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OUTLINE OF 1982 SURVEY IN SAMBURU HILLS AND NACHOLA AREA, NORTHERN KENYA

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ABSTRACT In 1982, the Japan-Kenya Expedition conducted geological, palaeontological and palaeoanthropological surveys in the Samburu Hills and Nachola area, north Kenya. In this paper, geography of the areas surveyed, and brief results of the survey, including discovery of fossil hominoids, are described.

INTRODUCTION

In modern evolutionary anthropology, one of major objectives is to clarify the origin of hominid lineage with age, place and mechanism. Further investigation of Miocene hominoids, especially late miocene hominoids has been needed. Biomolecular analysis of extant hominoids has suggested the later divergence of hominids from African Miocene hominoids. Goodman *et al.* (1983) have pointed out that the first appearance of hominids might be in the period between 5 and 10 million years ago. Therefore, it is very necessary to examine palaeoanthropological, palaeontological and geological evidence of hominoids of that age, at least. In Africa, however, there is a big information gap of hominoid fossils and environmental background in the period between 4 and 14 m. y. a., that is, the period between *Kenyapithecus* and *Australopithecus afarensis*.

To fill the gap, the Japan-Kenya Expedition began to conduct geological, palaeontological and palaeoanthropological surveys at the late Miocene sediments west of Baragoi, north Kenya in 1980. Fortunately in the 1982 field season, the expedition discovered fossil specimens of a large hominoid and *Kenyapithecus* in the Samburu Hills and Nachola area respectively. In this paper, the geography of the areas surveyed and camping for the survey are introduced, and also results of the 1982 survey and analyses of materials collected in the areas are summarized.

PHYSIOGRAPHY

Baker (1963) briefly discussed the physiography of the area, recognizing two main subdivisions, the El Barta Plains immediately west of Baragoi, and the Volcanic Area further west. We recognize following four major subdivisions (Makinouchi *et al.*, 1984):

1). the El Barta Plains
2). the Nachola Area of gently dipping lavas and sediments which are not deeply incised
3). the Samburu Hills, generally steeply dipping lavas and sediments which are deeply incised

