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Cercopithecidae, and Suidae

Edited by

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Related Archival Materials: The KGA paleontological collection record plots (on file, available for viewing upon request)

CHAPTER 6

Fossil Suidae of the Konso Formation

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Abstract

The suid sample from the Konso Formation spans the ~1.9 Ma to ~0.85 Ma time period, although very few fossils are known from strata younger than ~1.25 Ma. The Konso fossil assemblage at ~1.9 Ma includes *Notochoerus clarki*, *Metridiochoerus andrewsi*, *Kolpochoerus limnetes* and *K. cf. majus*. The Konso *N. clarki* represents one of the youngest known occurrences of this taxon. *Kolpochoerus cf. majus* is common throughout the Konso Formation sequence. Its facial and dental morphology suggests a condition broadly intermediate between earlier *K. phillipi* and later *K. majus*. At Konso, the ~1.9 Ma *K. limnetes* is continued by fragmentary ~1.75 Ma to ~1.45 Ma fossils attributed to *K. limnetes/olduvaiensis*. Fossils younger than ~1.45 Ma are attributed to *K. olduvaiensis* based on third molar development and advanced facial morphology. *Metridiochoerus andrewsi* continues from ~1.9 Ma to ~1.75 Ma, but was replaced by *M. compactus* and *M. hopwoodi* by ~1.6 Ma. *Metridiochoerus modestus* is documented after ~1.45 Ma, so that three species of *Metridiochoerus* co-occur. The few fossils from ~0.85 Ma include fragments of *K. olduvaiensis*, *M. modestus* and cf. *Phacochoerus*.

6.1 INTRODUCTION

A total of 742 craniodental suid fossils recovered from the Konso Formation are systematically reported here. Isolated anterior teeth are not allocated to genera and species, except for the generic attribution of the upper canines. An additional 200 postcranial fossils are currently catalogued as Suidae. All materials referred to the Suidae are listed in Appendix Tables A3.1 to A3.14 with their provenience.

Based on the craniodental remains, the Konso suid fossils are represented by four genera (*Notochoerus*, *Kolpochoerus*, *Metridiochoerus*, *Phacochoerus*) and nine species, spanning the ~1.9 Ma to ~0.85 Ma time period. At any single time horizon, there appears to have been up to four or five contemporaneous species lineages. Suwa et al. (2003) provided an initial overview of the Konso suid fauna.

Suid fossils of the Sorobo Member, Turoha Member, and lower part of the Kayle Member (stratigraphic intervals 1 and 2 spanning ~1.9 Ma to ~1.75 Ma) are attributed to *Notochoerus*

clarki, *Kolpochoerus limnetes* (or *Kolpochoerus limnetes/olduvaiensis* at ~1.75 Ma), *K. cf. majus* and *Metridiochoerus andrewsi*. The suids of the middle part of the Kayle Member (stratigraphic interval 3 spanning ~1.65 Ma to ~1.55 Ma) are attributed to *K. limnetes/olduvaiensis*, *K. cf. majus*, *M. hopwoodi* and *M. compactus*. The suids from the upper part of the Kayle Member and Karat Member (stratigraphic intervals 4 and 5 spanning ~1.45 Ma to ~1.25 Ma) are attributed to *K. olduvaiensis* (or *Kolpochoerus limnetes/olduvaiensis* at ~1.45 Ma), *K. cf. majus*, *M. hopwoodi*, *M. compactus*, and *M. modestus*. The uppermost Karat Member sediments of the Konso Formation (stratigraphic interval 6 at ~0.85 Ma) produced fewer fossils but include fragments attributed to *K. olduvaiensis*, *M. modestus* and cf. *Phacochoerus*.

6.2 METHODS

The systematics adopted in this report follows White and Suwa (2004) for *Notochoerus*, Souron et al. (2013) for *Kolpochoerus*, and Harris and White (1979), Harris (1983) and Cooke (2007) for *Metridiochoerus*. The metrics presented follow Harris and White (1979) and Harris (1983).

The morphological criteria followed in allocating partial dentition to species within genera are outlined in the respective remarks. Body part descriptions of the referred materials (listed in Appendix Tables A3.1 to A3.14) are those of the KGA faunal catalogue (see Chapter 2).

6.3 SYSTEMATIC PALEONTOLOGY

Family Suidae GRAY 1821

Genus *Notochoerus* BROOM 1925

Notochoerus clarki WHITE AND SUWA 2004

Referred Konso materials (Appendix Table A3.1)

Sorobo Member and lower part of Turoha Member (~1.9 Ma): 17 specimens.

Descriptive remarks

Three of the Konso *Notochoerus clarki* specimens, KGA4-165 (right maxillary fragment with M² and M³), KGA4-2413 (left mandibular fragment with M₃) and KGA4-1882 (left M₃) were figured in White and Suwa (2004). Another specimen, KGA4-166 (right mandibular fragment with M₃), was figured in Suwa et al. (2003). Including these four specimens, a total of 17 dental or dentognathic specimens from Konso were attributed to *N. clarki* by White and Suwa (2004).

These dentitions exhibit features considered representative of the species. Compared to *Notochoerus scotti*, *N. clarki* third molars are relatively conservative with weaker degrees of mesiodistal crown elongation, pillar development and hypsodonty. In these respects, they more closely resemble the *N. euilus* condition, but are derived relative to the latter in slightly greater hypsodonty and “gracilized” molar and premolar morphology (thinner enamel, tendency for more complicated pillars, and smaller and rounded premolars). The M³s exhibit four lingual pillars and terminal cluster, with tendency of stellate pillar wear pattern. The M₃s exhibit four lateral pillar pairs and terminal cluster, or a fifth smaller pair and terminal pillar(s). The main lateral pillars tend to be H-shaped in wear, and the median pillars tend to be single with a relatively simple round shape.

