Macromammalian faunas, biochronology and palaeoecology of the early Pleistocene Main Quarry hominin-bearing deposits of the Drimolen Palaeocave System, South Africa

Justin W Adams, Douglass S Rovinsky, Andy IR Herries, Colin G Menter

The Drimolen Palaeocave System Main Quarry deposits (DMQ) are some of the most prolific hominin and primate-bearing deposits in the Fossil Hominids of South Africa UNESCO World Heritage Site. Discovered in the 1990s, excavations into the DMQ have yielded a demographically diverse sample of *Paranthropus robustus* (including DNH 7, the most complete cranium of the species recovered to date), early *Homo*, *Papio hamadryas robinsoni* and *Cercopithecoides williamsi*. Alongside the hominin and primate sample is a diverse macromammalian assemblage, but prior publications have only provided a provisional species list and an analysis of the carnivores recovered prior to 2008. Here we present the first description and analysis of the non-primate macromammalian faunas from the DMQ, including all 826 taxonomically identifiable specimens catalogued from over two decades of excavation. We also provide a biochronological interpretation of the DMQ deposits and an initial discussion of local palaeoecology based on taxon representation.

The current DMQ assemblage consists of the remains of minimally 147 individuals from 9 Orders and 14 Families of mammals. The carnivore assemblage described here is even more diverse than established in prior publications, including the identification of *Megantereon whitei*, *Lycyaenops silberbergi*, and first evidence for the occurrence of *Dinofelis* cf. *barlowi* and *Dinofelis* aff. *piveteaui* within a single South African site deposit. The cetartiodactyl assemblage is dominated by bovids, with the specimen composition unique in the high recovery of horn cores and dominance of *Antidorcas recki* remains. Other cetartiodactyl and perissodactyl taxa are represented by few specimens, as are *Hystrix* and *Procavia*; the latter somewhat surprisingly so given their common occurrence at penecontemporaneous deposits in the region. Equally unusual (particularly given the size of the sample) is the identification of single specimens of giraffoid, elephantid and aardvark (*Orycteropus* cf. *afer*) that are rarely recovered from regional site deposits.

Despite the diversity within the DMQ macromammalian faunas there are few habitat- or

biochronologically-sensitive species that provide specific ecologic or age boundaries for the deposits. Recovered species can only support the non-specific, mixed open-to-closed palaeohabitats around Drimolen that have been reconstructed for the other penecontemporaneous South African palaeokarst deposits. The identified *Equus quagga* ssp. specimens recovered from the floor of the current excavation (~-4.5-5m below datum) suggests that most, if not all the DMQ specimens, were deposited after 2.33 Ma. Simultaneously, the identification of *D.* cf. *barlowi* and *L. silberbergi* are consistent with earlier Pleistocene deposits and a pre- 2.0-1.8 Ma deposition for at least some of the DMQ fossil assemblage.

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2 Quarry hominin-bearing deposits of the Drimolen Palaeocave System, South Africa

4 Justin W. Adams[1][#]*, Douglass S. Rovinsky[1][#], Andy I.R. Herries[2,3], Colin G. Menter[3]

9 [1]Department of Anatomy and Developmental Biology, Monash University, Melbourne, Victoria

10 3800, justin.adams@monash.edu; rovinsskyd@gmail.com, +61 03 9902 4280

12 [2]The Australian Archaeomagnetism Laboratory, Dept. Archaeology and History, La Trobe

13 University, Melbourne Campus, Bundoora, Victoria 3086, Australia; a.herries@latrobe.edu.au,

14 +61 03 9479 1392

16 [3]Centre for Anthropological Research, University of Johannesburg, Auckland Park 2006, South

17 Africa, menterc@drimolen.org, +27 011 559 1919

21 [#]Shared first authorship based on equal contributions to the research and manuscript

23 *Corresponding author: justin.adams@monash.edu

26 **Abstract**

28 The Drimolen Palaeocave System Main Quarry deposits (DMQ) are some of the most prolific

29 hominin and primate-bearing deposits in the Fossil Hominids of South Africa UNESCO World

30 Heritage Site. Discovered in the 1990s, excavations into the DMQ have yielded a

31 demographically diverse sample of *Paranthropus robustus* (including DNH 7, the most complete

32 cranium of the species recovered to date), early *Homo*, *Papio hamadryas robinsoni* and

33 *Cercopithecoides williamsi*. Alongside the hominin and primate sample is a diverse

34 macromammalian assemblage, but prior publications have only provided a provisional species

35 list and an analysis of the carnivores recovered prior to 2008. Here we present the first

36 description and analysis of the non-primate macromammalian faunas from the DMQ, including

37 all 826 taxonomically identifiable specimens catalogued from over two decades of excavation.

38 We also provide a biochronological interpretation of the DMQ deposits and an initial discussion

39 of local palaeoecology based on taxon representation.

41 The current DMQ assemblage consists of the remains of minimally 147 individuals from 9

42 Orders and 14 Families of mammals. The carnivore assemblage described here is even more

43 diverse than established in prior publications, including the identification of *Megantereon whitei*,

44 *Lycyaenops silberbergi*, and first evidence for the occurrence of *Dinofelis* cf. *barlowi* and

45 *Dinofelis* aff. *piveteaui* within a single South African site deposit. The cetartiodactyl assemblage

46 is dominated by bovids, with the specimen composition unique in the high recovery of horn

47   cores and dominance of *Antidorcas recki* remains. Other cetartiodactyl and perissodactyl taxa are

48   represented by few specimens, as are *Hystrix* and *Procavia*; the latter somewhat surprisingly so

49   given their common occurrence at penecontemporaneous deposits in the region. Equally unusual

50   (particularly given the size of the sample) is the identification of single specimens of giraffoid,

51   elephantid and aardvark (*Orycteropus* cf. *afer*) that are rarely recovered from regional site

52   deposits.

54   Despite the diversity within the DMQ macromammalian faunas there are few habitat- or

55   biochronologically-sensitive species that provide specific ecologic or age boundaries for the

56   deposits. Recovered species can only support the non-specific, mixed open-to-closed

57   palaeohabitats around Drimolen that have been reconstructed for the other penecontemporaneous

58   South African palaeokarst deposits. The identified *Equus quagga* ssp. specimens recovered from

59   the floor of the current excavation (~-4.5-5m below datum) suggests that most, if not all the

60   DMQ specimens, were deposited after 2.33 Ma. Simultaneously, the identification of *D.* cf.

61   *barlowi* and *L. silberbergi* are consistent with earlier Pleistocene deposits and a pre- 2.0-1.8 Ma

62   deposition for at least some of the DMQ fossil assemblage.

65   KEYWORDS: *Chasmaporthetes*; *Dinofelis*; *Lycyaenops; Megantereon*; *Paranthropus*; *Homo*

75 **Introduction**

77 The Drimolen fossil site was discovered in 1992 during survey of the region for a sinkhole by Dr

78 A.W. Keyser (then with the Geological Survey of South Africa; since 1993 known as the

79 Council for Geoscience, one of the National Science Councils of South Africa) (Figures 1 and 2).

80 During his third site visit a hominin tooth was found from one of the 'Main Pinnacles', which led

81 to ad-hoc calcified sediment collection and mechanical preparation of fossil specimens from

82 1992 to mid-1994. In October 1994, a five-by-five metre alphanumeric grid was erected in the

83 Main Quarry along with three fixed theodolite stations; shortly thereafter excavations into the

84 decalcified material began that led to the recovery of the DNH 7 and 8 *Paranthropus robustus*

85 specimens from the 'Eurydice Pinnacle' (Keyser et al., 2000). From 1995 until 2009, the site was

86 excavated for 10 months out of the year, during which time changes to the grid system (e.g.,

87 numeric) and calcified sediment extraction methods (e.g., feather-and-wedge vs. drilling) were

88 introduced. Although greatly reduced excavation seasons (~6 weeks per year) have been

89 employed from 2010 to the present, this nearly 25-year history of sampling the Main Quarry

90 deposits has led to the recovery of a substantial assemblage of *Paranthropus robustus* and *Homo*

91 sp. remains, as well as non-hominin primate and other faunal remains (Keyser et al., 2000;

92 Gommery, Senut & Keyser, 2002; Lockwood et al., 2007; O'Regan and Menter, 2009; Moggi-

93 Cecchi et al., 2010; Gallagher and Menter, 2011)

95 These excavations into the Main Quarry, and progressive exposure of the Drimolen Palaeocave

96 System, has established that the site consists of a single large cavern in-filled with three main

97 types of sedimentary deposits (speleothem, breccia, siltstone/sandstone) that often grades from

98 one to the other laterally across the exposures (Figure 2; Keyser et al., 2000). The base of the

99 sequence consisted of a thick flowstone speleothem deposit that was extensively mined at the

100 turn of the 20th century. This formed an undulating basal floor onto which all the other deposits

101 and fossil were deposited. This basal speleothem consists of clast-poor layers of flowstone with a

102 sharp contact to the overlying fossil-bearing sediments. As such, it formed a significant time

103 before an entrance formed allowing the clastic deposits to enter the cave.

104

105 In the centre of the Main Quarry a thick clast-supported, fossil-bearing breccia (referred to by

106 Keyser et al. [2000] as the 'Blocky Breccia') occurred that represents the opening and

107 subsequent collapse of a vertical entrance to the cave forming a central debris cone. This is best

108 preserved against the western wall of the cavern where the deposits remain indurated (Figure 2).

109 The eastern part of this debris cone has suffered from collapse due to undercutting by lime

110 miners removing the basal speleothem; as a result, the very eastern part of the Main Quarry was

111 filled with mining debris and removal has accelerated the decalcification of these deposits.

112

113 During phases of flooding, the fine-grained fraction within the blocky breccia was then

114 winnowed to the edges of the cavern to form a series of interstratified siltstone and sandstone

115   deposits (referred to by Keyser et al. [2000] as 'Cave Siltstone'). As a result, these two

116   sedimentological deposits are contemporary and the clast-supported breccia of the central debris

117   cone grades through a matrix-supported breccia and into the laminated siltstone and sandstone

118   deposits towards the edge of the cavern. This exact sequence of formation can be seen at the

119   nearby Wonder Cave active karstic system. The oldest siltstone and sandstone deposits in-filled

120   the southern area of the Main Quarry. As the debris cone began to grow upwards and expand

121   laterally it became less steep and matrix supported breccia became more prevalent. It is possible

122   that at this time the original vertical shaft entrance, that would have initially restricted the access

123   of certain animals to the cave, may have become so in-filled with sediments that entry became

124   more accessible via a shallow talus cone into the fine-clastic sediment floors at the edge of the

125   cavern. The southern area of the Main Quarry had become completely in-filled during this early

126   phase due to the presence of a stepped cave roof, leading to concentrated deposition of the fine-

127   grained siltstone and sandstone in the northern area of the cavern. It is notable that macrofaunal

128   remains have not been recovered from the oldest southern siltstone and sandstone deposits, but

129   are instead recovered either from the northern siltstone and sandstone deposits or from the

130   central talus cone, suggesting that they could have been washed into the cave or that animals

131   inhabiting the cavern stayed in the daylight zone around the entrance. Despite this there is little

132   to suggest that the two periods are separated by any significant time interval, other than a series

133   of thin (<2cm) flowstones forming during the deposition of the northern siltstone and sandstone

134   deposits.

135

136   Despite the decades of excavation into the Drimolen Palaeocave System, to date only a basic

137   listing of macromammlian taxa recovered from the first years of Main Quarry deposits (Keyser

138 et al., 2000) and a more comprehensive analysis of the Order Carnivora (O'Regan and Menter,

139 2009) have been previously published. This analysis provides the first primary description of the

140 entire macromammalian (e.g., all Orders other than Macroscelidea, Insectivora, and Rodentia

141 [exc. Family Hystricidae]) faunal assemblage excavated from the Drimolen Main Quarry since

142 palaeontological sampling began in the early 1990s. We only present data on the fossil

143 specimens attributable to at least Order as the taxonomically non-diagnostic remains from the

144 deposits form the basis for a separate study reconstructing the taphonomy of the Main Quarry

145 deposits. As we note below, to avoid unnecessary duplication of previously published data we

146 also do not present primary descriptions on the previously described Main Quarry carnivores

147 (O'Regan and Menter, 2009) or non-hominin primates (Nieuwoudt, 2014).

148

149 **Materials and Methods**

150

151 The Drimolen Main Quarry (DMQ) fossil assemblage is curated in the Evolutionary Studies

152 Institute at the University of the Witwatersrand and consists of 1380 specimens derived from

153 excavation of decalcified sediments and processed calcified sediment blocks (Keyser et al.,

154 2000). Since the start of the excavations, the Drimolen Main Quarry decalcified material has

155 been excavated in one-by-one meter (or smaller) squares in 10 cm increments and all material

156 has been sieved through three different mesh sizes (the smallest being ~1 mm). The sieving

157 regimen, though, has undergone some changes over the years with wet sieving of the smallest

158 mesh size from 1997 along with all these "fines" being sorted at a sorting table and not just

159 quickly "over the sieve". Since 2014, we have also wet sieved the medium fraction via a water

160 pump and all the "fines" are now sorted in the lab over the following year. Prior to 2003, the

161 only provenience for the decalcified material was by its grid square and 10cm level boundaries.

162 Since 2003, a total station theodolite has been permanently used at Drimolen allowing

163 identifiable specimens or fragments larger than 2 cm to be directly piece-plotted in reference to a

164 three-dimensional model of the deposits created via a Trimble laser scanner in 2012 (via the

165 University of Cape Town Zamani Project) and again in 2015 with a Leica Nova MS50

166 multistation (from La Trobe University).

167

168 All calcified breccia blocks have been removed from the Main Pinnacles through standard

169 feather-and-wedge techniques. Most of the calcified material was removed in the 1990s with no

170 drilling of breccia after this period. Prior to 1997, this calcified material was either surveyed with

171 a theodolite (without electronic distance meter) or at the very least the Pinnacle number or plane

172 table location was recorded on the block. Since 1997, all calcified blocks were only sampled

173 when a total station was available and were surveyed with at least six survey points. Breccia

174 blocks within a decalcified excavation square were also recorded in this manner. The only other

175 sampling of calcified material has been removing blocks that are decalcifying from the 'Eurydice

176 Pinnacle'. This material is prepared mechanically until close to the bone and then the reduced

177 block is prepared via acetic acid processing.

178

179 For this analysis we only considered specimens preserving sufficient morphology to be identified

180 at least to Order level and are not presenting data on indeterminate mammalian elements or

181 fragments. We have also not undertaken an analysis of the 554 primate craniodental and

182 postcranial specimens, as this collection has recently been partially analysed (see Nieuwoudt,

183 2014) and a full publication of this substantial assemblage will be forthcoming. We have also not

184 duplicated the primary description of the Main Quarry carnivores of O'Regan and Menter

185 (2009), but we have re-evaluated the previously published *Dinofelis* and *Chasmaporthetes*

186 specimens because of their bearing on biochronological interpretations and present data on

187 carnivore specimens catalogued since publication of that study.

188

189 The taxonomic and/or element attributions were made in direct reference to the extant mammal

190 skeletal materials of the Department of Vertebrates (Large Mammal, Small Mammal and

191 Archaeozoology Sections) collections of the Ditsong National Museum of Natural History

192 (Pretoria, South Africa), previously described fossil specimens in the Plio-Pleistocene Section of

193 the Ditsong Museum and Evolutionary Studies Institute of the University of the Witwatersrand

194 (Johannesburg, South Africa). All measurements of specimens reported here were taken using

195 Mitutoyo 150 mm calipers with a direct digital input, including dental (**MD**: mesiodistal, **BL**:

196 buccolingual; taken at the level of occlusion unless otherwise noted) and horn core metrics (**AP**:

197 anteroposterior, **ML**: mediolateral; taken at the level of the pedicle unless otherwise noted).

198 Three-dimensional (3D) surface scans were captured with an Artec Spider (Artec Group,

199 Luxembourg) to facilitate morphological comparisons of some of the specimens following

200 methods described in Adams et al. (2015). In some cases, external specimens were examined

201 using a Dino-Lite Edge AM4815ZTZ microscope (AnMo Electronics Corp.).

