

## PHYLETIC STATUS OF *KENYAPITHECUS*

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### Introduction

The purpose of this paper is to discuss the phyletic status of *Kenyapithecus*, especially as a genus of non-hominid hominoids, using the material which have been discovered from Nachola by the Japan-Kenya Joint Palaeoanthropological Expedition to Northern Kenya directed by the author (Ishida 1984).

For more than a quarter of the century since the beginning of 1960s, Simons' proposal (1961; Simons and Pilbeam 1965) that *Ramapithecus* (Lewis 1934) and *Kenyapithecus* (Leakey 1962) might have been the earliest hominids has been believed by many physical anthropologists. With development of molecular taxonomy and increasing number of additional fossils, however, their hominid status has become doubtful. Even Pilbeam who supported Simons' proposal has changed his opinion after new discoveries (Pilbeam 1986) of *Ramapithecus* from Siwalik, Pakistan. These new discoveries have revealed that the face of *Ramapithecus* was much similar to that of orangutans. He suggested that *Ramapithecus* should be a synonym of *Sivapithecus*, which he placed in an ancestral position of a Pleistocene gigantapexes, *Gigantopithecus*, and modern orangutans.

Walker and Andrews (1973) have thrown doubt on the hominid status of *Kenyapithecus* by reassessment of the reconstruction of its dental arcade based on a newly discovered mandible from Fort Ternan, Kenya.

In this paper, the phyletic status of *Kenyapithecus* will be discussed on the basis of sexual dimorphism in canine size, morphology of the dental arcade, and foot bones from Nachola.

### Nachola area and the dates of the sediments

Our research field in northern Kenya is located on the eastern side of the Rift Valley (Fig. 1). The nearby town is called Baragoi, and is ca. 350 km north of Nairobi. The field is divided into two areas by geological age. One of them is the Nachola area of the middle Miocene, and the other is the Samburu Hills of the late Miocene. The Nachola area lies 15 km west of Baragoi. Several hundred fossils of *Kenyapithecus* have been recovered from the Nachola area since 1982. The Samburu Hills is located between Nachola and the Rift Valley, from which a large hominoid is known.

The Neogene System in and around the Samburu Hills, Northern Kenya, is divided into seven main formations on the basis of stratigraphy and geochronology (Fig. 2). In ascending order, they are the Nachola, Aka Aiteputh, Namurungule, Nanyangaten, Kongia, Nagubarat and Tirr Tirr Formations (Sawada *et al.* 1988).

The Nachola Formation, which is widely distributed along the Baragoi River, is the lowest part of the Neogene System, either unconformably overlying the Precambrian Basement Complex or being in fault contact with it. The Aka Aiteputh Formation conformably overlies the Nachola Formation and occurs in Nachola and the Samburu Hills. The Namurungule Formation covers the Aka Aiteputh Formation. And, the Nanyangaten Formation unconformably overlies the Nachola and Aka Aiteputh Formations.

*Kenyapithecus* occurs in the Aka Aiteputh Formation at Site BG-X in Nachola (Ishida 1984). The beds bearing *Kenyapithecus* fossils were accumulated between 15.4 Ma and 12.8 Ma, according to K-Ar