Genus *Kolpochoerus* VAN HOEPEN AND VAN HOEPEN 1932

Kolpochoerus cf. *majus* (HOPWOOD 1934)

Referred Konso materials (Appendix Table A3.2)

Sorobo Member and lower part of Turoha Member (~1.9 Ma), 94 specimens;
middle part of Kayle Member (~1.55 Ma to ~1.65 Ma), 14 specimens;
upper part of Kayle Member (~1.4 Ma to ~1.45 Ma), 24 specimens;
Karat Member (~1.25 Ma to ~1.4 Ma), 48 specimens.

Descriptive remarks

The Konso *Kolpochoerus* cf. *majus* collection includes several partial crania, all highly fragmentary. All but one come from the ~1.9 Ma levels, and a single mid-facial to basicranial specimen (KGA4-2611) comes from the ~1.45 Ma level.

KGA4-21 is a fragmentary hemi-snout considered male from its canine alveolar size (Fig. 6.1). It preserves a nasal rugosity ~78 mm long, forming a developed gutter between it and the root of the broken canine flange. A similar overall morphology occurs in the recently described male *Kolpochoerus phillipi*, but with a less developed nasal rugosity (Souron et al., 2013).

KGA4-812 is a male palatal fragment with a well-preserved supra-canine flange (but lacking its posterior end) (Fig. 6.2 left). The supra-canine flange is ~72 mm long anteroposteriorly from the canine alveolar margin to the posterior root of the flange. An estimation of its total length is ~75 mm. The flange projects laterally by ~30 mm forming a gutter ~22 mm wide. Its size and rugose projection are broadly comparable to the *Kolpochoerus phillipi* condition.

KGA4-240 is a comparatively large (cf. KGA4-2611, see below) mid-facial specimen. Although it is broken just posterior to the supra-canine flange, it is assumed male from size. The specimen is broken just at the zygomatic root, the latter being ~31 mm thick. The break exposes a developed sinus system that is continuous from the maxillary sinus into the zygomatic, suggesting presence of a modest-sized zygomatic knob.

The female supra-canine flange is intact in the palatal fragment KGA4-2577 (Fig. 6.2 right). It is considerably smaller than in the male example, being ~60 mm long anteroposteriorly, but extending only ~15 mm laterally to form a weak gutter ~12 mm wide. It takes the form of a sharp localized crest with no rugose development.

A partial mid-face and cranial base are preserved in KGA4-2611, which comes from the ~1.45 Ma stratigraphic level. Although damaged, the zygomatic region is slender and sufficiently preserved to show that there was no development of a zygomatic knob. The root of the zygomatic is ~24 mm thick, and the break exposes a small sinus discontinuous from the maxillary sinus.

We interpret the above facial evidence to suggest sexual dimorphism in *Kolpochoerus* cf. *majus*, wherein males possess a supra-canine flange in the form of a thick, roughened and anteroposteriorly elongated ridge, a nasal rugosity on the lateral snout, an intervening gutter, and (apparently) a modest-sized zygomatic knob. Females lack development of these features.

The mandible is represented by up to 10 partial corpora (Figs. 6.1 and 6.3), but only one is preserved bilaterally with an intact symphysis (KGA4-1448). The corpus exhibits a strong lateral bulge characteristic of the genus (e.g., Harris, 1983), and is comparatively shallow in height (Table 6.1). The symphysis is broad as reported previously for *Kolpochoerus majus* (Gilbert, 2008; Souron et al., 2013).

The dentition is characterized by simple but robust premolars and a molar row not expanded anteroposteriorly (Fig. 6.1 bottom) (see the Appendix Table A3.2 for crown dimensions). The lower dentition typically preserves the P₂ but not the P₁. However, examples lacking the P₂ are

also known. Likewise, the upper dentition preserves a sizable P². In KGA4-2577, a sizeable P¹ alveolus occurs anterior to the P² crown (Fig. 6.2 right), while in three other specimens the alveolar bone is sufficiently preserved to confirm the lack of a P¹ (Fig. 6.2 left).

The Konso premolars retain the simple basal kolpochoere morphology, but their features are robust and less sectorial than in the earlier *Kolpochoerus afarensis* or *K. phillipi*. They lack the “gracilized” morphology seen in the premolars of the *K. limnetes*/*K. olduvaiensis* lineage, and are relatively larger in size. The P⁴ retains two well-developed and distinct buccal cusps and lacks the characteristic pillar wall invaginations seen in the thinner enameled *K. limnetes*/*K. olduvaiensis* homologues.

The M₃s of the lower stratigraphic levels are characterized by relatively little talon or talonid development. The M³s have two lingual pillars and a strong single terminal. The M₃s commonly have only three lateral pillar pairs with the third pair compressed against each other distally, or three pillar pairs and an additional small median terminal pillar.

Third molar crown height remains relatively low, but in all molar positions, individual pillar/cusp topography is accentuated because of the well-separated main pillars projecting distinctly higher than the lower median pillars. This gives an incipiently lophodont morphology to the molar row, which is retained through moderate occlusal wear. At Konso, the above morphological characteristics enable separation of *Kolpochoerus* cf. *majus* molars from those of *K. limnetes* or *K. olduvaiensis*. Further differences are the thicker enamel and the simpler, mesiodistally compressed pillar wear pattern in the Konso *K. cf. majus*, in contrast to the more invaginated pillar pattern of *K. limnetes* or *K. olduvaiensis*.

