Human exploitation of nocturnal felines at Diepkloof Rock Shelter provides further evidence for symbolic behaviours during the Middle Stone Age

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Within the animal kingdom, carnivores occupied a unique place in prehistoric societies. At times predators or competitors for resources and shelters, anthropogenic traces of their exploitation, often for non-nutritional purposes, permeate the archaeological record. Scarce but spectacular depictions in Palaeolithic art confirm peoples' fascination with carnivores. In contrast with the European record, research on hominin/carnivore interactions in Africa has primarily revolved around the hunting or scavenging debate amongst early hominins. As such, the available information on the role of carnivores in Anatomically Modern Humans' economic and cultural systems is limited. Here, we illustrate a particular relationship between humans and carnivores during the MIS5-4 Still Bay and Howiesons Poort techno-complexes at Diepkloof Rock Shelter, South Africa. The recovery of numerous felid remains, including cut-marked phalanges, tarsals and metapodials, constitutes direct evidence for carnivore skinning and, presumably, pelt use in the southern African Middle Stone Age. Carnivore exploitation at the site seems to have focused specifically on nocturnal, solitary and dangerous felines. The lines of evidence presented here suggest the capture and fur use of those felines in the context of highly codified and symbolically loaded cultural traditions.

Interactions with felids are deeply rooted in the evolutionary trajectory of hominins; they manifest themselves in terms of competition, predation and/or exploitation (e.g.1–7). In Europe, the identification of carnivore tooth marks on hominin bones points towards a predominantly predator/prey type of relationship between felids and Middle Palaeolithic populations (e.g.8). A rare case of Middle Pleistocene hominin exploitation of a large felid (Panthera leo fossili) is documented at the Gran Dolina, Sierra de Atapuerca, in Spain2. Coinciding with the cultural bourgeoning associated with the beginning of the Upper Palaeolithic in Europe, these interactions seem to take on a new form, with felids occupying a significant role within symbolic practices of modern human groups. Exploitation of medium (lynx Lynx lynx) and large (cave lion Panthera spelaea) felids by Upper Palaeolithic people is well documented across Western Europe: canines, either perforated and worn as personal ornaments8–11 or used as retouchers7, have been recovered from several archaeological assemblages. Felid bones exhibiting cut-marks consistent with skinning and possible fur use are also known from various sites in that region (e.g.5,11,12). Felid representations attest to the symbolic value attributed to these predators by Upper Palaeolithic societies. Remarkable examples include the magnificent felid depictions from Chauvet Cave in France13 and the therianthropic Löwenmenschen ivory figurines recovered from sites in the Swabian Jura14–16. At La Garma in Spain, the recovery of cut-marked distal phalanges of cave lion Panthera spelaea illustrates the use of pelts from this dangerous animal, interpreted in the light of ritual activities during the Magdalenian17.
On the African continent, several lines of evidence document predation and competition between medium and large felids and early hominins (see for instance16–18). There is limited archaeological information, however, on Anatomically Modern Humans’ interactions with carnivores. This contrasts with the ethnographic record, which illustrates a diverse and complex set of interactions between people and carnivores across Africa, generally embedded within highly codified cultural practices. Leopard pelts, for instance, are used to distinguish people from one another, often people of higher status from those of lower status. In Zulu culture in South Africa, wearing a leopard skin is a privilege granted to the king or members of the royal family19. In East Africa, amongst Karamojong and Acholi people, the fur of this animal is part of the warrior’s regalia20. Lion hunting is instrumental in maintaining the Maasai social structure based on an age-grade system and newly initiated men (ilmurran) are expected to know how to hunt lions21. Maasai men in Kenya and Tanzania hunt lions for several overlapping motivations, including “achieving and reinforcing the role of ilmurran in society” and “to obtain prestige”22.24.

Symbolically loaded behaviours appear from at least 100,000 BP in Africa, well prior to the advent of the Upper Palaeolithic in Eurasia (e.g.22–27). Archaeologically visible proxies for the use of symbols as a means of intra- and inter-human group communication are documented from several Middle Stone Age (MSA) rock shelters in South Africa, often –but not exclusively– in association with the Still Bay and the Howiesons Poort techno-complexes. Still Bay and Howiesons Poort symbolic proxies include the practice of ochre and shell engravings23,27–30; the use of perforated marine and terrestrial shell beads as personal ornaments24,31,32; and the habitual use of ochre (e.g.30,33,34). There is no clear evidence thus far for carnivore exploitation in the context of symbolic practices during the MSA.