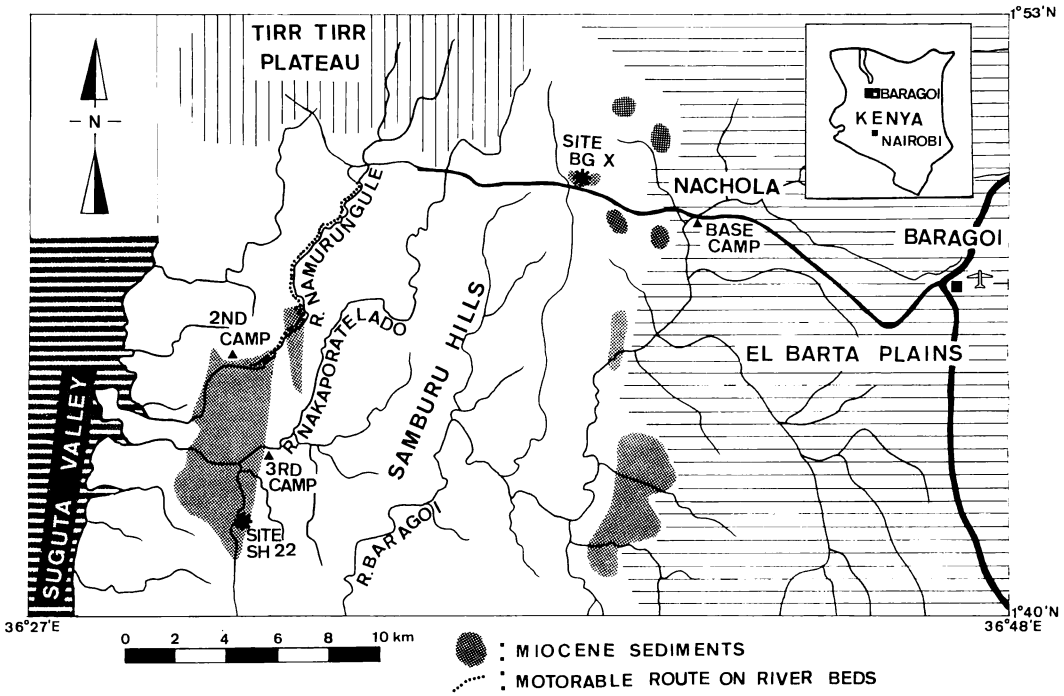

Fig. 1. Map of area surveyed

4). Suguta Valley

To the west occurs the Tirr Tirr Plateau and to the south the Lopet Plateau which are comprised of elevated area of flat lying lavas resistant to erosion. The four categories are depicted in Figure 1.

I) The El Barta Plains comprises gently undulating terrain underlain by Basement complex granites and gneisses. They are virtually treeless except along water courses, where *Acacia* species form a fringing woodland. The altitude of the plains ranges from 1,210 – 1,420 m (4,000 – 4,700 ft.) and they have an annual rainfall averaging about 500 mm (20 inches) *per annum*. Soils in the plains are generally thin and rocky, but areas near drainage lines are commonly underlain by alluvial clay soils. Under these circumstances run-off after rain is rapid, and the area is prone to flash floods.

II) The Nachola Area is distinctly different from the El Barta Plains, being comprised of flat-lying or gently dipping lavas with a better developed vegetation cover. *Acacia* species and *Euphorbia* groves are a dominant feature of this area, but grassy plains are important. Soils tend to be dark clayey types (black cotton soils) formed of the break-down products of basaltic and phonolitic lavas. There is a more or less well developed north-south grain to the drainage lines and topography on account of fault structures and the regional north-south strike of the strata. The Nachola area rises gently westwards to a divide at about 910 m (3,000 ft.) beyond which the countryside is much more deeply dissected by erosion. This divide forms the western boundary of the Nachola area.

III) The Samburu Hills form a wide north-south trending belt of deeply dissected volcanic

rocks. They range in altitude from 600 m. (2,000 ft.) in the west to about 910 m. (3,000 ft.) in the east. The strata tend to dip at angles greater than 15 degree and there are many faults trending north-south. As a result, the area is one of low rainfall (no records) and is very hot; temperature of over 40°C (105°F) are common. There are no permanent streams but a few permanent water holes occur in the region. Vegetation is dominated by *Acacia* species, *Salvadora* and small euphorbias. *Hyphaene* palms occur along the lower reaches of the luggas (dry stream beds).

IV) The Suguta Valley is a flat low-lying tectonic depression at an altitude of about 300 m. (900 ft.) above sea level. There are no rainfall records for the valley. It is very hot, with many doum palms (*Hyphaene*) along water courses.

CLIMATE

The survey area is predominantly semi-arid ranging from cool in the east near Baragoi to extremely hot in the Suguta Valley to the west. In the Samburu Hills there are strong winds, especially in the evening. These almost invariably blow towards the Suguta Valley and are strong enough to move sand particles which form drifts in sheltered areas. Apart from the rainfall readings measured at Baragoi, very little climatic information is available for the area. The expedition measured maximum and minimum temperatures (Fig. 2-3) at Nakaporatelado (Camp 3) and Nachola (Base Camp).

