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Some new machaerodonts from Makapansgat limeworks

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tine and maxillar, and it extends forwards in a broad arc. In the palatine, there are two pairs of palatine foramina, the anterior pair next to the suture. The nasal canal is completely filled with matrix, but a small portion is seen projecting dorsally; this is probably part of the vomer.

The anterior and posterior portions of the skull are represented by vertical sections through the skull. Anteriorly, the entire section is taken up by the nasal canal, which is bounded ventrally and laterally by the maxillae. Dorsally the nasal canal is covered by the nasal bones. The vomer is seen as a short vertical rod adjoining the maxillae along their median ventral surface. Cutting across the nasal passage horizontally is a large sheet of bone. This is probably the mesmethmoid which in life would have been a vertical longitudinal bone dividing the nasal passage into two halves. The turbinals are unpreserved.

The posterior section cuts vertically through the dorsal cerebral fossa, which is separated from the small olfactory fossa ventrally by horizontal wings of the frontals extending in from the sides of the braincase. The floor of the braincase is formed by the presphenoid, and on the right this is seen to suture with the palatine. Beneath the presphenoid is a small canal, the olfactory chamber of the nasal cavity. This is separated from the lower narial passage by the horizontal wings of the vomer, mentioned above. The large cerebral chamber is divided by a thin median sheet of bone. All these cavities of the skull are filled with a calcareous matrix.

Specimens M259 and M607

These two specimens have been superficially described by Toerien (1954) and were provisionally ascribed to the genus Machaerodus.

They were described in more detail here and, as suggested by Ewer (1956), identified as Dinofelis.

Specimen M259 (fig. 5a) comprises the upper and lower jaw symphysis, with the incisors and all but one of the canines of a large felid. The fragment extends to the posterior extremity of the upper canine alvecli, although the left canine is attached only by the anterior part of its root. Dorsally the premaxillae are arched and curve round the ventral sides of the nares. The mandible, which is firmly attached to the upper jaw is less complete. The ventral part of the symphysis is broken off. On the left, 5 cms of the dorsal part of the ramus is present.

Dentition

All the incisors and canines are present except the left lower canine. Most of the teeth have been broken in some way. The incisors are large, especially I^3. The right $I\frac{2}{2}$, I^3 and the left I_3 are intact - the remaining ones, except the left I^3 have been sliced through vertically, and are represented by sections. The left I^3 is broken at the tip. I^3 is large and caniniform. Internally, the two basal lateral accessory cusps can just be seen. The nature of the internal surfaces of the rest of the incisors is obscured by the amount of hard matrix welding the symphysis together.

The crowns of both upper canines are broken at the tips. The pulp cavities have been invaded by a calcareous matrix which has expanded and cracked the teeth, distorting them. In section they are oval and flattened laterally. The anterior edges are rounded while the posteriors are sharply crested. The crown height of the right canine is calculated to be about sixty millimetres. There are no serrations.

The lower right canine (crown), from the small amount that is missing from the tip, could not have been much longer than 32 mm. In cross section it is elongated antero-posteriorly and curves outwards and backwards. There is one pair of foramina on the symphysis, under each I_2.

Specimen M607 is an almost complete right ramus (fig. 5b). The angle, part of the symphysis containing the canine and incisors, and the tip of the coronoid are missing.

The ramus is thick under the premolars and molar, with a slight lingual depression under the diastema. It widens considerably at the symphysis where the broken surface has exposed the large oval root of the canine. There is no mental process or crest. From what is present of the coronoid process, it was large, but not quite as large as that of modern cats. The masseteric fossa is deep, with a prominent dorsal ledge. Beneath the P_3 and diastema on the labial side are two large mental foramina. On the lingual side there is a large mandibular foramen under the coronoid process.

Dentition

P_3 is reduced but double rooted. There is a distinct cingulum posteriorly and the tooth is wider here than in the anterior region.

P_4 is large and well developed. It has a large main cusp, two accessory cusps of equal size and an additional posterior talonid which is continued lingually into a posterior cingulum. The main cusp has a slight backward pitch.

M_1 is not particularly narrow. The posterior protoconid is only slightly longer than the anterior paraconid and its apex is directed backwards. There is no sign of a metaconid but there is a small

talonid. The protoconid and paraconid are separated by a distinct notch, reminiscent of that seen in modern cats. Laterally the two cusps bear a well-defined wear facet.

None of the teeth is serrated. Most of the diastema is present, and its length indicates that the upper canine was mediumly long. The size of the canine root indicates that it was large and directed laterally.

Specimen M2136

Specimen M2136 (fig 6a) is the anterior half of a right mandibular ramus. It is broken immediately behind the P_4 alveolus. None of the crowns of the teeth is present, and the dorsal portion of the ramus has been sheared off, presenting a section through the roots of the premolars.

