The excavation of site 362

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Introduction

Locality 362 was found during the 1987 field season by Helen Wilson,, a member of the British Archaeological Mission team (see chapter 6, Figure 6. 7, this volume). The fauna collected from the surface of the locality in 1987 included Bovid, Tragulid, Cervid, Rhinoceratid, Giraffid and a Proboscidean (see Table 6.6). The bones appeared to come from an area of about one square metre lying within orange-brown sandy silt with calcium carbonate concretions. This sandy silt graded downward into medium grained sandstone and had a sharp upper contact with a purple-pink mudstone. The mudstone had sharp contact with the overlying medium grained sandstone. According to palaeomagnetic studies by Dr. Helen Rendell,, the orange-brown sandy silts from this locality date fall within the Olduvai event (ca. 1.67 - 1.87 Ma) (see this volume, Figure 6.3).

In 1987, all bone from this locality and immediately down slope was collected, and the site was protected with cloth and a layer of earth to retard further erosion. In 1989, it was apparent from the amount of material that had eroded in only two years that the site would not survive much longer. It was thus decided to excavate it on account of its diverse fauna, good fossil preservation and dense concentration of material within a defined area. The main objectives of the excavation were to recover *in situ* fossil material, and to record it systematically in order to aid understanding of how it accumulated, and to obtain good fossil specimens for the Geological Survey of Pakistan that could serve as research and reference material for future workers.

Methodology

Before beginning the excavation, the fossil material that had eroded from the surface since the site was covered in 1987 was collected. This material was confined to the gully running northwards, down slope from the site, and the distance of the main pieces from the site was recorded to provide an indication of the rate at which the site was being eroded. All the specimens collected were cleaned and marked as described below, and are catalogued in Table 9. 6 (end of report). This material complements that found in the 1987 survey, and summarised in Table 6. 6.

The excavation of the site by the two authors began on 11th March, 1989 and lasted three weeks. A trench 2.6 m. long and 1.46 m. wide was cut into the slope below the sandstone ridge to provide a working platform either side of the bone distribution visible in the slope surface. A permanent site datum was established by fixing a red-painted 6" nail into the surface of the sandstone ridge, c. 1 metre west of the trench, and a datum level below it was established with the aid of a theodolite. This datum level was given an arbitrary height of 100 metres, and the permanent site datum is therefore located at 102.14 metres.

Deposits were removed in horizontal spits down to the level of the bone concentration. The western side of the trench did not contain any bones, and was excavated to c. 40 cm below the surface of the bone distribution to provide greater accessibility and a work space for the excavation of the bones. Each sedimentary unit was recorded, and the north, east and west facing sections (see Figure 9. 6) were drawn at a scale of 1:20.

As most bones were concentrated within a small area, their position was recorded by establishing a one metre square grid. All co-ordinates taken on the bones, i.e. northings and eastings, were measured in relation to this grid square, the depth being measured down from the 100 metre temporary site datum. All co-ordinates were measured to the central axis point of each particular bone. For larger bone fragments, a note was made of the orientation and the angle of dip of the bones. A series of scale 1:10 plans were made of the bone distribution at each appropriate level (see Figures 9. 7 - 10). Bones were carefully excavated with dental picks and brushes. As the sediments were very hard, it was sometimes necessary to soften them with a small amount of water. Many of the fragile bones were heavily cracked due to bioturbation, and fragile ones were given a coating of 70% PVA (Polyvinyl acetate adhesive) solution in the field. Some specimens required further treatment with PVA once back in the field base.

Each specimen was cleaned manually in the field and at the field base with dental picks and toothbrushes, and marked with the site number, followed by GB (indicating G for Geological Survey of Pakistan (GSP) and B for British Archaeological Mission to Pakistan), and the specimen catalogue number. Table 9. 7 (end of report) lists each specimen by number, provisional taxon, anatomical element, co-ordinates, orientation, angle of dip, along with other relevant information. Once cleaned, marked, and recorded, all bone material was stored at GSP, Islamabad.

Results: Surface Collection of the Locality and Gully

Table 9. 6 (end of report) lists the fossil collected in 1989 from the surface of the locality and the gully running downslope from the site. Over 75 specimens were collected, of which more than two thirds were diagnostic; i.e. identifiable to at least anatomical element and/or genus. Provisional identification of this material indicates the presence of Bovid, Proboscidean, *Sivatherium* and *Rhinoceros*.

Table 9. 8: Comparison of the surface and excavated fossil assemblages from site 362.

Taxon	% of species in surface collections	% of species in excavation
Bovid	25	15
Carnivore	--	11
Sivatherium	1	2
Rhinoceratid	5	1
Proboscidean	1	<1
Suid	--	<1
Cervid	1	--
Tragulid	<1	--
Bird	--	1

It is interesting to compare the overall composition of the species represented at site 362 from its surface collection, and from the excavation. The general features are shown in Table 9. 8. As indicated, the surface collection provided a reasonably accurate indication of the importance of bovids, giraffids, Proboscidean and rhino. However, it failed to indicate the presence of carnivore (11% of the excavated total), pig and bird. Conversely, there was no trace of cervids in the excavated material, although these were present in small amounts in the surface collection. However, it should be noted that the identifications of the Bovidae in the excavated assemblage are very provisional, and more detailed research may show that cervids are present in small amounts. In conclusion, it is suggested that surface assemblages give a reasonable indication of the taxa in a fossil accumulation, but are unlikely to show the full range of types, or the rarer ones.

Erosion rates

It was obvious that locality 362 was eroding very quickly. 75 specimens had been eroded from their original context and washed down slope in just two years between 1987 and 1989. This suggests that the 217 specimens found in 1987 might have resulted from ca. 6 years' erosion. At this rate of erosion, it is unlikely that the 175 bones remaining in the deposit would have remained in situ for much more than 10 years.

The Excavation: Stratigraphic sequence

The sedimentary sequence of the site is shown in Figure 9. 6, and consisted of (from top to bottom): loose sandstone (context 1), mudstone (context 2), sandy silt (context 3), and sandy silt with abundant fossils and increased mineralised concretions (context 4). Underlying deposits were not investigated.

Context one is a grey coloured, medium grained, c. 10 cm thick, bioturbated loose sandstone that has a well defined contact with the underlying mudstone. Context two is purple-pink, c. 40 cm thick, bioturbated, moderately compacted mudstone that has a sharp, uneven contact with the lower sandy silt unit. Context three is an orange-brown, c. 50 cm thick, bioturbated, sandy silt with occasional concretions. The unit is well compacted and has very occasional round-oval mudstone inclusions (c. 5 cm in diameter).

Context four contains the fossil accumulation, and is an orange-brown sandy silt which grades downwards into a medium-grained sandstone. It has abundant concretions which increase in size with depth from c. 5 mm - 2 cm in diameter. Mudstone inclusions are also present. Roots in this unit are marked by mudstone and sandstone infilling. Fresh roots could be seen protruding out of the surface fractures of many of the bones. The bone bed extended in a roughly rectangular strip from the centre of the northern part of the trench into its south-east corner. It was approximately 1.20 m long, c. 75 cm wide and had a uniform thickness of c. 30 cm.

