The Palaeolithic Tools From Bali

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I. Introduction

Tools are main object of palaeolithic research in Indonesia. These were discovered in soil layers or as surface finds mostly without association with fossil men or other elements of human life. This situation is different from what were the case in China (Chang 1963 : 21-35), Africa (Clark 1970 : 46-148), and Europe (Howell 1968); for example, where palaeolithic tools were discovered in association with other remains of human activities. The activities were basically related to hunting activities-such as ancient fireplace, food, camp sites, or even with human skeletal remains.

Before the second world van Stein Callenfels has succeeded in compasing an autline of the Indonesian prehistory, which also included a description of the Indonesian palaeolithic although only limited to the Ngandong finds (human/animal fossils, tools made of bone or antler, and stone flakes). As models of comparison, van stein Callenfels took the palaeolithic of Europe as weel as of several other areas in East Asia Such as Ordos and Choukotien. Another autline on the development of the palaeolithic in Indonesia, but a more comprehensive one, was put forward by van Heekeren shortly before the second world war. In his outline, van Heekeren touched upon the evolution of Indonesian fossil men and their cultural remains during the palaeolithic period, comprising tools from Ngandong, Sangiran, and Punung. In describing the palaolithic culture, van Heekeren-like van Stein Callenfels-also used the classification of the European palaeolithic; (i-e. Chellean, Acheulean, Chelleo-Mousterean, Sevalloisean, Clactonean) as his standard of comparison to the Indonesian palaeolithic (van Heekeren 1941, Soejono, 1999 : 2).

The idea of existence of the chouper-chopping tool complex was futher developed where similar type of tools were found after the second world war in Pakistan, Myanmar, Thailand, North Vietnam, Malaysia, The Philippines, and Indonesia.

Attention to palaeolithic tools in Indonesia started to develop after the second world war and new findings were reported from South Sumatra (Lahat), Lampung (Kaliuda), South Kalimantan (Awang Bangkal), South Sulawesi (Cabbenge), Sumbawa (Batu tering), Lombok (Pelambik, Butik), Flores

(Wangka, Maumere, Ruteng), Timor (Atambua, Noelbaki) and Bali (Sembiran, Trunyan, Batur) (Soejono, 1984 : 89).

In The tradition of stone tool making during the hunting period in Indonesia, two basic forms were known, namely the chopper tradition and the flakes tradition, both developed in Indonesia since the end of middle pleistocene (Heekeren, 1972 : 33).

In general, the tool industry of the palaeolithic tradition in Indonesia has produced rough shaped forms. In the beginning, the cortex yet adhered to the stone tools, especially on the handle part. These massive tools were made from gravel or large flakes. The present result showed that the technique of stone tools making is monofacial with main forms which could be classified into Chopper, chopping tool, proto hand-axe, and hand-adze, few hand-axe are also found but in some areas in Indonesia. At some sites there were varius variations in forms and sizes.

Palaeolithic tools in Bali were for the first time found in May 1961 (Soejono, 1964 : 360; Soekmono, 1965 : 102). The tools were found on the Sembiran ridge which contains basaltic gravels. Other findings occured at Kintamani and Tarunyan, of which the raw material was the same as of the tools found at Sembiran. The next research that was undertaken in 1962 had obtained some stone tools in wich the tools were kept in the Branche office of Restoraton and Development of Historical and Archaeological Remains (Kantor Suaka Peninggalan Sejarah dan Purbakala) at Bedulu, Bali.

On June 1990, the writer undertook survey in the areas of Sembiran, Pacung, and Julah and found a number of palaeolithic tools. The tools were found at several spots where the soil had been eroded by rain water or even cultivated by the local farmers. The artifacts were found around the village main, road which connects Pacung with Sembiran on one of the mountain ridges sloping to the north. The finding were located south of the Julah village.

The geological structure of the Julah area is simple, that is a basaltic layer covered with large stone, lapilli and mixed with brouwn reddish soil. The northern part at Bali is connected with what is called Solo Zona in Java which is characterized by a volcanic structure formed in the pleistocene period up to resent times (Soejono, 1984 : 105).