The *Kolpochoerus* cf. *majus* dentitions from the upper stratigraphic levels of Konso exhibit a significant increase in size. Average M³ length is 34.0 mm (n=13) at ~1.9 Ma and 39.2 mm (n=14) at ~1.45 Ma to ~1.25 Ma. Average M₃ length is 36.5 mm (n=17) at ~1.9 Ma and 41.5 mm (n=5) at ~1.45 Ma to ~1.25 Ma. Variation in the upper stratigraphic level specimens also includes more developed M3 distal crowns and slightly higher crown heights than those from the lower Konso levels. In the M³, there is a higher frequency of developed accessory terminal cusps flanking the main third lingual pillar. In the M₃, there is a tendency for better developed third lateral pillar pair and terminal pillar. The M³ size increase through time is accompanied by a weak tendency for relative elongation: average Breadth/Length index values are 0.71 (n=13) at ~1.9 Ma and 0.61 (n=13) at ~1.45 Ma to ~1.25 Ma. However, such a relative elongation is not evident in the M₃: average Breadth/Length index values are 0.52 (n=17) at ~1.9 Ma and 0.50 (n=5) at ~1.45 Ma to ~1.25 Ma.

Discussion

Suwa et al. (2003) referred the above materials to *Kolpochoerus majus*, but pending a comprehensive evaluation in light of the emerging evolutionary history of this clade (Gilbert, 2008; Souron et al., 2013), we conservatively allocate them here to *K. cf. majus*.

Kolpochoerus cf. *majus* is common at Konso throughout the ~1.9 Ma to <~1.4 Ma levels. The Konso form represents a generally good intermediate stage between the ~2.5 Ma *K. phillipi* (Souron et al., 2013) and the ~1.0 Ma *K. majus* of Daka (Gilbert, 2008). A possible hypothesis is that these three constitute an evolutionary lineage (but see below). They share simple molar morphology, little or no premolar reduction, distinctly projecting crest-like supra-canine flanges in males (but not in Daka), and little or no facial elongation. These are shared primitive features, which are useful in differentiating them from the more derived *K. limnetes*/*K. olduvaiensis* lineage.

Shared derived features of the three are more subtle, but one is the incipient lophodonty

observed as early as ~2.5 Ma (Souron et al., 2013). At Konso, this feature can be used to sort fragmentary and/or isolated molars of *Kolpochoerus* cf. *majus* from those of the *K. limnetes*/*K. olduvaiensis* lineage homologues. Observations of the >2.5 Ma Omo Shungura Formation materials suggest that early specimens of *K. limnetes* already exhibited a flatter occlusal topography compared to *K. phillipi* or Konso *K. cf. majus*, suggesting cladogenesis, perhaps associated with more grazing in the *K. limnetes* lineage at ~3.0 Ma.

Compared to the earlier *Kolpochoerus phillipi* (Souron et al., 2013), the Konso materials are

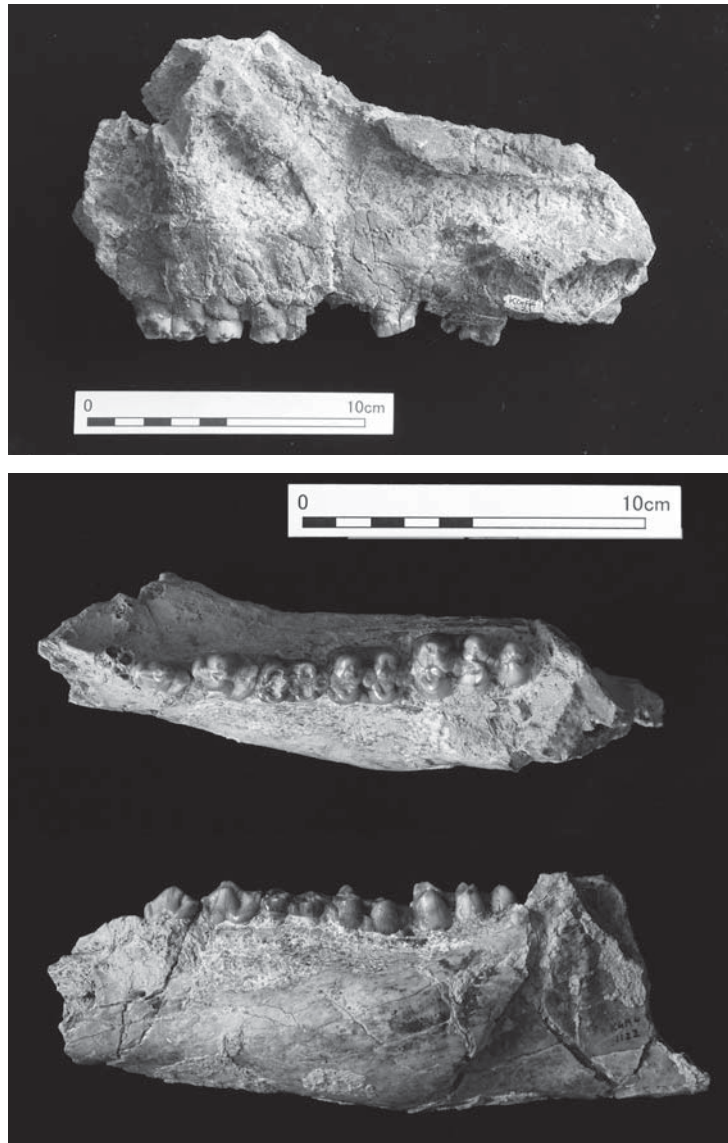


Fig. 6.1. *Kolpochoerus* cf. *majus* maxilla and mandible (~1.9 Ma). Top, KGA4-21 male right snout, lateral view. Bottom, KGA4-1122 left mandibular corpus with P₂ roots and P₃ to M₃ crowns (occlusal and lateral views).