Carnivores, although always in very small numbers, are usually present in MSA faunal assemblages retrieved from southern African rock shelters. These assemblages often comprise remains of small (i.e. the African wild cat Felis silvestris), medium (i.e. the caracal Caracal caracal and/or the serval Leptailurus serval) and large (i.e. the cheetah Acinonyx jubatus and the leopard Panthera pardus) felids. One exception is the largest of all extant felids, the lion Panthera leo, never documented from such contexts. Some authors have proposed that the occurrence of carnivores in faunal assemblages could result from skin exploitation by hunter-gatherers. This was suggested for instance at Bushman Rock Shelter35 in the interior of southern Africa and at Blombos Cave36 in the southern Cape. In one of the Howiesons Poort layers from Klipdrift Shelter, Reynard et al.37 mention the occurrence of cut-marks on a caracal/serval phalanx, which they interpret as evidence for skinning. In one of the pre-Still Bay layers at Sibudu Cave in KwaZulu-Natal, Clark38 describes a series of three parallel cut-marks on the plantar surface of the distal condyle of a small felid (African wild cat size) metapodial, which are consistent with skinning38. Evidence for carnivore skin exploitation during the MSA remains, however, tenuous, since it relies solely on this handful of cut-marked bones retrieved from sites spread across the southern African region. Besides, the significance of such practices for human groups is unknown. Here, we present the largest sample of felid specimens yet recovered from a MSA site in southern Africa, with direct evidence of regular skin removal and presumably fur use by humans.

Diepkloof Rock Shelter, South Africa: Brief Presentation of the site and chrono-cultural-sequence

Diepkloof Rock Shelter (hereafter DRS) is a large and prominent rock shelter located 14 km from the shoreline of the southern Atlantic Ocean in the West Coast of South Africa40 (Fig. 1), in the Winter-Rainfall Zone. A perennial river, the Verlorenvlei River, runs about 100 m directly downslope from the rock shelter. Past vegetation, reconstructed using wood charcoal, as well as modern vegetation include a mosaic of plant communities consistent with the open and dry habitats typical of the Fynbos Biome in the Cape Floristic region41. These comprise open grassy areas, scrub and shrubs, Fynbos vegetation, as well as patches of Afromontane forest mesic thickets. The proximity of the Verlorenvlei River explains the presence of riverine woodland/wetlands, reed and rush beds41.

Excavations at the site from 1999 to 2013 have uncovered a 3.1 m deep archaeological sequence. Deposits are associated with human occupations of the shelter dated from MISS to MIS342,43 -but see44,45- and consistent with distinct techno-complexes including, for a large part of the sequence, the Still Bay and the Howiesons Poort46,47 (Fig. 1). The Howiesons Poort from DRS is unique in its high stratigraphic resolution and chrono-cultural developments, across three successive phases46. It is best known for having produced several hundred fragments of engraved ostrich eggs presumably used as containers and marked with geometric motifs45,48, a practice shared across a vast territory, from the south of Namibia49 to the south coast of South Africa50. Regular ochre processing at the site is illustrated by hundreds of shale, ferricrete and shale/ferricrete pieces collected throughout the MSA sequence, including some bearing evidence of grinding, as well as the recovery of tabular quartzite fragments covered in red ochre43.51.

Besides the rich lithic and ochre samples, DRS has yielded a large and taxonomically diverse faunal assemblage, reflecting the various habitats present around the site40,53. Existing taphonomic data indicate that Verreaux’s eagle (Aquila verreauxii) may be responsible for the accumulation of some of the small mammal, tortoise and bird remains50,51. A few coprolites found in one Early Howiesons Poort and two post-Howiesons Poort stratigraphic units suggest visits of the rock shelter by hyenids. While these carnivores might have brought in some of the remains, including the hyenid and canid bones, which are common in hyena-accumulated assemblages, Steele and Klein50 identify people as the main accumulators of the faunal assemblage. The diversity of ungulates suggests the adoption of varied acquisition strategies by the inhabitants of the rock shelter, targeting medium to large gregarious individuals as well as smaller solitary ones. Both docile (i.e. the eland Tragelaphus oryx), Pelorovis antiquus potentially aggressive (i.e. the extinct long-horned buffalo) and/or the serval (Leptailurus serval) large ungulates were hunted.50. Notwithstanding the impact of anthropogenic overhunting in the last few centuries on carnivore distribution and frequency, the taxonomic composition of the archaeological carnivore assemblage reflects modern distribution of carnivores that still occur in the area52. Steele and Klein50 mention the presence of nine terrestrial carnivore taxa.
They identified the remains of canids (the Cape fox *Vulpes chacma* and the black-backed jackal *Canis mesomelas*), several small carnivores (the honey badger *Mellivora capensis*, the Cape grey mongoose *Galerella pulverulenta* and a genet *Genetta sp.*), a hyenid (Hyaenidae gen. et sp. indet.), and felids, namely *Felis silvestris libyca* *Caracal caracal* and/or *Leptailurus serval*, and *Panthera pardus*. Felids overwhelmingly dominate the carnivore sample, with more than 75% of the carnivore remains (NISP).

