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A Tentative Reconstruction of the Cranial Human Remains of Hanoman 1 From Bukuran, Sangiran (Central Java)

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Abstract

The 16 cranial fragments of Hanoman 1 were discovered in 1989 at a smaller landslide from the upper part of the Lower Pleistocene Pucangan formation in the Sangiran area. We present here a synthetic stratigraphic section, constructed by means of several trenches excavated at the site. A first reconstruction of the skull is given. Based on this the skull ranges within the limits of variation of the Javanese *Homo erectus* group.

Kurzfassung

Die 16 Schädelfragmente von Hanoman 1 wurden im Bereich eines kleineren Hangrutsches im oberen Teil der altpleistozänen Pucangan-Formation im Gebiet von Sangiran entdeckt. Wir präsentieren hier ein synthetisches stratigraphisches Profil der Fundstelle, das aus mehreren Schürfen zusammengesetzt werden konnte. Eine erste Rekonstruktion des Schädels wird vorgestellt. Demnach liegt der Schädel innerhalb derVariationsbreite der javanischen *Homo erectus* - Gruppe.

Introduction

The human fossil we gave the name of Hanoman 1 was discovered by a javanese peasant at the end of April 1989, near the hamlet of Bukuran, in the Sangiran dome. It was then transmitted to the Puslit Arkenas Indonesian French team. The fossil is now conserved in the Palrad Laboratory of Bandung.

After a geological survey in the field, the team undertook in July 1989 a one month extensive stratigraphic excavation on the place of the find. The anthropological study of the Hanoman 1 fossil remains is mainly based on a reconstruction, using a cast made in the Palaeoecology Radiometry laboratory.

The fossil itself consists of 16 cranial fragments. It has been found within the earth coming from a smaller landslide of the Pucangan Lower Pleistocene clays.

Such discoveries of vertebrate remains by mere chance often occur in the Sangiran area, which is thoroughly cultivated, by ploughing, during irrigation works, or are eroded after a big pouring rain. Most of the *Pithecanthropus* remains were discovered in such a way.

The Site

The site is located along the southern flank of a relatively large valley separating the kampung (village) of Bukuran and the kampung of Sendangbusik northwards (Fig. 1). The top of the hills displays large outcrops of the middle Pleistocene Kabuh sandy layers: the S 38 skull, found in 1980 and then transmitted to T.Jacob, has been discovered on the top of such a hill near the kampung of Sendangbusik. Along the flanks of the valley and in the riverbed we find the Pucangan clayey formation.

The small landslide which yielded the cranial fragments is stratigraphically situated not far from the Pucangan (clays) / Kabuh (sands) boundary.

The first geological insight indicates that the Pucangan and Kabuh beds, with different lithological facies, show a quite evident southward dipping related to the structural evolution of the Sangiran dome as a whole (L.J.C. van Es, 1931; R.W. van Bemmelen, 1949). No faulting seems to have affected the layers at the spot of the find. Therefore we considered it useful to dig stratigraphic trenches in order to get a complete section of the area.

The Excavation

Figure 2 shows the location where the twelve trenches were excavated, together with the measured structural direction and dipping in the area. Roughly speaking, the northern trenches present the older layers. Trenches A, F, G, H, H' and E concern the Pucangan layers. Trench B describes the local Pucangan / Kabuh - boundary, while trenches C and D comprise the Kabuh beds only.

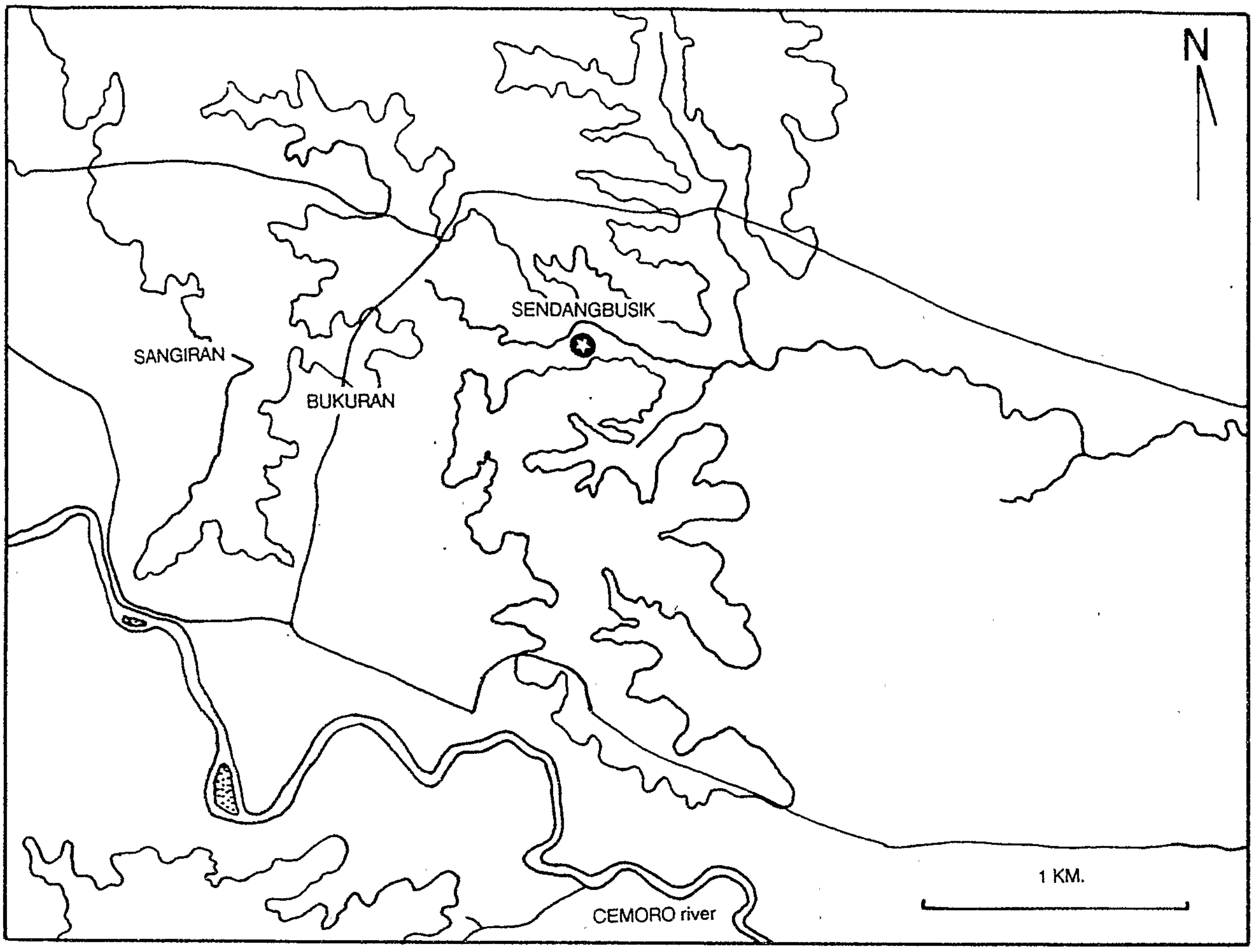
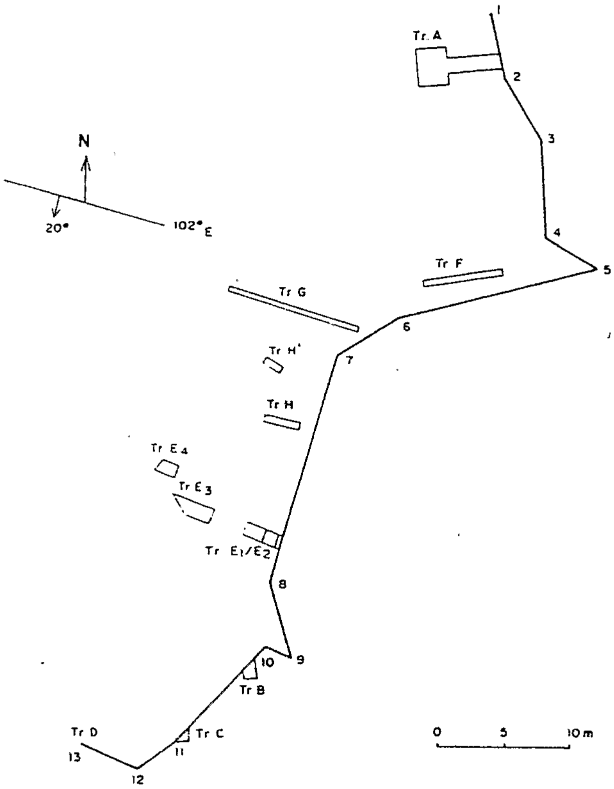