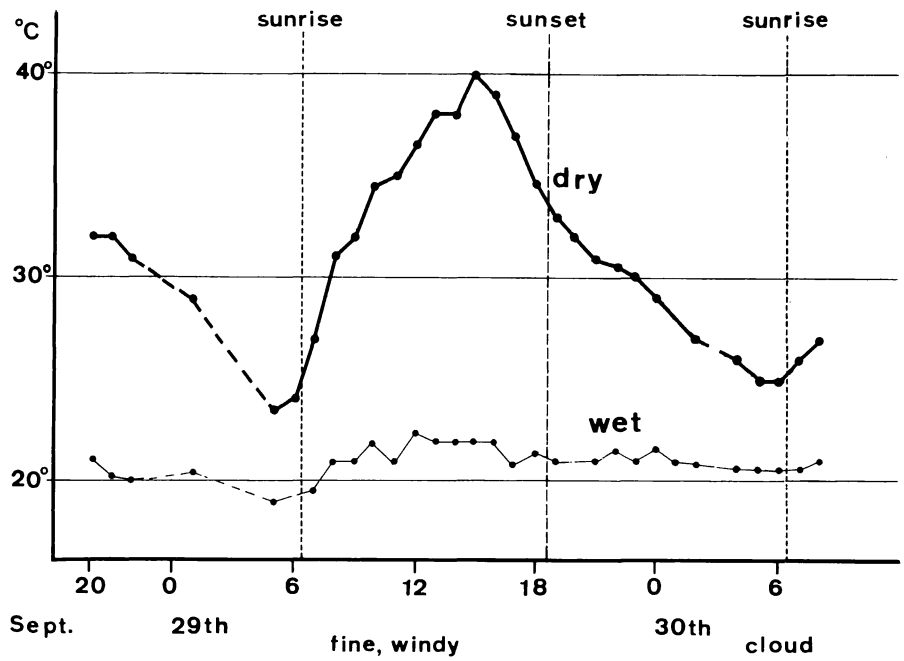

Fig. 2. Temperatures (dry and wet bulbs) measured at Nakaporatelado (Camp 3).

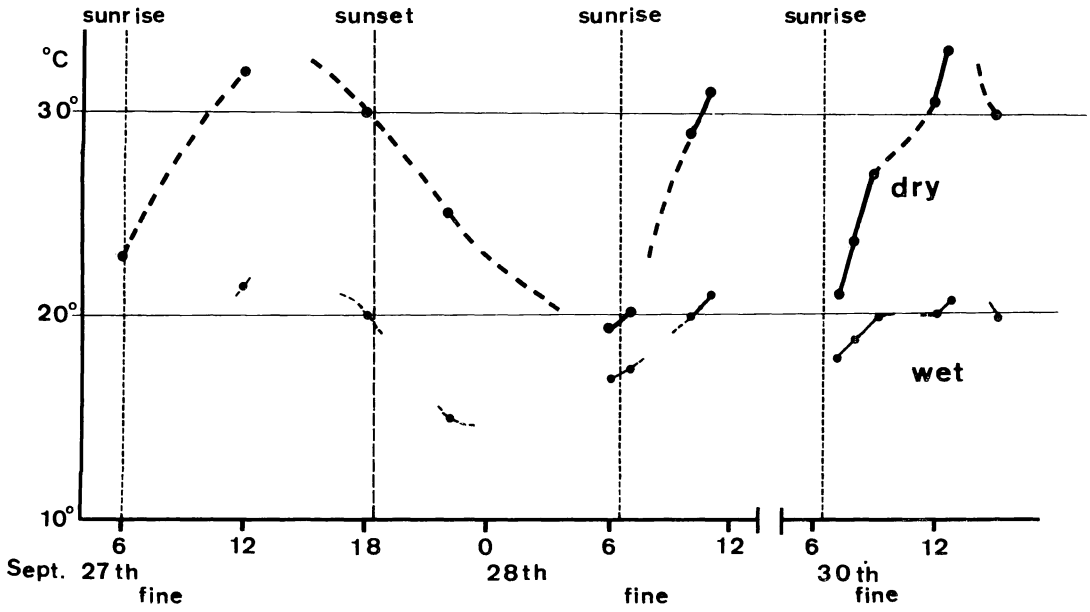

Fig. 3. Temperatures (dry and wet bulbs) measured at Nachola (Base Camp).

