A Fossil Hominid from Rudolf

T. Whitworth

The South African Archaeological Bulletin, Vol. 21, No. 83. (Oct., 1966), pp. 138-150.

Stable URL:
http://links.jstor.org/sici?sici=0038-1969%28196610%2921%3A83%3C138%3AAFHFR%3E2.0.CO%3B2-U

The South African Archaeological Bulletin is currently published by South African Archaeological Society.

A FOSSIL HOMINID FROM RUDOLF

T. WHITWORTH

Hatfield College, University of Durham

SUMMARY

In 1959, a fossilized human skull including the right branch of the mandible was discovered, still partly enclosed in undisturbed late Pleistocene lake beds, near Kabua Water-hole on the west side of Lake Rudolf. It is a long, narrow and thick walled skull with receding brow and immensely massive mandible, but possessing only modest brow ridges and rather inflated occiput. The face was probably large, with smooth muzzle and diminutive anterior dentition. Resemblances to other fossil Hominidae are listed, and the age of the skull is discussed.

INTRODUCTION

In the summer of 1959, a party from the University of Durham visited the remote district of Turkana in northern Kenya to study the geology of the region bordering the west shore of Lake Rudolf. The expedition was financed by the Council of the Royal Society and by the Trustees of the Boise Fund. Substantial assistance was also provided by the Government of Kenya through its Chief Geologist, Dr. W. Pulfrey, and by East Africa Command.

The Durham party was in Turkana from July to September. Near Kabua Gorge, excellent outcrops of Pleistocene lake beds were discovered, overlying Miocene volcanic rocks. The lacustrine sediments contain profuse fossilized mollusca, and yield less well preserved remains of a suite of fossil mammals indicating rather more humid conditions at the margin of the late Pleistocene Lake Rudolf than now obtain there (Whitworth, 1965A). In places, numerous weathered-out artifacts litter the eroded surface of the deposits (Whitworth, 1965B). The remains of a fossilized human skull were recovered from the Pleistocene lake sediments and form the subject of the following account.

I wish to acknowledge my obligation to Professor T. S. Westoll, F.R.S. and Dr. A. Zinovieff, who have read the script of this paper and have made valuable suggestions for its improvement. In addition, Mr. W. H. Charlton, L.D.S. has given advice and information which has been gratefully incorporated; and Dr. K. P. Oakley has kindly permitted me to examine a great quantity of fossil hominid material in the collections of the British Museum (Natural History).

DESCRIPTION OF THE HOMINID SKULL

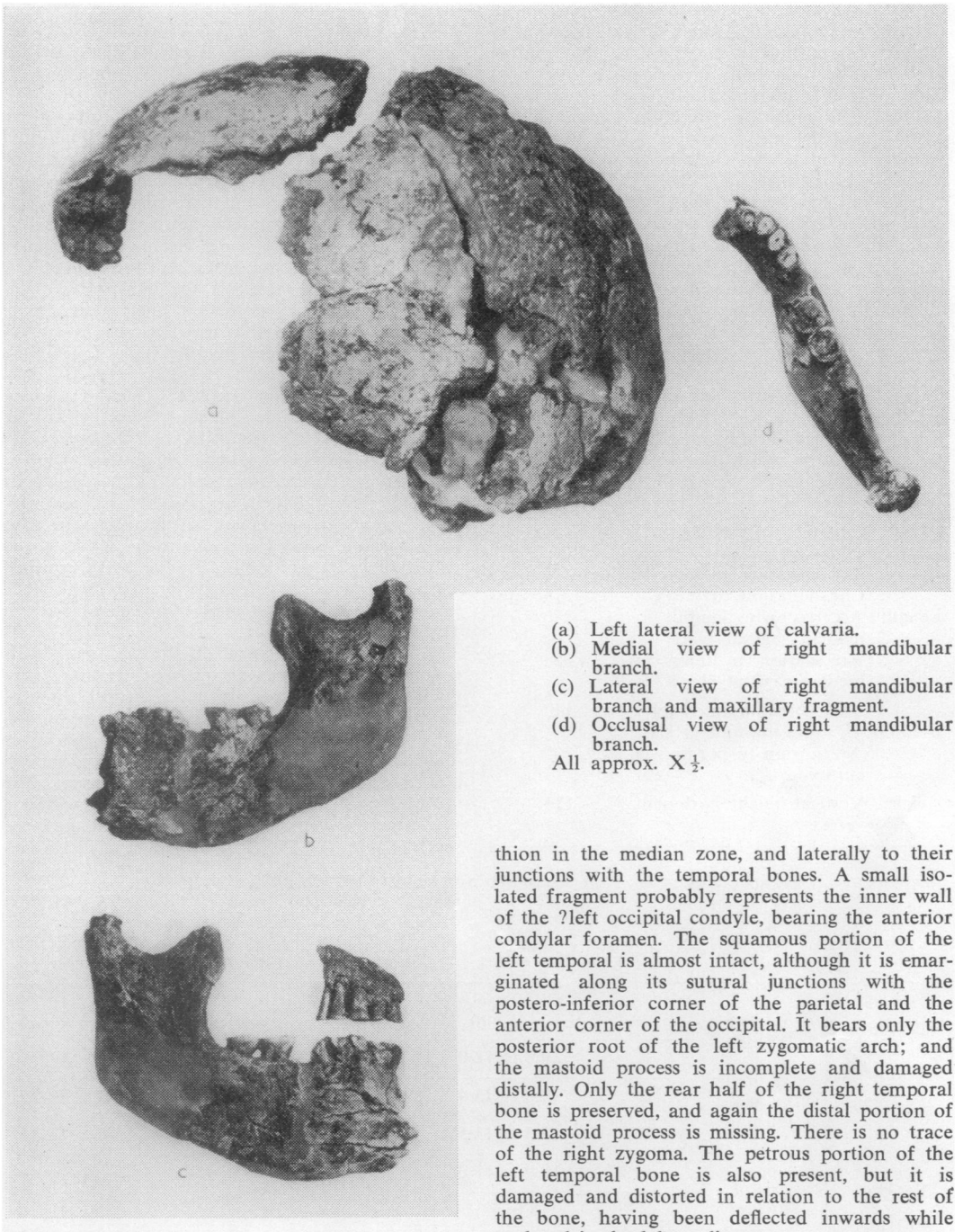
The fossilized hominid skull from Kabua was found on 8th September 1959. The skull was undisturbed, lying on its left side, with its right surface exposed by recent gullying, in littoral Pleistocene deposits, belonging to the lower part of the lacustrine succession, about 1,250 yards SSE of Kabua Water-hole (approximate position 35°47′E., 3°27′N.). Closely associated in the sediments with the skull were the upper part of a humerus, and a few badly weathered cervical vertebrae and rib fragments. Nine days after its discovery, the skull and associated remains (subsequently termed Kabua 1) were removed. Simultaneously, the surrounding sediments were trenched to provide stratal sections and a minute search was made for associated implements, both on the surface immediately adjacent, and in the trench sections. Unfortunately, no artifacts were found in place, but part of a very large fossilized hippopotamus was discovered *in situ* with its bones encrusted with lake shells, about twenty feet away from Kabua 1 and at approximately the same stratigraphical horizon.

