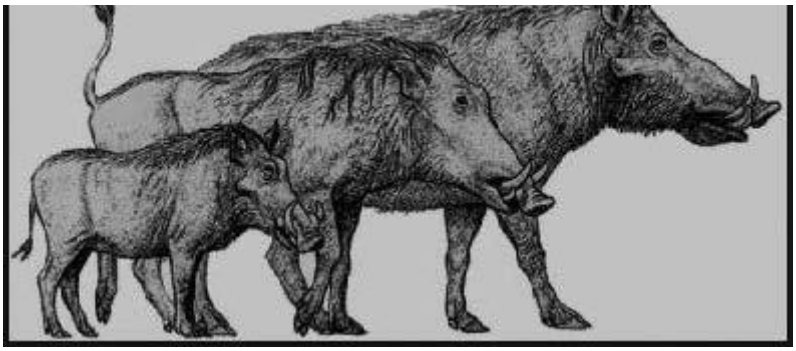
A million years old three Species of Pigs

From the Site of Buia (Eritrea)



According to modern studies, the origin of the family of pigs is known to be from Asia, and later they appeared in Africa around 21Ma, and around 16.5Ma arrived in Europe and China. Some species are also believed to be evolved in the Indian Subcontinent and dispersed around 13.8Ma to Eurasia. To date, the oldest evidence of the subfamily is known from Early Miocene, and the youngest in the early Late Miocene age, documenting a range from about 20 to 9M.

Pigs are intelligent and adaptable animals. They occupy a unique role in several ecosystems, being large and mostly omnivorous mammals.

They are known since the late Eocene in Asia and they are present in the wild across the Old World. They have been important to human populations as a source of food, became domesticated early during the Neolithic and since then have been introduced worldwide. Diseases and parasites carried by wild pigs are also an important focus of socioeconomic and public health studies. In addition, some wild pigs are also critically endangered and a focus of biodiversity conservation studies.

The late part of the evolutionary history of the pigs is relatively well known owing to a relatively rich fossil record, notably in the Neogene (a geologic period starting 23.03 million years ago to 2.58 million years ago) of Eurasia. This record includes some of the best-known and most remarkable evolutionary trends among mammals. Several studies documented rapid morphological changes of dentition through time that is, increases in length, height, and

complexity of the third molars and reduction of the premolars and incisors; in several lineages of African Neogene pigs. These include: Nyanzachoerus-Notochoerus, Metridiochoerus, and Kolpochoerus (extant Phacochoerus and Hylochoerus) are phylogenetically nested within the two latter genera, respectively. These lineages comprise overall about 25 species that are often abundantly represented in different Plio-Pleistocene African sites.

Those rapid morphological changes, notably used in biostratigraphic studies, can potentially be correlated to known environmental changes and are thought to illustrate the transition from omnivorous diets to more herbivorous ones through adaptation by natural selection.

They have been found to be a powerful tool for biochronological correlation because of their progressive craniodental morphology that indicates a rapid process of speciation and evolution

Shreds of evidence of three species of fossil pigs have been documented from the Buia Basin dating to about 1.0 million years.

The fossil specimens of extinct pigs were collected during the last two decades of field survey at the late Early Pleistocene sites of the Buia Basin, directed by the Eritreo-Italian research team. Specimens were collected from the surface and are currently housed at the paleontological laboratory of the National Museum of Eritrea (NME), in Asmara. These species are scientifically classified as: Kolpochoerus olduvaiensis, Kolpochoerus majus, and Metridiochoerus modestus. They are morphologically evolved and are found in association with a diverse large fossil vertebrate faunal assemblage, including our genus Homo and a rich accumulation of acheulean lithic tools.

The anatomic, biometric, morphometric, and dental microwear analyses among the species, show significant data on dietary traits, habitat, and evolutionary changes.

Our microwear study involves the analysis of teeth of the three fossil pig species from the Buia Basin in order to answer questions concerning their life and diet. Teeth play a fundamental role during an animal’s life and come in many shapes

and sizes for chewing food. A typical mammal tooth includes two parts: a crown and one or more roots. The crown is covered by a layer of dentine, overlain by enamel, while the root is coated with cementum.

In order to understand the paleoecology and dietary habits of the extinct pigs, we used an innovative technique known as Dental Microware Analysis.

The technique allows us to examine the abundance, distribution, orientation, size, and shape of micro-features on the chewing surface of enamel, which directly reflects the properties of food consumed. Enamel is the hardest and most mineralized tissue in the body and it is known, from studies on living mammals, that enamel micro-features relating to food consumption renew every few weeks in life. Thus, at the point of death, the teeth will illustrate the final weeks of the diet of the animal.

The result of our study, on these three pig species, shows the dental anatomic distinction between the three pig species. Conversely, the microwear patterns recorded on the dental surfaces show overlapping of ecological niches among the species.

Their opportunistic feeding and rapid reproduction process might have sustained their survival within the mosaic environments of the Buia Basin in competition with other faunas (other ungulates, carnivores, and monkeys) and our genus Homo. The moderate-sized hypsodont Kolpochoerus majus was contemporaneous with the advanced Kolpochoerus olduvaiensis. Thus it may have been adapted to the open grasslands of the Buia Basin together with the small Metridiochoerus modestus. These species might have consumed dry leaves, grasses, wood bark, and importantly, might have relied on a rooting diet. The results are that browser characteristics for Kolpochoerus olduvaiensis, mixed feeding for Kolpochoerus majus, and for the high-crowned Metridiochoerus modestus, have important consequences for adaptation, habitat preference, and diet.

Their presence alongside our genus Homo in highest number and diversity in the fossil record is a testimony to their adaptive strategies to different environments. They show better potential of presence in the fossil record than any ungulates in

several regions of Africa and the Levant. Buia pigs varied dietary habits were the result of their general food requirement advantages and this can be easily noticed from their varied cranio-dental convergent morphology.

These advantages allowed the two genera from the Buia Basin to evolve, adapt and/or disperse far and wide, through appropriate and successful response to the pressures of climate change, compared with other groups of mammals.

They were competitive for dietary resources with other large mammals including carnivores and herbivores. Reflecting on their specialized craniodental anatomy, and high reproductive success they had successful and diverse dietary habits as a response to the dietary challenges profoundly occurred during the trajectory of their evolution. The last representatives of these species are found in the Middle Pleistocene, albeit descendants of a number of these species have survived until the present day.

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