

# GEO-PAL UGANDA



**Uganda Museum, Kampala**

# Geo-Pal Uganda

## 1 Aims and Scope

Geo-Pal Uganda is a scientific journal whose aim is to provide a vehicle for the dissemination of knowledge concerning the geology and palaeontology of Uganda. It publishes original papers that contribute to scientific debate on issues in geology and palaeontology relevant to Uganda and neighbouring countries where there may be an overlap in interests. Its scope embraces all fields of investigation in palaeontology and in the case of geology, all fields that may throw light on the

context of its fossil record (geological context, radio-isotopic age determinations, stratigraphy, palaeoclimatology, palaeoenvironments, etc.). Original articles, as well as review articles are accepted. Each publication will appear as a separate issue of the journal and will be published as soon as possible after the editors are satisfied that the scientific quality of the article warrants its dissemination.

## 2 Submission of manuscripts

Authors should submit their articles to Geo-Pal Uganda in electronic format in order to facilitate the editorial and reviewing process and thereby to shorten publication time. Manuscripts should be

sent to the Uganda Museum, Kira Road, P.O. Box 5718, Kampala, Uganda by mail or preferably by email to the editor.

Contact

[<ezramusime@yahoo.com>](mailto:ezramusime@yahoo.com)

## 3 Copyright Information

Submission of a manuscript implies that the work has not been published before (except in the form of an abstract, a review or thesis), that it is not under consideration for publication elsewhere; that its publication has been approved by all co-authors and by the authorities at the establishment where the research was carried out. Transfer of copyright to the Uganda Museum becomes effective if and when the article is accepted for publication.

The copyright covers the exclusive right to reproduce and distribute the article, including reprints, translations, photographic reproductions,

microform, electronic form (offline, online) or other reproductions of similar nature.

All articles published in this journal are protected by copyright, which covers the exclusive rights to reproduce and distribute the article (e.g. as offprints, pdfs), as well as all translation rights. No material published in this journal may be reproduced photographically or stored on microfilm, in electronic data bases, video disks etc., without first obtaining written permission from the copyright owners.

## 4 Subscription information

ISSN 2076-5746

Copies of published articles can be obtained from the Uganda Museum, P.O. Box 5718, Kampala, Uganda, by requesting the article either printed on paper, or in pdf format. Articles printed on paper will imply a charge of \$20 to cover handling and postal fees. Articles in pdf format will be sent free

of charge. Requests for articles should preferably be made by email to the Chief Commissioner of the Uganda Museum [<mwanjankale@yahoo.com>](mailto:mwanjankale@yahoo.com) copied to [<saramussasarah@yahoo.com>](mailto:saramussasarah@yahoo.com) and [<ezramusime@yahoo.com>](mailto:ezramusime@yahoo.com).

## 5 Production

Uganda Museum, P.O. Box 5718, Kampala,

© Uganda Museum, Kampala

# Geological and palaeontological archives relating to Early Miocene localities of Uganda, 1957-1969

Sarah Musalizi<sup>1</sup>, Brigitte Senut<sup>2</sup>, Martin Pickford<sup>3</sup>, Ezra Musiime<sup>4</sup>

1. Department of Palaeontology, Uganda Museum, Kira Road, Kampala, Uganda  
<saramussasarah@yahoo.com>

2. UMR 7207 (CR2P) du CNRS, Case postale 38, 8, rue Buffon, 75005, Paris, France, <bsenut@mnhn.fr>.

3. Collège de France, Paris, France <pickford@mnhn.fr>

4. Department of Palaeontology, Uganda Museum, Kira Road, Kampala, Uganda <ezramusime@yahoo.com>

Musalizi, Senut, Pickford & Musiime, 2009 - Geological and Palaeontological Archives relating to Early Miocene Localities of Uganda, 1957-1969. *Geo-Pal Uganda*, 1 : 2-96.

## Abstract

Archives represent important historical documents. We here present a transcription of the available archives relevant to understanding the discovery and exploitation of Early Miocene fossil localities in Uganda, between 1957 and 1969.

These archives provide valuable insight concerning Uganda's palaeontological heritage, not only regarding its history, but also information of scientific importance such as precise locality data of fossil collections, sampling sites for radio-isotopic dating and notes on geological context. They also reveal weaknesses in the cataloguing system employed and subsequent actions taken regarding the fossils, which make it difficult to determine what was collected. Some of the fossils may have been lost, and some have been kept overseas. An attempt is made to determine the quantity of fossil material collected, which can be compared with the current holdings in the Uganda Museum, in order to determine where any discrepancies lie.

**Key Words :** Uganda, Early Miocene, Palaeontology, Geology, Archives

## Introduction

Archives transcribed herein correspond to the field notes of W. W. Bishop and others on his team (Sonia Cole, Shiela Bishop, Andrew Hill, Alan Walker). Bishop was responsible for the research.

E. J. Wayland, the director of the Geological Survey of Uganda, first found fossils at Napak in 1920, but little was written about the material, and no follow-up research was undertaken (a small collection of fossils was housed in the Geological Survey of Uganda, Entebbe). The scientific discovery of the sites, especially Napak I and Moroto I are due to John Wilson, who found them in the late 1950's, and brought them to the notice of the Geological Survey of Uganda, and the Uganda Museum. Other sites were found by Alec Trendall soon afterwards while he was carrying out the geological survey of the Napak Sheet. The early field notes are generally undated, but from 1961 until 1969, notes were usually headed with the day's date. W. W. Bishop kept several field note books at the same time, one for the daily tally of fossils found (usually in the handwriting of Sonia Cole), one for geological observations in his own hand, and some notes in a third book, usually in Shiela Bishop's hand. There is some overlap in entries, with a few geological observations interlarded with the daily tally, and some daily tallies included in the geological note book.

No formal catalogue was kept of the fossils found, but the site abbreviation and year of collection was generally written on the fossils themselves, or on slips of paper kept with the specimens if they were too small to write on. This makes it difficult to estimate exactly what fossils were found, but an attempt has been made by totalling the daily tallies. The figures presented at the end of this paper, represent a minimum number of fossils collected.

Some of the fossils were entered into a Card Catalogue (UMP #) at the Uganda Museum (probably by A. Walker) a copy of which exists in the Palaeontology Section, but which has been damaged by termite activity. Most of the fossils were, however, kept in cotton bags or in small cardboard pill boxes, with information written on the lids, usually in W.W. Bishop's handwriting.

Some fossils were sent to experts in Europe and America, and not all the specimens have been returned to Uganda. Various specimens are curated in the Natural History Museum, London, some are in the National Museum of Kenya, and some are undoubtedly in other countries.

Other archives, including a few official reports to government, and letters have been included when they provide additional information about the sites.

The archives provide a view of the intellectual climate in which W.W. Bishop carried out his researches into the Early Miocene fossil sites in northeastern Uganda. We see here the beginning of his interest in radio-isotopic dating, a maturing of his research in taphonomy, and the development of his interests in geomorphology and geology. Not so evident in the field note books are his interests in palaeoenvironments and palaeoecology which he focussed on later in his career, but a close reading of the archives shows the beginnings of his attention to these subjects.

In the archives one can discern the increase in knowledge and expertise of W.W. Bishop and his close team members, from the first somewhat hesitant reports in 1957-1958 to the more confident ones of the mid 1960's.

Apart from his published works on Napak and Moroto (see bibliography) which represent ideas that had had time to mature, little is known about the day-to-day background research that culminated in the published papers. The archives provide a glimpse of these activities, and as such are of importance to those who are interested in the development of scientific ideas. At the time, Bishop's studies at Napak and Moroto represented a new direction in African palaeontological practice, with greater emphasis being attached to geomorphological and geological context, absolute dating, taphonomy, stratigraphy, palaeoenvironments, and the interplay between tectonics, volcanics, erosion and deposition in rift settings and in the vicinity of volcanic centres. Prior to Bishop's researches, emphasis had generally been focussed on theoretical climatostratigraphy which over a period of 40 years gave rise to a vast archive of circular reasoning. Climatostratigraphy was finally abandoned as a correlation tool during the early 1960's, thanks in no small measure to W.W. Bishop and like-minded scientists. There can be little doubt that the Napak fossil sites played a major role in developing Bishop's ideas, because the relationships between the fossiliferous deposits and the volcanic edifice of Napak are so clear. The old notion that all the fossil deposits in East Africa accumulated in lakes that fluctuated in dimensions during pluvial and inter-pluvial periods, an idea born of the climatostratigraphic model and used to bolster its reality, could not realistically be applied to Napak. If the Napak deposits, which are high above the

surrounding plains on the flanks of a volcano, were to be fitted into the climatostratigraphic way of thinking, then one would need to invoke the inundation of almost the entire African continent. However, the deposits were not lacustrine as once thought (Trendall, 1965). Bishop was the first to demonstrate that the fossil horizons at Napak were palaeosols that formed on volcanic ashes that accumulated on the flanks of the volcano as part of the normal activity of that volcano. This realisation prompted the reinterpretation of other East African Miocene fossil occurrences, all of which had at one time or another been interpreted as lake beds. Almost all of them, such as Songhor, Koru, Rusinga, Karungu, Mfwangano and Uyoma, were found to represent more or less mature palaeosols developed on volcanic ashes and lava flows. Fully lacustrine deposits are extremely rare in East African Early Miocene deposits.

### Abbreviations

Bishop often used abbreviations in his field notes. We have kept them as written in the field notes (agg – agglomerate ; Alek – Alekilek : ant – anterior ; app (approx) – approximate ; Aug – August ; BB – Better bones ; bet – between ; Buk – Bukwa ; c. – about (circa) ; c/s – coarse ; Calif. – California ; Chalico – *Chalicotherium* ; comp – composed ; cont – continued ; cop. – coprolite ; croc – crocodile ; Dec – December ; diam – diameter ; Diamant – *Diamantomys* ; diff – difference ; Dino (Deino) – *Deinotherium* ; det – determinable ; equiv – equivalent ; f/g – fine grained ; flg – flag ; frag. – fragment ; ft – foot (feet) ; gast – gastropod ; identif – identifiable ; inc – including ; indet – indeterminate ; individ – individual ; ins – inches ; invert – invertebrate ; Jan – January ; Kod. – Kodiakori ; lg – large ; Limno – *Limnopithecus* ; lr – lower ; m – molar ; mamm – mammal ; mast – mastodon ; m/g – medium grained ; misc – miscellaneous ; Mor – Moroto ; mpod – metapodial ; Nap – Napak ; OD – Ordnance Datum ; Oryct – *Orycteropus* ; p. – page ; palaeomag – palaeomagnetic ; pcs – pieces ; Plio – *Pliopithecus* ; pm – premolar ; pt – part ; Pterod – *Pterodon* ; re – regarding ; rept – reptile ; rt – right ; Rhino – rhinocerotid ; seds – sediments ; sp. - species ; spp. species (plural) ; specs – specimens ; sev – several ; S. T. & J – skulls, teeth and jaws ; Sun – Sunday ; Tr – trench ; UB – unidentifiable bones ; UMP – Uganda Museum Palaeontology ; up – upper ; v. – very ; volc. – volcanic ; w. - with ; yds – yards ; all Bishop's measurements are in feet (') and inches (").

Everyday activities not related to research do not feature much in the field notes, but where they do, we have kept them in, as they provide additional information of who was involved in the work (Father René Lavocat, expert on fossil rodents, for example). A question mark (?) in the field notes signifies that, at the time of writing, there was doubt about the attribution of the specimen, or that a figure or word is illegible.

René Lavocat, a French palaeontologist, expert of fossil rodents, identified some of the fossil specimens which accounts for spellings such as sciurognat (the French pronunciation of sciurognath) and the use of cubitus for the ulna.

Bishop always employed three letters from the site name followed by Latin Numerals when designating fossil sites, thus Buk II, Nap I, Nap II, Nap IV, Mor I, Mor II, etc. (for Bukwa, Napak and Moroto respectively).

There are many « gastropod eggs » listed in the notes, but almost all of them are in fact insect cocoons and brood chambers. A few caterpillars are listed but these are in fact expanded vermiculite crystals. The same applies to a listing of « caterpillar or volc. glass ». « Monitor » refers to the monitor lizard, a rare fossil at Napak. The main fossiliferous hill at Napak is locally known as Akisim (variously spelled Okathim and Kisimb in diverse reports).

## **Layout**

Visits to the various sites in northeastern Uganda occurred during the same safaris, with the result that notes in each field book jump from locality to locality. In the following parts, we have rearranged the archives by locality for ease of reference. This does not result in distortion of the archives per se, but does not provide the correct view of each day's activities as a succession of events. Where the archives are dated, then it is easy to reconstruct the sequence of events. Bishop often camped at Napak, and would drive to the Moroto sites and back again in the same day, or with an overnight stop in Moroto Town. Where the daily notes are not dated, we have kept the entries in the order in which they appear in the note books, but since three books were kept at various times, there are some entries out of chronological order. Where possible we have placed the out-of-order entries into their proper position.

In the following sections a dashed line is generally used to signify a page turn and question marks are either those of Bishop where they refer to identification of fossils, or ours where words or letters are illegible.

## **Part 1**

### **HISTORY OF DISCOVERY OF NAPAK FOSSIL SITES**

The Kisimb Hill (= Akisim = Okathim) fossil site was found by E. J. Wayland in 1920. This is now thought to be site Nap VII according to Bishop's field notes, but could well be Napak II and the Pleistocene site southwest of site II.

Napak I and III were found by John Wilson in 1957 (probably August).

Alec Trendall (1965) records the position of several sites in the Iri Member in plate 8 of his monograph on Napak. These are un-numbered on the map, but a manuscript in the Bishop archives gives their numbers as II (southeast of Akisim summit), VI (northwest of the summit) VII (west-northwest of the summit) and VIII (northwest of Alekilek). A Pleistocene site southeast of Akisim summit remains without a number.

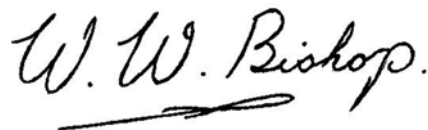
In the same plate Trendall localises three sites in the Napak Member, I close to Alekilek, IV due north of Alekilek and west of Akisim summit, and an un-numbered site northeast of Napak I.

Napak II was found prior to or during 1961 but the precise date of discovery is not known.

Napak IV was discovered by A. Trendall and D. Sutherland in 1960, possibly August, although the precise date of the find is not known.

Napak V was found on 9th August, 1961, by W.W. Bishop's team.

Napak IX was discovered in August, 1962 during the Brathay Expedition to Uganda.

A handwritten signature in cursive script that reads "W.W. Bishop." The signature is written in dark ink on a white background. The letters are fluid and connected, with a prominent flourish under the final "p".

**Figure 1.** W.W. Bishop's signature

**Part 2**  
**GENERAL NOTES ON KARAMOJA PALAEONTOLOGY**

Drawer-by-drawer guide to the Geological Survey Pleistocene stone tool and fossil collection. Sept. 1957.

Section I Drawer 116	Fossil mammalian material from Napak (Karamoja) T.C. (Trendall Collection)
Drawer 116	12 Napak fossils, Napak Karamoja.
436	Kochemaluk, Fossil wood from unconsolidated tuffs E of Moruangichubai
437-448	Fossils Napak (Alek & Kod +) from John Wilson
456	Kochemaluk, Finely bedded coarse & fine tuff & fossil wood from E of Moruangibuchubai
462-469	Alekilek Fossil wood from main site also rainspots in tuff and roots in situ

---

Fossil gastropods for Bernard Verdcourt, East African Herbarium - Nairobi  
1 Block of tuff from Kadam containing gastropod - collected by Mr John Wilson.

Verdcourt identified the specimen as *Limicolaria* sp.

---

GEOLOGICAL SURVEY OF UGANDA

Report N0 WWB/7

Date October, 1957

**Preliminary Report on Fossil Material from Napak (Karamoja)**

by  
W.W. Bishop & S. Bishop

NAPAK (Karamoja)

Introduction :

Fossiliferous material from the Napak tuffs was sent into the Department by Dr A.F.Trendall at the end of August, 1957. (For description of localities and their lithology see letter A.F.T to Director of Geological Survey of 19th August, 1957).

The material consisted of eighteen pieces from the two localities of Okathim (7 pieces) and Kodiakori (11 pieces) of which 8 of the specimens had been found by Mr J. Wilson (Field Officer, Department of Agriculture) and a further 10 specimens by Dr Trendall. Mr Wilson gave his material to the Department for identification but wished certain of the specimens to be returned to him at a later date.

The complete assemblage is at present in the Department Rock Store (Drawer N° 116 of the Pleistocene Stone Tool and Fossil collection). The specimens were briefly examined and the following observations made.

OKATHIM LOCALITY :

The seven specimens were made up as follows :

Fossil Flora	(3 specimens)
Mollusca	(2 specimens)
Mammalia	(2 specimens)



## FLORA :

- T.L.356 Leaf impression in tuff. Little detail visible. Probably unidentifiable.  
T.L.357 Leaf or stem impressions in tuff. Little detail. Probably unidentifiable.  
T.L.361 Three small fragments of fossil wood preserved in the round but without detail.

The three specimens are of interest in the light of the Palaeobotanical work of Dr R. Chaney on specimens from the Bugishu sanstones which were suggested as being not older than mid-Tertiary (Chaney, 1933). Further search near Napak would possibly reveal larger stems that could be sectioned and identified, or better preserved leaf impressions, but these would yield little of value concerning the dating of the tuffs as even with a large floral assemblage only broad time divisions can be defined.

## MOLLUSCA :

T.L.358 and T.L.359. Both contain small gastropods which could be developed from the tuff and possibly identified by an expert. There would seem little point in this, however, unless the tuffs could be shown to yield a large number of gastropods, as big assemblages are necessary if mollusca are to be used for dating and zoning, as by De Heinzelin in the Lake Edward area (De Heinzelin, 1955).

## MAMMALIA :

T.L.353 A broken piece of a molar, probably approximately half of a primitive cone-toothed proboscidean. The cones are broken but their general pattern and some of the enamel is preserved. The root area is absent but the fragment is certainly identifiable. Tentatively it is compared with *Palaeomastodon* sp. or *Trilophodon* sp. and it gives a possible means of dating the deposit. This type of tooth is probably Miocene in age although because of the survival of primitive species in Africa, until it has been accurately identified and supported by additional fauna, the possibility of this being a case of survival of a primitive species into the lower Pleistocene must not be overlooked.

T.L.354 An almost complete skull of a small rodent which has now been developed from its matrix revealing the characters of the upper and lower jaws and the pattern of the teeth.

It is tentatively identified as a Hystricomorph, probably related to the modern Cavioidae (Guinea Pigs). Its species can almost certainly be identified with the help of comparative material, as identification is based on skull form, shape of the lower jaw, and tooth pattern, all of which are well preserved. The majority of the fossil rodents of East Africa have been obtained from the Lower Miocene deposits of Kenya.

Photographs of T.L.353 and T.L.354 have been sent to the Coryndon Museum to help in obtaining more accurate identifications.

## KODIAKORI LOCALITY :

Eleven specimens were obtained.

- Fossil Flora (3 specimens)
- Mollusca (1 specimen)
- Mammalia (7 specimens)

### Flora :

- T.L.351 A small piece of wood (or possibly tusk) but unidentifiable.  
T.L.352 Fossil wood. Unidentifiable.  
T.L.371 Very small piece of wood. Unidentifiable.

Fossil wood is described by Dr Trendall as being abundant here but as far as identification and dating are concerned the remarks made concerning the Okathim locality again apply.

## MOLLUSCA :

T.L.370 A crushed, large gastropod, badly deformed and incomplete. Unidentifiable. As above, if further gastropods are located the total assemblage might be useful in dating.

## MAMMALIA

T.L.347 A cluster of large bones, including the head of a femur and other ends of long bones. Could be further developed from matrix. By size probably elephant.

T.L.348 Distal end of a large femur, a little broken. May be elephant but appears insufficiently robust.

T.L.349 Broken end of a long bone. Identification? Elephant?

T.L.350 A much worn fragment of bone. Although worn, some articulating facets remain. May be indentifiable.

T.L.367 A piece of a large bone and at least one smaller one. Needs further developing from matrix for possible identification.

T.L.368 Piece of long bone. One articulating surface. May be identifiable.

T.L.369 Very small piece of bone. May be rib but very worn and unidentifiable.

Further work is required on these specimens but the size of the bones, particularly in T.L.347, 348, 349, 367 and 368 suggests a large animal, possibly a proboscidean. It is possible that all the fragments may be associated with the skeleton of a single animal.

## CONCLUSIONS :

The Okathim locality is, at the present stage of the discoveries, the more interesting. T.L.353 and 354 both suggest a tentative Miocene age for the deposits and are capable of more accurate identification with respect to species. It would be dangerous, however, to date the deposits finally upon only two species. Nevertheless, the presence of Rodent and Proboscidean remains, both well preserved, would suggest that the area might yield other species if excavation was carried out.

The Kodiakori locality has not yet yielded anything that would be identifiable further than to family but the presence of numerous remains, probably of Proboscidae, suggests that excavation might yield identifiable remains such as teeth, which by virtue of size and durability are often found as fossils. In each case further research would seem worthwhile to try to extend the assemblage and obtain an age for known levels within the volcanic sequence. However, until it is known whether the remains represent only stray skeletons or "bone horizons" it would not seem advisable to carry out large scale excavations.

-----  
February 1958

Addendum to Report WWB/7

Two fossils from the Okathim locality of Napak, a broken molar of a primitive cone-toothed proboscidean (T.L.353) and the skull of a small rodent (T.L.354), were forwarded to the Coryndon Museum. These have now been identified as follows :

T.L.353. Identified by Dr L.S.B. Leakey as belonging beyond question to a primitive elephant *Trilophodon angustidens* var *kisumuensis*. Fossil remains of this species have been recovered from the Kenya localities of Rusinga, Mfwangano and Songhor, in association with a Miocene fauna.

T.L.354. Identified by Mrs S. Coryndon as unquestionably *Diamantomys*, a hystricomorph, related to the modern Guinea Pig (see Main Report), one of the commonest rodents at the Miocene sites of Rusinga, Mfwangano and Songhor.

A larger assemblage is necessary before an age can be assigned to the Napak deposits but the presence of two typically Miocene species suggests a Miocene or early Pliocene date for their deposition.

21st February, 1958.

---



**Figure 2.** The remnant of Napak Volcano known as Akisim, viewed from the volcanic plug, Lokupoi, 2009.



**Figure 3.** The plug of Napak Volcano exposed at Lokupoi, Karamoja, Uganda (Photo G. Bès, 2008).

### Part 3

## NOTES ON NAPAK I

Records of the Geological Survey of Uganda, 1957-1958.  
Faunal Site Napak I

This site is situated on the remnant of Napak known as Akisim, in a col between the main mass of Akisim itself and the agglomerate plug of Alekilek. It is at a radial distance of just over 6 miles south-west of the carbonatite-ijolite plug of Lokupoi, which marks the position of the former central vent of Napak.

The fossiliferous beds are 100 feet thick and comprise horizontally bedded, unconsolidated fine grey tuffs or ashes with occasional agglomerate bands. The ashes are highly calcareous and contain flaggy beds, up to 2 inches in thickness, of tuffaceous limestone. The fossiliferous beds overlie coarse agglomerate which rests on lava. They are also overlain by agglomerate, which forms steep crags on Akisim. The general relationships are shown in figure 4 of King's report (1949, facing page 14); the upper section of his "ashes and tuffs" are the fossiliferous beds. The base of the fossiliferous section occurs at a height of 4,480 feet O.D. and is approximately 500 feet above the Basement rocks at this point.