WATER SUPPLY

The provision of adequate potable water supplies is a continuing problem in the survey area. Subsurface water supplies in the Nanyangaten lugga near Nachola are reliable all year round. In the Samburu Hills, however, subsurface water is sporadic in occurence, only a few parmanent water holes being known. The most reliable of these is the waterhole at Lochuatom. Less reliable supplies are known in the Namurungule and Nakaporatelado luggas. In the latter lugga, the water is alkaline, some souces being undrinkable.

WILDLIFE

There are a few gazelles, hunting dogs (*Lycaon*), vervet, baboons, and ostriches on the El Barta Plains and in the Nachola area. Further west in the Samburu Hills a greater variety of wildlife exists but they are never very populous. Greater kudu, caracal, baboon, rock hyrax, porcupine and klipspringer are relatively common. Birdlife is generally rather poor, but large flocks of raven and sandgrouse occur in the Samburu Hills.

The gastropod fauna in the Samburu Hills is typical of assemblages formed in hot semi-arid to arid areas elsewhere in Africa. *Zootecus insularis* is common as are *Pupoides caenopictus* and *Gastrocopta klunzingeri, Bloyetia, Nothapalinus* and *Truncatellina* seem to be rare.

PEOPLE

The survey area is sparsely populated by nomadic Turkana people. There are several manyattas near Nachola and along the Nanyangaten lugga, but west of this river the population dwindles rapidly. Prior to the survey period the Samburu Hills was unpopulated, but during the expedition a small numbers of families moved into the hills with their livestock. Despite their limited numbers, they made a tremendous impact on the vegetation, not only by cutting trees to manufacture bomas and manyattas, but by browsing camels and goats. Each boma, which was utilized only for one or a few nights required about 100 trees to be cut. Once abandoned, the bomas were not reused. Under these circumstances it is easy to visualize why the Samburu Hills are undergoing rapid erosion.

COMMUNICATIONS

The problems of transportation in the Samburu area can be very great. A main road runs from south to north from Maralal to South Horr, passing through Baragoi. It is passable in most weather conditions. West of Baragoi a track leads towards Nachola eventually reaching the Suguta Valley by way of Lochuatom (Etua Etom) waterhole. West of the waterhole it is practically impassable except for enterprising 4WD vehicles and drivers. A few of the luggas provide partial access to the Namurungule Formation by building a track from Lochatom 12 km down the Namurungule Lugga. This track was only passable by narrow 4WD vehicles such as small Suzuki jeeps. Beyond this track all movement was by foot. Heavy and bulky items were carried by donkeys to the Camp 1 and 2, but all surveys were done by walking.

There is an airstrip at Baragoi and it would be possible to build additional strips near Nachola and in the Suguta Valley. However, ground transportation will continue to present severe problems until additional roads are made. In 1982, consumables were either driven up from Nairobi or flown from Naivasha. The cost of road transport and airplane for the supply runs were comparable, and in future it would be better to be supplied by air transport once the basic camp equipment and others bulky or heavy items are installed in a base camp. If landing strips are built at Nachola and in the Suguta Valley the camps could be supplied with consumables relatively easily at the same time minimising ground transportation requirements.

CAMPING

In view of the logistic problems of conducting a survey in Nachola and the Samburu Hills, a base camp was established at Nachola on the banks of the Nanyangaten Lugga. The camp was near permanent subsurface water supplies in the lugga and was well shaded by large *Acacia tortilis* trees. The village of Baragoi was 13 km by track to the East. The nearest vehicle fuel supply was at Maralal about 100 km to the South. A significant feature of this camp was the equable climate. It was close to one of the main survey areas, Nachola.

Fly camps were set up at two places in the Samburu Hills and these were supplied from the base

camp with food and other consumables almost everyday. Both campsites (the second and the third) were selected so as to be near water seepages, the former at the northern end of the Namurungule Formation, the latter in Nakaporatelado lugga at the eastern limits of the formation. The provision of kuni (wood fuel) was no problem at either campsite. Living conditions at camps 2 and 3 were rigorous, not only because of difficulties of supply, but also because of high daily temperatures and evening windstorms. This was a constant problem. Insects were seldom problematical at any of the camps.

