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Hyenas and Hunters: Zooarchaeological Investigations at Prolom II Cave, Crimea

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ABSTRACT Prolom II, a stratified archaeological cave deposit in the eastern Crimean Peninsula, Ukraine, dates back to approximately 135000–60000 years ago. Stone tool industries from four human occupation levels are characteristic of the Middle Palaeolithic, typically associated with Neanderthals. In addition to the stone tool artifactual material, there is abundant faunal material, including saiga antelope, horse, bison, hyena and bear. This zooarchaeological investigation examined approximately 3500 specimens of animal bones to discern between natural and cultural modifications, and to elucidate human patterns of exploitation of faunal resources in prehistoric subsistence.

The high proportion of carnivores, particularly hyena, in the fauna suggest that much of the faunal material is present as a result of non-human agents. Morphological characteristics, such as gnawing marks and punctures, were abundant on most herbivore skeletal elements. Bone destruction patterns were consistent with carnivore and scavenger behaviour, as documented in modern comparative studies. Stone tool cut marks were identifiable under microscopic examination on only six specimens of saiga antelope.

The preliminary conclusion is that the site was occupied alternately by carnivores, primarily hyenas and, occasionally, humans. These occupations were probably short-term stays. The deep stratigraphic deposits represent accumulations over long periods of time. We cannot assign more than a few of the faunal specimens to human hunting or modification, despite the large number of stone tools present at the site. The densest and highest frequencies of stone tools occurred in the same levels as the greatest frequencies of hyena bones, which are very unlikely to represent human prey. The human contribution to the faunal assemblage appears to be minimal. The entire collection of bones cannot be used to characterize human subsistence. This is consistent with a growing literature that reassesses the role of humans in the accumulation of animal bones in a variety of archaeological and palaeontological sites. Copyright © 2000 John Wiley & Sons, Ltd.

Key words: Crimea; zooarchaeology; Middle Palaeolithic

Introduction

There is considerable ongoing debate about Middle Palaeolithic subsistence, concerning hunting versus scavenging by humans during that period, and the relative contribution of humans versus other species or geological processes in the accumulation of faunal assemblages in archaeological sites (Binford, 1982, 1984; Chase, 1986, 1988, 1989; Gamble, 1986; Trinkaus, 1987; Farizy & David, 1992; Stiner & Kuhn, 1992; Kuhn, 1993, 1995, 1998; Patou-Mathis, 1993; Stiner, 1993, 1994, 1998; Marean & Kim, 1998; Shea, 1998). Traditionally, the entire contents of sites containing stone tool industries have been attributed exclusively to the actions of humans as the predominant hunters responsible for killing and transporting prey to such sites (e.g. Hoffecker *et al.*, 1991; Baryshnikov & Hoffecker, 1994; Baryshnikov *et al.*, 1996). Over the last couple of decades, a

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growing appreciation of taphonorny, and of the wide diversity of agents contributing to site formation, has led to reconsideration of interpretations of Mousterian hunting patterns (e.g. Costamagno, 1999). The case presented here is such a reassessment of a Middle Palaeolithic archaeological site that has been interpreted as evidence for intensive, and perhaps specialized, hunting by Neanderthals.

Prolom II

Prolom II is a collapsed cave located on the left bank of the Kuchuk-Karasu River in the eastern foothills of the Crimean mountains (Figure 1). It was discovered by Kolosov and excavated by him, beginning in 1977. It was reported by Stepanchuk in 1993, with special attention to non-utilitarian bone artifacts. The geological stratigraphy consists of eight horizons, and includes four cultural layers, each of which includes abundant faunal material and lithic artifacts. Level 1 had a small lithic assemblage, with 48 tools, but a larger faunal assemblage (number of identified specimens (NISP) = 2735). Level 2 had a much larger archaeological assemblage, including 237 tools, and had the largest faunal assemblage, with NISP = 3268. Level 3 also had an important lithic component, with 302 tools, but a much smaller faunal assemblage (NISP = 172). Level 4 was also rich in tools, having 283, and poor in fauna (NISP = 45). For the purposes of these analyses, Levels 1 and 2 are most important because of their much larger faunal assemblages.

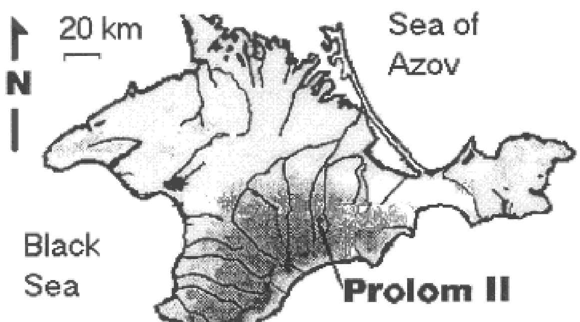

Figure 1. Location of the archaeological site of Prolom II on the Crimean Peninsula, Ukraine.