**Sample studied and results**

**Stratigraphic origin of the remains.** In this study, we consider only felid remains (n = 61). Most of these (n = 40) come from the stratigraphic deposits that have been exposed from the “Main Sector”, while the others come from the “Trench” (n = 13) and from the “Back Sector” (n = 8)40 (Fig. 1; Table 1). The majority of the felid remains come from stratigraphic units assigned to the Still Bay ‘Larry’, the three Howiesons Poort phases and the MSA ‘Jack’ (Table 1). One bone comes from the MSA ‘Mike’ and another one from a post-Howiesons Poort layer. No felid remains were identified in the pre-Still Bay ‘Lynn’, a techno-complex represented by one stratigraphic unit only46.

**Taxonomic composition of the felid assemblage.** The felid remains belong to a minimum number of 18 individuals (Table 1). Three specimens are attributed to the leopard and were recovered from distinct techno-complexes, thus representing a minimum number of three individuals. Twenty-seven remains belong to the African wild cat and represent a minimum number of seven individuals. Half of the remains in the felid
There is no diachronic pattern regarding the stratigraphic provenience of autopodal bones (claws are absent), a quarter carpals/tarsals and a fifth metapodials, while other skeletal elements represent with bones from the autopod: more than a third of the assemblage comprises proximal and intermediate phalanges of caracals; and a proximal radius, a navicular, a talus, a medial cuneiform, one proximal and two intermediate phalanges, a pisiform, two complete cuboids, a complete talus and a complete navicular, a complete first metacarpal, one fragmentary and one complete vertebra and one distal radius.

Table 1. Anatomical distribution of the felid skeletal elements (data in NISP and %NISP).

| Species            | Total NISP | Phalanges | Carpals/Tarsals | Metapodials | Others |
|--------------------|------------|-----------|----------------|-------------|--------|
| Leopard            | 3          | 3         | 0              | 0           | 0      |
| Caracal            | 17         | 7         | 2              | 3           | 4      |
| Caracal/serval     | 27         | 8         | 5              | 6           | 8      |
| African wild cat   | 27         | 8         | 5              | 6           | 8      |
| TOTAL              | 61         | 25/41     | 13/21.3        | 12/19.7     | 11/18  |

Table 2. Stratigraphic provenience of the felid remains per techno-complex in the Diepkloof Rock Shelter archaeosequence (data provided respectively in NISP and MNI; SB: Still Bay; HP: Howiesons Poort).

| Species            | MSA Mike | Pre-SB Lyn | SB Larry | Early HP | MSA Jack | Interm. HP | Late HP | Post-HP |
|--------------------|----------|------------|----------|----------|----------|------------|---------|---------|
| Panthera pardus    | —        | —          | —        | 1/1      | 1/1      | 1/1        | —       | —       |
| Caracal caracal    | —        | —          | 2/1      | —        | —        | 3/1        | 9/1     | —       |
| Caracal/serval     | 1/1      | —          | 4/1      | 1/1      | —        | 2/1        | 9/1     | —       |
| Felis silvestris   | —        | 7/1        | —        | 3/1      | 3/1      | 5/1        | 8/2     | 1/1     |
| TOTAL              | 1/1      | 13/3       | 5/3      | 4/2      | 11/4     | 26/4       | 1/1     |

