Reports

Middle Stone Age Man-Animal Relationships in Southern Africa: Evidence from Die Kelders and Klasies River Mouth

Abstract. *The Middle Stone Age (earlier upper Pleistocene) sites of Die Kelders Cave I and Klasies River Mouth Cave I, southern Cape Province, South Africa, have provided faunal assemblages which imply that Middle Stone Age peoples were exploiting local resources less effectively than Later Stone Age (later upper Pleistocene–Holocene) peoples in the same area. The age structure of the* Pelorovis *(giant buffalo) herd in the Klasies site suggests that Middle Stone Age hunters may have been responsible for initiating a decline in the species' abundance that culminated in its final disappearance 10,000 to 12,000 years ago.*

In this report I present some recently developed evidence for Middle Stone Age (MSA) man-animal relationships from Die Kelders Cave I and Klasies River Mouth Cave I in the southern Cape Province, South Africa (Fig. 1), and point out some interesting contrasts between this evidence and that from Later Stone Age (LSA) sites in the same area. To my knowledge, the southern Cape is the only part of sub-Saharan Africa in which adequate data to seek out such contrasts have been developed.

Until very recently, MSA industries were thought to date between roughly 40,000 and 10,000 years ago (*1, 2*), but there is now excellent evidence that even the latest MSA is older than 35,000 to 40,000 years (*3, 4*), the limit of radiocarbon dating as practiced by most laboratories. In South Africa, MSA industries can be shown on geological evidence to have existed at least as early as the beginning of the last (Eem) interglacial, some 125,000 years ago, while recent K-Ar dates from East Africa suggest a possible beginning date of more than 180,000 years ago (*5*). It is impossible to say precisely what kinds of people made MSA tools because the true artifactual associations of many supposedly MSA human skeletal remains are unestablished (*2*), while at sites such as Die Kelders I and Klasies I, where MSA associations are well documented, the human remains are very fragmentary.

Industries and associated faunal materials that immediately postdate MSA ones are as yet poorly known or described. All the southern Cape post-MSA materials referred to below are in fact younger than 20,000 years. Excavations that will provide materials to fill the gap between 20,000 years ago and the latest MSA at perhaps 40,000 to 45,000 years ago are currently under way in the southern Cape at Boomplaas Cave A (*6*). For the sake of convenience here, all post-MSA industries have been lumped as LSA, although until the materials from Boomplaas and comparable sites elsewhere in sub-Saharan Africa have been described, it will not be clear whether all post-MSA stone industries are similar enough technically and typologically to warrant a common label. Human remains belonging to the early LSA, as defined here, are unknown, but there is reasonable evidence that the makers of LSA tools during the last 18,000 years were anatomically modern (*Homo sapiens sapiens*) (*7*).

Die Kelders Cave I was excavated by Schweitzer (*8*) and contains both MSA and LSA levels separated by a long period of nonoccupation (?50,000 years). Tankard's study of the Die Kelders profile (*9*) has suggested an earlier last glacial age (?75,000 to ?55,000 years) for the Die Kelders MSA horizons. Klasies Cave I was excavated by Wymer and Singer (*10*) and, like Die Kelders I, contains both MSA and LSA deposits separated by a major nonsequence (?60,000 to ?70,000 years). Butzer's evaluation of the profile (*11*), supplemented by Shackleton's oxygen isotope analysis of associated marine shells (*12*) and Bada's aspartic acid racemization dates (*13*), indicates that the MSA occupation of Klasies I probably spans the last interglacial.

From Table 1 it is clear that the Die Kelders and Klasies faunas exhibit some important differences, probably related to differences in the immediate environments of the sites. In particular, the Die Kelders people seem to have focused on small mammals to a far greater extent than the inhabitants of Klasies. Mole rats and hares, which are barely represented at Klasies, occur by the dozens and even by the hundreds in some levels at Die Kelders. Small antelopes, especially the grysbok, which are not especially prominent at Klasies, are the dominant ungulates at Die Kelders. The overall impression is that the Die Kelders MSA environment contained relatively fewer large terrestrial mammals than the Klasies one, a contrast which characterized the two environments in historical times. But there may have been a positive aspect to the Die Kelders MSA concentration on such creatures as mole rat and hare. Both animals are significantly underrepresented in the deposits by foot bones (compared to other skeletal elements), which suggests that they may have been hunted largely for their pelts, with which the feet would have been removed. The fur of the mole rat in particular is of such high quality that it has even been considered for commercial exploitation.