The beds are of limited extent and this, coupled with their horizontal disposition, thin bedding and general lithology, suggests that they formed in a shallow depression on the flanks of the main volcano. This may have been caused through blocking of a valley by a subsidiary vent now probably represented by the agglomerate plug of Alekilek. However, although Alekilek suggests a plug in form (King, 1949, fig. 4) and consists principally of coarse massive agglomerate, its north-eastern and eastern face exposes fine-grained, well-bedded tuffs with variable dip. By whatever means the hollow was formed, it seems certain that ash and agglomerate, resulting from minor outbursts of activity, were gradually accumulated while fine detritus washed in.

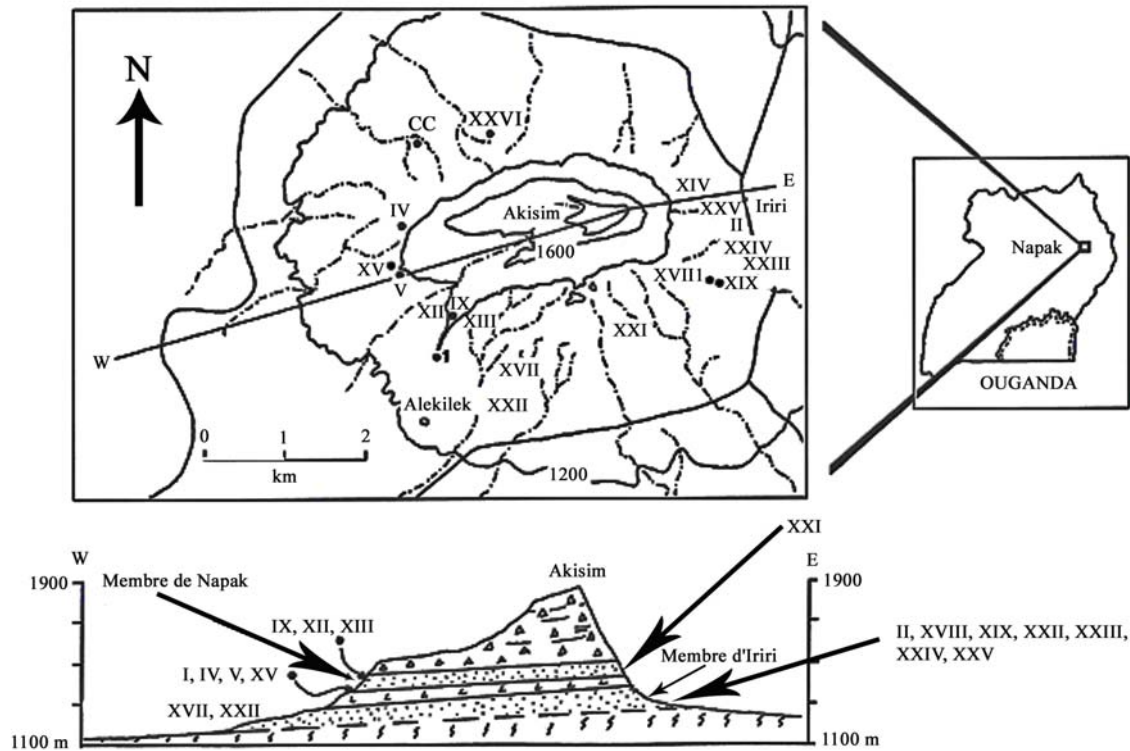
Local non-sequences and reddened surfaces, the occurrence of abundant fossil wood, and the presence of layers of calcareous nodules (kunkar), flags with rainspotting and layers of curled, sun-dried mudstone, give evidence of numerous breaks in deposition. The fossils occur sparingly upon these temporary land surfaces.

---

#### Napak Site I

Good wood with structure

Better bones	96+4
Unidentifiable bones	210
Teeth & jaws	57
Total fragments 1961	367
Total fragments 1958	1114
Grand total	1481
Also fruits	10
Gastropods	5
Pisolites	



**Figure 4.** Location of fossiliferous sites on the flanks of Akisim, Napak, Uganda (modified from Pickford *et al.*, 1986a).

---

Site I 1958

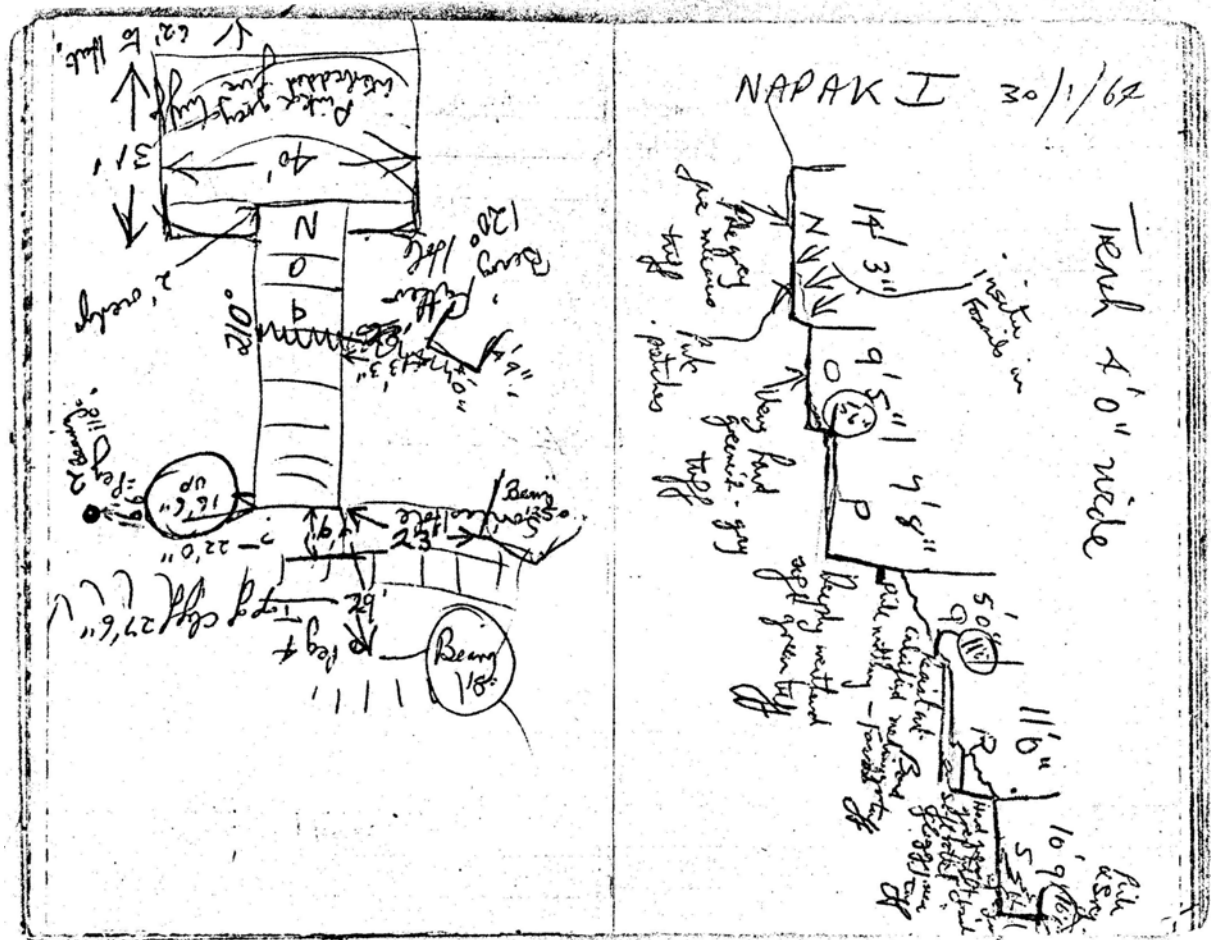
- 1,114 mammalian fossils
- 778 unidentifiable fragments
- 188 better bones with distinct facet or form
- 148 teeth & j. 13%
  - 39 Proboscidean teeth (+ molar)
  - 45 proboscidean tusk
  - 35 Rodent (23% of T. J. & S)

Heights Napak I - 1958 quoted as Base 4480' OD 500 feet above basement.

---

Fossils Napak I - 7th Aug. 1961

- 46 indet bone fragments
- 22 probably determinable bone fragments (including bird bones)
- 21 teeth etc identifiable
  - 4 elephant tusk and tooth
  - 8 rodent jaws and teeth
  - 1 Hyaenodontine carnivore jaw
  - 1 Primate (?*Limno* ?*Proc*)(left upper canine (broken) & root of pm)
  - 3 atsragalae
  - 1 chalicothere ? molar
  - 1 indet tooth frag
  - 1 pig tusk



**Figure 5.** Extract from field notebook, concerning the layout of screening trenches at Napak I, 30 January, 1964 (W.W. Bishop manuscript)

1 phalange (small)  
89 Total  
29 others

Napak Site I - 9/August/61

6 rodent teeth & jaws	10 teeth & jaws
1 bovid	1 Gastropod
1 broken ?carnivore tooth	1 woody fragment / to section
1 anthrac ???small top to tooth	42 assorted bones
1 jaw with broken teeth roots	1 fragment of shell?
Total 55	

Fossils collected as at 9th August '61 : Nap I      55 + 89 = 144

Napak Site I - Thursday 17th August

Better bones	30
Unidentifiable bones	38
Rodents	8
Primate	1 jaw
Pig ?(part of tusk?)	1
Proboscidea part of tusk w. enamel	1

Total 79 (11 teeth and jaws plus 2 fruits, 1 gast, total 82)

Totals Napak Upper Fossiliferous Levels: Nap I

Good bones	100
Bad bones	210
Teeth & jaws	57
Total	367
Good	188
Bad	778
T & J 13%	148
Total	1114

Good	284
Bad	988
T a J	205 14% of total
Total	1479

Napak I 1961 contd

Teeth and jaws	
Rodent	33
Primate	5
Suid	2(?)
Carnivore	2
Proboscid	8 (6 tusk, 2 teeth)
Ungulates	2
Misc.	5 (rhino, chalice etc)
	57

---

Rodent fossils - Napak

Napak I - 11th August '61

8 ? Fruits  
3 Gastropods  
17 Mammal jaws and teeth  
    9 rodents  
    1 carnivore  
    1 Bovid  
3 ? Primates  
3 frags elephant tusk & teeth  
1 ? Modern tooth  
31 probably identifiable bones  
98 Unidentifiable fragments  
157 total

Upper level fossils

Site I 383 (365??)

Teeth and jaws Site I 59

---



**Figure 6.** Primate fossils from Moroto II, Napak I and Napak V, 1961 collection, featuring on one of W.W. Bishop's glass teaching slides. This archive provides valuable information about the original condition of the two juvenile mandibles in the middle row (*Ugandapithecus major*), both of which were damaged in order to expose the permanent teeth which were in their crypts. The two fossils at the top left are part of the Moroto II *Afropithecus turkanensis* assemblage, prior to the discovery of the teeth and other parts of the snout. The mandible beneath the centre of the ruler is UMP 62-17, *Limnopithecus evansi*.





**Figure 7.** Fossils from Napak featuring on a glass teaching slide of W.W. Bishop ca 1961. Some of these fossils are no longer in the Uganda Museum collections. In the Ident lot (bottom right), a primate talus is visible in the top row second from right, next to two ruminant tali. The specimen labelled “Primate” (top of page) is possibly a suid maxilla with canine and P1/, but the specimen is no longer in the Uganda Museum.



**Figure 8.** View of fossiliferous bedded volcano-sedimentary deposits at Napak I and Napak IX above a nephelinite lava, and beneath mudflow and debris flow deposits, view northeastwards from the vicinity of the village of Alekilek, 2009.

Brathay Expedition 1962 - Tricker et al 1963

Site I, prominently situated on the ridge between the steep-sided plug-like remnant of Alekilek and main mass of Akisim was investigated for three days with Dr Bishop and Professor Allbrook leading the party on the first visit. Fossils were discovered on all three days and mammalian specimens were, as usual, outnumbered by pieces of fossil wood.

Napak I. A total of 67 fragments of fossil mammals. These consisted of :-

Skulls, teeth and jaws	10
“Better” bones	17
Unidentifiable fragments	

The skulls, teeth and jaws included the broken crown of unerupted molar of *Proconsul major*. This creature was a large unspecialised ape of which some 10 specimens are known from Kenya and now a further 10 specimens have been found from Napak (7) and Moroto (3) in Uganda.

Two fragments of mastodont teeth also occurred together with four rodents, represented by two lower jaws of the guinea-pig-like creature *Diamantomys*, and two isolated incisors. One tooth of a dog-like carnivore and two teeth of small ruminants of the family Tragulidae (probably *Dorcatherium songhorensis*) complete the list of identifiable material.

-----  
(1964 Field season)

8th January - Wednesday. Father Lavocat & Sonia Cole arrived Entebbe 10.10 am to Survey & then to Entebbe for lunch. In afternoon Lab at Makerere - shopping & then fossils in museum. Supper - Uganda Club.

9th January - Thursday. Left Kampala at 9-0 am via Jinja (dam) to Mbale - lunch & then on to Napak at 6.0 pm.

10th January - Friday - Early in morning to Napak I - Excavation in Trench - Rodents *in situ* at 3 levels N-P-R. Also removed overburden from Peg 1 - Lavocat's site - *in situ* *Diamantomys* and associated skeleton. Also from Cole's corner (kg 3).

11th January - Napak I no work rest only.

Napak I

Peg I	Skull, bone & assoc. pieces	2 + 95
Peg 4	Teeth and bone	5
Surface	Bones, teeth a jaws	24
Total		126

NAPAK I 11th Aug '61

8 ? Fruits  
 3 Gastropods  
 17 Mammal jaws & teeth  
     9 Rodents  
     1 Carnivore  
     1 Bird  
     3 ? Primates  
     3 *Frag. Elephant tusks*  
     1 ? *Proden* teeth

31 Probably identifiable bones.  
 98 Unidentifiable frags.

157 TOTAL

---

TOTAL FOSSILS as at 11th Aug  
 611 (Napo I, II & III) + 106 (NAP II)  
 = 717 pieces.

**Figure 9.** Example of daily tally of fossils collected, Napak I, 11 August, 1961 (W.W. Bishop's handwriting).

Napak I 26-2-65

Surface finds from riddle

2 rodent incisors

2 rodent jaws (1 Richard's *Diamant.* 1 no teeth)

1 Jaw ?? No teeth  
1 fragment of probosc. tusk  
4 better bones (mammal)  
21 indet bones (mammal)  
1 piece centipede

---

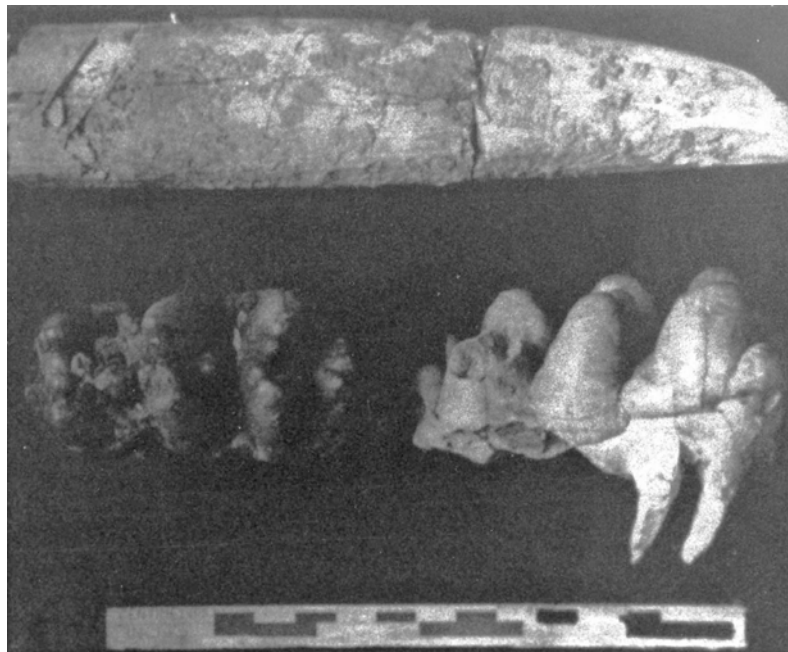
28-2-65 - Napak I surface  
1 tooth carnivore  
5 indet. bones

---

5-3-65 - Napak I surface  
(slopes below)  
1 skull *Diamantomys*  
1 frag tusk mastodont  
1 molar (?milk) mastodont  
1 astragalus ruminant  
13 indet bones  
1 ? Frag reptile  
Abundant wood + gastropod eggs

(Riddle) Napak I  
1 jaw with frag incisor Rodent  
6 indet bones

---



**Fig. 10.** Photograph of gomphothere teeth in the display consecrated to Napak at the Uganda Museum erected by Bishop in the late 1960's. The present whereabouts of these teeth is unknown, although a cast of the lower tusk is preserved in the Palaeontology Division at the museum.



**Figure 11.** Napak I, view of main fossil site and the cliffs of Alekilek. The figures are examining one of Bishop's screening dumps, 2009.

Gastropods	
Napak I 1958	2 gastropods
Napak I 1961	6 gastropods
Remainder of specimens from Napak collected January 1964 - Dr W.W. Bishop	
Napak I Peg 3	1 specimen
Napak I Excavation "R"	4 specimens (includes 1 piece of gast whorl with gast egg inside)

-----

Letter from Bernard Verdcourt to WWB - 1.V.64

Deposit I	1 <i>Limicolaria</i> sp
Napak I Peg 3	1 <i>Limicolaria</i> sp
Napak I R	4 <i>Limicolaria</i> cf <i>leakeyi</i> , but if so the egg is much larger than those of present day species (lent to T. Pain)

-----

23rd January 1965

Napak I - Traverse to Alekilek & Akisim with Jack Miller for dating samples.

Fauna Nap. I

S T & J mammals	5 (4 rodent)
Better bones	7
Indet bones	26
	38
Snake vertebrae	2
Centipede (caterpillar?)	1
gastropods	2
Gastropod eggs	5
Leaf impression	1

---

MB/3 - Napak I site. Sample of Bed 7 (?) Buff micaceous tuff (sampled for Damon at Tucson). Half way up cliff at Nap. I. Separate various micas to investigate possibility of any being derived from Basement. Damon age 19+/- 2 million. Geochron for coarse, more weathered tuff lower in sequence obtained 25+/- 2 after initially obtaining 30 million. Overlies main faunal horizons at Nap I but is still approx 100 feet below Nap IX & Nap X which are at top of tuffs.

---

### **Report of the Napak and Moroto Exposures : January 1968**

Napak I : Still very clean due to hardness of sediments but for the same reason little has weathered out

Fauna collected in January 1968 by Alan Walker & Co.

Napak I : 4 indet mammal frags

---

### **Specimens collected by Dr Kroemenhoek of Namilyando College in early December 1967**

Napak I                      4 rodent incisors  
                                    1 rodent caudal  
                                    1 better mammal  
                                    1 bird frag  
                                    1 mand frag + broken tooth (?carnivore)

---



**Figure 12.** Alekilek and Napak I, viewed southwestwards from Napak V. The lower cliff is a nephelinite lava flow, and the fossil site of Napak is at the nose of the ridge above it, 2009.

## Part 4 NOTES ON NAPAK II

### **Bishop 1958 - Records of the Geological Survey of Uganda 1957-1958.**

Faunal site Napak II

Napak II is situated a mile south-east of the summit of Akisim and the principal site is 400 yards south of the Iri Police Post at a radial distance of 4 miles from the center of Lokupoi. The fossiliferous sediments occur in valleys in the sub-volcanic surface at the base of the volcanics. The surface of the Basement rocks descends in this area from 4,150 to 4,180 feet to the northwest of the Police Post, to approximately 4,100 feet at the main, fossil site. There appears to have been a broad valley in the pre-volcanic surface, and King (1949, p. 5) records 65 feet of grits, sandstones and ashes, limestone and agglomerate at the base of the volcanics in this vicinity. The fossiliferous sediments occur only locally, at the bottom of individual valleys cut in the Basement rocks. The pattern of these pre-volcanic valleys seems to have been largely followed and re-excavated by the present-day streams.

Various pieces of proboscidean tusk and the ends of long bones of large mammals were found washing out from the sediments in this area. One gully yielded the following sequence:-

- |  |          |
|--|----------|
| 3. Medium to fine-grained, tuffaceous brown sands .. | 5 feet   |
| 2. Fine-grained, grey volcanic ash ..                | 4 inches |
| 1. Grey to green, clayey quartz grit ..              | 3 feet + |

The beds have been tectonically disturbed, as they dip at a low angle to the south-west. The basal grit yielded shattered mammalian and other bones, including one very worn Rhinocerotid tooth together with fragments of reptilia, including teeth of crocodile, and unidentifiable casts of gastropods.

Lithologically the fossiliferous deposit contrasts with Napak I, but resembles fossiliferous grits and gravels at Ombo, Mariwa and Karungu in Kenya, all of which occur on or a short distance above an irregular surface of Basement rocks.

---

Iri Police Post - Nap II 6th August 1961

determinable	28 pieces
	3 croc teeth
	Turtle scute (pieces)
	1 rolled bone
	2 frags tusk ? elephant
	1 frag rhino tooth
	5 coprolites

18 indeterminate

Iri Police Post. Nap II excavated material

20 pieces inc 4 ?croc, turtle carapace, Fish? bone

Surface Napak II - 8th August '61 & gulleys to south of excavation

40 pieces inc 5 large bones, 1 phalange, 2 mamm teeth (1 elephant), 8 coprolites, 1?? Fruit.

Total up to 10th Aug - 106 pieces

---



**Figure 13.** Eastern nose of Akisim, Napak, Uganda, viewed from Iriri. Napak II is at the base of the hill to the left of the image, 2009.

Napak IIC - 26/1/64

Surface

Proboscidea

1 molar mastodont

1 part of molar mastodont

Rhinoceros

1 molar

Unidentified

1 carpal or tarsal

2 pcs rib

1 part of tooth

Indeterminate

3 pcs tusk?

5 indet.

Napak IIB

1 indeterminate (rolled)

Napak II

3. Grit with inclusions of angular blocks of chocolate shaley mudstone. Much basement quartz + fossils, 6'+

Well bedded ? volcanic (illegible ? Minerals)

2. Light grey friable micaceous tuff with bands (2-3") of chocolate mudstone, 12'+/-

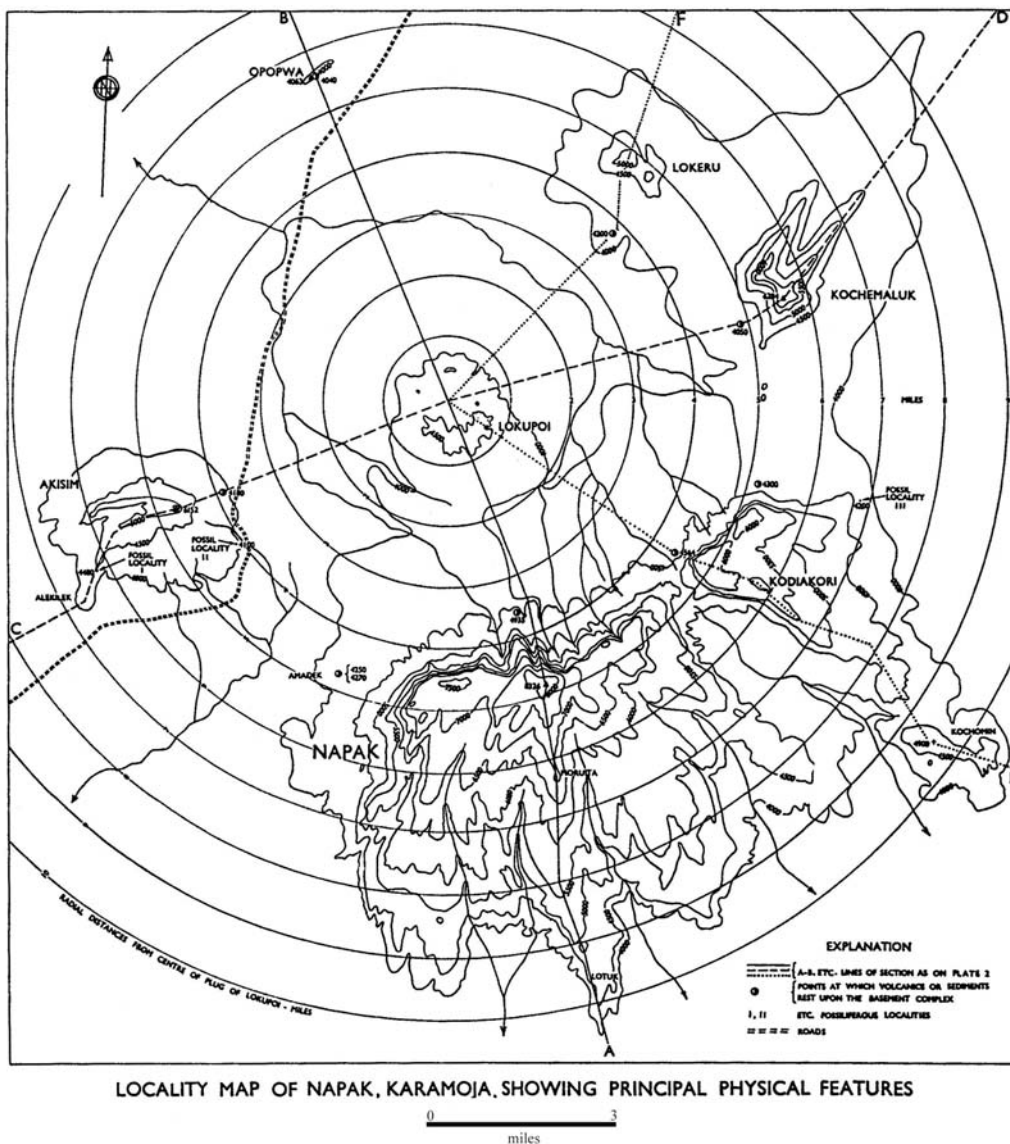
1. 9" thick greenish ? welded tuff very hard. Gravel (quartz)

Basement.