202

203 In order to facilitate discussion and integrate the DMQ assemblage within the broader South

204 African late Pliocene and Pleistocene fossil record, we draw from the extensive published

205 literature on the well-described penecontemporaneous South African fossil deposit faunal

206 assemblages (e.g., Bolt's Farm, Gondolin, Haasgat, Kromdraai, Swartkrans, Sterkfontein). To

207   facilitate comparisons of the proportion (based on the minimum number of individuals, MNI) of

208   mammals in the DMQ deposits relative to other South African assemblages we have also

209   calculated the McIntosh evenness statistic (McIntosh, 1967). We would note, however, that such

210   direct comparisons of faunal assemblages assume that the taphonomic histories of these deposits

211   (from predepositional processes and time-averaging to excavation/sampling methodologies) have

212   not introduced substantial biases in the faunal representation or abundance; an assumption that

213   may not always be warranted as each deposit has an idiosyncratic depositional history (see

214   discussions in Brain, 1981; Reed, 1996; Pickering, 1999; Adams, 2006). As a comprehensive

215   taphonomic analysis of the DMQ assemblage is still ongoing, we will not address the role

216   taphonomic processes had in shaping the faunal presence/absence/abundance with the Main

217   Quarry deposits at this time. We also largely do not consider the more recently described faunal

218   assemblages (e.g., Motsetse [Berger and Lacruz, 2003], Hoogland [Adams et al., 2010], Malapa

219   [Dirks et al., 2010; Kuhn et al., 2012]) as the faunal data from these localities is based on

220   extremely small sample sizes and generally limited to simple listings without primary

221   descriptions or supporting data.

222

223   **Results**

224

225   The current listing of identified non-hominin specimens (number of individual specimens, NISP;

226   MNI) from the Drimolen Main Quarry is provided in Table 1, including previously published

227   primate specimens described in Nieuwoudt (2014) and carnivore specimens described in

228   O'Regan and Menter (2009).

229

230   **Systematic Palaeontology**

231

232   Order CARNIVORA Bowditch, 1821

233   Family FELIDAE Batsch, 1788

234

235   Subfamily MACHAIRODONTINAE Gill, 1872

236

237   Genus DINOFELIS Zdansky, 1924

238   Type species *Dinofelis abeli* Zdansky, 1924

239

240   *Dinofelis* cf. *barlowi* Broom, 1937

241

242   **Referred specimens.** DN 2791, right partial maxillary canine.

243

244   **Description.** This single partial canine is the first specimen from the site to be considered

245   comparable to *Dinofelis barlowi* (Figure 3A). The canine exhibits greater transverse crown

246   compression than present in pantherines like extant and contemporaneous *Panthera pardus*

247   Linnaeus, 1758 canines from Swartkrans Member 1 (e.g., SK 349 [0.77], SK 354 [0.75]) (Table

248   3; Figure 4). The size and transverse crown compression of DN 2791 is consistent with the

249   machairodonts *Dinofelis piveteaui* Ewer, 1955a KA 61 type specimen (0.59; BL: 12.12 mm /

250   MD: 20.48mm) and *Dinofelis barlowi* BF-55 22 specimen (0.59; BL: 14.52 mm / MD: 24.54

251   mm). In contrast to the canines of the KA 61 *D. piveteaui* specimen, the DN 2791 specimen is

252   both more curved from root to crown, more oval in cross-section, and lacks the well-developed

253   distal carina. The DN 2791 specimen is, however, identical to BF-55 22 in root-to-crown

254   curvature, the ovoid cross-sectional shape, and the development of the mesial and distal carinae.

255   Based on these comparisons we provisionally attribute the canine to *D.* cf. *barlowi*. We discuss

256   the significance of this novel specimen relative to the previously published DMQ *Dinofelis* aff.

257   *piveteaui* craniodental and postcranial specimens (O'Regan and Menter, 2009) below.

258

259

260   Genus MEGANTEREON Croizet and Jobert 1828

261   Type species *Megantereon cultridens* Cuvier, 1824

262

263   *Megantereon whitei* Broom, 1937

264

265   **Referred specimens.** DN 976, left partial P4; DN 3254, left mandibular symphysis and corpus

266   with partial canine.

267

268   **Description.** Two specimens represent the machairodont *Megantereon whitei* from the Drimolen

269   Main Quarry deposits. The DN 976 left P4, while broken and reglued with slight distortion on

270   the lingual aspect, preserves part of the protocone, paracone and metastyle (Figure 3B; Table 2).

271   The protocone is extremely small and grades smoothly into the upright paracone. There is a deep

272   notch separating the paracone and bulbous metacone, and a distinct notch on the metastyle. This

273   morphology is shared with the KA 64 *Megantereon whitei* P4 to the exclusion of other

274   machairodonts (e.g., *Dinofelis piveteaui, Dinofelis barlowi*), similarly-sized extant felids (e.g.,

275 *Panthera pardus*, *Acinonyx jubatus* Schreber, 1775), or the indeterminate Main Quarry felids

276 (DN 530, 4300, 5498) described below.

277

278 The DN 3254 left partial mandible preserves part of the symphysis and alveolus for the i1-i3, the

279 canine alveolus with part of the canine root, and the diastema (Figure 3C). Although this

280 specimen preserves the anterior portion that does not overlap other South African *M. whitei*

281 mandibles (e.g., KA 64, TM 856, STS 1588; Ewer, 1955a; Turner, 1987a), several

282 morphological features align the specimen with *M. whitei*; the most diagnostic of these features

283 is the presence of a mandibular flange on the anterolateral border of the corpus adjacent to the

284 canine alveolus. The root of the canine indicates the tooth was small (length: 12.5, breadth: 7.1)

285 and consistent with other African and Eurasian *Megantereon* specimens (Palmqvist et al., 2007).

286 Finally, the diastema is sharply margined and elongated given the absence of any premolar

287 alveolus despite the preserved length of the corpus.

288

289

290   Felidae gen. et sp. indet.

291

292 **Referred specimens.** DN 530, right P4; DN 558, left proximal ulna; DN 2236, terminal phalanx;

293 DN 2701, left partial mandible; DN 2937, indet. maxillary incisor; DN 3291, right calcaneus;

294 DN 4300, right P4 (probable antimere to DN 5498); DN 4354, two associated indet. mandibular

295 incisors; DN 4590, right partial astragalus; DN 5498, left P4 (probable antimere to DN 4300).

296

297   **Description.** A small collection of carnivore craniodental and postcranial specimens are

298   attributable to the Family Felidae but are not considered sufficiently diagnostic to attribute to

299   genus or species. The DN 558 left proximal ulna preserves part of the olecranon process and

300   articular surface and is derived from a large, *Dinofelis*-sized felid but is too damaged to

301   confidently attribute. Also likely derived from a larger felid is the DN 3291 partial calcaneus and

302   DN 4590 partial astragalus, with the latter similar to the previously described DN 2149b *D*. aff.

303   *piveteaui* astragalus (O'Regan and Menter, 2009: 338). In contrast the DN 2236 phalanx is from

304   a smaller felid species that appears slightly larger than extant caracal (*Caracal caracal* Schreber,

305   1776) and preserves a robust volar surface. The DN 2937 maxillary incisor is tall, pointed, and

306   distinctly tricusped, preserving parts of two discrete lingual accessory cusps and is consistent

307   with derived machairodont incisors (e.g., BF-55 23 *D. barlowi*, KA 61 *D. piveteaui*, KA 64

308   *Megantereon whitei*; Biknevicius, Van Valkenburgh & Walker, 1996; Christiansen and

309   Adolfssen, 2007); the similarly-shaped DN 4354 mandibular incisors are also likely derived from

310   a machairodont felid, perhaps the same individual, given their shared size and distinct

311   morphology.

312

313   Four of the indeterminate felid craniodental specimens may ultimately be attributable below the

314   level of Family with additional analysis beyond this primary description. The DN 2701 left

315   mandible preserves the posterior portions of the corpus, including gonion and the condylar and

316   coronoid processes. The masseteric fossa is deep and exhibits robust scarring both dorsal and

317   ventral to the margins. The specimen is much smaller than *D. barlowi* (BF-55 23) and *D.*

318   *piveteaui* (KA 62, KA 63) mandibular remains, but similar in size to both *M. whitei* (KA 64, STS

319   1588) and *P. pardus* (extant comparative and SK 349) mandibles. However, in contrast with

320   extant *P. pardus* mandibles (and SK 349) the DN 2701 coronoid process is shorter, narrower

321   anteroposteriorly, and less robust. In addition, the DN 2701 gonion exhibits less lateral flare and

322   the condyle is more robust and angled relative to the axis of the corpus. The DN 2701 coronoid

323   process is also smaller and less robust than that of the KB 5224b *M. whitei* mandible from

324   Kromdraai B (Turner, 1987a), but shows a similar condylar morphology to both the KB 5224b

325   and KA 64 specimens. Unfortunately, this region is poorly preserved or absent in other South

326   African *Megantereon* mandibles to assess potential variability in coronoid process morphology

327   that may eventually provide for a more confident attribution of the DN 2701 specimen.

328

329   The DN 530, 4300 and DN 5498 maxillary fourth premolars all preserve similar cusp

330   morphologies (DN 4300 and DN 5498 are probable antimeres based on shared morphology and

331   spatial position in the deposits) and are likely derived from the same felid species (Figure 5A).

332   The DN 530 specimen exhibits damage to the crown elements, and the DN 5498 P4 was broken

333   in three places and reglued; however, the latter retains some of the maxillary alveolar bone

334   including the alveolus for the M1, which indicates a robust, ovoid and possibly double-rooted

335   M1 in life. All of these specimens exhibit weakly-developed protocones that grade smoothly into

336   the paracone, and a deep cleft dividing the paracone and metastyle. They are all larger than

337   extant *Acinonyx jubatus* and *Panthera pardus* (comparative measurements in Turner, 1984;

338   Table 2) and also differ in protocone size (e.g., more developed than in *A. jubatus*, less separated

339   from the paracone and more distally positioned than in *P. pardus*). None of these specimens can

340   be accommodated into *Dinofelis* based on their size and morphology of the parastyle and

341   metastyle (Table 2). The closest metric and morphological match for these Main Quarry

342   specimens is the KA 64 *Megantereon whitei* P4; however, the DN specimens exhibit a parastyle

343   more distinct from the paracone, a more rudimentary ectostyle, no buccolingual pinching of the

344   metastyle, and a flared posterior lip of the metacone (Figure 5A). Lacking a strong

345   morphological match for these specimens, we have deferred a more specific taxonomic

346   attribution of the specimens pending further analysis.

347

348

349   Family HYAENIDAE Gray, 1821

350

351   Genus LYCYAENOPS Kretzoi, 1938

352   Type species *Lycyaenops rhomboideae* Kretzoi, 1938

353

354   *Lycyaenops silberbergi* Broom in Broom and Schepers, 1946

355

356   **Referred specimens.** DN 974, right P3.

357

358   **Description.** A primary description of the DN 974 specimen was provided in O'Regan and

359   Menter (2009), although we differ in treating the DN 974 specimen as a right P3 rather than a

360   right P2 based on size and morphology (Figure 5B; Table 3). In the original description,

361   O'Regan and Menter (2009: 343-344) allocated DN 974, and the DN 404 partial cranium, to

362   *Chasmaporthetes nitidula* Hay, 1921 based on dental metrics and interpretation of mesial

363   accessory cusp and P4 morphology relative to the Swartkrans Member 1 *C. nitidula* specimens

364   (specifically SK 305, 306, and 307) and previously published descriptions by Broom (1948) and

365   Ewer (1955b).

366

367   In contrast to the prior taxonomic attribution, the preserved morphology of the DN 974 specimen

368   is most consistent with the type specimen and other African specimens of *Lycyaenops*

369   *silberbergi*. The DN 974 right third premolar preserves a tall paracone and a large distal

370   accessory cusp, but no mesial accessory cusp and only a modest mesial cingulum. The crown is

371   rectangular in outline, has a distally-shifted lingual shelf well-separated from the paracone, and

372   the paracone is separated from the distal accessory cusp by a distinct 'waist', particularly well-

373   developed on the labial aspect. This morphology is shared with the *L. silberbergi* P3 type (STS

374   130) and other specimens from Sterkfontein Member 4 (STS 127, 130, 135; SF 369/372,

375   383/373, 408) and the *Lycyaenops* cf. *L. silberbergi* from Laetoli (NHM AS 7.VI.35, LAET 75-

376   494) (Turner, 1986, 1990; Werdelin and Dehghani, 2011). It differs from the *C. nitidula* P3s

377   from Swartkrans Member 1 (SK 305, 306, 309, 312, 313) and Member 3 (SKX 29205) in the

378   development of the strong waist on the labial aspect and generally in mesial accessory cusp

379   morphology (Ewer, 1955b; Brain, 1981; Turner, 1993). We echo prior publications that there is

380   some variability in mesial accessory cusp expression across *C. nitidula* maxillary premolars (e.g.,

381   Brain, 1981: 234 'type A, primitive' and 'type B, advanced'; Werdelin and Peigné, 2010);

382   however, only SK 305 and 306 preserve a more reduced mesial accessory cusp (the former is

383   damaged in this region) and both have more developed mesial cusps than that seen on DN 974.

384   As noted by O'Regan and Menter (2009) the DN 404 dentition is damaged, but the P3 has a

385   distinctly oval profile and smooth labial contour; the mesial and lingual aspects of the crown are

386   somewhat crushed and offset, prohibiting confident morphological assessment but likely

387   exhibited a modest mesial accessory cusp (and is closely resembling the 'type A, primitive'

388   Swartkrans Member 1 SK 306 partial maxilla).

389

390

391   Hyaenidae gen. et sp. indet.

392

393   **Referred specimens.** DN 2864, partial right scapula; DN 2973, partial right P4; DN 3281,

394   partial right P2.

395

396   **Description.** In addition to the four indeterminate hyaenid craniodental and postcranial

397   specimens described by O'Regan and Menter (2009), three further elements can be attributed to

398   the family. The DN 2864 scapula preserves a very large infraglenoid tubercle relative to the size

399   of the preserved glenoid fossa and is derived from hyaenid smaller than extant *Parahyaena*

400   *brunnea* Thunberg, 1820. The DN 2973 right P4 preserves the complete protocone and lingual

401   aspect of the anterior accessory cusp and paracone with little occlusal wear. There is some

402   buccolingual swelling on the paracone that is shared with extant *P. brunnea* P4s and the SK 327

403   *P. brunnea* P4 from Swartkrans Member 1 (although smaller than the latter), and there is no

404   evidence for buccolingual compression or a ridge leading to the trigon basin as in *Crocuta*

405   *crocuta*. This specimen, along with the DN 2321 P4 fragment described by O'Regan and Menter

406   (2009: 344), support the occurrence of a hyaenid individual distinct from *Lycyaenops* and

407   *Chasmaporthetes* in the Main Quarry deposits. In contrast, the DN 3281 right P2 preserves the

408   anterior margin of the crown and half of the anterior root that lacks the cingulum distinctive for

409   *P. brunnea* dentition. The specimen preserves strong labial ridging and a flattened lingual aspect,

410   and is too buccolingually expanded to represent *Chasmaporthetes* or *Lycyaenops*. The closest

411   extant morphological match is *Crocuta crocuta*; minimally suggesting an additional hyaenid

412   distinct from *L. silberbergi, C. nitidula,* and the DN 2973/2321 individuals.

413

414

415   Order CETARTIODACTYLA Montgelard et al., 1997

416   Family BOVIDAE Gray, 1821

417

418   Tribe ALCELAPHINI de Rochebrune, 1883

419

420   Genus CONNOCHAETES Lichtenstein, 1814

421   Type species *Connochaetes gnou* Zimmermann, 1780

422

423   *Connochaetes* sp.

424

425   **Referred specimens.** DN 704, left maxillary third molar; DN 1111a, right maxillary second

426   molar.

427

428   **Description.** Only two of the identifiable alcelaphin specimens represent the genus

429   *Connochaetes* in the Main Quarry sample. The DN 704 third molar, derived from decalcified

430   sediments, is a complete crown (ML: 29.80 mm, BL: 19.02 mm) that exhibits moderate occlusal

431   wear. The DN 1111a molar is also a complete crown (ML: 25.47 mm) with moderate occlusal

432   wear but is set within a partially mechanically processed aggregation of indeterminate

433   postcranial fragments. As isolated teeth the specimens cannot be confidently attributed below the

434   generic level. Both specimens are consistent in cusp morphology, central cavity complexity and

435   overall size with extant comparatives and fossil *Connochaetes* sp. specimens from Swartkrans

436   Members 1 Hanging Remnant (e.g., SK 2482, 3008, 3102, 14120x) (linear metrics in Vrba,

437   1976).

