

PALEOANTHROPOLOGICAL AND ARCHAEOLOGICAL DISCOVERIES FROM  
LANG TRANG CAVES: A NEW MIDDLE PLEISTOCENE HOMINID SITE FROM  
NORTHERN VIET NAM

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The hominid fossil record of Southeast Asia is very poorly represented. Though significant samples of Pleistocene hominids have been recovered to the north in China at Zhoukoudian and to the south in Java at Sangiran, the confluence of these two regions, Southeast Asia, has yielded a very small and unreliably dated sample of fossil hominids. The fact that Southeast Asia has been at the center of political turmoil and generally closed to researchers for the past 50 years is in large part responsible for this paucity of hominid discoveries.

In 1987 we established contact with Vietnamese scientists from the Institute of Archaeology in Hanoi and began the first cooperative paleoanthropological field research project in Indochina for nearly half a century (Ciochon and Olsen 1986). During the first two field seasons (1987 and 1988) we surveyed a wide variety of Pleistocene hominid sites throughout northern Viet Nam (Olsen and Ciochon 1990). At the end of the second field season we selected a site in western Thanh Hoa province named Lang Trang Caves for our first cooperative excavation. In January 1989, with funding from the National Geographic Society, we began an excavation of Lang Trang Caves. This excavation yielded a relatively complete Middle Pleistocene fauna with hominids in a datable context (see Ciochon, Olsen and James 1990). The excavation also yielded numerous artifacts likely derived from the Late Pleistocene and Holocene deposits.

LANG TRANG CAVES

The Lang Trang cave system is located about 125 km SSW of Hanoi in the tower karst region of Ba Thuoc district about 15 km from the Lao border (see Figure 1). It consists of a complex of four caves and several smaller openings. Lang Trang caves lie on the east side of the meandering Ma River that has its origin in the uplands of eastern Laos and flows into the Gulf of Tonkin. The caves are located about 20 metres above the river level on the western face of a massive limestone tower that rises several hundred meters above

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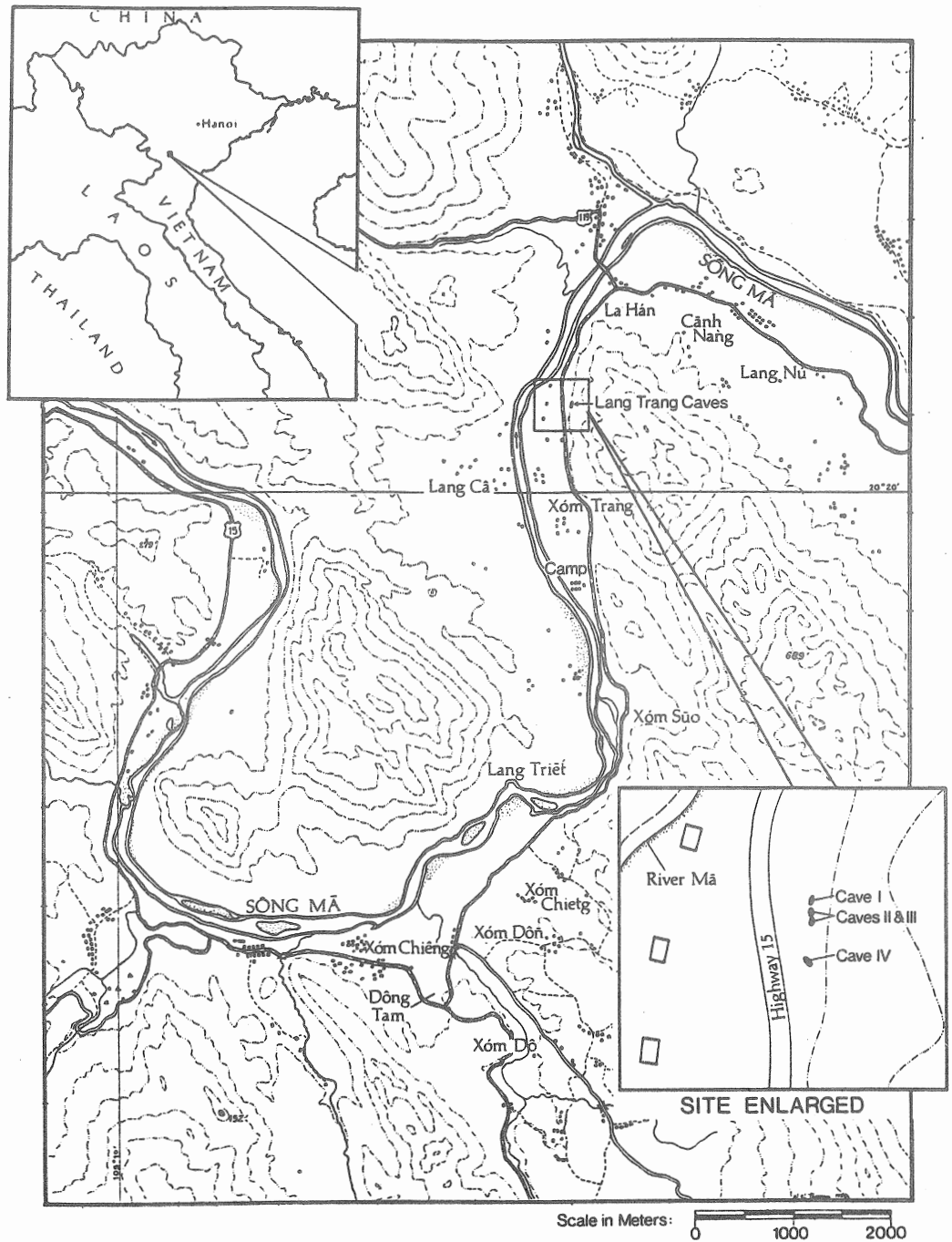


FIGURE 1: TOPOGRAPHIC MAP SHOWING LOCATION OF THE MA RIVER VALLEY IN NORTHERN VIET NAM AND THE POSITION OF LANG TRANG CAVES

the level of the river. This Devonian-aged tower karst is very steep-sided with vertical slopes reaching more than 80 degrees in places.

