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A new distal pedal phalanx from the Late Pleistocene Pinnacle Point 5-6N rockshelter (Western Cape, South Africa)

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With the exception of *Homo neanderthalensis*, fossil foot bones that are attributable to the genus *Homo* are extremely rare [1]. Most of the (scarce) fossils associated with the Middle Stone Age (MSA) in Africa consist of craniodental remains, with comparatively few postcranial bones [1-2]. In this paper, we describe and comparatively analyze a new human foot phalanx from Pinnacle Point 5-6N (PP5-6N) rockshelter (Western Cape, South Africa).

Pinnacle Point is a rocky headland on the southern Indian Ocean coast of South Africa that preserves an abundance of caves and rockshelters. These sites have gained scientific notoriety from their rich, well-preserved archaeological records that date to the origins of modern humans. The caves and rockshelters occur in quartzite of the Table Mountain Sandstone Formation. Extending off the south coast is a wide, gradually sloping continental shelf (the Agulhas Bank), which would have been variably exposed during the lower sea levels of the Pleistocene, exposing an entirely novel ecosystem (the Paleo-Agulhas Plain) [3].

PP5-6N is a rockshelter with ~15 vertical meters of excavated archaeological sediment that represents nearly continuous human occupation from ~110-50 ka [4]. In 2017, a human distal pedal phalanx was excavated from near the base of the vertically thick LBSR Stratigraphic Aggregate, which dates to around 91-86 ka. The specimen, with inventory number 683795, was found in a combustion feature and is burned black. It was found in association with stone tools, animal bones, mollusks and fire modified rock. To date, it is the only human remain that has been recovered in situ in a Middle Stone Age context at PP5-6N.

We provide here a complete metric and morphological study of this foot phalanx within a global comparative framework in relation to other Pleistocene fossils and recent human samples. Due to the near absence of well-identified distal foot phalanges in the MSA of South Africa [5], we include Neandertals, Middle Palaeolithic modern humans (MPMH), Upper Palaeolithic modern humans (UPMH) and several recent modern human samples as comparative samples for the study of the PP5-6N phalanx. The age at death for this specimen is adult, based on its completely fused proximal epiphysis. The bone is compressed in its dorsoplantar (DP) dimension, and the proximal articular facet is slightly bi-concave. The distal tuberosity exhibits a slight medial cant. The bone's size and morphology correspond to a right distal pedal phalanx that probably derived from the second or third toe (digit).

Although most of the metrical variables of 683795 fall comfortably within the ranges of variation of distal phalanges of Neandertals, and both the fossil and recent modern human samples, our metrical comparisons conclude that the Pinnacle Point phalanx differs from all the comparative sample averages in at least some of the variables. In general, the 683795 phalanx is longer, narrower and less robust than those of Neandertals. When compared with the meagre samples of UPMH and MPMH human toes, and the moderate samples of recent human homologues, 683795 is seen to be comparatively long and broad. Unfortunately, the small UPMH and MPMH samples preclude a firm conclusion regarding its affinities. More well-identified fossils are needed in order to substantiate the affinities of the 683795 toe bone.

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