Skeletal element representation. Most of the felid skeletal parts preserved (50/61 or 82%) are consistent with bones from the autopod: more than a third of the assemblage comprises proximal and intermediate phalanges (claws are absent), a quarter carpals/tarsals and a fifth metapodials, while other skeletal elements represent less than a fifth (Table 2; Fig. 2). There is no diachronic pattern regarding the stratigraphic provenience of autopod versus other skeletal parts, all evenly distributed across the archaeological sequence. The leopard remains include the distal half of a proximal phalanx, one complete and one fragmentary intermediate phalanges. The caracal/serval remains include five fragmentary proximal phalanges, three fragmentary and six complete hind and front intermediate phalanges, one complete pisiform, one proximal calcaneum, one fragmentary and one complete talus, two complete naviculares, one complete cuboid and one complete medial cuneiform. Other skeletal parts preserved are a partial mandible with dentition and two proximal radii. The African wild cat sample comprises one complete and two fragmentary hind proximal phalanges, five complete intermediate phalanges, a complete pisiform, two complete cuboids, a complete talus and a complete navicular, a complete first metacarpal, one fragmentary third and fourth metacarpals and a fragmentary second metatarsal. Besides elements from the autopod, the African wild cat sample also includes two partial mandibles with dentition, three proximal ulnae, two lumbar vertebrae and one distal radius.

Human-induced bone surface modifications. Forty-four felid remains exhibit different stages of discoloration, from dark brown to white (calcined), resulting from burning (Table 3). Seventeen remains bear microscopic trampling striations on their surface (Table 3). Three caracal/serval long bones preserve evidence of green breakage: both parts of a broken metacarpal shaft; the proximal edge of a broken distal second metatarsal; and the distal edge of a broken proximal third metacarpal. A distal radius of a juvenile African wild cat also presents the characteristic of a bone that was broken while still fresh.

Sixteen remains, mostly elements from the autopod (n = 13), exhibit butchery marks produced by cutting with stone artefacts (Table 3; Figs. 3 and 4). These remains include two of the three leopard phalanges; a distal radius, a talus, and a fourth metatarsal of African wild cats; a proximal radius, a third metatarsal, and two intermediate phalanges of caracals; and a proximal radius, a navicular, a talus, a medial cuneiform, one proximal and two intermediate phalanges of caracals/serval. Figure 3 combines the location and orientation of cut-marks observed on the felid autopod bones. On phalanges, metapodials and tarsals, the cut-marks are short, transverse and located on both the dorsal and palmar/plantar sides (Figs. 3 and 4). On the caracal/serval proximal radii, the cut-marks are transverse and located on the anterior face of the shafts. We did not observe cut-marks on the cranial material.
or on the vertebrae. With the exception of one caracal/serval phalanx from stratigraphic unit 'Lauren' in the MSA 'Mike', all cut-marked bones come from Still Bay 'Larry' (n = 4), Early (n = 1), Intermediate (n = 5) and Late (n = 5) Howiesons Poort stratigraphic units.

**Table 3.** Human-induced bone damage and surface modifications (data in NISP and %NISP).

| Species                     | Skeletal element | Burning | Trampling | Green breakage | Cut-marks |
|-----------------------------|------------------|---------|-----------|----------------|-----------|
| Leopard                     | Phalanges        | 3       | 1         | 0              | 2         |
| Caracal + caracal/serval    | Phalanges        | 12      | 5         | 0              | 5         |
|                             | Metapodials      | 2       | 1         | 3              | 1         |
|                             | Carpals/Tarsals  | 4       | 1         | 0              | 3         |
|                             | Long bones       | 1       | 1         | 0              | 2         |
| African wild cat            | Phalanges        | 7       | 2         | 0              | 0         |
|                             | Metapodials      | 4       | 3         | 0              | 1         |
|                             | Carpals/tarsals  | 4       | 0         | 0              | 1         |
|                             | Long bones       | 4       | 2         | 1              | 1         |
|                             | Vertebra         | 2       | 1         | 0              | 0         |
|                             | Mandible         | 1       | 1         | 0              | 0         |
| TOTAL                       |                  | 44/72.1 | 17/27.9   | 4/6.6          | 16/26.2   |

**Figure 2.** Skeletal elements preserved for leopard, caracal/serval and African wild cat.
The African wild cat distal radius broken while fresh also exhibits a cut-mark. Eleven of the sixteen cut-marked specimens are burnt and trampling marks are present on six of the cut-marked bones.