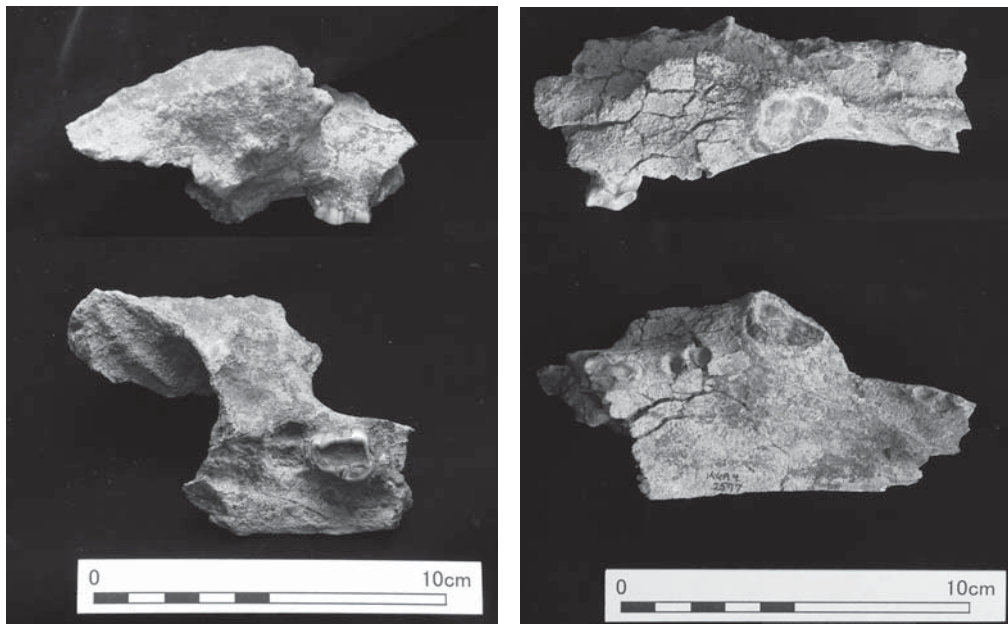


Fig. 6.2. *Kolpochoerus cf. majus* maxillary fragments with supra-canine flange (~1.9 Ma). Left panel, KGA4-812 left male maxilla with P³ crown and large canine alveolus; lateral (top) and palatal (bottom) views. Right panel, KGA4-2577 right female maxilla with broken canine, P¹ alveolus and P² crown; lateral (top) and palatal (bottom) views.



Fig. 6.3. *Kolpochoerus cf. majus* mandible KGA4-1448 (~1.9 Ma).

apparently more derived in a wide mandibular symphysis, perhaps a greater tendency to lose the P¹, and robust non-sectorial premolars.

Compared to the later Daka *Kolpochoerus majus* condition (Gilbert, 2008), the Konso *K. cf. majus* retains the primitive supra-canine flange morphology. The zygomatic knob was lacking in females, and probably only modestly developed in males. The Daka *K. majus* dentition is also more derived in their slightly larger size and increased hypsodonty, foreshadowing the Middle Pleistocene *K. majus* condition. Within the Konso *K. cf. majus*, a slight increase in molar size, complexity and hypsodonty, and a slight gracilization and complication of premolar form are observed between the ~1.9 Ma and <~1.4 Ma materials. The ~1.0 Ma Daka condition can be seen as a continuum of this trend. However, given the significant differences in cranial morphology and size between the Konso and Daka materials, the transition between the two conditions might have been more abrupt than gradual.

A fuller assessment of the systematic relationship between *Kolpochoerus phillipi*, Konso *K. cf. majus*, and *K. majus* from Daka and later stratigraphic horizons is outside the scope of this report (see Souron et al., 2013 for further perspectives).

***Kolpochoerus limnetes* (HOPWOOD 1926)**

sensu White (1995) *K. limnetes*, Cooke (2007) *K. heseloni*

Referred Konso materials (Appendix Table A3.3)

Sorobo Member and lower part of Turoha Member (~1.9 Ma), 17 specimens.

Kolpochoerus limnetes/olduvaiensis

sensu Suwa et al. (2003), transitional between earlier *K. limnetes* and later *K. olduvaiensis*

Referred Konso materials (Appendix Table A3.4)

Lower part of Kayle Member (~1.75 Ma), 2 specimens;
middle part of Kayle Member (~1.55 Ma to ~1.65 Ma), 10 specimens;
upper part of Kayle Member, below or just above TBT (~1.45 Ma), 20 specimens.

***Kolpochoerus olduvaiensis* (LEAKEY 1942)**

sensu Harris (1983) late *K. limnetes*, Cooke (2007) *K. olduvaiensis*

Referred Konso materials (Appendix Table A3.5)

Upper part of Kayle Member, above TBT (~1.4 Ma to ~1.45 Ma), 102 specimens;
Karat Member (~1.25 Ma to ~1.4 Ma), 12 specimens;
uppermost Karat Member (~0.85 Ma), 2 specimens.