438

439

440   Genus DAMALISCUS Sclater and Thomas, 1894

441   Type species *Damaliscus dorcas* Pallas, 1766

442

443   *Damaliscus* sp.

444

445   **Referred specimens.** DN 2790, right horn core; DN 4778, right horn core.

446

447   **Description.** Two partial right horn cores, representing two adult individuals, are attributed here

448   to the genus *Damaliscus*. The most complete of the cores, DN 2790, preserves the pedicle

449   (infiltrated by an extensive sinus) to approximately ¾ of the body of the core, which exhibits a

450   small amount of torsion approaching the broken margin (Figure 6A). The base of DN 2790 core

451   is mediolaterally compressed (AP: 35.25 mm, ML: 26.34 mm) and there is a deep medial groove

452   on the body. The DN 4778 specimen preserves the body of the core in two articulating pieces,

453   with a third associated fragment lacking a clear contact point. While mechanical preparation

454   damage to DN 4778 prohibits confident metric comparison it exhibits analogous mediolateral

455   compression to the DN 2790 specimen.

456

457   Both the DN cores exhibit similar size, curvature and mediolateral compression to extant

458   *Damaliscus dorcas* comparative specimens and the SK 14206 specimen attributed to *Damaliscus*

459   cf. *dorcas* by Vrba (1976) (ML: ~24 mm). Both Main Quarry specimens contrast with previously

460   described *Damaliscus niro* Hopwood, 1936 horn cores (including the Swartkrans Member 2

461   specimen SK 2862) in size (e.g., SK 2862, AP: ~44 mm, ML: ~36 mm; Vrba, 1976; published

462   metrics from Olduvai and Cornelia in Gentry and Gentry, 1978), the onset of torsion and the

463   absence of transverse ridging (see also Cooke, 1974; Gentry, 2010). Although these two

464   specimens are morphologically close to *D. dorcas*, we agree with Gentry (2010: 786) that a

465   comprehensive revision of smaller *Damaliscus* from Pleistocene localities is critical before

466   attributing specimens like the Main Quarry horn cores to a species within the genus.

467

468

469   Genus MEGALOTRAGUS van Hoepen, 1932

470   Type species *Megalotragus priscus* Broom, 1909

471

472   *Megalotragus* sp.

473

474   **Referred specimens.** DN 748a, right M2; DN 748b, right M3; DN 856, left M2 (?); DN 4807,

475   left M2.

476

477   **Description.** Four isolated alcelaphin maxillary molars exhibit dental dimensions that exceed

478   extant *Connochaetes* comparatives with analogous occlusal wear and are consistent with fossil

479   specimens attributed to the extinct genus *Megalotragus*. The two associated right molars (DN

480   748a, b) preserve complete crowns (DN 748a ML: 27.90 mm, BL: 19.20 mm; DN 748b ML:

481   36.02 mm, BL: 19.41 mm) and moderate-heavy occlusal wear (Figure 6B). Both DN 4807 and

482   DN 856 are left M2s (with the DN 856 position in the toothrow only tentative) with moderate

483   occlusal wear. While DN 4807 is missing the lingual enamel surface and is somewhat distorted,

484   DN 856 preserves a nearly complete probable M2 crown (ML: 31.64 mm, BL: 24.42 mm) (with

485   regluing and minor enamel damage). All four of these specimens are directly comparable in size

486   and cusp morphology to *Megalotragus* maxillary remains from Swartkrans Member 1 Hanging

487   Remnant (e.g., SK 2245, 2432, 3031) and Member 2 (e.g., SK 14120, 14218) (linear metrics in

488   Vrba, 1976).

489

490

491   Alcelaphini gen. et sp. indet.

492

493   **Referred specimens.** DN 3, left deciduous P3; DN 41, left maxillary molar; DN 42, left

494   maxillary molar (associated with DN 41); DN 82, left M3; DN 90, left deciduous P3; DN 255,

495   horn core fragment; DN 259, right m1; DN 309, left M1 or M2; DN 446, right m1; DN 475, right

496   deciduous p4; DN 529, right mandible with deciduous p3-p4; DN 719, right P3; DN 722, right

497   m1 or m2; DN 831, right (?) horn core fragment; DN 837, mandible fragment; DN 863, cranial

498   fragment; DN 878, horn core fragment; DN 1001, left (?) horn core fragment; DN 1006, right

499   deciduous p3; DN 1007, left m3; DN 1013, right horn core fragment; DN 1015, left mandible

500   with deciduous p2-p4; DN 1021, right P3; DN 1025, deciduous P4; DN 1026, left m1 or m2; DN

501   1043, horn core fragment; DN 1061, left M2; DN 1065, right deciduous p3; DN 1099, left (?)

502   horn core fragment; DN 1143, left mandible with deciduous p2-p4; DN 1156, indet. side M2 or

503   M3; DN 2053, horn core pedicle fragment; DN 2157, right M1 or M2; DN 2161, horn core tip

504   fragment; DN 2168, tooth fragment; DN 2854, right m3; DN 2992, left mandibular molar

505   fragment; DN 4321, horn core fragment; DN 4466, right deciduous p4; DN 4514, right

506   deciduous p4; DN 4526, left m3; DN 4647, molar fragment; DN 4653, left mandible with p3-p4;

507   DN 4779, right M3; DN 4780, left m3.

508

509   **Description.** Because of either incomplete preservation and/or the metric and morphological

510   overlap in the isolated dentition of extant and extinct alcelaphin genera and species, a total of 45

511   Main Quarry specimens could not be confidently attributed below the level of the Tribe. Within

512   this sample, 11 specimens (DN 259, 529, 722, 863, 878, 1099, 1156, 2157, 2161, 2992, and

513   4653) are derived from minimally four larger size class III individuals (e.g., within the size range

514   of extant *Connochaetes* or larger); all adults excepting DN 529, which is an extremely young

515   individual with the deciduous premolars just erupting. The remaining specimens are derived

516   from minimally 9 larger class II and smaller class III alcelaphin individuals (e.g., within the size

517   range of extant *Damaliscus* and *Alcelaphus*), including at least seven immature individuals

518   retaining their deciduous dentition (e.g., DN 1015; Figure 6C).

519

520   At present we include in this group five partial horn cores that may ultimately be attributable to

521   the generic or specific level; however, the paucity of horn cores from penecontemporanous South

522   African fossil deposits (particularly relative to the eastern African record) limits our ability to

523   confidently diagnose the specimens. The DN 4321 horn core exhibits a very large sinus within an

524   expanded pedicle, but supporting a very compressed core body that somewhat resembles the

525   morphology of extant *Sigmoceras lichtensteinii* Peters, 1849 (alt. *Alcelaphus buselaphus*

526 *lichtensteinii sensu* Gentry, 2010; Kingdon and Hoffman, 2013b). DN 1043 is a left, likely

527 immature horn core (AP: 39.31 mm) that is derived from a smaller alcelaphin and somewhat

528 resembles the immature cores of extant *Damaliscus lunatus* Burchell, 1823 as well as the SK

529 14008 indeterminate bovid horn core from the Member 1 Hanging Remnant.

530

531 The three remaining horn cores (DN 255, 381, and 1013) appear to exhibit the same morphology

532 and are likely derived from the same alcelaphin species. The most complete of these, DN 1013,

533 is a ~10 cm portion of a right horn core pedicle and body (Figure 6D). The base of the horn core

534 lacks bossing as in extant *Alcelaphus* or *Connochaetes*, and the strong anticlockwise torsion

535 eliminates attribution to extant *Damaliscus* (as well as the Swartkrans Member 1 SK 3211b

536 *Numidocapra porrocornutus* Vrba, 1971 specimen, and *Parmularius braini* Vrba, 1977 or

537 *Damaliscus gentryi* Vrba, 1977 specimens from Makapansgat Member 3). Amongst the

538 previously described alcelaphin fossil horn cores, the closest comparative specimen is the SK

539 14183 *Beatragus* sp. Heller, 1912 from Swartkrans Member 2 (Vrba, 1976). When oriented

540 relative to SK 14183, DN 1013 exhibits features previously used by Vrba (1976) when

541 attributing the SK specimen to *Beatragus*: anteroposterior flattening of the core ~3cm above the

542 base, anticlockwise torsion, a modest mesial keel, foramina along the anterolateral border, and

543 slight swelling on the posterolateral aspect (which is compromised by surface damage) that may

544 indicate the origin of a posterolateral keel. We note, however, that the DN 1013 specimen is

545 smaller (AP: 37.78 mm, ML: 45.35 mm) than the SK 14183 *Beatragus* specimen (AP: 45.15

546 mm, ML: 51.18 mm) and the torsion is more exaggerated; potentially reflecting ontogenetic,

547 demographic or phylogenetic differences.

548

549

550   Tribe ANTILOPINI Gray, 1821

551

552   Genus ANTIDORCAS Sundevall, 1847

553   Type species *Antidorcas marsupialis* Zimmermann, 1780

554

555   *Antidorcas recki* Schwarz, 1932

556

557 **Referred specimens.** DN 224, left adult male horn core; DN 879, left male horn core; DN 884,

558 right immature male horn core; DN 890, right adult male horn core; DN 938, left adult female

559 horn core; DN 990, right (?) immature male horn core; DN 995, left adult female horn core; DN

560 1014, right sub(?)adult female horn core; DN 1022, left adult male horn core; DN 1048, indet.

561 side female horn core; DN 1055, right (?) immature male horn core; DN 1058, left sub(?)adult

562 male horn core; DN 1060, right adult male horn core; DN 1068, left adult male horn core; DN

563 1071, left sub(?)adult male horn core; DN 2483a left adult female horn core; DN 2483b right

564 adult female horn core; DN 2789, indet. side male horn core; DN 3033, indet. side female horn

565 core; DN 3294, right immature male horn core; DN 4438, right adult female horn core; DN

566 4690, left immature male horn core (possible antimere of DN 884); DN 4698, indet. side female

567 (?) horn core; DN 4777, right male horn core; DN 4796, left adult female horn core.

568

569 **Description.** At present, this collection of 25 *Antidorcas recki* horn core specimens from at least

570 16 individuals is the largest described sample for the species from the Cradle (and outside the

571 Olduvai Bed deposits) (Gentry, 1966; Gentry and Gentry, 1978; Cooke, 1996). It is also the most

572   demographically diverse from the South African deposits, with minimally eight males (three

573   adult, 2 probable subadult, 3 immature) and eight females (seven adult, 1 probable subadult)

574   recorded in the sample.

575

576   The morphology of the horn cores largely conform to the description of male and female *A. recki*

577   specimens from Olduvai (Gentry, 1966; Gentry and Gentry, 1978) and Bolt's Farm Pit 3 (Cooke,

578   1996) (and contrasts with extant *Antidorcas marsupialis* horn cores) in the vertical rise of the

579   horn core from the sinus-filled pedicle, degree of mediolateral compression, strong posterior

580   angulation within the short body, and a lack of lateral divergence or torsion (Figure 7A and 7B;

581   Table 4). The adult and immature male DN specimens contrast with those of *Gazella vanhoepeni*

582   Wells and Cooke, 1956 from the Makapansgat Member 3 deposits (e.g., M 412, 415, 2224, 2717,

583   8245, 8384, 9006, 9026) in the less pronounced mediolateral compression, core body size, and

584   the sharper posterowards curvature in the core (Figure 7A). We do note, however, that none of

585   the male DN horn cores exhibit the strong transverse ridging present on the Bolt's Farm Pit 3

586   male cranium (UCMP 69521), which aligns the DN specimens with some of the noted *A. recki*

587   variants from Olduvai and Peninj described by Gentry and Gentry (1978: 429). The substantial

588   sample of female *A. recki* horn core specimens in the Main Quarry sample provides further

589   evidence for the presence of strong sexual dimorphism in this skeletal feature within the species

590   (Cooke, 1996). The DN female cores are substantially smaller, straighter, and exhibit a far more

591   rounded cross-section than the male counterparts (Figure 7B); consistent with the morphology of

592   the Bolt's Farm Pit 3 UCMP 80168 and 80169 specimens (Cooke, 1996; Table 4).

593

594   *Antidorcas* cf. *recki*

595

596 **Referred specimens.** DN 140, right indet. maxillary molar; DN 175, right m1 or m2; DN 308,

597 right m3; DN 401, left P4; DN 447, right m1; DN 989, right P3; DN 1002, right mandible with

598 p4-m2 (associated with DN 2283); DN 1034, right m1 or m2; DN 1054, right M1 or M2; DN

599 1059, indet. side male (?) horn core; DN 1115, right immature horn core; DN 1116, right m3;

600 DN 1135, left P4; DN 2175, indet. side m1 or m2; DN 2270, left mandible with p4 and m2; DN

601 2271, right P4; DN 2283, right m3; DN 2307, right immature horn core; DN 2328, left p4; DN

602 2554, left M2; DN 2614, right mandible with deciduous p2-p4 and m1-m2; DN 3009, left P3;

603 DN 3287, right m2; DN 3346, left m1 or m2; DN 4185, right M2; DN 4290, right m3.

604

605 **Description.** In addition to the attributed *Antidorcas recki* horn cores, a collection of 26

606 *Antidorcas* craniodental specimens have also been recovered from the Main Quarry deposits.

607 This sample of isolated teeth display similar crown morphology with other previously attributed

608 *Antidorcas recki* dentition from Bolt's Farm (see above; Cooke, 1996), Kromdraai A (e.g., KA

609 964B, 1002, 1111, 1093) and dissimilar to both extant *Antidorcas marsupialis* Zimmerman, 1780

610 and the hypsodont *Antidorcas bondi* Cooke and Wells, 1951 specimens from Swartkrans

611 Member 2 (Vrba, 1976). Furthermore, most of these isolated specimens were recovered

612 interspersed within the decalcified Main Quarry sediments alongside the diagnostic *A. recki* horn

613 core specimens; and in the case of DN 3346 and 4185, were recovered from just adjacent to the

614 DN 3033 and 3294 horn cores. We do, however, recognise and support the caution expressed by

615 Gentry (2010) regarding the separation of remains of *A. recki* from early remains of *A. bondi* and

616 *Antidorcas australis* Hendey and Hendey, 1968/*A. marsupialis*. In keeping with a more

617 conservative approach to these fragmentary craniodental remains, we treat them as provisionally

618 attributable to *A. recki*.

619

620

621   Genus RAPHICERUS C.H. Smith, 1827

622   Type species *Raphicerus campestris* Thunberg, 1811

623

624   *Raphicerus* sp.

625

626 **Referred specimen.** DN 591, right p3.

627

628 **Description.** The single right mandibular third premolar is a complete crown (ML: 7.68mm, BL:

629 3.10mm) with only superficial occlusal wear. The tooth is very mesiodistally elongate, exhibiting

630 the gracile cusp morphology and weak-development of distal elements (e.g., hypoconid,

631 entoconid/entostylid barely developed and fused) that is similar to the equivalent tooth preserved

632 in the KA 710 *Raphicerus campestris* mandible from Kromdraai A (Vrba, 1976) and extant *R.*

633 *campestris* comparatives.

634

635

636   Tribe OREOTRAGINI Pilgrim, 1939

637   Genus OREOTRAGUS A. Smith, 1834

638   Type species *Oreotragus oreotragus* Zimmermann, 1783

639

640   *Oreotragus* sp.

641

642   **Referred specimens.** DN 290, left mandible with deciduous p3; DN 400, right m2; DN 432,

643   right m1 (associated with DN 400); DN 438, right mandible with m1-m3; DN 590, left M1 or

644   M2; DN 710, right mandible with deciduous p3; DN 857, left mandible with m3; DN 910, right

645   mandible with m1-m3; DN 965, right mandible with deciduous p3; DN 1008, right mandible

646   with deciduous p3; DN 1046, left M1 or M2; DN 4773, left m2.