A general method of stone tool classification into several types is based on the form of artifacts. In this approach, formal attributes of artifacts were as indicator to distinguish the stone tools qualitatively and quantitatively and to separate on assemblage of artifacts from the others.

Typological method was used to learn about stone tools cronologically and about regional classification of people who made the stone tools (Boardez, 1970 : 2). Technological analysis can describe technical rules to breack stone in connection with the use of raw material to prepare tools, since those material had close relation with techniques

of making tools.

II. PALAEOLITHIC INDUSTRY

2.1. Location

Bali is a island, roughly mushroom shaped cover about 5,000 square kilometers-150 kilometer east-west and 80 kilometers north-south. The southem extension of the island, a rocky and arid Peninsula called the Bukit, is kept from being an island in its own right by a tiny isthmus. The island of Nusa Penida, geologically similar to the Bukit, lies off Bali's southeast coast.

Bali is just 600 miles south of the equator, latitude 8o 4' 8" 52' south , and at longitude 114" 26' to 115" 42' east, is about one-third of the way around the globe from Greenwich. Bali's proximity to the equator keeps the island consistently warm year-round, with a mean temperature of 27,2" C (Abu, 1981 : 12).

Geologically, the island of Bali is a succession of volcanoes with intervening saddles and alluvial slopes covered with rich ash. Bali, and in fact, most of Indonesia, lies along a large are where two of the earth's seven tectonic plates meet. The meeting of these plates is one of the ways volcanoes and islands are formed. Bali's volcanic mountains are located in the north of the island, as the zone of seismographic and volcanic activity, where the plates meet, slopes north in the area where Bali is located.

Palaeolithic tools in Bali were found at some sites as on the Sembiran ridge which contains basaltic gravels, Pacung, Julah. Other findings oceured at Kintamani and Tarunyan, of which the row material was the same as of the tools found at Sembiran (map. 1).

2.2. Technology

As we know stone is the easiest material to find in our environment. The type of stone that was usually used was volcanic stone and limestone which is hard in nature and easy to be splitted. The technique of stone tool making, at first was undertaken in a very simple way in accordance with the function of the tools. Later, the techniques of stone tool-making increased because of perfectness of their forms.

Paleolithic tools of Bali were found at places where the soil was eroded and the remains were found on the earth surface scattered among big stone as well as among lapilli as result of the mount Batur eruptions. The tools of Bali were made of large volcanic stone or gravels which are scattered around the area. Among the large volcanic stone, some showed clear traces of making. This showed the application of the shattering technique as used in the pacitanian tradition (Soejono, 1984 : 106). This shattering technique was applied to abtain smaller pieces of stone for reguiring the tools. The tools were also made by using the direct percussion technique : the stone was struck by using another stone as hammer (Oakley, 1955 : 24). This technique was generally applied at Sembiran, Batur, Pacung and Julah. The technique of striking the stone by using another stone could be done in two ways, which is the hammerstone technique and the anvil technique

(Fagan, 1975 : 261). The hammerstone technique is a way of preparation, by holding the core stone in one hand and the hammerstonne in the other hand, while the anvil technique is a technique of preparation by striking the core stone to another stone which is used as an anvil.

Most of the palaeolithic tools at Sembiran, Batur, Pacung and Julah sites show brown reddish patina covering the black nuccleous of the stone and were aften found worn. From the 103 specimens found, only 13 specimens are without patina. The tools were found in a dry river bed and in a coconut tree plantation near the beach, at Sembiran site and near the like Batur, at Batur site. It seemed that the tools have been transported the finding sports. Many tools show traces at usage and are very rolled, only a few tools without patina look undamaged. The technique at manufacture in general was rough flaking mostly applied to small or medium size pabbles or sometimes to large flakes. The cortec covers a large part of the surface, especially at the part of the handle. Retouches at the edge show that the tools had already been used.