Fig. 1. Location of the site.



We also found two smaller, heavily rolled siliceous flakes (Figure 4) which can be related to the so-called Sangiran flakes from the uppermost Kabuh layers above trench D. The Hanoman 1 human fossil was found near trench G.

As seen in the trenches (Figure 5), the Upper Pucangan layers at Bukuran consist of black or blueish-gray clays, comprising a lot of beds with freshwater molluscs. Calcareous concretions are also found, mainly in the lowermost trenches. Several clayey layers represent weathered volcanic ash beds.

The Lower Kabuh layers begin with yellowish clays which are probably also the result of the weathering of volcanic ashes. The following beds are made of fluviatile gravelly and sandy layers, sometimes showing cross-bedded structures, where the material is mainly of volcanic origin. Those are often interrupted by fine-grained tuffs pointing to volcanic eruptions (Figure 6).

←
Fig. 2. Location of the stratigraphic trenches at Bukuran.

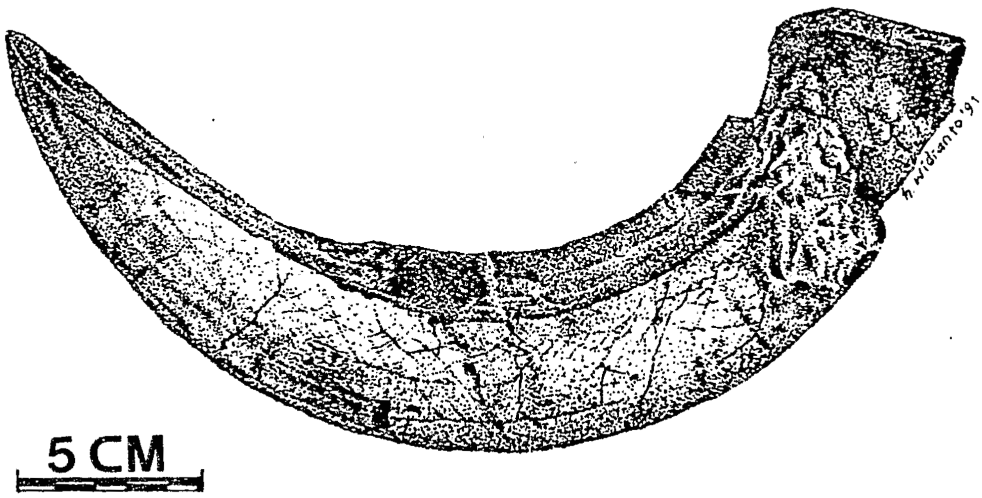


Fig. 3. Lower canine of the fossil *Hexaprotodon* sp. from Bukuran.

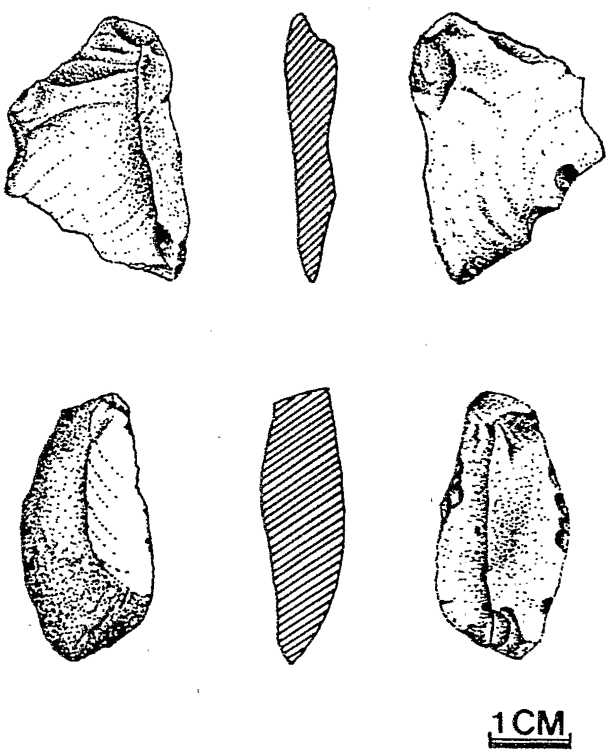


Fig. 4. Flakes from the Kabuh layers at Bukuran.

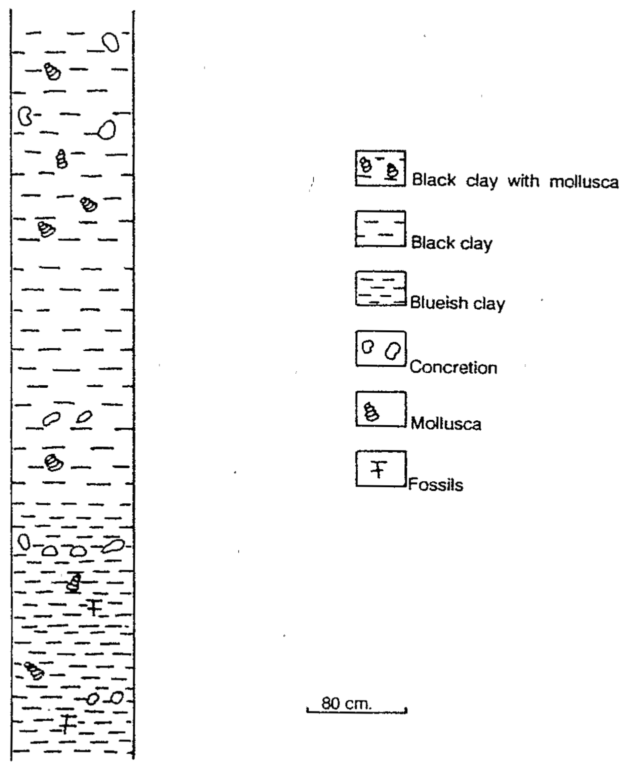


Fig. 5. Stratigraphic section of trench A (Pucangan formation)