Descriptive remarks

Fragmentary but informative cranial materials are represented by two specimens. KGA10-2792 (~1.44 Ma) is a partial face confined mostly to the snout (Fig. 6.4, right). It exhibits a large, elongate snout, with huge canines (alveolar diameter ~80 mm, maximum breadth across the supra-canine flanges ~250 mm) accompanied by a laterally flaring supra-canine flange (length ~180 mm, breadth ~55 mm, anterior height ~68 mm). Rugosities are ill-developed along the sides of the snout opposite the canine flange. The supra-canine gutter, although moderately deep, is not constricted. The long snout is over ~350 mm long, before starting to rise towards the forehead into a concave lateral profile. From the remaining alveoli and roots, P¹ is confirmed absent and P² present. This partial face conforms in morphology to that described for the advanced part of the *Kolpochoerus limnetes* lineage (= *K. olduvaiensis*) from the upper part of the

Turkana Basin sequence (younger than ~1.6 Ma) (Harris, 1983). But KGA10-2792 appears larger in size, especially in its enormous canine alveolus and supra-canine flange.

KGA6-45 (~1.75 Ma) is a left maxillary fragment preserving an erupting canine and supra-canine flange (Fig. 6.4, left). Based on the laterally projecting supra-canine flange and large canine dimensions (~42.5 mm, about ~30% larger than *Kolpochoerus cf. majus* male canines), we attribute it to a male. Its supra-canine flange morphology is similar in pattern to that of KGA10-2792, forming an anterolaterally broad triangular prominence, contra the linear rugose crest of the male *K. cf. majus* and some *K. limnetes*. However, the KGA6-45 canine flange is much smaller (length ~115 mm, breadth ~35 mm, anterior height ~35 mm) than that of KGA10-2792.

Fragmentary mandibular corpora are represented by KGA11-157 and KGA4-2604, both from the ~1.45 Ma stratigraphic level. The lateral corpus bulge is at the weak to moderate side of the *Kolpochoerus cf. majus* range of variation.

The dentition is represented mostly by isolated teeth. Allocated specimens and crown dimensions are tabulated in the Appendix (Tables A3.3 to A3.5).

Premolars are morphologically more gracile than in the Konso *Kolpochoerus cf. majus*, tending to have somewhat rounded crown contours, greater degrees of crenulation and infolding of pillar walls, and thinner enamel.

The M³s from the lower stratigraphic levels (~1.9 Ma) have three developed lingual pillars and a small to moderate-sized terminal pillar. The ~1.6 Ma to ~1.45 Ma homologues exhibit similarly developed talons, or four lingual pillars and a small terminal pillar. The <~1.45 Ma and



Fig. 6.4. *Kolpochoerus olduvaiensis* partial snout KGA10-2792 (right) (~1.44 Ma) compared with *K. limnetes/olduvaiensis* supra-canine flange fragment KGA6-45 (left) (~1.75 Ma), both dorsal views.

higher stratigraphic level homologues tend to be larger-sized. They usually have four full lingual pillars, the fourth either as the main structure of a terminal complex, or more often with an additional terminal pillar. These M^3 s also tend to be higher crowned than the homologues from the earlier stratigraphic levels.

The M_3 s from the lower stratigraphic level (~1.9 Ma) have four lateral pillar pairs and a juxtaposed small terminal pillar. Those from the intermediate stratigraphic levels (~1.6 Ma to ~1.45 Ma) range in variation from a similar talonid development to a more developed M_3 with four lateral pillar pairs and a terminal cluster. From the <~1.45 Ma and higher stratigraphic levels, most M_3 s appear somewhat higher crowned, and with four lateral pillar pairs and a sizable terminal pillar or terminal pair/cluster (Fig. 6.5).

Average M^3 length increases from 48.2 mm (n=3) at ~1.9 Ma, to 53.3 mm (n=2) at ~1.65 Ma to ~1.45 Ma, to 54.5 mm (n=9) at ~1.45 Ma to ~1.4 Ma.

Average M_3 length increases from 55.0 mm (n=2) at ~1.9 Ma, to 57.6 mm (n=6) at ~1.65 Ma to ~1.45 Ma, to 62.6 mm (n=5) at ~1.45 Ma to ~1.4 Ma.

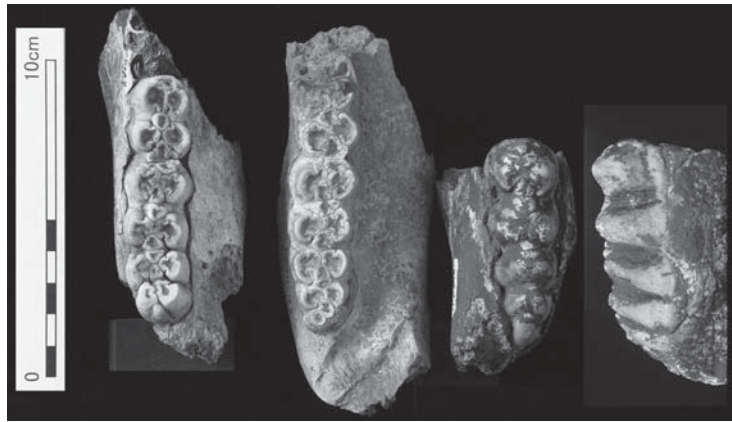


Fig. 6.5. *Kolpochoerus limnetes*/*K. olduvaiensis* lineage lower third molars. Left two, KGA4-2609 and KGA11-157 right mandibular fragments with M_2 and M_3 (both *K. limnetes/olduvaiensis*); right two, occlusal and lingual views of KGA10-17 left mandibular fragment with M_3 (*K. olduvaiensis*).

Discussion

The Konso *Kolpochoerus limnetes*/*K. olduvaiensis* lineage is common throughout the ~1.9 Ma to ~1.4 Ma levels. It is represented largely by fragmentary dentitions, which apparently represent a phyletic lineage. As was the case in the Lake Turkana Basin (Harris and White, 1979; Harris, 1983), morphological boundaries cannot be objectively defined from the well-represented dental succession.

