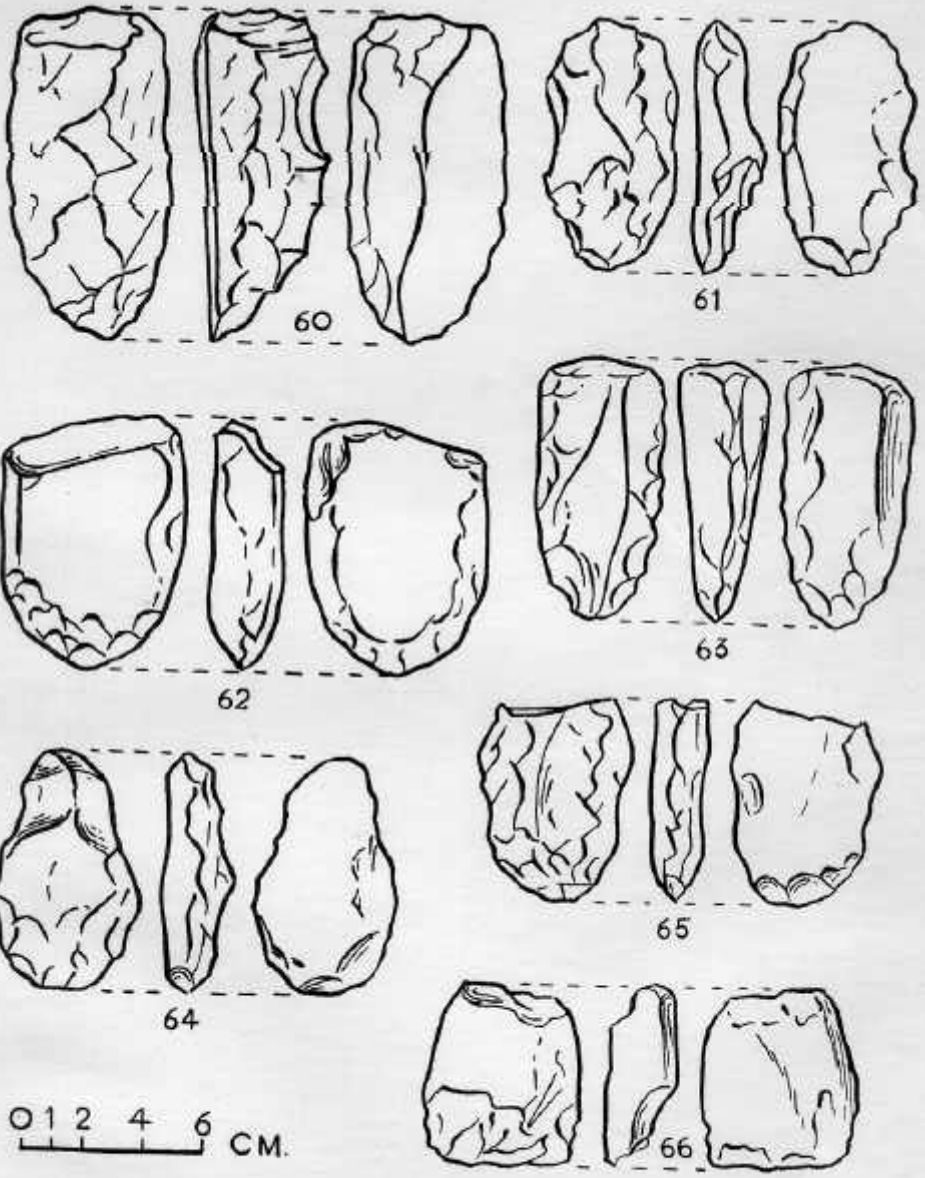
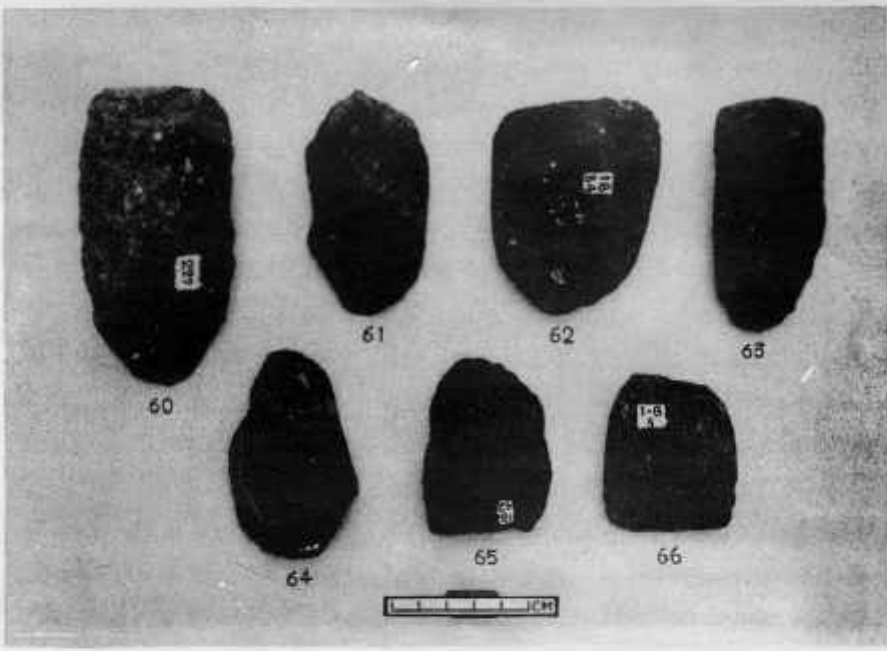
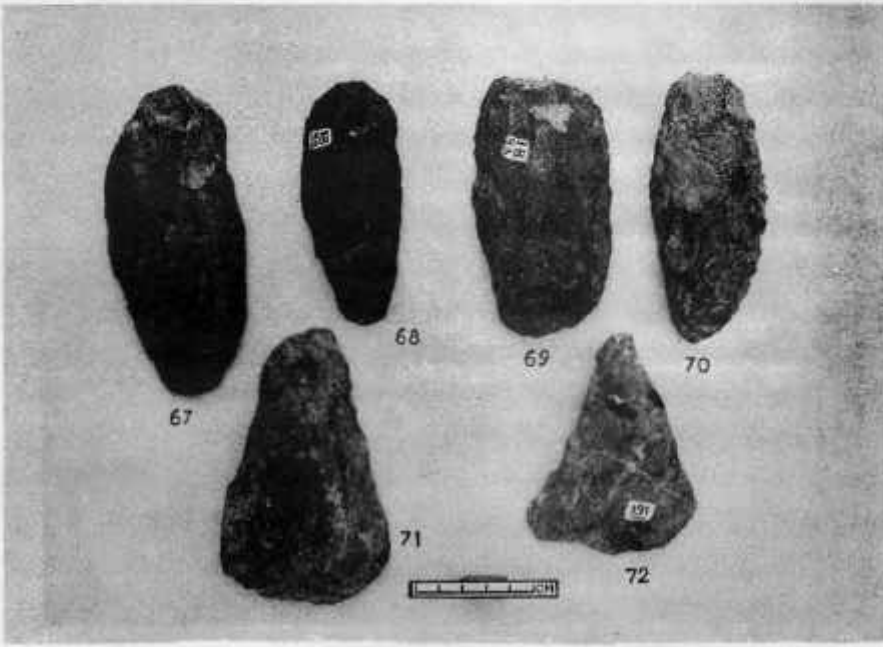