Lang Trang caves I, II and III are in close proximity to one another whereas cave IV is located some 30 metres to the south. All four caves are at the same elevation relative to one another and to the Ma River. Fossiliferous breccia is found in all four caves occurring on the floor, walls and the ceiling. Microanalysis of the breccia reveals large quantities of iron oxide (more than 80%) and small quantities of angular quartz (less than 20%). One small lens of calcified sand enclosed in the breccia of cave I also contained a very high content of iron oxide indicating a common derivation with the breccia deposits. The fractures within the breccia are all filled with calcite.

Quartz is commonly found in river terraces in karst regions and iron is abundant in the soils of equatorial regions. Therefore the breccia deposits likely had their origin in the soils on the slopes of the towers which eroded and accumulated in the caves and/or were transported by Ma River during flood cycles when the river was more proximate to the caves. The river transport model is supported by the presence of micro-invertebrate sponges of riverine origin in the breccia as well as snails and molluscs. Furthermore, the pooled distribution of fossil vertebrate accumulations in the limestone crevices and alcoves of the cave walls and ceiling and the rolled appearance of some of the bones and teeth substantiate a river borne source of origin for the breccia.

Microanalysis of the breccias in Lang Trang caves I-IV reveals no significant sedimentological differences except for the walls and ceiling of the upper chamber breccia of cave IV which has a significantly higher iron oxide content, less quartz and some clay. Therefore, it is likely the breccia of caves I-III and the lower chamber of cave IV were derived from the same source and were all laid down in the Middle Pleistocene. Breccia samples with tooth enamel embedded in them were collected from all four caves for absolute age determinations using electron spin resonance by Henry Schwarcz of McMaster University (see Grün, Schwarcz and Zymela 1987 for method). The preliminary ESR dates for cave breccias are as follows: Cave I, 480,000±40,000 BP; Cave II, 285,000±24,000 BP; Cave IV lower chamber, 146,000±2000 BP. Given the results of the sedimentological analysis of the breccias from caves I-IV and similarities in mammalian species reported from each cave breccia (see below), it can be concluded that the fauna of Lang Trang caves dates to the Middle Pleistocene.

#### Faunal Remains from Lang Trang caves

One thousand and twenty-five (1025) identifiable fossil specimens were recovered from Lang Trang caves during the January 1989 expedition. Of these, 213 are from Cave I, 294 from Cave II, 83 from Cave III and 435 from Cave IV. A provisional faunal list of all the species recovered from Lang Trang caves is presented in Table 1. Approximately 36 mammalian taxa are identified in this provisional list. The two most common taxa are *Sus scrofa* and *Muntiacus muntjak*. The two rarest taxa are *Cuon antiquus* and *Felis temminckii*. Primates constitute 13% of the fauna with 5 specimens attributed to *Homo*

sp., 44 to *Pongo pygmaeus* ssp., 2 to *Hylobates* sp., 74 to *Macaca arctoides* or *M. mulatta* and 5 to *Presbytis* sp.

The hominid specimens, two molars, one premolar, one canine and one incisor were recovered from three of the four caves: cave I (1), cave II (2) and cave IV (3). Some of these hominid teeth are likely attributable to *Homo* cf. *erectus* based more on temporal context than on morphological criteria. Many of the other identifications in Table 1 are also tentative. Much additional analysis and comparison with type specimens from collections of *Stegodon-Ailuropoda* fauna in museums needs to be undertaken before more definite results can be presented.

|             |  |  |  |
|-------------|--|--|--|
| PRIMATES    | Hominidae<br><i>Homo</i> sp.   | ARTIODACTYLA   | Suidae<br><i>Sus scrofa</i>  |
|             | Pongidae<br><i>Pongo pygmaeus</i> ssp.   | Cervidae<br><i>Cervus (Rusa) unicolor</i><br><i>Cervus</i> sp.<br><i>Muntiacus muntiak</i> |  |
|             | Cercopithecidae<br><i>Macaca arctoides</i><br><i>Macaca mulatta</i><br><i>Macaca</i> sp.<br><i>Presbytis</i> sp. | Tragulidae<br><i>Tragulus</i> cf. <i>javanicus</i>   |  |
|             | Hylobatidae<br><i>Hylobates</i> sp.  | Bovidae<br><i>Bos (Bibos) gaurus</i><br><i>Bos</i> sp.<br><i>Capricornus sumatraensis</i>  |  |
| CARNIVORA   | Ursidae<br><i>Ursus malayanus</i><br><i>Ursus thibetanus</i><br><i>Ailuropoda melanoleuca</i>                    | PERISSODACTYLA   | Tapiridae<br><i>Tapirus (Megatapirus) angustus</i>                     |
|             | Mustelidae<br><i>Arctonyx collaris</i><br>cf. <i>Melogale moschata</i>   | Rhinocerotidae<br><i>Rhinocerus sinensis</i>   |  |
|             | Viverridae<br>cf. <i>Paguma larvata</i><br>cf. <i>Paradoxurus hermaphroditus</i><br>cf. <i>Viverra</i> sp.       | RODENTIA   | Hystriidae<br><i>Hystrix subcristata</i><br><i>Atherurus macrourus</i> |
|             | Canidae<br><i>Cuon antiquus</i><br>cf. <i>Canis</i> sp.  | Rhizomyidae<br><i>Rhizomys troglodytes</i>   | Muridae<br><i>Rattus sabanus</i>                                       |
|             | Felidae<br><i>Panthera tigris</i><br>cf. <i>Panthera pardus</i><br><i>Felis temmincki</i>                        | CHIROPTERA   | Family Indet<br>Gen. et sp. indet.                                     |
| PROBOSCIDEA | Elephantidae<br><i>Elephas namadicus</i>   | GASTROPODA   | <i>Cyclophorus</i>   |
|             | Stegodontidae<br><i>Stegodon orientalis</i>  |  |  |