The cranial evidence described above, although fragmentary and confined to only two specimens, is nevertheless potentially informative regarding evolutionary patterns of the *Kolpochoerus limnetes*/*K. olduvaiensis* lineage. The Konso evidence suggests that a derived supra-canine flange morphology occurred at ~1.75 Ma, whereas the earlier Turkana Basin sequence (Koobi Fora and Shungura Formations) contains instances of the primitive rugose linear crest. This may reflect either emerging taxonomic differences or within-species morphological variability.

As discussed in Suwa et al. (2003), the Konso *Kolpochoerus limnetes*/*K. olduvaiensis* lineage dentition shows progressive development of the third molars from ~1.9 Ma to ~1.4 Ma times. At the same time, compared to the Turkana Basin evidence, there appears to be a time-lag in this development. Even the largest M3s from the upper part of the Kayle and Karat Members are shorter and have fewer lateral pillar pairs than the contemporary Turkana Basin homologues.

The striking cranial similarity between Konso (KGA10-2792) and Turkana (KNM-ER 788) *Kolpochoerus olduvaiensis* in their elongated snout and supra-canine flange morphology suggests, however, a common regional morphology. Perhaps, advanced M3 morphology progressively emerged in the Turkana Basin (or elsewhere) and such adaptive phenetic tendencies dispersed to adjacent populations.

Genus *Metridiochoerus* HOPWOOD 1926

Metridiochoerus andrewsi HOPWOOD 1926

sensu Harris and White (1979) and Harris (1983) *M. andrewsi* stage 3,
Cooke (2007) *M. andrewsi*

Referred Konso materials (Appendix Table A3.7)

Sorobo Member and lower part of Turoha Member (~1.9 Ma), 13 specimens;
lower part of Kayle Member (~1.75 Ma), 2 specimens.

Descriptive remarks

KGA4-995 is a set of right and left mandibular fragments with bilateral M₃s from a stratigraphic level just below the ~1.9 Ma Turoha Tuff (=KBS Tuff of the Turkana Basin). The alveolar bone is sufficiently preserved to establish P₄-M₂ presence and P₁-P₃ absence. The M₃ is comparable in length to the Turkana Basin homologues reported from below the KBS Tuff. The M₃ has four lateral pillar pairs, the last pair merging distally as worn.

KGA6-43 is a bilaterally crushed snout from the ~1.75 Ma stratigraphic level with the right canine and P⁴-M³ and left M² and M³ preserved (Fig. 6.6). Its alveolar bone preservation is sufficient to establish absence of P¹-P³. The canine alveolar bone projects in sheath-like fashion



Fig. 6.6. *Metridiochoerus andrewsi* partial cranium KGA6-43, right lateral view. Upper left panel is occlusal view of the postcanine teeth.

along the base of the canine for ~70 mm, but does not form a flange-like projection or rugosity. This suggests a female attribution, although basal canine dimensions are not necessarily small (43 mm by 28 mm). The M^3 is large, comparable to the time-equivalent homologues known from the Turkana Basin. The M^3 has three fully developed (mesiodistally elongated) lingual pillars, a smaller fourth lingual pillar and an additional terminal complex.

KGA19-159 is a distal portion of an unworn M^3 from the ~1.8 Ma stratigraphic levels, and is tentatively allocated to *Metridiochoerus andrewsi*. It is broad and high-crowned with a jumble of accessory pillars, but not as high-crowned as in *M. compactus*, suggesting attribution to an advanced *M. andrewsi* stage.

A few M^3 fragments from the ~1.6 Ma stratigraphic levels were formerly assigned to *Metridiochoerus andrewsi* (faunal list of Suwa et al., 2003). The presence of four lingual pillars and a variably formed terminal cluster is suggested. Although the adjacent pillars appear more mesiodistally juxtaposed than usual in *M. hopwoodi*, further examination suggests that this may be within variation of *M. hopwoodi* distal M^3 morphology. The inferred shortness of these M^3 s would fit a *M. hopwoodi* attribution.



Fig. 6.7. *Metridiochoerus compactus* left mandibular fragment with M^3 , KGA4-2772, occlusal and lateral views.

***Metridiochoerus compactus* (VAN HOEPEN AND VAN HOEPEN 1932)**
sensu Harris and White (1979), Harris (1983), and Cooke (2007)

Referred Konso materials (Appendix Table A3.8)

Middle part of Kayle Member (~1.55 Ma to ~1.65 Ma), 4 specimens;
upper part of Kayle Member (~1.4 Ma to ~1.45 Ma), 36 specimens;

Karat Member (~1.25 Ma to ~1.4 Ma), 3 specimens.

Descriptive remarks

KGA4-2772 and KGA10-1679 are fragmentary but tall mandibular corpora (Fig. 6.7) that house the large and hypsodont M_3 .

Other than these two mandibular fragments, the Konso *Metridiochoerus compactus* is known solely from isolated teeth. The M_3 is large, the M^3 s with five or six lingual pillars and terminal pillar(s), and the M_3 s with five or six lateral pillar pairs and terminal pillar(s). Few are well-preserved and little worn enough to measure crown height, but two M^3 s are ~90 mm or taller, and several M_3 s are ~70 mm or taller. The hypsodonty index (Ht/Br ratio) values are usually over 3, and commonly close to 4. The M_3 s in wear exhibit advanced fusion of pillars, producing a highly confluent wear pattern typical of this species.

