

The Archaeology of Peñablanca Cave Sites, Northern Luzon, Philippines

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ABSTRACT

Three cave sites in the Peñablanca limestone area of northeastern Luzon were excavated in 2003 in order to understand the transition from Upper Paleolithic to Neolithic cultures. The excavations in Eme, Callao and Dalan Serkot Caves showed a lower flake tool assemblage (25,000–6000 BP) and an upper ceramic assemblage with continuing flake tools (2000 BP). The excavations also showed differential usage of the caves as burial or frequentation sites during the Neolithic Period. Morphological and petrographic analysis of the earthenware sherds from the caves demonstrates an affinity with pottery from the riverbank sites in the Cagayan Valley. However, technological and usewear analysis of flake tools showed no change in form or use between periods.

Key Words: Philippine Archaeology, Paleolithic, Neolithic, Earthenware Pottery, Flake Analysis, Cave Sites

INTRODUCTION

The archaeological excavation of some of the Peñablanca Cave sites in the Cagayan Valley, Northern Philippines, was part of a Ph.D. thesis project undertaken in the Research School of Pacific and Asian Studies, The Australian National University. The aim of the project is to understand the transition from the stratigraphically lower flake tool assemblages found in the caves into the upper Neolithic assemblages that are found both in the caves and in the open sites. In order to do this, it is necessary to look for evidence of changes in material culture and subsistence strategies through time. The results of initial analysis of the earthenware sherds and lithic implements, as well as new radiocarbon dates, will be presented.

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THE PROJECT AREA

Northeastern Luzon (Figure 1) is composed of a large faulted basin occupied by the Cagayan Valley, with the Sierra Madre mountain range in the east, notably, the Cordillera Central in the west, and the Caraballo Mountains in the south. The Sierra Madre is a rugged mountain range with peaks up to 1800 meters (Wernstedt and Spencer 1967).