Besides obvious differences, the Klasies and Die Kelders faunas exhibit some interesting similarities. Although eland was probably not the most common larger bovid near each site, and although the sites are and almost certainly always have been in contrasting environments, the most common larger bovid remains at both sites

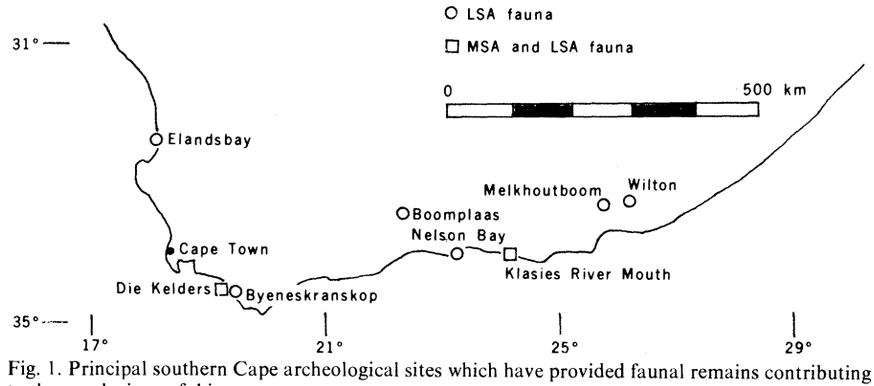

Fig. 1. Principal southern Cape archeological sites which have provided faunal remains contributing to the conclusions of this report.

belong to eland. This is in strong contrast to local LSA sites (*14*), where eland, although often present, is nowhere especially abundant. An MSA preference for eland, perhaps related in some way to the species' reputed docility, may be implied. Another feature both Klasies and Die Kelders share is the absence or near absence of suids (too dangerous?), although either the bushpig or the warthog or both were undoubtedly present nearby, and one or both occur in substantial numbers in comparable LSA sites.

Table 1. Minimum numbers of individuals by which the various mammalian species are represented in the MSA deposits of Die Kelders Cave I (16 levels) and Klasies River Mouth Cave I (8 levels). Species listed in capital letters are ones believed to have become extinct 10,000 to 12,000 years ago.

Animal	Number of individuals	
	Die Kelders I	Klasies I
Erinaceus sp., hedgehog	4	
Papio ursinus, chacma baboon		7
Homo sp., man	6	5
Canis mesomelas, black-backed jackal		1
Mellivora capensis, honey badger	6	2
Aonyx capensis, clawless otter		8
Herpestes ichneumon, Egyptian mongoose		3
Herpestes pulverulentus, Cape grey mongoose	15	5
Atilax paludinosus, water mongoose		2
Genetta sp., genet	2	
Hyaena brunnea, brown hyena	1	3
Felis libyca, wildcat	3	1
Felis cf. *caracal*, caracal	1	3
Panthera pardus, leopard		10
Arctocephalus pusillus, Cape fur seal	26	64
Mirounga leonina, southern elephant seal		1
Loxodonta africana, elephant		3
Procavia capensis, rock hyrax	86	51
Diceros bicornis, black rhinoceros	7	5
Equus cf. *quagga*, quagga	1	4
Potamochoerus porcus, bushpig		6
Phacochoerus aethiopicus, warthog		3
Hippopotamus amphibius, hippopotamus	11	16
Raphicerus melanotis, grysbok	132	53
Oreotragus oreotragus, klipspringer	15	
Ourebia ourebi, oribi		2
Pelea capreolus, vaal rhebuck	19	7
REDUNCA (REDUNCA) SP., reedbuck	7	8
Redunca fulvorufula, mountain reedbuck	1	7
Hippotragus leucophaeus, blue antelope	6	52
DAMALISCUS CF. *NIRO*, bastard hartebeest	1	2
CONNOCHAETES (CONNOCHAETES) SP., wildebeest	8	13
Alcelaphus cf. *buselaphus*, hartebeest		5
ANTIDORCAS AUSTRALIS, southern springbok	7	4
Tragelaphus scriptus, bushbuck		24
Tragelaphus strepsiceros, kudu	3	13
Taurotragus oryx, eland	28	104
Syncerus caffer, Cape buffalo	4	44
PELOROVIS ANTIQUUS, giant buffalo	4	52
Lepus capensis, Cape hare	200	1
Hystrix africae-australis, porcupine	2	23
Bathyergus suillus, mole rat	1864	
Georychus capensis, mole rat		7
Cetacea, whales and dolphins	4	9

