

Human Skeletal remains of *Homo sapiens* from Fa-Hien Lena: An Analysis Based on Excavations Conducted between 1986 to 2012

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Abstract—Fa-Hien Lena rockshelter, located in the southwestern wet zone of Sri Lanka, has yielded some of the earliest and most significant evidence for anatomically modern *Homo sapiens* in South Asia. Archaeological excavations conducted between 1986 and 2012 revealed a long, well-stratified sequence of human occupation spanning from the Late Pleistocene to the mid-Holocene. Within these deposits, fragmentary and more complete human skeletal remains were recovered, providing critical insights into early human biology, behavior, and adaptation to tropical rainforest environments. The earliest skeletal evidence, dated to approximately 35,000 years before present, confirms the presence of modern humans during the Late Pleistocene and represents some of the oldest securely dated *Homo sapiens* remains in the region. Later excavations documented intentional burials dating to the terminal Pleistocene and early Holocene, including relatively complete skeletons associated with cultural materials such as stone and bone tools, faunal remains, and ochre. Osteological analyses indicate anatomically modern morphology and offer information on health, age, and mortuary practices of prehistoric rainforest foragers. The Fa-Hien Lena human skeletal assemblage demonstrates early and sustained occupation of tropical rainforest environments by *Homo sapiens*, challenging earlier models that viewed such habitats as marginal for Pleistocene hunter-gatherers and contributing significantly to the understanding of early human dispersals in South Asia.

Index Terms—Skeleton, *Homo sapiens*, Fa-Hien Lena, burials, rockshelter

I. Introduction

The study of human skeletal remains is central to reconstructing the evolutionary history, biological variation, and adaptive strategies of *Homo sapiens*. In South Asia, archaeological and paleoanthropological research has increasingly highlighted Sri Lanka as a key region for understanding early modern human dispersals and long-term occupation of tropical environments (Perera, 2010). Among the island's prehistoric sites, Fa-Hien Lena rockshelter holds exceptional importance due to its well-preserved stratigraphic sequence and the recovery of early *Homo sapiens* skeletal remains. Archaeological excavations conducted between 1986/87 and 2009/10 and 2012 have significantly contributed to redefining regional narratives of human evolution, particularly in relation to rainforest adaptation and behavioral complexity (Wijeyapala, 1997; Kennedy, 2000; Stock et al., 2022)

Fa-Hien Lena is situated in the southwestern wet zone of Sri Lanka, an ecological setting characterized by dense tropical rainforest, high rainfall, and rich biodiversity. While earlier models of human dispersal suggested that such environments posed substantial barriers to early modern humans, evidence from

Fa-Hien Lena directly challenges this assumption. Excavations undertaken over multiple phases since 1986/2012 by the Department of Archaeology of Sri Lanka, in collaboration with international researchers, have revealed a continuous sequence of human occupation dating back to approximately 48,000 years BP, making it one of the earliest securely dated *Homo sapiens* sites in South Asia (Perera, 2014; Wedage et al., 2019).

The human skeletal assemblage recovered from Fa-Hien Lena forms a critical component of this archaeological record. Remains recovered during excavation seasons between 1986/87 and 2009/10 and 2012 include cranial fragments, teeth, long bones, vertebrae, and partial skeletons of both adult and juvenile individuals. Although many of these remains are fragmentary, their stratigraphic association with securely dated cultural layers has enabled reliable interpretation within a broader chronological and behavioral framework. The skeletal material provides direct biological evidence for the presence of anatomically modern humans in Sri Lanka during the Late Pleistocene (Kennedy, 2000).

Morphological analyses consistently identify the Fa-Hien Lena individuals as *Homo sapiens*, displaying key anatomical characteristics such as reduced brow ridges, gracile cranial features, and dental morphologies comparable to early modern humans from Africa and Southeast Asia. At the same time, certain skeletal traits—such as limb proportions and body size—suggest possible localized adaptations to humid, forested environments. These findings contribute to ongoing debates regarding phenotypic plasticity and regional variation among early modern human populations, emphasizing adaptation rather than limitation in tropical settings.

II. Methodology

The present study is based on a systematic review and synthesis of archaeological and osteological data derived from excavations conducted at the Fa-Hien Lena rock shelter, Sri Lanka, between 1986 and 2012 (Wijeyapala, 1997; Perera, 2010; Wedage et al., 2019; Stock et al., 2022). The methodology integrates field excavation records, stratigraphic data, osteological analyses, and chronological information reported in excavation reports and peer-reviewed publications. The primary focus is on human skeletal remains attributed to anatomically modern *Homo sapiens* recovered from Late Pleistocene and Holocene deposits.