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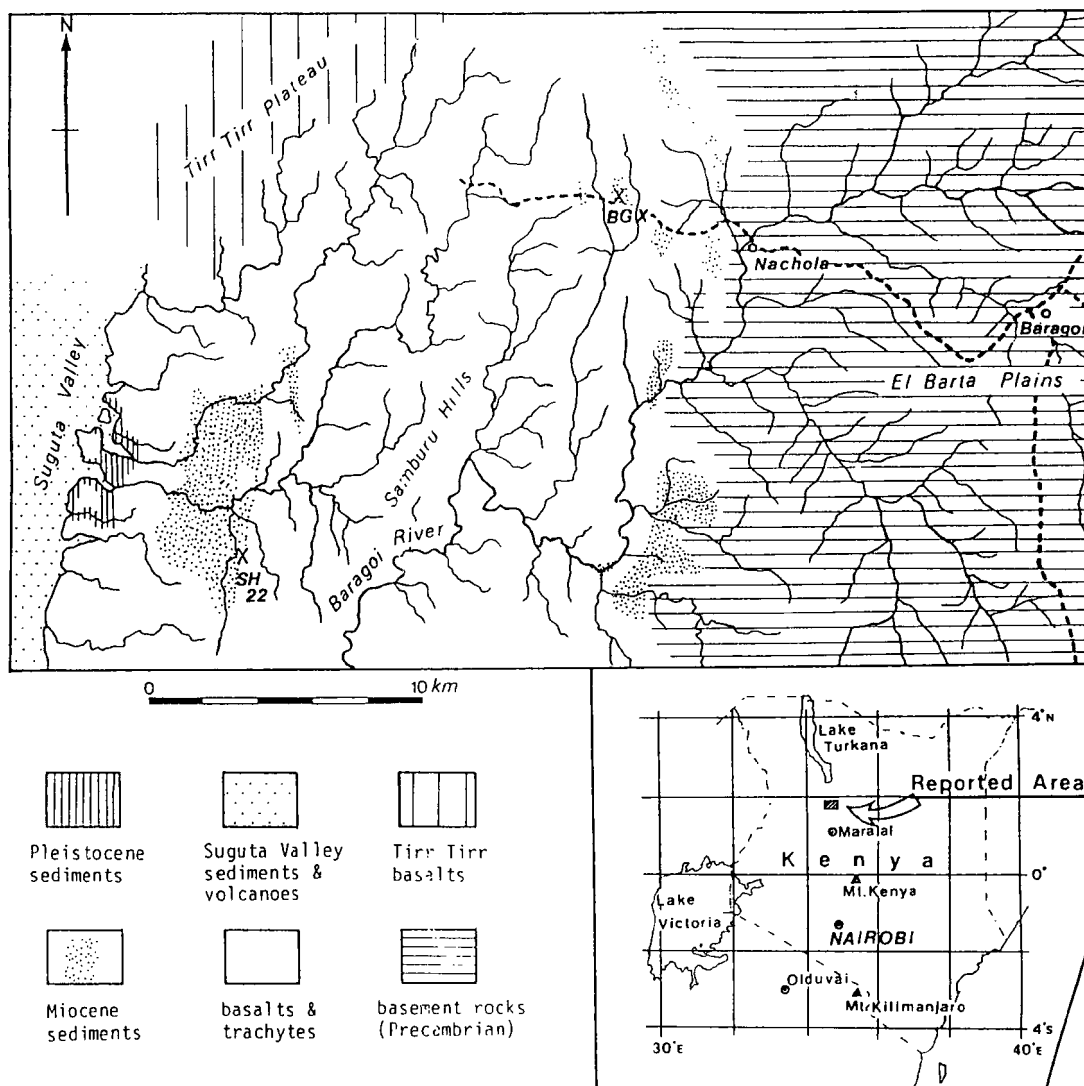


Fig. 1 Index map and simplified geological map of the Nachola area and Samburu Hills, Northern Kenya.

dating of volcanic rocks (Itaya and Sawada 1988).

### Sexual dimorphism of the canine sizes

Simons and Pilbeam (1965) placed *Ramapithecus* and *Kenyapithecus* in hominids on the bases of their small canine size, thick enameled cheek teeth, and parabolic dental arcades. In this section, canine size is analyzed from a viewpoint of sexual dimorphism.

Our knowledge of sexual dimorphism in fossil hominoids is still quite limited, although it is essential for classification and taxonomy. Until recently, not numerous specimens of *Kenyapithecus* have been available; only a few canines have been available so far for the analysis of sexual dimorphism. Our expedition team, however, has discovered 32 canines of *Kenyapithecus* from the Aka Aitheputh Formation in Nachola. These new discoveries have made it possible to statistically analyze the sexual dimorphism of the genus (Ishida *et al.* 1991). As is shown in Figs. 3 and 4, the Nachola canines are clearly clustered into two groups. The larger canines are higher-crowned and more robustly-built, while the smaller ones are lower-crowned and more gracile. We inferred that they are males and females, respectively. This suggests that *Kenyapithecus* had a marked degree of sexual dimorphism. The smaller upper canines from Nachola are similar in size and morphology to the small upper canine of *K. wickeri* (KNM-FT46b),

