

FOSSIL ANTHROPOIDS FROM NACHOLA AND SAMBURU HILLS, SAMBURU DISTRICT, KENYA

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ABSTRACT During the 1982 expedition to Samburu Hills and Nachola, a number of hominoid fossils was found from two Miocene deposits. A small hominoid and a large late Miocene hominoid are contained in the fossils. The former most closely resembles *Kenyapithecus africanus*, and the latter may be ancestral to the extant African apes and hominoids, to gorilla alone, or not to any living hominoids. The various alternatives are discussed.

INTRODUCTION

During the 1982 Japan-Kenya Expedition, under the direction of one of the authors (H.I.), twenty three fossil primates specimens were collected from two Miocene localities. K-Ar age determinations and biostratigraphic analyses indicate that the specimens are from sediments which accumulated in the later portion of the middle Miocene (*pre-Hipparion*) and the earlier parts of the late Miocene (*post-Hipparion*) between 12 and 8 million years ago. Very few fossil primates have been discovered in Africa from deposits of this age (Ngorora, Ngeringerowa and Nakali) so that the 1982 collection is of great importance in helping to fill what used to be a great information gap between 14 m.y. and 4 m.y. ago. The specimens from Nachola and Samburu Hills are approximately contemporary with *Ramapithecus* and *Sivapithecus* from Chinji and Nagri levels in Pakistan (Pilbeam *et al.*, 1980) Lufeng in China (Wu *et al.*, 1980) and various places in Europe (De Bonis *et al.*, 1974).

We here provide basic morphological description of the newly discovered material and briefly discuss its significance.

SPECIMENS FROM EMURUILEM (SITE BG 'X')

Small Anthropoids:

KNM BG 9163 is a lightly worn right lower canine, with pitted and eroded enamel. The crown is low, possibly female in morphology. The lingual cingulum is connected to the main cusp by a short ridge. The root is long and relatively straight, the crown is curved distally and has a well developed distal heel. It is difficult to decide whether this tooth represents a Cercopithecoid or a small hominoid.

Large Anthropoids:

KNM BG 9159 is probably a deciduous lower P_3 . The crown is canted laterally on the roots which are small in comparison with the crown. The main cusp has prominent mesial and medial ridges running from its occlusal tip to the lingual cervical border, which encloses a lingual fossa. The fossa has a central ridge running vertically upwards from the cervix. Distally a groove runs from the tip onto a poorly defined distal cingulum. The buccal surface of the crown is comprised of an anterior facing "honing" surface and a laterally facing surface. The medial ridge possesses and incipient tubercle about half way up. This tooth is difficult to identify because of lack of knowledge concerning the deciduous dentition of Miocene primates. It is compatible in size with *Kenyapithecus africanus*.

Kenyapithecus sp.:

KNM BG 9154 is a lightly worn right lower M_3 lacking the tips of the roots. It possesses a buccal cingulum on the protoconid and entoconid, hypoconulid is comprised of a main cusp with cusplets on either side. In other respects it is similar to other M_3 's of *Kenyapithecus* from Baragoi. The trigonid basin is partly filled by a ridge running centrally from the entoconid. The lingual notch is low, as is the notch between hypoconid and hypoconulid. The enamel is not deeply wrinkled but the intercusp grooves are well defined. Small accessory cusplets occur between the metaconid and hypoconid and between the hypoconid and hypoconulid.

KNM BG 9160, a rootless right upper P^4 , is unworn and has pitted and slightly eroded enamel. The paracone possesses distinct anterior and posterior crests and a ridge which leads centrally into the sagittal valley. The protocone is slightly lower than the paracone, and also possesses anterior and posterior ridges which join those from the paracone, to form the mesial and distal margins of the mesial and distal fovea respectively. The lingual flare is strong, as in *K. africanus*.

Kenyapithecus cf. *africanus*:

KNM BG 9149 is a small fragment of maxilla containing the roots of molar (probably M^1) and partial anterior alveoli of the roots probably of M^2 . The maxillary sinus extends downwards between the roots of M^1 .

KNM BG 9150 is another maxillary fragment with roots of a molar *in situ*. The root of the zygomatic process of the maxilla can be seen a short distance above the broken alveolar edge. The maxillary sinus extends low down over the roots of the molar. The lingual edge of the alveolar process is vertical for 1 mm before sloping towards the midline of the palate.