647

648   **Description.** The 12 mandibular specimens attributed here to *Oreotragus* are derived from at

649   least nine individuals (five adults with occluded third molars, four immature individuals

650   retaining their deciduous premolars). The more complete DN 438 (m2 MD: 11.96 mm, BL: 5.82

651   mm; m3 MD: 16.02 mm, BL: 5.66 mm; Figure 7C), DN 857 (m1 MD: 9.53 mm, BL: 6.15 mm;

652   m2 MD: 11.79 mm, BL: 6.42 mm; m3 MD: 19.34 mm, BL: 6.45 mm) and DN 910 (m1 BL: 5.79

653   mm; m2 MD: 13.31 mm, BL: 6.49 mm; m3 MD: 15.41 mm, BL: 6.51 mm) specimens preserve

654   relatively complete corpora and molars. The dental measurements of the DN *Oreotragus*

655   specimens place them roughly in the narrow zone of overlap between the smaller-bodied fossil

656   *Oreotragus* populations from Gondolin GD 2 and the larger-bodied *Oreotragus* from Haasgat

657   HGD and Makapansgat Member 3 (see Adams, 2012a for comparative *Oreotragus* dental

658   metrics). As noted in Adams (2012), a comprehensive revision of the fossil record of the genus is

659   essential to establish the significance of the metric variability in *Oreotragus* across South

660   African Plio-Pleistocene deposits.

661

662

663   Tribe REDUNCINI Knottnerus-Meyer, 1907

664   Genus REDUNCA C.H. Smith, 1827

665   Type species *Redunca redunca* Pallas, 1767

666

667   *Redunca* cf. *fulvorufula* (Afzelius, 1815)

668

669 **Referred specimens.** DN 111, right partial horn core and orbital margin; DN 2573, right partial

670 horn core; DN 4775, right partial horn core.

671

672 **Description.** The most complete of the reduncin horn core specimens attributed to *Redunca* cf.

673 *fulvorufula* is DN 111, which preserves the right horn core pedicle as well as part of the right

674 superior orbital margin and cranial vault. The two other right horn cores, while retaining less

675 adhering cranial vault portions preserve the same core morphology as DN 111. The angle of horn

676 core insertion, absence of sinuses in the pedicle, and development of the postcornual fossa are

677 consistent with members of the tribe, and the size, insertion angle and cross-sectional shape of

678 the core excludes attribution to genus *Kobus* Smith, 1840. Among extant and extinct *Redunca*

679 species, the DN specimens are smaller than, and exhibit more upright and rounder horn cores,

680 than both the extinct *Redunca darti* Wells and Cooke, 1956 from Makapansgat Member 3 (e.g.,

681 M 446 [type specimen], M 453, M 461, M 464, M783) and extant *Redunca arundinum* Boddaert,

682 1785 comparative specimens (see also discussion of *Redunca* horn cores in Adams, 2006). The

683 DN horn cores are similar in these morphological features to extant *Redunca fulvorufula* and the

684 Gondolin GD 2 *Redunca* sp. horn cores (Adams and Conroy, 2005; Adams, 2006), but are from

685 distinctly smaller-bodied individuals than the population sampled in the Gondolin GD 2

686   assemblage. Although the evolutionary relationships of South African Plio-Pleistocene *Redunca*

687   and the diversity of reduncins during the Neogene remain unresolved (see Adams and Conroy,

688   2005; Adams, 2006, 2012; Adams et al., 2010; Gentry, 2010), the morphology expressed by the

689   Main Quarry specimens is most comparable with extant *R. fulvorufula*; a species present in the

690   Cradle by at least the mid-Pleistocene (e.g., Gladysvale External Deposits; Lacruz et al., 2002).

691

692

693   Tribe TRAGELAPHINI Blyth, 1863

694   Genus TRAGELAPHUS de Blainville, 1816

695   Type species *Tragelaphus scriptus* Pallas, 1766

696

697   *Tragelaphus* sp.

698

699   **Referred specimens.** DN 120, right mandible with p2-m3; DN 163, left m3; DN 164, left m1;

700   DN 165, left m2; DN 399, right p3; DN 1011, left M1; DN 1027, associated right p3, p4, and

701   m1-m2 in a mandibular corpus; DN 2788, left maxilla with deciduous P4 – M2; DN 4112, right

702   m1 or m2.

703

704   **Description.** The Drimolen Main Quarry *Tragelaphus* sample includes at least two different

705   species. At least one species of large *Tragelaphus* is represented by the DN 399 and DN 2788

706   specimens. The crown of the DN 399 p3 is complete and unworn, but the roots are incompletely

707   formed. The crown is brachydont and the morphology of the paraconid, metaconid and entoconid

708   are consistent with extant *Tragelaphus strepsiceros* Pallas, 1766 comparative specimens. The

709   DN 2788 maxilla retains the deciduous p4 and the M2 is just reaching the occlusal plane. Like

710   the DN 399 specimen, the brachydonty and loph morphology is consistent with the genus, and

711   size of the dentition is within the range of extant *T. strepsiceros*. Although these two specimens

712   could potentially be derived from the same immature individual, we consider them as

713   representing minimally two different individuals based on provenance: the DN 399 specimen

714   was recovered from decalcified sediments (-2.3m below datum; MBD) whereas the DN 2788

715   specimen was mechanically recovered from a surface-recovered *ex situ* calcified sediment block.

716

717   The remaining specimens are derived from at least one smaller species of *Tragelaphus*, likely

718   representing minimally four individuals of *Tragelaphus pricei* Wells and Cooke, 1956 or the

719   *Tragelaphus scriptus* lineage; however, lacking horn cores we cannot provide a more specific

720   attribution. The most complete of these specimens are the DN 120 and DN 1027 right mandibles

721   (Figure 6C). Both specimens exhibit similar dental metrics, corpus depths, premolar morphology

722   (including paraconid-metaconid fusion on the p4) and buccal lophid rounding to the *T. pricei*

723   holotype (M 18) and paratype (M 17, M 19) specimens from the Makapansgat Member 3

724   deposits (Wells and Cooke, 1956). The evolutionary relationships between the South African *T.*

725   *pricei* and other smaller fossil *Tragelaphus* (e.g., *Tragelaphus nkondoensis* Geraads and Thomas,

726   1994) and extant *T. scriptus* is not resolved (see Gentry, 2010), and further assessment of the

727   African record may eventually permit a more specific diagnosis of the Main Quarry specimens.

728

729   Tragelaphini gen. et sp. indet.

730

731   **Referred specimens.** DN 1193, right m1 or m2 with associated tooth fragment in matrix.

732

733   **Description.** Two associated craniodental specimens (catalogued as DN 1193) are

734   morphologically consistent with a large-sized tragelaphin but are not attributable to generic level.

735   The associated tooth fragment is a partial molar (probably a lower buccal loph), while the more

736   complete tooth is a damaged right lower molar lacking the lingual enamel surface. The angled

737   buccal lophids and brachydonty of the lower molar is consistent with the tribe, and the size

738   places the specimen within the range of extant *Tragelaphus strepsiceros* and smaller

739   *Taurotragus oryx* individuals.

740

741

742   Bovidae gen. et sp. indet.

743

744   **Referred specimens.** 538 specimens (see Supplemental Table 1)

745

746   **Description.** The majority of the indeterminate bovid specimens from the Main Quarry deposits

747   are postcranial elements (n = 365), with only 173 craniodental specimens (primarily

748   nondiagnostic enamel fragments, mandibular incisors or poorly preserved horn core fragments)

749   not attributed below the Family level (Supplemental Table 1). Although these remains are

750   undiagnostic, we would note that there is no indication of additional bovid taxa in the Main

751   Quarry deposits beyond those established by the other referred specimens above. The one

752   exception is the DN 647 partial left maxillary molar, which exhibits hypsodonty consistent with

753   alcelaphins, but also resembles some of the smaller ovibovin remains potentially attributable to

754   *Makapania* Wells and Cooke, 1956 from Swartkrans Member 1, Gladysvale, and Haasgat HGD

755   (Vrba, 1976; Lacruz et al., 2002; Adams, 2012a).

756

757

758   Family GIRAFFIDAE Gray, 1821

759

760   Giraffidae gen. et sp. indet.

761

762   **Referred material.** DN 1097, right humerus.

763

764   **Description.** The DN 1097 specimen is an extremely large right cetartiodactyl humerus that

765   preserves the medial portion of the condyle, supracondylar region, and the diaphysis to the distal-

766   most portion of the humeral crest (Figure 8A). Although no standard metrics could be gathered,

767   the preserved length of the specimen is ~26 cm and the length of the medial epicondyle to

768   midsagittal of the condyle is ~6.5 cm, indicating an approximate epicondylar width of ~12-13

769   cm. In addition to the size of the preserved specimen, several morphological features align DN

770   1097 to extant giraffid comparative specimens (e.g., *Giraffa camelopardalis* Linnaeus, 1758) to

771   the exclusion of a large bovid (e.g., extant *Syncerus caffer* Sparrman, 1779). The supracondylar

772   diaphysis is ovoid (anteroposteriorly compressed, mediolaterally wide) rather than triangular

773   from a more robust humeral crest. The medial articular surface of the condyle is

774   anteroposteriorly flattened and cylindrical, and lacks a strongly developed sagittal ridge laterally.

775

776 Unfortunately, there is a paucity of fossil giraffid postcranial from the South African

777 palaeokarstic deposits, with only small collections described from Makapansgat Member 3 and

778 the Swartkrans Members 1-3 deposits (Reed, 1996; Watson, 1993). Only a single humerus

779 attributed to the extinct *Sivatherium* Falconer and Cautley, 1836 has been described from

780 Swartkrans Member 1 Hanging Remnant (SK 3172), but this left humerus preserves only the

781 non-overlapping proximal region. The penecontemporaneous eastern African record is more

782 substantial, with postcranial samples from Koobi For a, Olduvai, Omo-Shungura and Laetoli

783 (Harris, 1976; Leakey and Harris, 1987; Harris, 1991; Robinson, 2011). The features that would

784 allow for confident attribution of the DN specimen as either giraffine or sivatherine (e.g.,

785 elongation of the diaphysis, relative compression and width of the distal epiphyses) cannot be

786 ascertained in the preserved state; and the humeri of Plio-Pleistocene giraffid species overlap

787 significantly in simple linear metrics (Leakey and Harris, 1987; Harris, 1991; Robinson, 2011).

788 Given these limitations, we treat this specimen as indeterminate below the Family level.

789

790

791 Family SUIDAE Gray 1821

792

793 Suidae gen. et sp. indet.

794

795 **Referred material.** DN 2850, right third metatarsal.

796

797 **Description.** The DN 2850 specimen is a nearly complete right third metatarsal from a juvenile

798 suid, preserving a notably immature proximal articular surface (missing part of the medial

799 articular surface) and an unfused distal metaphyseal surface (Figure 8B). The diaphysis of the

800 element is visibly robust (ML: 12.07 mm, dorsoventral depth: 10.05 mm) given its overall length

801 (53.18 mm). Metric comparisons of the proximal articular and distal metaphyseal surfaces of DN

802 2850 against the third metatarsals of extant *Phacochoerus aethiopicus* Pallas, 1766 and

803 *Potamochoerus porcus* Linnaeus, 1758 place this very immature element outside or just within

804 the measured ranges of even fully adult *P. aethiopicus* and *P. porcus* individuals with complete

805 proximal articular surface development and distal metaphyseal fusion (Table 5). The size of the

806 specimen at its developmental stage would therefore seemingly preclude attribution to either of

807 these extant genera.

808

809 Comparable fossil suid third metatarsals are extremely rare within African Plio-Pleistocene

810 deposits (Bishop, 1994); however, a partial right third metatarsal of *Metridiochoerus andrewsi*

811 (G 8105) has been described from the Gondolin GD 2 assemblage (Adams, 2006). The G 8105

812 specimen only preserves the proximal articular surface and part of the diaphysis and is derived

813 from a more developmentally mature individual (or full adult), and the single comparable

814 measurement reflects the larger body size of the species compared to the extant suids (Table 5).

815 While the overall shape of the proximal articular surface and robusticity of the diaphysis appears

816 shared between DN 2850 and G 8105, the significant ontogenetic differences prohibit confident

817 attribution of the Main Quarry specimen to the same genus or species based solely on these

818 broad similarities. Similarly, while other suid genera (e.g., *Notochoerus, Kolpochoerus*) are less

819 frequently recovered than remains of *Metridiochoerus* in South African Plio-Pleistocene

820 deposits, we also lack equivalent postcrania for these lineages to allow for direct comparisons. At

821 present, we can only state that this specimen is derived from an extinct suid lineage that

822 exhibited larger adult body size than extant or attributed fossil *Phacochoerus* or *Potamochoerus*.

823

824

825   Order PERISSODACTYLA Owen, 1848

826   Family EQUIDAE Gray, 1821

827   Genus EQUUS Linnaeus, 1758

828   Type species Equus caballus Linnaeus, 1758

829

830   *Equus* cf. *quagga* ssp. (Boddaert, 1785) (*sensu* Klingel, 2013)

831

832 **Referred material.** DN 3424, left distal tibia; DN 4525, intermediate phalanx; DN 4781, partial

833 ungual phalanx.

834

835 **Description.** The DN 3424 specimen preserves part of the distal metaphysis and articular surface

836 from a left tibia, from the medial malleolus to the midline. There is no indication of persistence

837 of a metaphyseal line indicating full closure of the distal growth plate and skeletal maturity of the

838 element. Unfortunately, no standard metrics could be taken from the specimen to facilitate

839 comparisons, but the element is directly comparable to extant *E. quagga* ssp. tibiae in size and

840 morphology and is visibly smaller than the *Equus capensis* Broom, 1909 distal tibiae previously

841 described from Swartkrans Members 1 Lower Bank (SKX 9596) and 2 (SKX 2390) (Churcher

842 and Watson, 1993), as well as the *Equus* sp. specimen from the Haasgat HGD deposits (HGD

843 1015; Adams, 2012a).

844

845   The DN 4525 intermediate phalanx preserves the proximal epiphysis (ML: 45.89 mm,

846   dorsoventral depth: 32.97 mm) and most of the diaphysis, but lacks the distal articular surface

847   and some of the anterior face of the distal metaphyseal/diaphyseal region. The articular surfaces

848   as preserved appear fully mature, there is no indication of a persistent metaphyseal line. As is the

849   case with the DN 3424 tibia, the intermediate phalanx is consistent with extant *E. quagga* ssp.

850   intermediate phalanges in size and morphology and smaller than previously described *E.*

851   *capensis* specimens from Swartkrans Member 3 (SKX 39182: proximal ML: 50 mm [min.],

852   proximal dorsoventral depth: 36 mm [min.]) and Haasgat HGD (HGD 1099, proximal ML: 53.49

853   mm, proximal dorsoventral depth: 33.84 mm) (Churcher and Watson, 1993; Adams, 2012a).

854

855   The DN 4781 specimen preserves only a partial proximal articular facet and part of the volar

856   surface of an equid ungual phalanx. The specimen is visibly larger than the hipparionin ungual

857   phalanges previously described from Swartkrans Member 1 (SKX 9166), Member 2 (SKX

858   2626), and Gondolin GD 2 (G 4218) (Churcher and Watson, 1993; Adams, 2006), and there is no

859   indication of multiple nutrient foramina on the volar surface or posterior projection of the

860   articular surface consistent with that tribe. The specimen appears to fall within the size range of

861   extant *E. quagga* ssp. comparative specimens, and was recovered in close spatial proximity to

862   the DN 3424 and 4525 specimens (see below). Collectively, this supports allocating this

863   specimen to both *E. quagga* ssp. and potentially to the same individual as the other equid

864   remains from the Main Quarry decalcified deposits.

865

866

867   Order PROBOSCIDEA Illiger, 1811

868   Family ELEPHANTIDAE Gray, 1821

869

870   Elephantidae gen. et sp. indet.

871

872   **Referred material.** DN 4335, maxillary incisor fragment.

873

874   **Description.** A single tusk fragment (DN 4335) recovered from the decalcified sediments can be

875   attributed to an indeterminate genus and species of elephantid (Figure 9A). The recovery of this

876   specimen, while relatively rare within other palaeokarstic deposits from the region, is not

877   unexpected given the presence of minimally two separate elephantid tusk portions within the

878   unexcavated calcified sediments of the Drimolen Main Quarry. The fragment exhibits both

879   surface pitting and break-edge rounding, and it is uncertain whether the specimen preserves the

880   most external, cortical enamel lamina or a more internal layer of enamel. The inner surface of the

881   fragment exhibits fresh exposure of enamel that highlights the light longitudinal banding of the

882   enamel, which under magnification is matched on the external, pitted surface of the specimen.