Excavations at Fa-Hien Lena were undertaken using stratigraphic techniques to ensure precise contextual recording. Deposits were excavated according to natural sedimentary layers, supplemented by measured artificial spits where stratigraphy was indistinct. A grid system was employed to maintain horizontal and vertical control, and depth measurements were taken from fixed datum points. Sediments were removed using hand tools to minimize damage to fragile human remains, and systematic sieving was conducted to recover small bone fragments and associated cultural materials.

Human skeletal remains were documented *in situ*, with detailed records of their spatial location, orientation, depth, articulation, and association with cultural features or burial pits. Particular attention was given to identifying intentional burial practices, including body positioning and the presence of associated materials. Fragile skeletal elements were stabilized prior to removal following standard conservation procedures to prevent post-excavation deterioration. Osteological analysis followed established protocols in physical anthropology. Skeletal elements were identified anatomically and assessed for preservation, completeness, and fragmentation. Taphonomic observations were recorded to evaluate post-depositional processes affecting the remains (Kennedy, 2000; Stock et al., 2022). Age-at-death estimations were based on dental development and eruption in sub-adults, epiphyseal fusion, and degenerative changes in adult individuals (Stock et al., 2022). Chronological placement of the human skeletal remains was established through radiocarbon dating of associated charcoal samples and, where possible, bone collagen. Radiocarbon dates were calibrated and correlated with stratigraphic data to place the remains within the broader occupational sequence of the site.

III. Results and Discussion

Fa-Hien Lena (site code YP), one of the largest known caves in Sri Lanka, is situated at 8° 12' 55" by 6° 38' 55" N in Yatagampitiya village near Bulathsinhala in the Kalutara District. The site lies in the foothills abutting the coastal plain and is a complex of interconnected rockshelters developed in a coarse crystalline gneiss cliff. The site was initially recorded in 1968 by then Assistant commissioner of the Department of Archaeology of the Government of Sri Lanka, S.U. Deraniyagala, when it was being used as a Buddhist cave temple. Subsequently it was reserved for future archaeological investigations. W.H. Wijeyapala, commenced excavations in 1986 as part of stage 5 of Deraniyagala's prehistoric research design (Wijeyapala, 1997). Two areas of the cave, labelled A and B, were explored, with the smaller Shelter B yielding a stratified sequence of habitation deposits that were radiocarbon dated from c. 38,000 to 4,500 cal. BP. The top layer 1, comprised brown silty sand with prehistoric occupation debris mixed with recent artifacts, due to the leveling of the floor in modern times. Beneath it, layer 2 consisted of light brown-grey silty sand, approximately 50 cm thick, with a high density of cultural material, and the fragmentary remains of two interred individuals coated with red ochre. The layer is dated by a radiocarbon determination on charcoal to ca. 5,400 cal. BP. The layer below, layer 3, is light brown loose sandy silt which is very rich in cultural material. Two radiocarbon dates have been secured on charcoal – ca. 7,700 cal. BP and 7,900 cal. BP. The dominant occupation deposit at the site occurred in Layer 4, comprising dark brown silty sand of medium compactness, ca. 25 cm thick, with high density occupation debris (Wijeyapala, 1997). The contents included a partial interment in a lower horizon of layer 4, red ochre, and seven postholes. Three radiocarbon dates (on charcoal from these occupation levels) calibrate to between ca. 38,000 and 30,000 BP. The earliest human occupation at the site is represented by layer 5, with fragmentary human remains. It is a dark brown to yellow, moderately loose sandy silt. layer 5 is very rich in cultural material including faunal

remains, stone artifacts and burnt shell, and predates 40,000 years BP. Fa-Hien Lena was inhabited during the late Pleistocene prior to the Last Glacial Maximum (LGM), and during the middle Holocene, but it lacks any dated evidence of occupation between the LGM and terminal Pleistocene, suggesting a lengthy hiatus in occupation between layer 4 and 3 (Wijeyapala, 1997; Perera, 2014; Wedage et al., 2019).

In 2009/10, and 2012 new excavations of Shelter B commenced under the direction of Nimal Perera, then the Assistant Director of the Excavation Branch, with a view to enhancing the stratigraphic and chronological resolution achieved by Wijeyapala in the 1980s and the collection of additional radiocarbon samples throughout the layers excavated. Cultural layers can be divided into four distinct phases: A, B, C, and D (Wedage et al., 2019). Phase D (layers 4 and 5 of the 1986 excavation) consists of a series of layers and contexts spanning a lengthy period from ca. 47,000 to 28,000 cal. BP, but it still lacks any dated evidence of occupation during the Last Glacial Maximum (LGM, ca. 28,000 to 13,000 cal. BP).