Stratigraphic Reconstruction

The roughly vertical sections drawn during the excavation, like those shown on Figures 5 and 6, display distorted stratigraphic profiles of the trenches: they highly depend on the position of the wall of the trench relative to the structural lines of the site. As we can see on Figure 2, the orientations of the trenches are somewhat scattered, due to the morphological conditions we met in the field.The reconstruction of the stratigraphy had therefore to take these geometrical parameters into account:

First, we chose for each trench a point of reference which has been carefully plotted on the map and the relative altitude of which was calculated in the field. Then, all the reference points were projected on an arbitrary line parallel to the structural line of the site, oriented N102E. Drawing a virtually vertical section which includes this arbitrary line gives the relative vertical position of the reference points of the trenches. By tracing in that plane a line which dips 20° southwards (structural dip of the site), we could easily calculate the former altitude of the reference points of the trenches before the folding of the Sangiran dome.

Again taking the structural dip into account, and then drawing the non-distorted stratigraphic profiles, we obtained a group of sections distributed allover the true pre-folding vertical scale (Fig. 7).

The construction of the synthetic section completed on Figure 7 takes all these profiles into account. It extends over 35 meters, showing the upper 26 meters of the Pucangan unit, and the lower 9 meters of the Kabuh formation. It shows the position of the lowermost fossil-bearing horizon, together with the inferred stratigraphic position of the Hanoman 1 remains.

The Age of the Bukuran Section

Direct radiometric analysis carried out on the middle and upper Pucangan layers always gave Lower Pleistocene ages (SUZUKI et al. in MATSU'URA, 1982; see also WATANABE and KADAR, 1985), the youngest ones being about 0.9 million years. The Kabuh layers gave results ranging between 0.9 and 0.6 million years.

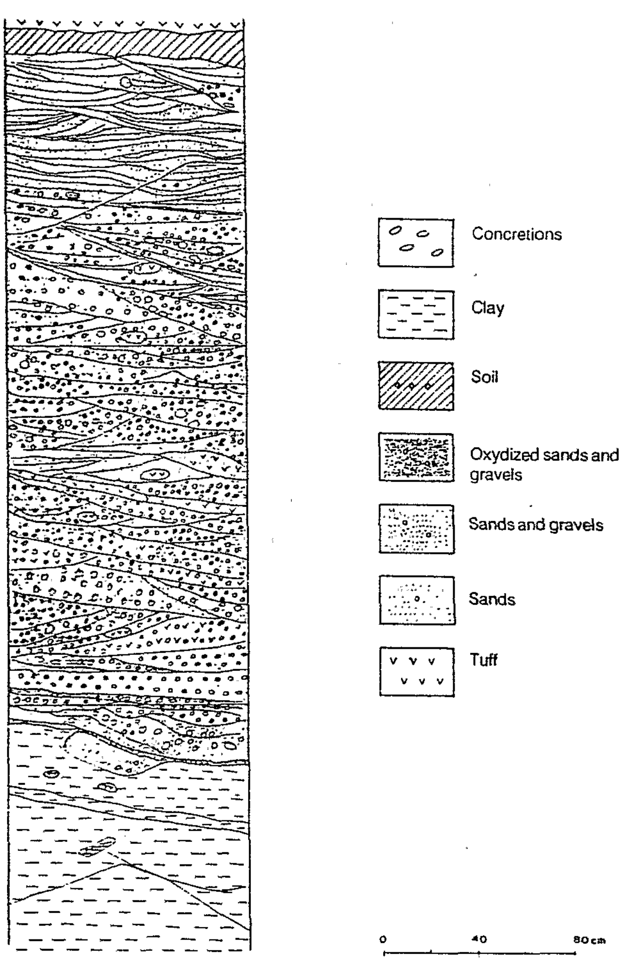


Fig. 6. Stratigraphic section of trench B (Kabuh formation).

The tectites found in the latter are contemporaneous with the Brunhes / Matuyama boundary, ca. 0.7 million years ago.

Paleomagnetic analysis (F.SÉMAH et al., 1980; YOKOYAMA et al., 1980; F.SÉMAH, 1986) show that the Pucangan / Kabuh boundary can be slightly older or slightly younger than the beginning of the Brunhes chron, depending on the location. The section of Bapang, not far from Bukuran, studied by F.SÉMAH (1986), clearly shows a reversed / normal transition, interpreted as the Brunhes / Matuyama boundary, about five meters below the last Pucangan bed.

From the results quoted above, we can therefore infer that the Bukuran section presented on Figure 7 covers a range of time between 1 million years (or somewhat older) and 0.6 million years ago.

An important fact to consider is the lithological facies of the Pucangan / Kabuh boundary at the excavation place. The so-called Grenzbank, a transitional sequence between the Pucangan and Kabuh unit (G.H.R. VON KOENIGSWALD, 1940) is lacking at Bukuran. At other sites, like in Ngebung or even at Bapang, the top of the Pucangan beds is covered by a conglomeratic bed, sometimes calcified, in which marine (lagoonal) and continental elements are mixed. This boundary bed can be developed as a several meters thick transitional stratigraphic zone. The *Meganthropus* B lower jaw found by MARKS in 1952 comes from that Grenzbank zone.

In Bukuran, where the tuffaceous and fluviatile Kabuh sequences directly overlie the Pucangan clay, no transitional bed is observed. It is possible that part of the upper Pucangan beds is truncated by erosion of the older Kabuh rivers. In such a case, the age of the lower part of the synthetic Bukuran section could be older than assumed. Anyway, the Sangiran dome itself covers a large area (more than 30 km^2), and we have to be very cautious when trying to make chronostratigraphic correlations based on lithological facies changes.

Identification and Reconstruction of Hanoman 1

The reconstruction of Hanoman 1 (H1) is a delicate work. The specimen consists of 16 small fragments, of which the state of conservation is not perfect. Each fragment was numbered from H1 (1) up to H1 (16). This reconstruction is made from casts (resin), and the identification of each fragment is mainly based on the observation of the cast and of the original. Nevertheless, it poses sometimes certain difficulties.