The second cultural layer is, perhaps, the most interesting, including a hearth and a dense bone concentration against the back wall of the cave. This layer had, by far, the largest faunal assemblage, dominated by saiga and horse. It is the best represented in both lithic and faunal materials combined, and has been considered to be the best evidence of an intense human occupation of the cave.

Dating is difficult for this site. Kolosov estimates that the stone tool industries in Prolom II represent an early position in typological and technological trends in the Ak-Kaya of the Crimea (Kolosov, 1986; Stepanchuk, 1993). The faunal composition and dental measurements on carnivores and horses are consistent with the first half of the Würm glacial period, occurring approximately 135 000–60 000 years ago (Eisenmann & Baryshnikov, 1995, p. 331).

Stone tool industries from four human occupation levels are characteristic of the Middle Palaeolithic, typically associated with Neanderthals. Chabai (1998, p. 11) characterizes the lithic assemblages for Prolorn II as belonging to the Ak-Kaya industry, dominated by scrapers, with some bifacial tools and few points. Stepanchuk (1993) regards this as a variant of the Eastern European Micoquian.

Table 1. Mammalian species reported in Stepanchuk (1993, p. 22) for all levels of Prolom II

Species	NISP	MNI
Mammutus primigenius	126	32
Bison priscus	176	14
Ovis/Capra	1	1
Saiga tatarica	3327	89
Megaceros giganteus	20	3
Cerms elaphus	32	8
Sus scrofa	10	4
Rhinoceros antiquitatis	85	10
Equus latipes	725	27
Equus hydruntinus	172	35
Canis lupus	119	15
Vulpes vulpes	154	9
Vulpes corsac	535	26
Vulpes lagopus	42	8
Crocuta spelaea	391	27
Panthera spelaea	1	1
Ursus spelaeus	196	25
Lepus sp.	4	3
Total	6118	337

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Table 2. Comparison of faunal species examined in this 1997 zooarchaeological study with those published in Stepanchuk (1993)

Species	1997		1997/1993		1993	
	NISP	MNI	NISP%	MNI%	NISP	MNI
Saiga tatarica	2190	49	66	55	3327	89
Equus sp.	397	21	44	34	897	62
Rangifier tarandus	89	4	–	–	–	–
Bison priscus	78	7	44	50	176	14
Alopex lagopus	411	12	979	150	42	8
Vulpes sp.	95	7	13	20	731	35
Crocuta spelaea	178	17	46	63	391	27
Canis lupus	39	2	33	13	119	15
Total	3477	119	61	47	5683	250

Table 3. *Saiga tatarica*

Element	NISP	MNE Left	MNE Right	MNE Side?	MNI
Cranium	28	7	6	9	7
Maxilla	319	42	39	–	42
Mandible	477	31	25	–	31
Vertebrae	55	–	–	9	9
Os coxae	39	14	15	–	15
Sacrum	3	–	–	3	3
Ribs	11	–	–	5	5
Scapula	13	7	5	–	7
Humerus	33	10	11	1	10
Radiocubitus	112	22	24	–	24
Carpals	156	20	28	–	28
Metacarpal	138	33	49	–	**49**
Femur	22	5	11	–	11
Patella	4	3	1	–	3
Tibia	33	13	13	–	13
Lateral malleolus	9	4	5	–	5
Astragalus	82	40	41	–	41
Calcaneum	83	34	21	–	34
Naviculocuboid	36	20	16	–	20
Cuneiform	18	13	4	–	13
Sesamoid	13	–	–	8	8
Metatarsal	62	14	23	–	23
Metapodial	26	0	6	–	3
Phalanx I	285	136	117	–	17
Phalanx II	114	52	57	–	8
Phalanx III	81	36	36	–	4

NISP = 2190; MNI = 49.
Bold print indicates element giving highest MNI count.

The zooarchaeological question

As previously noted, the propensity to attribute everything in a site with stone tools present to human action has been applied to Prolom II. Stepanchuk (1993) extends the interpretation of a few pieces of clearly worked bone to infer that many instances of modification or damage to bones are the result of intentional human production of tools. He attributed the bone concentration in the second cultural layer to a ritual purpose, as 'a simple utilitarian explanation cannot be found' (Stepanchuk, 1993, p. 21). Finally, he connects the engraved bone to the bone concentration, noting that 'the impression of a certain specific complex (may hold the) key to the solution of certain important aspects of the spiritual life of Neanderthal Man' (Stepanchuk, 1993, p. 37). Barychnikov *et al.* (1994) attribute bone fragmentation patterns in association with

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stone tool industries as evidence for intensive hunting of saiga in the Crimean Palaeolithic, noting scraping and cut marks, in particular, in remains from Prolom II. They do concede that hyenas also occupied the site; numbers of hyena milk teeth attest to the presence of a den. They also suggest that several distinctive breakage patterns attributed to human disarticulation and modification may actually be a result of carnivore action.

