

DARK SOIL PITS AND GRAVES IN VOLCANIC CAVE C6.1, KRONG NO, DAK NONG PROVINCE: DOCUMENTATION AND DISCUSSION

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Abstract

Dark soil pits and graves are critical documents discovered in volcanic cave C6.1. As a result of the investigation and excavation of cave C6.1 conducted in 2017, 2018, and 2019, we have discovered vestiges of nine dark soil pits and seven relatively intact graves, together with teeth and other human remains scattered in the cultural layer. This is an important source of information on the racial composition of the prehistoric inhabitants of the Central Highlands during the Neolithic period, as well as the paleoenvironment, environmental adaptations, and flora and fauna that prehistoric inhabitants exploited for their livelihoods. This article introduces documents and reconstructs the socioeconomic picture of the prehistoric inhabitants of cave C6.1. It also contributes scientific documents for the general conservation and promotion of heritage to develop sustainable cultural tourism in Dak Nong Province.

Keywords: Central Highlands; Geopark; Neolithic; Prehistoric inhabitants; Remains.

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1. INTRODUCTION

The cave C6.1 prehistoric site, located in Krong No District on the campus of Dak Nong Global Geopark, was discovered and explored in 2017 (Lê et al., 2018; Nguyễn et al., 2017; Nguyễn, La, & Lê, 2018). It was first excavated in 2018 over an area of 6 m², including 2 m² of the 2017 survey, which did not excavate the entire cultural layer (Figure 1a) (Nguyễn et al., 2018; Nguyễn, Lê & La, 2019). In 2019, cave C6.1 was excavated for the second time, and the excavation pit was expanded from the pit dug in 2018 to a total area of 10.3 m². The stratigraphy is 1.85 m thick and includes 23 excavated layers averaging 8 cm/layer, divided into eight cultural levels based on the texture and color of the soil (Figure 1b) (Nguyễn, Lê, Nguyễn et al., 2019; Nguyễn, Nguyễn, Lê et al., 2020).



(a)



(b)

Figure 1. Excavation pit of cave C6.1 in Krong No, Dak Nong

Notes: a) Excavated pit in 2018; b) Excavated pit in 2019.

Source: Photos by Le Xuan Hung.

The excavation pit in cave C6.1 was dug for on-site conservation. Typical cultural levels and important relics with scientific research value, such as dark soil pits and burial mounds, were processed and preserved at the site (La et al., 2018; La et al., 2022). As a result of the excavation, we recorded nine dark soil pits, labeled F1–F9, and five reddish-brown stains of burnt soil that are traces of stoves (Nguyễn, Nguyễn, La et al., 2020). The dark soil pits contain the remains of stoves (charcoal, dark gray ash, and burnt soil), food remains (animal remains, many bones with burn marks and mollusks), circular clusters of stones, and stone relics. These are precious cultural relics that help to understand the history and culture of the early Neolithic period in Dak Nong. They are documents of outstanding value, such that UNESCO established Dak Nong Global Geopark in 2020 (La, Lương, Phạm, Búi et al., 2020; La, Lương, Phạm, Phạm et al., 2020; Le et al., 2023).

In addition to the stove remains, seven relatively intact burials were recorded in the excavation pit, of which graves 5 and 7 contained two individuals each. Along with the above relatively complete remains, the remains of at least 10 other humans were found scattered in the cultural layer of the excavation pit. Five of these were infants, four were adults, and one was a teenager (Nguyễn, 2020).

Human remains are a highly valuable source of data on the racial composition of the post-Hoa Binh Neolithic inhabitants of the Central Highlands. Burials and fires also reveal the relationships among prehistoric cultures, the paleoenvironment, the environmental adaptations in exploiting food sources and residence customs, and the use of raw materials by prehistoric residents to make tools at Krong No between 7,000 and 4000 BP. This article describes the burial documents and characteristics of dark soil pits in the excavation pit of cave C6.1 and discusses monuments, relics, and other issues related to the early Neolithic period in the Central Highlands.

2. DOCUMENTATION OF DARK SOIL PITS AND BURIAL TOMBS

2.1. Dark soil pits

Dark soil pit F1 has a nearly circular shape. Its coordinates are in cells C2, C3, D2, and D3. Pit F1 appears at the surface of the excavation pit and extends 30 cm below the pit surface. Its average diameter is 60 cm. It is wide at the top, gradually shrinks with depth, and ends with a basin-shaped bottom at layer 2.1 (Figure 2a) (Lê et al., 2019). The soil in pit F1 is dark brown, relatively porous, and contains few tree roots. In the middle of the pit are a few small basalt stones with traces of charcoal and ash from the stove. The collected artifacts include stoneware, prehistoric pottery fragments, animal bones, and mollusk shells.