2.3. Typelogy

The remains of hunting life showed limited people's ability in using the materials available around them. Technology of people at the preliminary level focused on the practical ceassification of stone tools into several types are bassed on the form of artifacts. The types of palaeolithic tools at Bali consist at :

1. Chopper

Chopper was made of medium and small pebbles with conoce edge, and some at the chopper's edge are straigt which was abtained through striking the stone edge on one side (Figure 1). Cartex is still attacked on most of the stone surface, especially on the part at the handle.

2. Hand-edze

Tools like chisels were made by steep striking on the opposite side of the handle, to form a convex edge. The plane at the handle part was shaped upright. Among the findings was also a black coloured chisel found at the batton of a dry rives; the river contained water in the rainy season only.

3. Proto hand-axe

This tool was made of pebbles, were one of the surfaces was flat shaped. The opposite surface was percussed or struck to obtain the pointed form; stone cortex still remains on the handle. Proto hand-axes which were found at Sembiran, Batur, Pacung, and Julah show traces of intensive use.

4. High back scraper

The handle part of this tool is straight, placed upright towards the base or the flat plane of the tool, so that it produced a semi-circular edge.

5. Horse hoof type chopper

This tool is the same as the high back scraper (Figure 2). The handle is straight, and also the steep sides to wards the base produce a semicircular edge. The reason why the base was made convex is to produce a sharp

edge.

6. Iron heater type chopper

This tool is elonged and looks like an iron heater with flat base. It shows a longitudinal flaking process on the upper surface. Flaking is also applied on the flat plane to obtain a sharp edge.

7. Chopping tool

This tool is made of a chump of stone where the edge is twisted through flaking which was done alternatively on both sides (bificial). Among them are tools where the cortex is still attached at the handle.

8. Scraper

This artefact has an edge on one side of the surface and was made of a pebble; some were made of small seizes pebbles. Among the scrapers are several with convex edges, obtained by flaking on one surface of the tool.

9. Flake tools

Flake tools of Bali were roughly prepared. Most of the cortex is still attached on one surface, in apposite to the detached plane. All tools show retouches of intensive use.

10. Blade tools

Blade tools were made of long flakes with parallel sides. Flaking was roughly done, the blade form is very simple and show archaic characteristies.

11. Core stone

This is a remnant of row material which had concave planes. Some of them shows retouches as traces of use on one of the side.

12. Hammerstone

Hammerstone are usualy selected pebbles and rather elongated. At one of the edges of the extreme planes are traces of intensive use. One of the hammerstone has a form and at one extreme and of this stone are found traces of use.

13. Miscellaneous tools

The material used is papple or flakes with irregular forms. The surface is roughly flaked. Retouches are observabble at some edges indicating that they had been used.

2.4. Characteristic

There are specific characteristics of the Balinese palaolithic tools, such as the handle part which tends to be straight with a convex or semi-circular edge. These characteristics are observable on the hand edge and the high back scraper. Group of hunters left stone tools of the mast roughly farms obtained through the shattering and spliptering process of big stone and flaking of pebbles with direct percussion tehnique.

The tools from Bali were found in places with eroded soil, and melude, massive tools made of pebbles or large flakes, but most of the findings consist of flake-blade tools. The row material is from volcanic stones, like among others basalt. Some of the tools show clear traces of breaking or shattering of big stone. The technique of shattering was to produce smaler pieces of stone for preparing tools. Basaltic stone used at Sembiran, Batur and Trunyan has brown reddish patina which covered the black stone core. Only a few tools were found without patina, especially in the

lower area of north Bali; these tools are originally from the mountain redge situated above the pacung village. The specific characteristics of the tools are that most of the tools tended to be straight at the handle and convex or semi-circular at the base. These characteristics are usually seen at the hand adzes and high back scrapers.