Some fragments show traces of connection that allow us to associate them. The morphological cha-

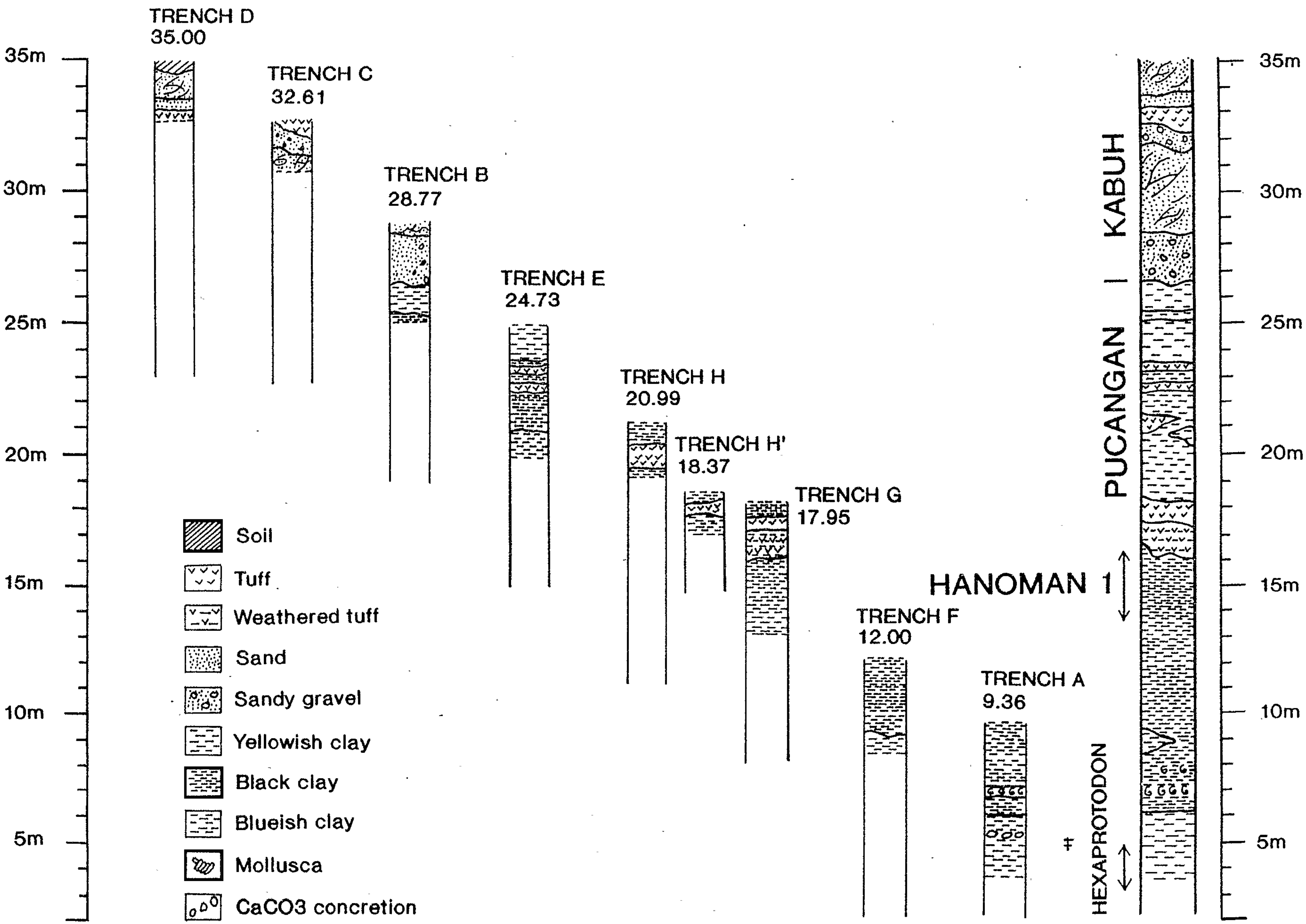


Fig. 7. Stratigraphic correlations between the Bukuran trenches.

racters (sutures, meningeal grooves, relief of the internal face, etc.), trace of connection, thickness and colour of bones, are some factors that played an important role during the process of identification. Finally, we attributed these fragments as follows:

- 3 frontal fragments : H1 (13), H1 (15) and H1 (16)
- 3 right parietal fragments : H1(5), H1(6), and H1(7)
- 4 left parietal fragments : H1(1), H1(2), H1(3), and H1 (4)
- 2 occipital fragments: H1 (11) and H1 (12).

Four fragments, however, remained to be identified because they have no trace of connection. These are H1(8), H1(9), H1(10), and H1(14). Again, by using the morphological characters, we have tried to position them on the skullcap.

Identification of the Isolated Fragments

H1 (8):

The form of this fragment is irregular, while the external surface is convex and wrinkled (Figure 8). It displays an artificial depression. On the other hand, two sutures are preserved along its borders, separated by an angle of 117°. They seem to be the intersection of the right and left parts of the lambdoid suture.

The ectocranial surface is divided by a groove into two equal depressions. According to its position, this groove should correspond to the occipital (sagittal) sulcus or the transverse sulci, and the two depressions represent the two cerebral fossae (if the groove is the occipital sulcus), or the cerebral fossa and cerebellar fossa (in the case of tranverse sulci).

Based on the form of the lambdoid suture and the biasterionic breadth, we suppose that this fragment is part of the occipital planum that preserved the occipital sulcus between the two cerebral fossae.

H1 (9):

This fragment is more regular than the previous one (Figure 8). It shows two straight edges running parallely, while the third is perpendicular to the first two. The fourth and the fifth sides form an angle of about 100°.

The external surface is convex, smooth, and has a depression due to the artificial removal of the outer table. The ectocranial surface is transversally concave, and clearly shows the imprints of the meningeal grooves. We think that this fragment is part of a parietal.

Classically, the meningeal grooves for the middle meningeal vessels will bend to the top and backward, approaching the sagittal border. The most anterior branch is parallel to the coronal edge of the parietal. Most of the branches tranverse the bone toward its occipital angle, and disappear 1 to 3 cm before reaching the sagittal border (PATURET, 1951). The meningeal grooves persist to the right direction for the right parietal, and to the left direction for the left one. The orientation of the grooves shows that this specimen should be a fragment of the middle part of a right parietal, situated about 3 or 4 cm from the sagittal border.

H1 (10):

This fragment is also irregular (Figure 8). Its ectocranial surface is convex and slightly debilited near the small preserved suture. The presence of a rather deep meningeal groove allows us to attribute this fragment to a parietal bone.

Two important morphological characters can be used for a more precise identification: a small part of suture and a meningeal groove. The position of this groove relatively to the suture reminds us of a left coronal suture. In this case the fragment would be a small anterior part of the left parietal.

H1 (14):

This fragment has a rectangular shape (Figure 8). The ectocranial surface is convex and wrinkled. A weak imprint of the meningeal grooves is visible on the endocranial surface. This piece is identified as a small fragment of the parietal bones.

The long and thick side should represent the upper part, while the thin one would be the lower part. On the other hand, the short and thin edge should be the anterior part, and the thick one the posterior part. Regarding its thickness this piece was part of the left parietal bone.

The imprints of the meningeal grooves on the endocranial surface are horizontal and weak. These characters are usually observed on the lower part of the parietal, between the middle and the posterior branches of the middle meningeal vessels, above the squamosal suture.

Morphological Description

The reconstruction of Hanoman 1, based on 16 small fragments belonging to the frontal, parietal, and the occipital bones, represents only a small part of each side. However, the reconstruction provides us with some important information about the morphological features of the skull.

Concerning the metric study, as we do not have clearly defined points of reference, we extrapolated the meeting points of the sutures and took the average of several measurements.

a. Norma verticalis (Figure 9).