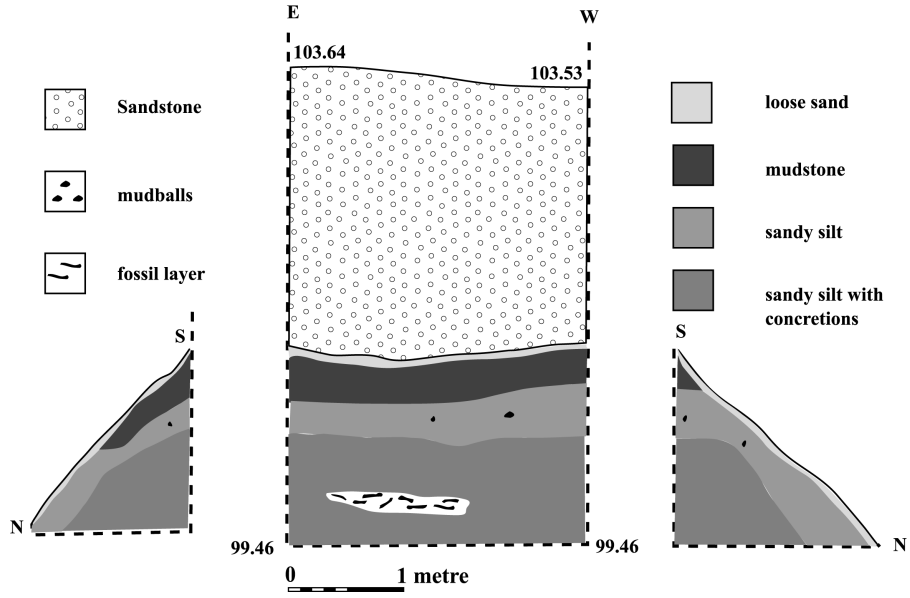

Figure 9. 6: Section of locality 362. (Based on field records by Mark Beech and Eddie Moth).

The Fauna

A total of 179 specimens were excavated, of which almost half were diagnostic i.e. identifiable to genus or family. As Table 1 shows, the provisionally identified fauna consists (in decreasing numerical importance) primarily of Bovid, followed by carnivore (*Canis*), *Sivatherium*, Gazelle, *Rhino*, Proboscidean, a large bird (?eagle size/type) and ?Suid.

Nature of the Fossil Accumulation

Three particular groups of bones were articulated: a Bovid humerus-radius-ulna (specimen numbers X21, X28 and X29), a *Sivatherium* humerus-radius-ulna (specimen numbers X19, X25, X27 and X136) (see Figure 9. 7), and a canid partial skeleton (see Figure 9. 10). Many of the other bones appeared to come from only a few individuals.

The major part of the skeleton of an adult male carnivore (*Canis cautleyi*; see Turner, this volume) was represented within the deposits (jaw (X119/X124), canines (X88/X104/X126), atlas (X92), humerus (X38), radius (X55), ulna (X41), os penis (X75), a pair of tibias (X125 (left) and X56 (right)), calcaneum (X105), astragalus (X100), metapodials (X84 / X93 / X154/ X158), carpals - tarsals (X103 / X105 / X112 / X160) and phalanges (X83/X175/X178). In addition many of the smaller ribs may have belonged to this particular animal, as no other species of small body size have yet been identified within the assemblage.

A pair of horns attached to a fragment of the crania (X12) and two maxillaries (X46-left maxilla, X51-right maxilla) all appear to belong to the same individual. The slender horns are set quite close together and project backwards from the skull at about 45 degrees, the tips of the horns curling upwards. The size and form of the horns suggest that the specimen is some sort of gazelle-type creature within the family of Bovidae.

A complete bird ulna (X15/X16) and almost complete carpometacarpus (X66) appear to belong to the same bird (? of eagle size/type).

Taphonomic factors

Most of the long bones were transversely fractured. Longitudinal and diagonal fractures are also present. Features such as step-fracturing, polishing, and sun-cracking were not seen on bone surfaces. A few bones exhibit traces of carnivore activity. Two specimens came from the gully collect: a pelvis shaft fragment (specimen G11/1) had several puncture marks and striations, and a Bovid distal humerus (specimen G16) had gnawing marks on its surface. The best evidence of carnivore activity came from one of the excavated specimens: a Proboscidean calcaneum (specimen number X62), which had one very deep puncture mark and at least three other shallower marks. It is worth noting that the deep puncture mark is of a size comparable with the carnivore canines recovered from the site (specimens X88 and X104).

Discussion: 1) Sediments

The sediments at site 362 are fine-grained, poorly sorted, and do not contain silt layers. Sedimentary structures are not preserved, perhaps due to the effects of bioturbation. The sandy silt grades downward into medium grained sandstone. In fluvial rocks, fine sediments generally represent lake, overbank or abandoned channel deposits. There are various ways of explaining the accumulation of the sediments at site 362:

1. Lake or depression: Deposition in lakes/depressions is usually marked by oscillatory ripple marks, and the presence of freshwater invertebrate fossils (bivalves and gastropods). In the case of site 362, no such ripple marks were present, and no freshwater invertebrate fossils were recovered during the excavation. It is worth also noting that no crocodile or turtle fossils are present in the recorded fauna.

2. Overbank deposit: Overbank deposits are generally recognised by the presence of silt layers, ripple marks and well sorted sediments. As mentioned above, the sediments at site 362 are poorly sorted and do not have any ripple marks or contain any silt layers.

3. Abandoned channel: Abandoned channel deposits are generally characterized by an upward decrease in particle size. This feature is present in the sediments at site 362, the sediments becoming increasingly finer upwards through the profile.

In the light of the above observations with regard to the sedimentary evidence, it would seem that the site may have existed within an abandoned channel system.

2) Bones

The absence of sun-cracking on bone surfaces would appear to indicate that the bones were not exposed to the sun for any great length of time. The material would therefore appear to have been either rapidly buried, or transported to where the sun could not affect them.

The excavation of articulated and semi-articulated limbs, as well as several complete fragile specimens e.g. the bird bones, the carnivore penis bone, and many ribs, suggests a negligible amount of transportation. The lack of roundness or step-fracturing to any of the specimens would also appear to confirm this hypothesis.

The presence of a large, adult, male carnivore (*Canis cautleyi*) within the assemblage may explain the accumulation of the bone material. Its skeleton was, however, found at the base of the fossil deposits, so it clearly cannot have been te primary collector. As noted already, several specimens exhibit traces of carnivore puncture marks and striations. The distribution of the bones in an elongated spread, with a north-west/south-east orientation may possibly represent the remnants of bones deposited in a carnivore passage-way or burrow.

In summary, the sedimentary evidence suggests that sediments accumulated within an abandoned channel system. The fossil evidence points to some sort of carnivore accumulation. A model may therefore be proposed as follows:

1. An abandoned channel slowly accumulates increasingly finer sediments, and eventually dries out.

2.A carnivore makes its den/cache of bone within this abandoned channel, either by burrowing, or by using a narrow gully near its bank.

3.The den/cache subsequently goes out of use, perhaps with the roof/passage-way collapsing, leading to the rapid burial of the bones.

Conclusions

With reference to our initial objectives, set out in the introduction to this report:

1. *In-situ* fossil bone material was recovered from site 362 and recorded in detail. The bones appear to represent a carnivore accumulation, which resulted in the preservation of some excellent specimens of Bovid, a carnivore (*Canis cautleyi*), *Sivatherium*, Gazelle, Rhino, some sort of bird of ?eagle size/type and a Suid.