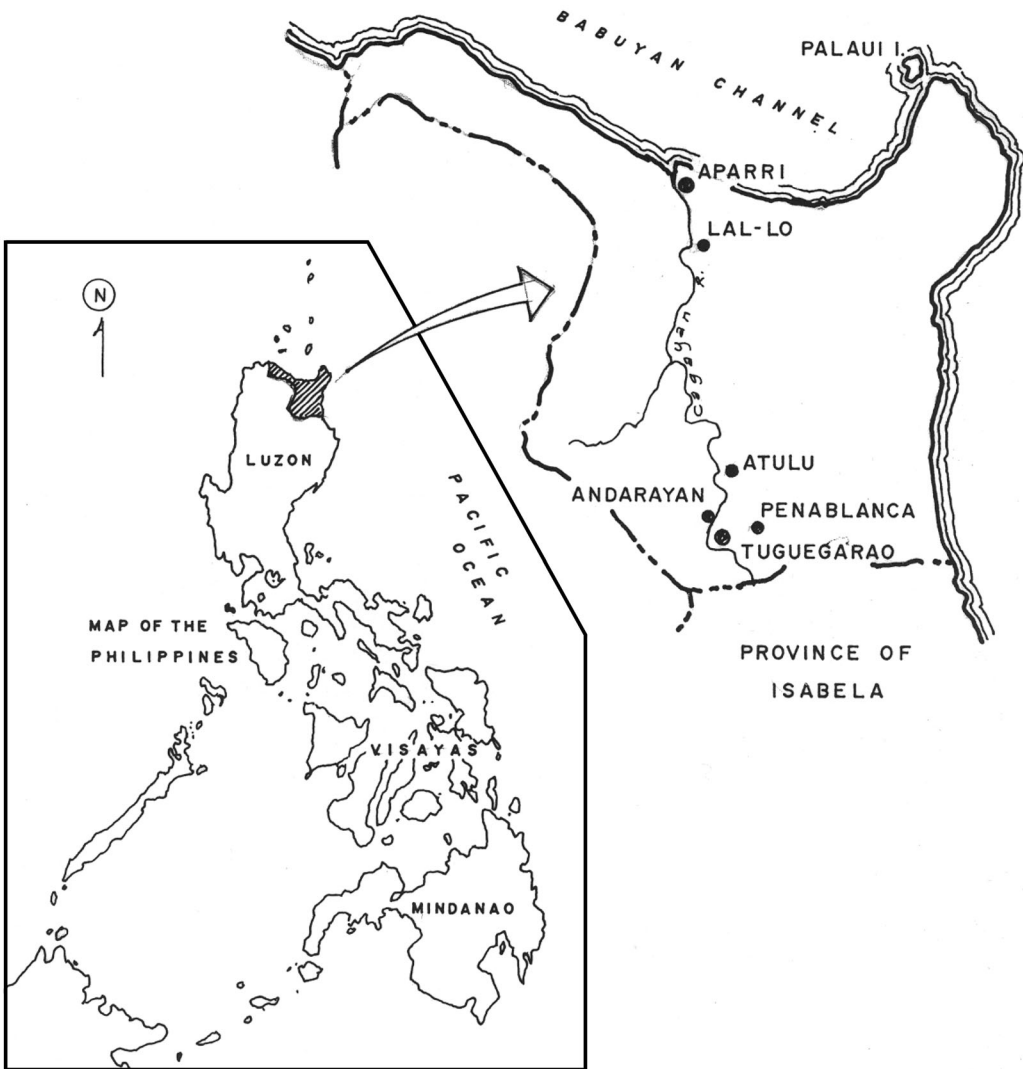


Fig. 1: Map of Northeastern Luzon

Along the western foothills of the Sierra Madre in the Municipality of Peñablanca lies the Callao Limestone formation, Callao being a barrio in the area. The formation consists of a 540 m thick bed of reef carbonates formed during the late Miocene and early Pliocene (Durkee and Pederson 1961; Mathisen 1980). The Pinacanauan de Tuguegarao River divides the Callao Limestone formation into separate northern and southern sections.

In 1976–77, archaeological exploration of caves sites in the Callao limestone formation was conducted in a search for Palaeolithic sites. The extensive explorations resulted in the identification of 43 caves and rockshelters that contained archaeological materials on their surfaces (Ronquillo n.d.; Ronquillo and Santiago 1977). A number of these caves were excavated between 1977 and 1982, and in 1999 (Figure 2). Those excavated in the southern section include Rabel, Laurente, Alejandro Malanos and Pedro Pagulayan Caves. Those in the northern section include Arku, Musang, Lattu-Lattuc, Callao and Minori Caves.

METHODOLOGY

An archaeological field protocol was designed to guide the excavation and documentation processes. The protocol was discussed and reviewed by the different team members before the start of each phase.

Excavation Procedure

Excavations were by a spit system following the natural contours. Each spit consisted of an arbitrary 5 cm depth of deposit, unless the top of the next stratigraphic layer below was exposed within the spit. Whenever a lower stratigraphic layer was exposed, the remainder of the overlaying layer in the square was removed first before the new layer was excavated, to avoid mixture of artifacts. Scraping was conducted within each spit to expose any features. A running numbering system was used for spits until the excavation was terminated. Different tools were utilized depending on the compactness of the sediment. Loose sediment was removed using pointed and margin trowels, while archaeological picks, geological picks, and folding shovels were used on compacted sediments. All sediments removed were sieved through a 2 mm screening table.

The location of each flake over 2 cm in maximum dimension was three dimensionally plotted in the excavation, and each flake was wrapped in bubble plastic before being bagged. Earthenware sherds such as rims, footrings, decorated body parts, and sherds with food residue were plotted and individually bagged. The same was done for datable materials such as charcoal. Shells, bones and teeth, body sherds and charcoal were counted and weighed by species or type for each spit.

Ceramic and Lithic Analysis

The earthenware rim forms were grouped according to surface finish, and then compared to the typology formulated by Ogawa (Ogawa 2002a; Ogawa 2002b) for the non-