TABLE 1: PROVISIONAL LIST OF THE PLEISTOCENE FAUNA RECOVERED FROM LANG TRANG CAVES BASED ON POOLED SAMPLE OF 1025 SPECIMENS FROM CAVES I-IV

The great majority of fossil specimens collected from Lang Trang caves are isolated teeth. However, several long bones of both small and large mammals and several cranial and mandibular fragments were also collected. The mammalian fossils collected from caves I-III were found mostly embedded in rock-hard breccia blocks that were first removed from the caves with the aid of a gasoline-powered rock saw and then had to be manually broken up with the aid of a chisel resulting in the extraction of the fossils.

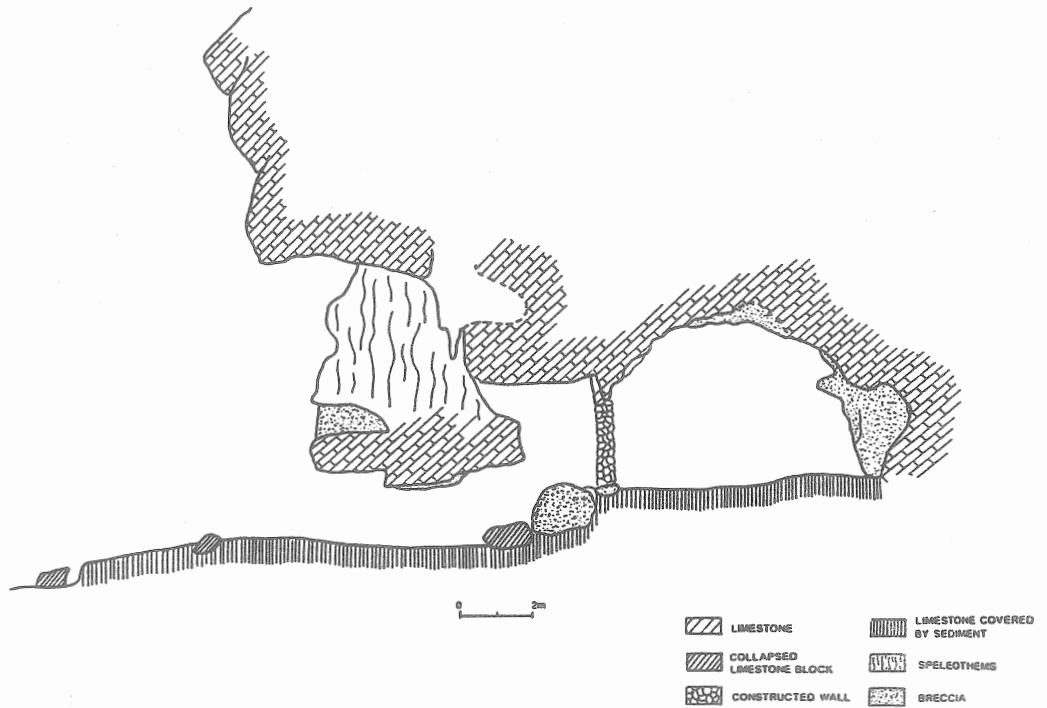


FIGURE 2: LONGITUDINAL PROFILE OF LANG TRANG CAVE II SHOWING LOCATION OF ARTIFICIAL WALL CONSTRUCTED BY THE NORTH VIETNAMESE ARMY AND THE BRECCIA DEPOSITS ON THE ROOF AND TO THE REAR OF THE CAVE