883   The DN specimen is similar in laminar enamel thickness and suggested cross-sectional area and

884   shape to the Swartkrans Member 1 Lower Bank specimens that have been previously attributed

885   to *Elephas* sp. Linnaeus, 1758 (SKX 45691, 45692b; Watson, 1993); however, as a single tusk

886   fragment we remain conservative in our attribution until further remains are recovered.

887

888

889   Order HYRACOIDEA Huxley, 1869

890   Family PROCAVIIDAE Thomas, 1892

891   Genus PROCAVIA Storr, 1780

892   Type species *Procavia capensis* Storr, 1780

893

894   *Procavia* sp.

895

896   **Referred material.** DN 552, left m1 or m2; DN 2365b, right I1; DN 2971, right and left I1

897   (antimeric); DN 3072, right distal femur; DN 4219, right I1.

898

899   **Description.** In contrast to the faunal samples recovered from most other South African

900   palaeokarstic localities and deposits there is only an extremely small sample of hyrax remains at

901   the Drimolen Main Quarry deposits (see Churcher, 1956; Brain, 1981). The collection of six total

902   specimens are largely isolated central incisors. The antimeric pair (DN 2971) are most likely

903   from a male individual given the sharp, centrally-positioned keel, while the DN 2365b and 4219

904   specimens exhibit the more rounded contour and mesial position of the central keel consistent

905   with being from females (Churcher, 1956). None of the recovered teeth are metrically consistent

906   with *Procavia transvaalensis* Shaw, 1937 (see comparative measurements in Churcher, 1956).

907   Similarly, the DN 3072 distal femur is homologous to extant *Procavia capensis* Pallas, 1766

908   comparative specimens and visibly smaller than the *P. transvaalensis* distal femur from Haasgat

909   HGT (HGT 1004; Adams, 2012a). As the composition of the sample does not allow us to

910   diagnose whether the sample is derived from the extinct *Procavia antiqua* Broom, 1934 (see also

911   Schwartz, 2007) and/or extant *P. capensis*, we can only attribute the Main Quarry specimens to a

912   species of *Procavia* that is not *P. transvaalensis*.

913

914

Order LAGOMORPHA Brandt, 1855

Family LEPORIDAE Fischer von Waldheim, 1817

915

916

917

Genus PRONOLAGUS Lyon, 1904

Type species *Pronolagus crassicaudatus* Geoffroy, 1832

918

919

920

Pronolagus sp.

921

922

923 **Referred material.** DN 2823, right mandible preserving the p3-m2.

924

925 **Description.** Only one of the 38 identified leporid remains could be identified as representing as

926 species of *Pronolagus* in the Drimolen Main Quarry deposits. The overall size of the specimen is

927 significant smaller than in extant *Lepus capensis* Linnaeus, 1758, and the p3 exhibiting both

928 anterior reentrants and no evidence of the posteroexternal reentrant extending nearly to the

929 lingual border of the tooth as in *Lepus*. Amongst extant analogues, the overall mandibular

930 morphology is similar to *Pronolagus rupestris* Smith, 1834 but the dentition and corpus is

931 somewhat smaller than both male and female *P. rupestris* comparatives. Given the currently

932 limited data on the South African leporid record (Winkler and Avery, 2010), we retain the

933 specimen at the generic level pending a more comprehensive review of the South African Plio-

934 Pleistocene lagomorphs.

935

936

937   Leporidae gen. et sp. indet.

938

939   **Referred material.** DN 771, right immature proximal tibia; DN 1083, left calcaneus; DN 2104,

940   right calcaneus; DN 2155, left distal scapula; DN 2256, left immature proximal tibia; DN 2330,

941   left mandibular corpus; DN 2333, right maxillary premolar or molar; DN 2341, left calcaneus;

942   DN 2342, left calcaneus; DN 2365c, left distal humerus; DN 2571, right immature distal femoral

943   epiphysis; DN 2715a, right distal humerus; DN 2715b, left proximal ulna; DN 2736, right

944   immature calcaneus; DN 2798, right proximal tibia; DN 2800, right immature distal femoral

945   epiphysis; DN 2805, right immature distal femoral metaphysis (articulates with DN 2800); DN

946   3059, left immature distal femoral epiphysis; DN 3304, left distal scapula; DN 4114, left

947   proximal ulna; DN 4116, left distal humerus; DN 4118, left calcaneus; DN 4120, associated set

948   of three lumbar vertebrae and sacrum; DN 4127, right immature proximal ulnar metaphysis; DN

949   4208, right distal humerus; DN 4225, left distal humeral metaphysis; DN 4226, left distal tibia;

950   DN 4227, right distal scapula; DN 4228, left proximal ulna; DN 4229, partial edentulous

951   maxilla; DN 4257, left immature calcaneus; DN 4381, left immature distal femoral epiphysis;

952   DN 4399, indet. side immature distal femoral epiphysis; DN 4531, left proximal tibial

953   metaphysis.

954

955   **Description.** The indeterminate leporid sample includes 34 numbered specimens (representing

956   36 total elements). Other than fragmentary and indeterminate craniodental remains (DN 2333

957   and DN 4229), the current collection is comprised of postcranial remains from what are likely

958   two different species. The majority of the remains are derived from a lagomorph somewhere in

959 body size between extant *Lepus capensis* and *Pronolagus rupestris.* A smaller lagomorph that

960 had adult and immature postcranial elements smaller than adult extant *P. rupestris* is represented

961 by DN 2104, 2155, 2715a&b, 2800, 2805, 3059, 4120, and 4228.

962

963

964 Order RODENTIA Bowdich, 1821

965 Family HYSTRICIDAE Fischer de Waldheim, 1817

966 Genus HYSTRIX Linnaeus, 1758

967 Type species *Hystrix cristata* Linnaeus, 1758

968

969 *Hystrix* sp.

970

971 **Referred material.** DN 2760, left maxillary molar (M2?)

972

973 **Description.** Only a single identifiable left maxillary molar can be attributed to an indeterminate

974 species of porcupine (Figure 9B). The presence of both mesial and distal interstitial wear facets

975 indicate that the specimen is either an M1 or M2; we favour the latter based on both the size and

976 occlusal outline but cannot confidently attribute the position. Metrically, the specimen (MD: 8.19

977 mm, BL: 9.27 mm [min. given minor enamel flaking]) falls within the range of extant *Hystrix*

978 *africaeaustralis* Peters, 1852 maxillary M1s and M2s and is smaller than both *Hystrix*

979 *makapanensis* Greenwood, 1958 and *Xenohystrix crassidens* Greenwood, 1955 (Adams, 2012b).

980 We would note, however, that the current metric range for *H. makapanensis* M1 and M2 is based

981 on an extremely small sample from the Gondolin GD 2 assemblage (e.g., derived from two

982   individuals; Adams, 2012b). As an isolated tooth lacking other diagnostic features we elect to

983   retain the specimen at the generic level.

984

985

986   Order TUBULIDENTATA Huxley, 1872

987   Family ORYCTEROPODIDAE Gray, 1821

988   Genus ORYCTEROPUS Geoffroy Saint-Hilaire, 1796

989   Type species *Orycteropus afer* Pallas, 1766

990

991   *Orycteropus* cf. *afer*

992

993   **Referred material.** DN 1062, right proximal radius.

994

995   **Description.** The DN 1062 right proximal radius preserves a nearly complete head with articular

996   surfaces and radial tuberosity, but very little diaphysis distal to the tuberosity (Figure 9C).

997   Although there is minor abrasion damage to the cortex around the radial head, the minimum

998   linear dimensions are 17.06 mm mediolaterally and 12.50 mm dorsoventrally. The articular

999   surface morphology of the specimen is diagnostically orycteropodid (to the exclusion of

1000 similarly sized carnivores, primates, *Hystrix* and *Smutsia* [Order Philodota]) in the well-

1001 developed medial articular facets for contact with the lateral coronoid process of the ulna Figure

1002 8C). The DN specimen is identical to extant *Orycteropus afer* radii available to us for direct

1003 comparison in both morphology and size, and exhibits excellent joint congruence with the

1004   capitulum of the *Orycteropus* cf. *afer* distal humerus from Swartkrans Member 1 (SKX 14261)

1005   (Lehmann, 2004).

1006

1007

1008   **Biochronology**

1009

1010   Fauna from the site has been recovered from both calcified and decalcified deposits in the Main

1011   Quarry using a variety of techniques over the years. A small portion of the collections from the

1012   early 1990s was developed from blocks recovered from the limeminers dumps just outside the

1013   Main Quarry. While these blocks have always been assumed to come from the Main Quarry

1014   deposits due to their proximity, the recent excavation of a new, older (~2.6 Ma) 50 m west of the

1015   Main Quarry (the Drimolen Makondo; Rovinsky et al., 2015; Herries et al., in review) does mean

1016   that this *ex situ* material could be mixed from more than one age of deposit. However, these two

1017   different deposits are not stratigraphically intertwined as is the case for deposits like Members 4

1018   and 5 at Sterkfontein (Herries and Shaw, 2011) or Swartkrans Members 1-3 (Herries and Adams,

1019   2013). This is currently no indication that similarly-aged Pliocene deposits exist in the Main

1020   Quarry itself.

1021

1022   Although there is notable diversity in the recovered Drimolen Main Quarry faunas, the majority

1023   of the specimens provide limited biochronological data for interpreting the age of the deposits.

1024   As is typical for South African palaeokarstic deposits in the region, the recovery of *Equus* cf.

1025   *quagga* ssp. from the *in situ* deposits indicates that at least part of the assemblage formed after

1026   2.33 Ma given the first appearance of the genus in African early Pleistocene deposits (Geraads,

1027   Raynal & Eisenmann, 2004). The remainder of the ungulate specimens identified from the Main

1028   Quarry are either not specifically attributable, are members of long-surviving Plio-Pleistocene

1029   lineages, or have poorly secured first appearance (FAD) and last appearance dates (LAD) in

1030   South Africa. The largest bovid sample in the assemblage, *Antidorcas recki*, has been recovered

1031   from eastern and South African deposits spanning the late Pliocene (e.g., Shungura Formation B-

1032   H; Gentry, 2010; McDougall et al., 2011; Brown et al., 2013) to the >1.07 Ma (or <0.780 Ma)

1033   Olduvai Bed IV (Tamrat et al., 1995) and the 1.07-0.780 Ma Elandsfontein deposits (Gentry,

1034   2010; Braun et al., 2013). The differences in the transverse ridging of the horn cores with the

1035   previously described Bolt's Farm Pit 3 specimens may or may not reflect a temporal difference

1036   in depositional age.

1037

1038   Although this analysis has not addressed the non-hominin primates from the Drimolen Main

1039   Quarry, data reported in Nieuwoudt (2014) and reproduced in Table 1 suggests a fairly

1040   homogenous sample of cercopithecoids relative to other nearby early Pleistocene palaeokarstic

1041   deposits that typically record greater taxonomic diversity (Brain, 1981; Jablonski and Freedman,

1042   2010). The specifically attributable DMQ specimens have been allocated to either the extinct

1043   papionin subspecies *Papio hamadryas robinsoni* Freedman, 1957 (alt. *Papio robinsoni*; Gilbert

1044   et al., 2015) or the extinct colobin species *Cercopithecoides williamsi* Mollett, 1947. Both of

1045   these species have FADs in the late Pliocene (a constrained FAD for *Papio* somewhat less clear,

1046   see Jablonski and Frost, 2010 and Gilbert et al., 2015) and are common in post ~2 Ma early

1047   (potential to mid-) Pleistocene South African deposits (e.g., Swartkrans, Sterkfontein Member 5,

1048   Kromdraai, Cooper's D, Gladysvale; Jablonski and Frost, 2010). As such, neither primate

1049   provides strong biochronological constraints on the depositional age of the Main Quarry deposits

1050   beyond being consistent with species recovered from other nearby early Pleistocene localities

1051   (e.g., Sterkfontein Members 4 and 5, Swartkrans Members 1-3, Kromdraai A and B) (Brain,

1052   1981; Jablonski and Frost, 2010).

1053

1054   The carnivoran specimens provide a more constrained depositional age. Remains of the genus

1055   *Chasmaporthetes* have been recovered across African localities, with *C. nitidula* described from

1056   South African deposits ranging from Sterkfontein Jacovec Cavern and Members 2 and 4 (<2.46-

1057   2.01 Ma; Herries et al., 2013) to as late as Swartkrans Member 3 (sometime between 1.3-0.6 Ma;

1058   Herries, Curnoe & Adams, 2009). However, *Lycyaenops silberbergi* has been recovered from a

1059   far narrower range of terminal Pliocene and early Pleistocene deposits of Laetoli (as *Lycyaenops*

1060   cf. *L. silberbergi*; Werdelin and Dehghani, 2011) in East Africa and Sterkfontein in South Africa

1061   (~3.8–2.02 Ma; Turner, 1990, 1997; Werdelin and Lewis, 2005; Werdelin and Peigné, 2010;

1062   Herries and Shaw, 2011; Herries et al., 2013). A single mandibular specimen (SK 300) of

1063   *Lycyaenops silberbergi* has been described from Swartkrans Member 1 (Ewer, 1955b), and

1064   although questions over provenience has been raised it is still considered derived from these

1065   deposits (see discussion in Turner, 1987b); this effectively establishes an LAD for the species

1066   within these deposits of 1.96-1.80 Ma (Pickering et al., 2011a; Herries and Adams, 2013).

1067

1068   The identification of *Dinofelis* cf. *barlowi* from the DMQ also argues for a late Pliocene-early

1069   Pleistocene deposition. This apparently endemic South African machairodont has been

1070   definitively recovered from a temporally narrow range of deposits spanning approximately 2.7–

1071   1.98 Ma (Werdelin and Lewis, 2001; Lacruz, Turner & Berger, 2006; Herries, Curnoe & Adams,

1072   2009; Werdelin and Peigné, 2010; Herries and Shaw, 2011; Pickering et al., 2011b; Kuhn et al.,

1073   2012). What cannot be determined at this point is the biological relationship of this specimen to

1074   the previously described *Dinofelis* aff. *piveteaui* specimens, as no maxillary canine was

1075   recovered or described in association with the craniodental remains. As discussed by O'Regan

1076   and Menter (2009), the basis for classifying the DMQ *Dinofelis* remains as *D.* aff. *piveteaui* is

1077   based largely on P4 morphology. The protocone of the DN 1012 P4 is reduced; not as reduced as

1078   *D. piveteaui* specimens from Kromdraai A or Motsetse but yielding a buccolingually-narrower

1079   tooth than is present in *D. barlowi*. Simultaneously, the P4 metastyle blade is only slightly

1080   mesiodistally elongated relative to *D. barlowi* and lacks the elongation exhibited by South

1081   African *D. piveteaui* P4 specimens. As with much of the anatomy of fossil taxa established from

1082   small sample sizes, it is difficult at present to establish whether these P4 features reflect sexual

1083   dimorphism, individual, or chronological variation within either *D. barlowi* or *D. piveteaui.* And

1084   while further craniodental specimens could ultimately link the DN 2791 canine with these other

1085   DMQ *Dinofelis* remains, there is no apparent morphological affinity to *D. piveteaui* maxillary

1086   canines to support treating the specimen as derived from the same population.