2. Sedimentological evidence suggests that this site was formed on the edge of an abandoned river channel. Further study of the sedimentary history of the deposits associated with this site is recommended to gain a fuller understanding of the environmental setting of this site.

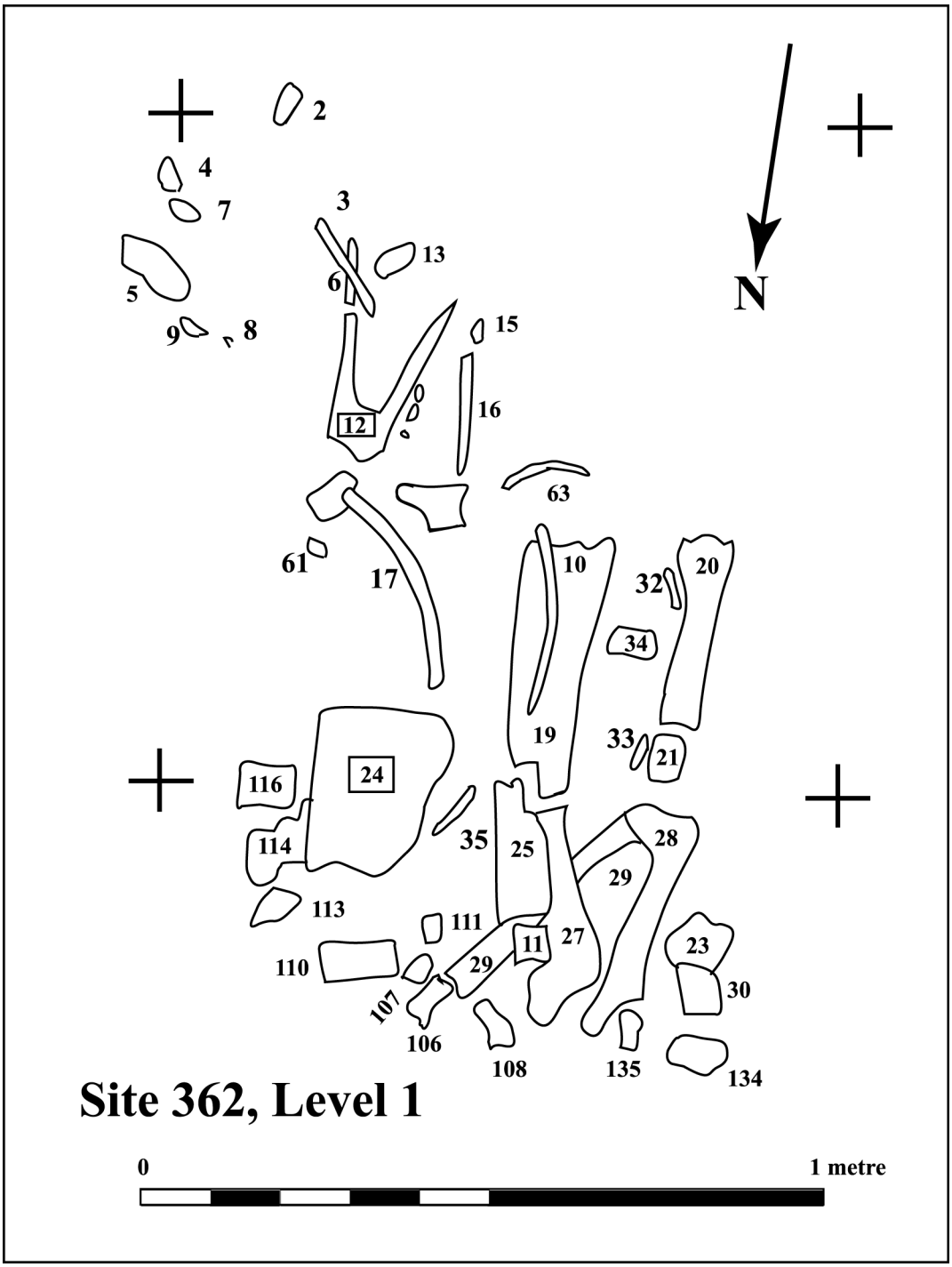

Figure 9. 7: Plan of level 1, locality 362 (based on field records by the authors and Eddie Moth).

The most important finds shown here are the bovid skull/horns (12), a radius-ulna of a bird (15,16), an articulated radius-ulna of *Sivatherium* (19, 25, 27), and a bovid humerus and radius-ulna (28, 29).