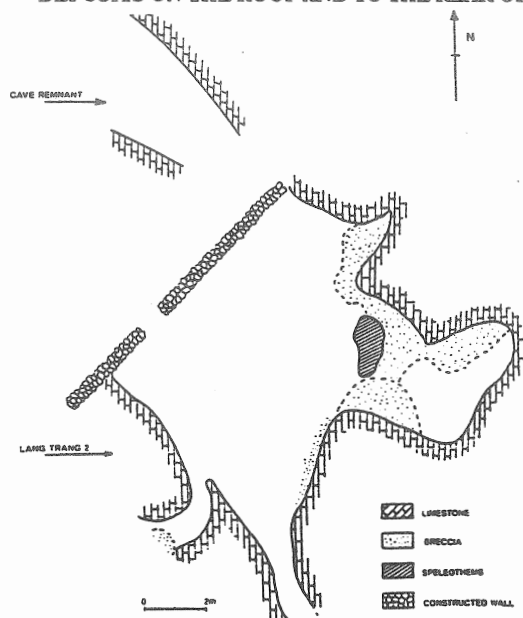


FIGURE 3: PLAN VIEW OF LANG TRANG CAVE II SHOWING CONSTRUCTED WALL AND BRECCIA DEPOSITS IN REAR OF THE CAVE

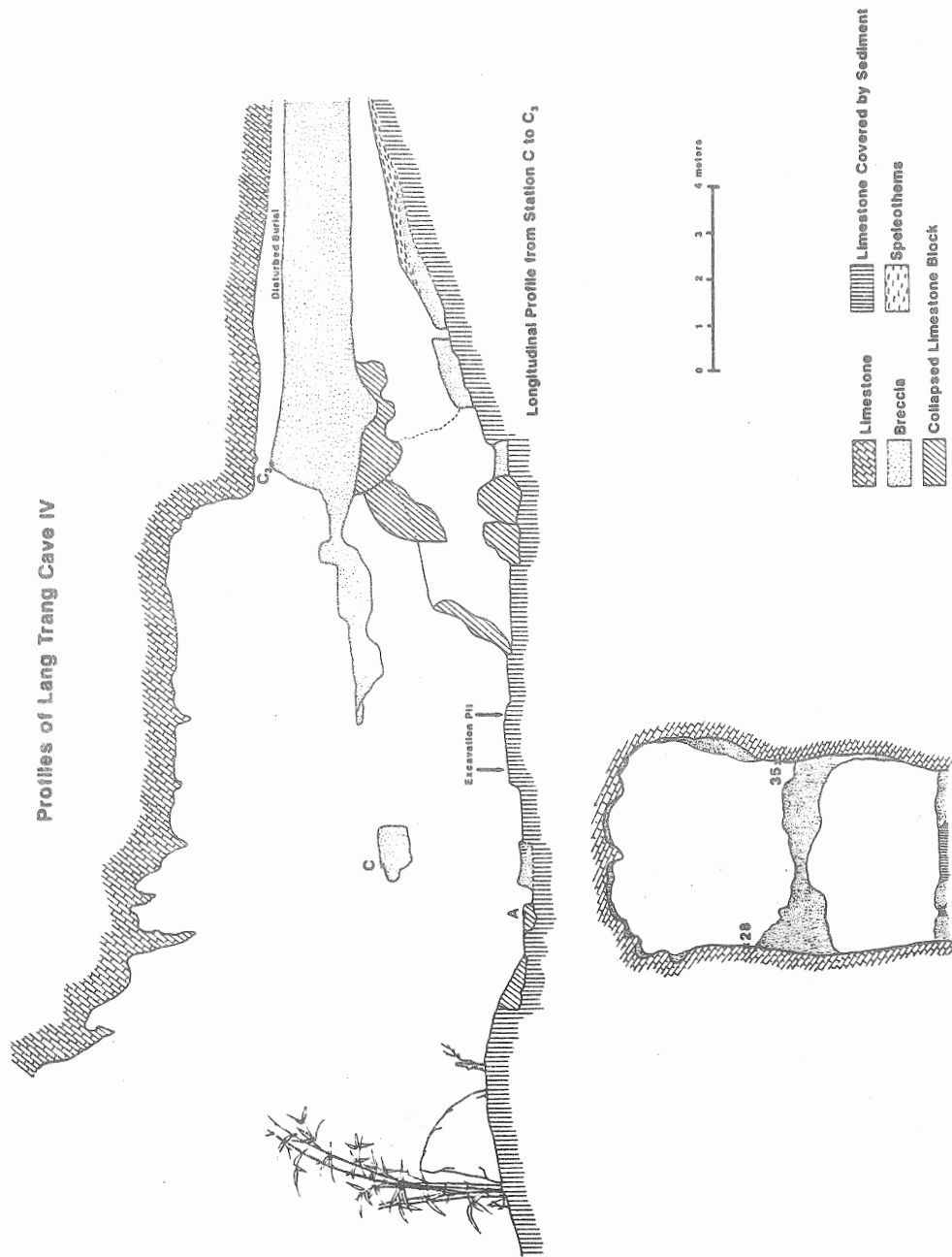
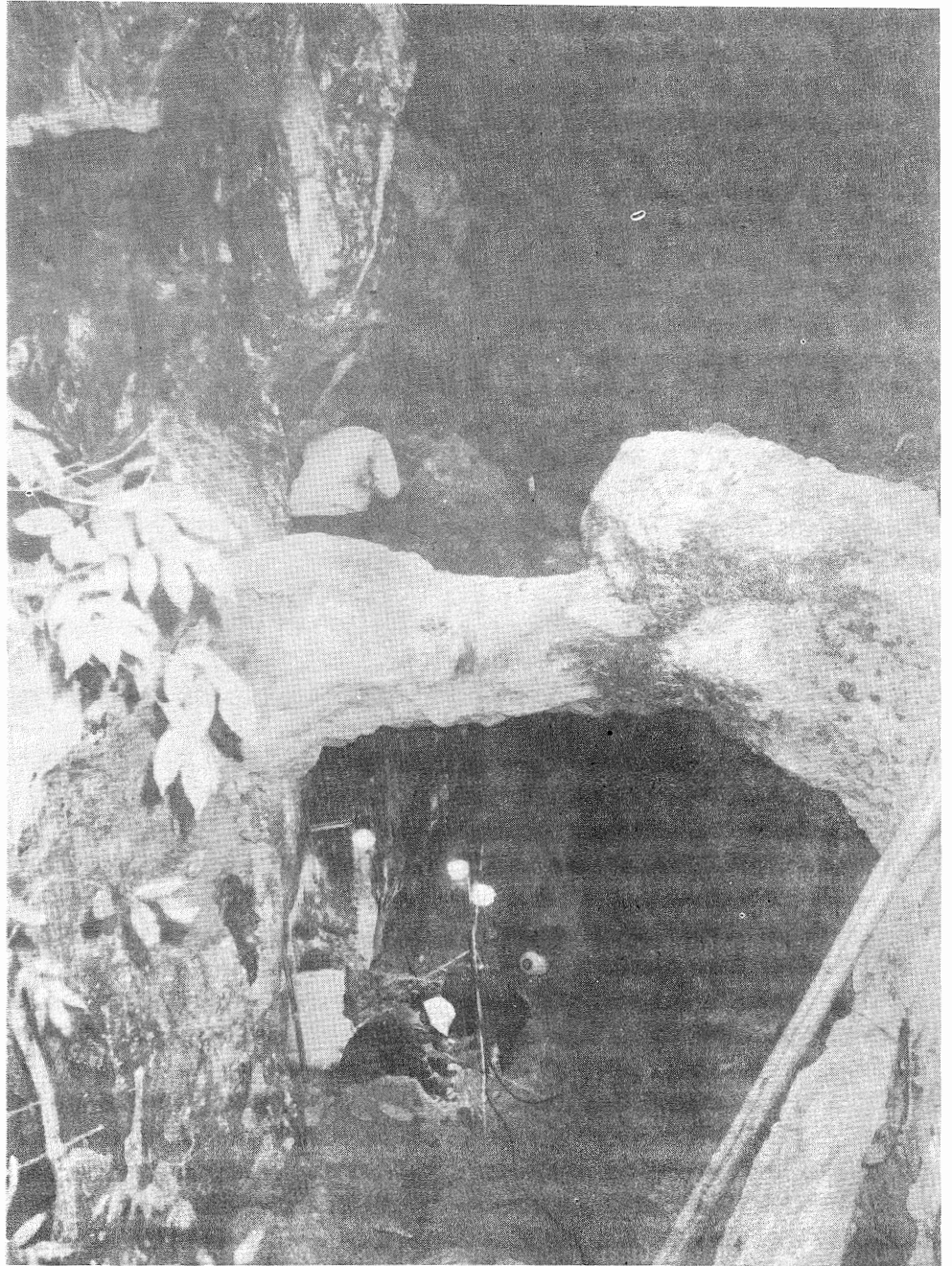