Dark soil pit F2 is at a depth of 30 to 40 cm below the surface of the excavation pit. Its coordinates are close to the wall of cell D3 (Lê et al., 2019). The average diameter of pit F2 is 50 cm. It is thick in the center, gradually thins, and has a basin shape (Figure 2b). There are a few large basalt stones in pit F2. Around the stones are traces of charcoal and ash from fires, some prehistoric ceramic fragments, animal bone fragments, and mollusk shells.

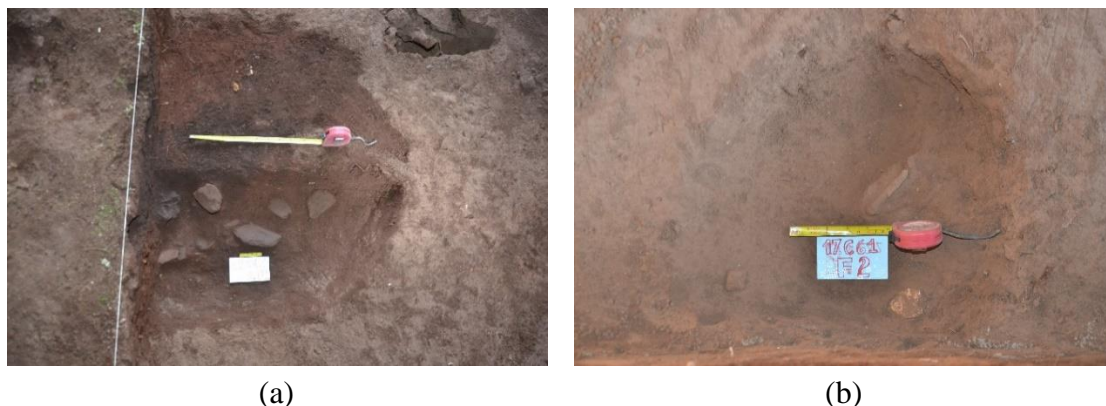


Figure 2. Dark soil pits and fire marks in the C6.1 excavation pit

Notes: a) Artifacts in dark soil pit F1; b) Dark soil pit F2.

Source: Photos by Le Xuan Hung.

Dark soil pit F3 appears in excavation layer 1.1 and has coordinates in cell C3 (Lê et al., 2019). The average diameter of the pit is 30 cm down to layer 1.2, where the diameter averages 50 cm and gradually expands toward the bottom, where it averages 85 cm. In longitudinal section, F3 looks like a cupped jar (Figure 3a). The processed depth of pit F3 is 70 cm. The remainder shrinks into a basin shape and was not further excavated to preserve the stratigraphy on-site for outdoor display. Pit F3 contains much charcoal and fine ash, and many stone tools, raw stones, animal bones and teeth, and mollusk shells.



Figure 3. Dark soil pits and remains of a stove in excavation pit C6.1

Notes: a) Dark soil pit F3; b) Dark soil pit F4.

Source: Photos by Le Xuan Hung.

Dark soil pit F4 has coordinates at the corner of cell C4 toward the east wall, close to the cave wall (Figure 3b) (Lê et al., 2019). The pit has an average surface diameter of 45 cm, and part of pit F4 penetrates the wall of the excavated pit. The results of peeling off the soil layers to a depth of 40 cm show that the structure begins to round into a basin shape. (It was not completely excavated to retain the stratigraphy for in situ preservation.) The soil in pit F4 is loose, dark brown, and mixed with much coal and ash. Notably, around pit F4, there is a yellowish-brown, rounded streak of soil. The collected artifacts

include whittling tools, pebbles, and scrap pieces. At the center of pit F4, small blocks of basalt that fell from the ceiling of the cave also appear.

Dark soil pit F5 is a circular cluster of stones, with coordinates in cell D4, close to the east and north walls (Figure 4a) (Lê et al., 2019). Relic F5 began to emerge at the surface of the excavation pit. Basalt stones appear about 20 cm from the pit surface at the bottom of excavation layer 1.2. The stones in the cluster are mostly 10 × 15 cm in size and arranged in a circle with an average diameter of 60 cm. Just below that layer is an additional layer of larger stones (12–17 cm). If the pit structure of F5 is cut in half, the exposed surface is composed of dark gray soil mixed with a few animal bones and snail shells. Deep down, interspersed between the stones, the soil is dark, smooth, and light like ash. The bottom of pit F5 is basin-shaped, and the soil is gray and white. Based on the structure, remains, and ash-like soil texture, we believe that F5 is most likely a cremation grave. This issue needs to be discussed further when DNA test results are available.