The Material. Kabua 1 (Pl. 1) consists of the greater part of a calvaria, the right branch of the mandible, a fragment of the maxilla, and two isolated molar teeth. It is regrettable that the associated post-cranial units, which might have exhibited diagnostic features, were found on arrival in Britain to have disintegrated in transit.

The medial zone of the frontal bone is virtually complete from the approximate position of the nasion to the coronal sutures. There is a narrow, discontinuous perforation, due to post-mortem damage, along the line of the metopic (frontal) suture, suggesting imperfect closure of that suture at the time of death. The right half of the frontal is deflected downwards very slightly, and not quite as much bone is preserved on that side as on the left. The internal angular processes of the frontal seem to be complete; and the inner segment of the supra-orbital margin is present on both sides, but a little more extensively on the left side.

Of the parietal bones, the left is the better preserved. A small part is missing anteriorly in the mid-zone and the antero-lateral wing of the left parietal adjacent to the orbit is absent. The entire anterior half or more of the right parietal bone is wanting, although there is an isolated fragment of the cranial vault which probably belongs there. Both parietal bones are damaged by perforations of the cranial roof near the midline.

The squamous portions of the occipital bones are complete from the position of the lambdoid sutures forward to a point just behind the opis-



(a) Left lateral view of calvaria.
(b) Medial view of right mandibular branch.
(c) Lateral view of right mandibular branch and maxillary fragment.
(d) Occlusal view of right mandibular branch.
All approx. X $\frac{1}{2}$.

Plate I: Kabua 1

thion in the median zone, and laterally to their junctions with the temporal bones. A small isolated fragment probably represents the inner wall of the ?left occipital condyle, bearing the anterior condylar foramen. The squamous portion of the left temporal is almost intact, although it is emarginated along its sutural junctions with the postero-inferior corner of the parietal and the anterior corner of the occipital. It bears only the posterior root of the left zygomatic arch; and the mastoid process is incomplete and damaged distally. Only the rear half of the right temporal bone is preserved, and again the distal portion of the mastoid process is missing. There is no trace of the right zygoma. The petrous portion of the left temporal bone is also present, but it is damaged and distorted in relation to the rest of the bone, having been deflected inwards while enclosed in the lake sediments.

The floor of the cranium is missing from the foramen magnum forwards, due to the absence of the basilar portions of the occipital bone, the

sphenoid and ethmoid bones, and the majority of the basal parts of the temporals. The upper facial skeleton is represented solely by a fragment of the alveolar portion of the right maxilla, bearing I^1 to P^2. The right body and ramus of the mandible are well represented, with part of the lower dentition, although the symphysis and angle are missing, and the teeth show advanced wear. The articular condyle is slightly damaged at its postero-internal angle.

The skull has been subjected during burial to very mild lateral crushing which has slightly distorted the general shape. Through the kind cooperation of Dr. J. C. Trevor, and of his colleague Mr. D. R. Brothwell, it has been possible to attempt a three-dimensional reconstruction of the calvaria of Kabua 1, which incorporates a correction of this post-mortem distortion. The method employed was to select a conservative spacing and orientation of the preserved parts, and then to construct a flexible mould. The mould was next distorted in a manner believed to reverse the deformation which the fossil had suffered; and, while the mould was so distorted, casts were taken. This reconstruction, which was completed by reflecting across the median sagittal plane of the cranium parts only preserved on one side, reinforces the measurements of the skull derived from the actual material, and confirms the low frontal profile.

TABLE 1. DIMENSIONS OF CRANIUM OF KABUA 1

Length	Chord nasion to lambda	about 190 mm.
	Chord nasion to inion	„ 215
	Arc nasion to lambda in median sagittal plane	„ 250
	Arc nasion to inion in median sagittal plane	„ 320
Breadth	Max. breadth in vicinity of supra-mastoid crests	„ 140
	Arc porion to porion via vertex	„ 305
Height	Vertical height porion to vertex	„ 120

Cranium. The calvarial portion of Kabua 1 is, in general terms, rather small, being long and narrow in dorsal aspect, long and somewhat low in lateral view. Even after correction for slight post-mortem compression there remains a suggestion of median longitudinal keeling in the frontoparietal region of the skull. The measurements in Table 1 are in some instances approximations, since their source is partly the incomplete material, partly the reconstruction mentioned above; but it seems unlikely that they seriously misrepresent the original dimensions of this skull. Thus the Cephalic Index of Kabua 1 is less than 70, indicating a marked dolichocephaly which is coupled with a modest cranial height. Nevertheless, the rather shallow calvaria of Kabua 1 appears to have been associated with a large face. This is indicated by the size and shape of the fragments of facial skeleton which are available. These fragments cannot be orientated satisfactorily one with the other, and related properly to the calvaria and its reference points, unless Kabua 1 is furnished with a somewhat disproportionately high face (see attempted reconstruction of entire skull in Text-fig. 1).

A pronounced feature of the calvaria is its robustness. The bones of the skull roof are very thick and are consistently at the upper limit of ranges of thickness recorded in modern human skulls, although external sculpturing of the bones of Kabua 1 and thickenings related to muscle attachments are not particularly pronounced. The thicknesses of human skulls vary greatly within a single race, and even in different parts of the same skull (Table 2). The frontal and parietal bones

TABLE 2. LIST OF SOME RECORDED THICKNESSES IN THE HUMAN SKULL

Bone	*Region*	*Left or Right*	*Kabua 1*	*Singer (1958)*		
				Europeans	*Cape Coloured*	*Bantu*
Frontal	Median Portion	L	10·0 to 12·0 mm	3·0 to 13·0 mm	1·8 to 10·0 mm	3·0 to 14·0 mm
		R	10·0 to 12·0	3·2 to 13·4	1·7 to 11·1	3·0 to 14·0
Parietal	Median Portion	L	10·8 to 13·0	4·2 to 11·1	3·0 to 10·2	3·9 to 12·3
		R	11·5 to 13·5	4·0 to 11·2	3·5 to 10·1	3·0 to 11·3
	Upper Lateral Portion	L	10·0 to 11·0			
		R	9·5 to 11·1			
	Lower Lateral Portion	L	7·0 to 9·0			
		R	6·0 to 7·5			