The general construction of this fragment compares with sp. M607, although it is slightly larger. The ventral surface of the symphysis is rounded but more angular than in sp. M607. The lateral border is rectangular and the symphysis flat. The diasteme is rather short and the lower canine root large and directed outwards. P^3 is double rooted and with the same oblique position on the ramus as in sp. M607.

The dentition differs from sp. M607 slightly by the larger P_3, although P_4 is the same size. The canine is estimated to have been rather smaller.

The mandible is slimmer beneath the premolars and the ventral border only slightly convex beneath P_4. The two dental foramina have the same position as in the previous specimen, but the anterior one is smaller.

Specimen M8357

Specimen M8357 (fig. 6b) is most of a right mandibular ramus. The portion in front of P_3 is not preserved, and neither is the angle, condyle nor part of the coronoid.

This specimen has been badly cracked and distorted and appears very flattened laterally. However, it can be seen that the coronoid process is not very reduced, the masseteric fossa is deep with a prominent dorsal ledge. and the masseteric foramen is large.

The teeth are not preserved and the alveoli appear laterally flattened, due to the distortion. P_3, however, has the same amount of reduction as that of specimen M607, is double rooted and set at an oblique angle on the ramus.

3.2 The isolated teeth

Specimen M8279

Specimen M8279 is the root and most of the crown of a left upper canine (fig. 7c). It is rather fragmentary and parts of it have been reconstructed in plaster.

The crown is missing about one third from the distal end. However, it must have been long, judging by the length of the root. It is extremely compressed laterally, with sharp anterior and posterior crests. Both bear well-marked serrations. At the level of the alveolus, the crown measures twenty-nine millimetres antero-posteriorly 13,4 millimetres transversely. This gives a diametral index of 0,43. The root tapers evenly.

Specimen M8356

Specimen M8256 is a complete left lower canine (fig. 7a and b). The

crown is conical, recurved, with an oval circumference at the base. The lateral side is convex, the medial side nearly flat. There is a posterior crest and an antero-medial one. Both bear coarse serrations, those on the anterior crest ending about one third of the way from the tip. A minute portion of the tip is broken off.

The root is more than half the length of the entire tooth. It is straight, flat laterally, but convex medially, the sides tapering towards the distal end. In the lateral view, it is truncated rather abruptly at the distal end.

The teeth from Sterkfontein.

Specimen (S.1) is the root and part of the crown of a left upper canine (fig. 7d). It has been badly fractured. The root is oval in section, tapering to a rounded distal end. The anterior border is curved while the posterior border is straight.

In section, the crown is a flattened oval, with sharp anterior and posterior crests. Neither is serrated. It could not be estimated with certainty how long the crown was, but it seemed to be about the length of the root. The degree of lateral flattening at the alveolus is slight.

Specimen (S.2) is most of the crown of a left lower canine and part of the root, (fig. 7e). The tip and a great deal of the lateral portion of the crown is missing, so that it appears sharply conical. The anterior border is curved, and rounded in section. From the portion of the root present it was long and wide antero-posteriorly. It is oval in section.

There is a basal tubercle on the medial side of the crown. From this extends a vertical smooth crest.

This specimen is similar to the single left lower canine from Makapan in the size, shape and the long root. It differs however in the more medial position of the anterior crest, and in the complete lack of serrations.

3.3 Skull with associated post crania

Specimen M8258 (figs. 9, 10a and b) is a rather badly preserved skull that was found attached to breccia block C containing carpal remains. A plan of the association of the two specimens is shown in fig. 8.

The left side of the skull is unpreserved except for the most dorsal portions of the frontal and nasal bones, which have been displaced to the right side. Of the right side, the anterior part of the frontal bone is present, as is the complete nasal, and almost all the premaxilla and maxilla. The ventral part of the maxilla has been sheared off, but part of the upper canine is present, although in an unnatural position due to a major vertical break through the fossil. Posteriorly all that remain are parts of the frontal and jugal outlining the orbit, with their respective processes. Behind this, the skull is unrecognisable, and is simply a mass of fragments embedded in matrix. It was impossible to remove the specimen from the matrix, which was left still attached to the left side. The whole fossil has been flattened laterally and the teeth that are present have been severly cracked and thus expanded.

The anterior portions of both mandibular rami are present, and locked to the skull at the symphysis. They have also suffered distortion so that the left ramus lies parallel and dorsal to the right one. Most of the crown of the right upper canine is

preserved. From what is present of the upper canines, they were moderately long, slightly curved, and with sharp anterior and posterior crests. They also appear to have been compressed laterally prior to fossilization, but have suffered additional compression during burial. There are no serrations.