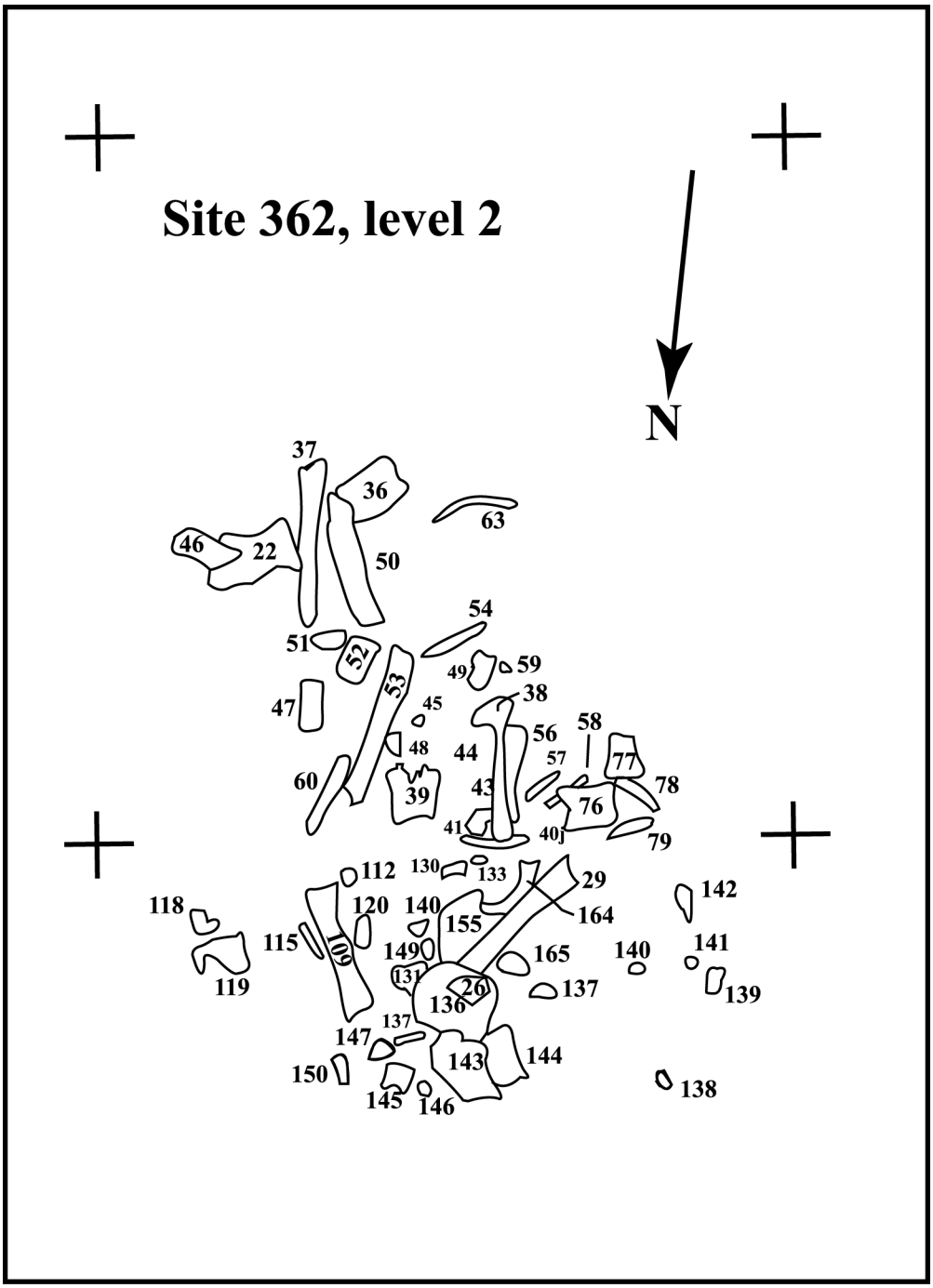

Figure 9. 8: Plan of level 2, locality 362 (based on field records by the authors and Eddie Moth).

The *Sivatherium* proximal humerus (136) in this level articulates with the radius-ulna in level 1 (19, 25 and 27).

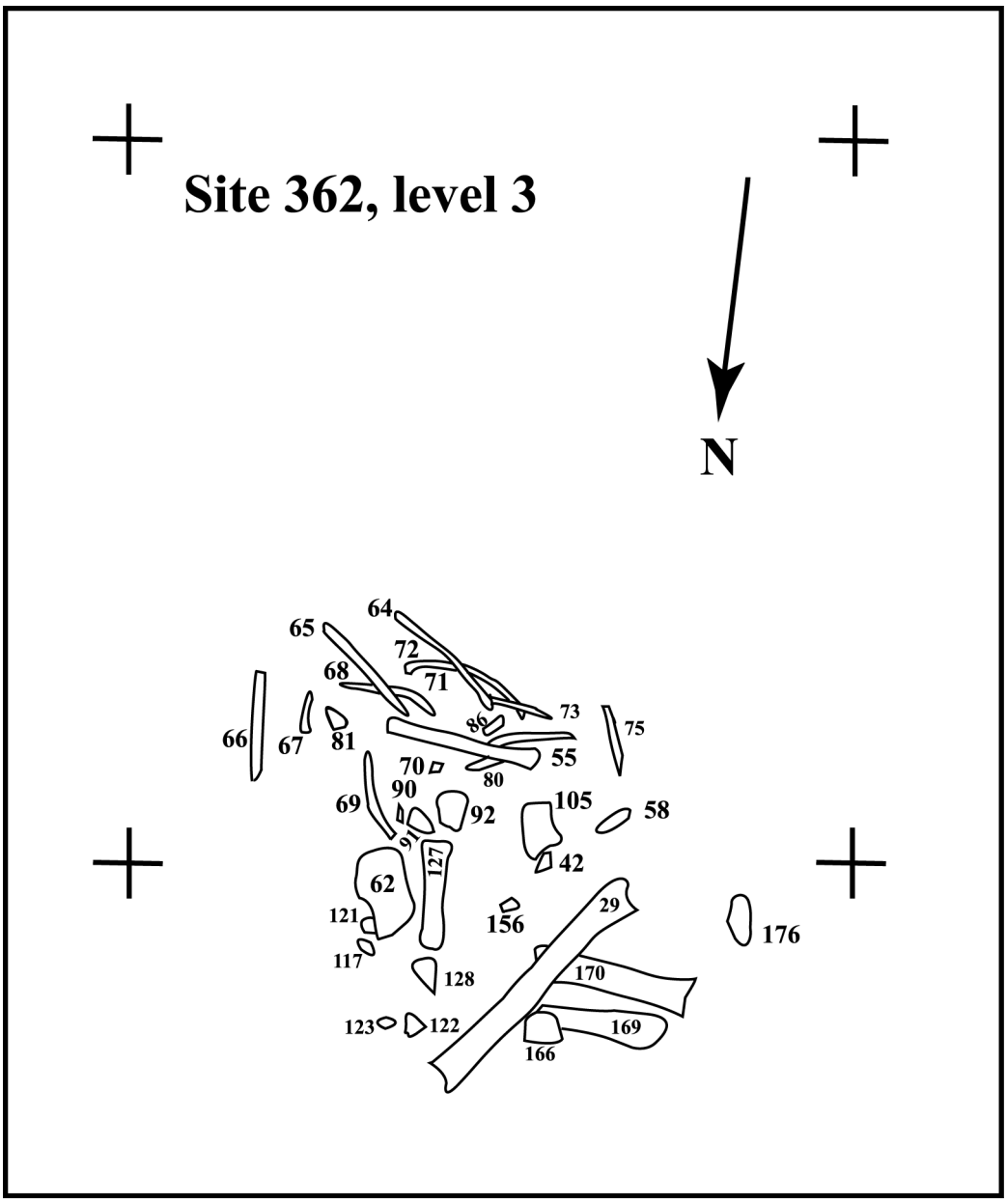

Figure 9. 9: Plan of level 3, locality 362 (based on field records by the authors and Eddie Moth).