All transportation in the vicinity of camps 2 and 3 was by donkey and backpack. From the base camp to the end of track at Namurungule was a 2–2.5 hour drive by 4WD jeep. From the end of the track to Camp 2 was a 30 minute walk, while to Camp 3 it was 1.5–2 hours by foot.

RESULTS OF SURVEY AND ANALYSIS

Geology

The geology of the area between Baragoi and the Suguta was described by Baker (1963). Prior to Baker's survey very little was done in the area, while subsequently it received little attention until the present decade. In 1980, the Japan-Kenya Expedition made a reconaissance of the Nachola area (Ishida *et al.*, 1982). In 1982, Nachola and Samburu Hills was surveyed intensively by the expedition.

Baker (1963) concentrated his studies on rocks of the Basement Complex, but provided a reconaissance map of the volcanic field which borders the Rift Valley, west of Baragoi. He extended formational names from the Mararal Map Sheet to the south implying that rock units, such as the Samburu Basalts and Rumuruti Phonolite, extended as far north as Baragoi. Recent surveys indicate that Baker's correlations may not be so straightforward and local formational names are here proposed for most rock units in the survey area.

Nachola area is underlain by Precambrian Basement Complex, above which come the Nachola Formation of Miocene age. *Kenyapithecus* occurs in this formation which consists of basaltic lavas and clastic sediments. The Samburu Hills are underlin by five formations, the Aka Aiteputh, Namurungule, Kongia, Nagubarat and Tirr Tirr Formations, and grey silts and fluviatile sediments in ascenending order. The Namurungule Formation is of late Miocene age and consists of tuffaceous alternations of sand and mud with intercalations of mud flow deposits. A large hominoid occurred in the basal part of the formation. Many faults, trending nearly N-S, cut the volcanics and sediments in the Samburu Hills and Nachola area (Makinouchi *et al.*, 1984).

Age of the Nachola and Namurungule Formation

Radiometric age determination on Miocene rocks from the area around Nachola area and the Samburu Hills have been restricted to the K-Ar dates from Tirr Tirr Trachyte (subsequently identified as alkali rhyolite) which yielded date of 6.3 and 6.4 Ma (Baker *et al.*, 1971).

The ages of the Nachola and Namurungule Formations, in which a large hominoid and *Kenyapithecus* occurred, were examined by the fission-track and the K-Ar datings, the palaeomagnetic measurements and biostratigraphy. K-Ar and fission-track datings showed that the ages of the Nachola, Aka Aiteputh, Namurungule and Kongia Formations were around 11, 13, 7 and 6.4 Ma respectively (Matsuda *et al.*, 1984). Biostratigraphical analysis has suggested that the Nachola Formation belongs to pre-Hipparion stage (earlier than 10 ± 0.5 Ma), and that the Namurungule Formation is in the post-Hipparion stage (later than 10 ± 0.5 Ma) and the fauna is similar to those of Ngeringerowa and Nakali. Therefore, it is supposed that the age of Namurungule Formation of the large hominoid might be 9 ± 1 Ma (Pickford *et al.*, 1984). However, more chronological analysis is needed to get accurate ages of the formations.

Fossiliferous localities and faunas

Fossils occurred in four basic geographic/stratigraphic areas. Middle Miocene fossils occur in sedimentary intercalations in a volcanic sequence at Nachola. Upper Miocene fossils occur in the Namurungule Formation, Samburu Hills. Mio-Pliocene fossils occur in the Kongia area, while Holocene fossils are found in grey silts near Suguta Valley and in travertine and terrace deposits in the drainage systems of the Samburu Hills (Pickford *et al.*, 1984).