1087

1088   Ultimately, if these previously described remains cannot be accommodated with either species

1089   *sensu stricto* we posit four potential interpretations of the DMQ *Dinofelis* material assigned to *D.*

1090   aff. *piveteaui* by O'Regan and Menter (2009) that will require further analysis to test whether: 1)

1091   they represent a derived *D. barlowi*; 2) they represent a primitive *D. piveteaui sensu stricto*; 3)

1092   they are derived from a discrete population undergoing anagenesis from a more primitive

1093   *Dinofelis* (e.g., *D. barlowi* [O'Regan and Menter, 2009] or *Dinofelis aronoki* [Werdelin and

1094   Lewis, 2001]) to *D. piveteaui* in the early Pleistocene; or 4) they represent a separate, previously

1095   unrecovered species of *Dinofelis* in the African record (which we view as less likely). If the

1096   DMQ *Dinofelis* aff. *piveteaui* remains represent a novel species, they would ultimately contribute

1097   little to interpreting deposit biochronology. As *D. barlowi* does not occur in South African

1098   deposits after 1.98 Ma, if the DMQ *Dinofelis* aff. *piveteaui* remains are a derived *D. barlowi* they

1099   would likely indicate deposition after 1.98 Ma – but would similarly lack an established FAD or

1100   LAD. Finally, given the recovery of the *D. piveteaui* type specimen from the (tentatively dated)

1101   1.89-1.63 Ma Kromdraai A deposits (Herries, Curnoe & Adams, 2009) and in east Africa by 1.61

1102   Ma (Werdelin and Lewis, 2005; McDougall et al., 2011), then if representing a primitive *D.*

1103   *piveteaui* or transitional *Dinofelis* then the DMQ *Dinofelis* aff. *piveteaui* specimens would

1104   suggest a depositional date prior to ~1.6 Ma and/or the Kromdraai A assemblage.

1105

1106   In sum, the DMQ faunal assemblage includes species only occupying the South African

1107   landscape after 2.33 Ma (*Equus* cf. *burchelli* ssp.), and includes the remains of carnivore species

1108   whose currently reconstructed LADs within the early Pleistocene indicate at least some of the

1109   deposits formed prior to (or near) 2.02 Ma (*Lycyaenops silberbergi*) to 1.98 Ma (*Dinofelis* cf.

1110   *barlowi*).

1111

1112   **Discussion**

1113

1114   This first description and analysis of the macromammalian fossil specimens from the Drimolen

1115   Main Quarry assemblage has documented remarkably high taxonomic diversity (9 Orders, 14

1116   Families) relative to sample size (NISP: 1390, MNI: 147). While deposits like Swartkrans

1117   Member 1 record a somewhat greater range of taxa (9 Orders, 17 Families), the number of non-

1118   hominin taxonomically identifiable specimens underlying this diversity is substantially higher

1119   (NISP: 4583, MNI: 103; Watson, 1993). Despite this diversity, the McIntosh evenness statistic

1120   for the DMQ is low (0.71) and one standard deviation below the mean (0.80; range 0.60-0.93;

1121   s.d. 0.087) for South African early-mid Pleistocene localities (Table 6) and close to the value of

1122   the Haasgat HGD *ex situ* assemblage (0.72; Adams, 2012a). This low value reflects the high

1123   proportion of *Papio hamadryas robinsoni* individuals relative to all other taxa recovered from

1124   the DMQ deposits. With the inclusion of *Cercopithecoides williamsi* and indeterminate

1125   specimens, 38.4% of the DMQ assemblage come from the Family Cercopithecidae; equal to the

1126   proportion (38.4%) of the second largest taxonomic group, the Family Bovidae. In this respect,

1127   DMQ is also similar to Haasgat HGD where non-human primates make up 35.1% and bovids

1128   make up 40.9% of the assemblage (Adams, 2012a); although we would reinforce that we are

1129   only considering the non-hominin components of the DMQ assemblage in comparison to the

1130   Haasgat HGD assemblage that lacks hominin remains.

1131

1132   The composition of the Drimolen Main Quarry bovid assemblage is not taxonomically unique

1133   relative to other penecontemporaneous South African fossil assemblages, but the numerical

1134   dominance of *Antidorcas recki* relative to other taxa is somewhat unusual. The only other site

1135   with a similar sample size of *A. recki*, Kromdraai A (NISP: 44, MNI: 13), has a far more

1136   substantial collection of alcelaphins (NISP: 220, MNI: 51) and only represents 11.5% of the total

1137   bovid assemblage (Brain, 1981). What stands in rather strong contrast to the typical element-

1138   wise representation of bovid elements is the high frequency of horn cores in the DMQ

1139   assemblage (see Brain, 1981; Watson, 1993; Pickering, 1999), particularly in the case of *A. recki*,

1140   where very few teeth have been recovered alongside a substantial number of horn cores.

1141   Interpreting the origin and significance of this pattern of element preservation in the bovid

1142   sample compared to other palaeokarstic deposits is beyond the scope of the present paper, but

1143   will potentially be informative on the taphonomic processes underlying the Drimolen Main

1144   Quarry deposit formation.

1145

1146   The only other substantially represented taxonomic group in the DMQ assemblage is the Order

1147   Carnivora, which comprises 13% of the faunal assemblage and is biased towards the Family

1148   Felidae (57.9% of the Carnivora and 7.5% of the overall faunal assemblage). This positions the

1149   DMQ assemblage as particularly carnivore-rich, with only Kromdraai B (15.8%), Swartkrans

1150   Member 3 (16.85%) and the Sterkfontein Member 5 deposits (West: 30.65%; Olduwan Infill:

1151   13.64%; STW 53 Breccia: 13.33%) having higher proportions of carnivores amongst the

1152   penecontemporaneous South African palaeokarstic assemblages. The proportion of carnivores in

1153   the DMQ assemblage is also substantially less than the recently described Drimolen Makondo

1154   deposits (25%; Rovinsky et al., 2015; Herries et al., in review), although the limited faunal

1155   sampling of the Makondo to-date (like other provisionally described faunal assemblages such as

1156   Motsetse [Berger and Lacruz, 2003], Hoogland [Adams et al., 2010], Malapa [Dirks et al., 2010;

1157   Kuhn et al., 2012]) necessitates further sampling to ensure these proportions are not artefacts of

1158   sample size. The co-occurrence of large predatory felids (with minimally three subfamilies and

1159   five genera represented in the deposit) - for example, *Panthera*, *Dinofelis* and *Megantereon* – is

1160   not uncommon in South African early Pleistocene deposits (Brain, 1981; Werdelin & Peigné,

1161   2010). What is unusual is the potential sympatric occurrence of two species of *Dinofelis* recorded

1162   by the DMQ *Dinofelis* cf. *barlowi* and *Dinofelis* aff. *piveteaui*, specimens. While it has been

1163   noted that temporal overlap of two *Dinofelis* species may have been relatively common, at least

1164   in East Africa (e.g., Lewis and Werdelin, 2007), this current study would represent the first

1165   strong evidence of such contemporaneous overlap within a single deposit (Werdelin and Lewis,

1166   2001, 2013; Werdelin and Peigné, 2010).

1167

1168   The Drimolen Main Quarry faunal assemblage is also unique relative to most

1169   penecontemporaneous South African karstic deposits in the under-representation of porcupine

1170   (Family Hystricidae) and hyrax (Family Procaviidae) remains in the deposits. These two families

1171   only comprise 2.7% of the total DMQ faunal assemblage, which falls below even the low

1172   proportions of these taxa at Sterkfontein Member 4 (4.2%; Brain, 1981) and Kromdraai A (9%;

1173   Brain, 1981), and strongly contrasts the representation of these families in the Swartkrans

1174   Member 1 (21.4%; Watson, 1993) and Haasgat HGD (19.5%; Adams, 2012a) faunal

1175   assemblages. There are a number of geologic (e.g., entrance morphology, deposit time-

1176   averaging), ecologic (e.g., immediate habitat and resource distribution) and/or taphonomic

1177   factors (e.g., pre-, peri- and postdepositional) that could underlie this low representation of these

1178   karst-utilising taxa that will require further analysis to assess.

1179

1180   In sum, this comprehensive accounting of the Drimolen Main Quarry faunal assemblage allows

1181   us to provide some initial comments on the palaeohabitats of the Drimolen region during

1182   depositon; although we note that a more comprehensive palaeoecological interpretation and

1183   analysis integrating stable isotopic results from the assemblage will be forthcoming. The overall

1184   vegetative communities and landscape ecology suggested by the taxon presence and abundance

1185   recovered from the DMQ deposits is largely consistent with the mixed, open-to-closed

1186   palaeohabitats that have been reconstructed for the other regional, penecontemporaneous South

1187   African palaeokarst deposits (Vrba, 1976, 1995; Brain, 1981; Benefit and McCrossin, 1990;

1188   McKee, 1991; Rayner, Moon & Masters, 1993; Brain, 1995; Schmid, 2002; Elton, 2007; see also

1189   summaries in Reed, 1996; Kuman and Clarke, 2000; Adams, 2006). In part this reflects the broad

1190   habitat types that most of the specifically identifiable taxa from the DMQ deposits can occupy.

1191   Both previously attributed primate taxa are larger-bodied and terrestrial (*Papio hamadryas*

1192   *robinsoni*, *Cercopithecoides williamsi*) and may have been sympatric, niche-partitioned primates

1193   adapted to the progressively more open habitats of the early Pleistocene (Elton, 2007; Jablonski

1194   and Frost, 2010). However, the composition and resource availability of these more open

1195   habitats, and how they contrast with earlier palaeoecosystems that supported cercopithecoids like

1196   *Parapapio* (that disappear from the record in the early Pleistocene), remains unresolved. Even

1197   the more unusual species recovered from the Drimolen Main Quarry deposits (indeterminate

1198   elephant, giraffe, and aardvark [*Orycteropus* cf. *afer*]) can unfortunately provide few constraints

1199   on the palaeohabitat types, distribution or proportions near the site. Neither the elephant or

1200   giraffe individual specimens could be confidently attributed below the level of Family, and

1201   extant aardvark populations occupy highly variable habitats across Africa with the only

1202   limitation being access to social insects (Kingdon and Hoffman, 2013a).

1203

1204   The dominance of *Antidorcas recki* in the bovid sample does not provide any specific evidence

1205   for reconstructing the overall vegetative community structure around Drimolen without further

1206   isotopic analysis. Although prior analyses of Sterkfontein and Swartkrans specimens have

1207   reconstructed the diet of this antilopin as a browser (Lee-Thorp and van der Merwe, 1993; Lee-

1208   Thorp, van der Merwe & Brain, 1994; van der Merwe et al., 2003), a single specimen from

1209   Gondolin was interpreted as a mixed feeder (Adams, 2012a) and sampled individuals from

1210   Olduvai have documented greater dietary flexibility and an increase in graze in the species

1211   through the Bed I deposits associating them more with bushland to grassland palaeohabitats

1212   (Plummer et al., 2009). The only bovid taxa recovered from DMQ with specific habitat

1213   requirements are the mountain reedbuck (*Redunca* cf. *fulvorufula*) and klipspringer (*Oreotragus*

1214   sp.). Extant mountain reedbuck graze primarily in montane grasslands on rocky, hilly and/or

1215   broken terrain (Irby, 1976; Kingdon and Hoffman, 2013b); klipspringer exhibit a suite of

1216   musculoskeletal, physiological and behavioural adaptations to browsing on pair-defended rock

1217   outcrops (Norton, 1980; Kingdon and Hoffman, 2013b). The presence of some uplifted

1218   topography and/or local kopjes with montane grasses and browse near Drimolen during the

1219   formation of the Main Quarry assemblage is further reinforced by the recovery of hyrax

1220   (*Procavia* sp.) and rock hare (*Pronolagus* sp.) (Kingdon et al., 2013; Happold, 2013).

1221

1222   The extinct DMQ large carnivores are similarly reconstructed as adapted for hunting within a

1223   range of open and closed palaeohabitats. Both *Dinofelis* and *Megantereon* have been

1224   reconstructed as ambush predators preferring a closed-mixed habitat (Marean, 1989; Lewis,

1225   1995a, b, 1997; Palmqvist et al., 2003; Christiansen and Adolfssen, 2007; Palmqvist et al. 2008).

1226   In its postcranial anatomy, the smaller-bodied *Megantereon* is reminiscent of the extant jaguar

1227   (*Panthera onca*), with relatively short, heavily muscled, and powerful limbs (Lewis, 1995b,

1228   1997; Christiansen and Adolfssen, 2007). Isotopic analyses of European *Megantereon* support

1229   the preference for a closed-mixed habitat, suggesting that the genus predated on browsers and

1230   mixed-feeders (Palmqvist et al., 2003, 2008). *Dinofelis* has been shown to have had greater

1231   flexibility in the forelimb than seen in the other African machairodonts (i.e. *Homotherium,*

1232   *Megantereon*; Lewis, 1995a, b, 1997) and a trend in the larger-bodied species toward a more

1233   *Panthera*-like cranial and postcranial anatomy, suggesting that although it seems to have been an

1234   ambush grappler much like *Megantereon* it may have been able to exploit a larger range of

1235   habitats than the other African sabertooth genera (Lewis, 1997; Lewis and Werdelin, 2007).

1236   Although postcranial remains of African *Lycyaenops* and *Chasmaporthetes* species are extremely

1237   rare (see Rovinsky et al., 2015), cursorial adaptations within the hunting-hyaena lineage supports

1238   more open habitats in the region, in contrast to the felids (Khomenko, 1932; Galiano and Frailey,

1239   1977; Berta, 1981; Tseng, Li and Wang, 2013). Amongst the extant carnivores identified by

1240   O'Regan and Menter (2009) modern populations of Cape fox (*Vulpes chama*), yellow mongoose

1241   (cf. *Cynictis penicillata*), and meerkat (aff. *Suricata suricatta*) typically occupy open, semi-arid

1242   to arid ecosystems (Kingdon and Hoffmann, 2013a). Interestingly, the extensive burrowing

1243   behaviour of meerkat and yellow mongoose also imply the presence of deep soils, with the latter

1244   avoiding rocky and hard soil regions for burrow construction (Kingdon and Hoffman, 2013a).

1245

1246   **Conclusions**

1247

1248   This first description of the non-primate faunas of the Drimolen Main Quarry provides an insight

1249   into the macromammalian community structure of a previously undescribed part of the Cradle of

1250   Humankind during the Early Pleistocene of South Africa. The fauna recovered suggests a

1251   community of great taxonomic breadth. Amongst the sampled Order Carnivora in particular

1252   there is a surprising amount of diversity, with a minimum of four large species of felid present

1253   alongside at least four hyaenid species, including the first strong evidence of two species of

1254   *Dinofelis* recovered from a single deposit (but see Lewis and Werdelin, 2013). Although there is

1255   a large amount of taxonomic diversity amongst the fauna, non-hominin primates comprise a

1256   significant percentage of the assemblage - a disparity that will only increase when the substantial

1257 Drimolen hominin sample is included in the overall faunal picture. As this publication provides

1258 the primary description of the recovered DMQ faunas, further analyses will need to be

1259 undertaken to understand the idiosyncrasies of the site, ranging from the taphonomic processes

1260 shaping the assemblage (particularly the large number of bovid horn cores and concomitant

1261 paucity of dental and postcranial remains) to a more integrated palaeoecological analysis of the

1262 Main Quarry.

1263

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1265

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1276

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1513

List of macromammalian species from the Drimolen Main Quarry deposits

Table 1. List of macromammalian species from the Drimolen Main Quarry deposits

Taxon	NISP	MNI
Order Primates[1]		
Family Cercopithecidae		
Tribe Colobini		
Cercopithecoides williamsi	22	8
Tribe Papionini		
Papio hamadryas robinsoni	260	45
Cercopithecidae indet.	272	4
Order Carnivora[2]		
Family Canidae		
Vulpes chama	1	1
cf. *Vulpes chama*	1	-
Canidae indet.	5	1
Family Felidae		
Subfamily Machairodontinae		
Dinofelis aff. *piveteaui*	17	2
?*Dinofelis* sp.	1	-
Dinofelis cf. *barlowi**	1	1
*Megantereon whitei**	2	1
Machairodontinae indet.	1	1
Subfamily Pantherinae		
Panthera pardus	5	1
cf. *Panthera pardus*	3	1
Panthera sp.	1	-
Subfamily Felinae		
cf. *Caracal caracal*	1	1
Felis silvestris lybica	3	1
cf. *Felis silvestris lybica*	4	2
Felidae indet.*	31	-
Family Herpestidae		
aff. *Suricata suricatta*	1	1
cf. *Cynictis penicillata*	3	1
Family Hyaenidae		
*Chasmaporthetes nitidula**	1	1
*Lycyaenops silberbergi**	1	1
Hyaenidae indet.*	7	2
Carnivora indet.	15	-
Order Cetartiodactyla		
Family Bovidae		
Tribe Alcelaphini		
Connochaetes sp.	2	2
Damaliscus sp.	2	2

Megalotragus sp.	4	2
Indeterminate (Class II/III)	34	9
Indeterminate (Class III)	11	4
Tribe Antilopini		
Antidorcas recki	25	16
Antidorcas cf. *recki*	26	2
Raphicerus sp.	1	1
Tribe Oreotragini		
Oreotragus sp.	12	9
Tribe Reduncini		
Redunca cf. *fulvorufula*	3	3
Tribe Tragelaphini		
Tragelaphus sp.	11	6
Indeterminate	2	-
Bovidae indet.	538	-
Family Giraffidae		
Giraffidae indet.	1	1
Family Suidae		
Suidae indet.	1	1
Order Perissodactyla		
Family Equidae		
Equus quagga ssp.	3	1
Order Proboscidea		
Family Elephantidae		
Elephantidae indet.	1	1
Order Hyracoidea		
Family Procaviidae		
Procavia sp.	5	3
Order Lagomorpha		
Family Leporidae		
Pronolagus sp.	1	1
Leporidae indet.	36	5
Order Rodentia		
Family Hystricidae		
Hystrix sp.	1	1
Order Tubulidentata		
Family Orycteropodidae		

Orycteropus cf. *afer*	1	1
Total	1380	147

[1]Taxonomic attributions, specimen counts, and MNI values as reported by Nieuwoudt (2014).