**Discussion and conclusion**

**Exploitation of felines for their fur at Diepkloof Rock Shelter.** While not documented for felids, there is available information on small (*Vulpes vulpes* and *V. velox*) and large (*Canis familiaris*, *C. lupus* and *C. latrans*) canid bone density. Canids and felids are cursorial quadrupeds, presenting similar skeletal architecture and dimensions and we therefore used published observations on canid bone mineral volume density as a comparative sample to investigate whether the DRS felid assemblage has suffered from density-mediated attrition. Canid skeletal elements with the highest density are the middle shafts of long bones (femur, tibia, fibula, and humerus), mandible, calcaneum, and middle shaft of metapodials; elements with the lowest density are the proximal and distal parts of ribs, centrum of thoracic vertebrae, proximal humerus, proximal tibia, sacrum and greater trochanter of the femur. At DRS, the felid elements preserved are all consistent with some of the densest skeletal parts in canids. Carpals and tarsals, overrepresented at DRS, are also compact bones, which are less prone to fragmentation and easier to identify than long and flat bones. The absence of most felid long bones could partly be due to high fragmentation leading to their non-identification, especially since identifiable portions in long bones are epiphyses, which present some of the lowest densities in canids.

Density-mediated attrition therefore seems to have strongly influenced the DRS felid skeletal element representation. The felid remains have also suffered from human-induced alterations in a similar manner to the ungulate assemblage (i.e. burning, trampling and intense fragmentation). This confirms that the occurrence of these remains amongst the archaeological deposits likely results from anthropogenic processes. The anthropogenic origin of the felid bones is further supported by the fact that caracals/servas and African wild cats are not particularly prone to using rock shelters and caves. Leopards on the contrary are cave-dwelling, bone-accumulators carnivores. At DRS, the scenario is, unsurprisingly, more intricate and probably combines both skinning and pelt discarding events. This is to be expected given the relatively small sample sizes per techno-complexes, the fact that the remains come from a sequence that covers a long chronological interval, the various taphonomic agents that have affected the assemblage, and the small size of the excavation area in comparison with the total surface of the rock shelter (Fig. 1).

![Figure 3](image-url) Cut-marks observed on felid phalanges, carpals, tarsals and metapodials, here combined on right felid manus and pes.

The skeletal element representation observed for the felid assemblage at DRS is reminiscent of the head and foot-dominated pattern regularly observed for ungulate assemblages from archaeological sites and resulting from the combination of taphonomic variables including density-mediated attrition as well as biases related to excavation and analytical procedures. The survival pattern observed for felid remains at DRS is neither completely consistent with a typical pelt processing scenario nor with a scenario where used skins would have been discarded. In the first case, most skeletal parts should be preserved with the exception of elements left in the furs (phalanges, caudal vertebrae and possibly skulls), while the inverse skeletal part representation would be observed in the second case. At DRS, the scenario is, unsurprisingly, more intricate and probably combines both skinning and pelt discarding events. This is to be expected given the relatively small sample sizes per techno-complexes, the fact that the remains come from a sequence that covers a long chronological interval, the various taphonomic agents that have affected the assemblage, and the small size of the excavation area in comparison with the total surface of the rock shelter.
The location and orientation of cut-marks observed on the DRS felid bones are all consistent with skinning motions. Similar transverse cut-marks located on tarsals, carpals, metapodials, phalanges and the anterior face of the radius were produced during experimental skinning of small to medium carnivores \(^{11,39,56,57}\). Skinning cut-marks occur on parts of the skeleton not covered by muscles, where direct contacts between the implement cutting through the skin and the bone surface can occur. At DRS, we did not observe cut-marks on any of the three fragmentary felid mandibles. This contrasts with experimental skinning, which tends to produce abundant cut-marks on the ramus and condyle of the mandible \(^{11,39,56,57}\), unless of course the skull remains inside the fur. Skeletal elements most likely to bear cut-marks related to butchery motions other than skinning -namely

Figure 4. Examples of leopard, caracal/serval and African wild cat cut-marked metatarsals, tarsals and phalanges retrieved from Still Bay (SB) and Howiesons Poort (HP) stratigraphic units.
The three feline taxa identified at DRS share several ethological traits that make them difficult to acquire, dangerous prey. Leopards, caracals and African wild cats are primarily nocturnal and solitary and, as secretive predators hunting by stalking their prey, they have developed particularly good talents at making themselves extremely elusive and therefore difficult to spot. There are documented modern cases of humans being eaten by leopards (e.g. 1,65,66) and a leopard under threat, for instance trapped, would be extremely aggressive.52 While caracals and African