KNM BG 9151, a rootless and partly worn right M^3 , has pitted and slightly eroded enamel. The protocone is the largest cusp, and is strongly joined to the paracone and metacone by wide crests. The hypocone is large and is separated by a deep groove from the protocone. It is joined to the metacone by a narrow crest. There is a small cingular fold distally and on the anterior surface of the protocone. The protocone cingulum is broken off on its lingual aspect. The paracone is incipiently divided into two cusps by grooves that run into the trigon basin and down the buccal surface of the cusp. The crown, though worn, shows no dentine exposure.

KNM BG 9152 is a moderately worn right M^2 with damaged roots. The crown is pitted and eroded. The protocone cingulum extends a small distance onto the lingual surface of the protocone. The protocone is the largest cusp, and is joined by broad ridges to the paracone and meta-

cone so that the trigon basin is restricted in depth and area. The hypocone is large. A peculiar feature of this tooth is the presence of an indentation in the cervix below the distal part of the metacone. Since other molars possess similar indentation, this feature probably does not represent an individual variant. The crown is worn but no dentine is exposed.

KNB BG 9153 represents a lightly worn, rootless right M^2 . The protocone cingulum is large and extends distally as far as the lingual notch. The enamel is coarsely but not deeply crenulated. The trigon basin is restricted, due to the broadness of the crests which join the protocone to the paracone and metacone. The anterior fovea is very small. The hypocone is joined to the metacone by a narrow crest, but is separated from the protocone by a deep intercuspal groove. The distal fovea is large, and is bordered distally by a beaded ridge or cingulum. A small indentation is present at cervix level below the distal margin of the metacone.

KNM BG 9157 is part of the buccal side of an upper right molar. Portions of the trigon and distal crest are preserved with a small part of the distal and buccal roots. The post-metacone cervical indentation is preserved, but is small. The crown is worn.

KNM BG 9158 is a small fragment of a molar in which the dentine-enamel junction is relatively flat.

KNM BG 9161 is the distal half of a worn upper molar consisting of the hypocone and parts of the protocone and metacone. Dentine-enamel junction is relatively flat.

KNM BG 9162 is half of an incompletely formed upper molar. The cusps preserved are probably the protocone and hypocone. The dentine-enamel junction seems to be quite flat.

KNM BG 9145 is a mandible in four fragments (A-D). Fragment A is the rear part of the right body containing M_2 and M_3 in medium wear (Plate 2). It is crushed on its lingual ventral border. The body is robust, the root of the ascending ramus sweeps broadly upwards from below M_2 , and would have hidden most of M_3 in lateral view if it were not broken. There is damage to the bone below the distal root of M_3 on the lingual side, which may represent the site of an abscess. The M_2 has a wide and broad trigonid basin to house the voluminous protocone of the M^2 during occlusion. The anterior fovea and crest are well developed. The intercuspal valleys are wide but not particularly deep. The hypoconulid is situated buccally of the central line. The distal fovea is small. The M_3 is worn, but the hypoconulid is relatively unworn. M_3 is larger than M_2 and the hypoconulid is almost the largest cusp. There is a small accessory cusplet in the lingual notch between the metaconid and hypoconid. The metaconid has a broad ridge which leads into the trigonid basin.

Fragment D which is the rear half of a worn right M_1 , has a distal contact facet for M_2 which is compatible in shape with that developed on the M_2 of fragment A. There is enamel exposed on the entoconid but the dentine-enamel junction is relatively flat.

Fragment C is the anterior part of the body of a right mandible with a clear joint surface for fragment A. It contains the roots of P_3 and P_4 and part of the alveolus of the canine. The latter extends to the ventral edge of the fragment to a point lower than the mental foramen. The foramen is situated 20 mm from the alveolar margin below P_3 . There is a prominent fossa below the premolars, the anterior edge of which sweeps markedly laterally as it approaches the canine jugum.

Fragment B is part of the left mandibular body below M_2 . It contains the sheaved off roots of M_2 .

KNM BG 9146 is a broken and eroded mandible symphysis containing the roots of the right P_3 and canine, and partial alveoli of the left canine and all four incisors. The sub-premolar fossa is well developed on the right side; the canine root is large and the incisor alveoli small; intercanine distance was small (c. 12 mm). There is large inferior transverse torus but no superior torus.