FIGURE 4: LONGITUDINAL AND TRANSVERSE PROFILES OF LANG TRANG CAVE IV WHERE THE MAIN EXCAVATION OF THE 1989 FIELD SEASON WAS LOCATED



**FIGURE 5: UPPER AND LOWER CHAMBERS OF LANG TRANG CAVE IV IN TRANSVERSE VIEW  
SHOWING EXCAVATION TT1 AND BRECCIA BRIDGE SEPARATING UPPER AND LOWER  
CHAMBERS**

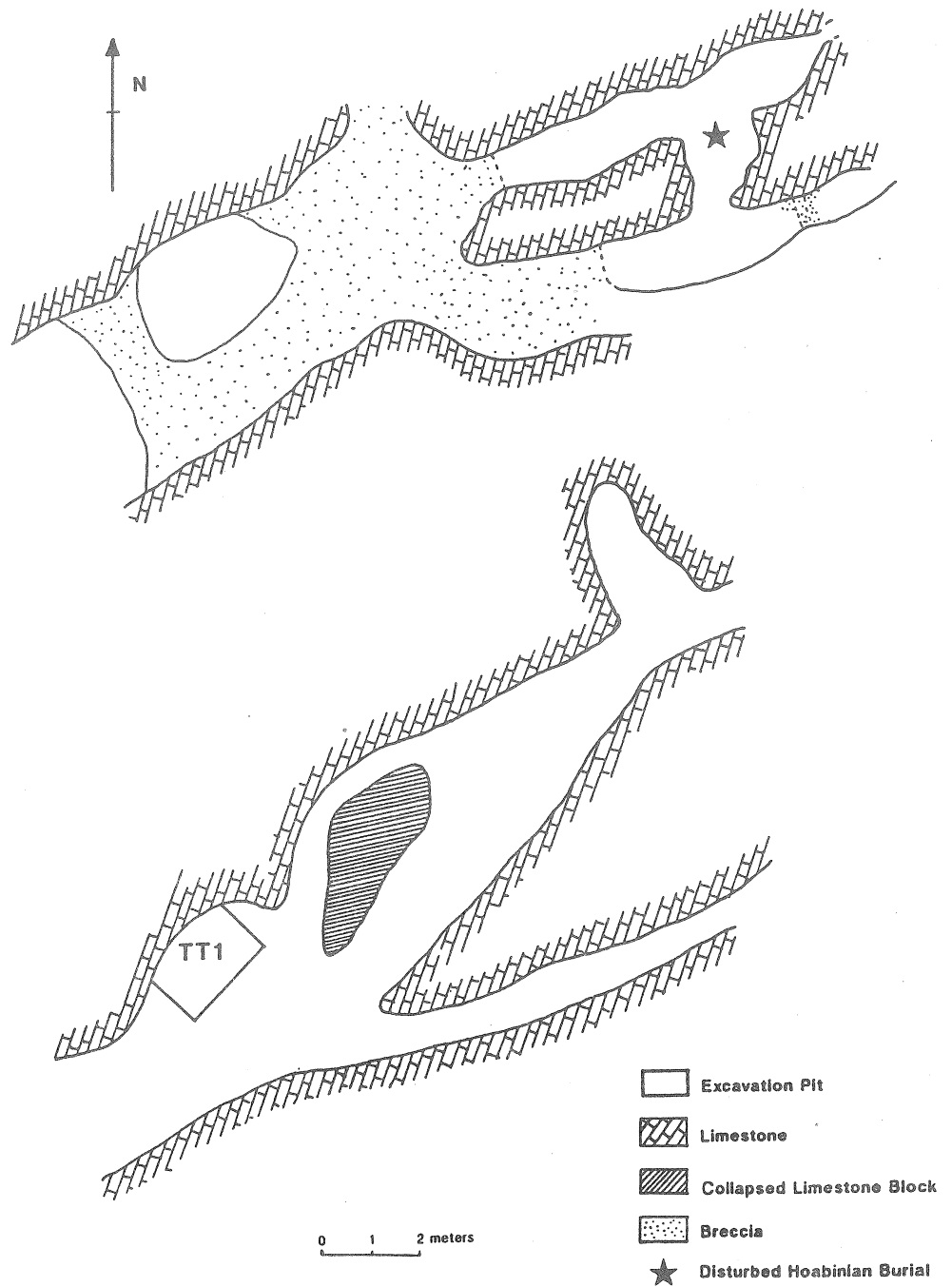


FIGURE 6: PLAN VIEW OF LANG TRANG CAVE IV SHOWING UPPER AND LOWER CHAMBERS AND EXCAVATION TT1



However, the fossils recovered from cave IV were excavated from soft sediment or partially denuded breccia on the cave floor.