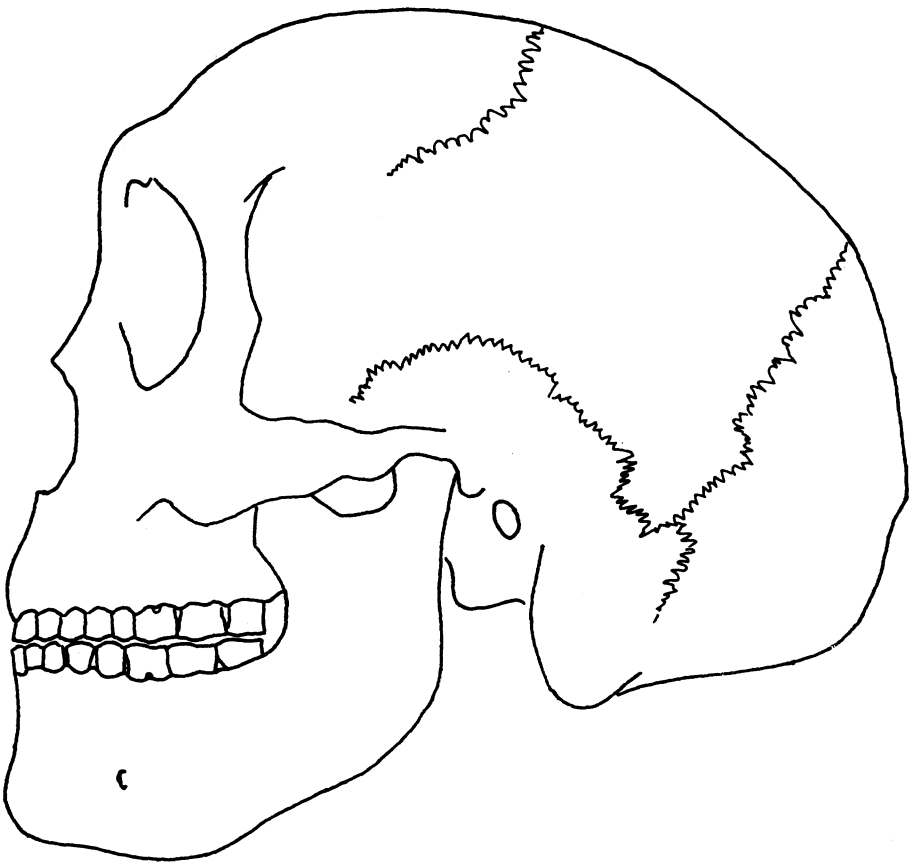


Fig. 1. Reconstruction of skull of Kabua 1. X $\frac{1}{2}$.

seem to provide the most consistent indices of thickness. The great thickness of the bones forming the cranial vault of Kabua 1 appears to be due largely to an abnormally thick development of cancellous bone between thin inner and outer lamellae of compact bone.

Viewed from above, Kabua 1 shows no sign of the pentagonal outline attributed to the boskopoid skulls, and found in some other extinct and recent crania; and there are no lateral parietal inflations. Indeed, the greatest breadth of this skull is approximately at the level of the asterion. Neither is there any sign of the interparietal fossa, said to characterize the boskopoid skulls, but actually present to a varying degree in many other skulls. When viewed from above, the cranial outline of Kabua 1 is smoothly oval. Another striking feature of Kabua 1 is the low brow and receding frontal bone which, in lateral view, shows near resemblances to that found in the Javan neanderthaloids (Weidenreich, 1951) and in some other neanderthaloid skulls, notably La Chappelle man (see Text-fig. 2). The frontal profile of Kabua 1 is also closely comparable with that of the Broken Hill skull, if the latter is divested of the enormous bony thickening at the level of the upper orbital margin. Moreover, the relationship between lambda and inion is similar to the characteristic neanderthal condition, in that the cranial roof slopes backwards slightly from lambda to inion, although this slope in Kabua 1 is perhaps nearer to the vertical than in the classic neanderthalers. On the other hand, the occiput of the Turkana calvaria, between inion and opisthion, is more convexly inflated in lateral profile than is commonly found in adult European neanderthalers. There is rather close resemblance here to the condition found in some of the fossil hominids from Mount Carmel. Unfortunately, the orientation of the foramen magnum cannot be determined accurately, neither is it possible to specify the size and shape of the aperture.

It is similarly impossible to determine the precise size and shape of the orbits from the small segment of each supra-orbital margin that is available; but the dimensions of those parts of the facial skeleton which are preserved suggest that the orbits must have been rather higher than is

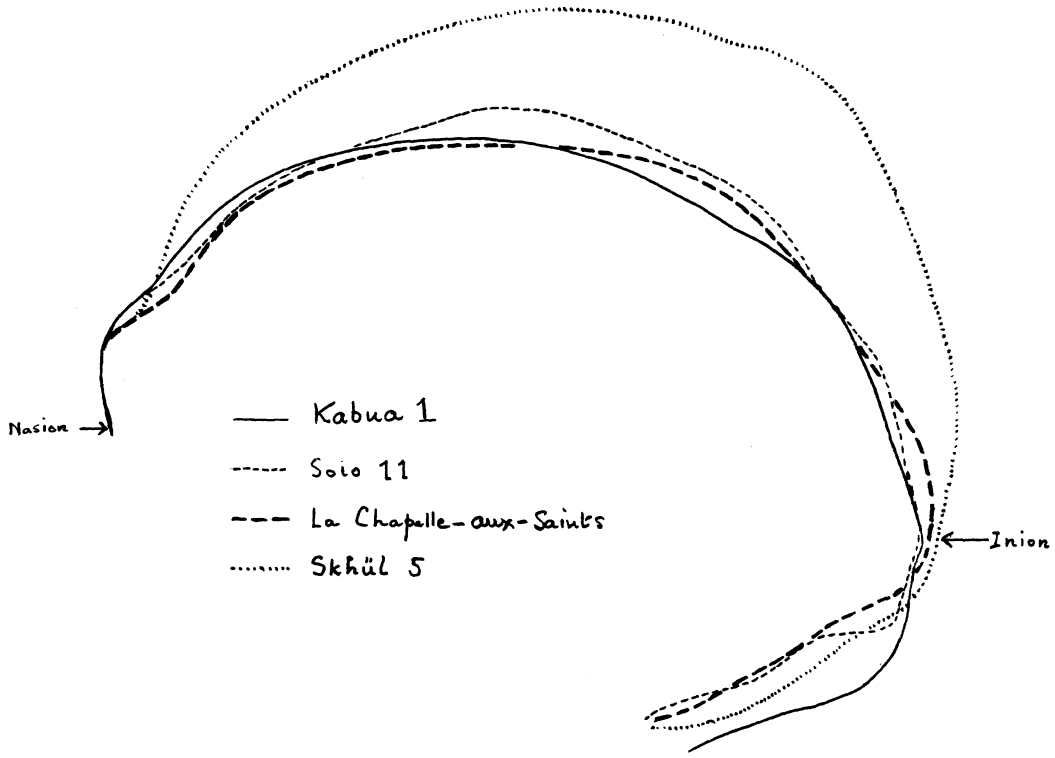


Fig. 2. Superimposed lateral profiles of four fossil skulls (Kabua 1, Solo 11, La Chapelle-aux-Saints and Skhül 5) oriented so that the nasio-glabellar regions coincide, and the iniac and postoccipital regions are roughly coincident. All approx. X½.

usual in modern *Homo sapiens* (Fig. 1). The internal angular processes in Kabua 1 are rather wide, so that the interorbital breadth, measured from dacryon to dacryon, is nearly 30 mm. This feature, taken in conjunction with the generally narrow nature of the calvaria, indicates that the orbits were probably also rather narrow, relative to their height. On the left side the inner part of the supra-orbital notch is present and suggests that this was large, open and well developed, possibly with a pronounced spine. In contrast, there is evidence only of modestly developed, rather rounded brow ridges, similar to those found in some reputedly female neanderthaloid skulls. There is also a fairly robust, slightly inflated, median glabellar thickening, not nearly as pronounced as in Rhodesian Man. There is no sign of a persistent metopic suture in the vicinity of the nasion and glabella, although the perforation and damage along the mid-line of the frontal farther back suggest that closure of the metopic suture was only just completed, or imperfectly completed, at the time of death. Internally, the frontal ridge is strong, angular and well defined. The state of preservation does not permit conclusions to be drawn concerning the nature of the frontal lobe of the brain, except tthat it was depressed and rather narrow. It is likely that the position of the fracture which forms the rear margin of the preserved portion of the frontal bone is closely related to the location of the coronal sutures, and may indicate that those sutures too were in process of closure, at the decease of the individual.