In Nachola area, more than 14 taxa of vertebrates were collected from four sites. The most important site found in this area was the Site BG X, which yielded a number of fossils provisionally assigned to *Kenyapithecus*, plus a few other mammals. A large number of sites is known in the Namurungule Formation, while most of them yield rather scrappy fragments of bone and teeth. In this formation, more than 1,145 specimens of 29 vertebrate taxa were collected, including 21 taxa of mammals, and the most interesting and important site found in 1982 is the Site SH 22 which yielded an important large hominoid specimen plus a moderately diverse vertebrate fauna, containing two kinds of *Hipparion* (Nakaya *et al.*, 1984; Kawamura and Nakaya, 1984). Two intriguing sites yielding impressions of leaves, feathers and foot prints were found in the formation. In the Kongia area, two richly fossiliferous sites were found, both yielded abundant Mollusca, but few vertebrates (Pickford *et al.*, 1984).

Kenyapithecus and a large hominoid

Teeth and fragments of maxilla and mandible of Anthropoid primates were found at the Site BG X in Nachola area. Most of them closely resemble *Kenyapithecus africanus* which is known from Maboko and other sites in Western Kenya, while the K-Ar date, 11 Ma, of Nachola specimens is appreciably younger than those of Western Kenya. Recently, R. Leakey and A. Walker found a kind of *Kenyapithecus* at Buluk in Northern Kenya. The range of morphological variation of this genus seems to be wide. A full scale revision of the genus will be needed in the near future (Ishida *et al.*, 1984).

KNM SH 8531 is the left maxilla with cheek teeth of a large hominoid primate, which was found on the surface of a conglomerate lense (Site SH 22) in the Namurungule Formation. The maxilla is approximately the size of a female gorilla. 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. It is supposed that this large hominoid could be ancestral to the extant African apes and hominids. Regarding the phylogenetical status of this hominoid, however, the various alternatives are discussed (Ishida *et al.*, 1984).

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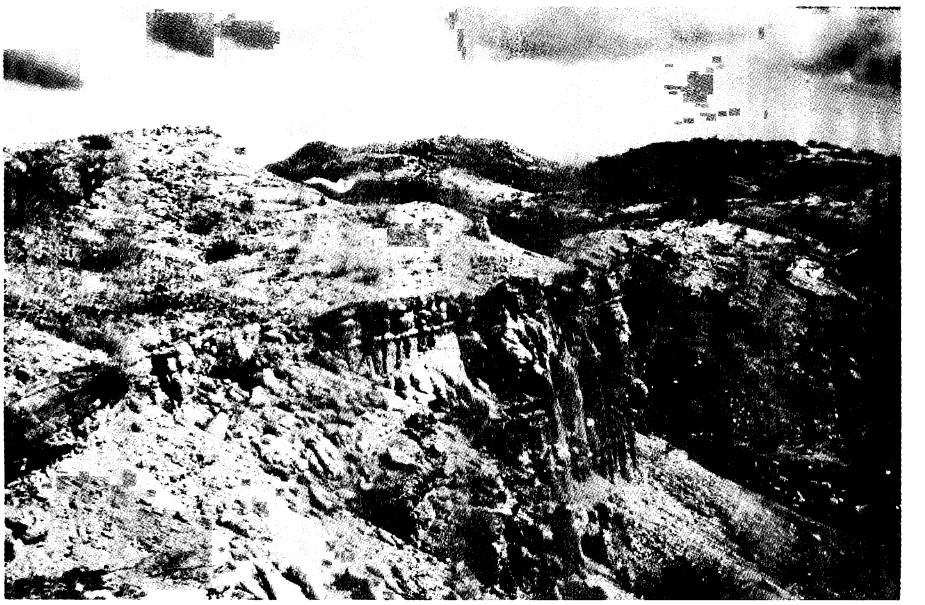
Explanation of the Plate 1

Fig. 1 The Site SH 22, at which a large hominoid occurred.
Fig. 2 The Samburu Hills (general view).