Lower levels

Napak II (Iriri) Up to 10th August - 106 pieces, plus Iriri last visit.





**Figure 14.** Physical features of Napak, published by Bishop, 1962.

Sun. 14.2.65 Napak IIC

Excavated from topsoil, continuation of trench.

1 frag mastodont tooth

1 indet disintegrated bone

Napak IIB - 14.2.65

1 bone - ?croc

1 frag - croc tooth

Napak IIC - 24.2.65, Surface

40 frags (part of one bone, very disintegrated)

Napak IID

1 better bone (large)

1 mussel

4 indet bones

10th January - Friday

In evening to Napak II (Police Post) to see James' excavations. Many coprolites in one place. Visited site of James' Rhino excavations & the anthracothere tooth site (This refers to James Nzabonimpa, Uganda Museum staff member)

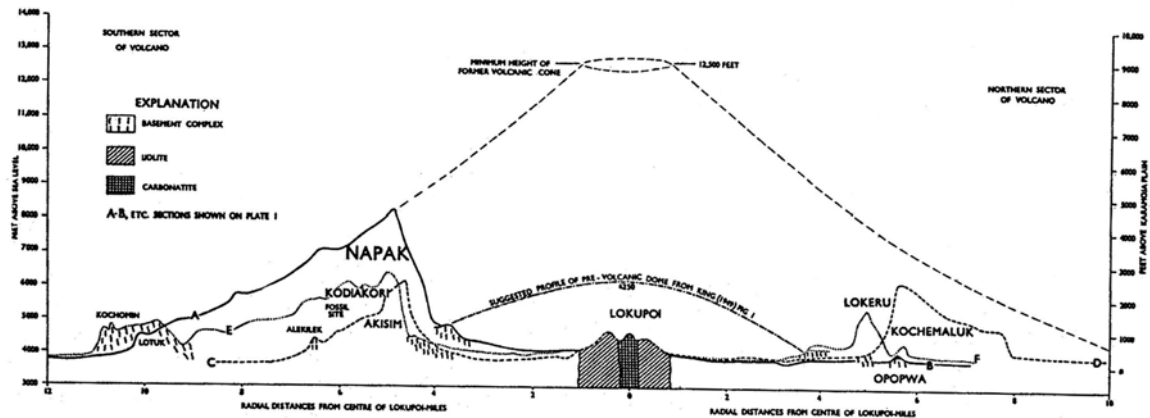


Figure 15. Sections through remnants of the Napak Volcano, published by Bishop, 1962.

Napak Site II (Iri Police Post)

24 coprolites

5 large bones (identif) including Patrick's

2 cops

6 turtle

30 fragmentary & rolled unident bones

38 pieces reptile bone

5 identifiable bones (mammal)

1 pieces fish bone?

1 identif reptile bone

2 indet bones

15 frags of excavated bone

4 excavated croc teeth

7 croc teeth

1 mastodon tooth

1 rhino tooth

3 elephant tusk frags (two tiny)

1 fragment of jaw with tooth indet

103 Mammalian remains

Also 1 fruit?

Napak II Iri Police Post

Ascending succession

I.- Basement - banded gneisses

II.- Conglomeratic gravel spreads. Thickness unknown, but seen to be in places at least 10'. Fragments mainly quartz, well rounded & up to 18" diameter. Obviously derived from basement. Probably local fluvial deposits.

III.- Grit c/s sandstone. Probably conglomerate grades up into this. Max thickness 20'.

V.- F/g Hard consolidated green tuff - maybe 2 bands of this tuff. Seen in stream bed beside excavation 9" thick.

IV.- Soft m/g micaceous tuff. Underlies V. This is about 1' thick minimum.

VI.- Soft flg. Micaceous green tuff 3' thick.

VII.- Red & green-grey soft tuffs. Min. thickness 6'.

VIII.- c/s unconsolidated angular gravel with much basement fragments & fossils. Red & green clay partings in this.

IX.- Red & green clay tuff with few thin grit layers. Whole 20' thick app. Most obvious layer 8' above base - just sundry layers in varying tuff sequence.

---

Napak II - Indet - freshwater gastros (II)

---



**Figure 16.** Well bedded tuffs beneath the summit of Akisim, above the site of Napak II, Irimi, Karamoja, Uganda, 2009.

### **Report of the Napak exposures - January 1968**

Napak II : Not visited by us but Kroemenhoek (sic) found quite a lot of large mammal bones and some good *Trilophodon* tooth fragments.

---

**Specimens collected by Dr Kromenhoek (sic) of Namilyando College in early December 1967**

Napak II                      50 indet mammal  
                                     22 turtle and croc  
                                     4 better mammal  
                                     11 frags mastodont teeth and tusk



**Figure 17.** Fossil wood in volcanic ash at Morusapir (Nap XXVI), northern flank of Akisim, Uganda, 2009.

**Part 5**  
**NOTES ON NAPAK III, VI, VII and VIII**

Napak Site III (Kodiakori)  
Not collected in 1961

---

Napak Site VI  
Indet frags                    625  
Oyster                            1

---

Napak Site VI - (Alec's Blunder)  
large bone mended  
685 Unidentifiable mammalia fragments  
1 identifiable astragalus  
1 rhino tooth frag  
1 mastodon tooth frag  
6 small tooth fragments (mast)  
1 elephant tusk frag  
696 mammal remains  
also 6+1 oysters  
1 croc tooth  
2 fruits  
36 reptile? Bones indet

---

Napak Site VII (Wayland's Kisimb Hill Site)  
69 Fruits  
2 gastropods  
5 mammal unidentifiable bone frags (small)

---

Napak Site VII - Wayland's Kisimb Hill Pleistocene site (see Trendall Fauna + numerous surface flakes) but in Miocene

Fruits	69
Gastropods	2
Bone frags	5
Total	76

---

Napak Site VIII - 15th August 1961  
Surface collection of numerous fragments

Teeth	9 fragments
Coprolites	3
Oyster	2
Unidentifiable	600
Better bone frags	38
Total	652

Matrix seems to be gritty - little exposure. No croc or turtle? Just mammal bone + oyster.

---



**Figure 18.** Dry screening at Napak IV, 2009. This is by far the richest vertebrate locality in the Akisim remnant of Napak Volcano.

Napak Site VIII (South Akisim)

38 better bones

600 Unidentifiable fragments

9 teeth fragments (6 rhino, 3 others mast)

647 Total

---

Locality VIII - Napak VIII

VIII/I Lava from above basal fossiliferous grits + tuff. Taken from stream bed where it has a rather steep dip. No biotite visible, plenty Augite. Two samples - one for dating + other oriented.

---

## Part 6 NOTES ON NAPAK IV

Fossils collected as at 9th August '61 from Nap IV in two days  
Nap IV 210

(Sutherland & Trendall add their specimens)

53 Better bones  
77 unidentified bones  
45 teeth & jaws  
175 total

45 T & J	37 rodent
	2 ?ungulate
	2 <i>Limno</i> (canine, molar)
	1 Pig ?Primate
	2 carnivore
	1 others
Also	7 gastropods
	13 possible fruits
Grand total	195 Napak Site IV –

---

9/Aug/61

Sutherland & Trendall's site - their specimens to be added to total.

7 gastropods  
14 possible fruits (including good ones)  
45 teeth and jaws of mamm  
    36 rodent  
    2 ?Bovid  
    2 *Limno* (canine & molar)  
    1 pig?  
    1 carnivore  
    1 Erinaceidae?  
    1 ??? tiny frag  
    1 primate ? canine

144 bones (various)

210 Total

---

Upper level fossils up to 11th Aug. 1961 Site IV - 210, teeth a jaws - 45

---

11th January 1964

Then on to site IV a lot of surface finds of teeth and bones, also gastropods etc.

Napak IV dip of beds 23° at 220°, 25° at 240°, 32° at 240°, 26° at 210°, 31° at 230°. In fact affected by camber of slope & thus higher figures are possibly the most accurate.

---

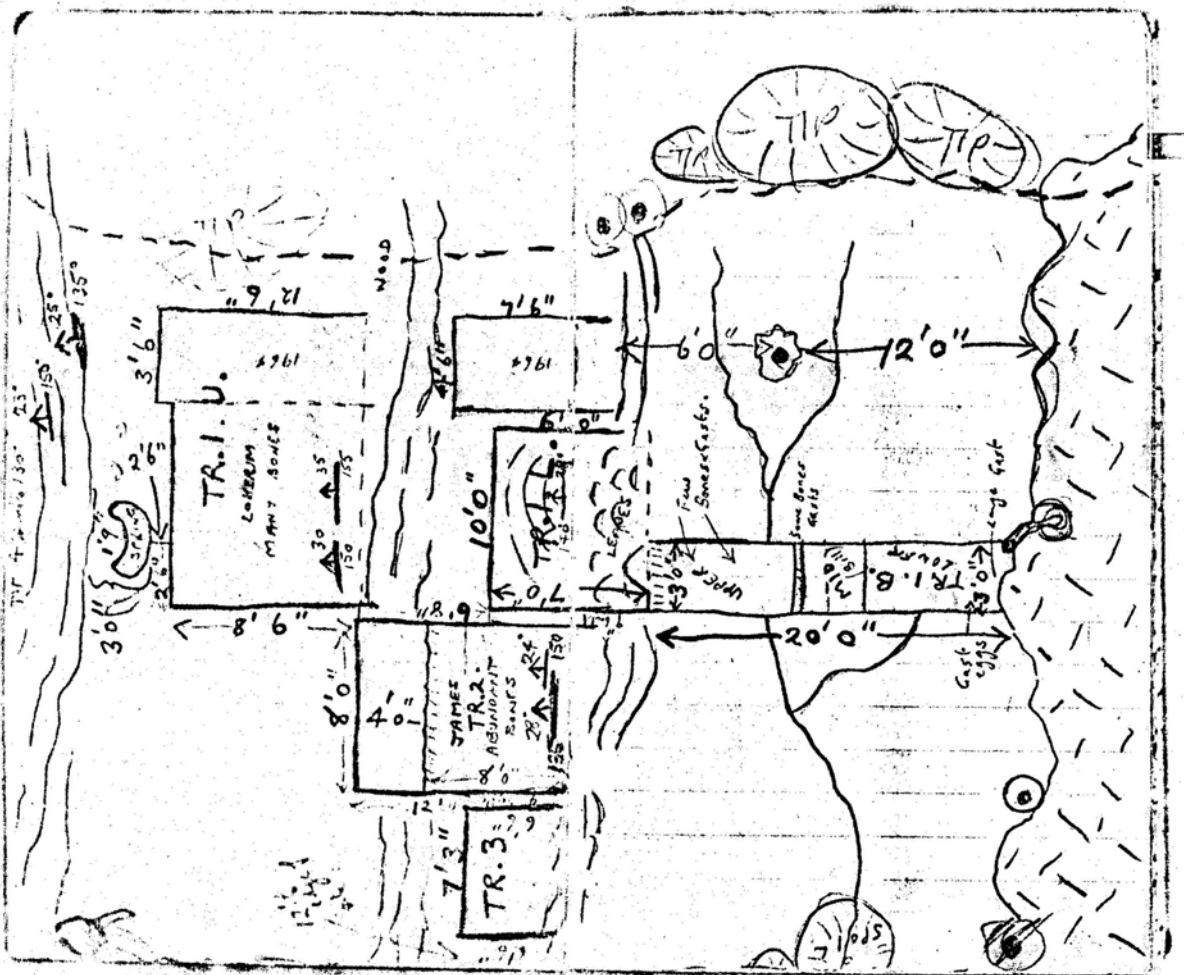
Napak IV 11/1/64

15 gasts or part of  
7 bones (inc 1 lizard)  
1 lizard jaw

- 1 millipede fragment
- 1 anomalurid jaw in situ
- Surface
- 23 rodents s t & j (mainly *Diamantomys*, 1 *Para*)
- 1 indet jaw frag
- 1 carnivore tooth frag (*Pterod?*)
- 1 tragulid
- 1 snout of Primate - Galagid
- 1 orbit of ?

Napak IV Trench IB - 13/1/64

- |               |                                   |
|---------------|-----------------------------------|
| Rodents       | 1 lr jaw sciurid                  |
|               | 1 lr jaw rodent                   |
|               | 1 lr jaw w. 2M <i>Paraphiomys</i> |
|               | 1 phalanx rodent                  |
| Reptile       | 1 vault of skull lizard           |
| Indeterminate | 3                                 |



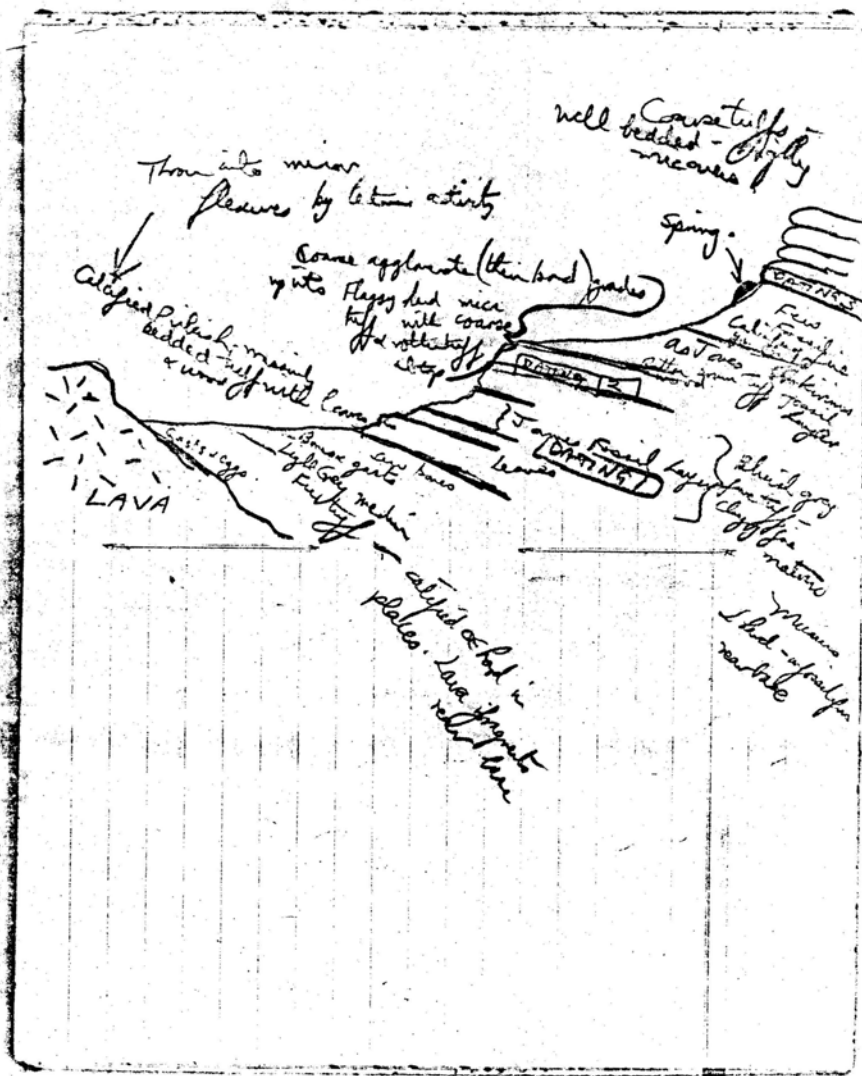
**Figure 19.** Lay out of screening trenches and dumps at Napak IV, page undated but probably 1964 (W.W. Bishop manuscript).

Napak IV Trench IC - 13/1/64

- |              |                          |
|--------------|--------------------------|
| Insectivores | 1 up jaw & part of orbit |
|--------------|--------------------------|



Rodents	1 lr jaw 1 part of jaw <i>Diamantomys</i> 1 tooth
Unidentified	6 incisors rodent 1 vertebra 1 caudal vertebra 1 phalanx 1 part of femur 1 humerus 5 bones
Bird	1 part of wing
Gastropods	2 gastropods 2 gastropod eggs
Indeterminate	22



**Figure 20.** Section of strata at Napak IV, on the page following the plan of trenches and screening dumps, undated, but probably 1964 (W.W. Bishop manuscript).

Napak IV Surface - 13/1/64

Primates	part of orbit - <i>Limno</i> Part of lr jaw w. Pm - <i>Limno</i> Broken up molar - <i>Limno</i> Incisor - <i>Limno</i>
Rodents	mandible - <i>Diamantomys</i> Auditory bulla - <i>Diamantomys</i> 2 fragments mandible - <i>Diamantomys</i> 2 teeth - <i>Diamantomys</i> 1 part of orbit - rodent 1 up jaw w. 2 broken teeth <i>Paraphiomys</i> Carpal or tarsal - rodent 3 incisors - rodent Part of jaw - rodent Radius - rodent Incisor of cricetid Calcaneum - rodent
Artiodactyls	3rd lr molar small artiodactyl 2 parts phalanx artiodactyl 1 broken molar artiodactyl
Proboscidea	1 part of tooth <i>Dinotherium?</i>
Unidentified mammal bones	1 scaphoid 1 part of pelvis 3 vertebrae
Reptiles	1 lr jaw lizard 4 vertebrae snake
Gastropods	2 gastropods 2 fragmentary gastropods
Millipede	1

---

Napak IV Trench IB - 14/1/64

Rodents	jaw paraphiomysid Up incisor rodent
Artiodactyls	Lr premolar ruminant Broken lr tooth tragulid
Unidentified	2 broken teeth Head of femur Part of pelvis
Indeterminate	5

---

Napak IV Trench IC - 14/1/64

Rodents	1 incisor
Artiodactyls	1 calcaneum
Carnivores	1 tooth
Unidentified mammal bones	1 part of scapula 1 incisor 3 vertebrae
Reptiles	1 scute lizard
Gastropods	5 eggs
Indeterminate	17

---

Napak IV Trench 1D - 14/1/64

Rodents	3 teeth <i>Diamantomys</i> 2 incisors rodent
Unidentified	1 broken femur 1 phalanx
Gastropods	1 egg
Indeterminate	13

---

Napak IV Surface - 14/1/64

Primates	1 part of jaw with 2nd incisor & canine - <i>Limno?</i> 1 incisor - <i>Limno?</i>
Rodents	4 teeth <i>Diamantomys</i> 1 jaw <i>Diamantomys</i> 8 incisors rodent 1 jaw phiomysid 1 part of muzzle rodent 5 vertebrae rodent 1 atlas rodent 1 part of rib rodent 1 tibia rodent 1 ear bone rodent



**Figure 21.** Napak IV, view of excavation activity, 2009.

---

Napak IV Trench IB - 15/1/64

Rodents	2 jaws <i>Diamantomys</i>
Indeterminate	3

---

Napak IV Trench IC - 15/1/64

Primates	1 upper molar
Rodents	2 incisors
Insectivores 1	1 small bone
Unidentified	1 caudal vertebra
Gastropods	2 eggs
Indeterminate	36

---

Napak IV Trench IVD - 15/1/64

Rodents	1 tooth <i>Diamantomys</i> 1 incisor in matrix rodent
Artiodactyls	Teeth in matrix 1 tooth 1 premolar 1 3rd phalanx
Unidentified	1 part of femur
Birds	1 humerus
Reptiles	1 vertebra snake
Gastropods	2 eggs
Indeterminate	12

---

Napak IV Surface - 15/1/64

Primates	1 premolar
Rodents	1 orbital arch 2 incisors 1 jaw 2 caudal vertebrae 4 vertebrae 2 phalanges 1 part of skull 1 unidentified bone 2 teeth <i>Diamantomys</i>
Artiodactyls	1 jaw 1 tooth
Unidentified	1 humerus 2 femora 1 ear bone
Reptiles	2 vertebrae big snake 1 scute lizard
Gastropods	13
Gastropod eggs	3
Indeterminate	51

---

Napak IV Trench IB - 16/1/64

Rodents	1 fragmentary jaw <i>Diamantomys</i> 1 incisor rodent
---------	--

---

Napak IV Trench IC - 16/1/64

Rodents	2 fragmentary incisors
---------	------------------------

Unidentified	3 vertebrae (fragmentary)
	1 humerus
	1 femur
	1 astragalus
Reptiles	1 scute lizard
Gastropods	7 eggs
Misc	1 caterpillar? or volcanic glass?
Indeterminate	16

---

Napak IV Trench ID - 16/1/64

Rodents	1 tooth <i>Diamantomys</i>
	2 incisors rodent
Primates?	1 ungual phalanx
Carnivores	1 lr carnassial
Reptiles	2 vertebrae snake
	1 scute lizard
Indeterminate	18

---

Napak IV Surface - 16/1/64

S.T. & J.	4
(Primate 1)	
(Rodents 3)	
Post-cranial	10
(Rodents	
Bird	1
Reptile	1
Gastropods	17
Gastropod eggs	4
Millipede	1
Indeterminate	39
Napak IV Surface cont.	
Bird	1 unidentified bone
Reptile	5 vertebrae snake
Millipede	1
Gastropods	17 (some fragmentary)
	4 eggs
Indeterminate	39

---

Napak IV Trench IB - 17/1/64

Indeterminate	5
---------------	---

---

Napak IV Trench IC - 17/1/64

Rodents	1 tooth <i>Diamantomys</i>
	1 vertebra
	1 part of pelvis rodent
Unidentified	1 vertebra
GASTROPOD EGGS	7
Indeterminate	9

---

Napak IV Trench ID - 17/1/64

Rodents	1 tooth <i>Diamantomys</i>
	1 incisor rodent
Artiodactyls	1 fragment phalanx
Unidentified	1 carpal or tarsal
	1 phalanx
Reptiles	2 snake vertebrae
Gastropod	1
indeterminate	29

TOTALS	NAPAK IV SURFACE	16/1/64	NAPAK IV SURFACE / cont.	16/1/64
S, T. & J.		4	BIRD	1 unidentified bone
(Primate 1)			REPTILE	5 vertebrae snake
(Rodents 3)			MILLIPEDE	1
Post-Cranial		10	GASTROPODS	17 (some fragmentary)
(Rodents)			4 eggs	
Bird		1	INDETERMINATE	39
Reptile		1		
Gastropods		17		
Gastropod eggs		4		
Millipede		1		
Indeterminate		39		