The ambiguity as to the agents responsible for the presence or modification of skeletal elements set the stage for a reanalysis of the faunal material from Prolom II. Following palaeontological identification of the majority of species by Baryshnikov at the Institute of Zoology at St. Petersburg, largely published in Stepanchuk (1993), in 1997, David and Enloe performed the detailed zooarchaeological analysis of the medium to large mammalian species to assess the relative potential contribution of humans to this assemblage.

Fauna present

The large faunal assemblage of over 6000 specimens includes amphibian, avian and mammalian bones recovered from the three excavation seasons, in 1981, 1982 and 1985, at Prolom II. Sixteen species of birds were identified by Baryshnikov & Potapova (1992), among a total of 33 specimens, and interpreted for their palaeoclimatological significance. The upper strata remains were principally forest dwellers, while the lower strata remains represented open prairie habitats. Nine species of microfauna were present, primarily indicating a cold steppic environment. Baryshnikov (1986, 1987) interpreted the mammalian remains as suggesting 'the predominance of open steppe-like landscapes with patches of woodland in the river valleys' (Stepanchuk, 1993, p. 21).

The large and medium size faunal remains are the object of this analysis as potential prey or scavenging targets for humans or other

Table 4. *Equus* sp.

Element	NISP	MNE Left	MNE Right	MNE Side?	MNI
Cranium	4	1	3	–	3
Maxilla	173	18	21	–	**21**
Mandible	130	21	16	–	16
Vertebrae	1	–	–	1	1
Os coxae	3	1	2	–	2
Sacrum	0	–	–	–	0
Ribs	0	–	–	–	0
Scapula	2	1	1	–	1
Humerus	1	0	1	–	1
Radiocubitus	7	3	4	–	4
Carpals	2	2	0	–	2
Metacarpal	12	7	2	–	7
Femur	0	0	0	–	0
Patella	0	0	0	–	0
Tibia	17	6	7	–	7
Lateral malleolus	0	0	0	–	0
Astragalus	13	6	7	–	7
Calcaneum	1	1	0	–	1
Naviculocuboid	0	0	0	–	0
Cuneiform	0	0	0	–	0
Sesamoid	2	0	0	2	1
Metatarsal	22	9	9	–	9
Metapodial	1	–	–	1	–
Phalanx I	3	1	1	–	1
Phalanx II	1	1	0	–	1
Phalanx III	2	0	1	1	1

NISP = 397; MNI = 21.
Bold print indicates element giving highest MNI count.

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Table 5. *Rangifer tarandus*

Element	NISP	MNE Left	MNE Right	MNE Side?	MNI
Cranium	8	–	–	1	1
Maxilla	11	3	4	–	**4**
Mandible	21	2	2	–	1
Vertebrae	3	–	–	1	2
Os coxae	0	0	0	–	0
Sacrum	0	–	–	–	0
Ribs	0	–	–	–	0
Scapula	0	0	0	–	0
Humerus	1	0	1	–	1
Radiocubitus	5	2	1	–	2
Carpals	1	0	1	–	0
Metacarpal	3	1	1	–	1
Femur	3	1	1	–	1
Patella	0	0	0	1	0
Tibia	4	2	2	–	2
Lateral malleolus	0	0	0	–	0
Astragalus	2	0	2	–	2
Calcaneum	1	0	1	–	1
Naviculocuboid	0	0	0	–	0
Cunciform	0	0	0	–	0
Sesamoid	3	0	0	1	1
Metatarsal	10	1	0	2	2
Metapodial	4	1	–	1	–
Phalanx I	1	1	0	–	1
Phalanx II	2	1	1	–	1
Phalanx III	6	3	3	–	1

NISP = 89; MNI = 4.
Bold print indicates element giving highest MNI count.

carnivores. The assemblage has been somewhat dispersed among a number of analysts and institutions. Table 1 presents the mammalian fauna summarized by Stepanchuk (1993, p. 22). A total of 6118 identified specimens are distributed among 337 individuals. Those figures are used for the following discussion of taxonomic frequency.

Not all of this assemblage was available for study. A summary of the actual material examined in 1997 for zooarchaeological purposes is presented in Table 2. Skeletal element counts for the species we examined in 1997 are presented in Tables 3–10. We were able to examine 3477 specimens, 57% of the medium to large mammalian assemblage reported in Stepanchuk (1993, p. 22). This included four species of herbivores (saiga, horse, reindeer and bison) and four species of carnivores (foxes, hyena and wolf). A comparison of Stepanchuk's (1993) publication with our analysis of those eight species (Table 2) reveals a basic proportional similarity, with a few notable exceptions. Those species make up 93% of the total assemblage reported in 1993, with an average of 22.73 identified specimens for each of the 250 minimum number of individuals. Our 1997 examination included 3477 identified specimens, 61% of those reported for the eight major species. There is an average of 29.22 specimens for each of the 119 minimum number of individuals; the latter figure is 47% of the number of individuals reported in 1993. While the aggregation problem (Grayson, 1984) of appending various vertical stratigraphic and horizontal collection units assigned by the excavators during the various excavation campaigns often presents a danger that summary minimum number of individuals (MNIs) may be slightly overestimated, the smaller percentage of MNI compared with NISP for our 1997 analysis versus the 1993 table (47% versus 61%) argues against inflation of the number of individuals. Among the eight species, the proportions of the number of identified specimens and of the number of individuals in the assemblage are roughly