[2]Taxonomic attributions, specimens counts, and MNI values as reported by O'Regan and Menter (2009) except where amended here (amended taxa and/or counts marked with an asterisk).

Measurements (in mm) of Drimolen Main Quarry Felidae gen. et sp. indet and comparative maxillary fourth premolars body.

Table 2. Measurements (in mm) of Drimolen Main Quarry Felidae gen. et sp. indet and comparative maxillary fourth premolars

Specimen	Deposit	MD	BL	Wpc	PaL	MtL
Felidae gen. et sp. indet.						
DN 4300	**Drimolen Main Quarry**	**29.8**	**11.6**	**9.4**	**11.8**	**12.3**
DN 5498	**Drimolen Main Quarry**	**30.2***	**11.6***	**9.3**	**11.1***	**11.9**
Megantereon whitei						
DN 976	**Drimolen Main Quarry**	**23.4***	**11.2***	**9.6**	**10.0**	**10.6**
KA 64	Kromdraai A	29.7	11.1*	9.7*	9.6	10.8
Dinofelis piveteaui and aff. *piveteaui*						
DN 1012	**Drimolen Main Quarry**	**36.5**	**13.9**		**13.5**	**14.3**
KA 61	Kromdraai A	41.0	13.0			17.8
MT 1986[1]	Motsetse	38.8	12.8			16.5
Dinofelis barlowi						
BF 55-22	Bolt's Farm Pit 23	37.0*	16.5			14.0
SF 5855[1]	Sterkfontein Member 4	35.2	15.5		13.0	13.7*

*Minimum value given damage to measured region.

[1]Measurements of Motsetse and Sterkfontein Member 4 specimens derived from Lacruz et al. (2006).

Regression equations and metrics for the Felidae canine shape groups in Figure 4. Maxillary canine MD length and BL width (in mm), along with the canine compression ratio (BL/MD).

Table 3. Regression equations and metrics for the Felidae canine shape groups in Figure 4. Maxillary canine MD length and BL width (in mm), along with the canine compression ratio (BL/MD).

Canine Morphology	Regression Equation		R^2
Conical-toothed	$y = 0.7533x + 1.2559$		0.95666
False Saber-toothed	$y = 0.7119x - 2.0968$		0.90962
Saber-toothed	$y = 0.495x - 0.01$		0.87541
	MD Length (mm)	BL Width (mm)	Compression Ratio
Conical-toothed Felids			**0.83**
Puma concolor (n = 28) [a]	12.85	11.70	0.91
Neofelis nebulosa (n = 18) [a]	11.49	8.24	0.72
Panthera uncia (n = 12) [a]	11.85	11.06	0.93
Panthera tigris (n = 28) [a]	24.28	19.74	0.81
Panthera onca (n = 20) [a]	19.12	15.92	0.83
Panthera pardus (n = 26) [a]	14.72	12.44	0.85
Panthera leo (n = 17) [a]	23.30	18.29	0.78
False Saber-toothed Felids			**0.61**
Dinofelis petteri (n = 2) [b]	20.95	12.65	0.60
Dinofelis aronoki [b]	20.40	12.80	0.63
Dinofelis barlowi (n = 4) [b]	24.08	14.60	0.61
Dinofelis piveteaui	20.48	12.12	0.59
Dinofelis cf. *diastemata* (n = 2) [b]	20.20	11.85	0.59
Dinofelis cristata (n = 2) [b]	25.25	16.85	0.67
Dinofelis palaeoonca [b]	18.60	11.70	0.63
Dinofelis sp. [b]	24.80	15.10	0.61
DN 2791	**23.22**	**14.09**	**0.61**
Saber-toothed Felids			**0.51**
Homotherium serum [a]	34.56	15.78	0.46
Megantereon cultridens (n = 27) [a,c]	22.56	11.56	0.51
Megantereon whitei (n = 8) [c]	24.06	12.28	0.51
Smilodon fatalis [c]	44.22	24.65	0.56
Smilodon populator [c]	42.83	19.03	0.44

[a] Christiansen, 2007; [b] Werdelin and Lewis, 2001; [c] Palmqvist et al., 2007.

Comparative measurements (mm) of African fossil *Chasmaporthetes* and *Lycyaenops* maxillary premolars.

Table 4. Comparative measurements (mm) of African fossil *Chasmaporthetes* and *Lycyaenops* maxillary premolars

Specimen[1]	Deposit	P2		P3		P4	
		MD	BL	MD	BL	MD	BL
Chasmaporthetes nitidula							
SK 305	Swartkrans Member 1	15.8*	10.7	20.3*	12.9	32.7	15.3
SK 306	Swartkrans Member 1			19.6	13.6	32.4*	14.8
SK 307	Swartkrans Member 1					32.4	14.5
SK 309	Swartkrans Member 1			21.1	14.6		
SK 310	Swartkrans Member 1	18.8	11.9				
SK 311	Swartkrans Member 1	18.4	12.5				
SK 312	Swartkrans Member 1			21.9	14.0		15.8*
SK 313	Swartkrans Member 1			20.8	14.4		
SK 379	Swartkrans Member 1	19.5	12.0				
SKX 29205	Swartkrans Member 3			22.4	12.8*		
SKX 22992/72	Swartkrans Member 3					30.8*	15.8
SF 363	Sterkfontein Member 4						15.4
Lycyaenops silberbergi							
DN 404	**Drimolen Main Quarry**			**20.2***	**11.6***	**31.5**	**13.3**
DN 974	**Drimolen Main Quarry**			**20.4**	**13.5**		
STS 130	Sterkfontein Member 2[2]			23.8	14.5*		
STS 135	Sterkfontein Member 4			19.6	11.9		
SF 383/373	Sterkfontein Member 4			22.6			
SF 369/373	Sterkfontein Member 4			22.8			
SF 408	Sterkfontein Member 4			20.3			
SF 463	Sterkfontein Member 4	17.1	11.0				
Lycyaenops cf. *L. silberbergi*							
NHM AS 7.VI.35	Laetoli (Laetolil Beds, Upper Unit)			17.7	12.5		
LAET 75-494	Laetoli (Unknown level)	19.1	11.0				

*Minimum value given damage to measured region.

[1]All measurements reported are by the authors except those for Sterkfontein (SF) premolars reported by Turner (1987) and Laetoli premolars reported by Werdelin and Dehghani, 2011).

[2]The stratigraphic origin of the STS 120 *L. silberbergi* type specimen from Sterkfontein is uncertain but may be derived from Member 2 or 3 (Brain, 1981).

Linear dimensions (mm) of the Drimolen Main Quarry *Antidorcas recki* horn cores.

Table 5. Linear dimensions (mm) of the Drimolen Main Quarry *Antidorcas recki* horn cores.

DN Specimen	Anteroposterior depth	Mediolateral width
Male		
224	43.56	28.05
890	40.53	28.01
1060	42.16	28.86
3294	35.69	
Female		
995	17.51	14.59
2483a	18.19	16.08
4438	17.92	15.16

Comparative measurements (mm) of the DNH 2850 *Metridiochoerus* sp. right immature third metatarsal and fossil and extant adult suid third metatarsals.

Table 6. Comparative measurements (mm) of the DN 2850 Suidae gen. et sp. indet. right immature third metatarsal and fossil and extant adult suid third metatarsals.

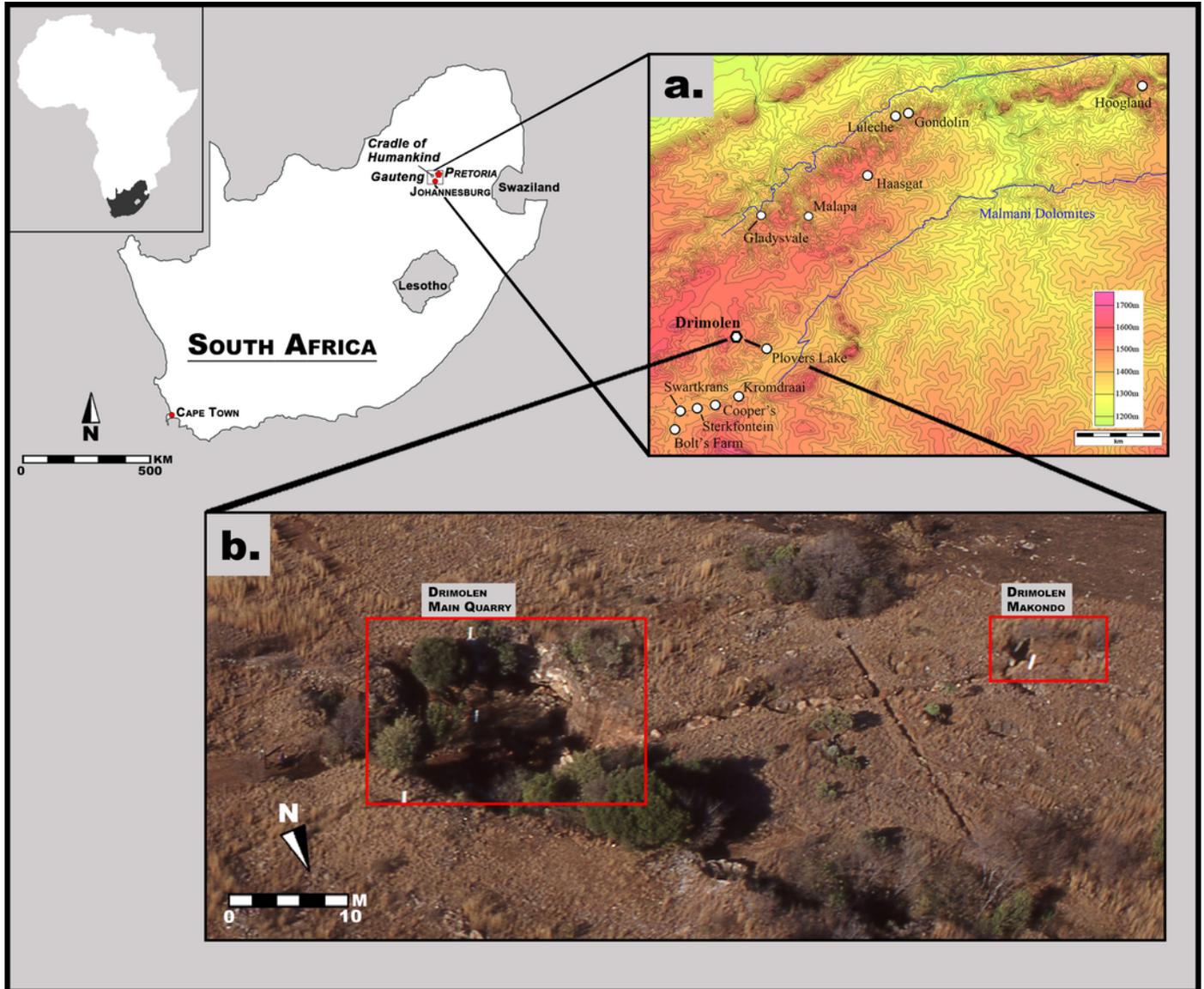
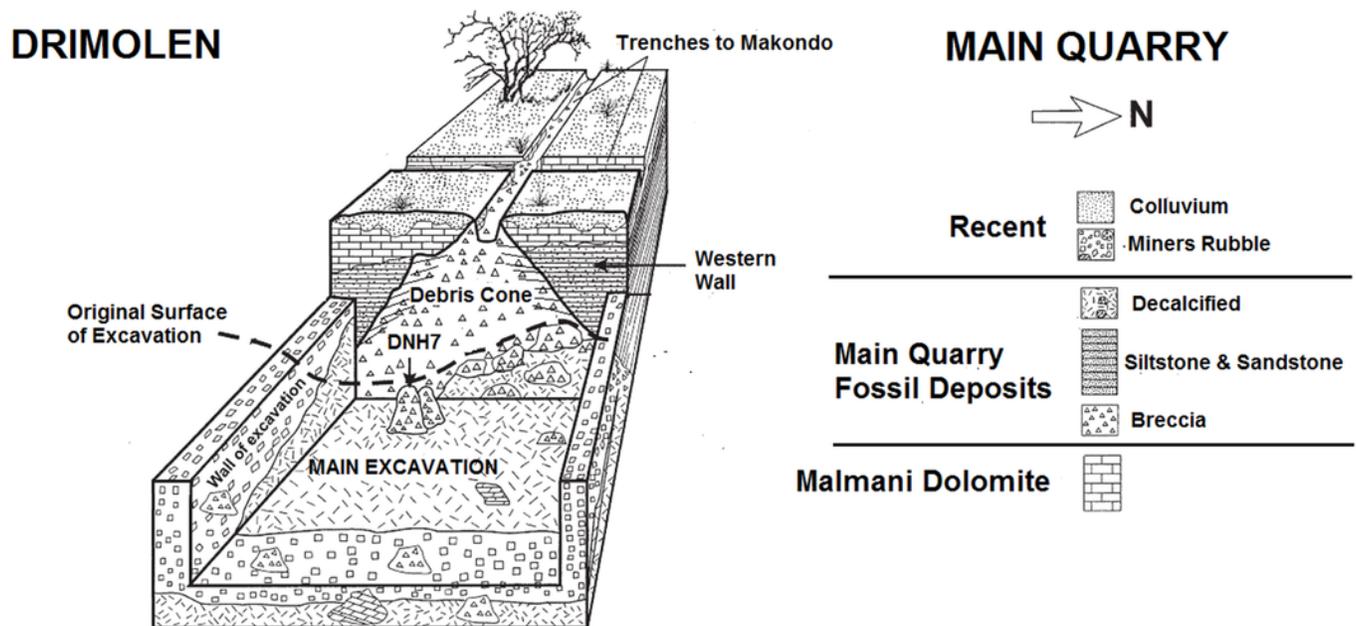
Measurement	DN 2850	G 8105	*Phacochoerus aethiopicus*				*Potamochoerus porcus*			
			Mean	Min.	Max.	*n*	Mean	Min.	Max.	*n*
Proximal dorsoventral depth	**21.99**	30.03	19.56	18.11	20.92	6	22.12	21.32	23.30	4
Distal mediolateral width	**16.24**	-	15.40	13.67	16.92	5	15.69	14.33	16.90	4
Distal dorsoventral depth	**17.04**	-	15.48	14.63	16.49	6	16.49	15.72	17.70	4

McIntosh evenness statistic values for the Drimolen Main Quarry and comparative South African fossil assemblages.