	SUGUTA VALLEY	SAMBURU HILLS	BARAGOI RIVER	NACHOLA AREA
PLEISTOCENE	basalts (0.12, 0.45) sediments	grey silts & fluviatile sediments	Alluvium (mud, sand & gravel)	Alluvium (mud, sand & gravel) basalts (1.75, 1.97)
MIOCENE		TIRR TIRR F. alk. rhyolite tuff breccias sediments basalts (3.6, 3.8, 3.9)*		EMURU AKIRIM alkali trachytes basalts (4.11)
		NAGUBARAT F. basalts (5.34, 5.38)		
		KONGIA F. basalts (5.67, 6.03) sediments		
				NANYANGATEN F. basalts (7.29)
		NAMURUNGULE F. mud flow deposits, tuff, mud, sand & gravel		
		AKA AITEPUTH F. sediments basalts (10.8, 12.7, 14.5, 14.1, 14.2) trachytes (14.4, 14.9) pyroclastics basalts (14.5, 15.0)		AKA AITEPUTH F. basalts (11.8, 12.8) tuff sediments
			NACHOLA F. trachytes (15.0) pyroclastics (17.7) trachybasalts (18.2) basalts (17.7, 19.0, 19.2) sediments	NACHOLA F. trachytes (15.4) pyroclastics trachybasalts basalts sediments
PRECAMBRIAN		PRECAMBRIAN BASEMENT COMPLEX		

**Fig. 2** Stratigraphy of the Nachola area and Samburu Hills. Numbers show K-Ar ages (Ma) (Sawada *et al.* 1988).

which was originally taken as evidence for the hominid status of *Kenyapithecus*. In addition, a large upper canine (KNM-FT39) and a large lower canine (KNM-FT28) in the Fort Ternan sample belong more probably to *K. wickeri* than to *Proconsul* (Pickford 1985). It is suggested, therefore, that the small canine of *K. wickeri* belong to a female individual (Fig. 5) and that *Kenyapithecus* is not a member of hominids.

**Dental arcade**

Pilgrim (1910) and Lewis (1934) suggested hominid characters in *Ramapithecus*. Especially, the latter author emphasized the parabolic dental arcade, and short and broad palate in his reconstruction of the maxillary morphology of *R. punjabicus*. Nearly 30 years later, a similar attempt for *Kenyapithecus*

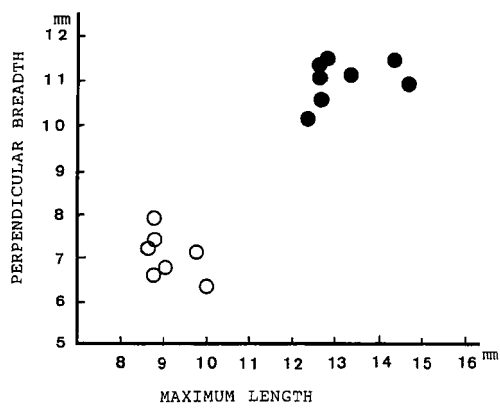


Fig. 3 Bivariate plots of *Kenyapithecus* maxillary canine specimens.

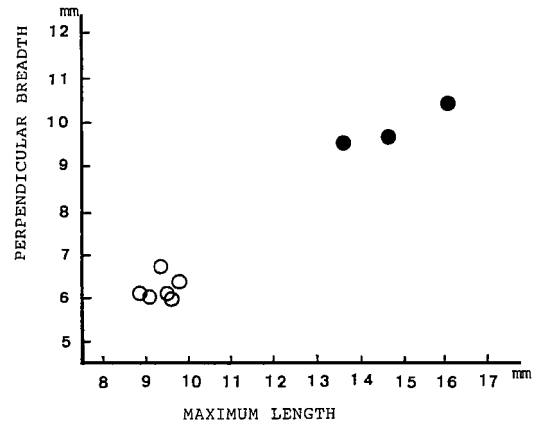


Fig. 4 Bivariate plots of *Kenyapithecus* mandibular canine specimens.