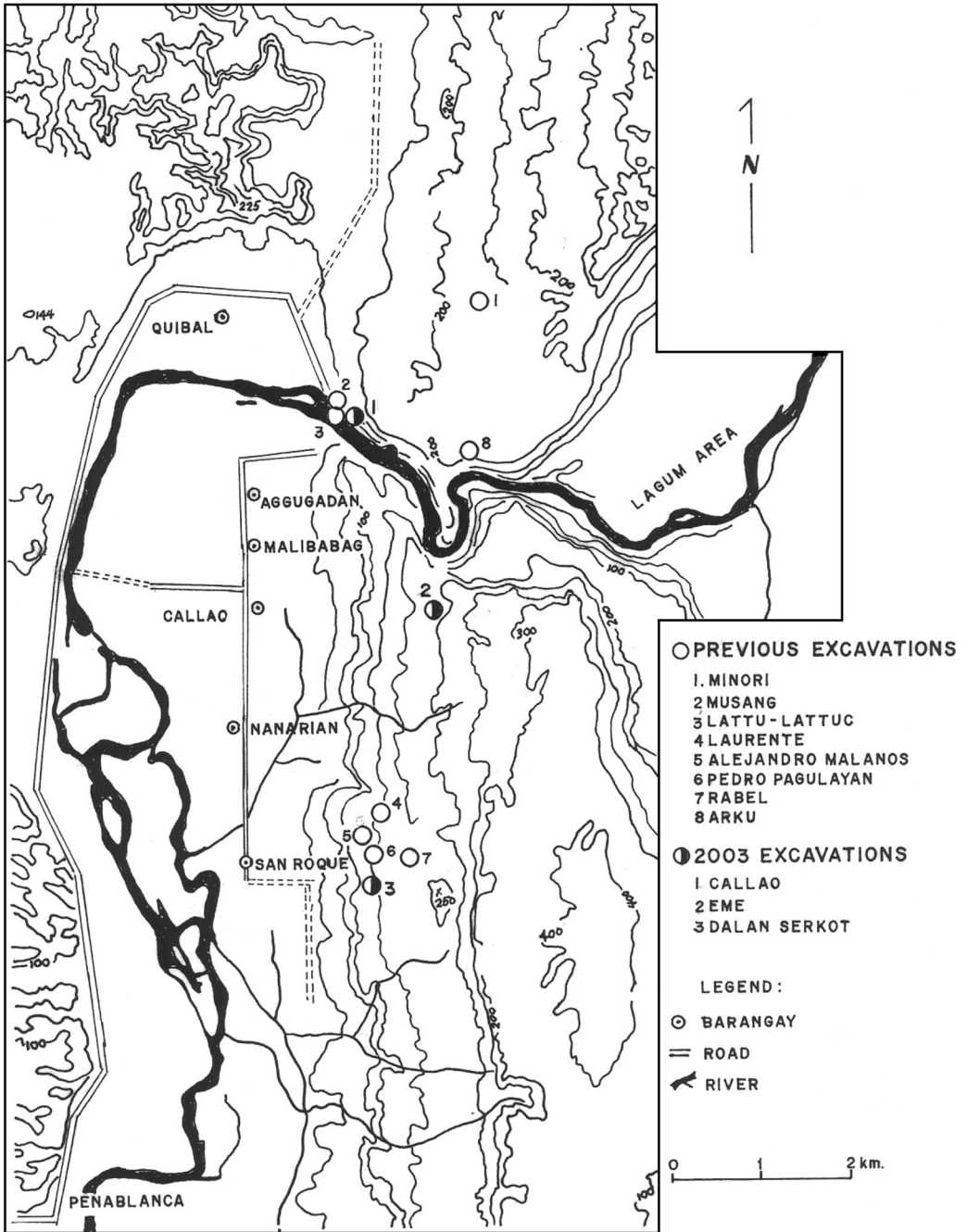


Fig. 2: Map of Peñablanca Cave Sites

decorated red slipped and black pottery found in the Irigayen and Conciso sites respectively along the Cagayan River. Thin-section petrographic analyses were conducted of sherds recovered both from the caves and from the Cagayan Valley sites of Nagsabaran, Magapit and Andarayan, as well as a modern earthenware sample from Atulu.

Flake tools were measured, and some non-metric attributes such as presence of cortex, shape of working edge, type of flake termination and raw material used were recorded. These flakes were then compared between the two major periods (preceramic and ceramic) represented in the caves. Use-wear analysis using low- and high-powered microscopy was conducted to identify probable contact materials.

EME CAVE

The Eme Cave complex lies about 2 km southwest of the National Museum Field Station at Callao Resort. It is composed of three caves, located at 17° 41.25'N and 121° 49.71'E. The cave complex was first discovered during the 1977 Archaeological Survey by Wilfredo P. Ronquillo and Rey Santiago (1977) of the National Museum. It lies at an elevation of 220 meters above sea level.

Two 2×1 metre squares were laid out and subsequently excavated. The northern square was designated SQ 1 and the southern SQ 2. The LDP (surface) for SQ 1 is -30 cm and for SQ 2 -133 cm below the datum point (Figure 3) The datum point was mounted on a limestone boulder against the north wall at the entrance.