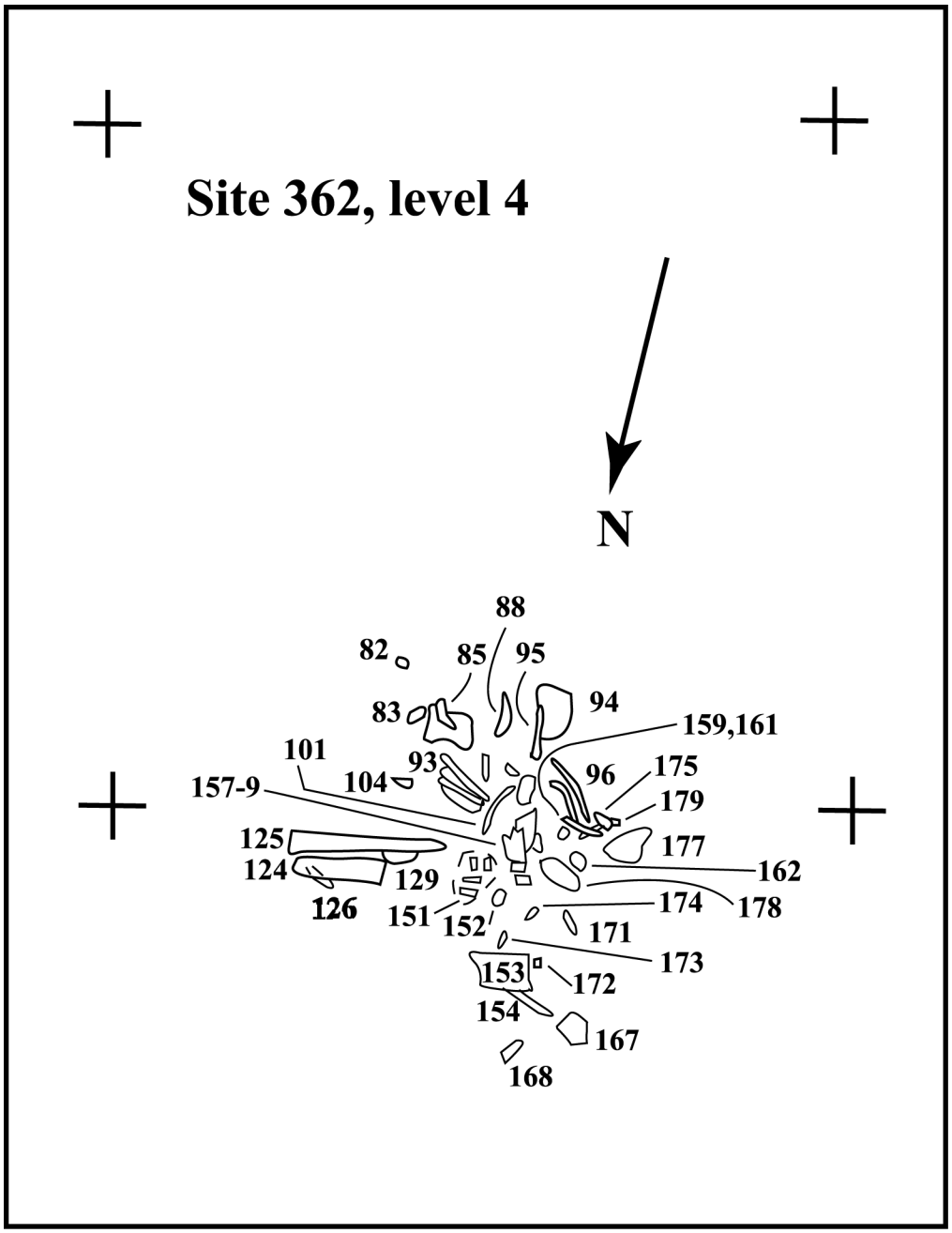

Figure 9. 10: Plan of level 4, locality 362 (based on field records by the authors and Eddie Moth). The canid partial skeleton was the main find in this part of the excavation.

Table 9. 6: Fossil material collected in 1989 from the gully down slope of locality 362

Key: lbf = long-bone fragment

Spec. No.	Distance down gully	Taxon	Element	Notes
GB 1	49 m	Large mammal	Indeterminate	
GB 2/	148 m	Medium mammal	Indeterminate	
GB 2/	248 m	Medium mammal	Indeterminate	
GB 3	47.5 m	Medium mammal	Indeterminate	
GB 4	46.6 m	Medium mammal	skull fragment	
GB 5	44.4 m	Bovid	Atlas	
GB 6	44.3 m	Small mammal	Indeterminate	
GB 7	43.3 m	Bovid	Jaw fragment with broken teeth	
GB 8	41.7 m	Bovid	Right distal metacarpal fragment	
GB 9	41.1m	Large mammal	Indeterminate	
GB 10	40.0 m	Medium mammal	Vertebra fragment	
GB 11/1	38.4 m	Medium mammal	Pelvis shaft	carnivore puncture marks and striations
GB 11/2	38.4 m	Medium mammal	Indeterminate	
GB 12	36.3 m	Bovid	Right distal tibia	
GB 13	36.0 m	Bovid	Right distal humerus	
GB 14	35.9 m	Bovid	Right distal tibia	
GB 15	33.4 m	Medium mammal	Indeterminate	
GB 16	33.5 m	Bovid	Left distal humerus	? chewing marks
GB 17	32.8 m	Medium mammal	Indeterminate	
GB 18	31.3 m	Medium mammal	Skull fragment	
GB 19	31.0 m	Bovid	Left proximal radius	
GB 20	30.5	Medium mammal	Indeterminate	
GB 21	29.7 m	Large mammal	Indeterminate	
GB 22	28.2 m	Medium mammal	Indeterminate	
GB 23	27.9 m	Medium mammal	Indeterminate (+ 4 other small ones)	
GB 24	25.3 m	Medium mammal	Indeterminate	
GB 25/1	23.3-23.6m	?Bovid	Pelvis (ilium)	
GB 25/2	23.3-23.6m	Medium mammal	Pelvis fragment	
GB 25/3	23.3-23.6m	Medium mammal	Indeterminate lbf	
GB 25/4	23.3-23.6m	Medium mammal	Vertebra fragment	
GB 25/5	23.3-23.6m	Large mammal	Proximal tibia + 1 indeterminate	
GB 26	23.1 m	Bovid	Left proximal radius	
GB 27	22.1 m	Bovid	Right distal humerus	
GB 28	20.7 m	Large mammal	Indeterminate	
GB 29/1	20.5 m	?Bovid	Distal radius	
GB 29/2	20.5 m	Large mammal	?vertebra	
GB 30/1	20.0 m	?*Sivatherium*	Left metatarsal shaft	
GB 30/2	20.0 m	Medium mammal	Pelvis fragment	
GB 31/1	19.6 m	?Bovid	Right radius-ulna fragment	
GB 31/2	19.6 m	Large mammal	Indeterminate lbf	
GB 32	18.95 m	Bovid	Right maxilla with tooth fragment	
GB 33	18.6 m	Bovid	Right proximal radius-ulna	
GB 34/1	14.6 m	?Proboscidean	astragalus	
GB 34/2	14.6 m	Medium mammal	Indeterminate	
GB 34/3	14.6 m	*Rhinoceros*	Right distal tibia	
GB 35/1	14.2 m	Medium mammal	Indeterminate	
GB 35/2	14.2 m	Medium mammal	Indeterminate	
GB 36/1	14.1 m	Bovid	Astragalus	
GB 36/2	14.1 m	Medium mammal	Indeterminate	
GB 37/1	14.2 m	Medium mammal	Indeterminate	
GB 37/2	14.2 m	?Bovid	Radius midshaft	
GB 37/3	14.2 m	Medium mammal	Indeterminate	