Fig. 10. Chopping tools, bifacially flaked.



Pl. X. Chopping tools, bifacially flaked.



Pl. XI. Hand axes.

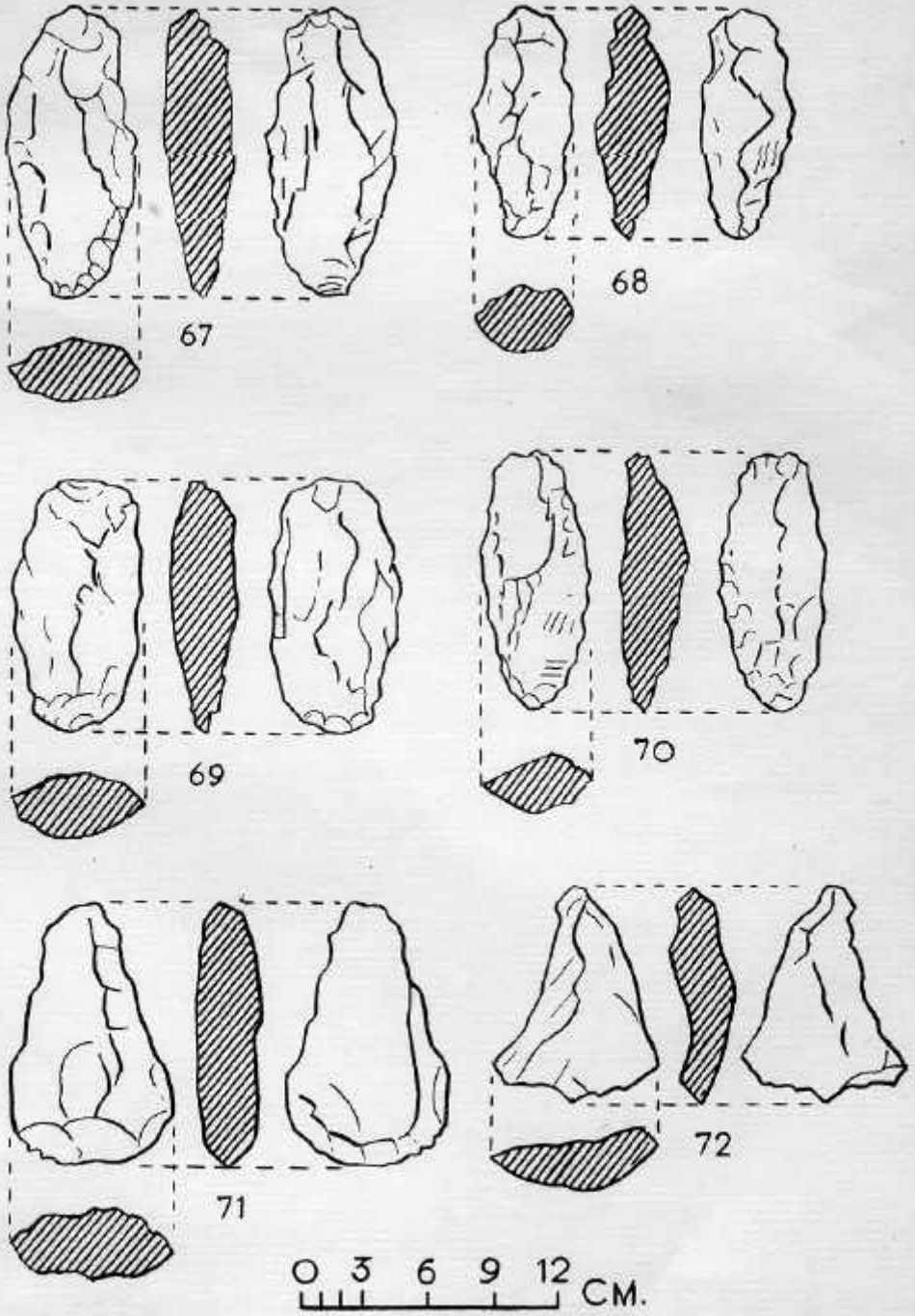