Table 6.1. Mandibular measurements (mm)

Specimen no.	<i>Kolpochoerus</i> cf. <i>majus</i>					
	KGA4-255	KGA4-532	KGA4-1122	KGA4-1448	KGA4-1762	KGA4-2558
Length of symphysis				(124)		
Width at canine alveolus				(110)		
Width at postcanine constriction				(85)		
Minimal width across postcanine alveolar crest				(56)		
Corpus width at M_2 to M_3 [at widest position]	52	42	48	42	44	43
Corpus height at M_2/M_3 taken buccally	68	49	57	56	53.5	54
Specimen no.	<i>Kolpochoerus limnetes/olduvaiensis</i> and <i>K. olduvaiensis</i>					
	KGA4-2604	KGA11-157	KGA10-17			
Corpus width at M_2 to M_3 [at widest position]	(46.5)	52.5	(42)			
Corpus height at M_2/M_3 taken buccally	(55.5)		(56)			
Specimen no.	<i>Metridiochoerus andrewsi</i>					
	KGA4-995					
Corpus width at M_2 to M_3 [at widest position]	(42.5)					
Corpus height at M_2/M_3 taken buccally	53					
Specimen no.	<i>Metridiochoerus compactus</i>					
	KGA4-2772	KGA10-1679				
Corpus width at M_2 to M_3 [at widest position]	47.5	41				
Corpus height at M_2/M_3 taken buccally	(73)	63				
Specimen no.	<i>Metridiochoerus modestus</i>					
	KGA10-517					
Corpus width at M_2 to M_3 [at widest position]	34					
Corpus height at M_2/M_3 taken buccally	48					

Recorded to closest 0.5 mm, () are estimates.

Metridiochoerus hopwoodi (LEAKEY 1958)

sensu Harris and White (1979), Harris (1983), and Cooke (2007)

Referred Konso materials (Appendix Table A3.9)

Middle part of Kayle Member (~1.55 Ma to ~1.65 Ma), 6 specimens;

upper part of Kayle Member (~1.4 Ma to ~1.45 Ma), 56 specimens;

Karat Member (~1.25 Ma to ~1.4 Ma), 37 specimens.

Descriptive remarks

The Konso *Metridiochoerus hopwoodi* collection comprises mostly isolated teeth. A few fragmentary mandibles provide limited information regarding the anterior dental row. KGA10-463 and KGA10-2788 alveoli show absence of P_3 and presence of P_4 and M_1 at moderate to strong stages of M_2 and M_3 wear.

The M^3 s usually have four lingual pillars and a terminal pillar or cluster (Fig. 6.8). The M_3 s usually have five or six symmetrically placed lateral pillar pairs (Fig. 6.8). The mesial two pairs have pillars that are elongated mesiodistally, which wear into an H- or T-shaped pattern. From the third lateral pillar pair and distally, the pillars are smaller tending to be dumbbell-shaped to round in wear. The median pillars are simple, especially in the lowers. The pillars are mesiodistally well-separated, and remain separated well into wear.

Metridiochoerus hopwoodi third molars are distinguished from those of the other *Metridiochoerus* species in exhibiting only moderate hypsodonty (Ht/Br ratio 2.2 in one M^3 and average 2.65 in six M_3 s). Because of this, the M_3 crowns tend to be longer than tall, especially in the M_3 .

Average M^3 and M_3 lengths are 58.0 mm (n=12) and 66.1 mm (n=12), respectively, comparable to the Turkana Basin and Olduvai Bed II counterparts (Cooke, 2007).



Fig. 6.8. *Metridiochoerus hopwoodi* third molars. Left column from top to bottom, buccal views of M_3 s, KGA10-4 (left M_3), KGA 10-557 (left M_3), KGA10-15 (right M_3). Middle series top row, occlusal views of M_3 s, from left to right KGA10-489/1080, KGA10-925, KGA10-4, KGA10-557, KGA10-15, KGA10-1084 (all left M_3 s except KGA10-15); middle series bottom row, occlusal views of M^3 s, from left to right KGA10-1282, KGA8-1, 10-1294/1301, KGA10-521, KGA10-2428, KGA10-18 (all right M^3 s except the left M^3 KGA8-1). Right column from top to bottom, lingual views of right M^3 s, KGA10-1282, KGA 10-1294/1301, KGA10-2428.

***Metridiochoerus modestus* (VAN HOEPEN AND VAN HOEPEN 1932)**
sensu Harris and White (1979), Harris (1983), and Cooke (2007)

Referred Konso materials (Appendix Table A3.10)

Upper part of Kayle Member (~1.4 Ma to ~1.45 Ma), 28 specimens;

Karat Member (~1.25 Ma to ~1.4 Ma), 25 specimens;

uppermost Karat Member (~0.85 Ma), 1 specimen.

Descriptive remarks

Both mandible and dentition attributable to *Metridiochoerus modestus* are distinctly smaller than in the other *Metridiochoerus* species.

KGA10-517 is a small mandibular corpus with M_3 crown and M_2 alveolus. The M_1 was apparently shed relatively early, judging from the remnant alveolus anterior to the M_2 , which may represent either a portion of the M_1 or more likely the P_4 . Another fragmentary mandibular corpus with an M_3 coming into occlusion preserves both the M_1 alveolus (its distal part starting to be resorbed) and a simple circular alveolus of the P_4 . This suggests that the M_1 was shed early in the Konso *Metridiochoerus modestus*, more so than in *M. andrewsi* or *M. hopwoodi*.

The M_3 s of *Metridiochoerus modestus* (Fig. 6.9) are distinguished from those of the other *Metridiochoerus* species by the combination of small size, advanced hypsodonty, and simplified pillar pattern. The pillars tend to wear into oval to round shape, especially from the third lateral pillar pair and distally. Because of advanced hypsodonty, the M_3 crowns tend to be taller than long, with the distal-most pillars curving cervico-apically in the M^3 s. Compared to *M. hopwoodi* M_3 s, pillar separation is weaker.