The anterior part of the frontal, in front of the postorbital constriction, and all the lateral parts of the parietals, are lacking. The morphology of the frontal can be estimated due to the occurrence of an important postorbital

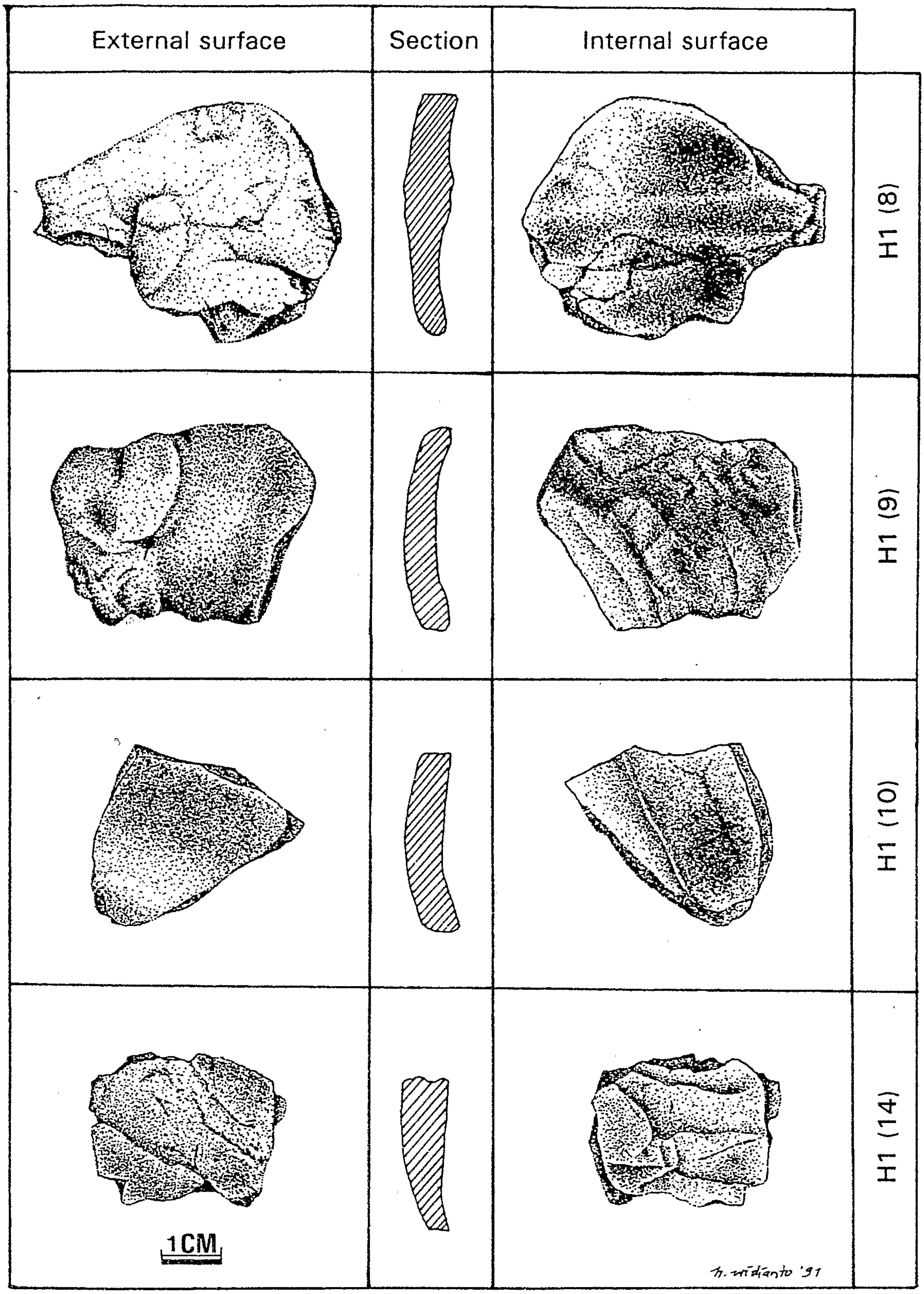


Fig. 8. Isolated cranial fragments of Hanoman 1.

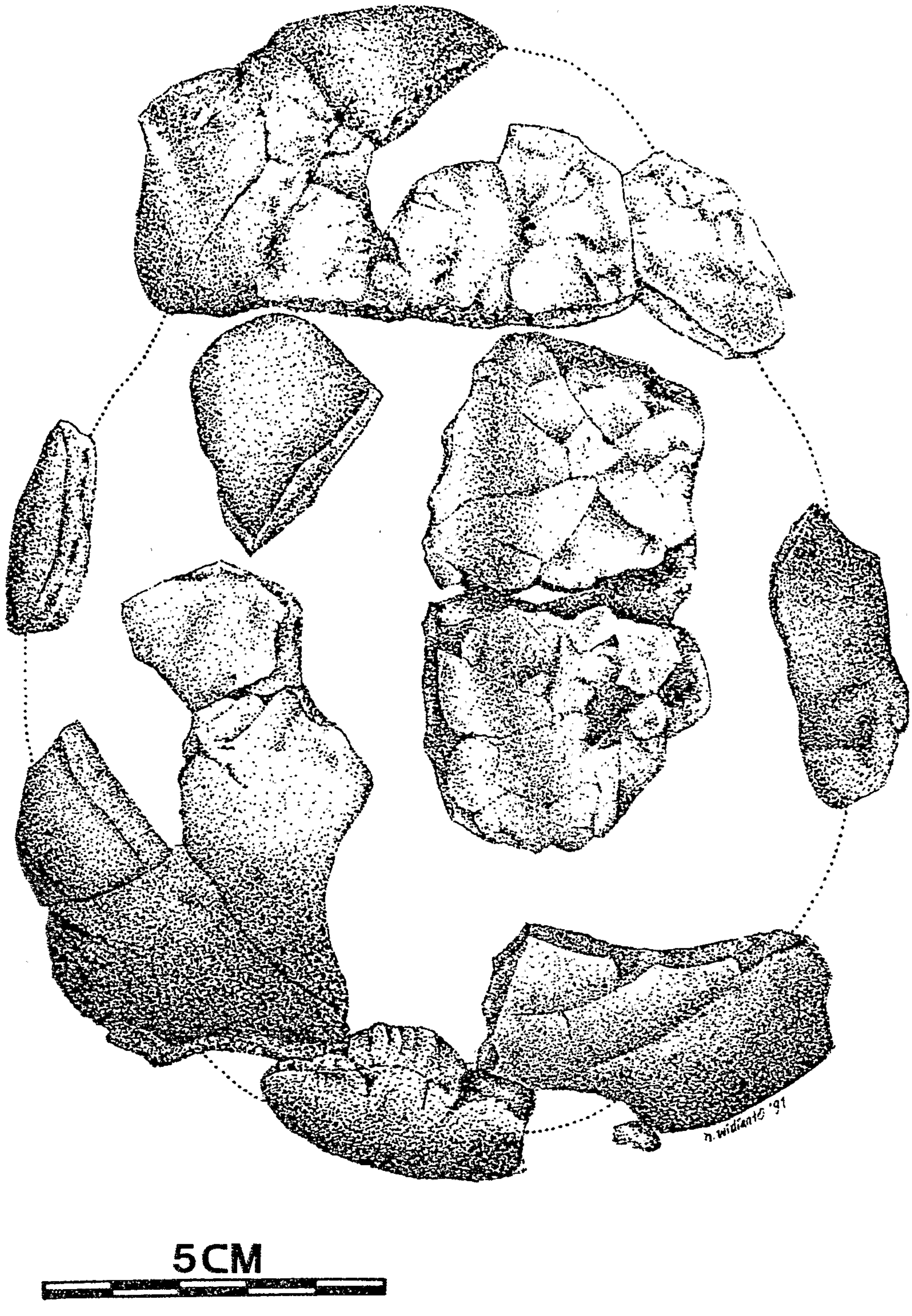


Fig. 9. Reconstruction of Hanoman 1 in norma verticalis.