Fig. 11. Hand axes.

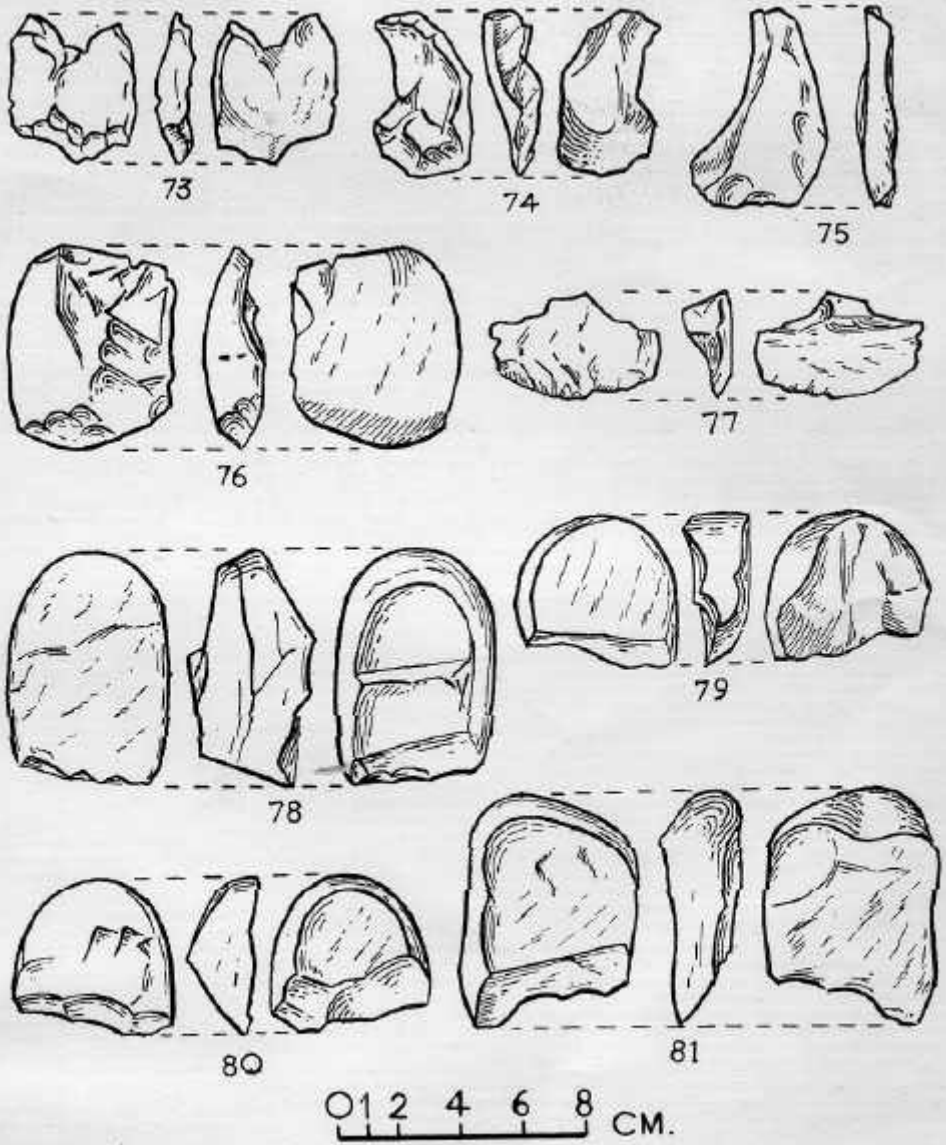
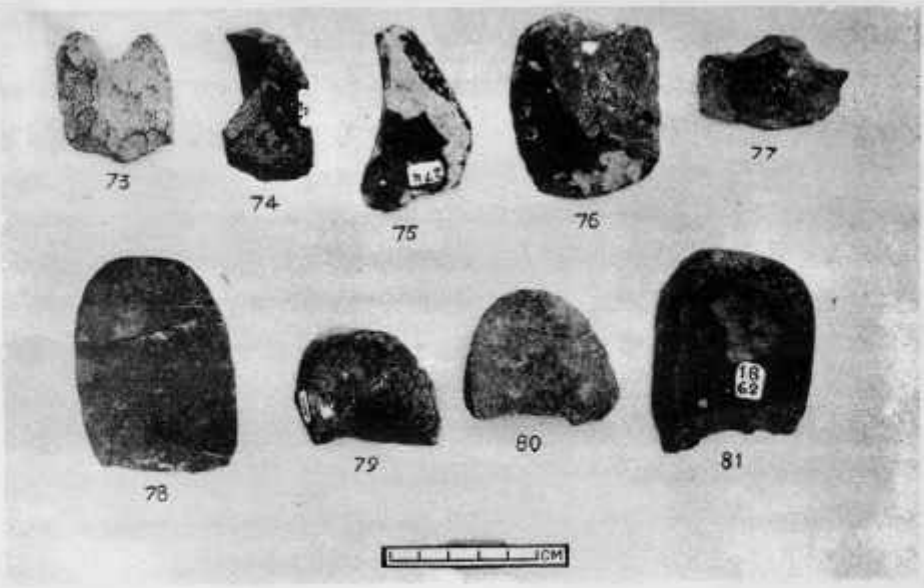
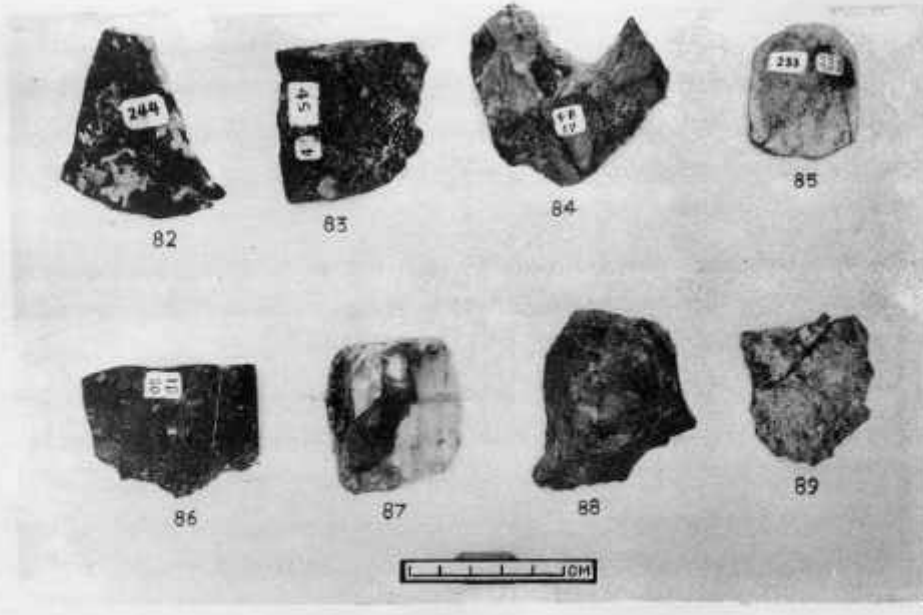


