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SWARTKRANS AS A CASE STUDY IN AFRICAN CAVE TAPHONOMY*

by

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SUMMARY

By taphonomy is meant the systematic study of death assemblages of once-living things — in this case of vertebrate animals. Such study may have various aims but in the present instance my objective has been the interpretation of bone assemblages in the Swartkrans cave to throw light on such topics as:

1. the ways in which bones found their way to the cave;
2. the nature of the animal communities which contributed bones to the assemblages and the kind of environment in which the communities lived;
3. the behaviour of the hominids and other animals whose bones form part of the fossil assemblage.

Swartkrans, though not a particularly large cave, is one of considerable complexity and can be used as a case study to illuminate several principles in African cave taphonomy. Three of these principles are discussed.

A. *That the particular stage in the cave's evolution, reflected in the form of the cave, will determine the nature of the bone assemblage accumulating at that stage.*

Swartkrans has passed through stages typical of many dolomite caves. Its initial opening appears to have been a narrow vertical shaft or aven and, at this stage, the underground cavern was probably used only by bats. Bones of larger animals are likely to have come from victims of a natural pit-trap hazard.

With the passage of time, collapse and solution in the vicinity of the shaft led to an open, amphitheatre-type of entrance area with an extensive talus-cone inside it, sweeping down to the lower recesses of the cavern. At this stage the site appears to have served as a sheltering place for hominids and baboons, while at the same time providing breeding lairs and feeding retreats for carnivores and porcupines. It was also intensively used by owls for roosting and breeding purposes.

Gradually the entrance area became choked with sediment, now designated Member 1, sealing off unfilled parts of the cavern system lower down. After a considerable lapse of time continued erosion of the hillside led to the development of new, tunnel-like openings to unfilled parts of the cavern and to solution channels in the filling itself. The tunnels clearly served as carnivore lairs but were apparently unsuitable for the purposes of owls and primates. Remaining spaces in the cavern were gradually filled, via these tunnels, with a second generation of bone-bearing sediments known in the Swartkrans context as Member 2.

The composition of the fossil faunas preserved in Swartkrans Members 1 and 2 differ considerably. The difference may be ascribed partly to age but very largely to the influence of cave-form during the accumulation periods of the two sediments.

B. *That criteria are definable whereby the various bone-accumulating agencies may be recognised.*

At Swartkrans, as in many other cave contexts, it is convenient to separate the fossil assemblages into microvertebrate and macrovertebrate components. Study of modern cave situations suggests that the microvertebrate bones generally represent the food remains of owls which roosted and bred within the twilight zone of the cave's entrance. Comparative data are presented for barn (*Tyto alba*) and spotted-eagle owls (*Bubo africanus*) hunting today in the vicinity of Swartkrans, and the nature of their food remains is shown to be very similar. In striking contrast are the food remains of Cape eagle owls (*Bubo capensis*), a roost of which has been studied a few kilometres north of Swartkrans. Dassies, hares, similarly-sized mammals and fresh water crabs featured prominently in the prey of these birds, blurring the distinction between typical owl-collected microvertebrate remains and those of larger animals whose presence is typically due to the activities of other agents. The more important of these agents are considered to be porcupines, several species of carnivores and hominids.

Hominid involvement in a bone accumulation may best be established, I suspect, by traces of culture associated with the remains. Such traces include bone and stone artefacts, indications of deliberate fire and the damage which artefacts or fire may have done to bones. Traces of culture do occur in both Swartkrans Members, but they are rare, suggesting that intensive hominid occupation did not occur or, in the case of Member 1, that durable cultural traces were not left in any abundance by the hominids of that remote time.

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Criteria for the recognition of porcupine involvement are now well established. Signs of porcupine activity may be seen in the bone assemblages from both Members at Swartkrans, but their influence there appears insignificant.

Information on the role of various carnivores as bone-accumulators in African caves is steadily being acquired. In the modern context both spotted (*Crocuta crocuta*) and brown hyaenas (*Hyaena brunnea*) are important, and differences fortunately exist between the natures of their typical accumulations. Remains of both species are found in the two Swartkrans Members, and their involvement in the bone-accumulating process is highly likely. Striped hyaena (*H. hyaena*) fossils are not known from Swartkrans, but recent studies on modern representatives from further north in Africa and Israel suggest that these hyaenas are probably of the greatest taphonomic significance.

Regrettably the hunting hyaenas (*Euryboas* spp.) known from Swartkrans Member 1 and elsewhere are now extinct. They appear to have been cave-frequenting animals and may well have been important bone-accumulating agents.

Several species of cat found as fossils at Swartkrans were probably of great taphonomic significance. They are the leopard (*Panthera pardus*) the false sabre-tooth (*Dinofelis sp*) and the true sabre-tooth (*Megantereon sp.*). In my opinion these cats, particularly the leopards and false sabre-tooths, may have been the major predators of the primates whose remains are so abundant in Member 1.

Evidence of body weights of bovids whose bones are preserved in Member 1 suggest that carnivores of larger prey-adaptation than is typical of leopards were also involved in the predation process. Possible candidates were *Dinofelis, Megantereon* or socially-hunting hyaenas, such as *Euryboas* may have been.

C. *That a number of biases have operated in the process of converting part of a living community into a death assemblage, as is represented by the fossils.*

It is regrettably obvious that a fossil assemblage is but an imperfect shadow of the once-living community from which it was derived. Between life and fossilisation a number of biases have inevitably intervened, each distorting in its own way our picture of the community as it was in life. I will mention three such biases which are clearly discernible in the Swartkrans fossil assemblages.

First, the individual parts of any single skeleton differ greatly in their robusticity and their ability to resist destruction. It is possible to ascribe to each part of a skeleton a "*potential survival rating*" which will indicate how likely that part is to survive as a fossil. Parts such as teeth, distal humeri and calcanii have high potential survival ratings, but the opposite is true of proximal humeri and caudal vertebrae, for example.

Secondly, the skeletons of certain kinds of animal are more robust and therefore more resistant to damage than those of other kinds. By means of controlled experiments it is possible to show that the skeleton of a primate, for instance a baboon, is far more vulnerable to carnivore action than is the skeleton of a bovid of comparable live weight. This fact explains, I believe, the observation that primates are represented by far fewer post-cranial parts at Swartkrans than are bovids.

Thirdly, the differing hunting strategies of various predators introduce inevitable biases to the bone assemblages which may result from the predators' activities. Most owls for instance hunt crepuscular or nocturnal prey, so that purely diurnal species present at the particular time were not included in the resultant fossil assemblage. Biases of a different kind are introduced by the sizes of hunting ranges of the predators involved. A leopard using Swartkrans as a feeding retreat would probably not bring back prey from more than a few hundred metres of the cave's entrance. Hyaenas rearing young in the cave, however, might well travel many kilometres in search of prey or scavenged food.

Finally, I am sure that it is true to say that any particular cave would have its unique problems to exercise the imagination of a taphonomist. The challenge of greatest taphonomic significance at Swartkrans is, I believe, to explain the extraordinarily abundant remains of hominids and baboons in the Member 1 sediment. The characteristically incomplete and damaged nature of these primate fossils suggests strongly that these are food remains of carnivores. But what sort of taphonomic bias was operating during Member 1 times which led to the more frequent addition of primates to the death assemblage than any other group of animals?