Cave II has had an unusual history. Though it originally had a wide physical opening of about 8 meters, the entire mouth has been closed with a brick wall constructed by the North Vietnamese Army during the war with the USA to act as a bomb shelter and weapons depot (Figures 2-3). A metal grate door closes off the wall to provide an entrance into the cave. Much of the breccia from the front chamber of cave II had been removed by the NVA. However, the breccia on the cave roof was studded with fossils as was the breccia in the rear chamber. The breccia on the roof of cave II was particularly hard and yielded several jaws of fossil mammals.

Lang Trang cave IV is the most stratigraphically complex of the four caves (see Figures 4-5). It consists of two chambers separated by a breccia floor. Part of this floor which divides the cave into the two chambers has collapsed resulting in the formation of a breccia bridge (Figures 4-5). The floor of the lower chamber is partially blocked at the cave entrance by several large, irregularly shaped, limestone blocks. This "natural dam" has created a sediment trap which allowed water to flow out of the cave but trapped sediment and fossils behind it. The collapsed breccia floor of the upper chamber fell into the lower chamber and was eroded by rain and underground water sources over many thousands of years resulting in the accumulation of a 40 cm layer of relatively soft sediment. Fossils that were at one time embedded in a rock-breccia above were now loosely scattered throughout the sedimentary layer or were in partially decomposed and denuded breccia blocks found in the sedimentary layer.

A one by two metre *sondage*, Test Trench 1 (TT 1), was opened up along the north wall of the cave's lower chamber, approximately four meters east of the dripline (Figures 4-6). This spot, situated immediately behind (east) of several large fallen blocks of limestone, seems to be relatively immune from the effects of erosion evident in more unprotected areas of the cave. Thus, the depositional sequence uncovered in TT 1 should not necessarily be extrapolated to the entire lower chamber's floor. From TT 1 more than 400 heavily mineralized fossil specimens were recovered by excavation. These fossils were very probably derived from the breccia walls and collapsed ceiling of the lower chamber. The degree of preservation of the TT 1 specimens was excellent since they had been slowly dissolved from the breccia by water action rather than extracted by force.

#### Geoparchaeological Remains from Lang Trang caves

Test Trench 1 also yielded a complex archaeological sequence which postdates all of the fossil remains. Its complexity is due to the fact that a long period of occupation seems compacted into relatively thin cultural horizons. Test Trench 1 reached a maximum depth of only 40 cm (near the east margin of the pit), yet prehistoric remains extending back at least as far as the Bronze Age were recovered. In addition, the mixed character of the sediments themselves precludes accurate interpretation based on this limited excavation. For example, the uppermost five centimeters of earth in TT 1 contain a rich assemblage of characteristic Bronze Age plainware ceramics and small flaked stone tools. Near the

southern limit of the *sondage*, a hearth (possibly two) was discovered with Bronze Age sherds in direct contact with the hardened lining of the fire pit. The matrix containing these finds, however, consists of eroded Pleistocene breccia and contains a wide range of fossil species including *Ailuropoda*, *Pongo*, *Hystrix*, *Sus*, and an unidentified member of the Cervidae.

Undifferentiated strata below 15 cm in TT 1 yielded a half-dozen large (5 to 10 cm, maximum length) stone flakes that do not typologically resemble those in association with the later prehistoric hearths near the surface of the cave floor. While it is not possible to assign an absolute antiquity to these finds, on stratigraphic grounds there is little question that they antedate the Bronze Age materials described earlier. Based on the provisional geomorphological interpretation presented below, it is thought these large flakes are of terminal Pleistocene or initial Holocene age.

The association among all of these finds suggests an aggregate rather than a behaviorally coherent assemblage of tools. At present, we interpret the formation of the lower chamber's sediments in the following way. Three distinct stratigraphic horizons are distinguishable in TT 1:

- (a) At the surface, a thin (1-5 cm) lense of highly disturbed undifferentiated soil constitutes the present cave floor. No artifacts were found distributed on this surface.
- (b) From 5 cm to a maximum depth of 15 cm, there is a zone of hard-packed reddish earth (Munsell 10R 4/7); probably a result of one or two hearths that have both indurated and discolored the cave's sediments.
- (c) A horizon extending from approximately 15 cm to 40 cm beneath the cave's present surface is comprised mainly of large, consolidated blocks of breccia that are in the process of decomposition. The erosional product of these blocks, many of which still contain Pleistocene fossils, is a loosely consolidated dark brown (Munsell 5YR 4/3) sediment that encloses the larger flakes referred to above. This lowermost horizon is characterized by progressively smaller breccia blocks and fines derived from their erosion as one moves down into the cave's accumulated sediments.

On the basis of these observations we suggest that Lang Trang IV was subject to at least one, and perhaps multiple episodes of significant roof-fall in the early Holocene. Our preliminary investigations revealed evidence of human occupation stratified *beneath* and *within* the breccia blocks resulting from these erosional events. Providing that the large stone flakes recovered from the lower stratum in TT 1 are indeed of Pleistocene/Holocene antiquity, then this interpretation is unavoidable. Unfortunately, this proposition currently rests on typological considerations alone, thus a definite conclusion cannot be confidently reached.