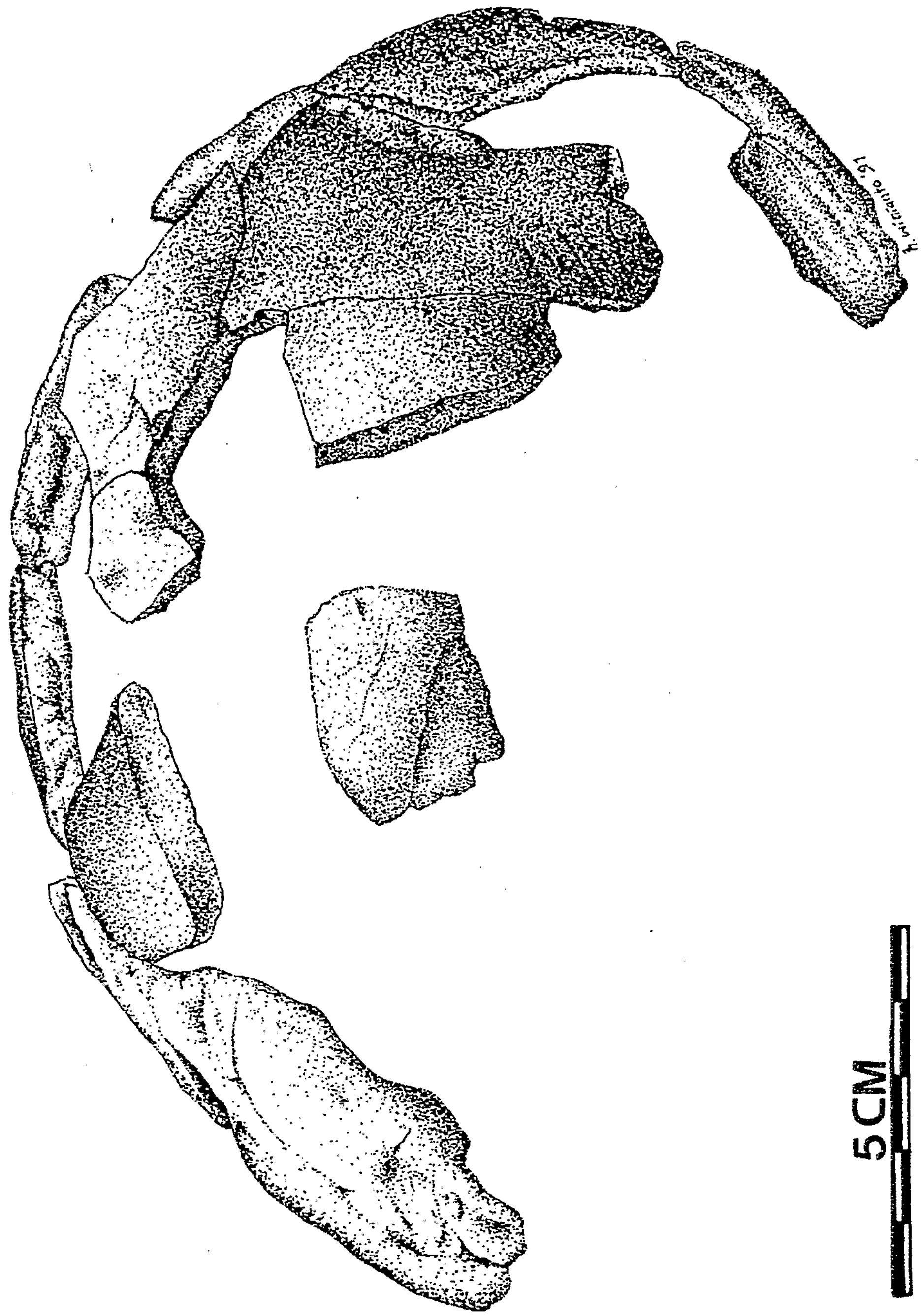


Fig. 10. Reconstruction of Hanoman 1 in norma lateralis.

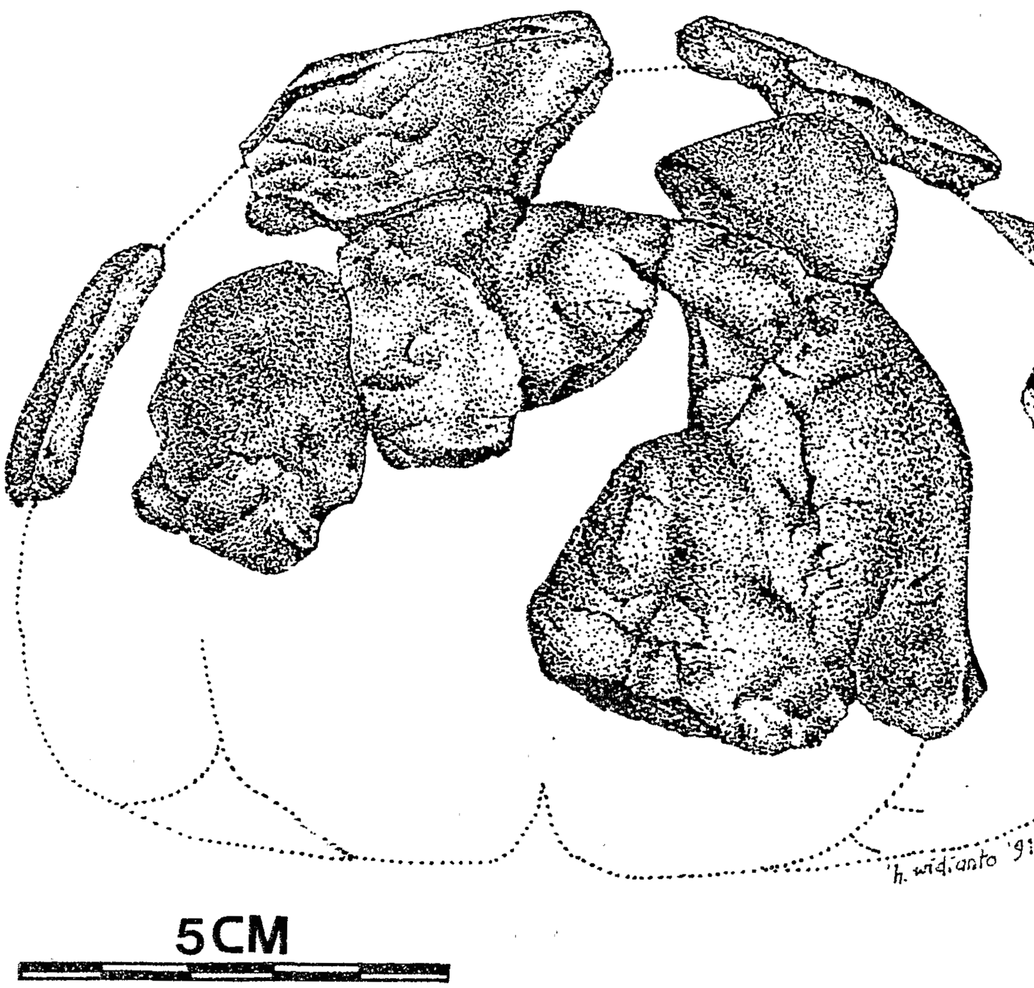


Fig. 11. Reconstruction of Hanoman 1 in norma facialis.

constriction on the left side, preserved on H1(16). It shows that the minimum breadth of the frontal was much reduced. Its left coronal suture seems to be straight until the postorbital constriction.