The right upper incisors and premolars are not preserved. The left premolars have been displaced and are very fragmentary. It appears that this part of the maxilla became detached and reversed both dorso-ventrally and ante-posteriorly so that P^4 is anterior to P^3. The crowns of P^3 and P^4 project at right angles to the left side of the skull, with their roots and shattered pieces of enamel embedded in matrix appearing uppermost. Only the lateral sides of the teeth had been preserved. All that remains of P^3 is the posterior accessory cusp. P^4 is large, with a conical paracone, separated from the metacone by a deep cleft. The metacone is the same length as the paracone. The crown is truncated by its collision onto the upper canine, which has also displaced part of it inwards. The left I_3 and a portion of I_2 are present, but do not show much detail except that they were moderately large. The left lower canine is very cracked and partially obscured by the upper canine, but its absolute size is large.

A broken tooth adheres to the posterior lateral edge of the left upper canine. It is suspected of being one of the displaced upper incisors, but because of its very broken nature, this is not certain. It also seems to be attached to a large fragment of bone projecting onto the mandible at the symphysis. This is again too fragmentary to be recognisable but may possibly be part of a mandible of another individual. The mandibular symphysis belonging to the skull is gently sloping, although the exact angle is obscured. The P^3 on

both sides are present as is the P^4 on the left side. The left P^3 is much smaller than P^4, double rooted, with a prominent main cusp and a smaller posterior accessory cusp. The right P^3 shows a small but distinct anterior tubercle and a cingulum is visible behind the posterior accessory cusp. The P^4 is large, with a prominent conical main cusp, two moderately well developed accessory cusps equal to each other in size, and a well developed posterior cingulum.

The cingulum forms a ledge and could be considered a talonid.

Breccia Block C associated with skull M8358

A plan of the associated between the two specimens is shown in fig. 8. The bones were too brittle and fragile to prepare fully and it was necessary simply to etch them out against the matrix. Nos. 1, 2 and 3 are fragments belonging to the skull. No. 1 is the zygomatic process of the right squamosal, which has become displaced from the rest of the skull. It is very slim for the size of the skull but this may be due partly to compression during burial. On the lateral side it is cracked and has been distorted. At one end, there is what appears to be the glenoid, extended on to No. 3, but it has been badly crushed.

No. 2 is a very thin piece of bone, again very cracked. It may be part of the left side of the skull, since it was lying on the medial side of No. 1, but it is not possible to identify it more specifically.

No. 3 is the posterior end of the right mandibular ramus. It has broken off from the rest of the ramus which is attached to the skull. The part represented seems to be the medial side of the masseteric fossa, but the bone surface has been badly corroded and distorted.

The angle, condyle and coronoid process are missing. The lower part of the ramus is very thick and is probably the lower border of the masseteric fossa.

Nos. 4 to 14 belong to a manus or pes. By their close association with the skull, they are likely to be a manus. All the elements are excessively large. No. 4 is a terminal phalanx. It has the typical shape although it has been rather distorted, and the dorsal surface is broken. At its proximal articulation, the remains of the second phalanx are fixed in place.

Nos. 5 and 6 appear to be metacarpals. No. 6 is very distorted and corroded, but one undamaged side of it is smooth and straight. No. 5 has also suffered much surface corrosion, but the distal condyle can be recognised at one end. The shafts of both specimens are very wide, and they are clearly of a large size. No. 7 is broken, a rather irregular shape, and is possible a carpal.

Nos. 8, 9 and 10 are first phalanges. Their distal ends are missing, but they were obviously large. The proximal facets are of a size corresponding to the metacarpals and the shafts have a wide diameter. No. 11 appears to be the distal end of a second phalanx, and it is also very large. Nos. 12, 13 and 14 are sesamoids associated with the phalanges, and of a size corresponding to the rest of the material. All the above specimens are of a size corresponding to each other, and indicate an exceptionally large paw.

3.4 THE POST CRANIAL SPECIMENS

The two breccia blocks A and B were clearly associated in the deposit, and all the bones belong to a single individual (with the exception of a few doubtful pieces and some rodent remains). The breccia blocks will be described separately. Each bone was numbered on the semi-

prepared breccia for easy reference and these numbers will be referred to in the text. Also associated with this material was a right manus, sp. 16202M, part of a right femur and part of a pelvis. These almost certainly belong to the same individual, and a diagram overleaf shows the distribution of these parts on the skeleton.

There follows a list of the bones, their catalogue number and their corresponding number in the breccia blocks. (All cranial specimens from this locality are catalogued with the 'M' preceeding the number, while the post-cranial specimens are catalogued with the 'M' succeeding the number).

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