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similar, 39% and 41% for six of the species. The most notable exception is the complete absence of reindeer reported in Stepanchuk (1993), an oversight that remains unexplained. The other exception involves the proportions of the various species of fox. We followed Baryshnikov's (1986) classification of the *Alopex* and *Vulpes* specimens in the assemblage made available to us. This consisted of 65% of the originally reported fox specimens and 44% of the originally reported individuals, almost identical to the overall proportions in the sample and total assemblages. Stepanchuk (1993) reports that faunal analyses were 'carried out by E.I. Danilova (materials from excavations of 1981) and G.F. Barishnikov (materials of 1982 and 1985), part in the field and part in the laboratory' (p. 21); the discrepancy may be a result of differences in the availability of comparative skeletal material and in the opinions of the different analysts. We consider that these differences have no significant impact on our zooarchaeological analysis and interpretations.

Saiga antelope is by far the most numerous species in these deposits. Over 3300 specimens were identified, the vast majority from the first and second cultural levels. We examined 2190 specimens (Table 3), representing at least 49 individuals from right metacarpals. Horse is the second most frequent species. Eisenmann (Eisenmann & Baryshnikov, 1995) had identified *Equus taubachensis* and *Equus hydruntinus* among over 900 specimens of horse. We examined 397 specimens (Table 4), representing at least 21 individuals from right maxillary teeth. Reindeer was the third most frequent herbivorous species in our 1997 examination. We examined 89 specimens (Table 5), representing at least four individuals from right maxillary teeth. Bison is the fourth most frequent herbivorous species in Stepanchuk (1993), represented by 176 specimens. We examined 89 specimens (Table 6), representing at least seven individuals from left mandibular teeth. There are a few good specimens of *Megaloceros*, including lower and upper dentition. Rhinoceros is represented by 85

Table 6. *Bison priscus*

Element	NISP	MNE Left	MNE Right	MNE Side?	MNI
Cranium	3	1	0	–	1
Maxilla	6	3	1	–	3
Mandible	30	7	3	–	**7**
Vertebrae	1	–	–	1	1
Os coxae	0	0	0	–	0
Sacrum	1	–	–	–	1
Ribs	0	–	–	–	0
Scapula	0	0	0	–	0
Humerus	0	0	0	–	0
Radiocubitus	2	2	0	–	2
Carpals	0	0	0	–	0
Metacarpal	0	0	0	–	0
Femur	0	0	0	–	0
Patella	0	0	0	–	0
Tibia	4	2	0	–	2
Lateral malleolus	0	0	0	–	0
Astragalus	1	0	1	–	1
Calcaneum	1	0	1	–	1
Naviculocuboid	0	0	0	–	0
Cuneiform	0	0	0	–	0
Sesamoid	1	0	0	1	1
Metatarsal	1	0	0	1	1
Metapodial	0	–	–	–	–
Phalanx I	0	0	0	–	0
Phalanx II	1	0	1	–	1
Phalanx III	2	0	0	2	1

NISP = 78; MNI = 7.
Bold print indicates element giving highest MNI count.

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Table 7. *Alopex lagopus*

Element	NISP	MNE Left	MNE Right	MNE Side?	MNI
Cranium	2	1	1	–	1
Maxilla	9	4	3	1	4
Mandible	56	10	11	–	11
Vertebrae	31	–	–	6	6
Os coxae	4	2	2	–	2
Sacrum	1	–	–	1	1
Ribs	0	–	–	–	0
Scapula	13	6	7	–	7
Humerus	31	13	11	–	**13**
Radiocubitus	36	9	9	–	9
Carpals	4	1	0	1	1
Metacarpal	8	5	1	–	2
Femur	13	5	4	–	5
Patella	1	1	0	–	1
Tibia	22	12	6	–	12
Lateral malleolus	0	0	0	–	0
Astragalus	3	3	0	–	3
Calcaneum	7	7	0	–	7
Naviculocuboid	1	0	0	1	1
Cuneiform	1	1	0	–	1
Sesamoid	0	0	0	–	0
Metatarsal	19	5	6	–	2
Metapodial	12	–	–	6	–
Phalanx I	28	13	12	3	4
Phalanx II	8	4	3	1	1
Phalanx III	0	0	0	–	0

NISP = 411; MNI = 13.
Bold print indicates element giving highest MNI count.

specimens and mammoth by 126 specimens. Other herbivores include red deer, boar, and hare. Curiously, included in this essentially cold steppe assemblage is one tooth of *Gazella*, unreported in Stepanchuk (1993).