2.5. Cronology

The cronology at the palaeolitic in Indonesia had been compiled by several scholars, and each gave a description that is no fully similar. There was still a question, even to movies him self, whether the pacitan culture has originated from the middle or upper pleistocene period (Movins, 1955 : 535). Some scholars stated that pacitanian technology is quite a advanced and cannot be considered too simple, while pithecanthropus has not been able to made such kind of tools (Mulvaney, 1970) nowadays there is a tendency to lay part of the Pacitanian evolution at the end of upper pleistocene. Van Heekeren himself put the Pacitanian at the beginning of upper pleistocene. Palaeolithic tools not found until the middle pleistocene period, with diferen level in each development areas (Movins, 1955 : 534).

At his moment, other palaeolithic culture in South Sulawesi, South Kalimantan, Lombok, Sumbawa, Flores, Timor, Sabu, and Bali are in general placed in he pleistocene period with no detailed levels. This is due to the incompleteness of data supporting their dates. Soejono tends to placed the clusters in the upper pleistocene. Aside from the fact that the palaeolithic sites are located at he areas containing pleistocene disclosures, the tool are taxonomically very close to the Pacitanian except that there are local varieties here and there (Soejono, 1984).

Palaeolithic industries with outstanding chopper-chopping tool charasteristics are found in Bali (Pacung, Sembiran, Batur and Trunyan), with the strong tendency towards an upper pleistocene stage of development. The wide spread massive tools are the chopper and chopping tool. Especially the horse hoof-shaped chopper as well as the side scraper show a wide distribution. It is evident that the massive tools have local traits which do not deviate much from the basic morphology and technology with is either monofacial or bifacial, so that it is easy to see the basic unity of these stone tools. Concerning the chopper-chopping tool characteristics in Bali, Soejono placed it in the upper pleistocene (Soejono, 1977 : 5). Further it was said that some tools showed the same style with pacitanian tools, seem from the use of the shattering technique, and the direct percussion with a hammerstone. Hammerstone were also found at the Sembiran site. Up to the present, the envil tecnique of shattering stone on a stone anvil has not been clearly known since there was not any findings of stone anvil at the site.

2.6. Man,s Relationship to the Palaeolithic

During the ice age the oceans were

bounded by continental ice sheets, and even in the equatorial zones the see level was lower than it is today. Because of this, western Indonesia, the South-East Asia mainland and southern China formed a solid land area until the glacial ice began to melf.

In the middle pleistocene age this area was already inhabited by a fairly homogeneouse, primitive from of man. The most famoust representative of this early species, pithecanthopus erectus, was diccovered in the valley of Solo on the island of Java in 1890 (Ramseyer, 1977 : 12). A chopper found at sambungmacan, which was made of basalf has been announced as being the tool of pithecanthopus soloensis who during the middle pleistocene. Sartono assumes the age at the sambungmacam fossil context to be that of the upper pleistocene, for reason that the elements of the fossil-bearing and pebble stone layers are similar to those of layers which are of the same age as Notopuro (Sartono, 1979). This choppers has been made from a large blade which clearly shows a bulb, having been flaked on the upper surface by the steeped and longitudinal technique.

Van stein Callenfels divided the palaeolithic culture into the Ngandong culture consisting of stone flakes, bone/ antler implement, and rayfist bone-from the upperpleistocene, and the pacitan culture which probably originated from the middle-pleistocene or from the same period as the Ngandong culture. He assumed that the Ngandong culture consists of several levels, and the doubted whether the artifacts and human fossil of Ngandong had any connection or were parts of the same context. He assumed that the pacitan culture probably belonged to the Solo man which he though to have Neanderthaloid characteristic. The assumption was based on the characteristic similarities betwen the pacitan culture and the early Stellenbosch culture in South Africa.

Soejono devided palaeolithic tools in Indonesia into there groups, were based on the hence discovered specimens :

a. Massive tools made of pabbles or big stone flakes.
b. Flake blade tools
c. Tools made of bone and antler.