Fig. 12. Scrapers.



Pl. XII. Scrapers.



Pl. XIII. Scrapers.

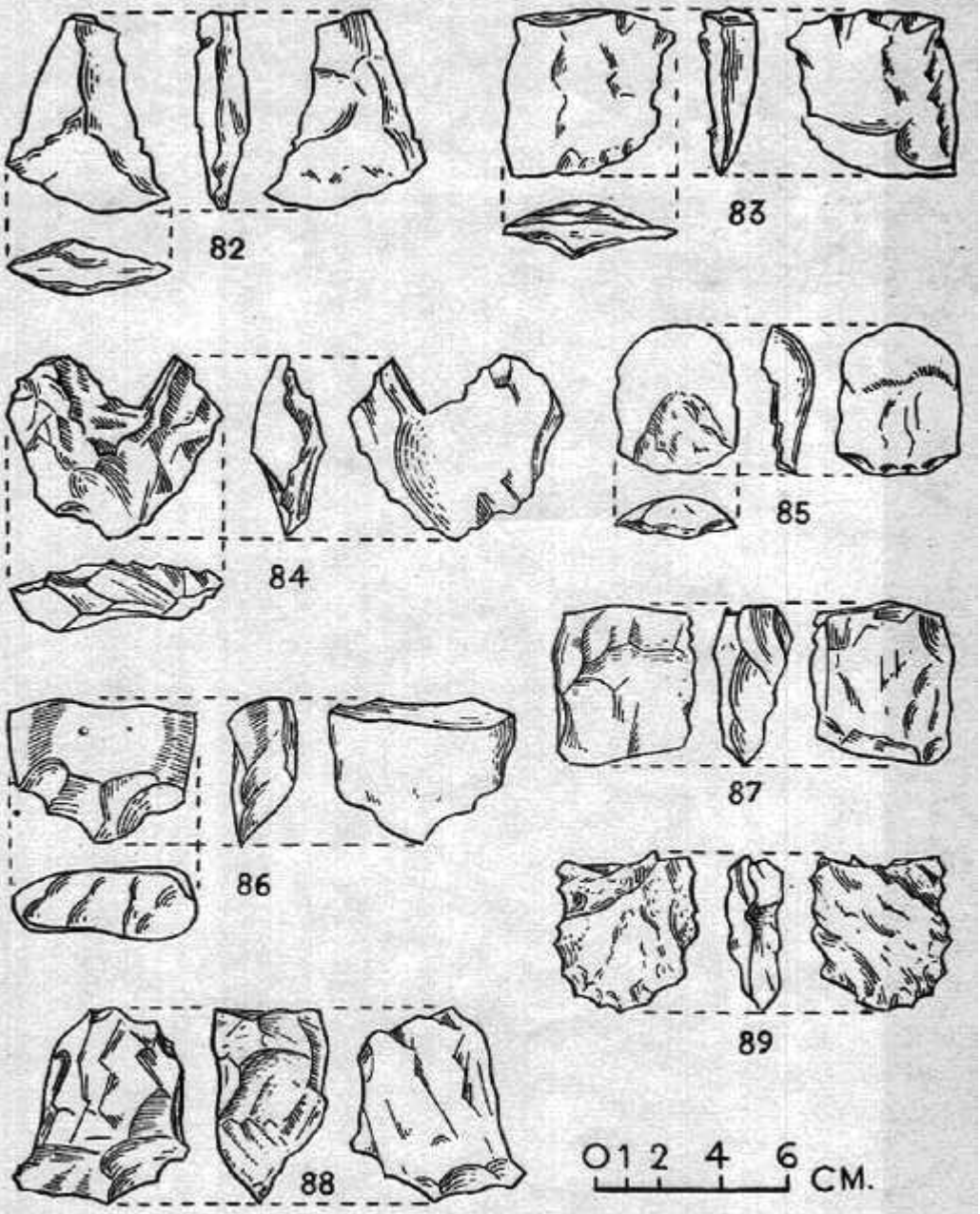


Fig. 13. Scrapers.