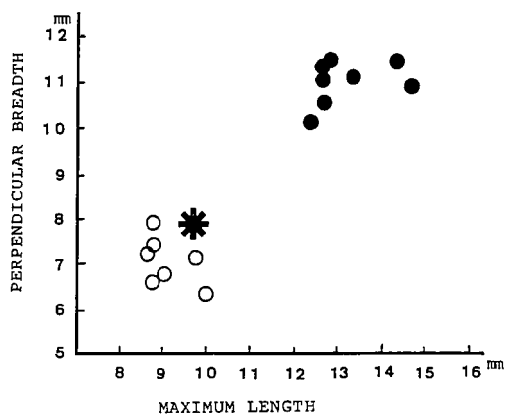


Fig. 5 Comparison of a maxillary canine (\*) of *Kenyapithecus wickeri* from Fort Ternan and those of Nachola's *Kenyapithecus*.

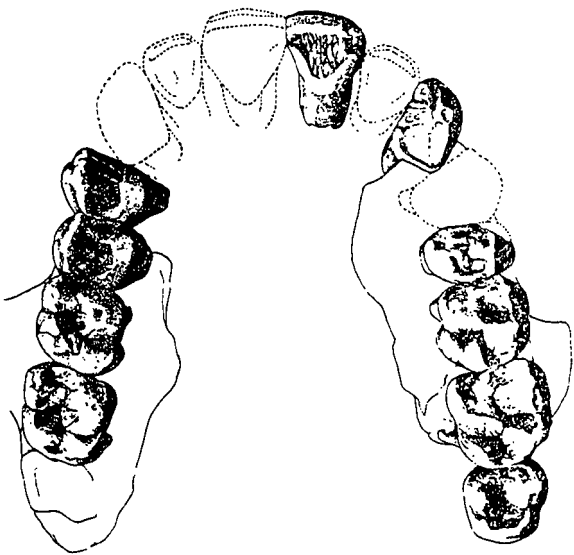


Fig. 6 Parabolic dental arcade of *Ramapithecus* reconstructed by Simons (Simons and Pilbeam 1965).

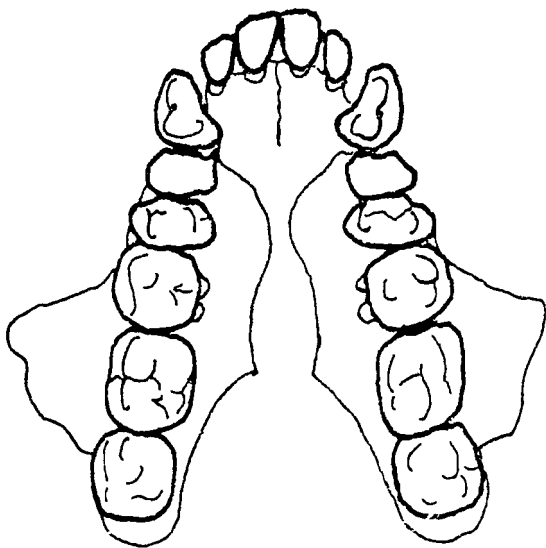


Fig. 7 Dental arcade of *Kenyapithecus* reconstructed by Walker and Andrews (1973).

*wickeri* was carried out by Simons and Pilbeam with maxillary fragments from Fort Ternan (KNM-FT46 and FT47: Simon and Pilbeam 1965; Simons 1969; Pilbeam 1969). As shown in Fig. 6, the dental arcade is parabolic, and the palate is short and broad in their reconstruction. They believed that *K. wickeri* had gnathic characters of hominids. The hominid status of *Kenyapithecus* proposed by Simons and Pilbeam (1965) is partly based on such gnathic characters.