The tools from Bali show clear traces of breaking or shattering of big stones. The technique of sattering was to produce smaller pieces of stone for preparing tools. Basaltic stone used at Bali has brown reddish patina which covered the black stone core. Discovereies of palaeolithic tools from Bali had proven that group :

a. was associated with group
b. either in greated or in smaller rations.

concerning the chopper in Bali, Soejono placed it in the upper pleistocene. This is based on the characteristic of the stone tools (Soejono, 1977 : 5). Further, it was said that some tools showed the same style with pacitan tools, seen from the use of the shattering technique, and the direct percussion with a hammerstone. Hammerstone were also found at the Sembiran and Batur sites. Up to the present, the anvil technique of shattering stone on a stone anvil has

not been clearly know since the was not any findings of stone anvil at the sites. Based on the abovemention reasons, there are indications that it was pithecanthropus saloensis who made the palaeolithic tools Bali.

III. CONCLUSION

The main evidence of man's life in the hunting and food gathering period in Bali are stone tools. Group of hunters left stone tools of the most roughly form obtained through the shattering and splintering process of big stone and flaking of pebbles with direct percussion technique. The specific characteristic of the palaeolithic tools Bali are that most of the tools ended to be straight at the handle and convex or semi-cilculer at the base. These characteristhic are usually seen at the hand adzes and high back scrapers.

The classification of palaeolithic tools has to be based on the typology of artifacts to observe their similarities and differences. Concerning the chopper in Bali is placed it in the upper pleistocene. This is based on the characteristics of the stone tools. Further, some tools in Bali, showed the same style with pacitanian tools, see from the use of the shattering technique, and the direct percussion with a hammerstone.