The parietal bones show no distinctive peculiarities, except their smoothly rounded transverse profile, which reflects a complete absence of the lateral parietal inflations that to some extent characterize recent human skulls and, incidentally, fossil boskopoid skulls. The inferior three-quarters of the lambdoid suture are open on the right side to within one inch of lambda; but the suture is almost completely obliterated on the left side, only being traceable with difficulty for a short distance in its middle tract. There is some indication of a small wormian bone on the right side, at the upper extremity of the open section of the lambdoid suture. The temporal bones, as far as they are preserved, do not show any marked abnormalities. All their sutural junctions with the

parietal and occipital bones (and probably also the anterior sutures between the temporal and sphenoid bones) seem to be open, or in the very early stages of closure, on both sides of the cranium. The sutures linking the squamous and petrous portions of the temporal bones were closing, but the fusion is incomplete, so that the courses of the sutures can be clearly distinguished.

The inferior and superior curved lines of the occiput are both well defined, but neither is very robustly developed. The area between the inferior curved line and the foramen magnum provides an unusually flat surface for muscle attachment, which is perhaps a little more extensive than is common in recent crania of similar size. There is no development of an external occipital protruberance, but there is a small, bony, backward-projecting hook at the mid-point of the inferior curved line, where it meets the ill-defined external occipital crest. The occipital condyles, as far as can be judged from the portion of the inner wall of the ?left condyle which is preserved, seem to have been distinctly larger and more robust than in recent hominid skulls.

It is not possible to distinguish very much of the internal sculpturing of the posterior cranial walls of Kabua 1, but in general the ridges and grooves are less pronounced and less sharply angular than in recent skulls. The internal occipital crest is strong, but not so angular as is customary in modern man, and the internal occipital protruberance is perhaps more broadly convex. The exact course of the groove for the superior longitudinal sinus is very difficult to determine.

The only remaining fragment of the upper facial skeleton belongs to the right half of the maxilla and consists of a part of the alveolar process, bearing I^1 to P^2, and the inferior portion of the body. The length of the alveolar margin occupied by these teeth is short, the arc from the alveolar point to a position on the outer maxillary wall opposite the external mid-point of P^2 measuring only 30 mm. There is just enough of the maxilla preserved to indicate that the anterior root of the zygomatic arch originated in approximately the same position in relation to the upper dentition as in recent human skulls. On the other hand, the nature of the external surface of this fragment gives the impression that the premaxillary portion, which is not ridged by the roots of the teeth, was rather smooth and flat across the front, with an appearance distinctly reminiscent of the muzzle-like condition found in classic neanderthalers. This flatness, coupled with the mutual relationships of the incisors, canines and premolar teeth, hints at a markedly semi-circular upper dental arcade, but the evidence is too incomplete to permit a definite pronouncement to this effect. Again, there is not enough of the maxilla preserved to be very certain about the canine fossa, but it seems likely from the general contours of that part of the maxilla which is available that the canine fossa was either ill-defined or absent.

Mandible. Only the right half of the mandible of Kabua 1, less the angular section, is present, but the remains are sufficient to permit an accurate reconstruction of the complete mandible. The lower jaw seems to have been abnormally large for the calvaria, but there is no doubt in the minds of the collectors that they belong to the same individual. The robustness of the mandible is quite extraordinary, and the massiveness of its body matches that of the Heidelberg jaw, as the measurements in Table 3 indicate. The reference point in the table termed the "masseteric marginal point" is adopted from McBurney *et al.* (1953) since, in the absence of the angle, it can probably be estimated more reliably than any other useful reference point in that vicinity. For definitions of other measurements employed in Table 3, see Buxton and Morant (1933) and Trevor (1950). One of the most interesting features of the mandible is the marked change in direction of the alveolar margin at the position of emplacement of the lower canine, which is clearly aligned with the incisors, whereas the premolars are aligned with the molar teeth. This arrangement resembles the condition found in a number of neanderthal mandibles, and differs from the condition normally encountered in modern human mandibles, where there is usually a gradual and progressive change in the orientation of the lower teeth along a parabolic curve from the incisors to the molars. Thus there is some further evidence of a widely semi-circular dental arcade in Kabua 1, which reinforces the less complete, but similar, indications of the maxilla.

The body of the mandible in Kabua 1 (Pl. I, Figs. b-d) deepens forward, but in an unusual manner. With a smooth, downward-facing convexity of its splenial margin, the body attains its maximum depth beneath the first lower molar, and then shallows again under the premolars. The condition of the inferior border of the mandible closely resembles that found in the Mauer and Ternifine jaws. On the other hand, Kabua 1 possessed a chin, perhaps developed to approximately the same extent as the chin of the male neanderthaler from La Ferassie, almost certainly less developed than is common in modern European man. There is a clearly defined incisive fossa.

Externally, the body is broadly convex, although its outer wall is dented by post-mortem crushing beneath the second and third molars. The external oblique line can be clearly distinguished, and possesses a degree of definition similar to that found in recent human adults. The mental foramen is placed about 24 mm below the alveolar margin at the junction of the second premolar and first molar, that is, about 18 mm above the

TABLE 3. DIMENSIONS OF MANDIBLE OF KABUA 1

Symphyseal height (subsymphyseale to infradentale)	approx. 40.0 mm.
Minimum depth of body, ectopraemolare to inferior margin	42.0
Minimum depth of body below M_1	43.0
Minimum depth of body, ectomolare to inferior margin	40.0
Minimum depth of body below M_3	36.0
Maximum thickness of body near mental foramen	18.0
Maximum thickness of body below M_2	19.0
Maximum thickness of body below M_3	more than 22.5
Length of mandible (shortest distance between intradentale and right condylion)	approx. 113.0
Bicondylar width of mandible (between lateral extremities of condyles) calculated by reflection across an estimated standard sagittal plane	approx. 138.0
Minimum breadth of ascending ramus (front to rear)	40.0
Chord coronion to approximate masseteric marginal point	approx. 77.0
Chord incisura to approximate m.m.p.	approx. 66.0
Chord condylion to approximate m.m.p.	approx. 83.5
Breadth of sigmoid notch (coronion to condylion)	33.5
Greatest depth of sigmoid notch (from coronion-condylion line)	12.0
Condylar length (lateromedial maximum)	approx. 21.0
Condylar breadth (anteroposterior maximum)	approx. 15.0

splenial margin of the mandibular body. In this, the position of the foramen differs slightly from the condition found in recent man, where the foramen is usually placed beneath the junction of the first and second premolars, or thereabouts, and in adults is approximately equidistant from the upper and lower margins of the mandibular body. In recent juveniles the mental foramen lies closer to the alveolar margin than to the inferior border.