KNM BG 9148 consists of a right lower M_3 (fragment A) and a second lower molar (fragment B) belonging to a single individual. Both molars are worn but no dentine is exposed. The M_2 has traces of a buccal cingulum in the labial notches. There is an accessory cusplet between the metaconid and hypoconid. The M_3 also has cingular remnants on the buccal surface and accessory cusplets between metaconid, hypoconid and hypoconulid. The trigonid basin is wide and well worn.

KNM BG 9155(A) is the distal half of a lower molar probably a left M_3 . It is heavily worn but enamel is not exposed on the occlusal surface.

KNM BG 9155(B) is a rootless broken and weathered right M_1 fragment with dentine exposed on the entoconid. The dentine-enamel junction is flat.

KNM BG 9156 is the anterior half of a lower molar, probably a left M_3 . It is well worn and possesses an accessory cusplet behind the metaconid. No enamel is exposed occlusally.

INTERPRETATION AND SIGNIFICANCE OF THE EMURUILEM HOMINOIDS

The hominoids from Emuruilem (Nachola Formation) are more derived in several respects than *Proconsul*. Important apomorphies are the absence of the superior transverse torus, the presence of a large inferior transverse torus, simplified molar cingula (both upper and lower), relatively low relief dentine-enamel junctions (combined with thick enamel), robust mandibular bodies, narrow incisive region in the mandible and the presence of large sub-premolar fossae in the mandibles. The canines in two individuals are large (probably both represent males). Primitive (plesiomorphic) features include the low root of the zygomatic process of the maxilla which is high in all extant great apes and man. In these respects the fossils most closely resemble *Kenyapithecus africanus* which is known from Maboko and other sites in Western Kenya (Pickford, 1982). Recent collections from Maboko reveal that *K. africanus* sometimes possesses lingual cingula on the upper molars (Pickford, in prep.) and individual teeth from Nachola and Maboko can be well matched. For the time being the Nachola specimens can be satisfactorily assigned to *K. africanus*, the only significant differences recognized at present being the post-metacone cervical indentations, which so far have not been noted in any Maboko specimens.

The potential seems high that additional material will be found at Emuruilem and a full scale revision of the genus is best kept in abeyance for the moment.

In view of the close similarity in dental morphology between specimens assigned to *Kenyapithecus* from Maboko and Emuruilem, it is somewhat surprising to find that the K-Ar date of Emuruilem is about 11 m.y.. This is appreciably younger than most estimates of the age of Maboko (c. 15 – 16 Ma. Pickford, 1981). However, it should be noted that L.S.B. Leakey (1970) thought that a specimen from 11 m.y. old deposits at Ngorora had affinities with *Kenyapithecus*, but the upper molar which was the basis for his report, is substantially larger than any tooth known from Emuruilem. Its morphology is, however, rather similar in several respects to teeth from Emuruilem.

If the K-Ar date of the Emuruilem Member is substantiated by future work, then the significance of the hominoids is very great. Little is known about African hominoids in the period 14 – 4 million years. Consequently the assemblage from Emuruilem is very valuable and when additional material is collected will prove to be most important.

SPECIMEN FROM SAMBURU-HILLS

Morphological Characteristics of Large Hominoid:

KNM SH 8531 is the left maxilla of a large hominoid primate. It was found in four fragments, one piece containing three molars, the second has the canine alveolus and two premolars, the third consists of the root of the zygomatic process and the fourth, the margin of the nasal aperture. All pieces join together to make a single specimen.

It was found on the surface of a conglomerate lense in the Namurungule Formation which contains a fauna suggestive of an early upper Miocene age, perhaps about 9 ± 1 m.y.. The specimen is fully described and interpreted in a separate paper, but a few pertinent points are mentioned here.

The maxilla is that of a large hominoid approximately the size of a female gorilla (Plate 1). The ratio of canine length to premolar row length suggests that it represents a female individual. The maxilla is most similar to those of African apes, in particular those of gorillas, except for the low and retired position of the root of the zygomatic process of the maxilla. In other respects it recalls the maxillae of gorillas, especially its size; the pneumatized anterior root of the zygomatic process; the sharp edged anterior margin of the nasal aperture; its length (*i.e.* prognathism); the degree of arching of the palate; and the curvature of the alveolar process both in occlusal and lateral views. It does not possess any of the many apomorphies of the Asian great apes (*Pongo*, *Sivapithecus* etc.) (Ciochon, 1983).