**Figure 22.** Daily tally of fossils collected from Napak IV, 16th January, 1964, in the handwriting of Sonia Cole.

Napak IV Surface - 17/1/64

Primate	1 patella
Unidentified	2 humeri
	1 femur
	3 vertebrae
	1 part of calcaneum
Gastropod	1

Napak IV Surface - 18/1/64

Primate	1 molar
Rodents	3 teeth <i>Diamantomys</i>
	1 part of jaw with incisor <i>Diamantomys</i>
	3 incisors small rodents
	3 incisors rodents
	1 lr jaw Phiomyid
	1 calcaneum rodent
	2 phalanges rodent
	2 vertebrae rodent
	3 parts of pelvis
	1 head of cubitus
Unidentified	1 vertebra
Reptiles	2 vertebrae (1 of snake)
	1 scute lizard
Gastropod	1
Indeterminate	32 (including 2 of rodents)

---

Napak IV Surface 21/1/64

Primate	1 small M or Pm. Galagid?
Rodents	1 tooth <i>Paraphiomys</i>
	1 part of jaw <i>Diamantomys</i>
	2 teeth
	2 incisors rodent
	2 humeri rodent
	1 patella rodent
	1 part of earbone rodent
	8 vertebrae rodent
	1 long bone rodent
	1 rib rodent
	1 phalanx rodent
Unidentified	1 fragment tooth
Reptiles	1 vertebra snake
Gastropods	2
Gastropod eggs	4
Indeterminate	18

---

Napak IV Trench IC lateral - 21/1/64

Rodents	1 skull <i>Diamantomys</i> in 3 blocks of matrix
	1 jaw <i>Diamantomys</i>
	1 jaw Phiomyid
Unidentified	3 pcs vertebrae?
Gastropods	1
Gastropod eggs	17
Indeterminate	7

---

Napak IV Spring site - 21/1/64

Rodents	1 phalanx
Reptiles	1 fragment bone
Gastropods	1
Gastropod eggs	5

Indeterminate 1

---

Napak IV Trench IC lateral - 24/1/64

Rodent 1 phalanx  
Indeterminate 5  
Gastropod eggs 6

---

Napak IV Surface (area of trench 2) - 24/1/64

Primate 1 incisor - *Limnopithecus?*  
Rodents 1 mandible (2pcs)  
1 tooth *Diamantomys*  
1 incisor rodent  
2 parts of incisors rodent  
2 vertebrae rodent  
2 phalanges rodent  
1 metapodial rodent  
1 long bone rodent  
1 finger bone rodent  
2 unidentified bones  
Insectivore 1 mandible  
Artiodactyl 1 astragalus  
Carnivore 1 canine  
Unidentified 1 epiphysis  
1 tooth  
1 part of tooth  
1 vertebra  
Indeterminate 68  
Bird 1 part of wing bone  
Reptile 2 vertebrae snake  
Gastropod eggs 2

---

Napak IV Surface (riddle) - 24/1/64

Rodents 5 incisors  
2 parts of incisors  
1 tooth criceton  
2 phalanges rodent  
3 vertebrae rodent  
2 metapodials rodent  
1 long bone rodent  
1 part of humerus rodent  
1 part of scapula rodent  
2 unidentified bones rodent  
Insectivore 1 tooth  
Artiodactyl 1 up molar  
Unidentified 1 vertebra  
Indeterminate 50  
Reptile 1 vertebra snake  
Gastropod eggs 2

---

Napak IV Trench 2 - 25/1/64



Primate	1 small up molar
	1 molar
Rodents	1 ear region
	4 incisors
	1 molar anomalurid
	1 phalanx
	1 metapodial
	1 head of calcaneum
	1 vertebra
	1 long bone
Artiodactyl	1 up molar ruminant
Unidentified	2 pcs bone
Reptile	2 vertebrae snake
Indeterminate	60

---

Napak IV Trench 2 (excavated) - 27/1/64

Rodents	3 jaws <i>Diamantomys</i>
	2 long bones rodent
	1 phalanx rodent
Reptiles	1 vertebra snake
Gastropod	1
Indeterminate	11

Riddle Trench 2 lateral

Primate?	1 small premolar
Rodents	1 jaw with tooth phiomyid
	1 incisor rodent
	2 phalanges rodent
	2 vertebrae rodent
Unidentified	1 vertebra
Reptile	1 scute lizard
	1 bone reptile
Indeterminate	30

---

Napak IV Trench 2 lateral - 27/1/64

Rodents	1 mandible
	1 tooth <i>Diamantomys</i>
	2 long bones rodent
	1 scapula rodent
	1 head of ulna rodent
	2 vertebrae rodent
Artiodactyl	1 up molar
Unidentified	1 phalanx
Reptile	1 scute lizard
	1 vertebra reptile
Indeterminate	32

---

Napak IVB Surface - 27/1/64

Chalicotheres?	2 parts of same jaw with 2 teeth
	1 up premolar

	1 part of ascending ramus
	1 head of radius
	1 part of ulna
Reptile	1 part of jaw crocodile
Indeterminate	2

---

Napak IV Trench 2 + lateral (riddle) - 28/1/64

Primate	1 lr 3rd molar
Rodents	1 tooth <i>Diamantomys</i>
	3 incisors rodents
	1 phalanx rodent
	2 vertebrae rodent
	2 long bones rodent
Reptile	1 vertebra
Indeterminate	30

---

Napak IV Trench 2 (excavated)

Rodents	5 incisors
	1 molar <i>Pedetes</i>
	2 phalanges rodent
	1 long bone rodent
Unidentified	1 tiny jaw
	1 post-cranial bone
Reptile	2 vertebrae snake
indeterminate	32

---

Trench 2 lateral (excavated)

Rodents	1 tooth <i>Diamantomys</i>
	1 broken mandible rodent
Insectivore	1 jaw (no teeth)
Indeterminate	20

---

Napak IV Trench IB excavated 13->16th January.

---

Napak IV

1. Apparently resting on agglomerate ? Fault through gully
2. 12' of calcareous - fossiliferous sediments - abundant surface kunkar, grey tuffs - fine grained with three 6"-9" bands of grey coarser subaerial tuffs with biotite. Two horizons at about 4' & 8' from base abundant fossil wood.
3. Overlain by 20' + of red-brown unfossiliferous fine tuffs.

The sediments dip c 15° -> direction parallel with main scarp of Akisim aggs above. Fossils from lower 12' see collection of mammals but include seeds (fruits) & gastropods. Sample of coarse tuff - w. biotite (few) about 10' above base of sequence on agglomerate. Fossils principally from medium grained grey bands in sequence.

---

Locality IV = Napak IV

IV/1 c/s tuff rich in augite and has visible biotite. This is sort of material in which fossil wood + bone is found - perhaps a bit coarser.

---

Napak IV - Factors in preservation

1. Calcareous crystal tuff in Miocene prevents break down of bony structure - through 25'+ of tuffs - sparsely distributed.
2. Creatures mainly died natural deaths & those surviving action of predators were stuffed into thin ashy soils
3. Possibility of some concentration in patches at some horizons as result of surface run off & local shallow channelling of unconsolidated tuffs
4. After build up & break down of cone probably in late Pleistocene (following tilting of beds by faulting or slumping) true secondary calcification rendered fossils more durable & coherent as specimens. Calcification results in resistant noses (?) At I, V & IX. At IV spring eyes are an example of this secondary calcification. (Section across site to show spring & water table & calcification of "cone" of ground)
5. In late Pleistocene & Recent times a shallow basin like valley formed a catchment in which the more durable fossils accumulated as a remanié deposit. [NB Work out volume removed (assuming that none escaped via outflow) & contrast with volume excavated & number of fossils recovered ] - Block diagram of site for final paper.

---

Rodent fossils - Napak 1964 despatched per Lavocat Jan 1964 - More sent May by Bishop.

Napak IV		
Spring site	Bone	1
Surface	Skulls, teeth & jaws	49
Surface	Skulls, teeth & jaws	10
Surface	<i>Diamantomys</i> skull	1
Surface	Post-cranial	58
1C	bones, teeth & jaw	28
1C lateral	jaws	2
Trench IB	jaws, teeth & bone	10
1D	Bones & teeth	14
Surface	Bones (8 very small)	27
Surface	Skulls, teeth & jaws	22

---

Gastropods Box 1 - Napak IV      1961    8 gastropods Upper levels - 26.7.1962

---

Fossil gastropods for Bernard Verdcourt, East African Herbarium - Nairobi

Napak IV	Surface collection of gastropods (in 4 pill boxes)	Total 69 specimens
Napak IV	<i>In situ</i> gastropods	3 specimens
Napak IV	Spring site ( <i>in situ</i> )	1 specimen
Napak IV	Trench 2 ( <i>in situ</i> )	1 specimen

Identified by Verdcourt as follows :-

Napak IV Surface	<i>Homorus</i> sp	22
	<i>Tayloria</i> sp	2
	<i>Limicolaria</i> sp	12
	<i>Trochonanina</i> sp	1
	<i>Maizania</i> sp	6
	Genus not known	1

	- a stenogyrid fragment consisting of two cylindrical strongly transversely costate whorls - perhaps a <i>Subulina</i>	
	indet.	24
Napak IV In situ	indet Achatinidae	1
	with egg or some inclusion	
Napak IV Spring site	badly deformed <i>Maizania</i> ?	1
Napak IV Trench 2	indet	1

---

Napak IV Trench 2 (excavated) - 30/1/64

Rodents	1 phalanx 2 long bones 1 pce vertebra
Insectivore	1 lr jaw + tooth
Artiodactyl	1 lr jaw + 2 teeth
Indeterminate	5
Below Trench 2	1 leaf impression

---

*Limno*. Small *Limno*? Molar from Nap IV not unlike *Limno macinnesi* 636/51 Rusinga. 2nd m. in maxilla. Small broken-blunted canine from Nap IV cf 533/56 canine of *Limno*, Songhor 17/47 *L. legetet*, Songhor 3/47 rt upper canine of *L. legetet*.

---

Napak IV Trench 1 (lower) - 13.2.65

<6 ins at bottom  
6-12 ins at top  
4 better bones  
12 indet bones

---

Napak IV Upper Trench I - 13.2.65

Top 6 ins  
1 rodent molar  
1 rodent incisor  
2 small better bones  
27 indet bones

---

Napak IV- 15.2.65 Trench I Lower 6 ins - below surface in very consolidated, hard tuff - many leaves

4 indet bone frags  
Leaves - some vertical, some contorted, some jade green, one large branch left in situ.

---

Napak IV - 15.2.65 Trench I Upper Top 12 ins

1 *Diamantomys* incisor  
3 small incisors (?1 rodent, ?2 insectivore)  
1 frag tooth?  
1 tiny vertebra  
3 better bones  
35 indet small scrap bones

---

Napak IV - 16.2.65 Trench I Upper 12 ins +

1 molar? Primate ? Layer 2

5 frags incisors rodent  
6 better bones  
56 small scraps bone

---

Napak IV - 16.2.65 Trench II layer 6  
1 molar ?rodent?  
1 frag jaw *Diamantomys* with 2 incisors  
1 frag *Diamantomys* incisor  
7 better bones  
c. 50 small scrap bones

---

Napak IV Surface - 17.2.65  
1 jaw with 3 teeth, small rodent  
1 jaw frag with 2 incisors, *Diamantomys*  
1 better bone  
6 indet bones

---

Napak IV Trench II - 17.2.65  
1 tooth rodent  
3 frags incisors small rodents  
3 better bones  
c. 60 indet bones

---

Napak IV Trench I upper - 17.2.65  
2 frags incisors, rodent  
9 better bones  
23 indet bones

---

Napak IV Trench I Upper - 18.2.65  
2 teeth rodent  
2 incisor frags rodent  
1 incisor *Diamantomys*  
3 frags jaw rodent  
1 better bone  
c. 80 indet bones

---

Napak IV Trench II (layer 7) 18.2.65  
1 molar primate  
1 premolar primate  
2 incisors rodent  
2 molars rodent  
4 vertebrae snake  
c. 70 indet  
2 teeth rodent  
7 frag incisor rodent  
1 frag mandible with broken teeth small rodent  
1 maxillary frag ? small carnivore  
1 root canine  
1 frag skull  
17 better bones including 1 head of femur

87 indet bones

Surface - 18.2.65

3 frags incisors rodent

1 tooth rodent

4 better bones

16 indet bones

---

Napak IV Trench III (started) - 18.2.65

1 jaw *Diamantomys*

2 incisors rodent

1 root of tooth, broken, indet

3 better bones

30 indet bones

---

Napak IV Surface - 19.2.65

2 jaws tiny ?cricetid

3 teeth rodents

1 tooth croc

1 jaw reptile

2 vertebrae snake

4 better bones

29 indet.

---

Napak IV Trench I Upper - 19.2.65

4 incisors rodent

4 better bones

33 indet

---

Napak IV Trench II - 19.2.65

6 frag incisors rodent

3 teeth *Diamantomys*

1 left lr jaw with incisor rodent

1 small jaw insectivore? (Tiny)

11 better bones

58 indet

1 fruit?

---

Napak IV Trench III - 19.2.65

1 tooth ruminant

2 teeth rodent

3 better bones

27 indet

1 vertebra snake

---

Napak IV Surface - 20.2.65

1 tooth *Diamantomys*

2 better bones

3 indet bones

1 gastropod

2 gastropod eggs  
1 frag millipede

---

Napak IV Trench I upper - 20.2.65

14 frag incisors rodent  
3 jaws with incisors rodent  
1 frag tooth primate?  
2 better bones  
1 snake vertebra  
1 frag skull lizard?  
1 vertebra bird?  
C. 50 indet bones  
1 gastropod  
5 gastropod eggs

---

Napak IV Trench II - 20.2.65

2 teeth *Diamantomys*  
8 incisors rodent  
1 tooth crown ?carnivore  
3 better bones  
27 indet

---

Napak IV Trench III - 20.2.65

13 indet

---

Napak IV Surface - 22.2.65

8 molars rodent  
2 incisors rodent  
9 better bones  
37 indet bones  
6 gastropods  
12 gastropod eggs

---

-----  
Napak IV Trench I upper - 22.2.65

5 incisors rodent  
1 molar rodent  
23 indet bones

---

Napak IV Trench II - 22.2.65

1 tooth ruminant  
2 teeth rodents  
6 better bones  
50 indet bones

---

Napak IV Trench III - 22.2.65

3 indet bones

---

Napak IV (Surface - sweeping & riddle) 25-2-65  
all finds very small

3 rodent incisors (pieces of)  
1 isolated rodent molar  
9 better mammal bones (4 vertebrae)  
57 indet bone frags (small)  
2 snake vertebrae  
6 fragments of gastropod.

---

Napak IV Surface (riddle) - 27.2.65

1 molar *Diamantomys*  
2 incisors rodent  
1 frag tooth enamel  
4 better bones  
26 indet bones  
2 frags reptile  
2 gastropods

---

Napak IV Trench II - 27-2-65

16 indet bones

Trench I upper

1 tooth (broken) ruminant  
11 indet bones  
1 frag reptile

---

Napak IV Trench I upper - 1.3.65

1 jaw with 2 teeth tiny rodent  
1 incisor rodent (frag)  
2 better bones  
19 indet bones  
1 caterpillar

---

Napak IV Trench II - 1.3.65

13 frags incisors rodent  
6 molars rodent (1 in jaw frag)  
1 tooth carnivore  
1 tooth ruminant  
1 tiny molar ?(Primate?)  
9 better bones  
86 indet bones  
2 ?reptile frags  
1 millipede





**Figure 23.** Napak IV viewed southwards from the low hill that encloses its north side, 2007.

---

Napak IV Trench I Base (started) - 1.3.65

2 incisors rodent (1 *Megapedetes*)

2 jaws with teeth *Diamantomys*

3 better bones

12 indet bones

1 gastropod

3 ?seeds

3 gastropod eggs

---

Napak IV Trench I Base (middle portion)

38 gastropods

8 indet bones

2 incisors rodent (1 in jaw)

1 molar *Diamantomys*

2 teeth Primate (*Plio?*)(1 lr molar, 1 1st premolar or canine)

4 better bones

1 fruit

---

Napak IV Surface - 2.3.65

3 indet bones

---

Napak IV Trench II - 2.3.65

9 frags incisors rodent

5 molars rodent (*Diamant*)  
2 teeth ruminant (1 up, 1 lr)  
2 small molars ?(Primate? Insectivore?)  
1 canine ? primate  
1 tooth insectivore ?  
3 frags reptile (2 jaws)  
5 better bones  
c 120 indet bones

---

Napak Trench I upper - 2.3.65  
2 frags jaw with teeth tiny rodent  
2 incisors tiny rodent  
1 molar tiny ? Insectivore  
1 worn lr molar ruminant  
1 tiny tooth ?  
2 better bones  
36 indet bones

---

Napak IV Trench I base (upper) - 2.3.65  
2 incisors rodent  
13 indet bones  
1 gastropod  
Many gastropod eggs

Trench I base (lower)  
6 gastropods (includes *L. leakeyi*) from near surface of lava  
fragments of other large gastropods  
2 frags incisors rodent  
2 better bones  
2 indet bones  
2 fruits

---

Napak IV Trench I base (middle)  
13 gastropods (including 1 large *L. leakeyi*)  
1 ? small fruit  
3 incisors rodent  
2 better bones (vertebrae)  
1 bone in tuff matrix  
Abundant wood fragments

---

Napak IV Trench I upper - 3.3.65  
1 jaw with incisor rodent  
1 molar primate (*Plio*)  
1 canine primate (*Plio*)  
1 tooth rodent  
9 frag incisors rodent  
1 left lr jaw with 3 teeth small rodent  
5 better bones  
2 skull frags reptile  
1 frag millipede

65 indet bones

---

Napak IV Trench I base - 3.3.65

1 incisor rodent  
6 gastropods (3 large) + frags of others  
1 fruit  
1 indet bone

---

Napak IV Trench II (pocket)

9 indet bones  
trench II  
15 frags incisors rodent (1 in jaw)  
1 jaw with 3 molars *Diamantomys*  
1 molar rodent  
1 up molar (broken) ruminant (2 frags - possibly same tooth)  
1 v. small molar ? Primate  
9 better bones  
1 jaw reptile  
1 skull frag reptile  
3 gastropods  
indet bones

---

Napak IV Surface - 4.3.65

1 jaw frag *Diamantomys* (4 teeth)

---

Napak IV Trench II - 4.3.65

1 frag lr molar ruminant  
1 molar primate (*Plio*)  
1 tooth rodent  
1 incisor ? primate  
1 tiny molar ? Primate  
5 frags incisors rodent  
2 molars *Diamant*  
1 small jaw with erupting molar rodent  
6 better bones  
127 indet bones

---

Napak IV Trench I Upper - 5.3.65

2nd & 3rd molars galagid  
12 frags incisors rodent  
1 molar *Diamant*  
7 better bones  
1 frag bone Bird  
43 frags reptile (? One individ)  
70 indet bones

---

Napak IV Trench II - 5.3.65

1 skull + sev fragments *Diamantomys*  
4 teeth rodent  
5 incisors rodent

2 better bones  
80 indet bones  
1 frag skull reptile  
1 gastropod  
5? Coprolites

---

Napak IV Trench I upper - 6.3.65

1 incisor rodent  
1st premolar small primate  
1 small jaw carnivore  
4 better bones  
5 frags reptile  
60 indet bones

Trench II

8 incisors rodent  
1 tooth *Diamantomys*  
5 better bones  
1 3rd lr molar galagid  
1 premolar ?ruminant (check)  
80 indet bones  
1 jaw *Diamantomys*

---

1. Grey tuff, bones in lower part
  2. Brown/grey; more clayey, + bones
  3. Golden, gritty, coarse, crystals
  4. Very hard + fossil wood
  5. Brown/grey, clayey (cf 2?)
  6. Greenish + bones
  7. Light grey, hard (cf 1?)
  8. Raindrop lapilli
  9. Very hard + leaves
- 

Report of the Napak exposures : January 1968 (possibly by A . Hill)

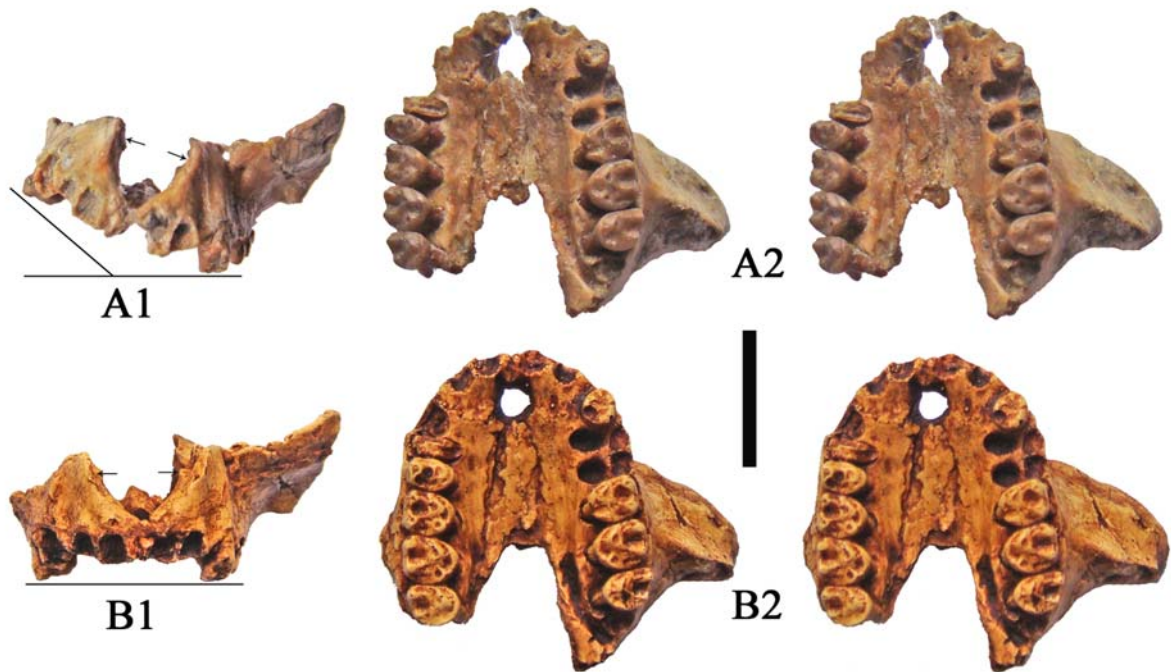
Napak IV : Grass not encroaching badly (partly, like I, due to exposed position and swept surfaces?) Softer sediments being eroded and some stuff lying around, mostly on fill-in of squares and trenches. Spoil heaps have developed a fairly hard crust and retained the shape - nothing except gastropod eggs (presumably discarded) to be seen because of this crust.

Napak IV      1 upper canine *L. macinnesi* (*in situ* in upper "Bones and teeth" layer - near the scale on fossil locality map)  
                  1 good turtle fragment  
                  1 snake vertebra  
                  2 gastropods  
                  1 coprolite  
                  3 small mammal vertebrae  
                  2 ruminant foot bones  
                  1 auditory bulla (?carnivore or *Diamantomys*)  
                  1 ant. pt of skull and dentition of *Diamantomys*  
                  1 l premolar and incisor root of *Diamantomys*

1 zygomatic process and maxilla of rodent  
 1 femur of rodent  
 8 indet mammal

Trench I upper  
 1 frag tooth ruminant  
 1 canine small primate  
 1 indet tooth  
 15 frags incisors rodent  
 3 molars rodent (*Diamant*)  
 1 lr jaw *Diamant*  
 1 tympanic bulla rodent  
 8 better bones  
 indet bones  
 1 frag reptile

---



**Figure 24.** UMP 64-02, holotype snout of *Micropithecus clarki*, A) specimen as reconstructed after suffering damage between January 2002 and January 2003, B) cast of the specimen made in 2001, before the specimen was damaged. Note the high angle at which the two halves of the palate have been joined together, resulting in a narrowed nasal cavity, and a broadened palate. Pieces aligned using the better preserved left maxilla as the baseline (A1 and B1 - anterior views, A2 and B2 - palatal views) (scale : 10 mm).