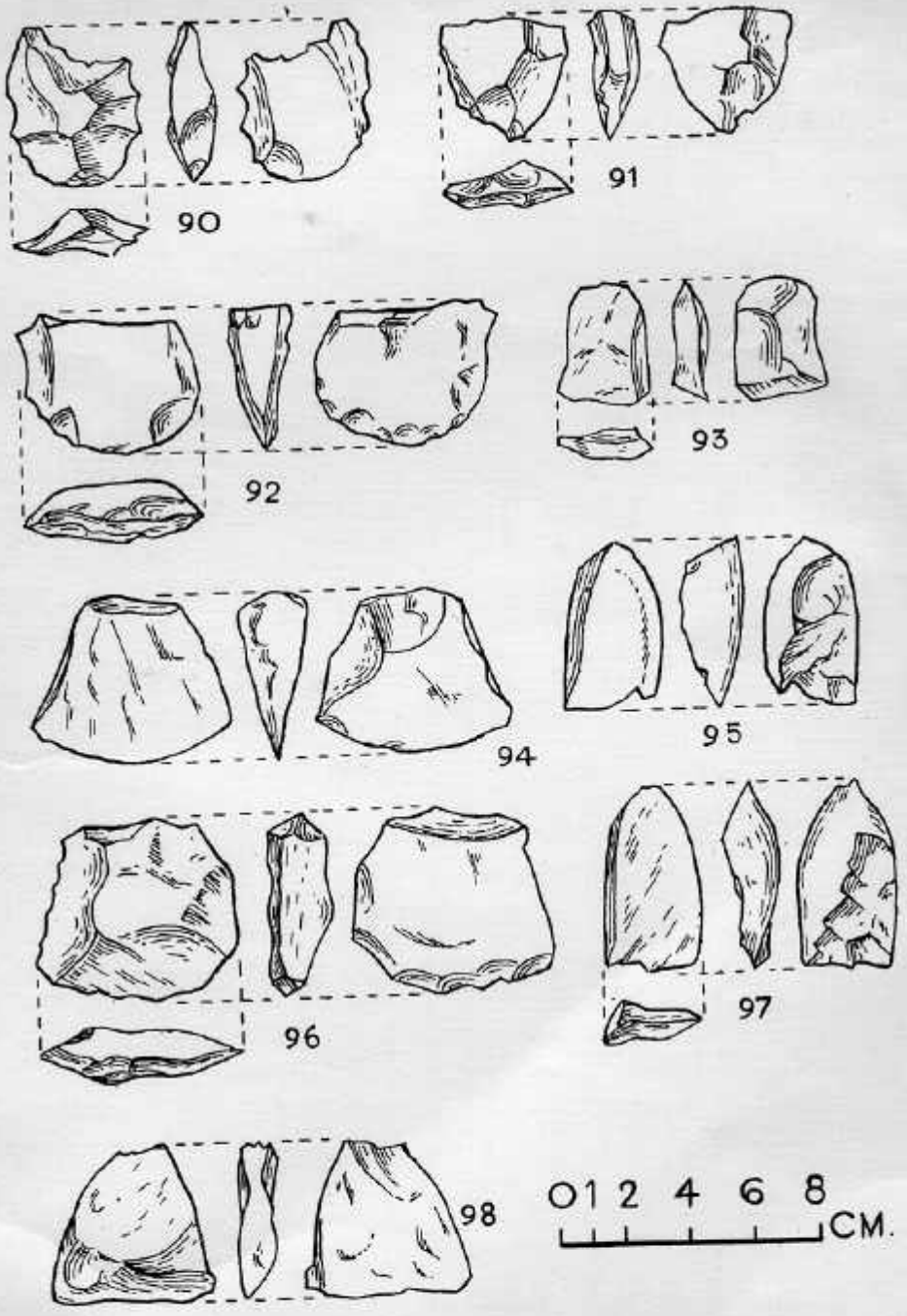
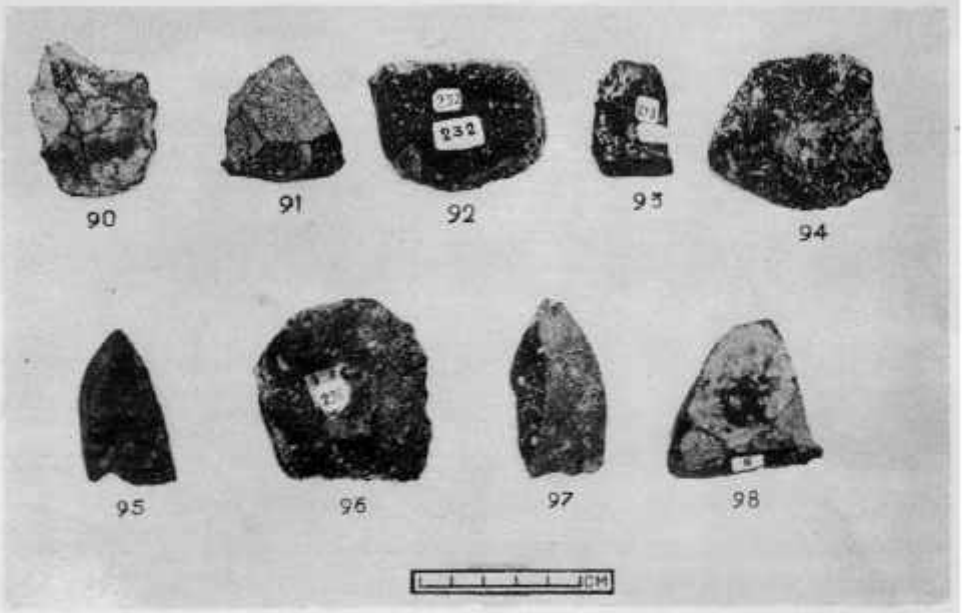
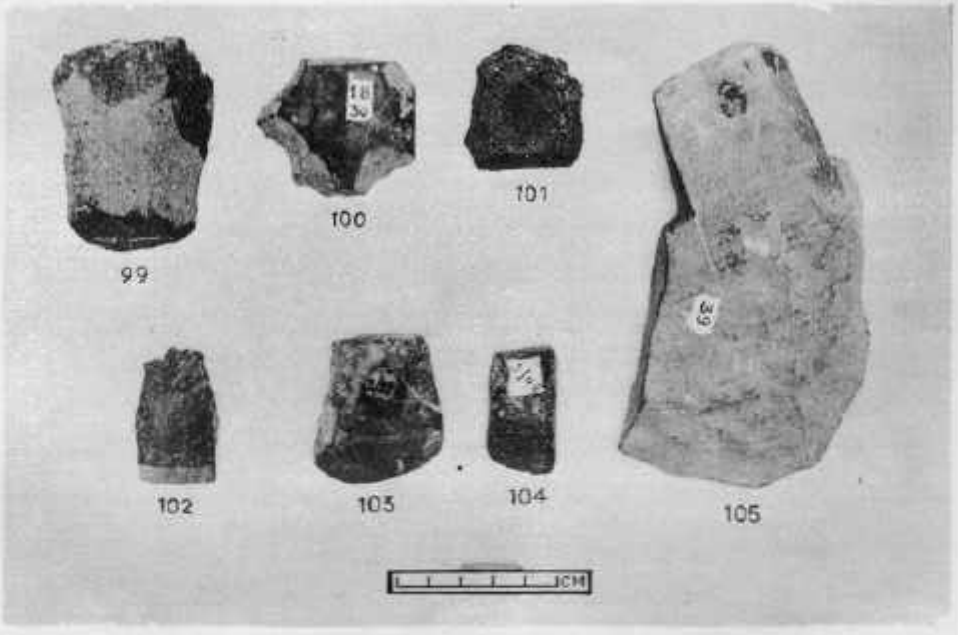