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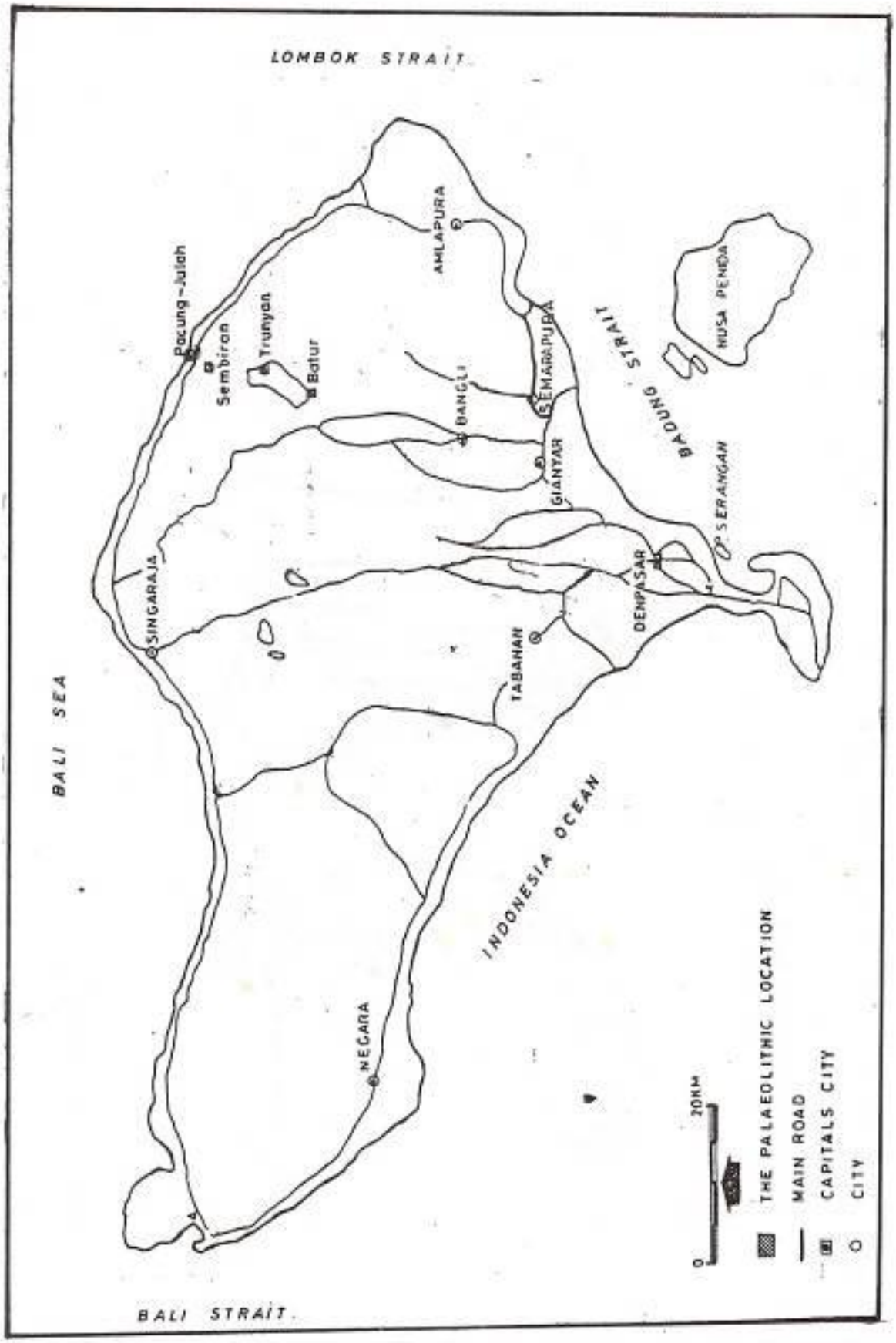
LOMBOK STRAIT
Pacung-Julah
Sembiran
Trunyan
Batur
AMLAPURA
BANGLI
SEMARAPURA
GIANYAR
BADUNG STRAIT
NUSA PENIDA
SERANGAN
DENPASAR
SINGARAJA
TABANAN
BALI SEA
INDONESIA OCEAN