Carnivores are particularly well represented in this assemblage. Most numerous are several species of foxes. *Alopex lagopus* and *Vulpes corsac* are represented by over 800 specimens. We examined 411 specimens of *Alopex* (Table 7), representing at least 13 individuals from left humeri, and 95 specimens of *Vulpes* (Table 8), representing at least seven individuals from left maxillary teeth. Hyena is also present in all levels, but particularly so in Levels 1 and 2, with 391 specimens. We examined 178 specimens (Table 9), representing at least 17 individuals from left and right maxillary teeth. Wolf includes 119 specimens, including at least one pathological mandible. We examined 39 specimens (Table 10), representing at least two individuals from maxillary, mandibular and vertebral elements. Cave bear is present in all levels, represented by almost 200 specimens. Cave lion is represented by one specimen in the large Level 2 assemblage.

Carnivore activity

A variety of archaeological actualistic and experimental data has been used to examine the role of carnivore accumulation and modification in faunal assemblages. Klein (1980, p. 243) has discussed carnivore-to-ungulate ratios as a means of distinguishing palaeontological from archaeological assemblages. He illustrates the difference with data from South African sites, where the palaeontological site had 3.5 ungulate specimens for each carnivore specimen, contrasted to 11.2 and 9.5 from Middle Stone Age archaeological sites and 12.8, 6.7, 7.1, 9.5 and 6.7 from Late Stone Age archaeological sites. At Prolom II, herbivore-to-carnivore ratios for the large assemblages of Levels 1 and 2 are very similar to each other at 2.9:l and, clearly, even further outside the range of archaeological sites than was Klein's (1980) palaeontological

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sample. The relatively high proportion of carnivores, particularly hyena, in the fauna, suggests that at least a portion, and perhaps the largest portion, of the faunal material is present as a result of non-human agents.

Following seminal research by Binford (1981) and Brain (1981) and others in the early 1980's, characteristics of hyena derived faunal assemblages have recently been documented from purely palaeontological sites by such researchers as Fosse (1996, 1997), Villa & Bartram (1996) and Brugal *et al*. (1997). Hyena damage patterns include percussion notches, scoring and striations, crenulated diaphysis shafts and depressed fractures. Such phenomena are clearly illustrated in Binford (1981, p. 44–51) and Lyman (1994, p. 206–211). In particular, flaked bone patterns of apparently continuous retouch, as illustrated by Stepanchuk (1993, p. 32, figure 14) as bone tools at Prolorn II, have been noted in the hyena den of Bois Roche by Villa & Bartram (1996).

Such morphological characteristics were particularly abundant on most skeletal elements of the herbivorous species at Prolom II. The majority of such instances concern saiga, as this is the majority species, and was reputed to have been hunted. Spiral and sawtooth fractures, not diagnostic as to agent of modification, are present on saiga metapodials. Metapodials are gouged, gnawed and punctured (Figure 2). Depressed fractures are particularly indicative of carnivore activity, as can be clearly seen on a humerus (Figure 3) essentially identical to an illustration in Lyman (1994, p. 209). Tooth punctures are particularly frequent on various elements of the saiga skeleton, including distal humerus, proximal radius, carpals, astragalus, distal tibia, metapodial and axis vertebra. Paired punctures are particularly evident on the calcaneum. (Figure 4).

Stepanchuk (1993, pp. 31–33) took particular notice of abundant first and second saiga phalanges 'with presumably artificial holes' (p. 31).

Table 8. *Vulpes* sp.

Element	NISP	MNE Left	MNE Right	MNE Side?	MNI
Cranium	2	1	0	1	1
Maxilla	24	7	6	–	**7**
Mandible	22	4	4	–	4
Vertebrae	3	–	–	2	2
Os coxae	2	2	0	–	2
Sacrum	0	–	–	–	0
Ribs	0	–	–	–	0
Scapula	0	0	0	–	0
Humerus	2	0	2	–	2
Radiocubitus	1	0	1	–	1
Carpals	0	0	0	–	0
Metacarpal	4	2	1	–	2
Femur	1	0	1	–	1
Patella	0	0	0	–	0
Tibia	2	1	0	1	1
Lateral malleolus	0	0	0	–	0
Astragalus	1	1	0	–	1
Calcaneum	3	1	2	–	2
Naviculocuboid	0	1	0	–	1
Cuneiform	0	0	0	–	0
Sesamoid	0	0	0	–	0
Metatarsal	8	2	2	–	2
Metapodial	1	–	–	1	–
Phalanx I	13	7	5	1	2
Phalanx II	3	1	1	1	1
Phalanx III	2	1	0	1	1

NISP = 95; MNI = 7.
Bold print indicates element giving highest MNI count.