The upper level of Lang Trang IV also yielded some significant archaeological remains in a small (c.1.5 meter diameter) tunnel that trends roughly due east from the back (southeast margin) of the cave's upper chamber (see Figures 4 and 6). This passageway, which extends approximately ten meters east beyond the easternmost limit of the upper

chamber, is itself characterized by several erosional pockets that initiate on both the north and south walls of the tunnel. In the largest of these erosional pockets, a chamber approximately 3 by 5 metres in extent, a substantial amount of sediment has collected and stone artifacts and vertebrate fossils were discovered scattered on its surface.

| LOWER CHAMBER  |    | UPPER CHAMBER  |   |
|--|----|--|---|
| A) <i>Stone tools (Pebble tools):</i> (N = 5)              |    | A) <i>Pebble tools:</i> (N = 18)                           |   |
| Unifacial Discoid  | 1  | Tools with transverse edges<br>(= choppers)                | 9 |
| Short axe  | 1  | Split cobble   | 2 |
| Pebble chopper   | 1  | Pebble choppers  | 1 |
| Split cobble   | 1  | Discoid tools  | 3 |
| Scraper  | 1  | Short axes   | 1 |
|  |    | Triangular axes  | 2 |
| B) <i>Flakes:</i> (N = 31)                                 |    | Large Core   | 1 |
| Primary flakes   | 4  | B) <i>Flakes:</i> (N = 9)                                  |   |
| Flakes with pebble cortex platform                         | 20 | Primary flakes   | 3 |
| Flakes with undetermined platform                          | 4  | Flakes with pebble cortex platform                         | 5 |
| Very large flakes  | 3  | Undetermined flake   | 1 |
| C) <i>Pottery:</i> (N = 45)                                |    | C) <i>Pottery:</i> (N = 6)                                 |   |
| Fragments of pottery from Bronze<br>Age to historic period | 45 | Fragments of pottery from Bronze<br>Age to historic period | 6 |

TABLE 2: PROVISIONAL LIST OF ALL THE ARTEFACTS RECOVERED FROM THE LOWER AND UPPER CHAMBERS OF LANG TRANG CAVE IV

Subsequent excavation yielded two subfossil human teeth attributable to *Homo sapiens* as well as artifacts typical of the terminal Pleistocene and early Holocene hunter-gatherer groups known in Viet Nam as the Sonvian (c.18,000-9,000 BC) and Hoabinhian (c.9,000-2,000 BC) complexes. These cultural remains include a ground and perforated cowrie shell (*Cypraea* sp.) bead, incised plainware ceramics and a range of stone tools including end choppers, unifacial discoids ("Sumatraliths"), and split quartzite cobbles (side choppers) (Figures 8-10). The latter artifact class bears strong similarities to known Pleistocene Sonvian assemblages in northern Viet Nam but the technological simplicity of such choppers renders an absolute affiliation with either Sonvian or Hoabinhian contexts on typological grounds virtually impossible. Of particular interest is the discovery of a very large pebble core (30 cm in diameter) used as the raw material for the production of big flakes for manufacturing tools. The use of large natural pebbles for cores is very common in Hoabinhian sites. The presence of flakes associated with this core indicate that the manufacture of tools occurred somewhere in the upper chamber of cave IV. The ceramics, typical of late Hoabinhian (or "Bacsonian") assemblages known elsewhere in the interior of northern Viet Nam, suggest a relatively late date for the burial. Such occurrences are thought to date to be between 8000 and 7000 BP.

The bulk of our evidence suggests that the materials derived from this chamber represent a highly disturbed terminal Pleistocene or early Holocene burial. Taphonomic