The anterior sides converge anteriorly and join the postorbital constriction. The posterior part forms a regular arch. The reconstruction shows clearly the general sphenoidal scheme of S.Sergi (in Martin and Saller, 1957), the same scheme as all hominids from Trinil and Sangiran. But it is different from that of Sambungmacan I, Ngawi I, or those of the Ngandong group. The maximum breadth of this reconstruction is situated in the temporal region. No parietal foramen is visible in the norma verticalis.

b. Norma lateralis (Figure 10).

Most of the parietal fragments correspond to the same parasagittal contour from the frontal to the lambdoid suture. The superior temporal line is only preserved on the left frontal. It seems that this line lies in the upper half of the bone, as it the case with all hominids from Trinil and Sangiran. On the other side it is somewhat different from the Ngandong, Sambungmacan, and Ngawi specimens, where it is placed in the lower part of the parietal (Grimaud, 1982). The squamosal suture, the bevelled suture, is clearly preserved on the fragments H1(3) and H1(4) of the left parietal bone.

c. Norma facialis (Figure 11).

This norma is taken on the vertex. We notice the presence of a weak sagittal keeling indicated by an elevation of the sagittal edge of the right parietal. This sagittal keeling is limited by the parasagittal flattening of the upper part of the parietal, which stretches out to the fragment of H1(15). The cranial contour in this norma is slightly convex and somewhat elevated. The transversal curve of the cranial vault is regular and lacks any important angulation.

d. Norma occipitalis (Figure 12).

The weak sagittal keeling seen from the norma facialis reappears in this aspect, where it subsides posteriorly. An important angulation is formed between the upper

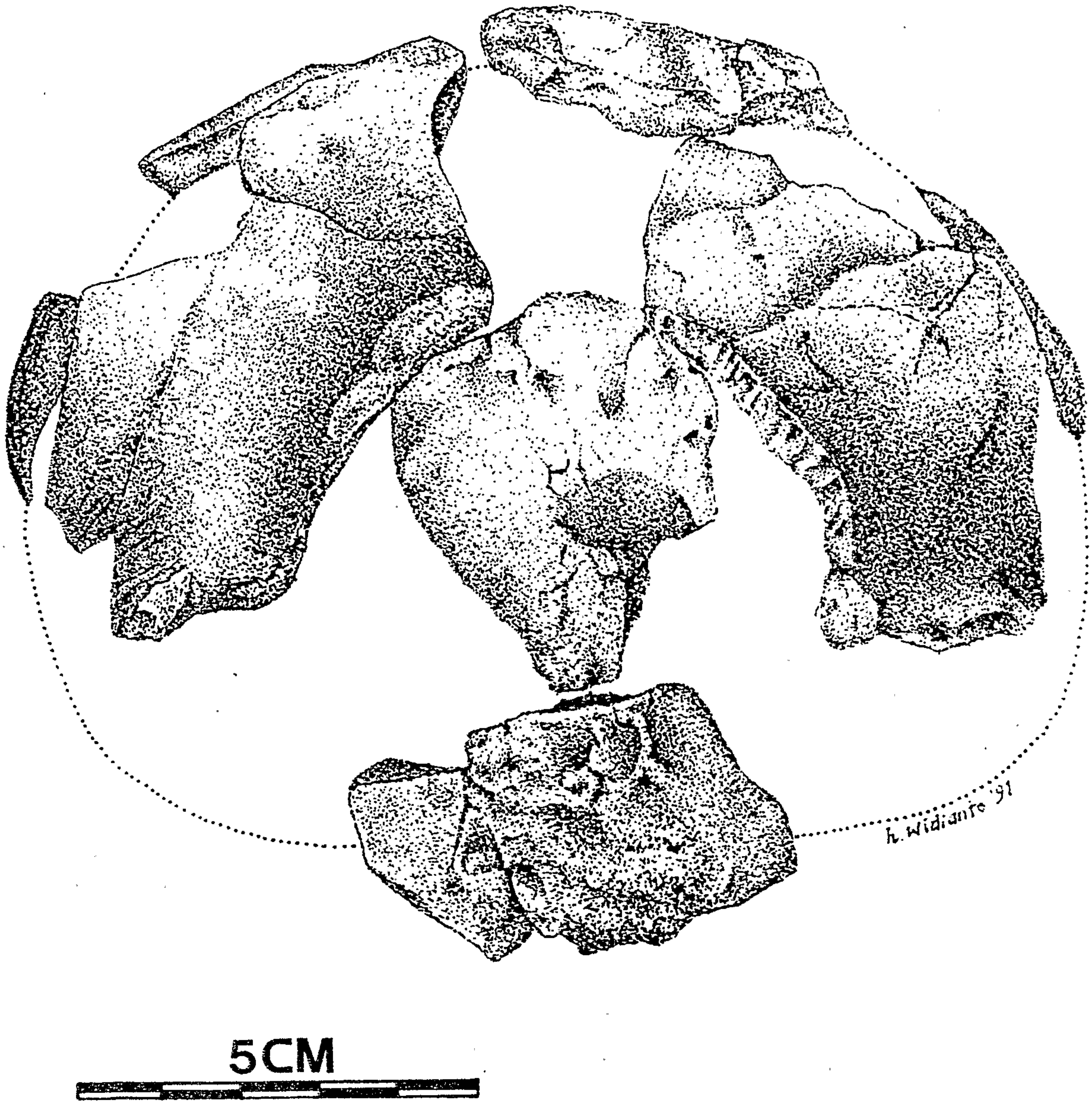


Fig. 12. Reconstruction of Hanoman 1 in norma occipitalis.

and lower parts of the parietal, the maximum breadth of which is positioned in the temporal region. This situation gives the implication to the transversal form of the biparietal vault in "pentagonal à pans latéraux convergents vers le haut". Except for its middle part most of the lamdbdoidal suture is present, and 2 cm long.

The asterionic region shows a considerable thickness of the bone. The mastoid angle is quite pronounced and creates a parietal notch in the middle of the squamosal suture. The position of this angle corresponds to the second type of VALLOIS (in M.-A. DE LUMLEY, 1973). Consequently, the asterion is situated in the middle of the squamosal suture.

Isolated Bones Observation

a. Frontal.