Dark soil pit F6 is denoted as 19.C6-1.B1-2.F6. Its coordinates are in cell C2 on the west wall, close to the cave wall (Figure 4b) (Lê & Phạm, 2020). Pit F6 is exposed in the excavation pit as a streak of dark, or dark brown, relatively porous soil mixed with animal bones and mollusk shells. Part of F6 was excavated in 2018. One side of the south wall excavated in 2019 is 20 cm wide, and the side of the west wall is 70 cm long and 15 cm deep from the surface of the excavation pit. Pit F6 is wide at the top and slightly tapered in a basin shape to the bottom. In general, the soil texture is relatively porous and mixed with animal bones and mollusk shells. These are the kitchen waste remains of prehistoric residents. The 533 collected artifacts include 1 stone tool, 7 scrap pieces, 9 pieces of pottery, 42 pieces of ocher, and 474 animal bones and mollusk shells.

Dark soil pit F7 is denoted as 19.C6-1.C1.F7. On the pit surface, the soil is yellowish-brown, reddish-brown, and mixed with a little grayish-white soil (Figure 4c) (Lê & Phạm, 2020). The soil texture is slightly lumpy and solid, 5–7 cm thick. Stone relics, some bones, and mollusk shells were obtained from pit F7. The burnt soil is brick red; this is the clearest trace of a stove in the excavation pit. At the bottom of pit F7, the soil is dark brown and soft. In all, 442 artifacts were collected, including 16 knapped pieces, 2 raw stones, 27 pieces of pottery, 346 bone samples, 19 mollusk shells, and 32 pieces of ocher.

Dark soil pit F8 is denoted as 19.C6-1.B1.F8. The pit appears 15–20 cm from the surface of the excavation pit and has a basin shape. Part of F8 penetrates the wall of the excavation pit (Figure 4d) (Lê & Phạm, 2020). The soil structure is friable and loose. F8 appears at the surface of layer 1.2, and its deepest depth is about 27 cm. The soil in pit F8 is darker brown than the outside, slightly clumped in laterite form, and mixed with many tree roots. Pit F8 contains many relics, such as stone tools, knapped pieces, animal bones, rough ceramics, and stones (sizes 10 × 10 cm and 15 × 15 cm) that fell from the ceiling of the cave. The soil at the bottom of pit F8 is grayish-brown and both softer and smoother than the soil above. The 857 collected artifacts include 7 stone tools of all kinds, 1 bone tool, 22 knapped pieces, 2 separated pieces, 4 raw stones, 1 stone nodule, 6 pieces of rough pottery, 760 animal bones, 15 mollusk shells, and 39 pieces of ocher.