GB 38	13.2 m	Medium mammal	Indeterminate	
GB 39/1	12.1 m	Large mammal	Vertebra fragment	
GB 39/2	12.1 m	Medium mammal	Indeterminate	
GB 39/3	12.1 m	Medium mammal	Indeterminate	
GB 39/4	12.1 m	Medium mammal	Indeterminate	
GB 40	12.8 m	Large mammal	Scaphoid	
GB 41	13.5 m	Medium mammal	Indeterminate	
GB 42	14.0 m	Bovid	Humerus midshaft	
GB 43/1	12.9 m	Medium mammal	Indeterminate	
GB 43/2	12.9 m	Medium mammal	Indeterminate	
GB 44	12.2 m	Bovid	Right distal tibia	
GB 45	12.0 m	Bovid	Right distal scapula	
GB 46	10.8 m	Bovid	Right distal tibia	
GB 47/1	11.2 m	?Bovid	Carpal	
GB 47/2	11.2 m	?Bovid	Radius midshaft	
GB 48	10.9 m	Medium mammal	?vertebra	
GB 49	11.6 m	?Bovid	Proximal metatarsal	
GB 50/1	11.3 m	Medium mammal	Indeterminate	
GB 50/2	11.3 m	Medium mammal	Indeterminate	
GB 50/3	11.3 m	Medium mammal	Indeterminate	
GB 51	9.6 m	Small mammal	Indeterminate	
GB 52	9.6 m	?Rhino	Carpal	
GB 53/1	8.5 m	?Bovid	Metatarsal	
GB 53/2	8.5 m	Medium mammal	Indeterminate	
GB 54	8.6 m	?Bovid	?phalange+ 2 Indeterminates	
GB 55	7.5 m	Large mammal	Indeterminate	
GB 56/1	7.0 m	Medium mammal	Rib fragment	
GB 56/2	7.0 m	Medium mammal	Indeterminate	
GB 56/3	7.0 m	Medium mammal	Indeterminate	& 7 other indeterminates
GB 57	6.1 m	Bovid	1st phalange, left	
GB 58/1	6.0 m	Large mammal	Indeterminate	
GB 58/2	6.0 m	Medium mammal	Indeterminate	& 1 other indeterminate
GB 59	6.2 m	Bovid (Medium mammal)	Jaw fragment	& 1 other indeterminate
GB 60/1	7.2 m	?Proboscidean	?metapodial	
GB 60/2	7.2 m	Large mammal	Indeterminate lbf	
GB 60/3	7.2 m	Medium mammal	Indeterminate lbf	
GB 60/4	7.2 m	Bovid	left distal unfused metatarsal	
GB 60/5	7.2 m	Large mammal	Indeterminate lbf	
GB 61	2.5 m	Bovid (Medium mammal)	Right jaw fragment + PM fragment	& 1 other indeterminate
GB 62/1	1.0 m	Bovid	Right proximal metatarsal	
GB 62/2	1.0 m	?Bovid &	Metatarsal	probably part of 62/1
		(Medium mammal)	3 Indeterminate	
GB 63	0.3 m	?	Indeterminate	
GB 64/1	0 m	Medium mammal	?vertebra fragment	
GB 64/2	0 m	Medium mammal	Indeterminate	& 3 other indeterminates
GB 65	50 m	Bovid	Right jaw fragment with M3	
GB 66	0.25 m	Medium mammal	Indeterminate lbf	
GB 67	0.58 m	Medium mammal	Indeterminate lbf	
GB 68	0.10 m	?Bovid	Distal metacarpal	
GB 69	0.09 m	?	Indeterminate	
GB 70	0.30 m	Medium mammal	Indeterminate lbf	
GB 71	0.28 m	Medium mammal	Indeterminate lbf	
GB 72	0.15 m	?	Indeterminate	
GB 73	0.20 m	Large mammal	2 Indeterminate lbf	
GB 74	0.25 m	Small mammal	1 rib	
			1 Indeterminate	
GB 75	0.30 m	Medium mammal	2 ribs	
		?	1 Indeterminate	

Table 9. 7: Catalogue of site 362 fossil specimens, excavated 1989

No.	Taxon	Element	East	North	Depth	Orientation/Notes
X1	Indeterminate	Fragment	0.85	0.05	100.42	
X2	Indeterminate	Fragment	0.82	0.02	99.9	N/S
X3	Indeterminate	Rib	0.75	0.24	99.85	N 60^{o} W; horizontal
X4	Bovid	2nd phalange	1.0	0.1	99.83	NW/SE, horizontal
X5	Indeterminate/Suid	Pelvis	0.97	0.23	99.91(t)	Acetabulum W. = 75mm
X6	Bovid	Bovid horn; joins 12	0.75	0.18	99.87(t)	
					99.84(m)	
X7	Indeterminate	Vertebra	0.98	0.15	99.86	NW/SE; horizontal
X8	Indeterminate	Fragment	0.92	0.34	99.85	
X9	Indeterminate	Fragment	0.99	0.31	99.86	
X10	Indeterminate	Rib	0.44	0.6	99.88	N/S; horizontal
X11	*Sivatherium* (part of 19)	Indeterminate	0.44	1.1	99.92	NW/SE; horizontal
X12	Bovid/Tragulid	Skull/horns; joins 6	0.60(t)	0.27(t)	99.84	NE/SW, horns horizontal
			0.77(m)	0.46(m)		
X13	Indeterminate	Carpal	0.70	0.28	99.86	NE/SW; horizontal.
X14	Indeterminate	Vertebra	0.65	0.63	99.82	N/S, dipping north.
X15	Bird (large)	Distal ulna; part of 16	0.54	0.39	99.85	N/S; almost horizontal
X16	Bird (large)	Ulna; part of 15	0.58	0.52	99.82	N/S, dipping slightly north
X17	Indeterminate	Rib	0.69	0.64	99.86	NW/SE; dipping west
X18	Indeterminate	Carpal?	0.83	0.55	99.81	NE/SW; horizontal
X19	*Sivatherium*	Radius; joins 25 and 27	0.45(N)	1.01(N)	99.86	N/S; horizontal
			0.40(S)	0.62(S)		
X20	Bovid	Right tibia	0.26(N)	0.89(N)	99.84	N/S; horizontal
			0.23(S) 0.61(S)			
X21	Bovid	Ulna; goes with 28, 29	0.27	0.96	99.81	N/S; horizontal
X22	Indeterminate	Vertebra	0.73	0.57	99.83	NE/SW; horizontal
X23	Indeterminate	Carpal? Tarsal?	0.20	1.22	99.85	
X24	Indeterminate	Scapula?	0.75	1.0	99.85	NE/SW; almost horizontal
X25	*Sivatherium*	Proximal radius	0.50	1.10	99.87	NE/SW; horizontal
X26	Indeterminate	Epiphysis	0.48	1.20	99.83	Horizontal
X27	*Sivatherium*	Ulna; belongs with 19,25	0.40	1.18	99.85	NE/SW; horizontal
X28	Bovid	Right humerus; goes with 29	0.27	1.17	99.83	N/S; proximal end dips north
X29	Bovid	radius-ulna; goes with 28	0.23	1.09	99.86	Distal end dips steeply to NE
X30	Bovid	Left humerus; goes with 28	0.20	1.23	99.81	NW/SE: dips slightly towards NW
X31	Indeterminate	Rib fragment	0.66	0.43	99.83	
X32	Indeterminate	Rib fragment	0.28	0.66	99.82	N/S; horizontal.
X33	Indeterminate	Rib fragment	0.35	0.93	99.80	N/S; horizontal
X34	Bovid	2nd phalange, complete	0.34	0.77	99.81	E/W; horizontal
X35	Indeterminate	Rib; ?part of 3	0.59	1.03	99.83	NE/SW; horizontal
X36	Bovid	Astragalus, left, complete	0.62	0.48	99.85	NE/SW; horizontal
X37	Indeterminate	Tibia, left	0.69	0.54	99.83	N/S; horizontal
X38	*Canis cautleyi*	Humerus, left	0.42	0.90	99.80	NW/SE; horizontal,
X39	Bovid	Metacarpal	0.54	0.92	99.81	N/S; horizontal
X40	Indeterminate	Rib	0.44	1.0	99.79	E/W; horizontal
X41	*Canis cautleyi*	Ulna	0.45	0.97	99.78	E/W; horizontal
X42	Indeterminate	Fragment	0.42	0.99	99.77	N/S; horizontal
X43	*Rhinoceros*	Carpal	0.47	0.93	99.82	Horizontal
X44	Indeterminate	Sesamoid; goes with 43	0.49	0.90	99.81	
X45	Indeterminate	Vertebra	0.53	0.84	99.78	
X46	Bovid/Tragulid	Maxilla; goes with 12	0.79	0.64	99.85	NW/SE, slight dip to NW
X47	Bovid	1st phalange, complete	0.69	0.81	99.80	N/S; horizontal
X48	Indeterminate	carpal	0.56	0.86	99.79	N/S, horizontal.
X49	Bovid	2nd phalange, complete	0.44	0.78	99.8	NE/SW, horizontal
X50	Indeterminate	rib	0.63	0.62	99.81	NW/SE, horizontal