Dentally, however, KNM SH 8531 differs markedly from gorillas. The molars are bunodont; molar enamel is relatively much thicker than it is in gorilla; the cusps are low and rounded with subdued crests; the lingual and labial notches are not wide and deep; the trigon basin is restricted in area and depth and the protocone cingulum is large. The protocone is the largest cusp, but the paracone, metacone and hypocone are of similar size. The third molar is the largest tooth while M^1 is the smallest molar (Table 1). P^3 and P^4 are anteroposteriorly enlarged as in *Gorilla* and the enamel extends rootward on the anterior buccal root of P^3 .

Table 1. Odontometric data of the Samburu large hominoid (KNM SH 8531).

C	ap	11 ^e	M^2	ap	15.7
	tr	9 ^e		tr	15.8
	root length	23 ^e			
			M^3	ap	16.6
P^3	ap labial	10.5		tr	16.8
	ap sagittal	8.6			
	tr	11.7	P^3-M^3	sagittal	64.5
			M^1-M^3	sagittal	46.4
P^4	ap	9.8	P^3-P^4	sagittal	18.5
	tr	12.7			
M^1	ap	13.9			
	tr	13.3			

ap = antero posterior, tr = transverse.

Interpretation of the Large Hominoid (KNM SH 8531):

This maxilla represents a most interesting primate. The combination of derived gorilla-like morphological characteristics of the maxilla and the primitive appearance of the bunodont molars which are unlike those of *Gorilla*, raises some interesting questions. The maxilla retains a few primitive characters, such as the low zygomatic root, which might be expected in a species as old as this, but the enlarged M^3 is not often found in primates and may represent a uniquely derived feature (autapomorphy). The absence in this specimen of the apomorphic characters which unite the Eurasian great apes, provide good evidence that we are dealing not with a pongid (*sensu stricto*) but with an African great ape.

The maxilla possesses none of the apomorphic characters found in *Australopithecus* and *Homo* and it is unlikely that it represents a hominid. Its dentition, however, especially the bunodont molar morphology resembles in some ways, that of *Australopithecus afarensis*. We therefore tentatively place this specimens in or near the family of African great apes (Panidae of Ciochon, 1983). It could be ancestral to the extant African apes and hominids, or it might be ancestral to the *Gorilla* alone or it may not be ancestral to any the living hominoids. The various alternative are depicted in Figure 1.

Figure 2 illustrates the chronological position of the Nachola and Samburu Hills hominoids relative to the fossil record of other hominoids and prehomonoids. It highlights the position of the fossils intermediate between the comprehensive samples from the lower and middle Miocene of Western Kenya and the rich assemblages from Pleistocene of Eastern Africa.