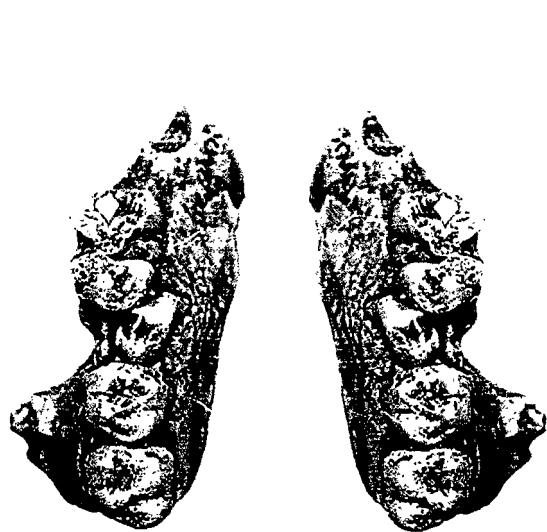
On the other hand, some anthropologists (Genet-Varcin 1969; Vogel 1973; Walker and Andrews 1973) doubted accuracy of their reconstruction because the midline of the plate is missing. In 1973, Walker and Andrews reassessed the reconstructed dental arcade of *K. wickeri* with a new mandibular specimen described by Andrews (1971). They adjusted the placement of the maxillary fragments (KNM-FT46 and 47) with the new mandible which preserved the midline of the symphysis. As shown in Fig. 7, the new reconstruction suggests that *K. wickeri* has straight and elongated tooth rows, and narrow and long palate. This indicates a non-hominid condition for this species.

From Nachola, maxillary fragments of *Kenyapithecus* have been discovered. We have tried to reconstruct the dental arcade with the mirror image of a well-preserved maxillary specimen (KNM-BG14700) and isolated incisors as seen in Figs. 8 and 9. Both of the maxilla and incisors are inferred to belong to male individuals. It is very difficult to reconstruct a parabolic arcade for the Nachola sample. It is supposed that the tooth rows of *Kenyapithecus* from Nachola may have been straight and elongated, and palate long and narrow as in apes. Consequently, the evidence from Nachola also denies the hominid status of *Kenyapithecus*.

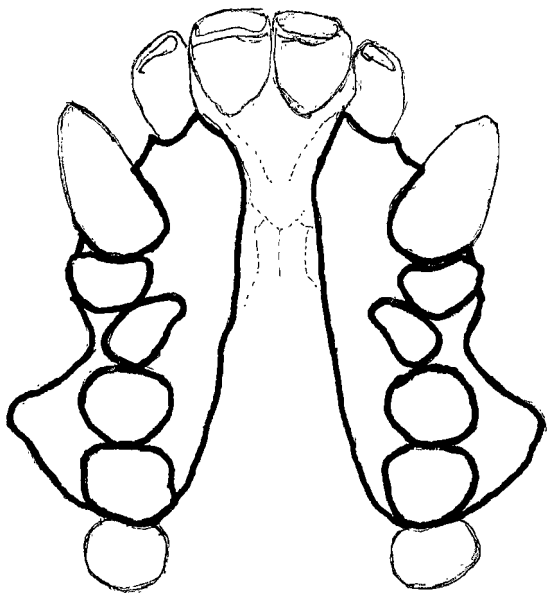
**Morphology of foot bones**

Hominids are distinguished from pongids by postcranial adaptations for their unique locomotor pattern (habitual bipedalism). In Nachola, 29 postcranial bones have been discovered from the Aka Aiteputh Formation, which also has yielded a number of isolated teeth and jaw fragments. There are two foot bones among the Nachola sample, a right talus (KNM-BG15529: Fig. 10) and a right calcaneus (KNM-BG17805: Fig. 11).