Table 2. Numbers of large bovids in different dental age-states in the MSA deposits of Die Kelders I and Klasies River Mouth I. The dental age-states are defined to include animals in which: 1, dP4 was unworn; 2, M1 was erupting to erupted, but essentially unworn; 3, M2 was erupting to erupted, but essentially unworn; 4, M3 was erupting to erupted, but essentially unworn; 5, P4 was erupting to erupted, but essentially unworn; 6, P4 was in early to middle wear; and 7, P4 was in late wear.

Species	Number in dental age-state						
	1	2	3	4	5	6	7
Taurotragus oryx, eland							
Die Kelders I	1	4		7	1	11	2
Klasies I	8	7	10	13	19	40	7
Syncerus caffer, Cape buffalo							
Die Kelders I				1			1
Klasies I	13	8	4	6	3	8	2
Pelorovis antiquus, giant buffalo							
Die Kelders I	1	1		1		1	
Klasies I	25	2	2	2	2	14	5

Klasies and Die Kelders are further similar in their content of marine creatures. The Klasies data are especially significant because for the moment they constitute the oldest evidence for the systematic exploitation of marine resources known from anywhere in the world. In addition to the seals listed in Table 1, the Klasies MSA levels also provided abundant shells (*15*), numerous penguin bones, and a few bones of flying seabirds and fish (*16*). The evidence is particularly interesting because it suggests that MSA peoples exploited coastal resources less effectively than LSA peoples in the same habitat (*4*). In particular, the Klasies MSA people seem to have brought back amounts of seal and penguin bones equivalent to those in coastal LSA sites, but the Klasies MSA levels contain far fewer remains of fish and flying birds than are found in comparable LSA horizons. It is now clear that Klasies is not an isolated occurrence because analysis of the Die Kelders samples has revealed the same pattern: seal and penguin bones occur throughout, but remains of fish and of flying birds are confined almost entirely to the LSA levels. The Klasies and Die Kelders data together suggest that active fishing and fowling may have been beyond the technological capabilities of MSA peoples.

Several of the mammalian species represented at Klasies and Die Kelders are no longer extant (Table 1) and are believed to have made their last appearance in the terminal Pleistocene, some 10,000 to 12,000 years ago (*17*). Especially notable is the giant buffalo, which is common enough at Klasies to allow a statement about the age characteristics of the fossil herd in the site. Table 2 shows that the Klasies giant buffalo fall almost entirely into two age groups—newborn or perhaps fetal individuals with unworn deciduous dentitions (class 1) and physically mature animals with the permanent molars in place and worn (classes 5 to 7). Individuals between very young and physically mature (classes 2 to 4) are significantly underrepresented, especially when the giant buffalo age data are compared to those for the other large bovids represented at Klasies, Cape buffalo and eland. The giant buffalo had a horn span often exceeding 3 m, and stood roughly 2 m tall at the shoulders, with a probable adult weight of 1300 to 1800 kg. Additionally, it may have exhibited all the ferocity and cunning of its much smaller living relative, the Cape buffalo. Perhaps the explanation for the peculiar age distribution of the Klasies giant buffalo is that the Klasies people, faced with such formidable prey, focused on females in advanced

pregnancy or perhaps even in the process of giving birth, thereby obtaining both cow and calf. Such a hunting pattern might have been particularly rational if the giant buffalo were seasonal breeders so that locating pregnant cows, at least as part of a seasonal round, was not especially difficult. In any case, over time such a pattern could have endangered the survival of the species, and it is interesting that giant buffalo remains become progressively less numerous relative to Cape buffalo ones upward through the sequence at Klasies. In the terminal Pleistocene (LSA) deposits of Nelson Bay Cave, which contain the latest known record of the giant buffalo (*4*), its bones are far less numerous than those of the Cape buffalo.

For the other Klasies and Die Kelders species which became extinct in the terminal Pleistocene, there is insufficient material to establish age distributions or time trends in relative frequencies. The coincidence of extinctions with now well-established environmental changes at the end of the Pleistocene (final last glacial) and in the early Holocene (*18*) suggests a causal role for such changes. But environmental changes by themselves are an insufficient explanation of extinction, insofar as the extinct creatures clearly survived the presumably analogous environmental changes at the end of the penultimate glacial, about 125,000 years ago (*17*). The contrasts between the Klasies and Die Kelders MSA faunas on the one hand and LSA ones on the other suggest that the new and critical factor at the end of the last glacial may have been the presence of significantly more competent predatory hominids.