Internally, the most pronounced feature of the mandibular body is the strong development of the mylohyoid ridge into a massive mandibular torus. It is this which gives a thickness to the body that rivals the robustness of the Heidelberg and Ternifine mandibles. Above the oblique ridge, between it and the posterior molars, is a deep and pronounced fossa which does not seem to be well developed in recent hominid mandibles, but is there superseded by an alveolar prominence. The mylohyoid ridge is replaced further forward by another thickening of the inner surface of the body, which lies above the sublingual fossa, approximately equidistant from the upper and lower margins of the body. The sublingual fossa is rather shallow; and another somewhat shallow fossa is developed between this antero-internal ridge and the buccal border of the mandible in the vicinity of the premolars and the canine. There is also a pronounced submaxillary fossa between the mylohyoid ridge and the cervical border of the body beneath the molar series, although this fossa may be exaggerated by post-mortem damage. To the rear, the internal oblique ridge swings upwards and, passing in front of the strong lingula, joins the coronoid process in the normal manner. Unfortunately, the inferior border of the body is damaged near the digastric fossa and it is impossible to determine the precise nature of the digastric muscle impressions. On the other hand, despite the fracture of the mandibular body just behind the symphysis, there remains some indication of the shape of the extremely deep and thick symphysis. In section it seems to have been intermediate, in some respects, between the symphyses of classic neanderthalers and of modern man. For example, the symphysis of Kabua 1 extended anteriorly into a chin, which was probably clearly defined but less pronounced than in most recent hominids. Conversely, the upper part of the inner symphyseal face seems to have possessed a convexity which echoes the condition in the neanderthalers without quite equalling it, but exceeds the corresponding convexity in the majority of modern mandibles.

Most of the mandibular angle is missing. Nevertheless, the anterior edge of the coronoid and the alveolar margin of the body can be united in a smooth unbroken curve, so that the mylohyoid ridge lines up correctly with the internal buttressing of the coronoid process; and the connexion of the two fragments, as reconstructed, cannot be substantially inaccurate. The peculiar shape of the inferior margin of the mandibular body prevents the use of a precise measurement like the mandibular angle (angle between standard rameal and standard horizontal planes) by pro-

foundly affecting the disposition of the standard horizontal plane; but in general terms it can be said that the ascending ramus (which is rather small and low in relation to the body, although its absolute height is greater than in most modern hominid mandibles) probably does not incline backwards from the body quite as much as in recent men. On the other hand, the ramus is strongly constructed with the customary thickenings apparently more pronounced than is usual in recent mandibles. The coronoid process is rather low by comparison with that of modern mandibles, the coronion being a trifle lower than the condylion. This compensates the more upright disposition of the posterior rameal margin in relation to the body, when calculating the rameal angle, which is about 78° and differs little from rameal angles commonly encountered in modern man. The coronoid process is broad from front to rear, with an approximately straight posterior edge and the leading edge extended into a pronounced, forward-pointing angle. There is a strong vertical rib on the inner surface of the ramus, which runs down from the coronion, about 3 mm behind this anterior angularity, and rejoins the leading edge of the coronoid process about 28 mm below the coronion. The main internal buttressing of the coronoid, which descends just in front of the inferior dental foramen to join the mylohyoid ridge of the body, is also unusually thick and strong, and extends closer to the rear margin of the coronoid process than is customary in modern man; thereby greatly reducing the extent and depth of the fossa which lies between the internal buttressing and the trailing edge of the coronoid, and receives an important part of the mandibular insertion of the temporal muscle. The outer side of the coronoid and the inner surface of the neck of the condylar process do not show any unusual features; but the outer surface of the condylar neck is reinforced by an abnormally strong vertical thickening which underlies the lateral extremity of the condylar head. The shape of the articular surface, viewed from above, differs from the condition normally found in recent hominid skulls, since the posterior rim of the sigmoid notch extends upwards as a buttress which actually contributes a small antero-lateral lobe to the otherwise oval articular surface. Consequently, the condylar breadth (maximum antero-posterior diameter of the condylar head) is much greater in relation to the condylar length (maximum transverse diameter) than is usual in modern mandibles. This anterior buttressing of the condylar process also gives it a much more upright appearance than the condylar process of recent hominids. The sigmoid notch is both shallow and wide, but neither characteristic is as pronounced as in the Mauer jaw. The inferior dental foramen seems to be stationed a small distance above the level of the alveolar margin of the body.

Dentition. The upper teeth preserved on the right maxillary fragment of Kabua 1 comprise first incisor to second premolar. In general terms, the anterior teeth are distinctly small; and they have been literally planed-off by wear, the severity of which is unusual in the anterior dentition of a comparatively young individual, and argues either a very resistant diet, or perhaps the habitual use of the anterior teeth for some purpose such as the preparation of hides. In the incisor teeth, wear has exposed the pulp cavity and secondary dentine seems to have developed. All the teeth have been truncated on their labial faces almost to the cervical border of the enamel, and on the incisors the surface of wear transgresses on to the neck of the tooth lingually, so that very little can be deduced about their initial crown patterns.

The upper incisors are normal, in that the first is larger than the second; and the root of the first is of rounded cross-section, while that of the second incisor is compressed in a proximo-distal direction (in relation to the jaw articulation). It is not possible to determine the full course of the cervical margin of the enamel owing to wear. The canine was clearly a stout tooth, larger than the incisors, with a crown of almost rectangular section, but a little convex labially. There is perhaps a less pronounced neck than there is in the upper canines of recent hominids, and the root here is unusually wide (proximo-distally) and is ungrooved on its distal surface. The type of wear on the canine makes it improbable that the tooth ever projected appreciably beyond the incisors and premolars, although the root is rather stouter than in modern man.

The upper premolars possessed crowns of oval section, the labiolingual diameter of the first being greater than that of the second. In both teeth, the roots are single and strongly compressed in a proximo-distal direction. The root of the first premolar is grooved longitudinally on both its proximal and distal surfaces: that of the second is grooved proximally, but is apparently unaffected on its distal surface. An isolated and badly weathered molar tooth, closely associated with Kabua 1, may be an upper molar. The crown is of roughly rectangular section, its measurements being: maximum proximo-distal diameter 12.4 mm; maximum labio-lingual diameter 10.8 mm. Unfortunately, little can be distinguished of its original occlusal pattern, except that it is probably the remnant of a four-cusped tooth.