The Diepkloof Rock Shelter felids in the context of carnivore exploitation by late Pleistocene populations in South Africa. Although always in small numbers, when felids are present in MSA assemblages they tend to be more abundant than hyenids and canids combined56–38,58–64. Table 4 compares the DRS felid sample with observations from other South African MSA assemblages, which have also yielded felid remains. The one felid bone with skinning marks from Klipdrift Shelter comes attributed to the Still Bay36,60. Several leopard, caracal/serval and African wild cat remains were also retrieved from the MSA deposits at Blombos Cave, attributed to the Still Bay.56–64 The leopard and the African wild cat have been identified from the MSA deposits at Klasies River Mouth and Border Cave but published information on these assemblages36,59 is provided in MNIs and is therefore not included in this table.

When considering both raw values (NISP) and percentages of the complete mammalian assemblages represented by felids (%NISP), the largest sample comes from DRS (Table 4). While still only representing a very small fraction of the fauna, the larger size of the DRS felid sample compared to other MSA sites is statistically significant (all Fisher’s Exact tests produce p values < 0.0005). We exclude inter-specialist variability as a possible bias having affected taxonomic identifications. The assemblages were indeed analysed by a limited number of specialists (and by the same one in several cases:50,58–60,63), using similar methods and in many cases the same comparative collections (i.e. from the Ditson Natural History Museum in Pretoria:36–38,61,62,64). There is no information published on felid skeletal part representation for other MSA assemblages, which hinders comparisons with DRS at this stage.

The recovery of felid bones exhibiting skinning cut-marks from the MSA ‘Mike’ at DRS and the pre-Still Bay at Sibudu Cave18 indicate that human exploitation of these carnivores is not restricted to the Still Bay and the Howiesons Poort, although evidence from DRS suggests a stronger signal for such behaviours during these two techno-complexes. At DRS, felid remains disappear in the post-Howiesons Poort stratigraphic units, pointing towards the abandonment of this practice. The one felid bone with skinning marks from Klipdrift Shelter comes from one of the Howiesons Poort stratigraphic units36, while the second largest concentration of felid material (17 African wild cat remains) noted for an MSA assemblage after DRS is from the phase M1 at Blombos Cave, attributed to the Still Bay.36–61

Table 4. Felid remains recovered from other MSA sites in southern Africa. The observations, provided in NISP and % of the total NISP for the mammalian assemblages, come from:36 for Ysterfontein (YST); 37 for Klipdrift Shelter (KDS); 36,61,64 for Blombos Cave (BBC); 62 and 58 for Sibudu Cave (SIB); and 64 for Bushman Rock Shelter (BRS).

| Felid Taxa       | DRS | YST | KDS | BBC | SIB | BRS |
|------------------|-----|-----|-----|-----|-----|-----|
| African wild cat | 27  | 7   | —   | 23  | —   | —   |
| Small felid      | —   | —   | 1   | 7   | —   | —   |
| Caracal/serval   | 31  | 13  | 3   | 1   | —   | —   |
| Medium felid     | —   | —   | —   | 1   | —   | —   |
| Leopard          | 3   | —   | —   | —   | —   | —   |
| Cheetah          | —   | —   | —   | —   | 1   | —   |
| Large felid      | —   | —   | —   | —   | 4   | 2   |
| Lion             | —   | —   | —   | —   | —   | —   |
| Total            | 61  | 20  | 2   | 13  | 4   | —   |

NISP mammalian fauna

| Location | NISP | %NISP |
|----------|------|-------|
| DRS      | 4173 | 1.5%  |
| YST      | 3324 | 0.6%  |
| KDS      | 2266 | 0.1%  |
| BBC      | 6529 | 0.4%  |
| SIB      | 6907 | 0.2%  |
| BRS      | 1822 | 0.2%  |

Behavioural implications of capturing nocturnal, solitary and dangerous felines. The three
wild cats are not powerful enough to represent life threats to humans, encounters with these predators could still result in serious wounds for the hunters.