IV. Human Skeletons from 1986/87 excavations season

The Fa-Hien Lena rockshelter is credited with the oldest known burials in Sri Lanka, based on their recovery in layers 4 and 5 with calibrated dates between 38,000 and 30,000 BP (Table 2). The description of the remains in Kennedy and Elgart (1988: 92-94) and Kennedy (2000:181-182, 238-39) is summarized in Table 1. The two earliest burial sets, from layer 5 and layer 4a (38,000 BP), are both described as commingled remains of secondary burials, representing an indeterminate number of persons. It is noteworthy that the oldest known burials are also the least determinate, although this commingling might reflect the great age of the remains rather than a difference in mortuary practices compared to the site's later burials. Fa-Hien Lena 1, skull of a child, associated with the B-N7-3 charcoal whose date calibrates to around 35,000 cal. BP (Table 1, 2), is also interpreted as the commingled remains of secondary burials. There is insufficient detail to decide whether the five persons had been buried at different times in the same location or buried together following treatment of the corpse prior to final disposal (Perera, 2010). As observed by Kennedy (2000: 181), the recovery of all of the child's cervical vertebrae (as well as much of the skull) suggests burial of the neck bones attached to the incompletely decomposed head by desiccated tendons. Finally, Fa-Hien 2, associated with charcoal that calibrates to around 35,000 cal. BP, is another child represented by skull remains (Perera, 2010). Overall, the available Pleistocene evidence for Fa-Hien Lena suggests a focus on skull burials, mainly of sub-adults, and presumably secondary. The early to middle Holocene burials from Fa-Hien Lena diverge from their Pleistocene counterparts in that the emphasis on skull burials appears to have waned. These burials, Fa-Hien 5 to 7 (Table 1), retain the emphasis on subadults but include a well-represented female. As observed by Kennedy (2000: 239), the distinct absence of mandible and extremity bones, and the coloration of the postcranial bones with reddish-yellow ochre, demonstrates the secondary nature of this burial. While it is reasonable to follow Kennedy's (2000) conclusion in the inference of secondary burials throughout the Fa-Hien Lena sequence, it may also be worth noting that

sub-adults may have been treated to lesser attention in their mortuary treatment than adults, based on the restriction of ochre coloration to the single well-preserved adult. Burial goods are not evidenced anywhere in the record as the cultural remains found in proximity with the burials (Kennedy, 2000) could all be cultural material in the burial fill.

Individual	Layer	Age	Sex	Representation
Fahien 4 (≥ 2)	5	Unknown	Unknown	Commingled secondary burials
Fahien 3 (≥ 2)	4a	Unknown	Unknown	Commingled secondary burials
Fahien 1 (1)	4	5½ - 6½ (child)	Unknown	Jaws, vault fragments, seven cervical vertebrae
Fahien 1 (2)	4	< 1 (infant)	Unknown	Vault fragments
Fahien 1 (3)	4	Infant	Unknown	Skull remains
Fahien 1 (4)	4	Juvenile	Unknown	Skull remains
Fahien 1 (5)	4	Adult	Female	Skull remains
Fahien 2	4	Child	Unknown	Mandible, teeth, cranial fragments
Fahien 7 (1)	3a	Juvenile	Unknown	Commingled secondary burial

Fahien 7 (2)	3a	Infant	Unknown	Commingle secondary burial
Fahien 5	3	~ 5 years	Unknown	Jaws, cranial and postcranial fragments
Fahien 6	2	17 – 21	Female	Cranium, postcranial bones

Table 1. Fa-Hien Lena: Human remains

Lab code	Samples	Layers	Measure	Calibrated (cal. Years BP)
Beta-33297	B-N5=2	2	4,750 ± 60	5,594–5,322
Beta-33293	B-M6-2	3	6,850 ± 80	7,916–7,570
Beta-33298	B-N6-2a	3a	7,100 ± 60	8,020–7,794
Beta-33295	B-M7-3	4	24,470 ± 290	29,126–27,872
Beta-33299	B-N7-3	4	30,060 ± 290	34,656–33,686
Beta-33296	B-M7-5	4a	32,060 ± 630	37,912–34,764
Beta-33294	B-M6-6	5	33,070 ± 630	38,826–35,828

Table 2. Calibrated radiocarbon dates (on charcoal) from Fa-Hien Lena.

Site	Contexts	Samples No	Samples	Date	cal. BP range	D13C
Fahien-lena	FH5	OxA-2661 4	Charcoal	10410 ± 40 BP	10640 - - 10139	29.5
Fahien-lena	FH6	OxA-2661 5	Charcoal	10340 ± 40 BP	10517 - - 10254	28.8

Table 3. Radiocarbon dates for deposits associated with Fa-Hien Lena burials.