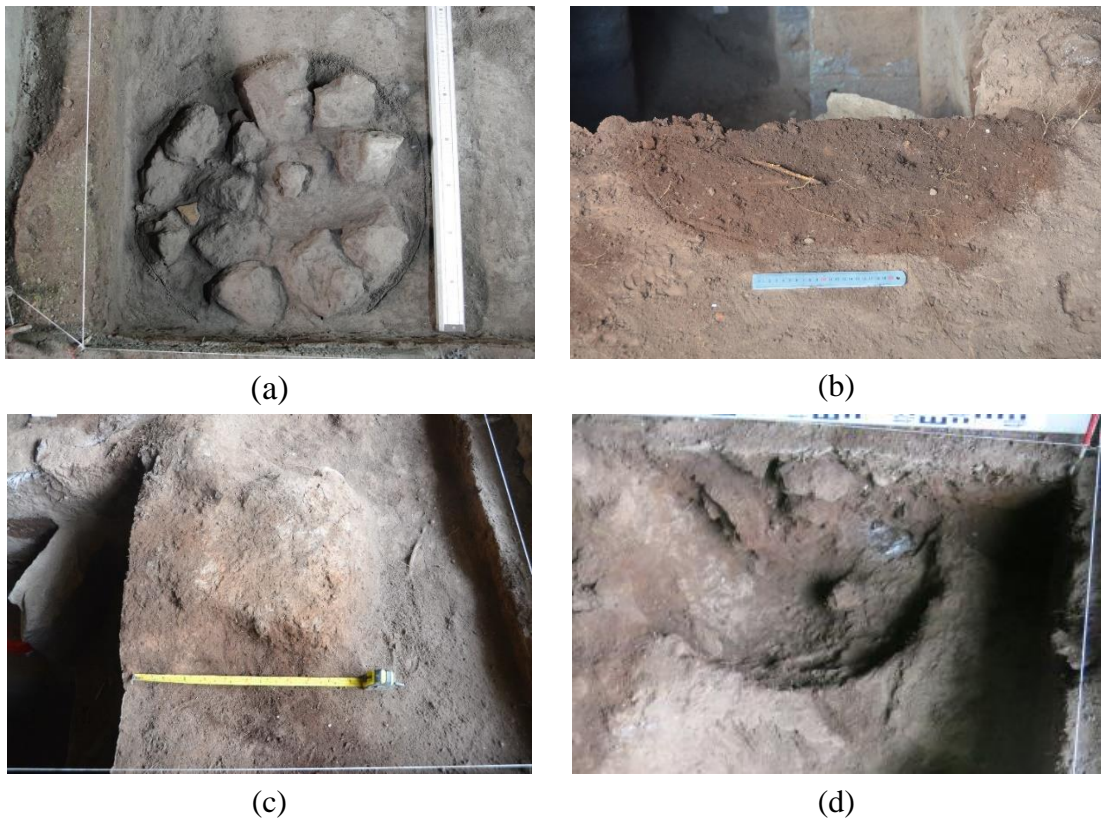


Figure 4. Relics in cave C6.1

Notes: a) Relic F5; b) Dark soil pit F6; c) Traces of burnt soil F7; d) Dark soil pit F8.

Source: Photo by Le Xuan Hung.

Dark soil pit F9, denoted as 19.C6-1.B2.F9, begins to appear from the bottom of layer 1.2. It is arc-shaped and nearly three-quarters the width of cell B2. The remaining part of F9 penetrates the cave wall (Lê & Phạm, 2020). From the top to the bottom of the pit, there are many rocks of various sizes that fell from the ceiling, but most are 10–15 cm or 15–20 cm in size (Figure 5). In the middle of F9 and at the northern edge, there are two large basalt blocks of size 35–40 cm that fell from the ceiling of the cave, and both large and small basalt blocks lie on top of each other to form a bowl-shaped mound.

The results of processing the soil layers in F9 show that F9 is small and oval-shaped at the surface and gradually grows with depth to layer 3.2. Down to layer 3.2, traces of dark soil spread almost to cell B2 and partly to cells B1 and B3. F9 gradually shrinks toward the bottom of layer 3.2, and its soil varies by cluster and depth. From layer 1.2 to the end of layer 3.1, in half of the pit from the pit wall to the outside of the cave wall, the soil is dark brown, smooth, and mixed with many tree roots. The remaining half of the soil is reddish brown and has a rougher texture. From the bottom of layer 3.1, the soil gradually turns brown and grayish-brown. The soil texture is softer and smoother than in the upper layers. The bottom of dark soil pit F9 has a basin shape, and in layer 4.7, the final layer, the soil is grayish-white, reddish-brown, smooth, soft, and hydrated. The 8,073 collected artifacts include 24 stone tools of various types, 1 grinding bone tool,

317 knapped pieces, 2 knapped slabs, 3 separated stone fragments, 7 stone nodules, 24 raw stones, 391 raw ceramic fragments, 6,901 animal bones, 35 mollusk shells, 1 pyrite specimen, and 367 pieces of ocher, some of which have grinding marks.



Figure 5. Relic dark soil pit F9 in cave C6.1

Source: Photo by Le Xuan Hung.

2.2. Graves

Researchers discovered seven graves with relatively complete remains in the excavation pit of cave C6.1. Among them, grave 5 has two remains (denoted as 5a and 5b), and grave 7 has two remains (denoted as 7a and 7b). The results of excavating the graves are as follows:

Grave 1 is denoted as 18.C6-1.C2.L4.6.M1. It was discovered during excavations in 2018, when a shin bone was discovered. Grave 1 was excavated and repaired until 2019 (Figure 6a). Grave 1 is distributed over three excavation layers (4.7, 4.8, and 4.9) (Nguyễn, Lê, Nguyễn et al., 2019). The soil in the grave is gray, grayish-brown, smooth, and homogeneous. The skeleton in grave 1 is lying on its side, with its head facing east into the cave. Its face is turned toward the cave wall and is lower than the leg bones, and its hands are holding its head. Grave 1 was processed for information at the scene and 3D-scanned to be 3D-printed for display. After obtaining the information, the grave was moved to the Museum of Nature for in-depth revision. The date of the grave in the cultural layer is 5,780 BP before calibration and 6,686 BP after calibration (Nguyễn, Nguyễn & Lê, 2019; Nguyễn, Lê et al., 2020). Artifacts collected in the tomb include 1 stone tool, 35 knapped pieces, 2 raw stones, 901 animal bones, 125 mollusk shells, and 7 pieces of ocher.