The right branch of the mandible of Kabua 1 carries only the roots of the second incisor to second premolar, the anterior root of the first molar, and very badly worn second and third molars. The anterior dentition appears to have

been remarkably small for such a massive jaw. The root of the second incisor, which is strongly compressed in a proximo-distal direction and longitudinally grooved (at least on its proximal surface), suggests that the tooth was even smaller than the corresponding upper tooth, as in recent hominids. The lower canine too possesses a similarly compressed root (smaller than that of the upper canine) which may have had very shallow longitudinal grooves on both its proximal and distal surfaces. Both the lower premolars were small, with oval roots, but the root of the first is perhaps more compressed in the proximo-distal direction than that of the second. In addition, the root of the first lower premolar is smaller than that of the first upper premolar; whereas the second lower premolar seems to have been rather unusual, in that, judging by the size of its root, it was approximately as large as the corresponding upper tooth.

TABLE 4. DIMENSIONS OF TEETH OF KABUA 1

		Max. proximo-distal diameter	Max. labio-lingual diameter
I^1		6.5 mm	7.5 mm
I^2		5.3	6.2
C		7.0	8.3
P^1		6.0	10.0
P^2		6.0	9.0
I_2	Roots only		5.7
C			7.4
P_1			8.0
P_2			9.0
M_2		12.0	12.2
M_3		11.7	11.5

Nothing can be said about the first lower molar, except that it was a large tooth, possessing roots clearly divided into an anterior group, longitudinally grooved, and a similar posterior group, in the manner commonly found in recent hominid mandibles. The crowns of the second and third molars are worn down almost to the inferior limit of the enamel in a manner which again indicates unusually severe abrasion, and very little of their crown pattern can be distinguished. Both teeth are a little larger than their counterparts in the majority of recent adult hominids, but the second molar is a trifle larger than the third. Both are almost equidimensional, the crown of the second molar approximating to a square section, the third being more nearly circular in cross-section. As is normal in modern dentitions, the lingual wall of the crown is almost vertical, the labial wall is more inflated and overhangs the roots. The second molar appears to lack a posterior fifth cusp, but the third molar may have originally possessed a weak development of the fifth cusp. There are no signs of cingula on either tooth. These two fossilized molar teeth also exhibit some less usual features. For example, the neck is perhaps less pronounced than in the bulk of modern human molar teeth. A more striking character, only occasionally found in recent dentitions, concerns the roots. The roots of the second lower molar in Kabua 1 seem to consist of two external roots and a single, median, pillar-like internal root, almost equalling the crown in its proximo-distal diameter; and these three roots give the impression of complete fusion everywhere except beneath the labial face of the crown. Under the third molar, even that division is either absent or much reduced, and there appears to be only one pillar-like root which is shallowly grooved externally. This association of the molar roots into a single column, coupled with a reduction of the normal cervical constriction of the tooth, recalls the condition of taurodonty found in many of the neanderthaloid dentitions from Krapina in Yugoslavia.

There remains an isolated neck and crown of a lower molar belonging to Kabua 1, which is probably the left third molar. Its dimensions are: maximum proximo-distal diameter of the crown 11.9 mm; maximum labio-lingual diameter 11.2 mm. This tooth closely resembles the emplaced third molar of the right side, and possesses the same arrangement of the roots. At the level at which the roots are detached, below the neck, they are completely fused into one stout, circular pillar, containing a single lumen of triangular section, with one side of the triangle placed underneath, and parallel to, the labial wall of the crown.

Similarities and differences exhibited by Kabua 1. The comparisons summarized below are presented solely on a morphological basis, and no implications of affinity are intended, unless specified. They are derived from direct collation of Kabua 1 with the other fossil material which is quoted.

Kabua 1 possesses a number of distinctive anatomical features, notably: a long, narrow, immensely thick-walled cranium which attains its maximum breadth about the level of the temporal bones, and lacks lateral parietal inflations; a low, receding frontal with brow ridges and inflated glabella; a rather long face, probably enclosing high, widely-spaced orbits, and possessing a deep, massive mandible with modestly developed chin; a maxilla smooth and muzzle-like across the front; broadly semi-circular dental arcades and small anterior dentition; an occipital which, although a trifle inflated below the inion, nevertheless sloped forward from inion to lambda when correctly oriented. Most of these characters serve, in combination, to distinguish Kabua 1 from the

various groups of Hominidae traditionally regarded as *Homo sapiens,* and tend to align Kabua 1 with the several neanderthaloid types of fossil hominids.

The low frontal profile of Kabua 1 is closely paralleled by the receding forehead of the Javan man from the late Pleistocene of Ngandong (Fig. 2), and by the East African Kanjera and Eyasi men; and it lies also within the range of variation found in the foreheads of European and Middle Eastern neanderthaloids. It is true that the supra-orbital ridges of Kabua 1 are substantially weaker than those usually encountered in classic neanderthalers, or in Wadjak, Rhodesian and Eyasi Man. Nevertheless, even the brow ridges of Kabua 1 are developed to an extent that lies within the range encountered in some allegedly female neanderthal skulls and in the less robustly constructed elements of the Solo assemblage, and they equal the supra-orbital development of Kanjera Man. Furthermore, they are coupled with a moderately strong glabellar inflation which adumbrates the more massive interorbital thickening found in Rhodesian Man.

The smoothly semi-circular coronal section of Kabua 1 in the parietal region is another point of similarity with the majority of neanderthaloid skulls and, incidentally, with the Kanjera and Swanscombe skulls. Many fossil hominid skulls (notably the boskopoid crania, a very few neanderthalers and, as reconstructed, Eyasi Man) are distinguished by a varying development of bilateral inflations of the parietal bones, which produce a slight interparietal flattening or concavity. This feature is also common in modern bushmen and occurs sporadically in the skulls of many other modern races, but is totally unrepresented in Kabua 1. On the other hand, further forward, the Turkana cranium may possess a very slight tendency to median frontal keeling, which is a character shared by a number of other fossil Hominidae, principally Solo, Wadjak and Rhodesian Man, the boskopoid cranium from Singa, a few European neanderthalers, and the South African Fish Hoek skull.

In the thickness of its cranial walls Kabua 1 has few rivals. Broadly speaking, neanderthaloid skulls do not possess an exceptionally robust cranial vault, despite their large size and pronounced local thickenings, and the majority of them are appreciably thinner walled than Kabua 1. It is noteworthy that the closest approximation to the thickness of Kabua 1 is probably found in the Kanjera 3 skull, and perhaps also in another East African fossil, Eyasi Man (although there are infrequent occurrences of an equivalent robustness even in *H. sapiens*). Incidentally, the Kanjera skull, as reconstructed, and Kabua 1 share a further similarity with Rhodesian Man, in that their cranial outlines when viewed from above are very roughly oval. All three show a minimal tendency to the pentagonal outline which is well defined in the boskopoid and Solo crania, and is also clearly distinguishable in Eyasi Man and a few European neanderthalers.

The occiput of Kabua 1 is, in the disposition of the area between the inion and lambda, characteristically neandertholoid; but in the region between the inion and the foramen magnum it seems to have been rather rounded and inflated, in a manner quite foreign to the typical European, African and East Indian neanderthaloids. In this respect Kabua 1 can be more closely aligned with some of the acromegaloid fossil skulls from Palestine (particularly those examples which Brothwell, 1961, prefers to regard as *H. sapiens*), and with sundry neanderthal ?females and juveniles from European localities.