V. Human Skeleton from 2012 excavation season

Fa-Hien Lena burial new human remains were uncovered during the 2012 excavation from context 248, a shallow pit feature within layer 247 (Figure 1) (Stock et al., 2022). Fa-Hien Lena burial was a relatively complete primary interment of an adult skeleton, although the elements that could be recovered

were extremely fragmentary and fragile. Within layer 248, calcium carbonate concretions just below the skeleton suggest that the presence of a burial pit cut into the site from a more recent context. Radiocarbon dates of charcoal samples that were in direct association with the skeleton and likely date to the time of interment place the burial at 10,640-10,139 cal. BP (Table 3) (Stock et al., 2022). Due to the extremely fragile nature of the skeleton, conservation was necessary to ensure maximal preservation for future analyses, and the skeleton was subjected to a thorough program of microCT scanning. During the primary interment, the body was placed in an extended position with the head and torso angled towards the left side, facing towards the back wall of the cave to the North (Figure 1) (Stock et al., 2022). The left leg was flexed at the knee and positioned below the right leg, which was extended. The arms were extended to the north, in front of the torso, with the elbows flexed so that the hands are situated towards the front of the face. As the skeleton was lying on its left side, the right humerus was above the left in the deposits; however, the right forearm crossed the left to be situated underneath, meaning that the skeleton was interred with crossed forearms and the final position represents some post-depositional movement (Stock et al., 2022).

Several hand bones were found in close proximity to the skull, in a position which would be slightly distal relative to the mandible, while others were further away on the other side of the distal forearms. The right hand was likely tightly flexed at the wrists towards the face of the skeleton, probably tucked under the chin, and the left hand flexed away from the face. The right ribs have slumped downwards so that their sternal ends are just covering the spinal column, which suggests that the torso was situated on the left side but also somewhat towards the surface of the deposit (Stock et al., 2022). Two large rocks were situated directly above the thoracic and pelvic regions and appear to have been deliberately placed above the body at the time of interment, these are responsible for much of the movement of, and taphonomic damage to, the thoracic region of the skeleton. While the general context of the burial included lithics and fauna, the only burial inclusions that appear to be associated with cultural activity at the time of interment are the two rocks placed over the thorax. Ribs from the thorax were found directly adhering to the rocks (Figure 2), supporting an interpretation that they were placed over the body when it was interred (Stock et al., 2022).

The skeleton is relatively poorly preserved. All bones, except for some pedal elements, are preserved as multiple fragments only. The cranium was extremely fragmentary and could only be recovered in sets of small pieces. In total there are over 100 cranial fragments, with approximately 5-10 of reasonable size. The rest are very small, which makes physical reconstruction impossible and virtual reconstruction extremely challenging. Almost all of the skull fragments belong to the cranial vault. The more fragile bones of the cranial base and face were generally not preserved, with the exception of fragments of zygomatic (malar) bone and left maxilla (Stock et al., 2022). There is partial preservation of much of the spinal column, but the ribs, scapulae, and pelvis regions directly underneath the two overlying rocks, were heavily fragmented. Most of the teeth on the right side were missing. At the time of interment, the body was laid on its left side, and this side of the dentition, which was lower in the deposit, was generally better preserved. The only

right-side elements preserved include the upper right second incisor, and the lower right first incisor and second molar. The maxillary dentition on the left side is represented by maxillary teeth from the second incisor to the third molar, and a complete set of adult teeth from the lower left quadrant (Stock et al., 2019).

Morphological characteristics of the Fa-Hien Lena skeletal assemblage consistently support their classification as anatomically modern *Homo sapiens*. Cranial and dental features, along with postcranial morphology, show close affinities with early modern human populations from Africa and Southeast Asia. Although preservation is limited due to the humid tropical environment, the available material suggests a generally gracile skeletal structure, with some robust postcranial elements possibly reflecting high levels of physical activity. These findings align with interpretations of phenotypic plasticity, indicating that early *Homo sapiens* were capable of adapting their biology to diverse ecological conditions without fundamental anatomical change.