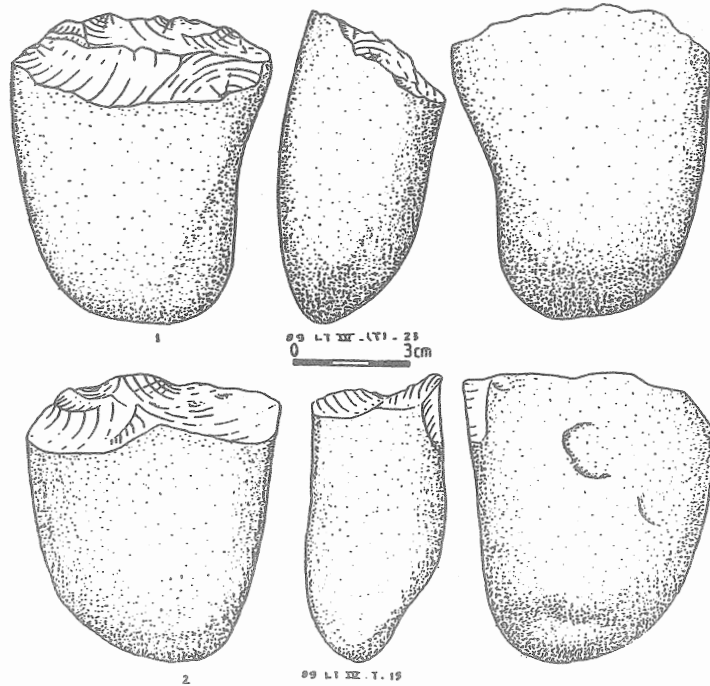


FIGURE 7: QUARTZITE END-CHOPPERS OF LATE SONVIAN OR HOABINHIAN TYPE, LANG TRANG IV UPPER CHAMBER

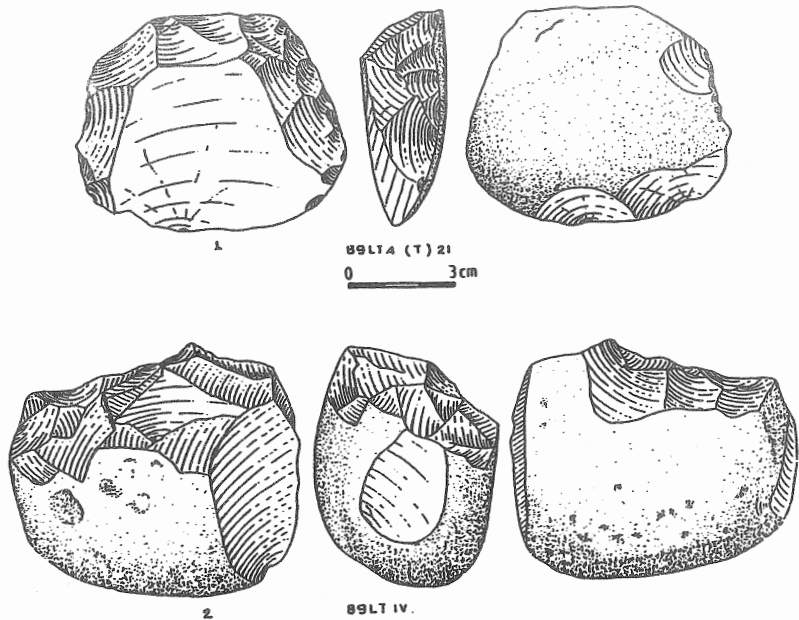


FIGURE 8: LANG TRANG CAVE IV UPPER CHAMBER: CHOPPER ON LONG QUARTZITE FLAKE (TOP), QUARTZITE PEBBLE SIDE-CHOPPER (BOTTOM)

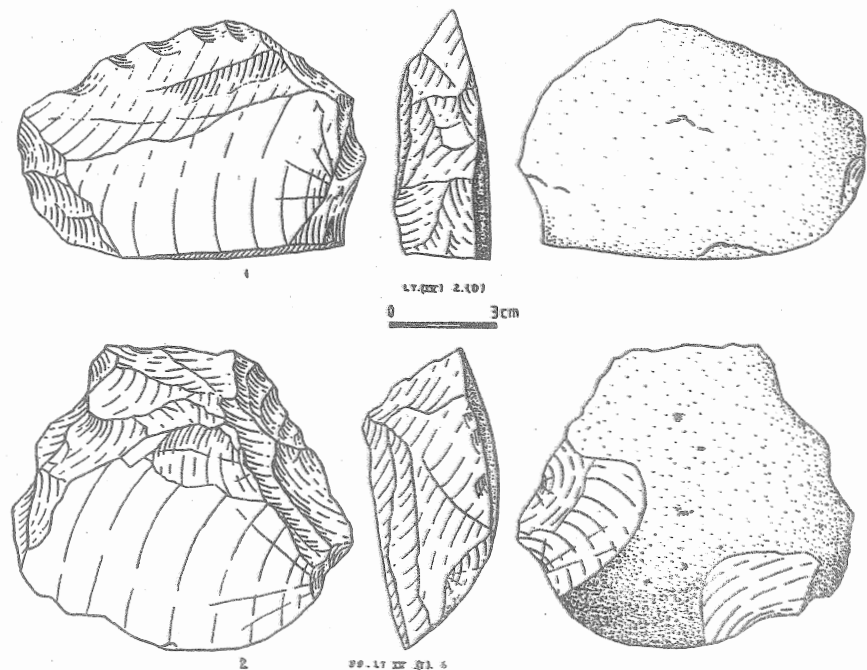


FIGURE 9: LARGE TRIMMED QUARTZITE FLAKES FROM LANG TRANG CAVE IV UPPER CHAMBER

factors including percolating groundwater and fluctuations in the Ma River's course and volume probably account for the disturbed nature of these remains.

A complete list of all the archaeological remains from Lang Trang IV appears in Table 2. We have as yet uncovered no archaeological materials that can be unequivocally assigned a Pleistocene antiquity. The simple direct percussion flakes from the lower horizon in Test Trench 1 and some of the artifacts in association with the assemblage from the upper chamber passageway clearly antedate the Bronze Age. Until further excavations can be completed, however, the absolute antiquity and cultural affinity of these remains must remain speculative.

#### LANG TRANG CAVES COMPARED WITH ADJACENT SITES

About 100 km due west from Lang Trang caves across the Lao border, there is a significant and potentially early hominid cave site that compares very favorably with Lang Trang caves. This site, called Tam Hang cave (Fromaget 1936), is often overlooked in discussions of the paleoanthropology of Southeast Asia. In the lowest levels of this cave a juvenile hominid calotte was discovered (Arambourg and Fromaget 1938). Fromaget (1940) suggested the specimen most closely resembles Modjokerto 1, a *Homo erectus*

specimen from Java. The fauna associated with the hominid calotte is the typical *Stegodon-Ailuropoda* assemblage. Nearly all species identified from Tam Hang cave are also found in the faunal list of Lang Trang caves (see Table 1). Additionally, Arambourg and Fromaget (1938) note the existence of a large assemblage of teeth of the orangutan, *Pongo*, at the same level as the hominid skull. We have discussed the possibility of visiting Tam Hang cave in northern Laos with our Vietnamese colleagues as part of the next survey of cave sites in this region. In addition, the Vietnamese note from published papers in French journals that several other karst cave sites are located in this same region of Laos. The Vietnamese have already consulted with Lao government officials over a proposal to conduct joint fieldwork in north-eastern Laos as an adjunct to our excavations of Lang Trang caves in western Thanh Hoa province.

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