Grave 2, denoted as 18.C6-1.D2.L4.8.M2, was discovered in 2018. The grave was buried in a gray soil layer, thickly wedged with small weathered basalt stones and milky white kaolin (Figures 6b and 6c). The structure of the grave was carefully treated, and the

grave boundary was identified. This is the grave of a child buried in a sitting position. The bones of the arm and leg are aligned vertically next to the skull, and the finger bones are located next to the cervical vertebrae (Nguyễn et al., 2018). After the grave was processed and information was recorded at the site, grave 2 was covered with plaster and taken to the Museum of Nature for research, restoration, and 3D printing for display.



(a)



(b)



(c)



(d)

Figure 6. Human remains in cave C6.1

Notes: a) Grave 1; b) Skull from grave 2, front oblique view; c) Grave 2; d) Grave 3.

Sources: Photo 6b by Nguyen Lan Cuong; Photos 6a, c, d by Le Xuan Hung.

Grave 3 is denoted as 18.C6-1.C2.L4.9.M3. It was discovered during excavation in 2018 (Figure 6d). Grave 3 was buried in grayish-white soil. The soil texture is relatively smooth and homogeneous. Grave 3 has coordinates in cells C2 and B2 and is 126 cm deep relative to the assumed baseline (Nguyễn, Lê, Nguyễn et al., 2019). Preliminary processing results showed that the bones were arranged in a haphazard way and stacked on top of each other. The current state of the grave has not been completely processed; only the bones distributed in layer 4.9 have been revealed, and no skull bones have been discovered. The absolute date of grave 3 is 5,850 BP before calibration and 6,672 years BP after calibration (Nguyễn, Lê et al., 2020). Grave 3 is being preserved in situ, and further research is needed. Artifacts collected in the grave layer consist of 646 specimens,

including 13 knapped pieces, 1 raw stone, 521 animal bones, 103 mollusks, 1 pyrite specimen, and 8 pieces of ocher.

Grave 4 is denoted as 19.C6-1.D1.L1.3.M4. It was discovered during excavation in 2019 (Nguyễn, Lê, Nguyễn et al., 2019). The remains of the grave first appear in layer 1.3, with the head facing northwest and the feet facing southwest. The soil in the grave is gray and grayish-brown. The soil texture is smooth and very soft (Figure 7a). The human remains in grave 4 are in a kneeling position and have been 3D-printed for display. Four small basalt stones under the head are arranged to position the skull. The soil at the bottom of the grave is grayish-white with a very smooth texture. Burial items include snails and carved tools. Grave 4 was removed and brought to the Museum of Nature for an in-depth review. Artifacts recovered from the tomb consist of 765 specimens, including 1 stone tool, 12 knapped pieces, 688 animal bones, 35 mollusk shells, and 29 pieces of ocher.



Figure 7. Burial remains in cave C6.1

Notes: a) Remains and burial items in grave 4; b) Remains and burial items in graves 5a and 5b.

Source: Photos by Le Xuan Hung.

Grave 5 is denoted as 19.C6-1.C1.L4.5.M5a-b. The grave contains the remains of two individuals, with many bones positioned haphazardly. The grave coordinates place it close to the west wall (Figure 7b). (1) Grave 5a contains quite a few skull fragments, but these could not be assembled into a skull because of the missing fragments. Only a few skull fragments could be pieced together. (2) Grave 5b contains some long bones, such as a humerus, a radius, and a tibia with a missing distal end. The intact bones are the ulna, patella, and cuboid. There are also fragments of the pelvis and two segments of the clavicle (Nguyễn, 2020). Burial items include three millstones (size 20 × 25 cm) with usage marks. These stone relics were consciously arranged by prehistoric inhabitants. A total of 159 artifacts were collected from the tomb, including 8 knapped pieces, 128 animal bones, 18 mollusks, and 5 pieces of ocher.

Grave 6, denoted as 19.C6-1.B1.L4.6.M6, was discovered in 2019 (Nguyễn, Lê, Nguyễn et al., 2019). Grave 6 is distributed in gray and grayish-white soil. Preliminary processing at the excavation site showed that grave 6 only exposed the head of a leg bone. The ends of the bones stand upright in a sitting position, and the ribs are partially exposed

(Figure 8a). An iron-shaped stone tool was discovered at the tip of the leg bone and left in place. After some preliminary information was recorded, grave 6 was covered with soil to preserve it for future research.