## Part 7 NOTES ON NAPAK V

Napak Site V - 9/Aug/61

New discovery - on way back from site IV Sutherland & Trendall

Site V - for details of lithology see other end of book.

Total 100 pieces  
Comprising 13 teeth and jaws  
1 gastropod  
2 fruits  
84 bone fragments

(1 very worn tooth (molar smooth top), 3 bovids, 1 ?Bovid ?Hyracoid, 4 rodents, 1 ?Primate ?Carnivore canine, 1 piece of jaw + 2 teeth - holes in jaw?, 1 canine ?Primate (large) - possibly, 1 smooth toothed - ?Oryct.

---

Fossils collected as at 9th Aug '61 from Napak V in two days

Napak V 100

---

Large molar Napak V - cf Songhor 381'49 - *P. major* Described and fig.

Other large molar Napak V with splayed roots cf CMH 35 Described and fig.

CMH 117 *Proconsul nyanzae*? Clarke & Leakey 1951, p. 53. Incisor region immature maxilla cf maxilla Napak V with unerupted incisor - unerupted median incisor partly exposed on a fractured surface. Probably *P. nyanzae* on several dimensions.

---

11th January 1964 - Napak V - spent 15-20 minutes collecting.

*Limno* canine

2 *Diamantomys* fragments

1 small *Cricetodon*?

1 worn tragulid tooth (quite large)

Some other bones & one good gastropod.

Totals Napak V Surface - 30/1/64

S. T. & J (Rodents 5) 14

Post-cranial (rodents 9) 17

Bird 1

Reptiles 8

Gastropods 12

Gastropod eggs 8

Fruit 1

Indeterminate 70

---

Napak V Surface - 28/1/64

Surface 3 incisors  
1 ear bone  
1 femur  
2 long bones  
1 vertebra

Artiodactyl	1 part orbital arch 1 up premolar 1 incisor ruminant
Unidentified	1 premolar 1 phalanx
Gastropods	6
Gastropod eggs	10
Indeterminate	37
Totals	
S. T. & J. (rodent 4)	8
Post-cranials (rodent 4)	5
Gastropods	6
Gastropod eggs	10
Indeterminate	37

---

Napak Site V

Wood	(2 pieces)
Coprolite	1
Better bones	64
Large bones	8
Unidentifiable bones	244
Teeth and jaws	57
Total mammal frags	373
S. T. & J (42% total T & J)	23 Rodent 4 Rhino 10 Primate 17 Ungulates 3 Others
Also	7 + Gastropods 10 Fruits or seeds 1 coprolite 2 Wood pieces 389 Grand total

---

Rodent fossils - Napak 1964 - Despatched per Lavocat Jan 1964 - More sent May by Bishop.

Napak V

Surface	11 Skulls, teeth and jaws 13 Post-cranial 1 <i>Diamantomys</i> 3 Teeth 2 Bone
Total	30

---

Gastropods - 26-7-62

Napak V 1961	7 gastropods
--------------	--------------

---

Napak Site V - 17th August

Better bones	50
--------------	----

Unidentifiable bones	150
Wood	2
Coprolite	1
Fruits	8
Gastropods	6 + fragments
Associated large bones (scapula etc)	8 (in separate bag)
Not including teeth & jaws	255
Illegible	7?
Rhino	2
Rodents	19
Bovid	13
Indet (small piece)	1
Grand total	297

---

Fossils collected as at 9th August '61  
Napak V 100

---

Brathay Expedition, 1962 - Tricker et al 1963.

Site V, which occurs in the same deposits as Site I, was reached after a walk of 3/4 mile north-west from Site I. The surface was again characterised by loose stone, calcareous concretions and fossil wood. Among the fossil mammalian specimens collected was a large jaw fragment found protruding from consolidated volcanic ash by Mr Williams. This specimen was excavated carefully using trowels and knives.

Napak V. A total of 149 fragments of fossil mammals. These consisted of :-

Skulls, teeth and jaws	20
"Better" bones	44
Unidentifiable fragments	85

The skulls, teeth and jaws include a large part of the left lower jaw of a chalicothere (an extinct early relative of the rhinos and horses which possessed claws instead of hoofs). Six rodents were represented (including 4 teeth of *Diamantomys*, an incisor of *Megapedetes*, a large ancestor of the modern Spring hare, and another isolated incisor), together with 10 teeth and jaw fragments of tragulids. (4 of the small *Dorcatherium songhorensis* and six representing the larger *Palaeomeryx africanus*). Three other indeterminate teeth also occurred.

The assemblage is not large enough to place much stress on the apparently higher percentage of Tragulidae at Napak V but this trend is emphasised also by the earlier collections. Thus it seems that the tragulids were probably more common at Napak V than at Napak I, despite the fact that the two assemblages were virtually contemporary and in very similar settings on the slopes of the then active volcano of Napak.

One coprolite and 4 land snails were also collected at Napak V.

---

15/1/64 - Napak V Surface

Rodents	1 jaw <i>Diamantomys</i>
	1 part of skull rodent
Gastropods	1 egg

---

18/1/64 - Napak V Surface



Rodents	5 incisors rodents 3 jaws <i>Diamantomys</i> 1 part of skull rodent 1 jaw <i>Anomalurus</i> 2 phalanges rodent 2 parts vertebrae rodent 1 astragalus rodent 1 axis rodent 1 long bone rodent 1 head of femur rodent 1 humerus rodent 1 ear bone rodent
Carnivores	1 jaw
Artiodactyls	4 teeth (2 fragmentary) 1 lr jaw articulation 1 humerus 1 vertebra
Unidentified	2 phalanges 1 lr part of calcaneum 1 head of calcaneum 1 part of vertebra 1 humerus 3 vertebrae 1 articular part of mandible 1 tooth root
Reptiles	1 part of skull (?croc) 2 scutes (1 of croc) 1 vertebra
Gastropods	5
Gastropod eggs	13
Misc	1 curled leaf 2 slugs?
Indeterminate	49
Indet rodent	4

---

Totals Nap V Surf 18/1/64

S. T. & J (rodents 10)	18
Post-cranial (rodents 10)	21
Reptiles	4
Gastropods	5
Gastropod eggs	13
Misc	3
Indeterminate	49
Rodent indet	4

---

Napak V Surface 27/1/64

Rodent	3 incisors 1 orbital arch 1 jaw (no teeth) Sciurognat 1 head of ulna
--------	---

	1 phalanx
	1 vertebra
	2 humeri
Artiodactyl	2 up molars (1 pce)
Unidentified	1 part of femur or humerus
	1 femur
Reptile	1 scute reptile
	2 scutes crocodile
Gastropods	3
Gastropod eggs	2
indeterminate	82
Totals	
S. T. & J (rodents 5)	7
Post-cranial (rodent 5)	7
Reptile	3
Gastropods	3
Gastropod eggs	2
indeterminate	82

---

Napak V Surface 29/1/64

Primate?	1 incisor
Rodent	1 lr jaw <i>Paraphiomys</i>
	2 parts of jaw <i>Diamantomys</i>
	3 teeth <i>Diamantomys</i>
	1 tooth anomalurid
	4 incisors rodent
	1 part ulna rodent
	2 humeri rodent
	1 phalanx rodent
	1 radius rodent
	1 long bone rodent
	2 vertebrae rodent
Artiodactyl	1 astragalus
	1 cubo-scaphoid
	1 jaw with teeth
Insectivore?	1 part of skull with tooth
Carnivore	1 jaw with teeth
Unidentified	1 part of pelvic girdle
	1 part of occipital condyle
	3 phalanges + 1 part bone
	1 part of shoulder bone
	1 head of femur
	1 part of ear bone
	3 parts of vertebrae
Reptiles	1 scute turtle
	1 part of skull crocodile
	4 scutes crocodile
Gastropods	22
Gastropod eggs	18

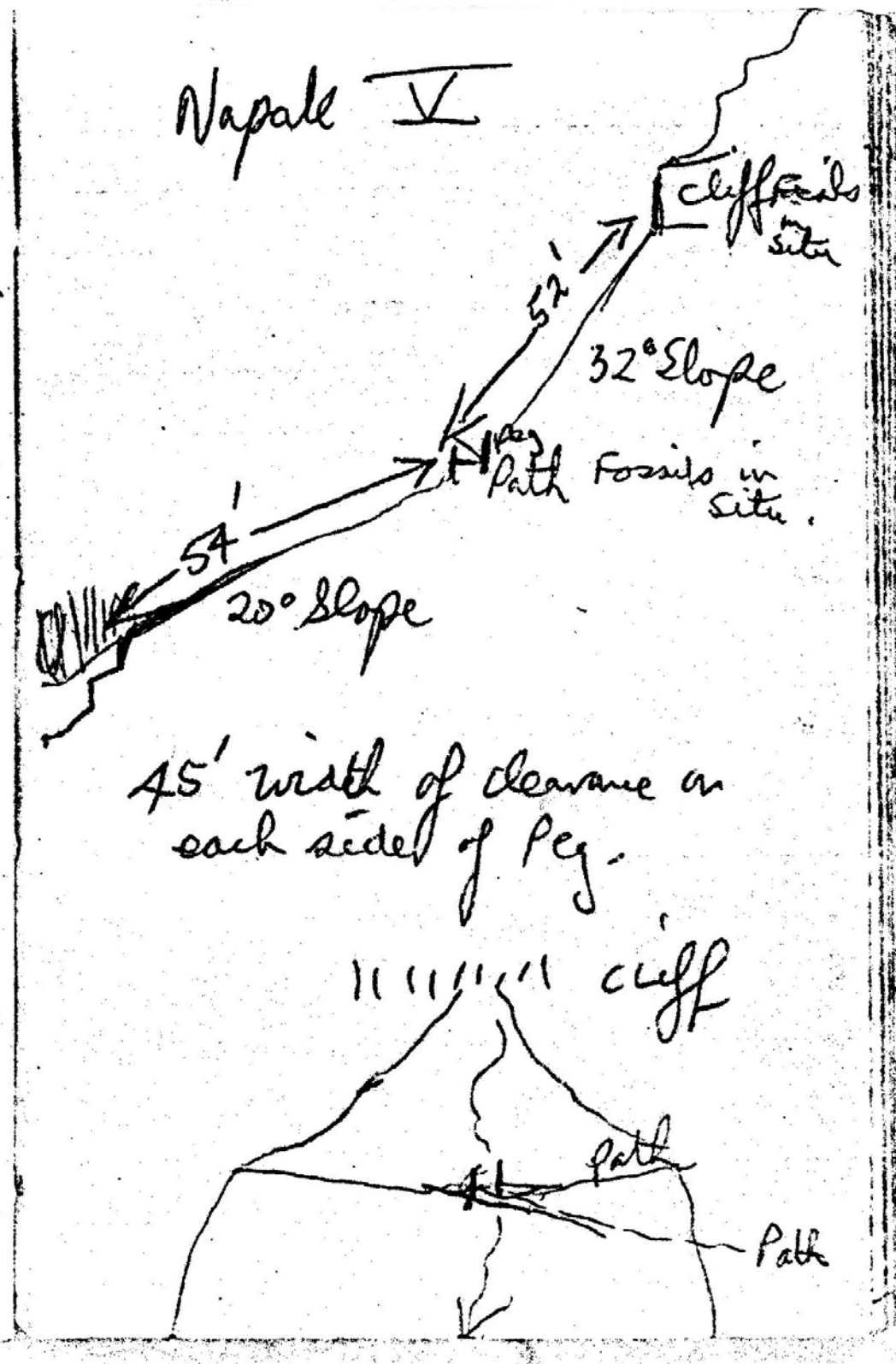


Figure 25. Topographic profile of Napak V, undated but between pages dated 28th and 30th January, 1964 (W.W. Bishop manuscript).

Fruit	1
Indeterminate	91
Totals S. T. & J.	17
(Primate? 1) (Rodents 11)	
Post-cranial (rodents 8)	20
Reptiles	6
Gastropods	22
Gastropod eggs	18
Fruit	1
Indeterminate	91

---

Napak V Surface - 30/1/64

Rodents	1 ear bone
	1 jaw phiomyid
	1 pce incisor
	1 jaw <i>Diamantomys</i>
	1 molar <i>Diamantomys</i>
	2 vertebrae (one part of)
	1 part of pelvic girdle
	1 femur
	1 astragalus
	1 humerus
	1 metapodial
	2 pcs unidentified bone
Artiodactyls	1 part mandible
	5 molars tragulid
	1 pce tooth
Carnivore	1 metacarpal or metatarsal
Unidentified	1 phalanx
	1 jaw
	1 radius + 1 distal end radius
	1 head of femur
	1 part of ulna
	1 vertebra
	1 carpal or tarsal
	1 small tooth
Bird	1 part humerus
Reptiles	1 scute reptile
	1 vertebra reptile
	1 vertebra snake
	2 scutes crocodile
	1 bone small reptile
	1 tooth crocodile
	1 small tooth in jaw crocodile
Gastropods	12
Gastropod eggs	8
Fruit	1
Indeterminate	70

---

Totals Upper level fossils - Nap V up to 11th Aug - 397??, Teeth and jaws Site V - 55.



**Figure 26.** Napak V, Akisim, Uganda, view of fossiliferous deposits, 2007.

Napak V Surface - 11.2.65  
2 teeth ruminant  
1 jaw frag + 2 teeth rodent  
1 jaw frag + 2 teeth ?  
1 jaw frag + 2 broken teeth croc  
1 vertebra  
19 frags bone (? 2 det)  
1 gastropod

---

Napak V Surface - 20.2.65  
4 incisors rodent  
2 parts lr jaw *Diamantomys*  
2 jaws (no teeth) rodent  
1 jaw ? Carnivore  
1 tooth ? Croc  
2 frags skull croc  
83 indet bones  
9 gastropods + 3 eggs  
1 millipede  
1 fruit fragment  
Hillside north of site                      1 gastropod

---

Napak V Surface (James) - 23.2.65  
3 rodent jaws with teeth  
4 rodent incisors  
1 ?tusk (?pig)  
15 Indet mammalian bones  
1 snake vertebra  
1 reptile jaw  
1 fruit?  
13 gastropods

Napak V Surface - 28.2.65  
1 frag mandible ?carnivore

---

Napak V - 4.3.65 Surface  
2 jaws rodent  
5 incisors rodent  
2 teeth ruminant (1 up, 1 lr)  
7 better bones  
31 indet bones  
2 frags reptile (1 croc, 1 small jaw)  
8 gastropods

---

Fossil gastropods for Bernard Verdcourt, East African Herbarium - Nairobi  
Napak V Surface collection of Gastropods Total 45 specimens

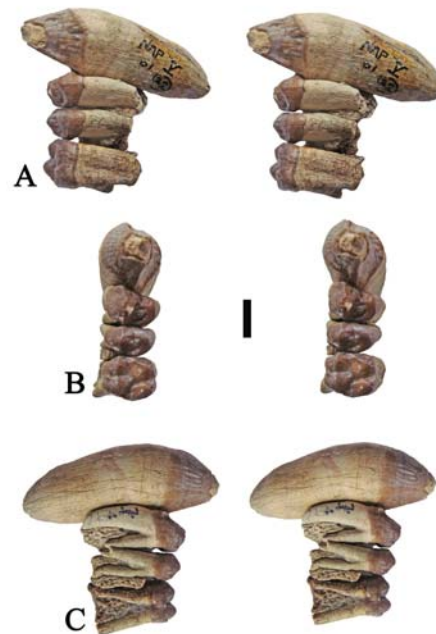
---

Identifications by Verdcourt  
Napak V Surface  
*Limicolaria*                                      8

<i>Homorus</i> sp	29
2 <i>Gulella</i> spp	2
<i>Trochonanina</i> sp	3
Indet	4

---

Napak V  
*Limicolaria* sp  
*Homorus* sp.  
 ?*Thapsia* sp.



**Figure 27.** Upper right tooth row (C1/-M1/) of *Ugandapithecus major* from Napak V, Uganda, A) lingual, B) occlusal and C) buccal views (stereo) (scale 10 mm). Individual teeth were found years apart, and each specimen was covered in ash matrix, indicating that the tooth row broke up before fossilisation. The canine, Nap V, UMP 62-04 and the P4/, Nap V UMP 67-01, were collected by W.W. Bishop in 1961 and 1967 respectively, the P3/, Nap V 220'09 and the M1/, Nap V 1'03, were collected by the Uganda Palaeontology Expedition in 2009 and 2003 respectively.

---

Report of the Napak exposures : January 1968 (Anonymous, but possibly by A. Hill).

Napak V: Grass encroaching at the periphery but sediments soft and much good stuff weathering out. Very promising.

Napak V:

- 1 prox pt 1st metatarsal *L. macinnesi*
  - 1 ant pt of large insectivore jaw and incisor, canine and 2 pm.
  - 2 pts mandible and teeth and 1 upper molar *Palaeomeryx africanus*
  - 1 turtle
  - 31 indet mammal
  - 1 millipede
-

## Part 8

### NOTES ON NAPAK IX

Brathay Expedition - 1962. Tricker et al, 1963.

A new site (Napak IX) was discovered on the ridge crest about 100 feet above site I and approximately 500 yards north-north-east along the ridge from Site I. The fragments of fossil mammalian material at this locality were, on average, larger but this is to be expected on a new site from which there had not been previous collecting activities.

Napak IX - A total of 161 fragments of fossil mammals. These consisted of :-

Skulls, teeth and jaws	19
“Better” bones	29
Unidentifiable fragments	113

The skulls, teeth and jaws include 5 fragments of mastodont teeth (3 molar and 2 tusk fragments), 10 rodents and 4 other unidentifiable pieces of jaw without teeth. Two land snails were also recovered.

The ten rodent pieces from this new site are of interest as they include 5 specimens of *Diamantomys* of which two represent juveniles, together with one piece representing the family Bathyergidae. In addition, 4 of the specimens are of Anomaluridae or flying squirrels. These usually occur only infrequently among the East African Miocene fossils and thus to find four pieces at one locality, one of them being a well preserved skull with teeth, is extremely fortunate. Although no teeth of Primates have been found to date at this locality one of the “better” bones recalls the head of the femur of the Gibbon-like genus *Limnopithecus* which is already known from Kenya localities and also from other sites at Napak.

Although there are minor variations in the composition of the fauna at the individual sites described above, the deposits are all broadly of one age and the combined fauna from the three investigated by the Brathay Group is undoubtedly contemporaneous with the well known Lower Miocene (Burdigalian) faunas of Kenya dating from broadly 20+- million years ago.

---

Napak IXB - 16/1/64 Surface

Proboscidea	1 premolar mastodont
	2 pcs molar mastodont
	2 parts of tusk mastodont
	2 parts of vertebrae mastodont
Artiodactyls	1 part of ungual phalanx
	1 cubo-scaphoid
Anthracothere	1 part of canine
Unidentified	1 tarsal or carpal
	1 part of femur
	1 tibia
	1 jaw with roots of teeth

Nap IXB - 16/1/64

Totals S. T. & J.	7
Post-cranial	7

---

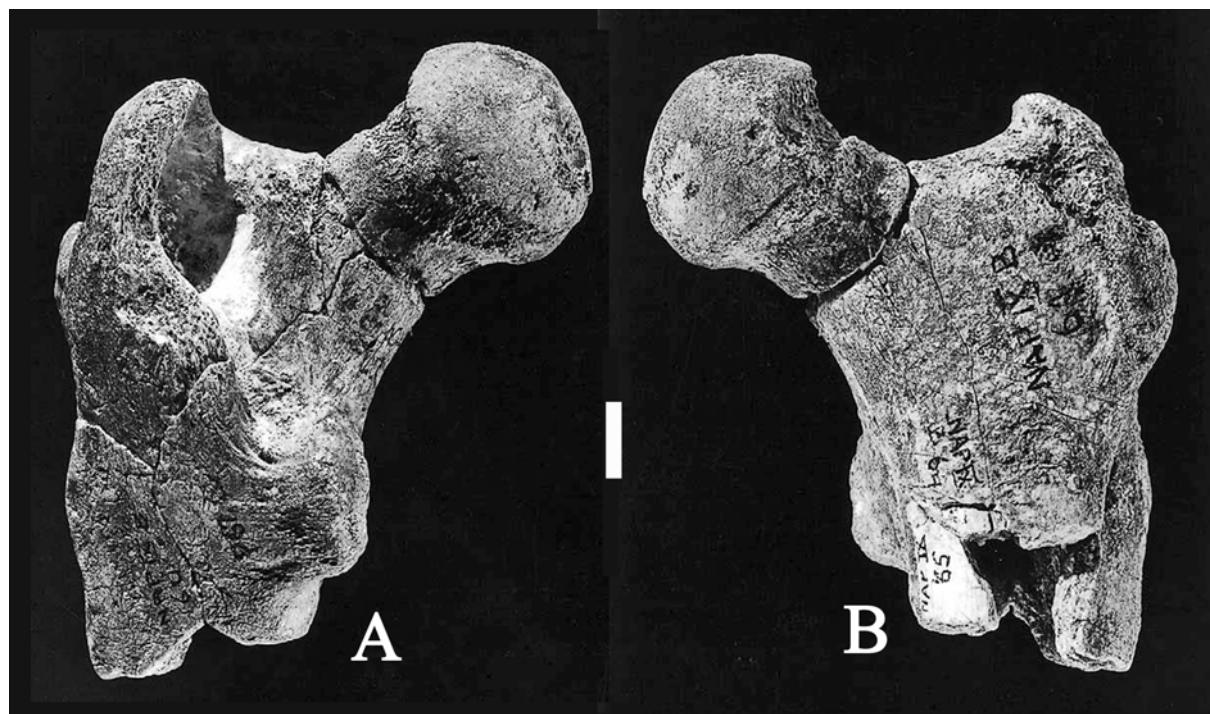


Napak IXB Surface - 17/1/64

Rodents	2 parts skull <i>Diamantomys</i> 1 incisor rodent
Proboscidea	6 pcs tusk mastodon 2 pcs molar mastodon 1 vertebra mastodon?
Artiodactyls	1 cubo-scaphoid 1 fragment humerus 1 molar 1 tooth <i>Palaeomyx</i> ?
Unidentified	1 carpal or tarsal 1 head of femur 1 epiphysis of vertebra 1 rib
Reptile	1 snake vertebra
Gastropod eggs	2
indeterminate	43

Totals Napak IXB 17/1/64

S. T. & J. (Rodents 3)	13
Post-cranial	7
Reptile	1
Gastropod eggs	2
Indeterminate	43



**Figure 28.** Left proximal femur of *Ugandapithecus major*, A) posterior, and B) anterior views, reconstructed from several pieces collected by W.W. Bishop in 1964, 1965 and 1967 and by the Uganda Palaeontology Expedition in 1999 (Napak IX B '64, Napak IX P.64, Napak IX '65, Napak IX P.67, Napak IX 46'99 (femur head)).