The excavation revealed five natural layers (Figure 4). Layer 1 (spit 1) and layer 2 (spit 2) were fine ashy sediments, but the latter had small pebble inclusions. Materials recovered from these layers were mostly earthenware sherds and a few animal bone fragments.

Layer 3 (spits 3-10) was a compacted sandy silt loam with earthenware sherds, flakes, lithic debris, riverine gastropods (*Thiara* sp.) and animal bones, the latter including many small bat bones recovered from sieving. The team observed deep vertical cracks in this layer, due perhaps to periodic drying and shrinkage. Loose sediment from layers 1 and 2 fills these cracks, and contains recent materials such as glass beads. Layer 3 has a radiocarbon date of 1908 +/- 74 uncal. BP (Wk-14882) on charcoal (see Table 1).

Layer 4 (spits 11-18) was a sandy clay deposit. No ceramic material was recovered. Flakes of andesite, chert and basalt, with flaking debris, were the only cultural materials recovered. Gastropod and riverine shells, and teeth of deer (*Cervus* sp.) and pig (*Sus* sp.) were also recovered, as well as continuing large numbers of bat bones. The radiocarbon date on charcoal for this layer is 3569 +/- 52 uncal. BP (Wk-14883). Layer 5 (spits 19-21) was again a sandy silty loam, but no archaeological material was recovered from this layer.