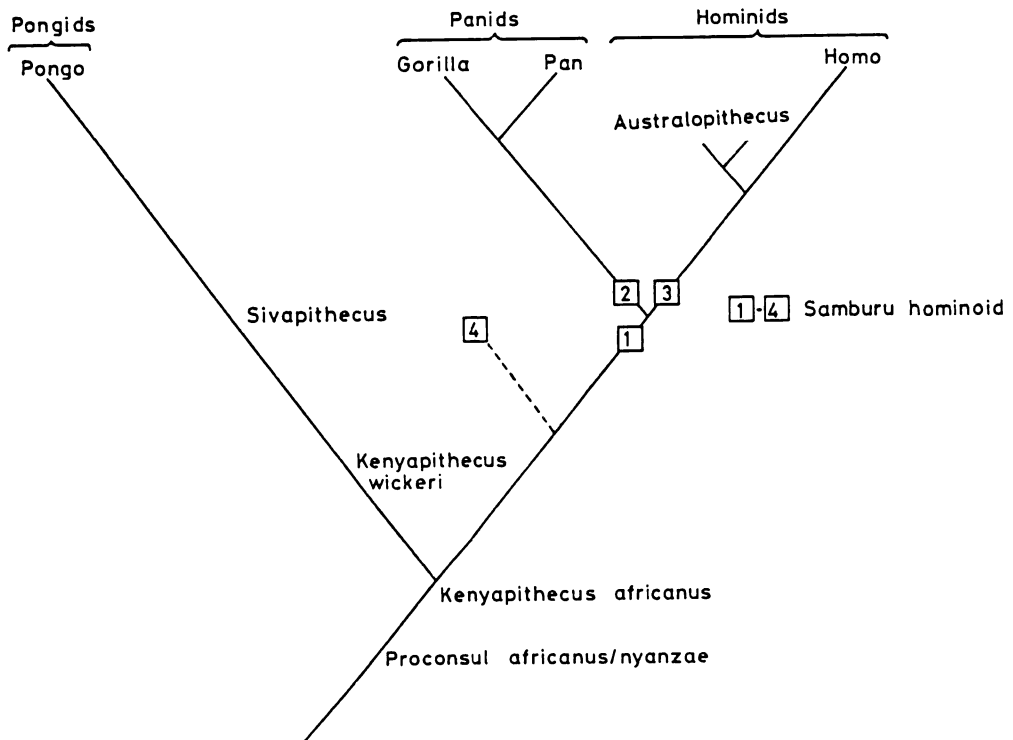


Fig. 1. Possible phylogenetic position of the Samburu large hominoid (KNM SH 8531), 1–4: ranking of possibility.