These observations, combined with archaeological evidence for skinning of felines during the MSA at DRS, suggest that the relationship between human and felines, and specifically the human interest in these carnivore pelts, was embedded in a wider development amongst late Pleistocene people's involvement with marking – of objects, of places and of people. Previous reporting of artefactual material from DRS and other pene-contemporary occupations for instance at Sibudu Cave, Blombos Cave and Klipdrift Shelter illustrates the regular involvement of MSA hunter-gatherers, especially during the Still Bay and Howiesons Poort, in marking of themselves, their possessions and their surroundings. The geometric markings on ostrich eggshells from DRS and Klipdrift Shelter transform generic eggshells into specific, distinguishable objects that carry recognisable meanings, likely marks of ownership. Perforated marine shell beads retrieved from Still Bay contexts at Blombos Cave and Sibudu Cave are items of personal ornaments worn in the context of symbolically loaded social interactions. The spatial organization of shelter occupations and the repetitive depositional arrangements of bedding and hearth areas at DRS and Sibudu Cave transform a location into a place, likely a home claimed and destined for re-use. The increased use of ochre and the deployment of decorative beads strung together transforms a man or a woman into a particular person, with particular relationships and allegiances. These are all markings that turn the generic into the specific and begin to demarcate meanings and establish visible claims on property, places and identities. We suggest that it is in this sphere of marking, of distinguishing, of identifying, that the interest in skinning dangerous carnivores at DRS should be set.

**Methods summary**

The felid remains presented here were selected from the MSA faunal material of DRS, which is currently curated by the Department of Archaeology at the University of Cape Town (UCT), South Africa. We produced initial anatomical and taxonomical attributions using the modern reference collections from the UCT department and completed them with the more extensive one from the Ditsong National Museum of Natural History in Pretoria. Specimen numbers provided in this paper follow our own, independent numbering system. For the minimum number of individual (MNI) estimates, we followed the definition proposed by Klein and Cruz-Uribe that takes into account ontogenetic age information when available (juvenile or adult based on a simple description of the fusion degree for long bones, i.e. unfused or fused). For the MNI counts, felid remains retrieved from different stratigraphic units within a given techno-complex were considered together and we have interpreted the felid remains from different techno-complexes as belonging to different individuals. For instance, seven African wild cat remains were collected from four distinct stratigraphic units attributed to the Still Bay 'Larry'. They have been pulled together, resulting in a MNI of one rather than four. The samples were always too small (NISP = > 10 per taxon and per techno-complex) to provide statistically meaningful %MAU counts.

We conducted a systematic microscopic investigation of bone surface modifications using an Olympus SZ61 optical microscope offering magnifications up to x45, under oblique lighting. We firstly estimated the visibility degree of bone surfaces (0–25, 25–50, 50–75, >75%), before attributing a degree of manganese coating following Val. We recorded the presence/absence of the following abiotic and biotic modifications: water abrasion, dissolution, trampling, root and rootlet etching, decalcification, crystals, concretions, gastric acid etching, rodent gnawing, invertebrate damage, carnivore damage (pits, punctures, scores, furrows and crenulated edges), bird of prey damage (scoring, notches, beak/talon impacts), and anthropogenic modifications (cut-marks, percussion marks, and polishing). The identification of the biotic and abiotic damage was based on the personal experience of one of us (AV) and on available literature on these aspects, notably:1,71–75. A colour-code tentatively linked to meanings, likely marks of ownership. Perforated marine shell beads retrieved from Still Bay contexts at Blombos Cave and Sibudu Cave are items of personal ornaments worn in the context of symbolically loaded social interactions. The spatial organization of shelter occupations and the repetitive depositional arrangements of bedding and hearth areas at DRS and Sibudu Cave transform a location into a place, likely a home claimed and destined for re-use. The increased use of ochre and the deployment of decorative beads strung together transforms a man or a woman into a particular person, with particular relationships and allegiances. These are all markings that turn the generic into the specific and begin to demarcate meanings and establish visible claims on property, places and identities. We suggest that it is in this sphere of marking, of distinguishing, of identifying, that the interest in skinning dangerous carnivores at DRS should be set.

**Data availability**

The dataset generated during the current study is available from the corresponding author on reasonable request.

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Author contributions

A.V. performed the data collection (taphonomic analysis), wrote the initial draft of the manuscript and designed the figures. G.P. P.J.T. and J.P. led the field project at Diepkloof Rock Shelter from the late 1990s until 2013. G.P. and J.P. contributed to the writing up of the manuscript. J.W.F. and P.J.T. provided feedback on the manuscript.

Competing interests

The authors declare no competing interests.

Additional information

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