Napak IXB Surface - 23/1/64

Primate	part of jaw with 2 M. <i>Limnopithecus</i>
Rodents	1 part of skull Cricetid 1 lr jaw with 3 teeth - Sciurid

Napak IXC *In situ* - 23/1/64

Rodent	1 jaw <i>Diamantomys</i>
Carnivore	

---

Napak IXC *In situ* - 24/1/64

Carnivore	1 radius (3 pcs) 1 humerus? (2pcs) 1 epiphysis long bone 3 diaphyses + 1 part bone 1 phalanx 1 scapula (5 pcs) 1 carpal or tarsal 2 indet bones 3 scraps
Unidentified	1 large indet bone
Gastropods	6 small 1 large 5 in matrix
Gastropod egg	1
Misc	1 gall? 1 root

Totals

S. T. & J. (Carnivore)	10
Indeterminate	6
Gastropods	12
Gastropod egg	1
Misc	2

---

Napak IXC *In situ* - 25/1/64

Carnivore	2 pcs long bone 1 articulation femur or humerus (on slope below)
Artiodactyl	1 mandible
Indeterminate	6
Gastropods	15 (4 in matrix, 11 below)
Leaf impression	1

Totals

S. T. & J.	1
Post-cranial	4
Indeterminate	6
Gastropods	15

Leaf 1

---

Napak IXC Surface - 25/1/64

Rodent 1 ear bone  
Bird 1 humerus  
Unidentified 2 vertebrae  
Gastropod egg 1

Totals

S. T. & J. (Rodent) 1  
Post-cranial 2  
Bird 1  
Indeterminate 6  
Gastropod egg 1

---

Napak IXB Surface - 25/1/64

Unidentified 1 part of head of large femur  
1 vertebra  
Bird 1 vertebra large bird  
Indeterminate 9

---

Napak IXC Surface - 30/1/64

Carnivore 1 part of long bone  
Indeterminate 1 pce of large bone

Napak IXB Surface - 30/1/64

Rodent 1 jaw *Diamantomys*  
Artiodactyl 1 astragalus  
Lizard 1 jaw with 2 teeth - Monitor?  
Indeterminate 5  
Determinable 1

Totals

IXC

Postcranial 1  
Indeterminate 1

IXB

S. T. & J. (Rodent) 1  
Post-cranial 2  
Reptile 1  
Indeterminate 5

---

Napak IX - 5-3-65

1 frag left lr jaw with M<sub>2</sub> & M<sub>3</sub> *Dorcatherium songhorensis*  
1 frag molar mastodont  
14 indet bones

---

Napak IXC

Carnivore and *Diamantomys* site - much higher than Nap I. Above a fairly thick agglomerate - see photo & levelled section.

Carnivore site. Fossils in fine grained light grey tuff - blocky weathering (few coarse blocks only in fine matrix (1'+/- seen). Overlain by coarse tuff virtually agglomerate (see photo) with blocks of lava etc & coarse basement debris up to 2" across average 3/4".

*Diamantomys* level - better bedded (almost flaggy) green to grey tuff.

---

Napak IX

Skulls, teeth & jaws	1
Better bones	1 (primate femur)
indet bones	19 (includes terminal phalange & centrum of vertebra of large mammal)

---

MB/4 - Napak site IX upper levels. These are the upper part of the main tuffaceous series of which Napak I section forms the base. Some coarse agg. in middle of section and bands 1' to 2' of coarse agg. near top of Nap IX & below sampled horizon which foreshadow oncoming of main agglomerate in cliffs above sampled horizon.

Sample grey micaceous tuff : Micas as in MB/3.

13. Coarse aggs of main Akisim Cliff
  12. Tuffs with some agg sample MB/4 near top.
  11. Agglomerate (coarse with basement)
  10. (Fossiliferous tuffs with Bed 7 (MB/2) near top. Nap I.
  9. Barren tuffs 30-40'
  8. Agglomerate 80'+/-
  7. Nephelinite lava 60-70' (MB/2) with vesicular top.
  6. Medium/coarse agg 150' +/- . Break in succession seen.
  5. Tuffs of MB/1 locality
- 

Rodent fossils Napak 1964 - Despatched per Lavocat Jan 1964 - more sent May by Bishop.

Napak IXB Surface	2 Skull & jaw
	1 Skull

---

Fossil gastropods for Bernard Verdcourt, East African Herbarium, Nairobi

Napak IX surface	2 specimens
Napak IXB surface	2 specimens
Napak IXC surface	15 specimens
Napak IXC Excavated (in situ)	10 specimens

Identified by Verdcourt

Napak IX surface	2 <i>Homorus</i> sp.
Napak IXB surface	2 <i>Homorus</i> sp.
Napak IXC surface	8 Mostly indet
	6 <i>Homorus</i> sp.
	1 <i>Cerastus</i> ??



**Part 9**  
**MOROTO I & II**

**NOTES BY W.W. BISHOP**

Moroto I (Loitakero)  
4628) - tree near fossil horizon  
4182)  
    48  
4676) - On lava flat - sample  
4234)  
    52  
Average 50

Surface Moroto Site I (John Wilson's) Loitakero

Basement slope  
Teeth identif           3  
    fragments         3  
Identif bone           2  
Unidentifiable bone 86)  
Turtle                 11) = 97  
    ----  
                          105  
    ----

Surface Moroto Site I (John Wilson's)

	22nd Aug	23rd Aug	24th 25th	Totals
Teeth	4	7	-	11
Better bones	20	34	5	59
Unident bones	142	343	103	587
Turtle frags	125	317	124	566
Coprolites	45	118	61	224
Total	336	818	294	1447
Grand total		1156		
cop.		163		
Total mammal & rept.		993		

Extension of II Kogole

Unident bone         38  
Turtle                 4  
                          42

Moroto Site II (Kogole – Bissett's Sands)

Teeth & jaws         9  
Better bones         24 (3 join, 2 join, others join)  
Unidentifiable bones 175  
Turtle                 4  
                          212

28/8/61

1 croc tooth high level  
1 tarsal bone (middle level)  
5 turtle (?) frags  
76 Unidentifiable bones (8 middle, 3 high level)  
83  
208 Mamm.  
256 Total

---

Extracts from Uganda Journal 27: 109-14, 1963. Tricker, Taylor & Bishop Brathay Expedition.

## MOROTO

The majority of the work done by the four permanent members of the Moroto fossil party was carried out at the sites Moroto I and Moroto II, respectively some 2 miles and 4 miles north-west of Nakiloro, which is itself 10 miles north of Moroto Township.

The programme of work carried out fell into the following categories:

- (i) Collecting from the surface of known sites
- (ii) Excavation at Moroto I
- (iii) Attempting to locate new sites

At Moroto I, numerous fossil fragments were collected from the surface. The excavations at this site yielded only a small amount of material suggesting that the fossils had been concentrated at the surface during a long period of weathering. At Moroto II, only surface collecting was carried out.

A new site with fossils was found some half a mile east of Moroto I. However, the fossils from this deposit proved to be of very recent age by contrast with the much older fossils of Lower Miocene age from the other sites. The fossils occurred in a soft calcareous tufa and consisted of land snails and a few fragments of "modern" mammalian bone.

## THE FOSSIL FAUNA

Moroto I: A total of 60 mammalian fossils. These included:

Teeth	4
"Better" bones	9
Unidentifiable bones	47

The teeth include one indeterminate canine, two fragments of mastodont molar and a slightly worn upper molar of an anthracothere, probably attributable to *Brachyodus aequatorialis*.

The finding of a tooth of this extinct relative of the pigs and hippopotamuses is quite significant as anthracotheres occur as fossils in many of the East African sub-volcanic, Miocene environments in Kenya.

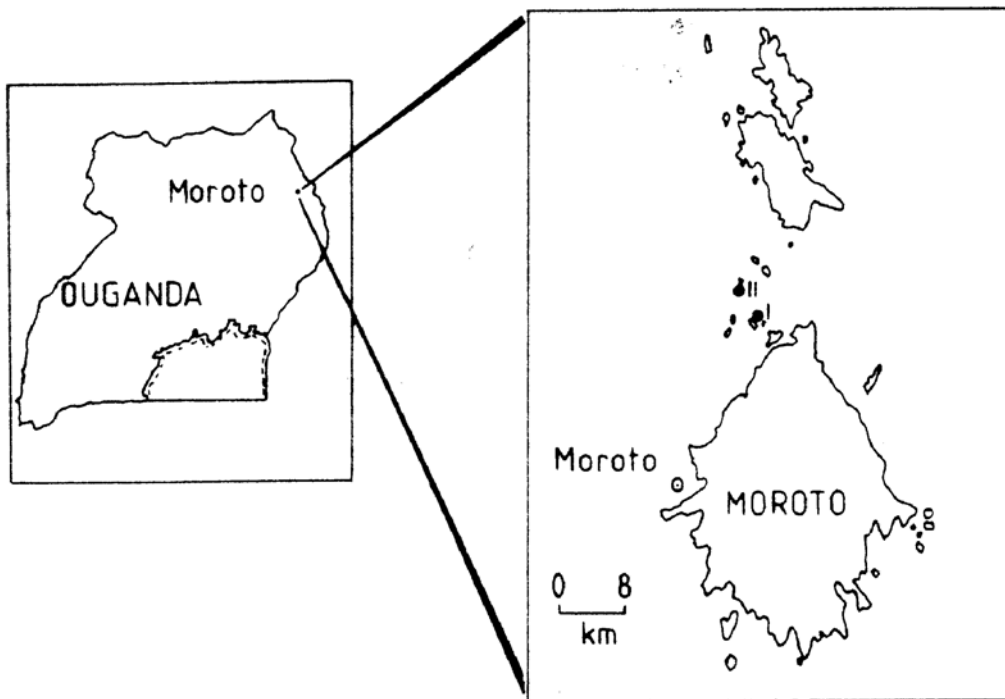
At Moroto I, 39 coprolites were also collected together with 81 fragments of Chelonian (turtle) carapace.

Moroto II: A total of 72 mammalian fragments. These included:

Teeth	5
Better bones	1
Unidentifiable bones	66

The teeth comprise 5 pieces of mastodont teeth (1 fragment of molar enamel, 2 root fragments and 2 tusk fragments). 1 coprolite and one Chelonian scute fragment were also found. At the nearby site Moroto IIa, a total of 10 fragments included 2 mastodont tusk fragments.

The poor preservation at these sites is evident from the coarse gritty lithology. It is reflected in the absence of small fauna and the very low percentage of teeth and conversely high percentage of unidentifiable fragments by comparison with the Napak and other volcanic ash environments. WWB.



**Figure 30.** Location of Moroto I and Moroto II, north of Moroto Mountain, Uganda (from Pickford *et al.*, 1986b).

---

Moroto II 20/1/64  
*P. major* site  
 Primates  
 3rd left m. in part of jaw  
 2nd rt m.  
 1st left pm  
 1st rt pm  
 2nd left pm  
 Rt canine  
 Fragment of left canine  
 left lateral incisor  
 left central incisor  
 9 skull fragments  
 11 possible primate bone fragments

---

Totals Moroto II 20/1/64  
*P. major* site  
 S. T. & J (=skulls, teeth and jaws) 23  
 (primate 18)  
 Post-cranial 12



(primate 11?)	
Bird	1
Reptile	10
Indeterminate	10
Anthracothere	1 tooth
Unidentified	4 fragments rolled teeth
	1 ulna
Bird	1 long bone
Reptile	1 part of skull
	9 scutes turtle
Indeterminate	6
	4 rolled

---

Totals Moroto II surface - 20/1/64

S. T. & J.	3
Post-cranial	1
Indeterminate	20
Anthracothere (?)	1 vertebra
Unidentified	3 fragments tooth enamel (2 slightly rolled)
Indeterminate	17
	3 rolled bone

---

Moroto I surface - 20/1/64

S. T. & J.	3
Post-cranial	2
Reptiles	131
Coprolites	14
indeterminate	80
Anthracothere	1 lr molar
	1 part of tooth
Artiodactyl	1 fragment phalanx
Unidentified	1 fragment tooth root
	1 post-cranial bone
Reptiles	127 scutes turtle
	3 bones
	1 tooth reptile
Coprolites	14
Indeterminate	80

---

Totals MOR II - 22/1/64

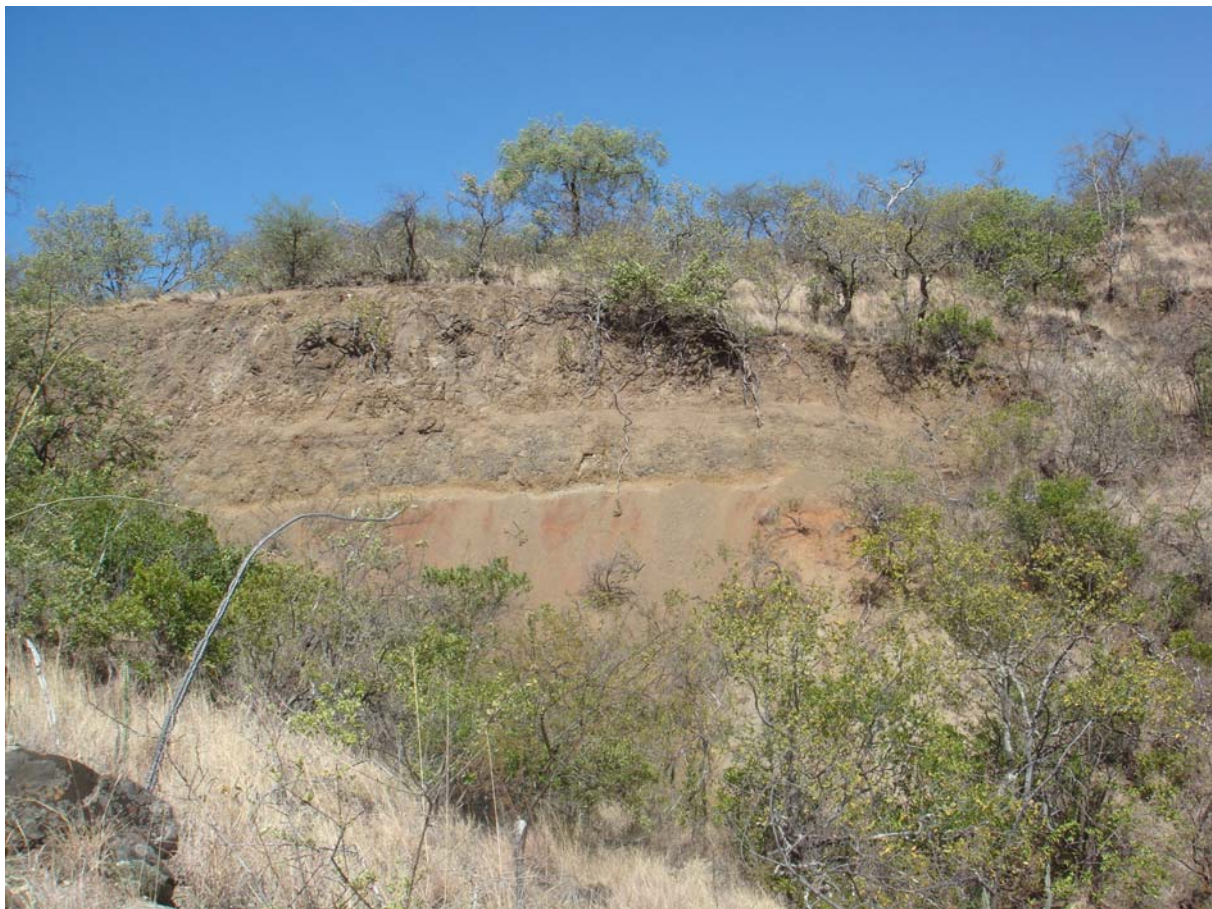
<i>P. major</i> site	
S. T. & J.	10
(primate 6)	
(rodent 1)	
Post-cranial	1
Reptile	1
Roots	4
indeterminate	59
Primate	3rd rt m
	Part of canine

Rodent	4 ?skull fragments
Proboscidea	1 frag. incisor
Unidentified	1 pce tusk
	2 tooth fragments
	1 pce shattered long bone (preservation cf <i>P.major</i> )
Reptile	1 scute turtle
Wood	4 pcs root
Indeterminate	59

---

Totals Mor II surface - 22/1/64

Post-cranial	2
Indeterminate	25
Unidentified	2 fragments vertebrae
Indeterminate	25



**Figure 31.** Moroto II, eastern valley, basalt lava overlying baked sediments at the head of the valley, 2009.

---

Totals Mor II B site - 22/1/64

S. T. & J.	8
(Primate 6)	
Post-cranial	1
Reptile	1
Indeterminate	26

Primate	3 fragments mandible with tooth roots <i>P. major</i> 1 part of lr canine
Artiodactyls	2 fragments mandible (one part ascending ramus) 1 frag. jaw with alveolae 1 end of tibia
Unidentified	1 worn fragment tooth enamel
Reptile	1 scute crocodile
Indeterminate	26 (many rolled)

---

Moroto site IIA (extension of II - Kogole)

Unident bone	38
Turtle	4
	----
	42
	----

---

Excavation Moroto Site I	25th Aug.	29 Aug.
3 reptile teeth		
3 Proboscidean molars		
Better bones	5	3
Unidentifiable bones	36	24
Turtle	33	5
	----	----
	80	32
	----	----
Coprolites	4	1
	----	----
	84	33
	----	----

---

(Map of Moroto 1 showing elephant tooth site and sample for dating and magnetism).  
(Field note book entry not dated, but interleaved with entries about Napak dated 28/1/64 and 30/1/64)

Moroto II Third visit Wednesday

Brushed & sieved an area 10' wide all the way up the slope.

Gully - 20 feet deep slope of 20° cleared to about 18'

Many lava blocks but most of teeth and maxilla fragments came from 9-10 feet above gully base.

Sequence is of light grey fine micaceous clayey sand at base - breaks into small blocks.

At just below fossil horizon darker grey coarser gritty sand - large blocks - some root channels in situ - top of this a russet or ochreous loose medium coarse sand - this seems to be level from which fossil comes. Need to excavate.

---

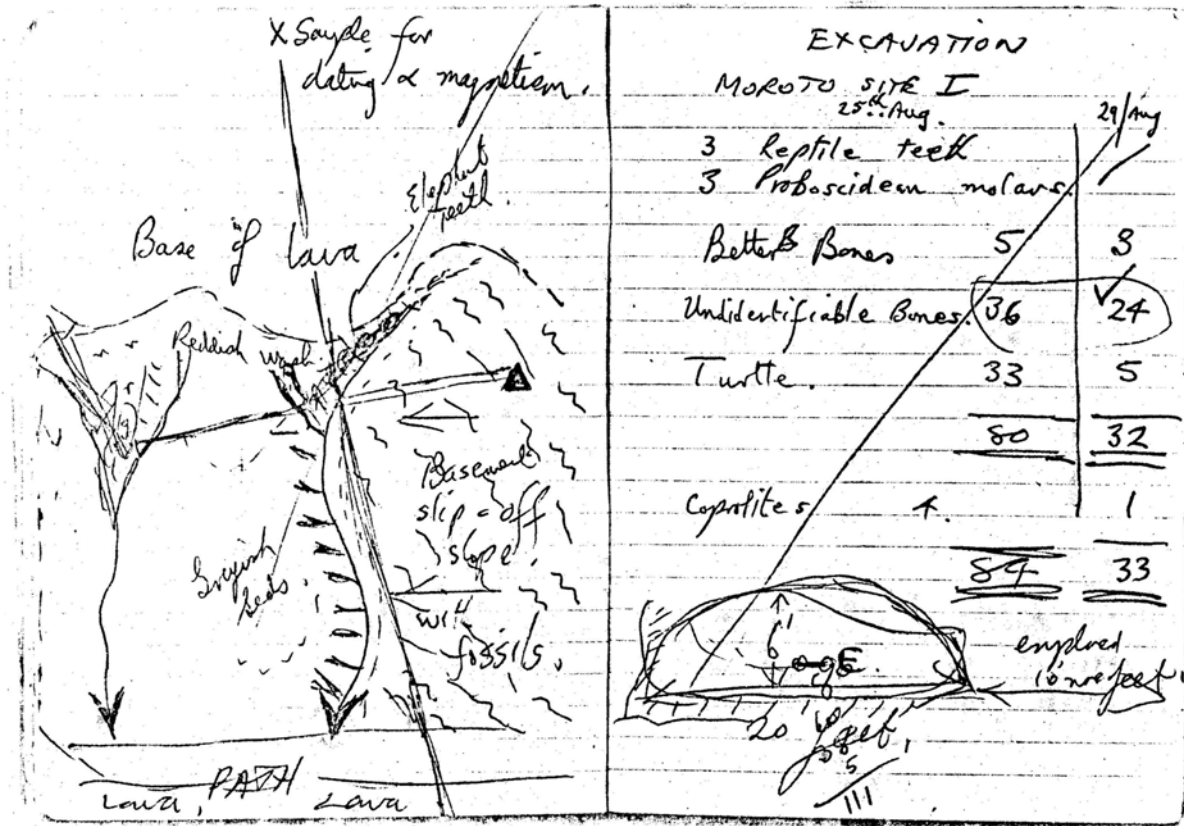
Loitakero - Moroto I

Ascending succession

1.- Basement gneiss

2.- Grey grits. Gravelly in places near basement hill.

3.- Reddened grey grits - not truly separate bed from 2 - same bed stained by overlying lava. Top of grit stained red by original lava. Strike of gneiss on road just below fossil site is 85°



**Figure 32.** Sketch map showing sampling locality of lava for age determination, opposite a page with daily tallies of fossils from Moroto I Excavation, 25th and 29th August (no year given, but probably 1964). The «elephant teeth» are the type series of *Eozygodon morotoensis*.

magnetic. Dip 32° to N. Few yds further down road schist has strike 60° with dip of 25° to N.W.

#### Kogole - Moroto II

Kogole top 63' above start of survey. Top comp. of highly weathered vesicular lava. First step up is 41' above start of survey ie diff. of 22' bet. 1st step & hill top.

Samples for dating & palaeomag. taken from this 1st step where lava is rather fresher & spheroidally weathered.

Below this 1st step which was sampled, again rotten vesicular lava onto basement at start of survey.

#### Succession (bottom to top)

1.- basal gravels

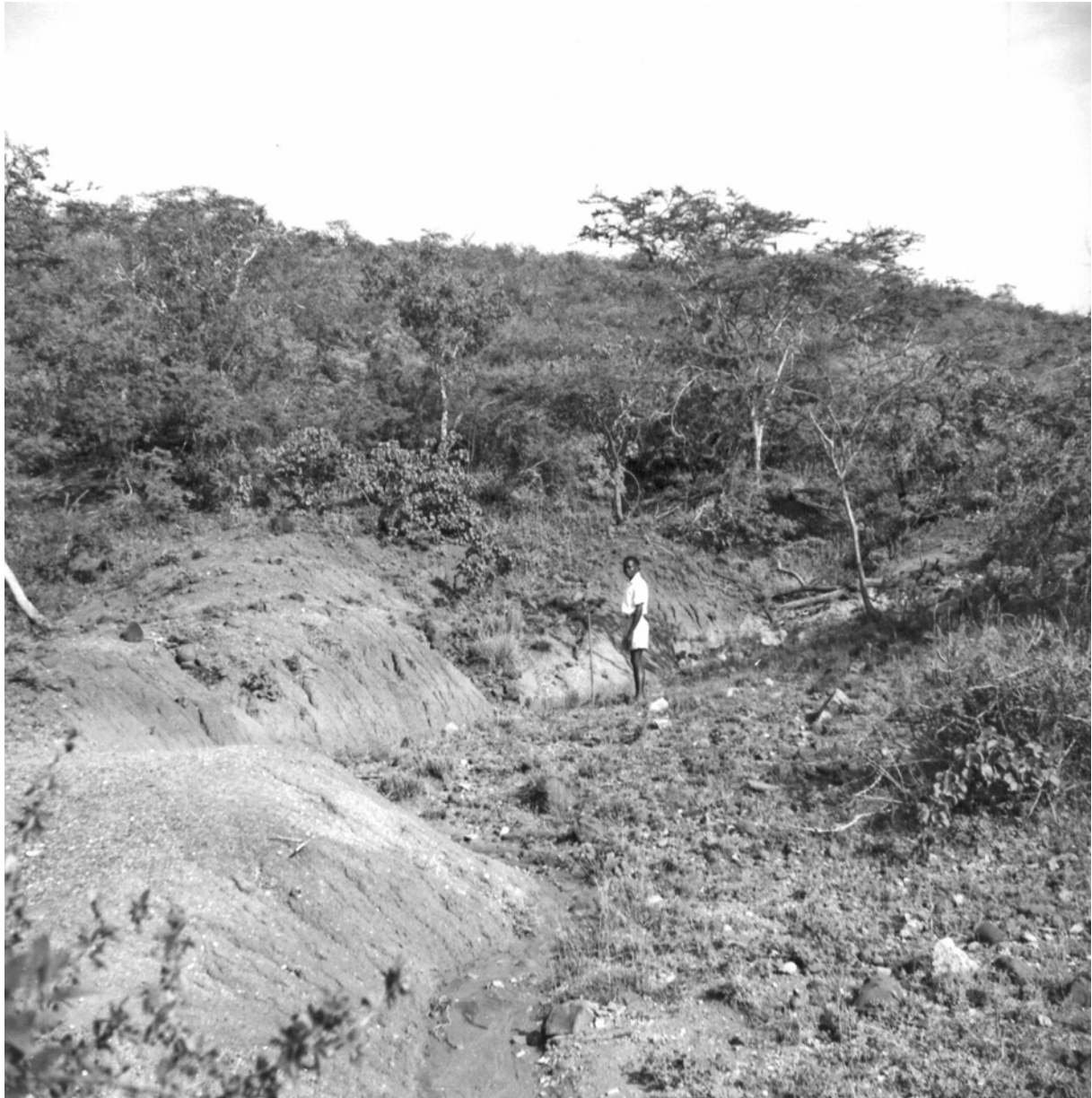
Exp. on L.B. at lower end of survey. Dip generally downstream & into L.B. Basement gneiss exp. within few feet of 20' gravel exposure. Contains boulders up to 6" diam. Nearly all derived from basement. Few volcanic. Almost certainly pre-nearby volc. deposit. Stream incised into basement before vulcanism then gradually filled perhaps due to downstream damming.