Figure 8. Burial remains in cave C6.1

Notes: a) Remains and burial items in grave 6; b) Remains and burial items in grave 7.

Source: Photos by Le Xuan Hung.

Grave 7 is denoted as 19.C6-1.C1.L4.6.M7a-b and has coordinates in cell C1. Grave 7 contains the remains of two individuals (one adult and one child) and overlaps grave 3, which was discovered in 2018. The bones are heavily decomposed and overlap each other (Figure 8b). The remains in the grave include pieces of limb bones, ribs, and a pelvis. The bones found in grave 7 were removed by researchers for in-depth analysis:¹ (1) Grave 7a has the vertebrae, left and right wrists, metacarpal bones of the left and right fingers, patella, left and right ankles, some metatarsals, and left toes. (2) Grave 7b has kneecaps, ribs, a segment of the lower jaw, and a segment of the sternum (Nguyễn, 2020). Artifacts in the grave include 2 stone tools, 60 knapped pieces, 2 raw stones, 1 cowrie shell, 1,285 animal bones, 261 mollusks, and 21 pieces of ocher.

3. DISCUSSION

In the excavation pit of cave C6.1, scientists discovered traces of stoves, food remains, and tool-making activities of prehistoric residents. The results of excavating the dark soil pits and grave relics show that in addition to similarities, there are also characteristics that are not completely similar, such as archaeological artifacts, soil colors, dark or light traces of fires, and monument structures. Archaeological artifacts, soil color, and structure are relatively similar in the nine black soil pit relics. They only differ in the size and depth of exposure of the relics. Remains in dark soil pits are directly related to the meal remains of prehistoric residents, such as small animal bones, snail shells, mussels, fish, crabs, and turtles. In addition, researchers discovered stone objects and ceramics left behind in dark soil pits as traces of the settlement process.

¹ The remains left at the excavation pit will be studied in the next phase.



Figure 9. Relic F4 and stone tools in cave C6.1

Source: Photo by Le Xuan Hung.

Within F1 and F2 and close to the surface layers of F3, F4, and F7, there are reddish-brown streaks of burnt soil. Much clumped soil, traces of charcoal and ash, animal bone fragments and mollusks burned black, many pieces of pottery with soot marks from the cooking process, and many loess piles were found. In the middle of these dark soil pits, the soil is smooth, black, and light. This is most likely a trace of the structure of the five stoves in cave C6.1. The stoves appear at many different cultural levels. The estimated age belongs to the late Neolithic to early Metal period. Although the soil structure of pit F4 is the same as that of the relics mentioned above, on the edge of the mouth and close to the edge, four stone tools (a carving tool, oval pebble, axe-shaped scraper, and disc-shaped scraper) were consciously arranged in an arc shape by prehistoric residents (Figure 9). These are most likely burial items. Perhaps, in addition to its stove function, this is also a cremation grave. This issue needs to be further researched.

Relic F5 is a circular stone structure with two layers of stones that overlap. This structure is similar to the three other stone clusters in cave C6', two of which have been excavated (Vũ et al., 2019), but is much smaller in size. The F5 rock cluster in cave C6.1 is being processed for conservation. The longitudinal section of the stone cluster shows that interspersed between the stones is black, smooth, light soil-like ash with no archaeological relics and few animal bones and mollusk shells. This phenomenon is similar to the two rock clusters in cave C6'. Most likely, these are the remains of a cremation grave from the time when the prehistoric inhabitants of cave C6.1 had contact with other Metal Age inhabitants in the northern Central Highlands. This issue needs further study.

Dark soil pits F6, F8, and F9 have a nearly circular, basin-shaped structure that is large at the edge of the mouth and tapers to the bottom. Many remains in the dark soil pits are the remains of meals eaten by the prehistoric inhabitants of cave C6.1, such as animal bones, snail shells, mussels, and turtles. Other remains include stone tools, raw stones,

ocher, many prehistoric ceramic fragments in the upper layer, and unclear traces of stoves F1, F2, F3, F4, and F7. These remains belong to the late Neolithic to early Metal period. However, reddish-brown burnt soil also appears within the lower layers of F3 and F9, similar to the upper layers of F3, F6, and F8 (Figure 5). The soil is clumpier, there are more traces of charcoal and ash, the animal bones and mollusks are charred black, and the stove marks are more obvious. Lens-shaped soil streaks and reddish-brown solid soil were also detected on the wall at cultural levels 6, 7, and 8. This suggests that these are stoves from the early stage in cave C6.1.