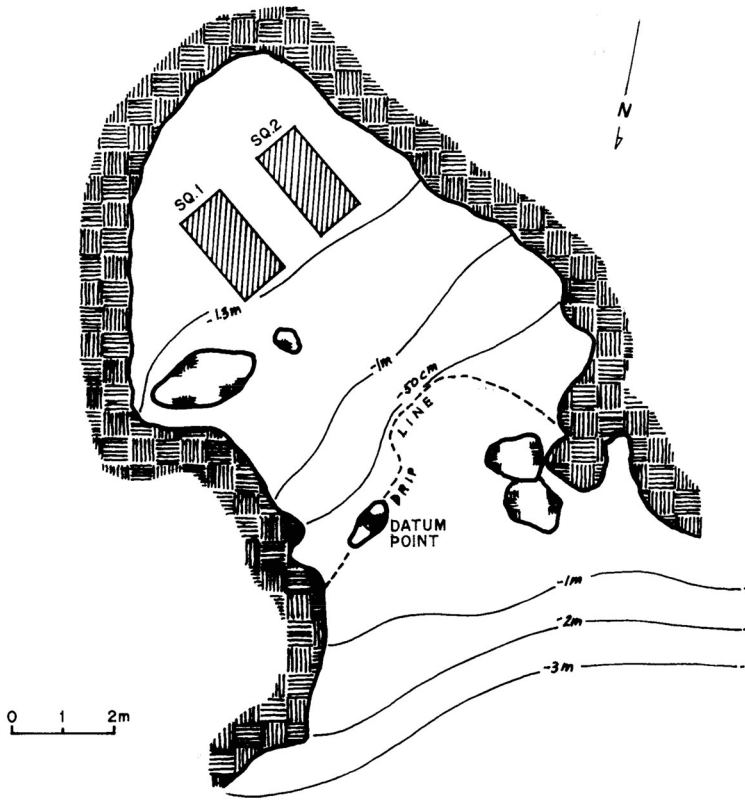


Fig. 3: Lay out of Eme Cave

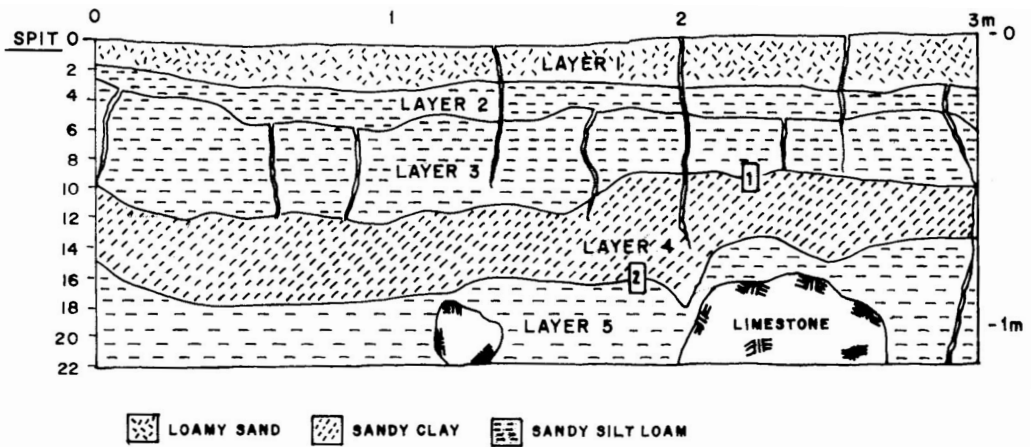


Fig. 4: Stratigraphy of Eme Cave

Table 1: Radiocarbon Dates for 2003 Excavation

Site	Context, depth	Date	Oxcal 2 sigma	Lab No.
Eme Cave	Charcoal, Preceramic layer, 67 cm Below Surface	3569 +/- 52 uncal. BP	2040-1740 BC	WK-14883
Eme Cave	Charcoal, Ceramic layer, 48 cm BS	1908 +/- 74 uncal. BP	60 BC-260 AD	WK-14882
Callao Cave	Charcoal, AMS, Ceramic layer, 40 cm BS	3335 +/- 34 uncal. BP	1690-1520 BC	WK-17010
Callao Cave	Charcoal, AMS, Preceramic layer, 112 cm BS	25,968 +/- 373 uncal. BP	24000-23200 BC, out of range	WK-14881
Dalan Serkot	Charcoal, AMS, Preceramic layer, 70 cm BS	6214 +/- 48 uncal. BP	5310-5040 BC	WK-14879
Dalan Serkot	Charcoal, AMS, Ceramic layer, 44 cm BS	3530 +/- 34 uncal. BP	1950-1740 BC	WK-15648

CALLAO CAVE

Callao Cave, which has an elevation of 85 meters above sea level, was first excavated in 1979-1980 by the team lead by Maharlika Cuevas (Cuevas 1980). They were able to dig a 4 × 4 meter square down to 7.5 meters in depth.

In 2003, two contiguous squares were opened against the east wall of the cave entrance. SQ 1 is the northern square and SQ 2 the southern square (Figure 5). The cave deposits at Callao are generally undulating, so excavation proceeded by removing the natural layers in sequence, as they were uncovered (Figure 6).

Layer 1 (spit 1) is a thin loose layer with modern materials. Layer 2 (spit 2) is more compact sediment that contains Chinese glass beads, earthenware sherds, bones and lithic debris. Layer 3 (spits 3-4) appears to be a late Neolithic deposit with shell beads, clay *ling-ling-o* earrings, brown, red-slipped and black earthenware sherds, flake tools, human bones and teeth, bat bones and riverine gastropods. Within this level a cemented deposit, probably due to calcium carbonate precipitation from the cave ceiling, occurred in the west central part of the two squares. This made excavation and recovery of materials difficult.

Layer 4 (spit 5-10) was still a Neolithic deposit in that it contained pottery, but no further *lingling-o* earrings or shell beads. Earthenware sherds with brown, red-slipped and black surface finishes continued to be recovered. A red-slipped carinated sherd with double parallel incisions enclosing a triangle with punctuate in-filling was also recovered (Figure 7). This decoration is similar to some reported from the Magapit Hill site near the Cagayan