NEGARA
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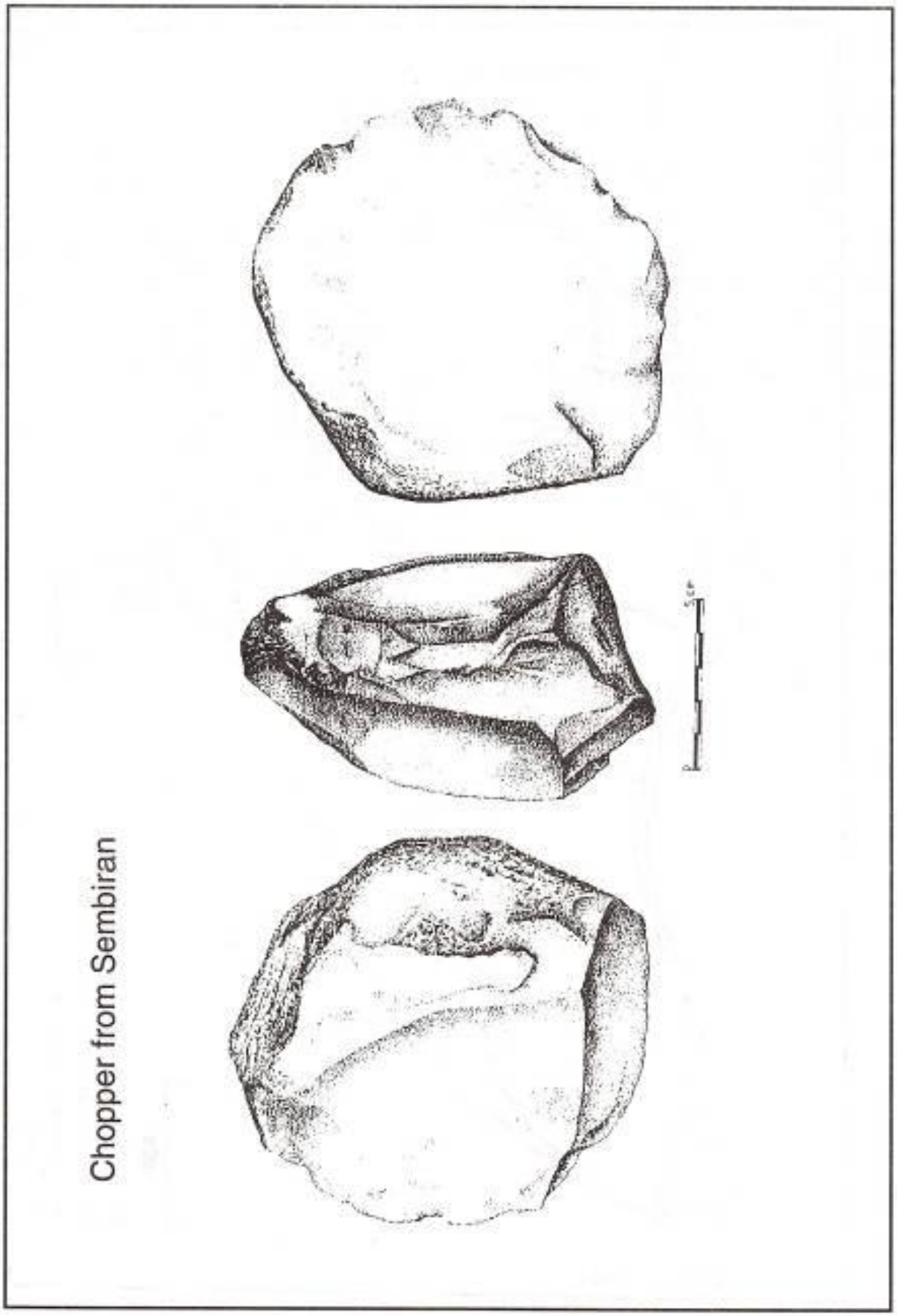
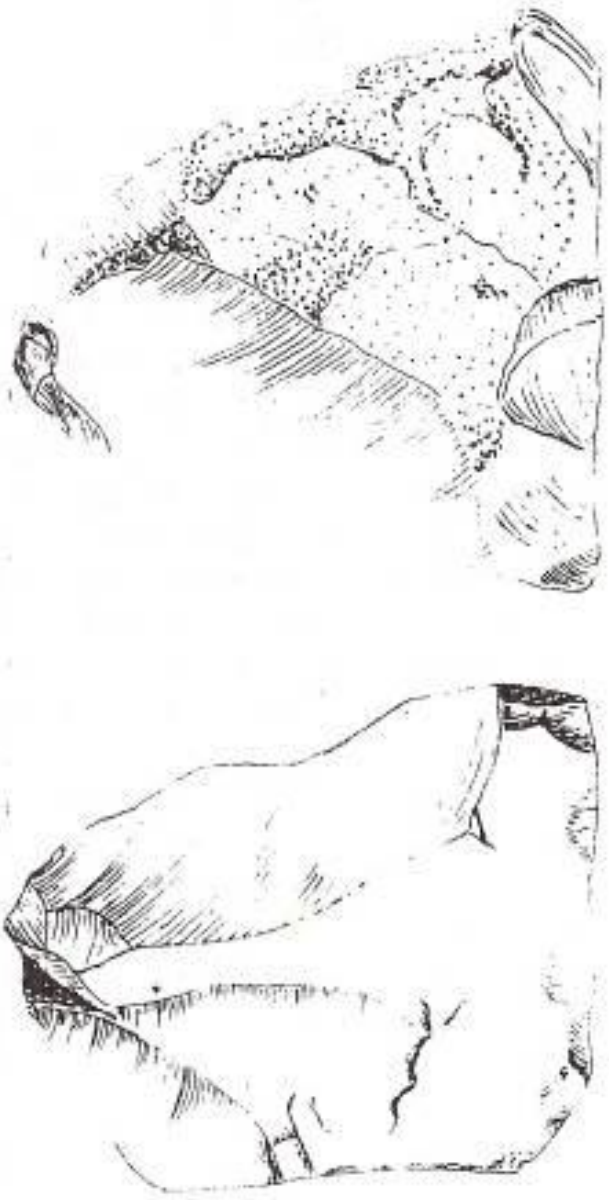
THE PALAEOLITHIC LOCATION
MAIN ROAD
CAPITALS CITY
CITY



Chopper from Sembiran

Figure. 1



Horse hoof type from Julah

Figure. 2