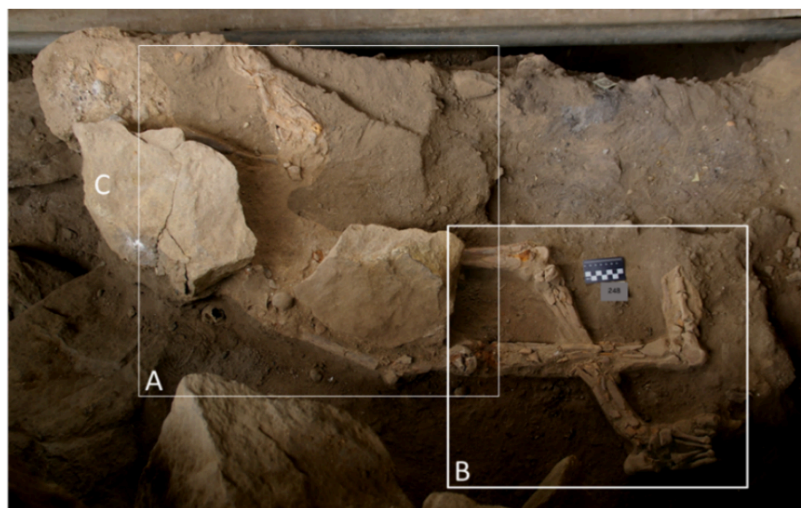


Figure 1. (A, C) Fa-Hien Lena burial in situ showing the burial position, and rocks placed above upper torso and pelvis, (B) Detail of lower legs and feet demonstrating the high degree of fragmentation of long bones (Stock et al., 2022)

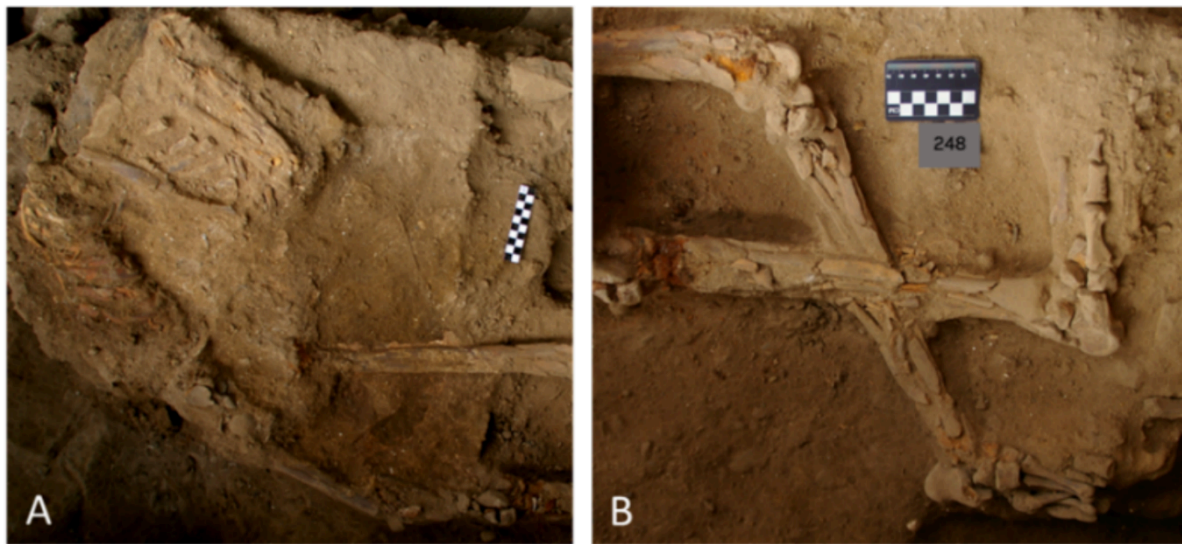


Figure 2. (A) detail of thoracic and pelvic regions after removal of overlying rocks, (B) long bones and relative completeness of smaller pedal elements (Stock et al., 2022)

VI. Conclusion

The human skeletal remains of *Homo sapiens* recovered from Fa-Hien Lena during excavations conducted between 1986 and 2012 provide crucial evidence for the early presence and long-term occupation of anatomically modern humans in Sri Lanka. These remains represent one of the earliest securely dated records of *Homo sapiens* in South Asia and significantly contribute to understanding regional human evolutionary history. Morphological analysis of the skeletal material, including cranial, dental, and postcranial elements, confirms their attribution to anatomically modern humans. Despite issues of preservation and fragmentation typical of tropical environments, the remains exhibit characteristics comparable to early modern human populations elsewhere in Asia and Africa. This evidence challenges earlier assumptions that tropical rainforests were unsuitable for early human settlement. The association of human skeletal remains with microlithic stone tools, bone implements, shell beads, and rainforest faunal assemblages demonstrates advanced technological skills, symbolic behavior, and successful adaptation to dense forest environments. Osteological indicators such as dental wear and stress markers further suggest physically demanding lifestyles consistent with sustained foraging and mobility.

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