2.- Grey-white grits.

Very light in colour sometimes orange-br. limonite stained. Texture of sandstone. Largely unconsolidated but some hard bands (15/2).

Fossil horizon about 2/3 up in this band. Get height from survey.

3.- Top gravels probably lateral equiv. of 1 as they sit right on basement. Contain few fossils.



**Figure 33.** Moroto I, image taken by W.W. Bishop during the early 1960's.

---

Loitakero - Locality 13 = Moroto I

13/1 Lava (2 specs) not to be dated.

Loc. Top of Loitakero Hill directly above Moroto I (200'? above)

This rock has no effect on compass. Very much fresher than lavas between basal sed and 13/1. This is very fresh but underlying ones much more rotten and have spheroidal weathering.

13/2 Lava (2 specs) \*Calif. 50' above fossil site on 1st level. Very hard + fresh compared to most of the material which is rotten. Maybe simply fresh layer. Similar to 13/1.

13/3 Grey grit. Material from which fossils are derived. Becomes more gravelly at base and where it overlaps onto basement gneisses.

---

Kogole - Locality 15

15/1 Lava (spheroidally weathered from 1st step above start of survey) 2 specs - dating Calif. + palaeomag. Difficult to get exact dip but seems to dip down into Mor II deposit valley about 8°.

15/2 Grey grit. Most consolidated of bed 2. Texture of c/s sandstone. From material like this that fossils are derived.

MB/6 - Basalt from mid slopes of Loitakero Hill (above Moroto I) Total rock. Feldspars if possible.

MB/7 - Basalt from lower slopes of Kogole Hill (above Moroto II). Some 40 feet above junction with basement. As MB/6.

Both MB/6 & MB/7 should yield ages - different flows of same series. Gives minimum age for underlying fossil horizons & dates overlap of Moroto lava onto Basement.

---

Rodent fossils from Moroto 1964

Moroto II (*P. major* site)      1 Fragment of rodent incisor

---

Moroto II M 9 Feb. 1965

By riddling,

1 3rd molar crown *P. major*

2 mandibular fragments with tooth roots

3 pieces bone probably belong

1 piece bone ?

1 terminal phalange

2 pcs indet bone

1 coprolite

---

9.2.65 M II P

1 indet. bone

---

9.2.65 Moroto II surface

1 mastodont tooth

58 indet bones

---

10.2.65 Moroto II P

Trench Upper part, near surface

2 indet. bones

1 tooth fragment



**Figure 34.** Moroto I, view of site corresponding to the sketch map drawn by Bishop (see Fig. 32), 2007.



**Figure 35.** *Afropithecus turkanensis* maxilla containing dM3/ and dM4/ from Moroto I, Uganda, 2007.

---

Trench, lower part, c. 1 ft depth  
1 vertebra ? Taken by W.B.  
2 fragments matrix containing pieces of bone  
1 bone probably determinable  
Several small fragments bone

---

10.2.65 Moroto II M  
From riddle  
5 fragments bone  
5 small fragments bone  
1 coprolite?

---

10.2.65 Moroto II surface  
1 frag. mastodont molar  
3 frags mastodont ivory  
1 determinable bone  
22 fragments bone (some very rolled)

---

23.2.65 Moroto II M  
Riddle  
6 frags bone (? 3 *P. major*)



**Figure 36.** Moroto II eastern valley, *Afropithecus* femur site, 2007.



---

Surface

1 frag mastodont molar

1 tooth ?

34 indet bones

---

Moroto I 24-2-65

2 bones indet

1 jaw with teeth ??

5 turtle frags

---

Moroto II 24-2-65

Surface

10 indet frags bone

---

Moroto IIA 24-2-65

38 fragments indet bone (mainly one large broken bone)

---

(No date - Notes made in Uganda Museum?)

Moroto I 112 rib bones in bags

417 coprolites in bags

963 indet bones in bags

Teeth : Roots of mastodons

1 Reptilian tooth

1 ?chalicothere ?? (eroded)



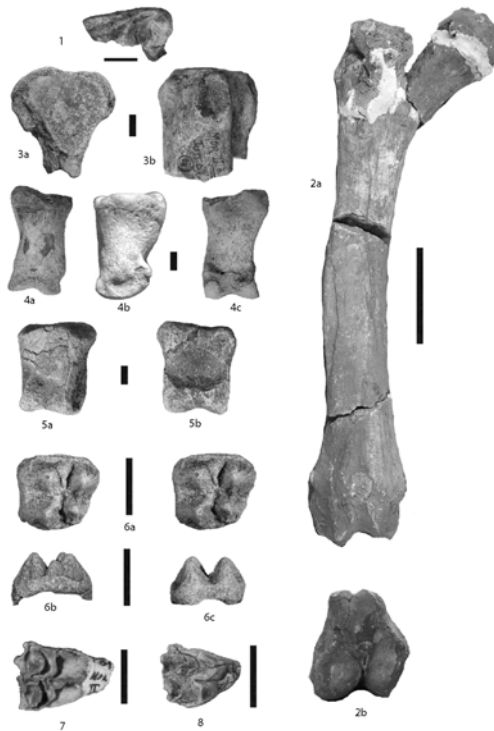
**Figure 37.** Deciduous upper molar of the anthracothere *Brachyodus aequatorialis*, from Moroto I, Karamoja, Uganda, 2009.

Two drawers in museum. Roots of Mast teeth included. Ask Alan re post-cranials.

9 fragments other teeth (1 canine)  
3 mastodont fragments  
1 ?tusk fragment  
1 anthracothere molar (*Brachyodus aequatorialis*)

Moroto II

I drawer  
Half Dino tooth  
1 artiodactyl tooth  
2 reptilian (croc) teeth  
6 mastodon tooth fragments  
2 tusk fragments  
1 indet tooth  
1 ?tragulid molar  
Bones



**Figure 38.** Artiodactyls from Moroto II (Scale bar : 1 cm except for femur which is 10 cm). From Pickford & Mein, 2006.

(1) Mor II, 19'01 *Brachyodus aequatorialis*, mesial part of left upper molar fragment, occlusal view.

(2) Mor IIb, S, Dec. 61, *Brachyodus aequatorialis*, left femur, a) cranial view, b) distal view.

(3), Mor II, S, Jan 62, *Brachyodus aequatorialis*, metatarsal, a) proximal view, b) plantar view

(4) Mor II, 61, *Brachyodus aequatorialis*, 1st phalanx, a) dorsal, b) lateral and c) volar views.

(5) Mor II, Jan 67, *Brachyodus aequatorialis*, 2nd phalanx, a) dorsal and b) volar views.

(6) Mor II, 4'98, *Morotochoerus ugandensis*, left M3/, a) stereo occlusal, b) anterior and c) lingual views.

(7) Mor II, 1'01, *Walangania africanus*, right upper molar, occlusal view.

(8) Mor II, 19'03, *Walangania africanus*, right upper molar, occlusal view.

**Report of the Moroto Exposures : January 1968 (anonymous, but probably A. Walker)**

Moroto I : Track N of army camp is the worst road I have ever driven on. One river crossing almost impossible. New security road being put in. Turkana and nameless others make the Moroto sites pretty dangerous at the moment. No Karamojong left in area - villages deserted. Site I very good (see list) with lots of stuff coming out, particularly in gully.

Moroto II : Very disappointing - quite clear but hardly anything coming out.

Moroto ?IIa (in gulleys to W) better.

**Fauna collected in January 1968 by Alan Walker & Co.**

Moroto I : (including J. Wilson Collection)  
43 pieces of chelonian remains (some very good)  
70 pieces indet mammal  
11 pieces better bone (including proboscoid patella and several hand and foot bones of proboscoid and anthracothere)  
3 pieces proboscoid tusk  
11 coprolites

Moroto III : 1 ?Anthracothere tusk

Moroto II : 40 indet mammal frags  
?IIa (nearer track in gulleys)  
4 indet mammal  
1 turtle  
1 piece *Trilophodon* molar

---



**Figure 39.** Screening at the Moroto II, where a lower third molar of *Ugandapithecus major* was found. Moroto Mountain in the background, 2009.

## Part 10 BUKWA

### NOTES BY W.W. BISHOP

Bukwa - cont:

Kenya 1:50,000 Kanyarkwat Sheet 74/2 (Uganda 55/2) Series Y 731 74/2 3 DOS

Locality down track ESE from Bukwa 2-2.5 miles - through village of Lamitina. Locality between Lamitina & Kabuchai, small hill  $1^{\circ}17'N : 34^{\circ}47'E$ . Just north of River Chamangeni a tributary of the Suam. Hill is from say 5950 to 6050' O.D.

Deposits on the south side of the hill - steep face - tuffs (grey etc) much fossil wood float - silicified? algae? Tuffs may be subaerial or water lain. Pass up half way up hill through reed bed (see sample) into leaf bed & then into a very light coloured a light weight fine tuff - *Dinotherium* level. Above this - graded agg to tuff - water grading? & then finely laminated grey tuff with current bedding & slump structures?

Above this coarse tuffs etc to about 30' or 20' from hill top overlain by lava (? Nephelinite) - sample for dating.



**Figure 40.** Bukwa, view of fossiliferous lacustrine deposits near the road, 2009.

East end of hill lava only - down faulted along N-S fault line.

North face of hill similar to south but on west & particularly N.W. - just below & north of village - low basement (gneiss) ridge striking towards Riwa. 20' or so high & on this sequence of weathered coarse tuffs - overlain by china stone ? Ash : laminated - (illegible) & then detrital bed with pieces of laminated tuff. Above this again grey tuff 1-2' followed by green clays with brown tuff horizons. Green clay is a weathered tuff & includes the fossil mammals *in situ*. Much secondary kunkar on surface.

Problems - Why were sediments ponded? - How far do they extend elsewhere.

REPORT BY ALAN WALKER ? 1968

Total Bukwa specimens (excavation only - not seiving of sediment) Dec. 196?

416 coprolites  
91 reptile frags and teeth  
32 bird frags  
1141 indet mammal frags  
67 better bones  
45 mammal teeth or tooth frags  
Many crab frags including carapace, claws, walking legs  
Many frags of small fish  
2 gastropods (very small)  
Many ostracods

---

Bukwa additional collections from ALAN WALKER (sic) (letter) : 27th Nov. '69.

Coprolites	30
Mammalian tooth frags (includes 1 ? <i>Brachyodus</i> )	5
Croc teeth	1
Gast eggs	1
Chelonian frags	13
Mammalian bone frags	161
Better bones (including Rhino or Deino vertebra + more tragulid foot bones	6 Pieces
Fossil wood	8 up to 4"
Concretions	6 small
Coprolites	29 (2"-1/2")
Chelonian	19
Mammal? teeth fragments	19 (Rhino, mastodon)(includes one tooth shattered).
Better bones (with articular surfaces)	6
Rib fragments	7
Rolled bone (rolled before fossil)	2
Indet bone frags 4"-1/2"	135

Also *in situ Dinotherium* - other locality - astragalus, coprolites - bone.



**Figure 41.** Bukwa is noteworthy for its palaeobotanical remains, here a leaf preserved in volcanic ash, 2009.

## Part 11 DISCUSSION

The Bishop archives provide valuable information concerning historical events, as they represent his writing as the events took place. His field notes and related archives provide useful data concerning the periods during which field work was undertaken (usually January to March, and July-August)(Table 1) and the approximate quantity of fossil specimens recovered, along with notes concerning their geological context. Furthermore, they yield essential information concerning the position from which samples were taken for age determinations.

**Table 1.** Summary of site visits arranged by month recorded in W.W. Bishop's field notes. Note that visits took place early in the year after grass has been burnt, and then in July-August. The sites were likely visited in other years, but either the relevant note books are missing, or no record was made of these visits.

	J	F	M	A	M	J	J	A	S	O	N	D	
<b>Napak I</b>													Discovered J. Wilson ?August 1957
1957								x?					
1961								x					
1964	x												
1965	x	x	x										
1967												x	
1985							x						
<b>Napak IV</b>													Discovered Trendall & Sutherland 1960
1960								x					
1964	x												
1965		x	x										
1968	x												
1985							x						
<b>Napak V</b>													Discovered Bishop, 9 August, 1961
1961								x					
1964	x												
1965		x	x										
1968	x												
1985								x					
<b>Napak IX</b>													Discovered Bishop, August 1962
1962								x					
1964	x												
1965			x										
1968	x												
1985								x					
<b>Moroto I</b>													Discovered J. Wilson (prior to 1960)
1961								x					
1964	x												
1965		x											
<b>Moroto II</b>													Discovered Bissett? (prior to 1960)
1961								x					
1964	x												
1965		x											

Although it is impossible to determine the precise quantity of fossils collected, the bulk of the material is listed in the note books. Uncertainty flows from the fact that some years no tally of fossils collected was made, some collections were made by other people during casual visits, and some material disappeared into private collections.

## Synopsis of fossils collected

Historical collections, 1957-1969

The following specimen counts take into account material listed in the field notes of W.W. Bishop and Sonia Cole and some field reports by A. Walker and others from 1961 to 1969. It is impossible to provide an accurate tally of the total numbers of specimens collected from the various Napak sites because records are not complete, but the figures provide an idea of the minimum numbers of specimens recorded from each site, and thus an approximation of their richness.

Bishop subdivided the Napak collections into several categories based on their "indentifiability" (STJ = Skulls teeth and jaws; BB, Better bones = postcranial bones with articular surfaces; UB, unidentified bones = bone fragments of various sorts). In addition he recognised botanical remains although these are not often listed in detail, gastropods and gastropod eggs. Most of the latter are now known to represent insect cocoons and brood chambers. Reptiles were sometimes listed separately as were insect remains (millipedes for the most part). Here the reptiles are listed along with the rest of the vertebrates, partly because some of them were misidentified rodent fossils.

	STJ	BB	UB	Molluscs	Total
<b>Iri Member</b>					
Napak II	44	122	151	1	357
Napak VI	10	1	685	8	713
Napak VII	-	5	-	2	7
Napak VIII	9	38	600	2	652
-----					
Total	63	166	1436	13	1729
-----					
	STJ	BB	UB	Molluscs	Total
<b>Napak Member</b>					
Napak I	255	342	1140	5	1742
Napak IV	597	525	2425	171	3718
Napak V	59	63	197	27	346
Napak IX	199	217	827	88	1331
-----					
TOTALS	1110	1147	4589	291	7137
-----					

From this accounting, it is clear that the most prolific site in the Napak Member is Napak IV, which also happens to be the smallest in area and the most limited in stratigraphic thickness. Napak V is the poorest of the four Napak Member sites, but yielded a significant number of large bones among which primates are relatively well represented. Napak I and Napak IX are areally the most extensive of the four Napak Member sites and fossils are derived from a relatively great thickness of strata (up to 20 metres).



## Ugandan fossils overseas.

**Table 2.** Ugandan fossils in the Natural History Museum, London, 22 December, 1997. Specimens registered as part of the Natural History Museum collections

Museum Number	Field Number	Specimen
M19084	Nap I – 16	Maxilla, <i>Hecubides euryodon</i>
M19085	Nap I – 19	Right M <sub>1</sub> <i>Hecubides euryodon</i>
M19090	Nap I – 15	Left maxilla <i>Pterodon nyanzae</i>
M19095	Nap IV 1961	Right M <sup>3</sup> <i>Kelba quadeemae</i>
M19096	Nap I – 17	Right maxilla <i>Metasinopa napaki</i>
M19097	Nap I – 20	Left mandible with M <sub>3</sub> <i>Metasinopa napaki</i>
M19099	Nap I – B	Right M <sub>1</sub> <i>Hecubides euryodon</i>
M21831	Nap I'61	Mandible with P <sub>4</sub> <i>Erythrozootes</i>
M21832	Nap I'58	P <sup>4</sup> <i>Chalicotherium rusingense</i>
M21833	Nap I	Right M <sub>2</sub> <i>Nguruwe kijivium</i>
M21835	Nap I'61	Hyracoid I <sup>1</sup>
M21836	Nap I'61	Lower canine <i>Nguruwe kijivium</i>
M21837	Nap V'61	Canine fragment carnivore
M21838	Nap IV'61	Right M <sub>1</sub> <i>Nguruwe kijivium</i>
M21840	Nap I'61	Right M <sub>2</sub> <i>Nguruwe kijivium</i>
M21841	Nap I	Left dM <sub>4</sub> <i>Nguruwe kijivium</i>
M25124	Nap IV	Incisor <i>Diamantomys</i>
M32435	Nap V'64	Left mandible <i>Kichechia zamanae</i>
M32436	Nap IV ID 16/1/64	Right M <sub>1</sub> <i>Kichechia zamanae</i>
M43551	Nap IV IC 1964	Left mandible with 5 teeth <i>Protenrec</i>
M43552	Nap IV IC 1964	Right maxilla with 5 teeth <i>Protenrec</i>
M43553	Nap IX'65	Right mandible with 4 teeth <i>Myohyrax</i>
M43554	-----	Mandible fragment no teeth
M43555	-----	Distal humerus Chiroptera

**NB.** There are Primate specimens from Napak and Moroto in the Natural History Museum, London, kept in the Palaeoanthropology Section, that do not appear on this list.

**Table 3.** Ugandan fossils for a long time kept at the Natural History Museum, London, but returned to Kampala in October, 1998.

Field Number	Specimen
Nap 1A'61	Canine Creodont?
Nap I'61 G	Right M <sub>3</sub> Creodont
Nap I'58 8	Left mandible fragment creodont
Nap IVB 1964	Edentulous jaw
Nap IV'64	Left M <sub>3</sub> fragment Hyracoidea
Nap IVB 1964	Right mandible fragment chalicothere
Nap IVB 1964	Distal radius ?Primate
Nap IV'64	M* <i>Walangania</i> ; M* <i>Dorcatherium songhorensis</i>
Nap IV'65 Tr 3	M <sub>1</sub> <i>Dorcatherium songhorensis</i>
Nap IV'65	M* <i>Dorcatherium songhorensis</i>
Nap IV 1965 Tr II	9 isolated teeth small ruminant
Nap IV'64 Tr IB	3 small tooth fragments ruminant
Nap IV'64	3 tooth fragments ruminant Palate <i>Hyaenodon andrewsi</i>
Nap IV'64 ID	3 teeth ruminants
Nap IV'65 Tr 2	Maxilla with dM <sup>3-4</sup> <i>Dorcatherium songhorensis</i>
Nap IV'65 Tr I up.	3 tooth fragments ruminant
Nap V Aug'62	Left P <sub>3</sub> <i>Nguruwe kijivium</i>
Nap V'64	18 teeth and jaw fragments <i>Walangania</i> and <i>Dorcatherium songhorensis</i>
Nap V'65	6 teeth <i>Walangania</i> and <i>Dorcatherium</i>
Nap V 13-8-64	Upper and lower teeth <i>Walangania</i> and fragment of tooth chalicothere?
Nap V Aug'62	4 jaw fragments and tooth <i>Walangania</i> 4 isolated teeth and maxilla <i>Dorcatherium songhorensis</i>
Nap IXC'64	Parts of associated forelimb skeleton <i>Walangania africanus</i>
Nap IX'65	Left mandible with M <sub>2-3</sub> <i>Dorcatherium</i>
Number not known	Distal tibia of <i>Proconsul major</i>
No Number	P* and right mandible with M <sub>2-3</sub> <i>Chalicotherium rusingense</i>

There are other collections of Ugandan fossils overseas, but details are unknown.

W.W. Bishop did not keep much personal information in his field journals, but from time to time he mentioned the names of people working with him in the field, or the names of those who contributed to the outcome of the projects in one way or another, or whose works he consulted for background information on fossils and geology.

This list provides interesting background information concerning the intellectual environment in which W.W. Bishop worked. His lack of palaeontological knowledge led him to consult the few available experts on East African Miocene Palaeontology, and encouraged him to hand out fossil samples to established scientists and students for identification. He himself generally concentrated on the geomorphology and geological context of the fossil sites, and his interests led him to include geophysicists in his team, so that radio-isotopic age determinations could be done, one of the earliest applications of this method to dating fossils sites in Africa. He did however, contribute to a few purely palaeontological papers, notably on the primates from Napak in collaboration with D. Allbrook. A long term interest which emerged from his Napak and Moroto research was taphonomy, at the time a neglected subject, but which he put onto a firm footing, not only with his own studies, but also by encouraging students to enter the domain. From this work also came a renewed interest in palaeoenvironments, palaeoecology and palaeoclimatology which, in East Africa, had been ignored for a long time. During the 1920's and 1930's, palaeoclimate had been used to erect the climato-stratigraphic correlation scheme for East Africa (Pluvial Stratigraphy) but this had been abandoned by the time that Bishop started his research at Napak and Moroto, based as it was on a series of circular arguments. Bishop was largely responsible for getting palaeoclimatology back onto the curriculum, but as a bona fide scientific research programme avoiding the problem of circularity.

**Table 4.** Persons featuring in W.W. Bishop's 1961-1969 field notes, their status at the time of the research projects and their contribution to the outcome of the projects (if any).

D. Allbrook	British Anthropologist at Makerere University, described the large fossil primate remains from Napak in collaboration with W.W.B.
W.W. Bishop	British Director Uganda Museum, geomorphologist, geologist
Shiela Bishop	Wife of W.W.B, geologist
Bissett	Associated with the discovery of Moroto II (Bissett's Sands) but rôle in discovery not entirely clear
Ralph Chaney	American Palaeobotanist, in 1933 described palaeoflora from Bugishu, Elgon, Uganda collected by E.J. Wayland
Sonia Cole	Kenyan Science Writer and occasional assistant to L.S.B. Leakey, compiled field tallies of Napak fossils collected between 1961 and 1965
Shirley Coryndon	British Palaeontologist, Coryndon Museum, Nairobi, Kenya, made the first identifications of Napak fossils
Damon	Radio-isotope geophysicist, Tucson
Jean De Heinzelin	Belgian Geologist, worked extensively in Congo (now DRC) on the Western Rift and the Congo Basin
Andrew Hill	One of W.W.B's British students
Basil King	Geologist, mapped Napak Volcano during World War II, later Head of Geology Department at Bedford College, London, where he was joined by W.W.B.
W. Krommenhoek	Dutch teacher, Namilyango College, Uganda, later Palaeontologist with interest in hippopotamids of the Western Rift, Uganda.