Plate 1



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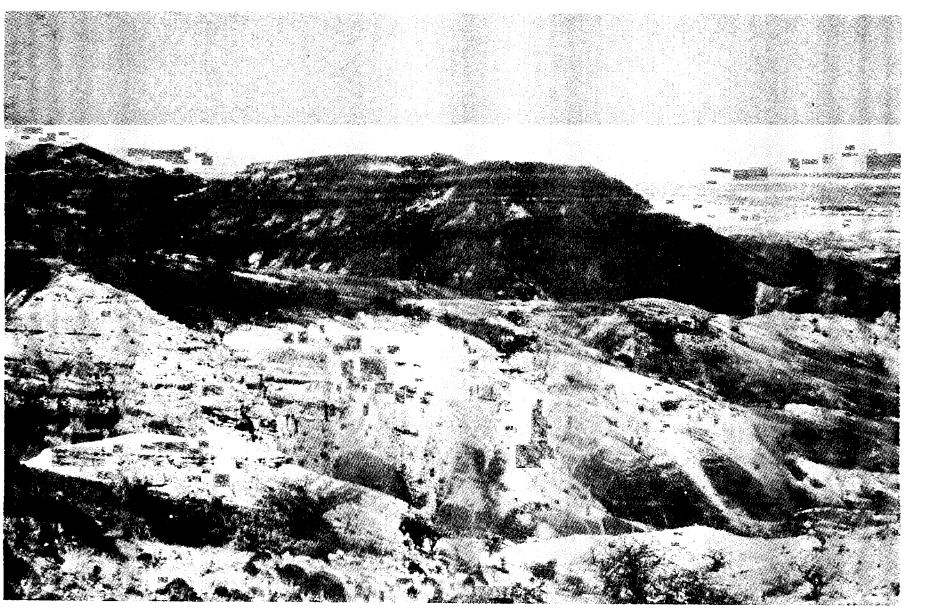

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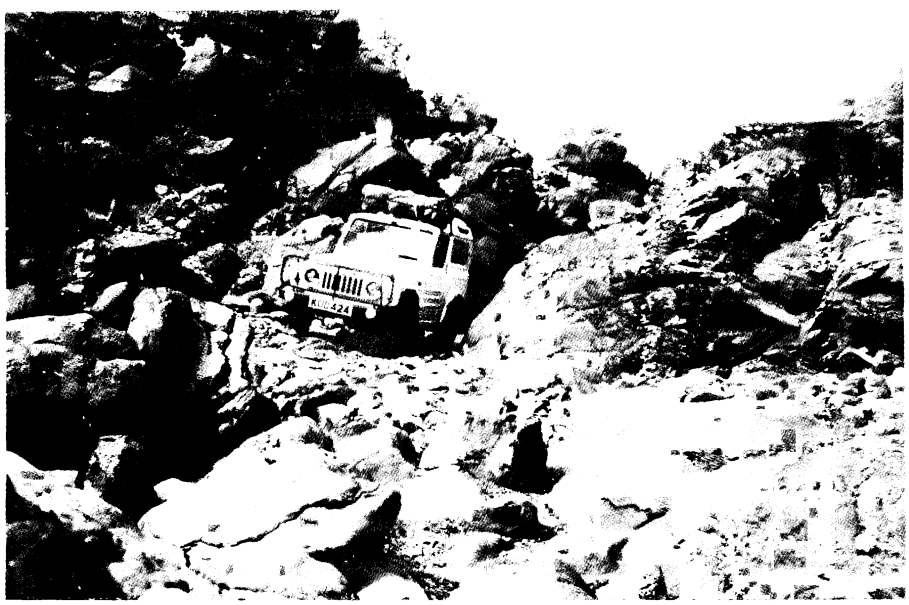
Explanation of the Plate 2

Fig. 1 The Site BG-X, at which *Kenyapithecus* and other anthropoids occurred.
Fig. 2 A 4WD jeep and motable route on river bed of the Namurungule.

Plate 2

1



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