The excavation results in 2018 and 2019 allow us to determine that the cave C6.1 relic has many similarities with the burials of prehistoric residents of the Hoa Binh culture in northern Vietnam. An in-depth study of seven burials in the excavation pit of cave C6.1 shows that the graves still preserve human remains in a side-lying or kneeling position. Grave 1 is at coordinate cell C2 at an excavation depth of 4.6 to 4.9 m in a layer dated 5,780 BP before calibration and 6,686 BP after calibration. The remains in grave 1 belong to an adult man, about 25 to 35 years old and 1.84 to 1.85 m tall. The anthropological composition of the skull is similar to that of *Melanesian* and *Indonesian* skulls. The human remains in grave 7 have a height of 1.81 to 1.83 m. These are the tallest ancient human remains discovered to date in Vietnam (Nguyễn, 2020). Research by Nguyễn (2020) shows that this height corresponds to Negro residents. Australian aboriginal skulls are also very similar to the ancient skulls at Mai Da Nuoc (Hoa Binh culture) and Con Co Nguá (Vietnamese Neolithic). Grave 2 is at coordinate cell D2, 4.8 to 68 cm deep from the surface of the excavation pit, with an age of $5,230 \pm 20$ BP before calibration and 5,966 BP after calibration. These are the remains of a child about 4 years old, buried in a sitting position. This is a child's skull, so the race is unknown, but the nasal cavity is wide, the eye sockets are tilted low, and the teeth are large, as often seen in black races (Nguyễn, 2019; Nguyễn, Nguyễn, La et al., 2020). Several lines of evidence allow us to guess that the inhabitants of cave C6.1 were descendants of the Hoa Binh culture inhabitants of northern Vietnam. These include the form of residence in caves, burial of the dead at the place of residence, burial lying down or sitting with knees bent, tomb floors that are lined with stones like a barrier to fix the body, and burial items such as oval axes and cowrie shells. However, to have a solid argument to prove the above statement, more extensive excavation and research are needed in caves containing traces of prehistoric activities. We will continue to address this issue in subsequent studies.

Explorations and excavations at cave C6.1 in 2017, 2018, and 2019 over an area of 10.3 m^2 have revealed a fairly intact cultural layer 1.85 m thick, including eight sedimentary units formed from 7,000 to 4,000 BP (Nguyễn, Nguyễn & Lê, 2019; Nguyễn, Lê et al., 2020). Although the excavation area is not large, an abundant number of relics were collected in the sediments, including traces of stoves and burial mounds. The total number of artifacts collected includes 179 stone tools, nearly 4000 knapped pieces or pieces of raw stone, 66 bone tools, 10 mollusk shells made into jewelry, and 1,276 shards of prehistoric pottery (Nguyễn, Nguyễn, La et al., 2020). The deepest burials and sedimentary units (layers 5, 6, 7, and 8) of cave C6.1 range in age from 7,000 to 6,000 BP. Blade sharpening tools are quite rare, with only one specimen, and ceramics have not

yet appeared. This shows that the level of exploitation, living activities, and tool-making intensity were still modest. However, this is the most typical representative of the early Neolithic period currently known in the Central Highlands. In addition to caves C6.1 and C6' that have been explored and excavated, scientists have also discovered 10 other caves containing cultural relics of prehistoric people in the volcanic area of Krong No. These relics have much research value and draw the most complete picture of the prehistoric cultural process here and in the Central Highlands.

Broader comparative research on other contemporary relics and artifacts in the Central Highlands shows that sharpened axes appear in most relic clusters, although the quantity may vary. The stone material, morphology, and manufacturing techniques also differ. Currently, the largest number of sharpened axes are in Thon Tam (Cu Jut, Dak Nong Province), followed by Lang Ga (Chu Prong, Gia Lai Province) and Buon Kieu (Dak Lak Province). In other relic sites, such as cave C6.1, Ho Tre, and Buon Hang, it is rare to see sharpened axes. Stone tools are mainly chipping tools, oval axes, disc-shaped scrapers, and short axes. The shape and manufacturing technique are based on the Hoa Binh industry, but the vast majority are carved on both sides.² Most of the relic sites have a fairly large collection of raw material (knapped pieces), reflecting the nature of the stone processing workshops of the prehistoric residents, which were not as specialized as in the late Neolithic to early Metal period in the Central Highlands.³