The high face of Kabua 1, with its tall, widely-spaced orbits, smooth muzzle and large mandible is self-evidently of generalized neanderthaloid type. However, in some details the mandible of Kabua 1 is very like the Lower Pleistocene Mauer jaw and the Middle Pleistocene mandibles termed *Atlanthropus mauritanicus.* In all these three forms, the mandibular body is virtually identical in size and massive construction, and in all three possesses a pronounced convexity of its inferior margin below the first molar. In fact, Kabua 1 fits almost perfectly to the left mandibular branch which is termed, in the British Museum (N.H.) collection of casts, *Atlanthropus* 2; except that *Atlanthropus,* like *H. heidelbergensis,* possesses not the slightest vestige of a chin, and the symphysis is distinctly simian. The curve of the lower dental arcade in Kabua 1 is closely matched in *Atlanthropus,* whereas the branches of the Heidelberg jaw diverge more strongly, in a manner recalling the condition in the fossil male jaw of *H. sapiens* from Obercassel. *Atlanthropus* and Kabua 1 possess a very similar coronoid process and sigmoid notch, but the coronoid of the Mauer jaw is lower and wider, and the incisura is shallower. Conversely, the backward inclination of the articular process is greater in *Atlanthropus* than in the other two; and *Atlanthropus* has the mental foramen placed below the second lower premolar, while the Heidelberg and Turkana jaws both have the foramen below the junction of the second premolar and first molar. In all three types the incisors and canines are surprisingly small in relation to the size of the mandible. This is also a feature of many other massively constructed, fossilized hominid jaws, such as those from Kanam and Wadjak, and of many

neanderthaloids. A detailed character of the Turkana mandible, the angular projection on the leading edge of the coronoid process, is repeated in *Atlanthropus* (and, incidentally, in the Saldanha and Wadjak skulls, some European neanderthalers, and the more *sapiens*-type Springbok Flats skull) but is absent from the Mauer jaw. Thus the lower jaw of Kabua 1 possesses a number of distinctive structural features in common with the fossil mandibles from Mauer and Ternifine. Some of these characters are customarily classified as archaic, but they are associated in Kabua 1 with one markedly "neanthropic" character, the possession of a chin; and it must be stressed that there is no intention here of attributing phylogenetical significance to these features shared with the northern ape-men.

The Kanam mandible also shows some resemblance to Kabua 1, notably in its massiveness and depth of body, the slight chin which probably remains after the defects in the mental region have been discounted, and the almost exactly similar sizes of the anterior teeth. It is worth remarking that of seven groups of characters recently quoted by Tobias (1960) as confirming, in association, the non-*sapiens* nature of Kanam Man, no less than five of them (very deep symphysis; very great body height at the first molar; absence of taper in body from symphysis to molar region; size relations of canines and incisors; and great thickness of body) apply with equal force to Kabua 1. The Wadjak jaw and a few neanderthaloid mandibles rival that of Kabua 1 in size, but invariably possess a straight lower margin to the mandibular body, and usually show a greater rearward inclination of the ascending ramus than Kabua 1 does. One other fossil mandible, that from Haua Fteah near Derna, has a general similarity in shape to Kabua 1, but a weaker construction. In addition, the ramus is very slightly higher and more inclined to the rear, and the third lower molar is a little more reduced than the corresponding tooth in Kabua 1.

From the similarities and differences listed above it is evident that Kabua 1 is, broadly speaking, a variant of the neanderthaloid type of skull. Where there are differences from the standard neanderthal pattern, almost invariably Kabua 1 differs only in degree, and, in respect of any one major character, the condition in Kabua 1 lies within the total range of variation exhibited by the extensive known series of neanderthaloids. Even the distinct chin of Kabua 1 is paralleled by a comparable development in, for example, the adult male neanderthaler from La Ferrassie and in the Palestinian Tabun 2. The only difference that seems to distinguish Kabua 1 unequivocally from all known neanderthaloids is the general shape of the mandibular body with its maximum deepening beneath the anterior molars. This condition has not been found so clearly developed in any European, Middle Eastern or Asian neanderthaloid possessing a suitably preserved lower jaw. It is unfortunate that information about the mandibles of African neanderthaloids is so scanty. The lower jaws of the Rhodesian and Eyasi hominids are unknown: the Haua Fteah mandible is only partially preserved and lacks parts which might be critical in establishing important resemblances: the Hopefield mandible is fragmentary. Nevertheless, despite the anomalous shape of the mandibular body, I am inclined, on balance, to regard Kabua 1 as representative of an African neanderthaloid stock, part of a spectrum of acromegaloid hominid types present in that continent at least until late Pleistocene times. The alternative possibilities, that Kabua 1 is a freak or an example of pathological deformity, have not been ignored, but are thought to be less likely.

Granted this conclusion, there remains the question of whether Kabua 1 can be related rather more intimately to any of the other African neanderthaloids of approximately similar age, such as Rhodesian, Saldanha, Eyasi and Kanjera Man. The material comprising Kanjera 3 is fragmentary, and some of it was not *in situ*, so that the reconstruction of the calotte must be to some extent conjectural; and even the Middle Pleistocene date proposed by Leakey (1935) has been questioned. Nevertheless, this Kanjera skull (collected about 275 miles SSW of Kabua) shows close agreement with Kabua 1, in its Cephalic Index, in the frontal profile, the strength of the brow ridges, the thickness of the cranial vault, the cranial outline in dorsal aspect, and in the shape of the coronal section at the parietals. There could be a rather close relationship here. Correspondence in Eyasi Man is less pronounced, despite the similar thickness of the cranial roof bones. In both reconstructions of *Africanthropus* present in the British Museum (N.H.) collections, the brow ridges are stronger than in Kabua 1, the skull is mesocephalic, there is a stronger tendency to pentagonal outline in *norma verticalis*, and the coronal section is of different shape. Indeed, Wells (1951) has suggested that Eyasi Man might conceivably show bushmanoid affinities. Both the Saldanha and Rhodesian skulls possess a pronounced oval outline when viewed from above, but have much stronger supra-orbital thickenings than Kabua 1, and occiputs which resemble more closely those of the La Chapelle, and similar, neanderthalers. In some measure, the differences between Kabua 1 and the Broken Hill skull parallel differences which have been commonly quoted to distinguish between the skulls of supposedly male and female neanderthalers from European sites; although it must be admitted that Genovés (1954) has seriously questioned the validity of those criteria.

AGE OF THE HOMINID SKULL

Some indications of the age of the lake beds which yielded the hominid skull, Kabua 1, are provided by the molluscan fauna of the lake beds and by the artifacts and fossil mammals which they yield. Abundant freshwater mollusca are excellently exposed *in situ*, and are believed to indicate, broadly speaking, an upper Pleistocene age. The fossilized mammals derived from the lower half of the inshore facies of the lake beds form an interesting assemblage, since nearly all of them are identical with, or closely similar to, modern species, but hardly any of them are present on the west side of Rudolf today (Whitworth, 1965A). Included are the spotted hyaena, an extinct equid, two kinds of warthog and a bush-pig, an unusually large hippopotamus, duiker, bushbuck, and probably water-buck and roan antelope.