Fig. 14. Scrapers.



Pl. XIV. Scrapers.



Pl. XV. Edge-ground tools and shouldered adze.

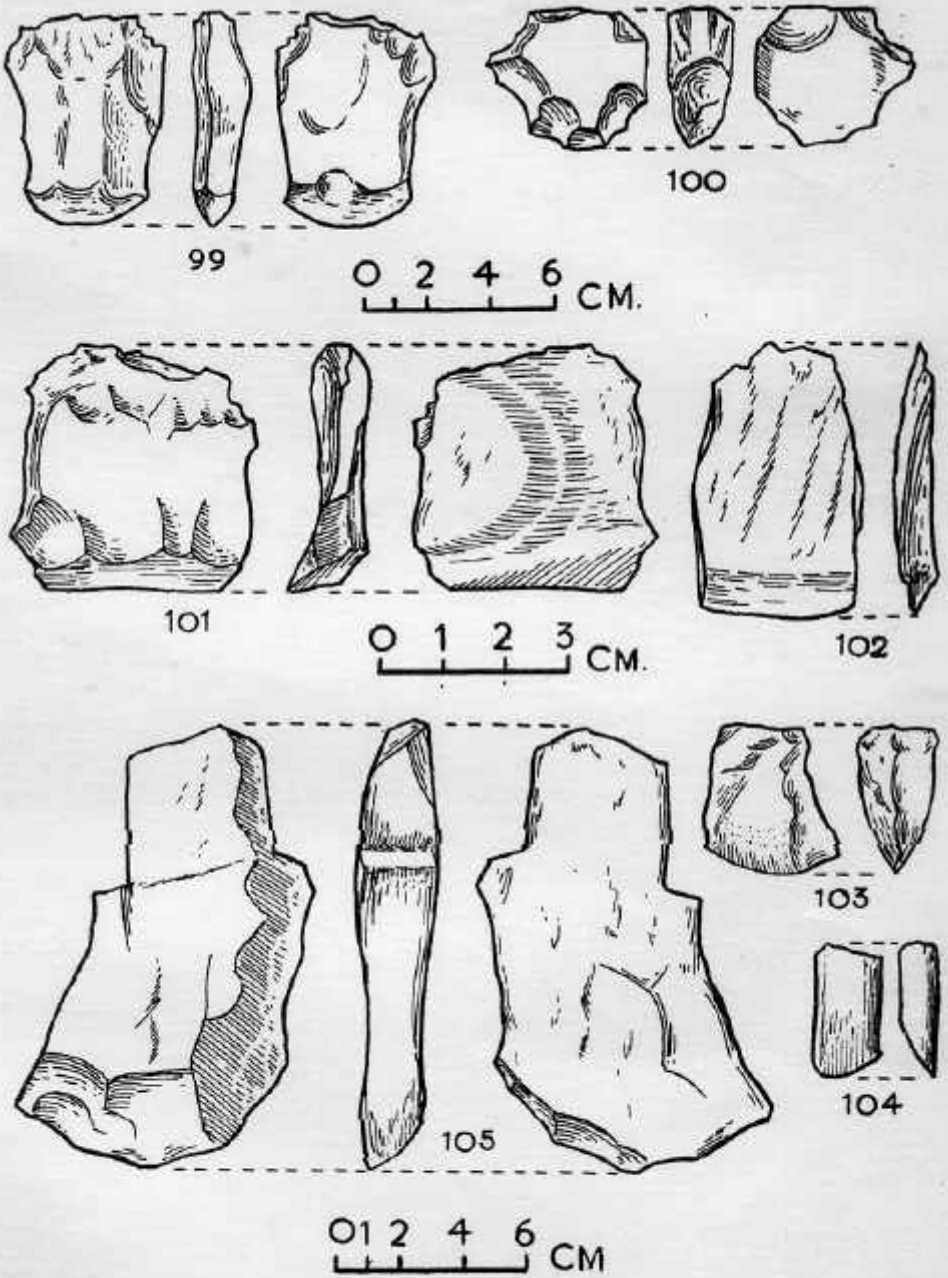


Fig. 15. Edge-ground tools and shouldered adze.