Pottery of the early period appears in the excavation pits of Thon Tam, Buon Kieu, Lang Ga, and cave C6.1, but the quantity is quite small. The ceramics are often rough, friable, and simple. The “ceramic coat” is mostly worn off, and some have rope patterns, but no engraved lines or holes appear. Thus, the early Neolithic stratum in the Central Highlands currently has six relic clusters distributed in three provinces: Gia Lai, Dak Nong, and Dak Lak. These ancient population groups resided on natural terrain, mainly in the Ia Sup semi-plain and the Krong Pak-Lak lowlands. On the other hand, the results of excavations of caves C6.1 and C6' in Dak Nong Province or test pits at the Buon Hang site in Dak Lak Province (Phạm et al., 2019) show that prehistoric inhabitants exploited the same flora and fauna. In general, the prehistoric communities resided in a similar ecological environment; all resided in the Serepok river basin. The only difference is in the customary type of cave or outdoor residence compared to other relics or groups of relics in the Central Highlands. This cultural stratum developed about 7,000 to 3,500 BP and most likely originated from the Hoa Binh culture.

4. CONCLUSION

Vietnamese archaeology has not yet discovered any relics dating to and bearing the characteristics of the “typical Hoa Binh industry” in the South Central, Central Highlands, and Southern regions. However, in some localities, scientists have discovered relic sites dating later than Hoa Binh, such as Bau Du in Quang Nam Province, Eo Bong in Phu Yen Province, Dinh Quan in Dong Nai Province, and especially the system of early

² See: Lê et al. (2014, pp. 103-106); Lê (2013); Lê (2015); Lưong et al. (2020, pp. 54-57); Nguyễn et al. (2016).

³ See: Lê (2018); Lê (2019).

Neolithic relics discovered and researched over the past decade in the Central Highlands. These include the Thon Tam relic site at Dak Wil Commune, Cu Jut District; relic sites in Dak Nong Global Geopark; Buon Kieu, Ho Tre, and Buon Hang relic sites in Dak Lak Province; and the Lang Ga relic site in Chu Prong District, Gia Lai Province. The discovery of stone tools from the Hoa Binh industry, human and fire remains, and the ^{14}C absolute dating system allow archaeologists to determine the origin of a cultural stratum and the technical organization, mode of residence or livelihood, anthropological characteristics, and the spiritual life of human communities.

The anthropological characteristics, method of burying the dead, and types and techniques of making stone tools show the attachment of the inhabitants of cave C6.1 to the Hoa Binh cultural tradition, but there are innovations that differ from Hoa Binh. The anthropological composition of the ancient people of cave C6.1 also shows characteristics similar to those of the Melanesian and Indonesian races, which were the main members of the Hoa Binh, Bac Son, and post-Hoa Binh cultures in northern and central Vietnam. However, the relatively large heights of the two human remains (M1 and M7) are not characteristic of the two races mentioned above. Therefore, research needs to continue on the racial interbreeding that may have occurred due to the mobility of post-Hoa Binh residential communities.

The prehistoric population of the Central Highlands resided in volcanic caves at Krong No. Was the continued residence in caves such as cave C6.1 a phenomenon of preserving the Hoa Binh tradition under favorable conditions of natural food sources in a relatively narrow area with a small group of residents? With the remaining group of early Neolithic relics, the residence is outdoors, the population size is larger, the space is much more spacious, and the intensity of living activities is more vibrant. This is clear evidence of adaptation and changes in residence methods due to the population size and technical capabilities of ancient resident groups.

Currently, we only partially know ancient livelihoods from animal bones, cultural relics, and burials in the cultural layer of caves C6.1 and C6'. Of the other outdoor sites, only Buon Hang in Dak Lak Province preserves animal remains. Other relic sites have been destroyed, so there is no possibility of obtaining information. The animal species exploited as food by the inhabitants of caves C6.1 and C6' show great richness and include mammals, birds, reptiles, and aquatic animals. This proves that the diverse exploitation of food in a broad ecosystem almost repeated the original hunting and gathering tradition of previous Hoa Binh residents. This is certainly different from the outdoor population groups, which had a larger population size, relatively stable residences, and knowledge of primitive farming. Alluvial areas along rivers, streams, and lakes may have been cleared to grow several types of vegetables, tubers, and fruits to supplement regular food sources or as a reserve for periods when natural supplies are depleted. Caring for wild plants and primitive farming appeared in Hoa Binh culture (Nguyen, 2023). In the post-Hoa Binh period, there is clearer evidence of farming and animal husbandry. Certainly, with previous experiences, prehistoric people in the Central Highlands would continue and improve the economic trend of production, even if still at a limited level.

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