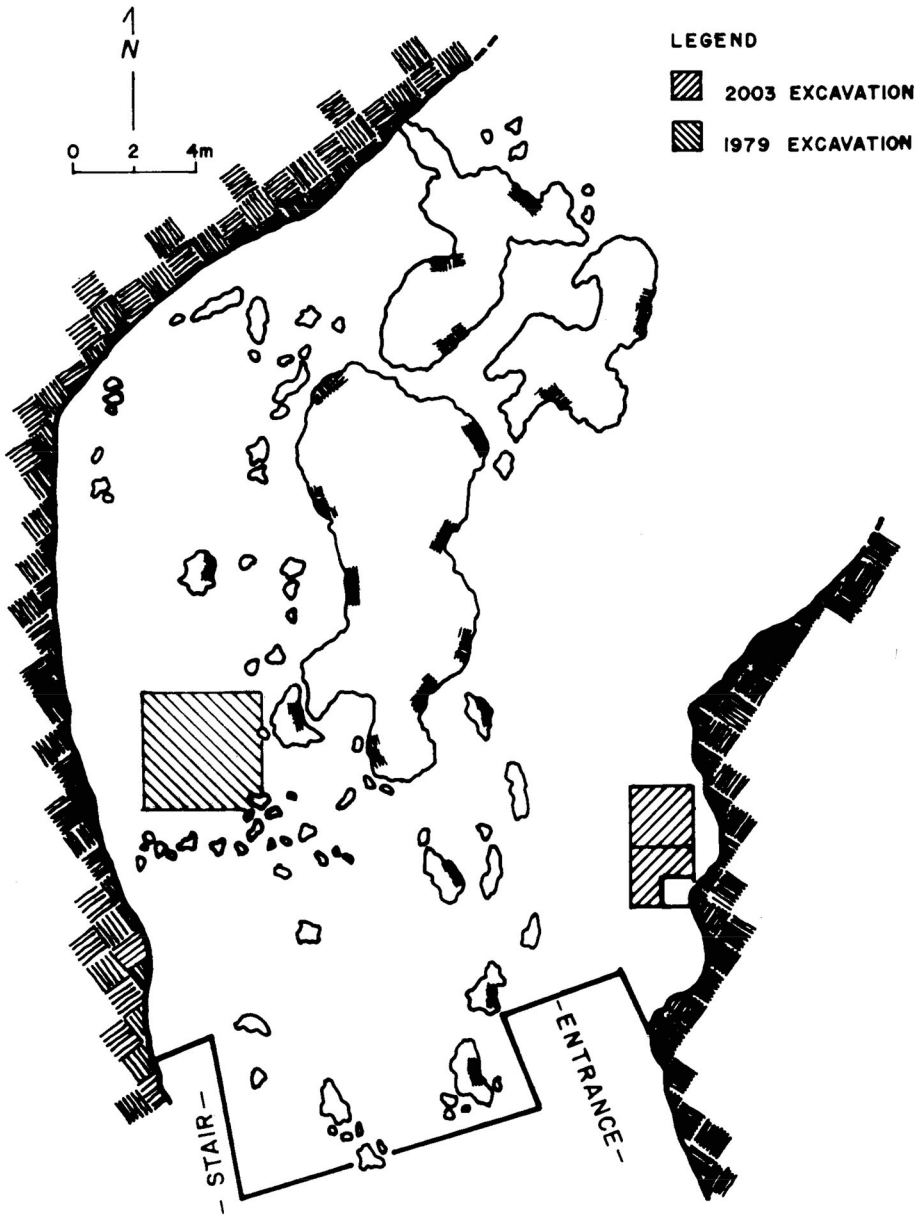


Fig. 5: Lay out of Callao Cave

River (Aoyagi, *et al.* 1993). This layer also included stone flakes, riverine gastropods, human bones, four deer teeth, a wild boar tusk, and 9 pig teeth. Layer 4b was an intermediary layer in the northeast corner of SQ 1. It was a distinctive reddish and loose sandy silt loam deposit, that may contain bat droppings.