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Table 9. *Crocuta spelaea*

Element	NISP	MNE Left	MNE Right	MNE Side?	MNI
Cranium	27	–	–	–	1
Maxilla	69	17	17	1	**17**
Mandible	63	10	12	–	12
Vertebrae	6	–	–	6	6
Os coxae	1	1	0	–	1
Sacrum	0	–	–	–	0
Ribs	0	–	–	–	0
Scapula	1	1	0	–	1
Humerus	2	2	0	–	2
Radiocubitus	6	1	2	–	2
Carpals	3	1	1	–	1
Metacarpal	1	1	0	–	1
Femur	0	0	0	–	0
Patella	1	1	0	–	1
Tibia	2	0	2	–	2
Lateral malleolus	0	0	0	–	0
Astragalus	2	0	2	–	2
Calcaneum	–	0	0	–	0
Naviculocuboid	0	0	0	–	0
Cuneiform	0	0	0	–	0
Sesamoid	1	1	0	–	1
Metatarsal	3	0	2	–	2
Metapodial	5	–	–	2	–
Phalanx I	4	3	1	–	1
Phalanx II	2	1	1	–	1
Phalanx III	2	0	1	1	1

NISP = 178; MNI = 17.
Bold print indicates element giving highest MNI count.

These are also noted by Baryshnikov & Hoffecker (1994, p. 461) for Prolom II and for other Crimean sites. The presence of such punctures is not surprising, given the number of specimens from various skeletal elements just shown. Chase (1990) has adequately demonstrated the potential for creation of such features by carnivores. Lyman (1994, p. 211, figure 6.24) further documents and illustrates digestive corrosion on domestic ovid phalanges identical to that illustrated on saiga phalanges in Stepanchuk (1993, p. 34, figure 15).

Channeling of diaphyses is another typical carnivore modification, particularly evident on a reindeer femoral diaphysis, as are crenellated edges, and on a saiga proximal radius fragment. Chewing damage by carnivores was not limited to specimens from herbivores. It can be seen on a wolf cervical vertebra that has been chewed (Figure 5), and on calcanea from *Alopex* foxes with numerous punctures.

Perhaps the most pernicious damage to bone was the result of digestion by hyenas. This can be seen on a number of species and elements. We have already noted the abundant destruction and number of holes among the saiga phalanges. This phenomenon can be most vividly illustrated by a reindeer metapodial that has been very reduced (Figure 6); the result has often been referred to as a 'used bar of soap', with its edges and surfaces rounded and almost obliterated. Fragments of equid tibia can be compared in Figure 7; the upper one has softened and rounded corners and edges, having suffered greatly from gastric juices, while the lower one has not, retaining its sharp edges. The top row of saiga third molars in Figure 8 has been subjected to digestion, compared with the pristine molar below them. The proportion of saiga teeth exhibiting this digestive phenomenon was as large as that appearing to be pristine.

Bone destruction patterns were very consistent with carnivore and scavenger behaviour, as documented in modern comparative studies. This assemblage appears to have been greatly

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Table 10. *Canis lupus*

Element	NISP	MNE Left	MNE Right	MNE Side?	MNI
Cranium	1	0	1	–	1
Maxilla	5	2	0	–	**2**
Mandible	7	2	1	–	**2**
Vertebrae	3	–	–	2	**2**
Os coxae	0	0	0	–	0
Sacrum	1	–	–	1	1
Ribs	2	1	0	1	1
Scapula	1	1	0	–	1
Humerus	0	0	0	–	0
Radiocubitus	2	1	1	–	1
Carpals	2	1	0	–	1
Metacarpal	0	0	0	–	0
Femur	0	0	0	–	0
Patella	0	0	0	–	0
Tibia	1	0	1	–	1
Lateral malleolus	0	0	0	–	0
Astragalus	1	1	0	–	1
Calcaneum	0	0	0	–	0
Naviculocuboid	0	0	0	–	0
Cuneiform	0	0	0	–	0
Sesamoid	2	0	0	1	1
Metatarsal	0	0	0	–	0
Metapodial	1	–	–	1	–
Phalanx I	5	2	3	–	1
Phalanx II	3	2	1	–	1
Phalanx III	2	0	0	2	1

NISP = 39; MNI = 2.
Bold print indicates element giving highest MNI count.

ravaged, with many punctures and other tooth marks that are less suitable for illustration. The purportedly hunted saiga suffers greatly from damage and digestion. The number of teeth that show digestive damage suggest that many other bones were eaten and almost, if not completely, digested. This would have greatly modified the character of skeletal representation in this assemblage, implying an even greater importance of carnivore and scavenger action in accumulating and modifying the faunal material.

Cut marks

In assemblages that may be the result of both carnivore and human activity, in which skeletal element representation and breakage patterns are equivocal as to their origins, many researchers look very closely for the unambiguous evidence of the presence of stone tool cut marks on the bones. Stepanchuk (1993) noted a considerable amount of cuts, incisions and scratches (p. 33, table 3). We examined very closely all potential cutmarks under low and high magnification. The vast majority of these had rounded cross-sections, and were clearly tooth marks, rather than human modifications. Stone tool cut marks were present and identifiable under microscopic examination on only six specimens, all of which were saiga antelope.