Réné Lavocat	French Abbé, Palaeontologist, expert on fossil rodents, studied the Napak rodents, worked in the field with W.W.B.
Louis S. B. Leakey	Kenyan Prehistorian, Director Coryndon Museum, Nairobi, described the strepsirrhine <i>Mioeuoticus bishopi</i> from Napak. Often consulted by W.W.B.
Wilfrid Le Gros Clark	British Palaeoanthropologist at the British Museum of Natural History, London, co-authored with L.S.B. Leakey a monograph on Early Miocene hominoids of Kenya (1951).
Jack Miller	British Geophysicist, Cambridge University, determined radio-isotopic ages of Napak and Moroto. Field work in Uganda with W.W.B.
James Nzabonimpa	Ugandan assistant to W.W.B. Staff Member Uganda Museum, made many discoveries of fossils and fossil sites.
T. Pain	Expert of achatinid gastropods
Patrick	Ugandan field worker
David Pilbeam	British Palaeoanthropology student at Yale University, described the Moroto palate as <i>Proconsul major</i> and collaborated with A. Walker on describing the monkey remains from Napak.
Richard	Ugandan Field assistant to W.W.B. worked at Napak and found important fossils
D. Sutherland	British Vulcanologist, collaborated with A. Trendall on the description of the Napak volcanics.
W. Taylor	British member of the 1962 Brathay Expedition
Alec Trendall	British Geologist, mapped the Napak Sheet, found some fossil sites, mainly palaeobotanical.
B. Tricker	British member of the Brathay Expedition (1962)
Bernard Verdcourt	British Botanist, East African Herbarium, expert on extant and fossil land snails of East Africa, studied the Napak gastropods.
Alan Walker	British Lecturer Makerere University, spent time at the Uganda Museum curating fossils with W.W.B. Published the fossil monkeys of Napak in collaboration with D. Pilbeam, and the Moroto hominoid vertebrae.
E.J. Wayland	British Director, Geological Survey of Uganda, found the first fossils at Napak in 1921. No follow-up surveys done.
D. Williams	Member or associate of the Brathay Expedition (1962), found some important fossils (articulated ruminant skeleton)
John Wilson	British Soil Scientist, discovered Napak I and Moroto I sites, which led to the later activity by W.W.B.

The period 1957 to 1969 was one of crucial advances in the practice of East African palaeontology and geology, in which a new vision extended and largely replaced the research methods carried out by the pioneers in East African Prehistory from the early 1920's to the mid-1950's. W.W. Bishop was largely responsible for establishing and promoting this revised way of thinking, while the sites of Napak and Moroto provided the intellectual challenge to him that focussed his attention on the genesis of the fossil record, and what could be determined from it in the way of palaeoenvironments, palaeoecology and palaeoclimatology. His field note books reveal interesting aspects of his intellectual development during this period. The note books are therefore potentially of as much interest to historians of science as his published opus is.

## Acknowledgements

Above all we thank the people of Iriri and Rupa in Karamoja who have participated in field work at Napak and Moroto in 1985 and on an annual basis since 1997. We thank the Uganda National Council for Science and Technology for according research permission, and the Uganda Museum for providing an excavation licence. The French Embassy in Kampala has supported the Uganda Palaeontology Expedition since its inception in 1985. The Geological Survey of Uganda is thanked for their support, as is the Geology Department of Makerere University. We also thank the Muséum National d'Histoire Naturelle, Paris, the French CNRS, the Collège de France, and the University of Paris 6, University of Lyon, I, the Museo Nacional de Ciencias Naturales, Madrid, the University of Ghent, Shimane University, Matsue, and Kyoto University for their support and for allowing members of their institutions to participate in the research, both in the field and in the laboratory.

## Bibliography of Napak and Moroto, Uganda

- Allbrook, D., & Bishop, W.W., 1963 - New fossil hominoid material from Uganda. *Nature*, **197**: 1187-1190.
- Bishop, W.W., 1958 - Miocene Mammalia from the Napak volcanics, Karamoja, Uganda. *Nature*, **182**: 1480-1482.
- Bishop, W.W., 1958 - Fossil apes and ivory. *Bull. Uganda Soc.* **1958**: 127-129.
- Bishop, W.W., 1962 - The mammalian fauna and geomorphological relations of the Napak volcanics, Karamoja. *Rec. Geol. Surv. Uganda*, **1957-58**: 1-18.
- Bishop, W.W., 1963a - The later Tertiary and Pleistocene in eastern equatorial Africa. In: F.C. Howell & F. Bourlière (eds) *African Ecology and Human Evolution*, **36**: 246-275, Viking Fund Publ. Anthropol., New York.
- Bishop, W.W., 1963b - Uganda's animal ancestors. *Wildlife and Sport*, **3** (3): 1-8.
- Bishop, W.W., 1964a - More fossil Primates and other Miocene mammals from North-east Uganda. *Nature*, **203**: 1327-1331.
- Bishop, W.W., 1964b - Mammalia from the Miocene volcanic rocks of Karamoja, East Africa. *Proc. Geol. Soc. London*, **1617**: 91-94.
- Bishop, W.W., 1967 - The later Tertiary in East Africa - volcanics, sediments and faunal inventory. In: W.W. Bishop & J.D. Clark (eds) *Background to Evolution in Africa*, pp. 31-56, Univ. Chicago Press.
- Bishop, W.W., 1968 - The evolution of fossil environments in East Africa. *Trans. Leics. Lit. Philos. Soc.* **62**: 22-44.
- Bishop, W.W., 1971 - The late Cenozoic history of East Africa in relation to hominoid evolution. In: K. Turekian (ed.) *Late Cenozoic Glacial Ages*, pp. 493-527, Cambridge, Yale Univ. Press.
- Bishop, W.W., 1972 - Stratigraphic succession 'versus' calibration in East Africa. In: W.W. Bishop & J. A. Miller (eds) *Calibration of Hominoid Evolution*, pp. 219-246, Edinburgh, Scottish Academic Press.
- Bishop, W.W., Miller, J.A., & Fitch, F.W., 1969 - New potassium-argon age determinations relevant to the Miocene fossil mammal sequence in East Africa, *Am. J. Sci.* **267**: 669-699.
- Bishop, W.W., & Trendall, A.F., 1967 - Erosion surfaces, tectonic and volcanic activity in Uganda. *Quart. J. Geol. Soc. London*, **122**: 385-420.
- Bishop, W.W., & Whyte, F., 1962 - Tertiary mammalian faunas and sediments in Karamoja and Kavirondo, East Africa. *Nature*, **196**: 1283-1287.
- Butler, P.M., 1962 - In: W.W. Bishop, The mammalian fauna and geomorphological relations of the Napak volcanics. *Rec. Geol. Surv. Uganda*, **1957-58**: 11.

- Butler, P.M., 1978a - Insectivora and Chiroptera, *In: V.J. Maglio & H.B.S.Cooke (eds) Evolution of African Mammals*, pp. 56-58, Cambridge, Harvard Univ. Press.
- Butler, P.M., 1978b - Chalicotheriidae, *In: V.J. Maglio & H.B.S. Cooke (eds) Evolution of African Mammals*, pp. 368-370, Cambridge, Harvard Univ. Press.
- Butler, P.M., 1984 - Macroscelidea, Insectivora and Chiroptera from the Miocene of East Africa. *Palaeovertebrata*, **14**: 117-200.
- Chaney, R.W., 1933 - A Tertiary flora from Uganda. *J. Geol.*, **41**: 702-709.
- De Heinzelin, J., 1955 - La fossé tectonique sous le parallèle d'Ishango, Mission J. de Heinzelin. I, Brussels (*Inst. Parcs Nat. Congo Belge*). 1950, **1**.
- Fleagle, J. G., 1975 - A small gibbon-like hominoid from the Miocene of Uganda. *Folia Primatol.* **24**: 1-15.
- Fleagle, J., & Simons, E., 1978 - *Micropithecus clarki*, a small ape from the Miocene of Uganda. *Am. J. Phys. Anthropol.* **49**: 427-440.
- Gebo, D., MacLatchy, L., & Kityo, R., 1997a - A new loridid humerus from the Early Miocene of Uganda. *Primates*, **38**: 423-427.
- Gebo, D.L., MacLatchy, L., Kityo, R., Deino, A., Kingston, J., & Pilbeam, D., 1997b - A hominoid genus from the Early Miocene of Uganda. *Science*, **276**: 401-404.
- Gommery, D., Senut, B., & Pickford, M. 1998 - Nouveaux restes postcrâniens d'Hominoidea du Miocène inférieur de Napak, Ouganda. *Ann. Paléont.* **84**: 287-306.
- Gommery, D., Senut, B., Pickford, M., Kamuhangire, E., Ssemmanda, I., & Musiime, E., 1999 - Les Hominoïdes du Karamoja. *Archéologia*, **360**: 52-57.
- Gommery, D., Senut, B., Pickford, M., & Musiime, E., 2002 - Les nouveaux restes du squelette d'*Ugandapithecus major* (Miocène inférieur de Napak, Ouganda). *Ann. Paléont.* **88**: 167-186.
- Guérin, C., & Pickford, M., 2003 - *Ougandatherium napakense* nov. gen. nov. sp. le plus ancien Rhinocerotidae Iranotheriinae d'Afrique. *Ann. Paléont.* **89(1)**: 1-35.
- Harrison, T., 1982 - *Small Bodied Apes from the Miocene of East Africa*. PhD Thesis, pp. 1-647. Univ. London.
- Harrison, T., 1988 - A taxonomic revision of the small catarrhine primates from the early Miocene of East Africa. *Folia Primatol.* **50**: 59-108.
- Hooijer, D.A., 1966 - Miocene rhinoceroses of East Africa. *Bull. Br. Mus. (Nat. Hist.) Geol.* **13**: 117-190.
- King, B.C., 1949 - The Napak Area of Southern Karamoja, Uganda. *Memoir of the Geological Survey of Uganda*, **5**: 1-57.
- Kingston, J., MacLatchy, L., Cote, S., Kityo, R., & Sanders, W., 2009 - Paleoenvironments of Early Miocene vertebrate localities at Napak and Moroto, Uganda: Lithofacies and isotopic analyses. *Journal of Vertebrate Paleontology, Abstracts*, **29**: 127A.
- Lavocat, R., 1973 - Les rongeurs du Miocène d'Afrique orientale. *Mém. Trav. Inst. E.P.H.E. Montpellier.* **1**: 1-284.
- Leakey, L.S.B., 1967 - Notes on the mammalian faunas from the Miocene and Pleistocene of East Africa. *In: W.W. Bishop & J. D. Clark (eds) Background to evolution in Africa*, pp. 7-28. Chicago and London, Chicago Univ. Press.
- Le Gros Clark, W.E., & Leakey, L.S.B., 1951 - The Miocene Hominoidea of East Africa. *Foss. Mamm. Afr.* **1**: 1-117.
- MacLatchy, L., 2009 - The postcranial anatomy of *Proconsul major*. *Journal of Vertebrate Paleontology, Abstracts*, **29**: 139A.
- MacLatchy, L., Downs, W., Kityo, R., Mafabi, M., & Musiime, E., 2003 - New catarrhine fossils from the lower Miocene of Uganda, with implications for the ape-monkey split. *Paleoanthropology Society Abstr.* **2003**: 17-18.
- MacLatchy, L., Gebo, D., Kityo, R., & Pilbeam, D., 2000 - Postcranial functional morphology

- of *Morotopithecus bishopi*, with implications for the evolution of modern ape locomotion. *J. Human Evol.* **39**: 159-183.
- MacLatchy, L., Gebo, D., & Pilbeam, D., 1995 - New primate fossils from the Lower Miocene of Northeast Uganda. *Am. J. Phys. Anthropol. Suppl.* **20**: 139.
- MacLatchy, L., & Pilbeam, D., 1999 - Renewed research in the Ugandan Early Miocene. In: P. Andrews & P. Banham (eds) *Late Cenozoic Environments and Hominid Evolution : a tribute to Bill Bishop*, pp. 15-26. Geological Society, London.
- MacLatchy, L., & Rossie, J., 2005 - New hominoid dental specimens from Moroto II, Early Miocene, Uganda. *J. Vert. Paleont. Abstr.* **25**: 86A.
- MacLatchy, L., Wunderlich, R., & Stern, J., 1998 - Distal femora of *Morotopithecus* and *Sivapithecus*. *J. Vert. Paleont.* **18**(3): 60A.
- MacLatchy, L., & Young, N., 2004 - The phylogenetic position of *Morotopithecus*. *Jl Human Evol.* **46**: 163-184.
- Morales, J., Pickford, M., & Soria, D., 2007. New carnivores (Creodonta and Carnivora) from the Early Miocene of Napak, Uganda. *Paleontological Research*, **11** : 71-84.
- Morales, J., Salesa, M., Pickford, M., & Soria, D., 2001 - A new tribe, new genus and two new species of Barbourfelinae (Felidae, Carnivora, Mammalia) from the Early Miocene of East Africa and Spain. *Trans. R. Soc. Edinburgh*, **92**(1): 97-102.
- Orliac, M., Lihoreau, F., Boisserie, J.-R., & MacLatchy, L., 2009 – Revision of the African Palaeochoerids : implications for the relationships of Hippopotamidae (Cetartiodactyla, Mammalia). *Journal of Vertebrate Paleontology, Abstracts*, **29**: 159A.
- Pickford, M., 1986a - A revision of the Miocene Suidae and Tayassuidae of Africa. *Tertiary Res. Spec. Pap.* **7** : 1-83.
- Pickford, M., 1986b - Dating the fossil primate record. In : J. Else & P. Lee (eds) *Primate Evolution* : 1-2. Cambridge, Cambridge Univ. Press.
- Pickford, M., 1986c - The geochronology of Miocene higher primate faunas of East Africa. In: J. Else & P. Lee (eds) *Primate Evolution* : 19-45. Cambridge, Cambridge Univ. Press.
- Pickford, M., 1986d - Geochronology of the Hominoidea : a summary. In: J. Else & P. Lee (eds) *Primate Evolution* : 123-128. Cambridge, Cambridge Univ. Press.
- Pickford, M., 1995 - Fossil land snails of East Africa and their palaeoecological significance. *J. Afr. Earth Sci.* **20** (3-4): 167-226.
- Pickford, M., 1998 - A new genus of Tayassuidae (Mammalia) from the middle Miocene of Uganda and Kenya. *Ann. Paléont.* **84**: 275-285.
- Pickford, M., 2002a - Ruminants from the Early Miocene of Napak, Uganda. *Ann. Paléont.* **88**: 85-113.
- Pickford, M., 2002b - New reconstruction of the Moroto hominoid palate and a reassessment of its affinities to *Afropithecus turkanensis*. *Human Evolution*, **17**: 1-19.
- Pickford, M., 2002c - Early Miocene grassland ecosystem at Bukwa, Mount Elgon, Uganda. *C. R. Palevol*, **1**: 213-219.
- Pickford, M., 2004a - Palaeoenvironmental reconstruction of Early Miocene hominoid-bearing deposits at Napak, Uganda, based on terrestrial molluscs. *Ann. Paléont.* **90**: 1-12.
- Pickford, M., 2004b - Palaeoenvironmental reconstruction of Early Miocene hominoid-bearing deposits at Napak, Uganda, based on terrestrial molluscs. *Ann. Paléont.* **90**: 1-12.
- Pickford, M., 2006 – New mammutid proboscidean teeth from the Middle Miocene of tropical and southern Africa. *Palaeontologica africana*, **42** : 29-35.
- Pickford, M. & Mein, P., 2006 - Early Middle Miocene Mammals from Moroto II, Uganda. *Beitr. Paläont.*, **30**: 361–386, Wien.

- Pickford, M., & Senut, B., 1988 - Habitat and locomotion in Miocene cercopithecoids. *In* : A. Gautier-Hion, F. Bourlière, J.-P. Gautier & J. Kingdon (eds) *A Primate radiation* : 35-53. Cambridge, Cambridge Univ. Press.
- Pickford, M., Senut, B., & Gommery, D., 1999 - Sexual dimorphism in *Morotopithecus bishopi*, an early Middle Miocene hominoid from Uganda and a reassessment of its geological and biological contexts. *In*: P. Andrews & P. Banham (eds) *Late Cenozoic Environments and Hominid Evolution: a tribute to Bill Bishop*, pp. 27-38. Geological Society, London.
- Pickford, M., Senut, B., Gommery, D., & Musiime, E., 2003 - New Catarrhine fossils from Moroto II, Early Middle Miocene (ca 17.5 Ma) Uganda. *C. R. Palevol*, **2**: 649-662.
- Pickford, M., Senut, B., Hadoto, D., Musisi, J., & Kariira, C., 1986a - Nouvelles découvertes dans le Miocène inférieur de Napak, Ouganda oriental. *C. R. Acad. Sci. Paris*, **302**: 47-52.
- Pickford, M., Senut, B., Hadoto, D., Musisi, J., & Kariira, C., 1986b - Découvertes récentes dans les sites Miocènes de Moroto (Ouganda oriental): aspects biostratigraphiques et paléocéologiques. *C. R. Acad. Sci. Paris*, **302**: 681-686.
- Pickford, M., & Tassy, P., 1980 - A new species of *Zygodontomys* (Mammalia, Proboscidea) from the Miocene hominoid localities of Meswa Bridge and Moroto (East Africa). *N. Jb. Geol. Palaeont. Abh.* **4**: 235-251.
- Pilbeam, D.R., 1969 - Tertiary Pongidae of East Africa: Evolutionary relationships and taxonomy. *Bull. Peabody Mus. Nat. Hist.* **31**: 1-185.
- Pilbeam, D.R., & Walker, A., 1968 - Fossil monkeys from the Miocene of Napak, northeast Uganda. *Nature*, **220**: 657-660.
- Rafferty, K.L., Walker, A., Ruff, C., Rose, M.D., & Andrews, P.J., 1995 - Postcranial estimates of body weights in *Proconsul*, with a note on a distal tibia of *P. major* from Napak, Uganda. *Am. J. Phys. Anthropol.* **97**: 391-402.
- Savage, R., 1965 - The Miocene Carnivora of East Africa. *Foss. Mamm. Afr.* **19**: 239-316.
- Senut, B., 1987 - Upperlimb skeletal elements of Miocene cercopithecoids from East Africa : implications for function and taxonomy. *Human Evol.* **2**: 96-106.
- Senut, B., Pickford, M., Gommery, D., & Kanimatsu, Y., 2000 - A new genus of Early Miocene hominoid from East Africa: *Ugandapithecus major* (Le Gros Clark & Leakey, 1950). *C. R. Acad. Sci. Paris*, **331**: 227-233.
- Simpson, G.G., 1967 - The Tertiary lorisiform primates of Africa. *Bull. Mus. Comp. Zool.* **136**: 39-61.
- Tassy, P., & Pickford, M., 1983 - Un nouveau mastodonte zygodontomyste (Proboscidea, Mammalia) dans le Miocène inférieur d'Afrique orientale: systématique et paléoenvironnement. *Geobios*, **16**: 53-77.
- Trendall, A.F., 1965 - Explanation of the Geology of Sheet 35 (Napak). *Report of the Geological Survey of Uganda*, **12** : 1-70.
- Tricker, B., Taylor, W., & Bishop, W.W., 1963 - Fossils from Karamoja. Brathay Exploration Group II. *Uganda J.* **27**: 109-114.
- Tsujikawa, H., & Pickford, M., 2006 - Additional specimens of Hyracoidea (Mammalia) from the Early and Middle Miocene of Kenya. *Ann. Paléont.* **92** : 1-12.
- Walker, A., 1968 - The lower Miocene fossil site of Bukwa, Sebei. *Uganda J.* **32** (2): 149-156.
- Walker, A., 1969a - Fossil mammal locality on Mount Elgon, eastern Uganda. *Nature*, **223**: 591-593.
- Walker, A., 1969b - New evidence from Uganda regarding the dentition of Miocene Lorisidae. *Uganda J.* **33**: 90-91.
- Walker, A., 1974 - A review of the Miocene Lorisidae of East Africa. *In*: R.D.Martin, G.Doyle & A.Walker (eds) *Prosimian Biology*, pp. 435-447. London, Duckworth.



- Walker, A., 1978 - Prosimian primates. *In*: V.J. Maglio & H.B.S. Cooke (eds) *Evolution of African Mammals*, pp. 90-99. Cambridge, Harvard University Press.
- Walker, A., & Rose, M., 1968 - Fossil hominoid vertebra from the Miocene of Uganda. *Nature*, **217**: 980-981.
- Wilkinson, A., 1976 - The lower Miocene Suidae of Africa. *Foss. Verts Afr.* **4**: 173-282.
- Wilson, J.G., 1959 - The soils of Karamoja District, Northern Province of Uganda. *Uganda Protectorate, Department of Agriculture, Memoirs of the Research Division, Series I: Soils, N° 5*.
- Winkler, A., 2002 - Rodents from the Early Miocene of Uganda: Preliminary results of renewed investigations. *J. Vert. Paleont.* **22**: 120A.
- Winkler, A., 2003 - New small mammal records from the Early Miocene of Uganda. *J. Vert. Paleont.* **23(3)**: 111A.
- Young N., & MacLatchy, L., 2000 - Is *Morotopithecus* a Great Ape? *Am. J. Phys. Anthrop.* **30**: 329-330.
- Young, N., & MacLatchy, L., 2004 - The phylogenetic position of *Morotopithecus*. *J. Human Evol.* **46**: 163-184.

# GEO-PAL UGANDA

## Editorial Board

Editor-in-Chief Ezra Musiime, Uganda Museum

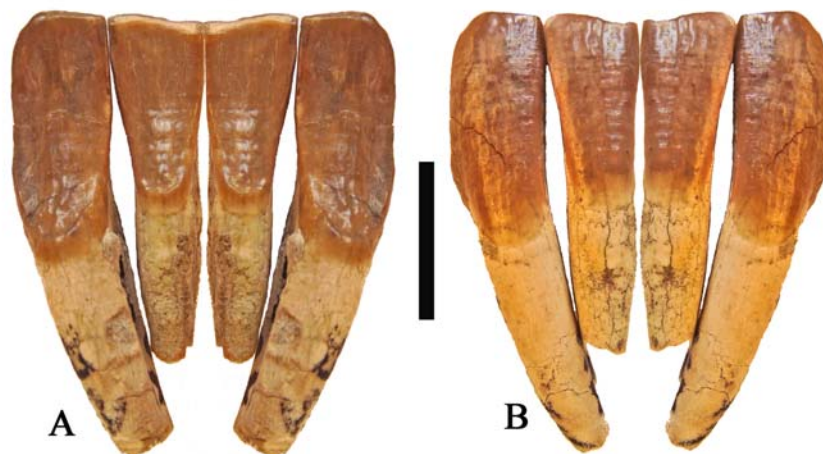
## Associate Editors

Brigitte Senut, Muséum National d'Histoire Naturelle, Paris  
Martin Pickford, Collège de France, Paris  
Sarah Musalizi, Uganda Museum, Kampala  
Rose Mwanja, Uganda Museum, Kampala  
Jorge Morales, Museo Nacional de Ciencias Naturales, Madrid  
Israel Sanchez, Museo Nacional de Ciencias Naturales, Madrid  
Yoshihiro Sawada, Shimane University, Matsue

© Uganda Museum, Kampala

Published by the Uganda Museum

Kira Road,  
P.O. Box 5718,  
Kampala,  
Uganda



Reconstructed lower incisor row of *Ugandapithecus major*, A) lingual, and B) labial view, based on fossils from Napak XV, discovered by the Uganda Palaeontology Expedition in 2007 (scale : 10 mm).