Artifacts were found in appreciable numbers on the surface of the Kabua lake beds, but none was *in situ* (Whitworth, 1965B). Nevertheless, they are all untravelled and it must be assumed that they were derived from the lake beds on which they reposed. The assemblage includes Kenya Stillbay tools in chert and a poorly represented microlithic industry of Upper Kenya Capsian affinities, both of which probably came from the lower part of the lake bed sequence. Plentiful Sangoan hand-axes in basaltic lava were presumed to originate from a slightly higher horizon, while advanced Lupemban points fashioned in chert were restricted to the top of the lake beds, and a suite of bone and elephant ivory harpoon heads is believed to be younger than any of the other implements. The evidence of the fossils and artifacts suggests that the Kabua lake beds range in age from late Pleistocene to epi-Pleistocene. Of these various artifacts, the Kenya Stillbay tools were invariably found closest to the site at which Kabua 1 was recovered, some of them being discovered only about twenty yards away from the skull.

This fossilized skull, Kabua 1, was found partly weathered out of the lake beds in the side of a gully; but careful examination, with the skull in place, satisfied the three geologist members of the party that without doubt the skull was still partly enclosed in an undisturbed, bedded series of sands and grits, near the base of a sequence of lake beds almost one hundred feet thick. The suggestion has been made in some quarters that the skull is part of a Mesolithic interment. This particular surmise is improbable, since there is not one shred of positive evidence to support it. During the removal of the skull, it was established by trenching that a thin layer of fine conglomerate or grit in the enveloping sands continued unbroken beneath the human remains, only about two inches below them. Similarly, careful excavation in the slope immediately behind the skull showed that another grit horizon at the same stratigraphical level as the skull could also be traced undisturbed to a distance of not more than three or four inches from the skull. If the remains did represent an intrusive burial, then the excavation was carried out with almost miraculous precision. The only sign of change in the sediments adjacent to the skull consisted of a cone of greyish-white discolouration of the sands, extending down from the skull at its apex. This was thought to represent lime-enrichment of the sands with materials leached from the bones, since there was no accompanying disruption of bedding in the affected sediments. These relationships are illustrated in Text-fig. 3.

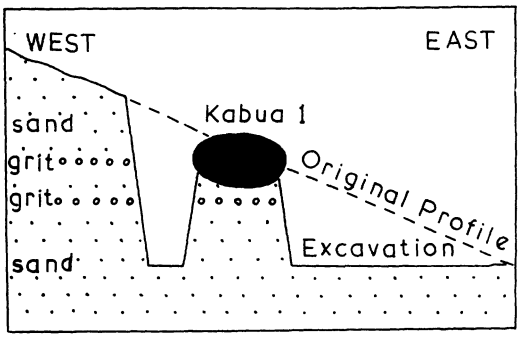


Fig. 3. Diagrammatic horizontal section through the Pleistocene lake beds near Kabua Water-hole, showing in detail the stratal relationships of the fossilized human skull, Kabua 1.

Two other considerations are perhaps significant in the provenance of Kabua 1. If this was a Mesolithic interment, it is surely remarkable that the most detailed search revealed not a single artifact of any kind in immediate association with the remains. Finally, there are many characters of the skull itself which, taken in combination, might be held to argue cogently against a Mesolithic dating. Similar morphological features have been quoted by a variety of authors to confirm the antiquity and archaic nature of other fossilized human remains. While it is patently unwise to overemphasize the stratigraphical implications of hominid morphology, nevertheless, the brutish appearance of Kabua 1 ought to be taken into account to some extent, when assessing its probable antiquity.

In the absence of any compelling evidence to the contrary, one must assume that the skull, Kabua 1, was genuinely *in situ* in the lake beds and that it is, therefore, of late Pleistocene age. Unfortunately, attempts to confirm the dating by chemical methods have proved somewhat inconclusive. Mineralization and fossilization seem to have proceeded to such an extent that it was deemed unprofitable to attempt to establish the absolute age of the bones by the C^{14} method.

Instead, radiometric assays to ascertain the Uranium content were carried out by the Atomic Energy division of the Geological Survey, at the request of the British Museum (N.H.). Fossilized hippo bones, some of them encrusted with Pleistocene shells and collected from the lake beds immediately adjacent to Kabua 1, were employed as controls, since there can be no doubts about their provenance. The Uranium content was found to be similar in the human and hippo bones, but the figure for all this material (four parts per million) was much lower than might have been expected. It may well be that the two sets of material thus tested are truly contemporaneous; but in an environment so deficient in Uranium, the method cannot be held to provide sure proof of really close contemporaneity. One can only say, in conclusion, that the bulk of the evidence now available seems to favour a late Pleistocene age for the fossilized hominid skull from Kabua; and that the rather close juxtaposition of Kabua 1 with Stillbay-type tools recalls a number of similar associations elsewhere in Africa, notably at Broken Hill, Hopefield, and Lake Eyasi.

REFERENCES

Brothwell, D. R. 1961. The people of Mount Carmel. *Proc. prehist. Soc.*, 27, 155-159, fig. 1, 2.

Buxton, L. H. D. and Morant, G. M. 1933. The essential craniological technique. *J.R. anthrop. Inst.*, 63, 19-47, pl. 11-13.

Genovés, S. 1954. The problem of the sex of certain fossil hominids, with special reference to the Neanderthal skeletons from Spy. *J.R. anthrop. Inst.*, 84, 131-144.

Leakey, L. S. B. 1935. *The Stone Age Races of Kenya.* Oxford.

McBurney, C. B. M., Trevor, J. C. and Wells, L. H. 1953. The Haua Fteah fossil jaw. *J.R. anthrop. Inst.*, 83, 71-85, fig. 1, 2, pl. 1.

Singer, R. 1958. The Boskop "race" problem. *Man*, 58, 173-178.

Tobias, P. V. 1960. The Kanam jaw. *Nature, Lond.*, 4717, 946-947, fig. 1.

Trevor, J. C. 1950. Anthropometry. *Chamber's Encyclopaedia*, new ed., 1, 458. London.

Weidenreich, F. 1951. The morphology of Solo Man. *Anthrop. Pap. Amer. Mus.*, 43, 205-290, fig. 1-26, pl. 16-47.

Wells, L. H. 1951. The fossil human skull from Singa. *Fossil Mammals of Africa*, 2, 29-42, fig. 1-3, Brit. Mus. (N.H.).

Whitworth, T. 1965A. The Pleistocene lake beds of Kabua, northern Kenya. *Durham Univ. J.*, 57, 88-100, fig. 1-5, pl. 1.

Whitworth, T. 1965B. Artifacts from Turkana, northern Kenya. *S. Afr. Archaeol. Bull.*, 20, 75-78, pl. 1.

References

232. The Boskop 'Race' Problem

Ronald Singer

Man, Vol. 58. (Nov., 1958), pp. 173-178.

Stable URL:

http://links.jstor.org/sici?sici=0025-1496%28195811%291%3A58%3C173%3A2TB%27P%3E2.0.CO%3B2-5