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Late-Quaternary Climatic Trends and History of Lake Erie from Stable Isotope Studies

Abstract. *Oxygen and carbon isotope measurements on mollusk and carbonate shells separated from a long sediment core in central Lake Erie document climatic changes of the Great Lakes region and the evolution of Lake Erie since deglaciation. On the basis of ^{18}O data, two major climatic improvements are recognized, one occurring between 13,000 and 12,000 years before the present (B.P.) and the other between 10,000 and 8,000 years B.P. Changing drainage patterns are also reflected in the ^{18}O contents of the Lake Erie water. Carbon isotopes reflect changes in aquatic vegetation and water depth. The settlement and industrialization of the Lake Erie drainage basin is documented in the ^{13}C and ^{18}O contents of modern mollusks.*

Paleotemperatures obtained from ^{18}O analyses of the carbonate skeletons or shells of marine organisms (*1*) and the results of isotope work on ice cores from Antarctic and Greenland ice sheets (*2*) are widely known. This report presents the results of ^{18}O and ^{13}C analyses on carbonate shells separated from the sediments in a long core from Lake Erie. An attempt is made to show that such ^{18}O analyses also can provide a rather detailed picture of climatic and water budget changes which occurred in the Lake Erie basin during the past 15,000 years. It is assumed that these shells were deposited in isotopic equilibrium with Lake Erie water and therefore reflect the composition of this water at the time of growth of these animals (*1, 3–5*). Furthermore, it is assumed that the ^{13}C contents of the shells analyzed reflect environmental conditions existing within the habitat of the various carbonate-depositing animals and depend primarily on the origin of the inorganic, dissolved carbon in the lake water (*4*).

The core site (core 13194) is located in the cental basin of Lake Erie, 22.5 km southeast of Erieau, Ontario, at a water depth of 24.4 m. It is one of several borehole sites in this area investigated by the Geological Survey of Canada and the Consumers' Gas Company, Toronto, Ontario, to determine the stratigraphy, history, and engineering properties of Lake Erie offshore sediments (*6, 7*).

The stratigraphic sequence, the inferred chronology, and a summary of the isotope data are shown in Fig. 1. Figure 2 gives a comparison of $\delta^{18}O$ and $\delta^{13}C$ values from all samples analyzed (*8*). Pollen studies encompass the upper half of the glaciolacustrine and Holocene sediments and provide the necessary chronologic control since the sediments contain insufficient organic matter for radiocarbon dating. We derived time horizons for specific pollen boundaries by correlating the pollen data with various radiocarbon-dated pollen records in Lake Erie and in the surrounding area.

The oldest samples obtained for this study are from a dark, grayish-brown, silty clay, "till-like" sediment from a depth of 26.5 m. These oldest "Lake Erie" sediments are interpreted as lodgement till deposited during the Port Bruce advance of the Erie lobe and are assigned an age of 13,800 years before the present (B.P.) (*9*). During the time that the ostracods lived in the pre–Port Bruce glacial lakes, "Lake Erie" had the lowest ^{18}O concentration in its history. This is not surprising since these glacial lakes received not only ^{18}O-depleted meltwaters from nearby glacial ice but also precipitations with lower ^{18}O contents than that of average present-day precipitations (*10*).

The high $\delta^{13}C$ values of the ostracod shells almost certainly indicate that at this time the dissolved inorganic carbon in the lake water was in, or close to, isotopic equilibrium with atmospheric CO_2. Pollen and other plant remains are absent; consequently, little if any plant life was established at this early stage.

The "till-like" sediment grades upward into partially laminated, dark grayish-brown glaciolacustrine silty clay with reddish-brown clay inclusions. These lake clays accumulated during the existence of several high-level glacial lake stages (Arkona to Lundy) through to the earliest postglacial lake phase, Early Lake Erie. Inferred ages for the sediment column during this time interval are 12,730 ± 200 years B.P. (sample I-3665) (*11*) for the rise in *Picea* (spruce) pollen at 14.5 m and 12,500 years B.P. for the top of the glaciolacustrine sediments at 9.2 m.

The rise in *Picea* pollen implies an advancing spruce forest and coincides with a