The M^3 s usually have four lingual pillars and variably developed terminal region, and the M_3 s have four or five lateral pillar pairs and terminal pillar(s). The hypsodonty index (Ht/Br ratio) averages 2.5 (n=4) in the M^3 and 3.0 (n=4) in the M_3 , values broadly in between those of *Metridiochoerus compactus* and *M. hopwoodi*. Average M^3 and M_3 lengths are 53.8 mm (n=8) and 55.1 mm (n=4), respectively, somewhat larger than the *M. modestus* reported from the Turkana Basin and Olduvai Gorge (Cooke, 2007).



Fig. 6.9. *Metridiochoerus modestus* third molars. Left column, lingual views of right M^3 s, top KGA10-11, bottom KGA10-1865. Middle series left three, occlusal view of right M^3 s, from left to right KGA10-11, KGA10-1865, KGA10-2507. Middle series right three, occlusal view of right M_3 s, from left to right KGA10-14, KGA7-199, KGA12-312. Right column, buccal views of right M_3 s, top KGA12-312, bottom KGA7-199.

Discussion

At Konso, *Metridiochoerus andrewsi* occurs from both the ~1.9 Ma and ~1.75 Ma stratigraphic levels, whereas *M. hopwoodi*, *M. compactus* and *M. modestus* occur from the ~1.65

Ma and younger horizons.

The latter three species are distinguishable by third molar size, hypsodonty, and pillar pattern morphology. In typical or advanced *Metridiochoerus modestus* M₃s, the second pillar pair tends to be notably smaller than the first and with a simple T-shaped wear pattern with a short stem. The simplified pillar morphology can be considered derived towards the *Phacochoerus* condition.

However, because of the apparently conservative M₃ morphology of the Konso *Metridiochoerus modestus*, especially the large size and sometimes weak degree of pillar pattern simplification, there were cases in which species allocations were challenging. In such cases, in addition to the morphological trends outlined above, a distinct feature was considered useful in distinguishing *M. modestus* from the other *Metridiochoerus* species: the mesiobuccal cusp of the *M. modestus* M³ tends to have a relatively short mesiolingual limb, contra the developed homologue in the other metridiochoere M³s (the latter resulting in a more H-shaped mesiobuccal cusp) (Cooke, 1994). Similarly, the mesiobuccal cusp of the *M. modestus* M₃ tends to have a main limb that slants mesiolingually, with weak or no mesiobuccal limb expression. In the other metridiochoere M₃s, a developed mesiobuccal limb typically runs mesiodistally. These details of pillar morphology are probably derived features of the *M. modestus* lineage, associated with its cuspal simplification.

As discussed in Suwa et al. (2003), the Konso metridiochoere representation differs markedly from that of the Turkana Basin. In the Turkana Basin, *Metridiochoerus andrewsi* was the dominant metridiochoere from >1.9 Ma to ~1.6 Ma, and then was apparently replaced by *M. compactus* (e.g., Cooke, 2007). Both *M. hopwoodi* and *M. modestus* were comparatively rare throughout the Turkana sequences, the former known after ~2.0 Ma and the latter after ~2.2 Ma. In contrast, at Konso, *M. hopwoodi* was the dominant metridiochoere after ~1.65 Ma. Both *M. modestus* and *M. compactus* were also well-represented, although *M. modestus* has so far not been recognized in the less abundant Konso assemblages of ~1.65 Ma to ~1.5 Ma. At Olduvai Gorge, all three species are well-known (Cooke, 2007).

Harris (1983) and Cooke (2007) prefer (or imply) a derivation of *Metridiochoerus compactus* from *M. andrewsi* in the Turkana Basin. Alternatively, *M. compactus* may have occurred earlier elsewhere (e.g., Olduvai Gorge), and then populated both the Konso and Turkana basins at broadly the same time. *Metridiochoerus hopwoodi* apparently evolved from the *M. andrewsi* sensu lato lineage prior ~2.0 Ma in the Turkana Basin or elsewhere. *Metridiochoerus modestus* appears to have been a rare but wide-ranging species as early as ~1.9 Ma, known by that time at both Olduvai and Turkana. As is the case with *M. compactus*, their absence from the earlier Konso fauna suggests that both *M. hopwoodi* and *M. modestus* were later immigrants to the Konso area. The somewhat conservative *M. modestus* molar morphology at ~1.4 Ma Konso may indicate that a distinct population of that species had populated the Konso area.

Genus *Phacochoerus* CUVIER F. 1826

cf. *Phacochoerus* sp.

Referred Konso materials (Appendix Table A3.12)

Uppermost Karat Member (~0.85 Ma), 1 specimen.

Descriptive remarks

KGA18-15 is a fragmented set of bilateral M³s and M₃s, recovered as a surface occurrence at a stratigraphic level above the ~0.85 Ma Baraisa Tuff-1. The specimen consists of tall columnar pillars (seven lateral pairs in the M₃). The mesial crown is damaged, but appears to exhibit

minimal expression of a mesial complex morphology, and the adjacent lateral pillars exhibit faint expressions of a Y or T wear shape. These and the remaining tall circular columns approximate the phacochoere condition. Although the possibility that this specimen is a “float” deriving from younger sediments (not represented in the immediate area) cannot be precluded, we report it here as a possible occurrence of *Phacochoerus* at ~0.85 Ma. It is large-sized, the M₃ measuring 58 mm long (estimate of central crown length) and 14.0 mm broad, as long as but narrower than the Konso *Metridiochoerus modestus* homologues.

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