Hanoman 1 shows a very low and a slight inclination of the frontal vault, very flat, compared to that of *Homo sapiens*. On the left side, this frontal preserves a postorbital constriction. The distance between the superior temporal line and the sagittal region of the frontal is much shorter than in modern man, while there are no frontal bosses. These morphological characters of the frontal show an archaic tendency (* very low and slight inclination of frontal vault, presence of a postorbital constriction, presence of an elevation of the superior temporal line, no frontal bosses).

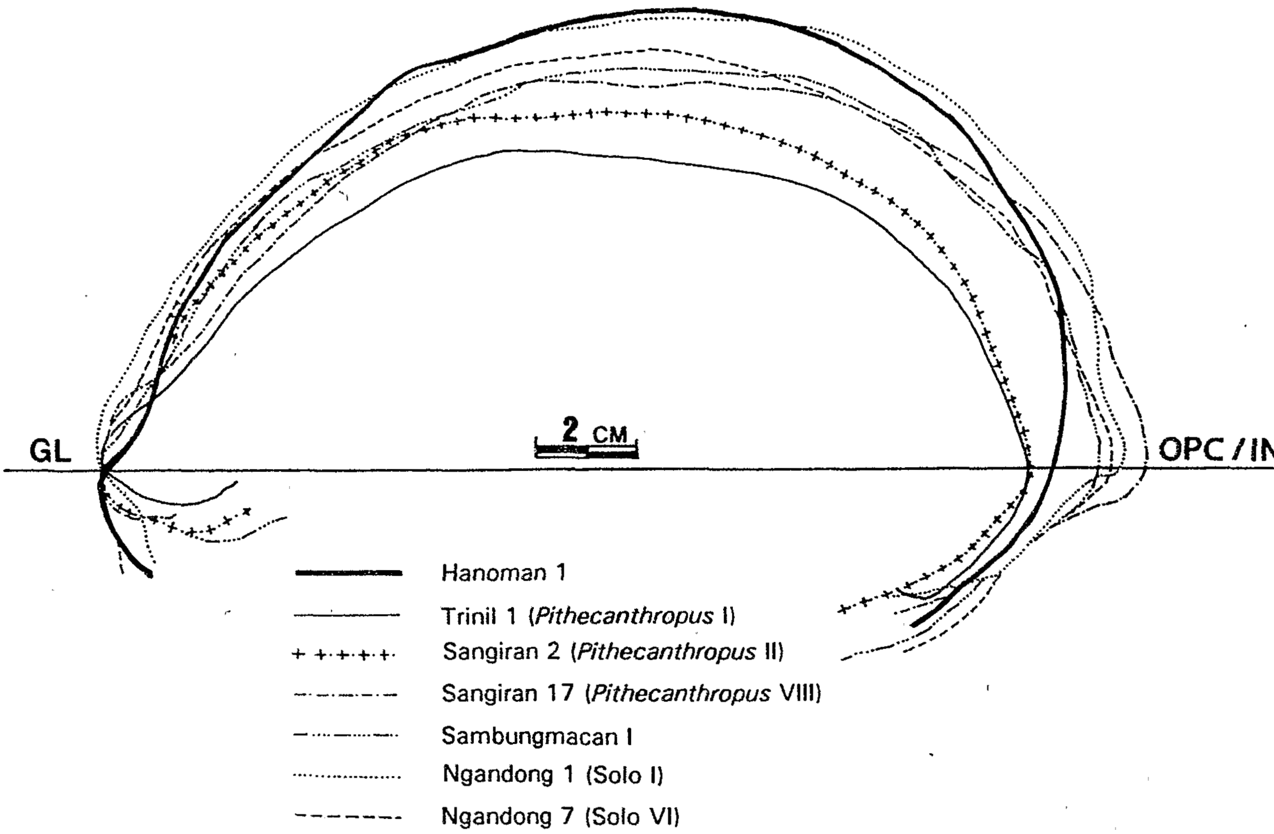


Fig. 13. Parasagittal curves: comparison between several *Pithecanthropus* skulls and the inferred shape of Hanoman 1.

The frontal inclination of Hanoman 1 is higher than that of Trinil 2 (*Pithecanthropus* I), Sangiran 2 (*Pithecanthropus* II), and Sangiran 17 (*Pithecanthropus* VIII), but lower than that of Ngandong I (Solo I) and Ngandong 7 (Solo VI) (Fig. 13). The frontal inclination lies between Sambungmacan I and Ngandong 7. The minimum frontal breadth, taken from the reconstruction by measuring symmetrically the temporal crest in the fragment of H1(16) is 97 mm, much wider than on *Pithecanthropus* II (79 mm), and *Pithecanthropus* I (84 mm), approaching *Pithecanthropus* VIII (99 mm) and Ngawi I (99 mm), but shorter than on Sambungmacan I (104 mm), Ngandong 7 .(104 mm), and Ngandong 11 (112 mm).

b. Parietal.

The sagittal curve of the parietal is flat, while the sagittal border is thick. A weak sagittal keeling is present. It seems that it has no parietal bosses, and biparietal breadth is in a low position, moving backward if we compare with the whole of the parietal bones. The anterior parietal sides converge anteriorly, where they directly join the postorbital constriction. The morphological characters of this parietal differ from those of *Homo sapiens*, but appear more archaic (* presence of weak sagittal keel, no parietal bosses, maximum cranial breadth lies in the temporal region, biparietal vault ow and moving backward, its anterior part narrow, joining the postorbital constriction).

The angular torus that appears in all hominids of Ngandong, Sambungmacan, Ngawi, and in the majority of the *Pithecanthropus* finds, is absent in Hanoman 1, although we notice a thickness in the left parietotemporal suture. The distance between the two asterions of this fossil is 97 mm, while the angle between asterion and lambda-asterion is 105^{o}. Among the *Pithecanthropus* finds (N=7), this angle ranges between 90^{o} and 105^{o} (average: 98,5^{o}), while it is 89^{o} to 108^{o} (average 96^{o}) in the Ngandong specimens (N= 98.5) (SPITERY, 1982). The value of Hanoman 1 falls thus into the limits of variation of all the hominids from Java.

c. Occipital.

The ectocranial surface of the fragments of the nuchal planum of H1(11) and H1(12) is rough, not allowing any estimate of the intensity of the planum nuchal relief. Together with the occipital planum of H1(8), they form a round occipital angulation, wider than that of Javan *Homo erectus*. In this reconstruction, the maximum breadth of the occipital is 97 mm (corresponding to the biasterion breadth). Its occipital height (lambda-sphenobasion) cannot be determined, ut he occipital should be somewhat rounder than any other hominid from Sangiran and Trinil.

Conclusions

Some important characters can be underlined from the study of this reconstruction. The frontal and the parietal of Hanoman 1 show the archaic state of characters, much closer to *Homo erectus* than to *Homo sapiens*: a moderately low, long, and flattened cranial vault. Most of the values for the outline in general, the size, the form, and morphological characters observed from this reconstruction, point to the limits of the variation of *Homo erectus*. The only occipital part still raises a problem: the place of the fragment H1 (8) gives the occipital angulation, which is different to that of the *Homo erectus* group from Java. That is why a more detailed study of the original fragment will be very important in order to solve this problem.

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