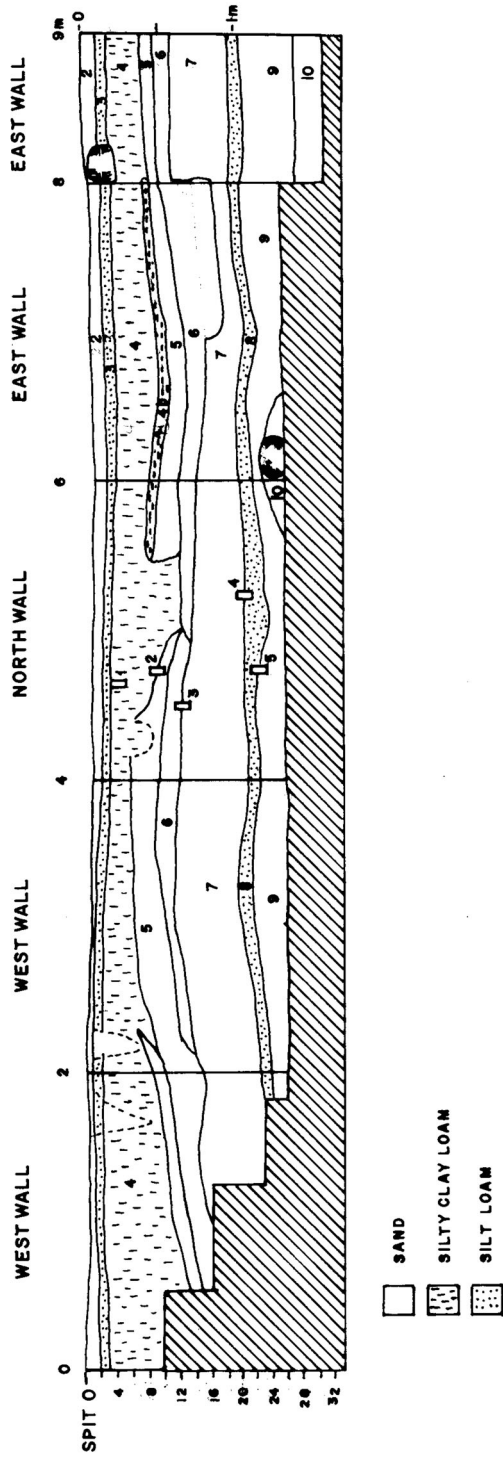


Fig. 6: Stratigraphy of Callao Cave

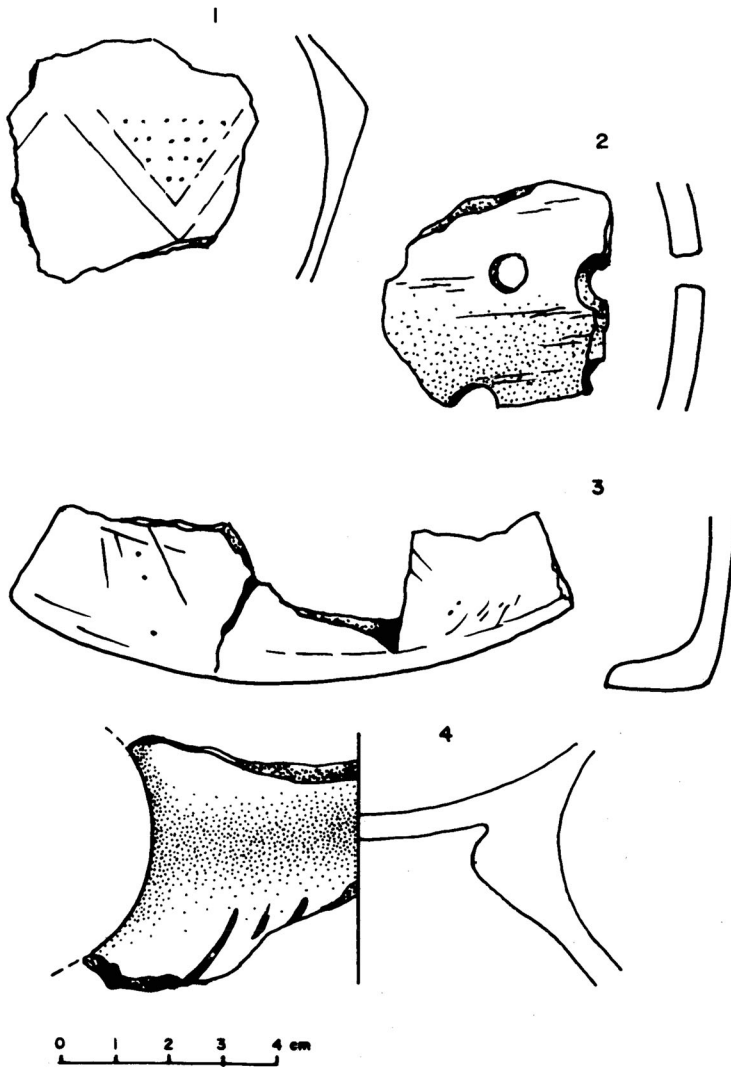


Fig. 7: Callao Cave Red Slipped Pottery; 1 incised and punctate infilling design, 2 perforated design on a ring foot, 3 carinated lid, 4 part of a ring foot

Layer 5 (spits 5-10) is black sandy deposit devoid of any cultural remains. It seems that this layer had undergone a burning event, but this possibility still needs further analysis. Layer 6 (spits 8-12) and Layer 7 (spits 8-24) were interbedded deposits of cemented and very loose sand, also devoid of cultural materials. Layer 7 had undergone oxidation, making it reddish in color. These layers could be water-laid deposits.