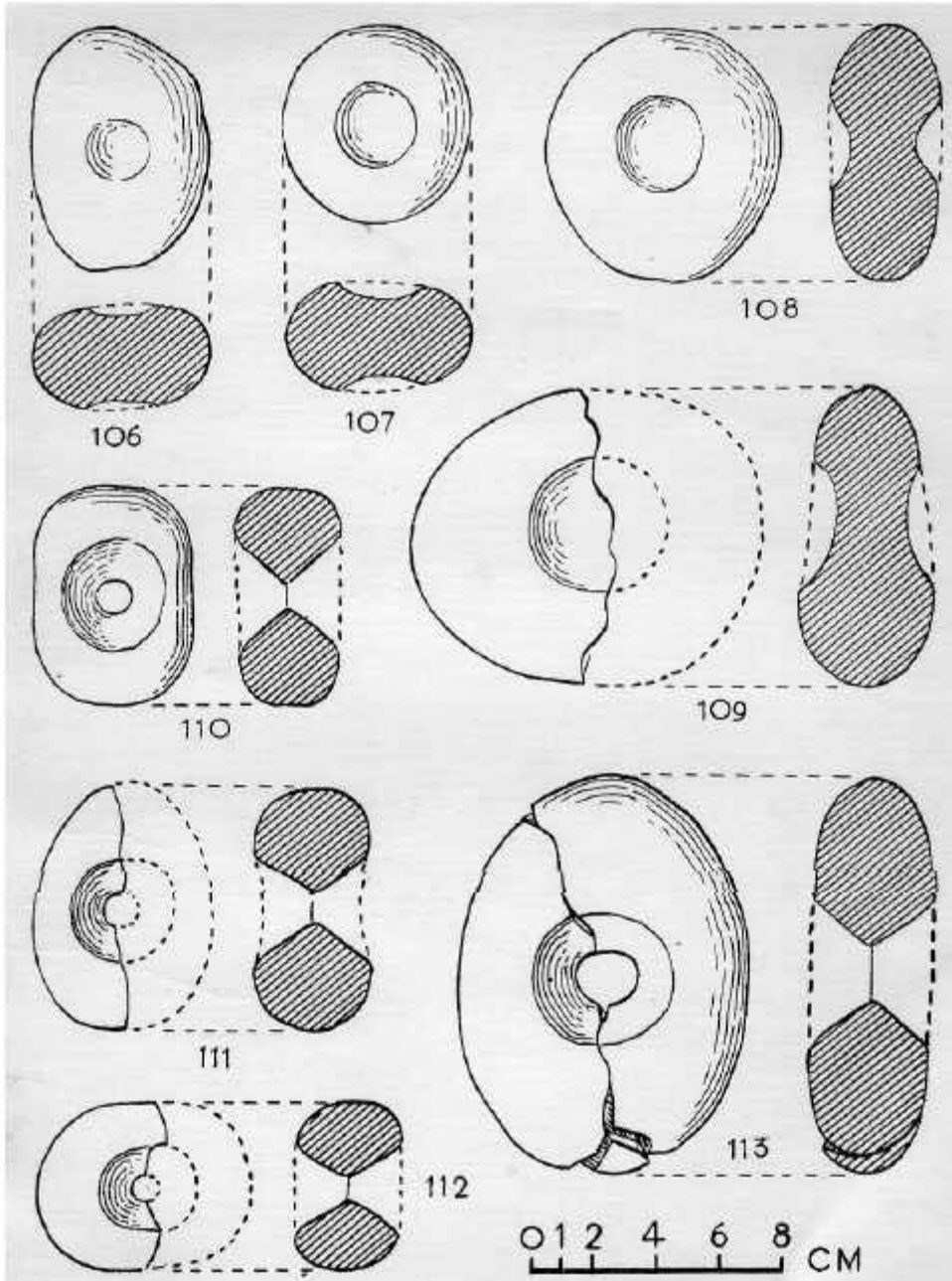
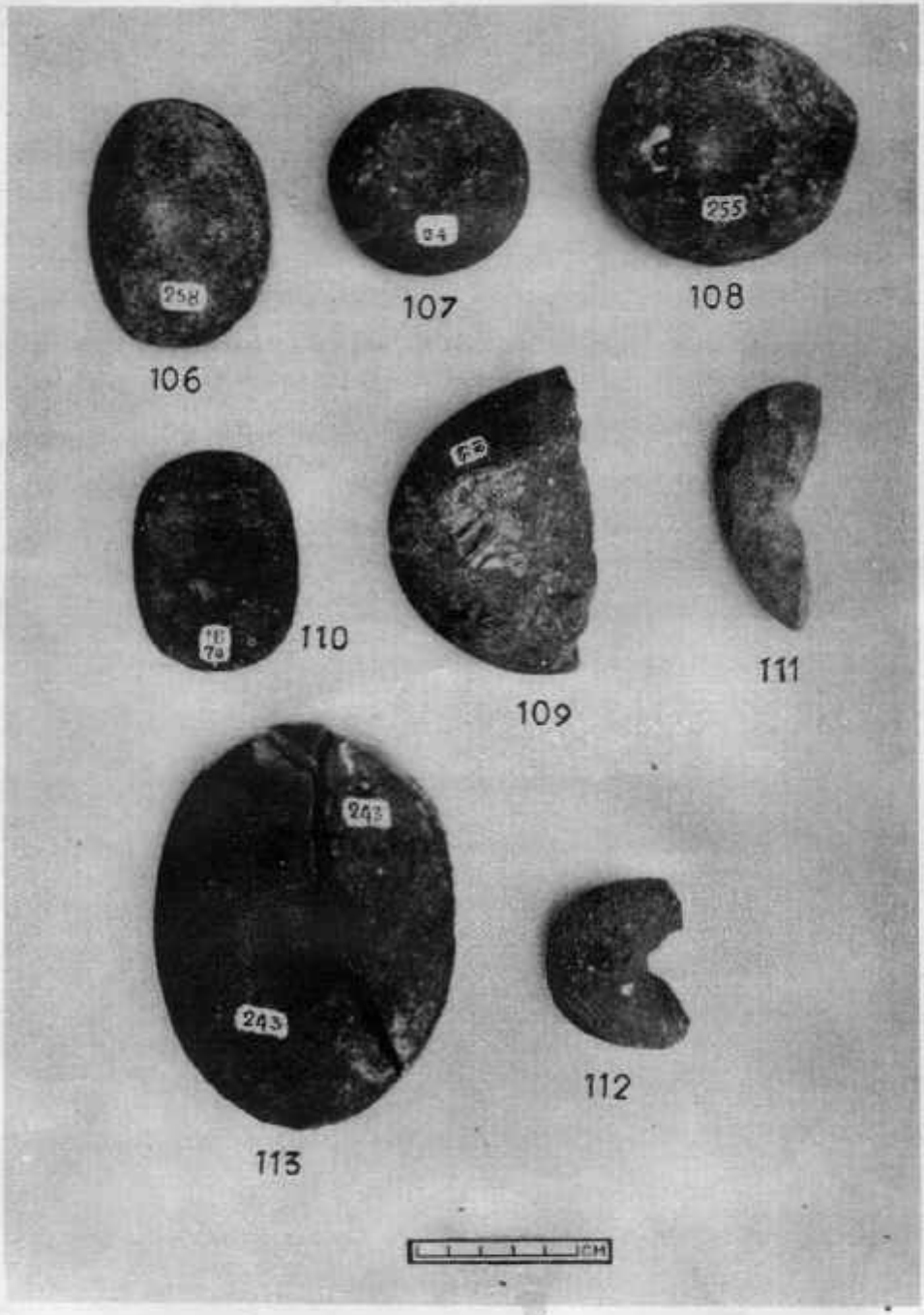


Fig. 16. Pitted and perforated pebbles (ring-stones).



Pl. XVI. Pitted and perforated pebbles (ringstones).