X51	Indeterminate	Vertebra	0.64	0.71	99.82	E/W, dipping 30° east
X52	Bovid	1st phalange, complete	0.61	0.73	99.83	NE/SW; horizontal
X53	Bovid	Metatarsal, right	0.60	0.82	99.81	NE/SW: horizontal
X54	Indeterminate	Rib	0.47	0.72	99.77	NE/SW; horizontal
X55	*Canis cautleyi*	Radius, left, complete	0.49	0.85	99.76	NW/SE; horizontal
X56	*Canis cautleyi*	Tibia, right proximal	0.41	0.90	99.78	N/S; horizontal
X57	Indeterminate	Rib	0.38	0.94	99.80	
X58	Indeterminate	Rib	0.37	0.95	99.80	E.W; horizontal.
X59	Indeterminate	Fragment	0.41	0.76	99.80	E/W; horizontal
X60	Indeterminate	Rib	0.72	0.91	99.82	NE/SW; horizontal.
X61	Indeterminate	Rib	0.79	0.65	99.83	NW/SE; horizontal
X62	Proboscidean	Calcaneum	0.66	1.0	99.84	NW/SE; horizontal
X63	Indeterminate	Rib	0.45	0.51	99.79	E/W; horizontal.
X64	Indeterminate	Rib	0.57	0.71	99.79	NW/SE; horizontal
X65	Indeterminate	Rib	0.67	0.73	99.80	NW/SE, horizontal
X66	Bird (Large)	Carpometacarpus; goes with 16	0.82	0.82	99.78	N/S; horizontal
X67	Indeterminate	Rib	0.75	0.80	99.77	NE/SW, horizontal
X68	Indeterminate	Rib	0.62	0.77	99.76	E/W; horizontal
X69	Indeterminate	Rib	0.66	0.91	99.77	N/S; slight dip to north
X70	Indeterminate	Rib	0.57	0.87	99.78	E/W; horizontal
X71	Indeterminate	Tooth fragment	0.54	0.80	99.75	horizontal
X72	Indeterminate	Rib	0.51	0.75	99.79	NW/SE; slight dip to NW
X73	Indeterminate	Rib	0.48	0.79	99.80	NW/SE; slight dipp to NW
X74	Indeterminate	Rib	0.43	0.83	99.78	E/W; horizontal
X75	*Canis cautleyi*	Os penis; L = 9 cm	0.33	0.84	99.80	NW/SE; horizontal
X76	Indeterminate	Vertebra	0.29	0.95	99.84	Horizontal
X77	Indeterminate	?pelvis	0.26	0.91	99.84	Horizontal
X78	Indeterminate	Rib	0.23	0.97	99.83	Horizontal
X79	Indeterminate	Vertebra	0.25	1.0	99.81	Horizontal
X80	Indeterminate	Fragment	0.50	0.85	99.75	Horizontal
X81	Indeterminate	Skull fragment	0.71	0.80	99.77	Horizontal
X82	Indeterminate	Fragment	0.60	0.79	99.74	Horizontal
X83	Carnivore	Phalange	0.57	0.86	99.72	NE/SW; horizontal
X84	Indeterminate	?vertebra	0.55	0.86	99.77	Horizontal
X85	Indeterminate	Rib	0.54	0.86	99.80	Horizontal
X86	Indeterminate	Rib	0.50	0.84	99.81	Horizontal
X87	Indeterminate	Fragment	0.49	0.88	99.80	
X88	Carnivore	Canine	0.45	0.89	99.81	NE/SW; horizontal
X89	Indeterminate	Rib	0.46	0.94	99.82	Horizontal
X90	Indeterminate	Rib	0.61	0.93	99.80	Horizontal
X91	Indeterminate	Fragment	0.59	0.96	99.80	Horizontal
X92	Carnivore	?atlas	0.54	0.94	99.80	NE/SW; slight dip to SW
X93	*Canis cautleyi*	Metatarsals I – IV; opp. foot to 158	0.50	0.99	99.81	NW/SE; horizontal
X94	*Rhinoceros*	Tooth fragment	0.37	0.88	99.81	
X95	Indeterminate	Rib	0.40	0.90	99.81	N/S; horizontal
X96	Indeterminate	Rib	0.35	0.95	99.81	NW/SE, horizontal.
X97	Indeterminate	Rib	0.35	1.0	99.81	NW/SE, horizontal
X98	Indeterminate	Fragment	0.35	1.01	99.82	Horizontal
X99	Indeterminate	Fragments	0.33	1.0	99.82	Horizontal
X100	*Canis cautley*	Astragalus, right	0.42	0.98	99.80	N/S; horizontal
X101	Indeterminate	Rib	0.45	0.97	99.80	NE/SW; horizontal
X102	Indeterminate	Rib	0.46	0.90	99.80	NW/SE; horizontal
X103	Indeterminate	Fragment	0.45	0.94	99.80	Horizontal
X104	*Canis cautleyi*	Canine	0.59	0.96	99.80	Horizontal
X105	*Canis cautleyi*	Calcaneum + 3 carpals /tarsals	0.41	0.92	99.80	Horizontal
X106	Bovid	1st phalange, complete	0.50	1.29	99.75	NE/SW, slight dip to NE
X107	Bovid	1st phalange, proximal fragment	0.60	1.23	99.75	Horizontal
X108	Bovid	2nd phalange, complete	0.50	1.34	99.74	NW/SE, slight dip to NW
X109	Bovid	Proximal radius-ulna	0.68	1.10	99.75	NW/SE; horizontal
X110	*Sivatherium*	1st phalange	0.70	1.20	99.77	E/W; horizontal
X111	Indeterminate	Carpal/tarsal	0.60	1.19	99.75	Horizontal