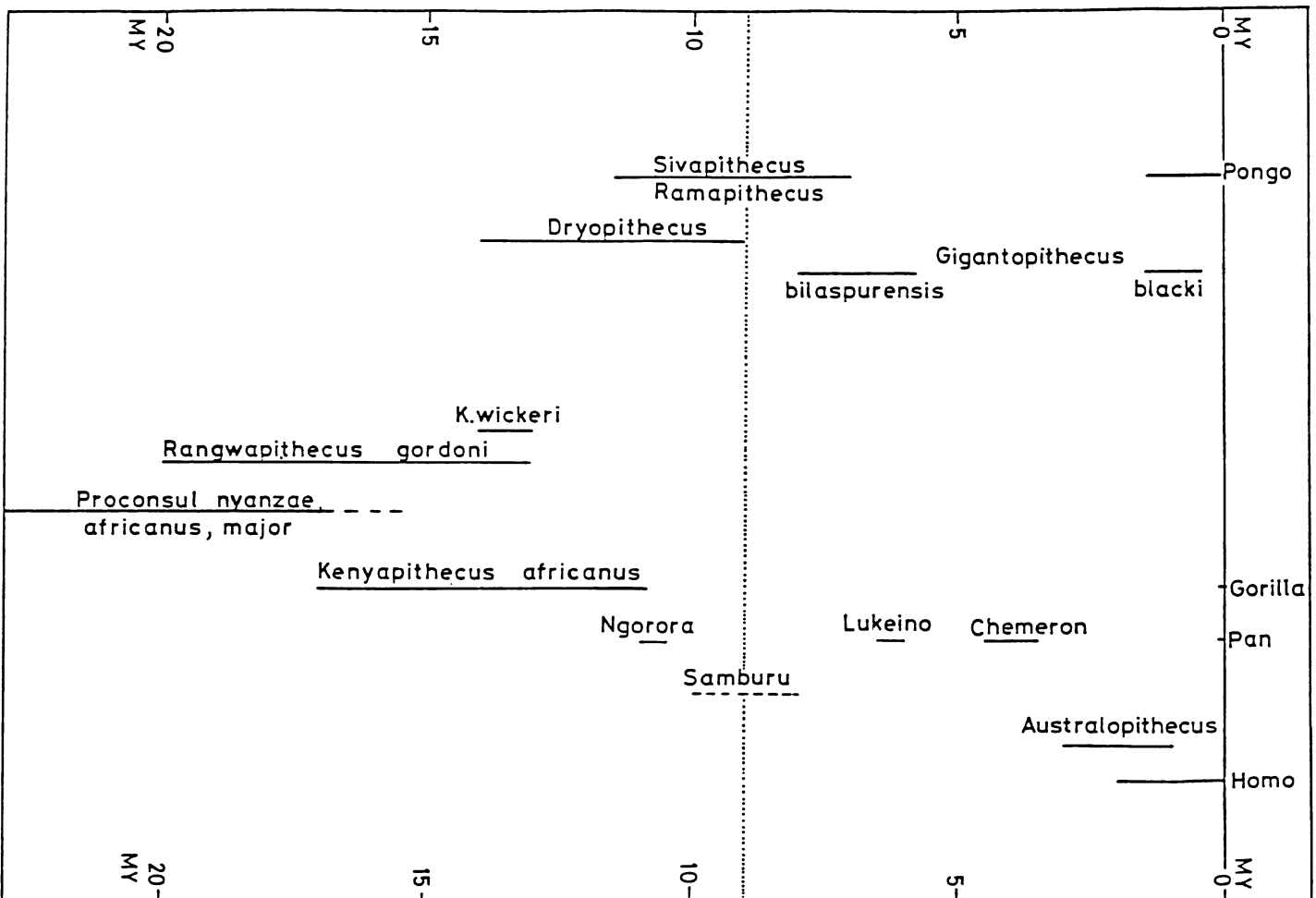


Fig. 2. Chronological position of the Nachola and Samburu Hominoids relative to the fossil record of other hominoids

Although the samples from Samburu District are somewhat limited, they possess tremendous potential for revealing a great deal about the transition from lower Miocene Primate faunas dominated by *Proconsul* and Pliocene faunas dominated by *Australopithecus*. Hopefully, they will also reveal something about the relationships if any of the Miocene Asian great apes to their contemporaneous African faunas.

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REFERENCES

- Ciochon, R.L., 1983. Hominoid Cladistics and the Ancestry of Modern Apes and Humans, A Summary Statement. In (Ciochon, R.L. and Corruccini, R.S., eds.) *New Interpretations of Ape and Human Ancestry*. Plenum, New York, pp. 783–843.
- De Bonis, L., B. Bouvrain, D. Geraads and J. Melentis, 1974. Première découverte d'un Primate hominoïde dans le Miocène supérieur de Macédoine (Grèce). *C.R. Acad. Sci. Paris* 278: 3063–3066.
- Leakey, L.S.B., 1970 in Bishop, W.W., and G.R. Chapman. Early Pliocene sediments and fossils from the Northern Kenya Rift Valley, Kenya. *Nature* 226: 914–918.
- Pickford, M., 1981. Preliminary Miocene Mammalian Biostratigraphy for Western Kenya. *J. Human Evol.* 10: 73–97.
- Pickford, M., 1982. New higher primate fossils from the Middle Miocene deposits at Majiwa and Kaloma, Western Kenya. *Am. J. Phys. Anthrop.* 58: 1–19.
- Pickford, M., (in prep.). A new look at *Kenyapithecus* based on recent finds in Western Kenya.
- Pilbeam, D.R., M.D. Rose, C. Badgley and B. Lipschultz, 1980. Miocene Hominoids from Pakistan. *Postilla*, 181:1–94
- Wu, R., G. Xu and G. Lu, 1983. Morphological features of *Ramapithecus* and *Sivapithecus* and their phylogenetic relationships. *Acta Anthrop. Sinica*. 2(1): 1–10.

Explanation of Plate 1

A large hominoid from Namurungule Formation, Samburu Hills.

Fig. 1 Buccal view of the left maxilla with P³ – M³ (KNM SH 8531), (x1-1/2)

Fig. 2 Occlusal view of the left maxilla with P³ – M³ (KNM SH 8531), (x1-1/2)

Plate 1

1



2



Explanation of Plate 2

Kenyapithecus cf. africanus

- Fig. 1** Occlusal view of the right M_3 (KMM BG 9148 A), (x2)
Fig. 2 Buccal view of the right M_3 (KMM BG 9148 A), (x2)
Fig. 3 Occlusal view of the right M_2 (KMM BG 9148 B), (x2)
Fig. 4 Buccal view of the right M_2 (KMM BG 9148 B), (x2)
Fig. 5 Occlusal view of the right M^3 (KNM BG 9151), (x2)
Fig. 6 Occlusal view of the right M^2 (KNM BG 9152), (x2)

Fig. 7 Occlusal view of the right M^2 (KNM BG 9153), (x2)

Fig. 8 Buccal view of mandible with 1/2 M_1 , M_2 and M_3 (KNM BG 9154), (x2)
Fig. 9 Occlusal view of mandible with 1/2 M_1 , M_2 and M_3 (KNM BG 9154), (x2)

Kenyapithecus sp.

- Fig. 10** Occlusal view of the right M_3 (KNM BG 9154), (x2)

