

# The Evolution of Pigs

BY KATHERINE MOORE, PH.D.

A RECENT STUDENT PROJECT in the Center for the Analysis of Archaeological Materials (CAAM) uses animal bones from the Penn Museum’s Near East collection to study the evolution of pigs.



Domesticated (left) and wild pigs. Pigs were domesticated multiple times across the Old World.

Does material from our collection support the theory that pigs evolve to a smaller size as they are domesticated? Animal remains from Hotu and Belt Caves along the Caspian shores of northern Iran were excavated by Museum curator Carleton Coon from 1949–1951 and have been in storage ever since. The skeletal material had been preselected in the field according to the research objectives of the time and consists predominately of jawbones with teeth. Museum storage trays hold hundreds of bones of sheep, goat, cattle, pigs, and birds that represented food remains for prehistoric people. As methods in zooarchaeology advance, older samples like this may reveal new information.

Katherine Morucci, who conducted research on the pig bones, has spent her time as an undergraduate at Penn studying animals from multiple perspectives. She volunteered in several vet clinics and shelters and was a field assistant in the Department of Anthropology primatology program in Argentina in 2013. She returned to South America to study animal bones from an archaeological expedition in Peru in 2015. Her thesis on the behavior of female pigs in indoor production facilities

at the New Bolton Center was the capstone of her degree in the Biological Basis of Behavior program. For her 2016 thesis in biology, she has focused on the evolution of her favorite research subject: pigs.

I have been working on the archaeology of animal domestication for many years. Now that the history of pigs is a topic of active research in Eurasia, new analytical approaches—some less sensitive to differences in excavation techniques and record keeping—made the Hotu and Belt Cave bones potentially important samples for study. Particularly, a photomapping and measuring approach called geometric morphometrics (GM) would allow subtle differences in size and shape in the Iranian pig teeth to be captured mathematically. These differences can be compared to samples from other sites, contributing to a regional picture of biological variation under human influence. In addition, the pig teeth can now be studied using current knowledge about how to determine the age, health status, and diet of the animals, and how to discern the ways the pigs had been used and discarded by humans as the cave layers accumulated.

The first step in Morucci’s project was visiting Near East Keeper Katy Blanchard to see the samples and

PHOTOS OF PIGS FROM WIKIMEDIA COMMONS



X-rays of the pig jaws reveal information on the teeth.

obtain permission to study them in the CAAM Zooarchaeology Lab. Next came a consultation with Museum Head Conservator Lynn Grant about how to clean the pig teeth for photography. Application of clear, sticky resin to artifacts was common in the 1950s, a practice which undoubtedly helped preserve the teeth and bones once out of the ground but which resulted in considerable dirt left on the teeth. Grant offered a box of tiny nylon toothbrushes and Morucci's next weeks were spent in the CAAM multipurpose lab, dabbing at tooth surfaces with acetone under the fume hood. Finally the teeth were ready for recording, and photographs were taken. Then, Morucci "mapped" the teeth, generating diagrams of shape relationships between individual animals.

The first results of the GM analysis were surprising since they showed no support for the expected trend of pigs getting smaller as they were domesticated. Instead, the diversity of pig sizes and shapes may indicate that the Hotu and Belt pigs are a mixture of wild and domestic animals. Other approaches may also be helpful in understanding the sample. Many of the pigs were too young to be part of the GM study since they still had their



The jaw and x-ray are compared.



Katherine Morucci examines Hotu and Belt pig teeth.

baby teeth. Using the x-ray suite in the Conservation Department, it has been possible to detail the developmental stages of these ancient piglets and figure out if their growth rates, diets, and dental development were similar through time.

The next step in the research includes high-powered photographs of the wear on the pig teeth using CAAM's new digital microscope and attempts to recover direct data on pig feeding from plant remains recovered from the teeth. Generating these new data on one part of the Hotu and Belt Cave collections will move us forward in our understanding of the evolution of pigs. ●

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