X112	Indeterminate	Sesamoid	0.68	1.02	99.73	Horizontal
X113	Indeterminate	Fragment	0.80	1.17	99.76	Horizontal
X114	Indeterminate	Lumbar vertebra	0.81	1.10	99.77	Dipping slightly to east
X115	Indeterminate	Rib	0.66	1.16	99.71	NW/SE; horizontal
X116	Bovid	Navicular cuboid	0.80	1.02	99.75	Horizontal
X117		Carpal/tarsal	0.66	1.10	99.74	Horizontal
X118		Fragment	0.86	1.12	99.75	Horizontal
X119	*Canis cautleyi*	Mandible ramus, right; goes with 124	0.82	1.16	99.74	NW/SE; horizontal
X120	Indeterminate	Fragment	0.62	1.13	99.76	
X121	Indeterminate	Fragment	0.66	1.09	99.76	
X122	Indeterminate	?carpal/tarsal	0.60	1.23	99.75	Horizontal
X123	Indeterminate	Rib	0.63	1.22	99.75	
X124	*Canis cautleyi*	Mandible, right	0.68	1.07	99.76	E/W; horizontal
X125	*Canis cautleyi*	Tibia,left; opp. leg to 56	0.67	1.05	99.76	E/W; horizontal
X126	*Canis cautleyi*	?incisor, upper	0.71	1.09	99.75	NE/SW; horizontal
X127	Bovid	Metacarpal, right prox.	0.59	1.05	99.79	N/S; horizontal
X128	Indeterminate	Fragment	0.58	1.15	99.79	
X129	*Canis cautleyi*	Jaw fragment plus ribs	0.60	1.05	99.74	
X130	Indeterminate	Phalange	0.48	1.03	99.72	E/W; horizontal
X131	Indeterminate	?carpal/tarsal	0.55	1.19	99.75	Horizontal
X132	Indeterminate	Rib	0.55	1.27	99.76	Horizontal
X133	Indeterminate	Rib	0.46	1.03	99.73	Horizontal
X134	Bovid	Distal femur, unfused epiphysis	0.20	1.37	99.78	Horizontal
X135	Indeterminate	Fragment	0.30	1.20	99.80	slight dip to north
X136	*Sivatherium*	Humerus, right; goes with 19,25,27	0.49	1.22	99.85	Horizontal
X137	Indeterminate	Fragments	0.36	1.22	99.83	Horizontal
X138	Indeterminate	Fragment	0.20	1.39	99.72	Slopewash
X139	Indeterminate	Fragment	0.12	1.20	99.76	horizontal, ? slopewash
X140	Indeterminate	Fragment	0.23	1.20	99.83	Horizontal
X141	Indeterminate	Fragment	0.16	1.19	99.77	Horizontal
X142	Indeterminate	Fragment	0.15	1.09	99.78	
X143	Bovid	Tibia, right	0.47	1.33	99.77	NW/SE; horizontal
X144	Indeterminate	calcaneum, proximal fragment	0.42	1.30	99.75	NE/SW, slight dip to NE
X145	Indeterminate	?carpal/tarsal	0.58	1.33	99.72	Horizontal
X146	Indeterminate	Fragments	0.53	1.35	99.73	Horizontal
X147	Indeterminate	?carpal/tarsal	0.58	1.30	99.80	Horizontal
X148	Indeterminate	?sesamoid	0.53	1.12	99.82	Horizontal
X149	Indeterminate	2 ?sesamoids	0.52	1.15	99.81	Horizontal
X150	Indeterminate	?carpal/tarsal	0.64	1.32	99.79	Horizontal
X151	Indeterminate	ibs	0.49	1.08	99.80	Horizontal
X152	Indeterminate	?carpal/tarsal	0.45	1.12	99.80	
X153	Bovid	Astragalus, right side	0.44	1.23	99.78	E/W; horizontal
X154	Indeterminate	Rib	0.43	1.25	99.76	NW/SE; horizontal.
X155	Indeterminate	Fragment	0.48	1.12	99.80	NE/SW; horizontal
X156	Indeterminate	?sesamoid	0.48	1.06	99.80	
X157	Indeterminate	Fragment	0.42	1.04	99.81	N/S; horizontal
X158	*Canis cautleyi*	Foot bone group	0.42	1.04	99.81	
X159	Indeterminate	?rib	0.40	1.03	99.72	Vertical
X160	Indeterminate	?carpal/tarsal	0.42	1.09	99.72	Horizontal
X161	Indeterminate	Ribs	0.38	1.00	99.74	Horizontal
X162	Indeterminate	?rib	0.32	1.04	99.75	E/W; horizontal
X163	Indeterminate	Ribs	0.38	1.08	99.75	
X164	Indeterminate	Pelvis	0.38	1.07	99.81	N/S; horizontal
X165	Bovid	3rd phalange	0.40	1.18	99.80	NE/SW
X166	Bovid	Calcaneum; right, fragment	0.43	1.23	99.80	Horizontal
X167	Indeterminate	Fragments	0.33	1.30	99.82	E/W; horizontal
X168	Indeterminate	Rib	0.42	1.33	99.77	NE/SW; slight dip to NE
X169	Indeterminate	Fragment	0.35	1.23	99.84	
X170	Bovid	Metatarsal, right, prox.	0.32	1.17	99.84	E/W; horizontal
X171	Indeterminate	Rib	0.32	1.14	99.82	NW/SE; horizontal
X172	Indeterminate	Rib	0.39	1.20	99.81	N/S, horizontal

X173	Indeterminate	Rib	0.44	1.18	99.80	NE/SW, horizontal
X174	Indeterminate	Rib	0.40	1.18	99.82	NE/SW; horizontal
X175	Carnivore	Phalange fragment	0.32	1.0	99.78	
X176	Indeterminate	Fragment	0.16	1.08	99.86	Horizontal
X177	Indeterminate	?vertebra	0.27	1.04	99.88	
X178	Indeterminate	Fragment	0.33	1.07	99.85	
X179	Indeterminate	Rib	0.31	1.01	99.86	E/W; horizontal

Notes:

X5: t=top,b=bottom, NW/SE. Suid left acetabulum/ischium/ilium fragment
X16 : Length = c. 26 cm.
X19 : *Sivatherium*.radius; goes with (X25) and ulna (X27). Length = 59 cm; Dist.radius breadth = 12.5 cm
X20 : Bovid, Right, almost complete. Distal breadth = 28 mm
X21 :Bovid ulna, lying with humerus, Joins with X28 and X29.
X28 :Bovid, right side, articulates with X29; distal breadth = 95 mm
X29 :Bovid, almost complete, articulates with X28. Length radius = 33 cm, Dist.radius breadth = 88 mm.
X30 :Bovid, Left side shaft fragment ?opposite leg to X28.
X38 :Canis, Left side, almost complete, Distal breadth = 43 mm
X39 : Bovid, Dist. breadth = 76 mm
X41 :*Canis*, Left Prox. fragment, articulates with X55?.
X46 :Belongs with X12, ? gazelle, left side, permanent dentition, worn.
X53 :Bovid, right side, Distal breadth = 68 mm.
X55 :*Cani*s, left side, Complete, Length = 21.8 cm, Prox. breadth = 24 mm, Dist. breadth = 31 mm
X56 : *Canis*, Right proximal. Opposite leg to X125.
X62 : Proboscidean, one deep carnivore puncture mark and at least three shallower ones. Length = 17.5 cm.
X66 : Bird bone, may belong to same bird as spec.no.X16?, eagle size/type??
X83 : Carnivore phalanx, Length = 19 mm.
X100 : *Canis*, right side, Length = 40 mm.
X105 : Length calcaneum = 63 mm
X110 : *Sivatherium*; Length = 12.5 cm, Prox. breadth = 56 mm.; Distal breadth = 54 mm
X124 *: Canis*: X119 probably belongs with this; right side, adult dentition: Incisors 1-3, canine and premolars 1-3, all = worn.
X125 : Canis, left side, complete, opposite leg to X56, Length = 23.5 cm.
X127 : Bovid, right side, Prox. breadth = 67 mm
X129 : Group of bones: cluster of ?ribs plus *Canis* jaw fragment (joins with X124), and one carpal/tarsal.
X143 : Bovid, right side, Distal breadth = 70 mm
X158 : Group of bones taken out as one, ?*Canis* foot, i.e. metapodials, carpals/tarsals etc, opposite foot is ? X93
X165 : Articular surface dipping to SW,. ? Bovid, almost complete.
X170 : Bovid, right side, Prox. breadth = 56 mm.