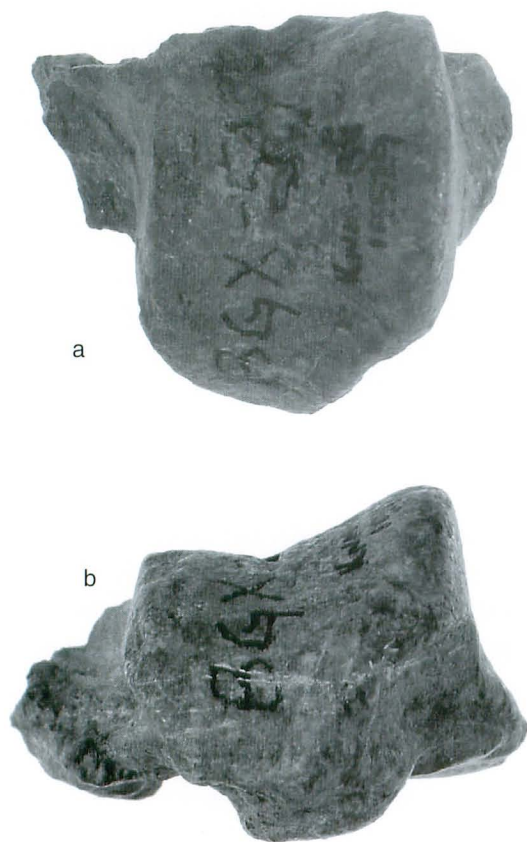
The talus is an eroded right trochlea, approximately 2 cm long proximodistally. The head and the most of the neck are missing. In size, this talus is similar to male *Papio* tali. The trochlea surface is somewhat lower on the medial side than on the lateral side and the trochlear groove is moderately



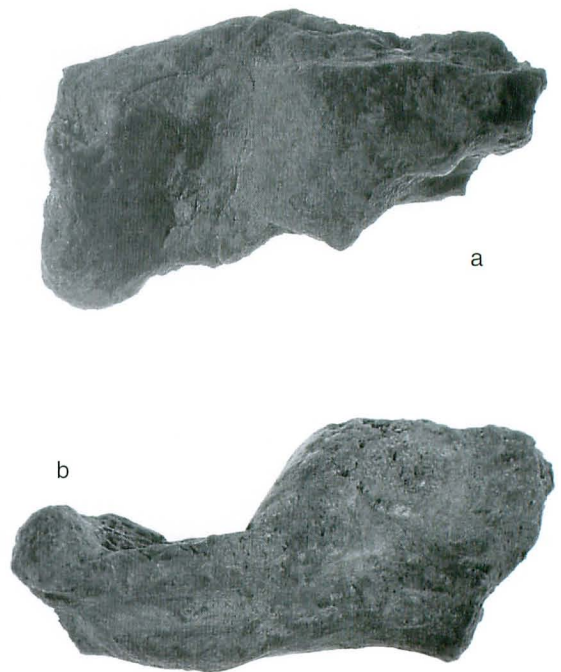
**Fig. 8** Mirror image of upper jaw of *Kenyapithecus* from Nachola.



**Fig. 9** Dental arcade of *Kenyapithecus* from Nachola reconstructed by Ishida.



**Fig. 10** Talus of *Kenyapithecus* from Nachola.  
a: dorsal view. b: posterior view.



**Fig. 11** Calcaneus of *Kenyapithecus* from Nachola.  
a: dorsal view. b: medial view.

developed. While talar morphology in these taxa is not closely similar to that of any particular extant taxon, there are eclectic similarities to the tali of large bodied platyrrhines and hominoids. It indicates function in the ankle region that is not as constrained as in cercopithecids or in specialized leaping primates tali of other.

The calcaneus is approximately 4 cm long, lacking the proximal part of the heel process and the sustentaculum tali. An expanded medial process of the heel tuberosity is a characteristic feature of arboreal primates that use the intrinsic flexors, independent of the extrinsic musculature, in order to produce the adept grasping with the toes. This function is important during various orthograde arboreal activities such as climbing and clambering.

In both the talus and the calcaneus, the morphological characteristics are adaptive for arboreal quadrupedalism, and not for bipedalism.

### Conclusion

To make clear the phyletic status of *Kenyapithecus* as non-hominid hominoids, sexual dimorphism of canine size and morphology of dental arcades of maxillae and foot bones, tali and calcanei, have been analyzed and discussed. It is concluded that *Kenyapithecus*, one of the middle Miocene hominoid genera, is no longer regarded as hominid because of their large male canines, straight and elongated dental arcades, and foot bones not adapted to habitual bipedalism.

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