These include cuts on proximal radii (Figures 9 and 10), proximal metacarpals, and the diaphysis of a radius. These are almost all consistent with disarticulation cut marks. The number

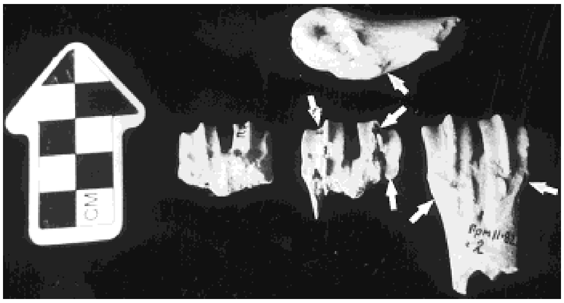

Figure 2. Gnawing, gouging and puncturing on saiga metapodials.

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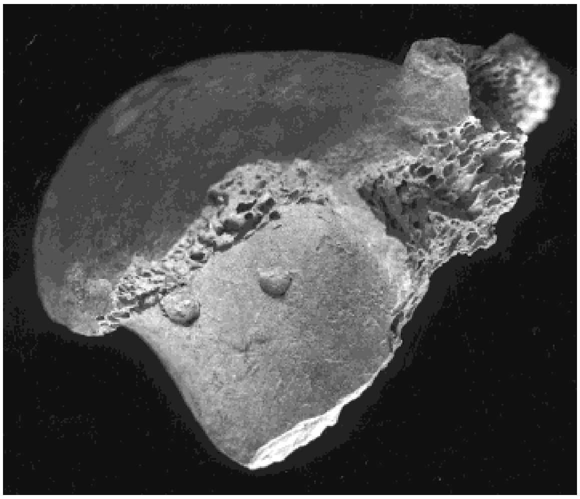

Figure 3. Depressed fractures from carnivore canine teeth on a saiga humerus.

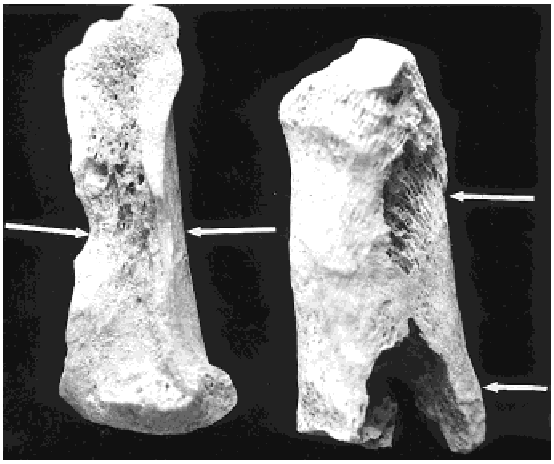

Figure 4. Opposite and paired carnivore tooth punctures on saiga calcanea.

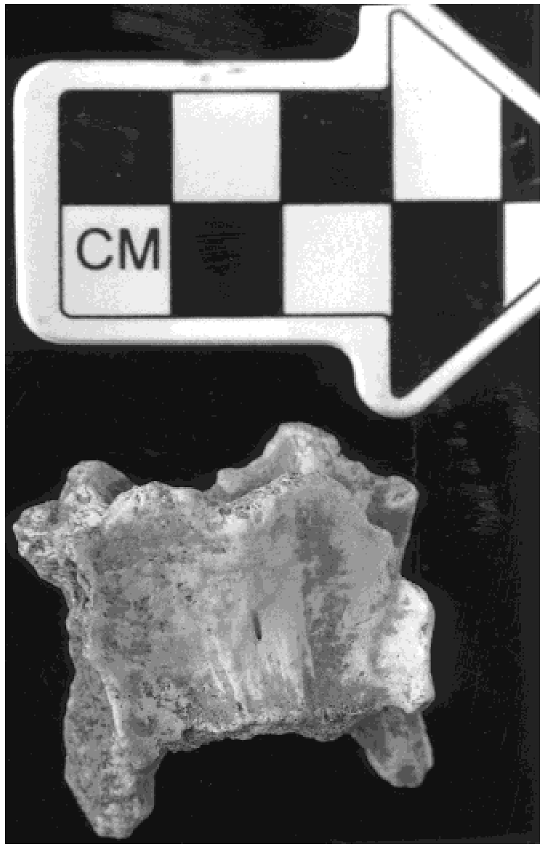

Figure 5. Carnivore chewing on a wolf cervical vertebra.

Figure 6. Digestive corrosion on a proximal fragment of reindeer metapodial.

of specimens bearing cutmarks, however, is tremendously low. We found only six such specimens out of over 1300 specimens examined, four tenths of a percent. This cannot really be used to support very strongly the interpretation that the predominance of saiga antelope in the deposits of Prolom II is a result of intensive or specialized hunting by Middle Palaeolithic humans.