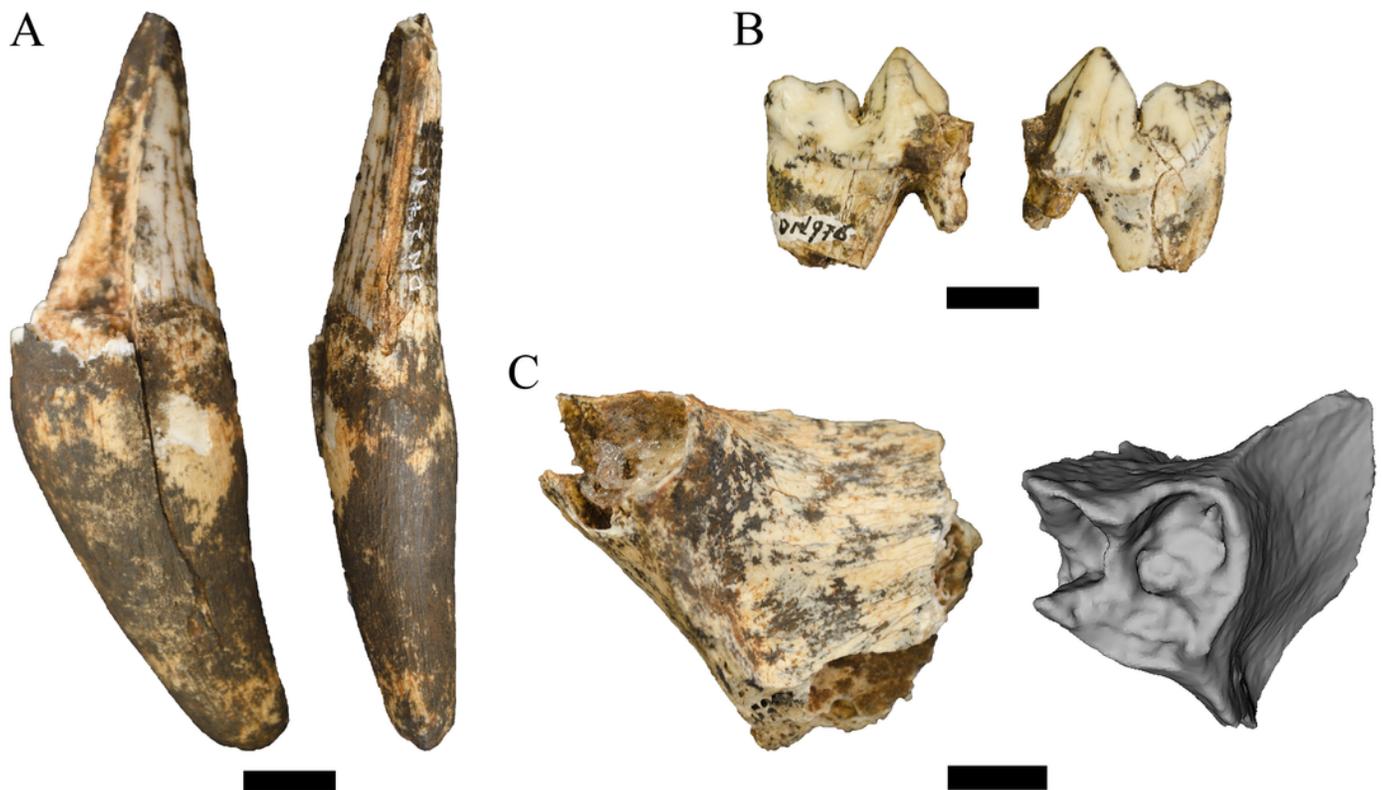
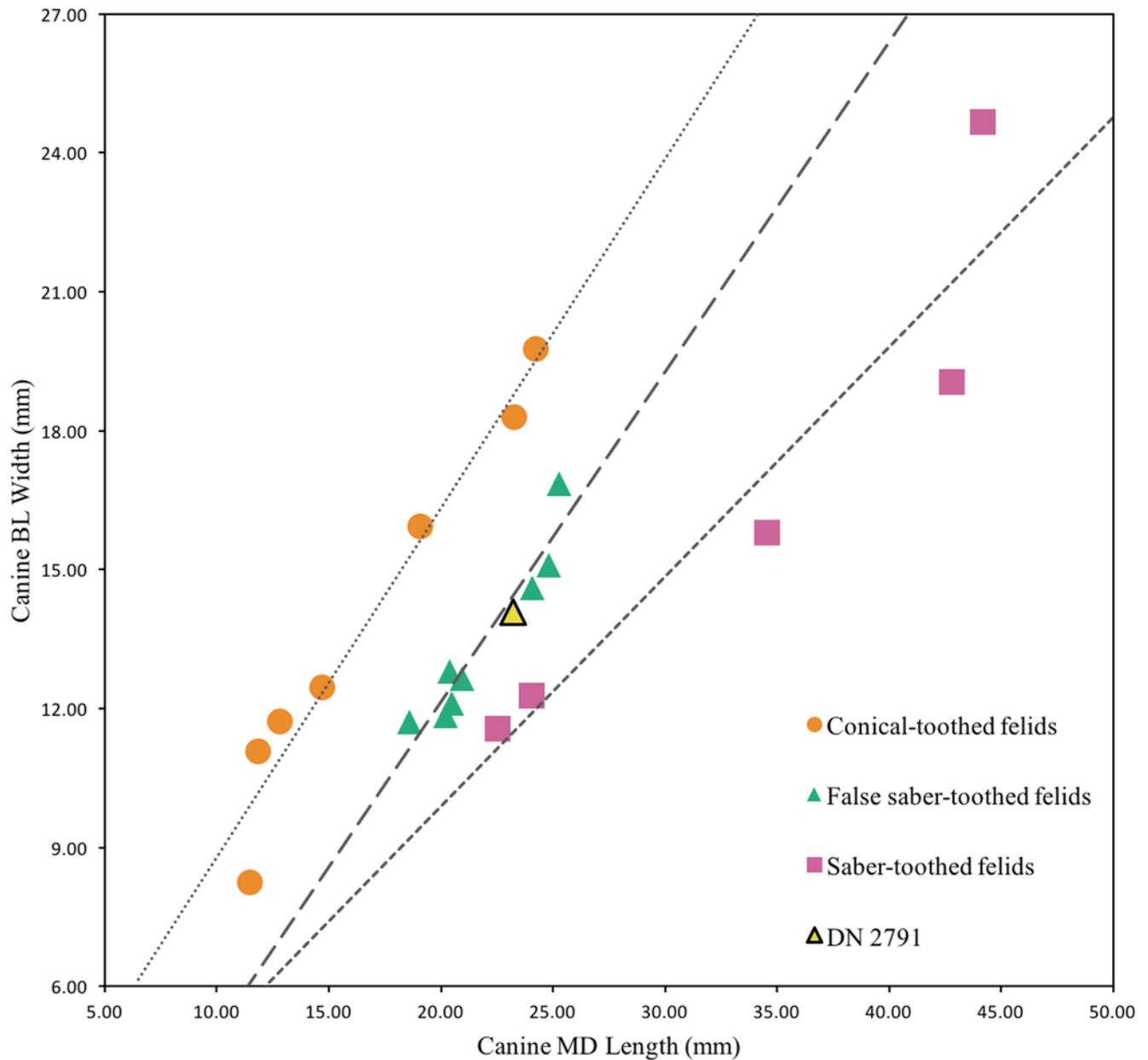
Table 7. McIntosh evenness statistic values for the Drimolen Main Quarry and comparative South African fossil assemblages.

Site*	Evenness
Drimolen Main Quarry	0.71
GD 2	0.60
Gladysvale	0.92
Haasgat HGD	0.72
Kromdraai A	0.83
Kromdraai B	0.76
Makapansgat 2	0.93
Makapansgat 3	0.81
Makapansgat 4	0.84
Makapansgat 5	0.78
Sterkfontein Member 4	0.67
Sterkfontein 53 Breccia	0.86
Sterkfontein Olduwan Infill	0.74
Sterkfontein Member 5 West	0.84
Swartkrans Member 1 Lower Bank	0.83
Swartkrans Member 2	0.86
Swartkrans Member 3	0.84

*Data from sources listed in Adams (2006, 2010) but modified to exclude hominin taxa from the calculation.

Aerial photograph and map of the Drimolen Palaeocave System relative to other penecontemporaneous South African fossil sites.

Schematic plan of the Drimolen Main Quarry excavation area and deposits.

3

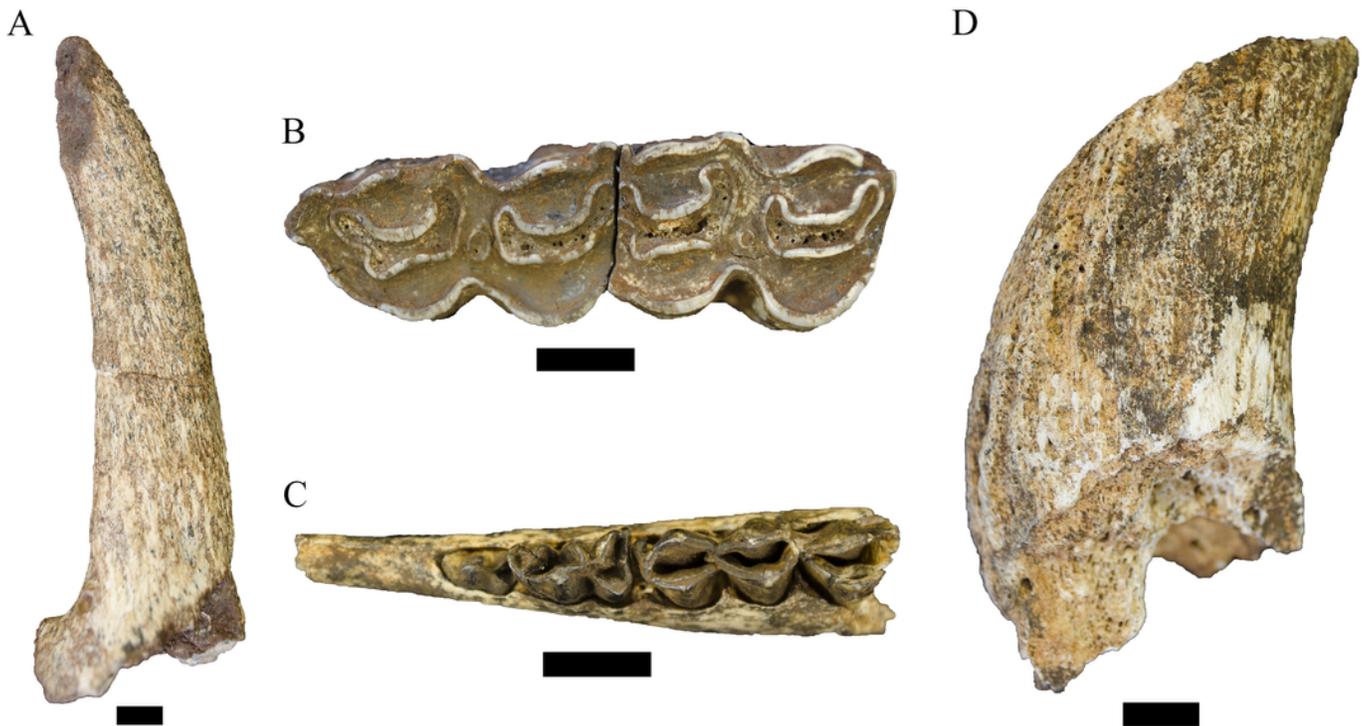
Order Carnivora specimens attributed to the Family Felidae from the Drimolen Main
Quarry.

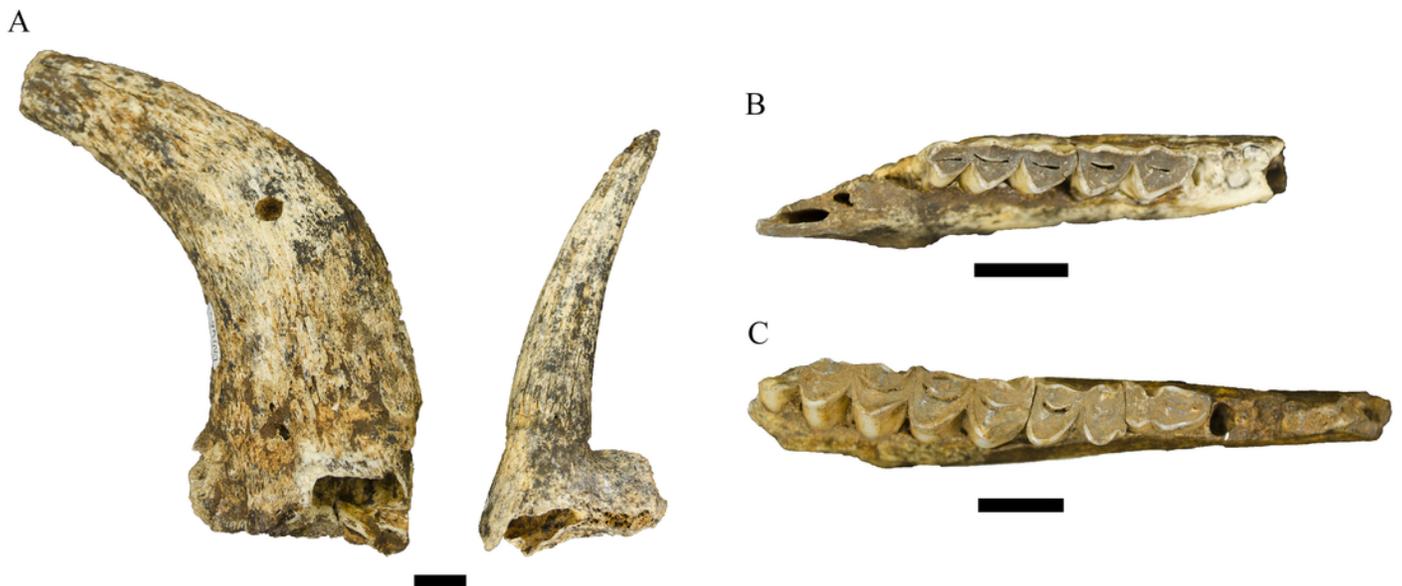
A, DN 2791 *Dinofelis* cf. *barlowi* right maxillary canine, buccal (left) and distal (right) views.
B, DN 976 *Megantereon whitei* left P4, buccal (left) and lingual (right) views. C, DN 3254
Megantereon whitei left mandibular corpus, lateral (left) and anterior oblique (right) view of
surface scan to highlight sharp diastema margin and mandibular flange. Scale bars equal
1cm.

Bivariate plot of select Felidae maxillary canine MD length on BL width (mm), including DN 2791 *Dinofelis* cf. *barlowi.* Metrics and regression equations presented in Table 3.

Order Carnivora specimens attributed to the Family Felidae and Hyaenidae from the Drimolen Main Quarry.

A, DN 4300 Felidae gen. et sp. indet. right P4, buccal view. B, DN 974 *Lycyaenops silberbergi* right P3, occlusal (top), lingual (left) and buccal (right) views. Scale bars equal 1cm.

6

Order Cetartiodactyla specimens attributed to the Family Bovidae from the Drimolen Main Quarry.

A, DN 2790, *Damaliscus* sp. right horn core, medial view. B, DN 748a and 748b, *Megalotragus* sp. right M2 and M3, occlusal view. C, DN 1015, Alcelaphini gen. et sp. indet. left mandible, occlusal view. D, DN 1013 Alcelaphini gen. et sp. indet. right horn core, anterior (probable) view. Scale bars equal 1cm.

Order Cetartiodactyla specimens attributed to the Family Bovidae from the Drimolen Main Quarry.

A, DN 1060, *Antidorcas recki* right male horn core, medial view (left); DN 995, *Antidorcas recki* left female horn core, medial view (right). B, DN 438, *Oreotragus* sp. right mandible, occlusal view. C, DN 120, *Tragelaphus* sp. right mandible, occlusal view. Scale bars equal 1cm.

Order Cetartiodactyla specimens attributed to the Families Giraffidae and Suidae from the Drimolen Main Quarry.

A, DN 1097, Giraffidae gen. et sp. indet. right humerus, anterior (left) and posterior (right) views. B, DN 2850, Suidae gen. et sp. indet. right third metatarsal, medial (left) and lateral (right) views. Scale bars equal 1cm.

Specimens attributed to the Orders Proboscidea, Rodentia, and Tubulidentata from the Drimolen Main Quarry.

A, DN 4335, Elephantidae gen. et sp. indet., maxillary tusk fragment, internal view. B, DN 2760 *Hystrix* sp. left maxillary molar, occlusal view. C, DN 1062 *Orycteropus* cf. *afer* right proximal radius, posteromedial view. Scale bars equal 1cm.