Site function interpretations

Chabai *et al.* (1995) categorized lithic raw material and faunal assemblage patterning for Middle

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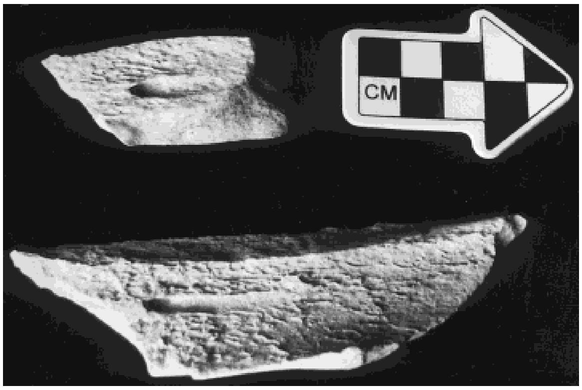

Figure 7. Comparison of horse tibia fragments, with digestive corrosion on the smaller upper specimen, and with none on the larger lower specimen.

Figure 8. Comparison of saiga mandibular third molars, with extensive digestive corrosion on the five upper specimens, and none on the lower specimen.

Palaeolithic sites of the entire Crimea, based on density and relationships among categories of artifacts, ranging from ephemeral stations and short-term stations to short-term camps and base camps. They include the four occupations at Prolom II as short-term stations, with high percentages of tools (30–40%) among low artifact densities (23–69/m^3), differentiated from ephemeral butchering stations by the presence of hearths at Prolom II. Chabai & Marks (1998, p.363) decline to reconstruct economic activities resulting from the extensive carnivorous activity. This is consistent with our analyses of the faunal assemblage.

Conclusions

Ecologically, regional conditions were favourable to both humans and hyenas. They were very likely competitors for shelter and food, a factor that was responsible for the presence of both throughout the deposits at Prolom II. How do we evaluate the anthropogenic contribution to the faunal assemblages from this site? We might look at how herbivore species were differently treated. A few individuals of very large fauna, such as mammoth or rhinoceros, are represented almost exclusively by teeth. There is considerable gnawing on other elements. These specimens, probably, must be attributed to scavenging by hyenas. Smaller medium to large fauna, the saiga antelope and equids, were probably exploited by both humans and hyenas. The paucity of clear indications of human intervention, and the extremely

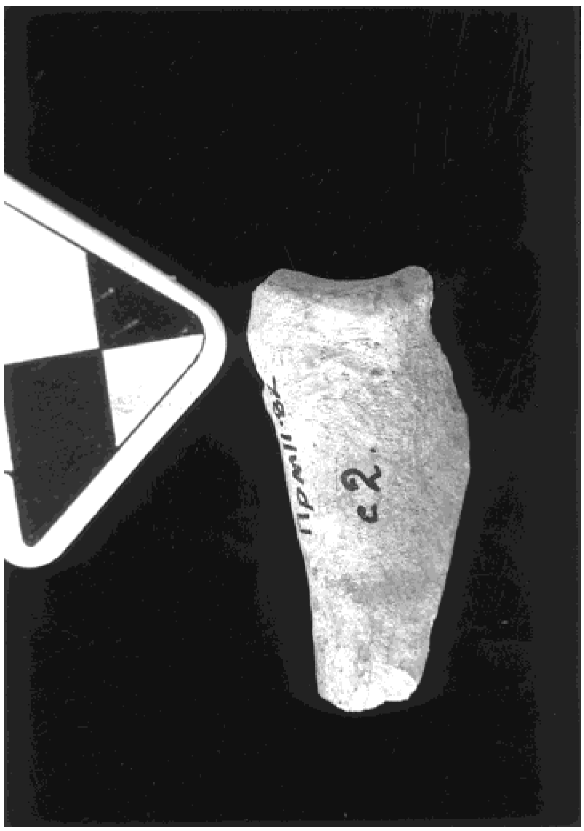

Figure 9. Fragment of a saiga radius exhibiting multiple horizontal cutmarks adjacent to the proximal articular surface. This suggests carcass disarticulation.

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Figure 10. Microscopic detail of the cutmarks on the saiga radius from Level 2.

comprehensive tooth and digestive damage in this assemblage, argues for hyenas as the main agent for the accumulation and modification of faunal material. This is true, even for the specimens of saiga which have best evidence—the cut marks—for some human intervention.

Our conclusion is that the site was occupied alternately by a wide variety of carnivores, primarily hyenas and occasionally humans. These occupations were probably short-term stays, and the deep stratigraphic deposits represent accumulations over very long periods of time. We cannot assign more than a few of the faunal specimens to human hunting or modification, despite the large number of stone tools present at the site. In fact, the densest and highest frequencies of stone tools occurred in the same levels as the greatest frequencies of hyena bones, which are very unlikely to represent human prey. The human contribution to the faunal assemblage appears to be minimal, and the entire collection of bones cannot be used to characterize human subsistence patterns. This is consistent with a growing literature that reassesses the role of humans in the accumulation of animal bones in a variety of kinds of archaeological and palaeontological sites.

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