Layer 8 was exposed at spit 21, and this again contained chert and quartz flake tools. A

probable hearth was observed at the south end of SQ 1. Fragmentary burnt bones were recovered, but species identification was impossible. An AMS radiocarbon date on charcoal for this layer is 25,968 +/- 373 uncal. BP (Wk14881). Layer 9 (spits 23-29) was again devoid of cultural remains, but contained burnt bones. Layer 10 (spits 30-32) was again culturally sterile.

DALAN SERKOT CAVE

Dalan Serkot Cave is located in Barangay San Roque, south of the National Museum Field Station. The cave has coordinates of 17° 39.87'N, 121° 49.20'E, and an elevation of 165 meters above sea level. The mouth of the cave faces southeast.

Two squares were opened; SQ 1 at 2 x 2 meters on the east side near the entrance, and SQ 2 at 1 x 2 meters on the west side and further inside the cave (Figure 8). Two cultural

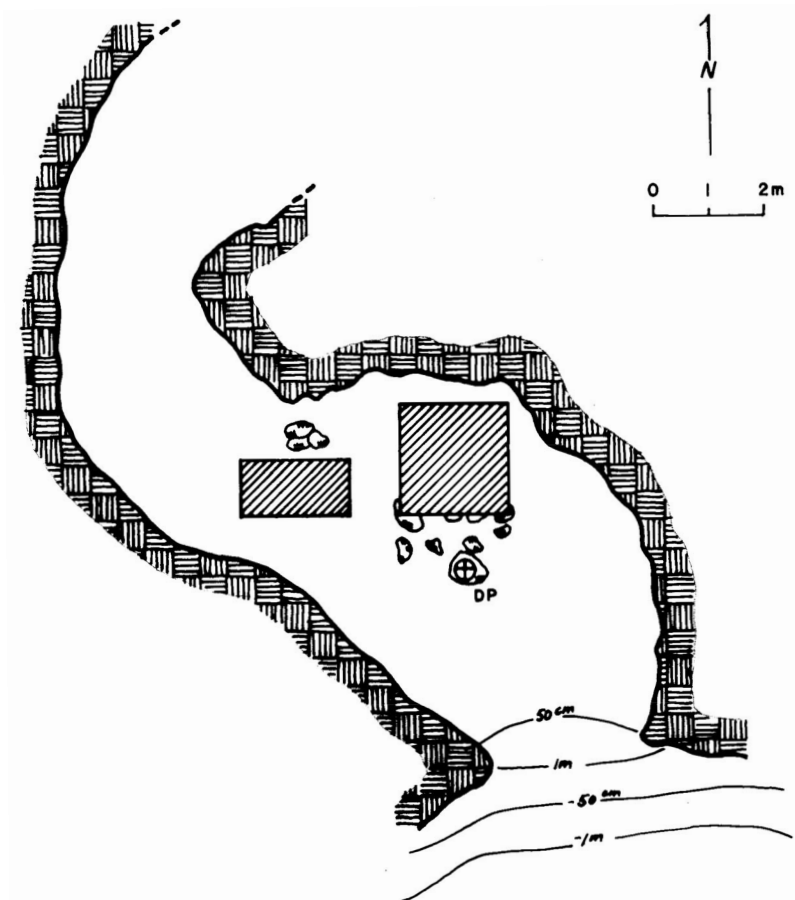


Fig. 8: Lay out of Dalan Serkot Cave

layers (Figure 9) were recognized. Thick brown earthenware sherds, probably parts of jar burials, littered the surface of the cave. Layer 1 in SQ 1 extended from spit 2 to spit 11 and contained earthenware sherds (as red-slipped, black and brown), human teeth and phalanges, human skull fragments and a few stone flakes. Some of the black sherds had incised designs on their rims, and carinations, the incised designs (Figure 10) resembling those from shell midden sites along the Cagayan Valley (Tanaka 2002). Land snail shells, two deer teeth and two pig teeth were also recovered.

In layer 2a (spits 12-20) no sherds were recovered, but there was an increase in chert and andesite flakes. A piece of charcoal attached to a chert flake from a depth of 70 cm from surface yielded an AMS radiocarbon date of 6124 +/- 48 uncal. BP (Wk-14879). Riverine gastropod shells dominated in this layer. Faunal remains include three deer teeth and a pig tooth. Small bones of bats and rat (*Rattus* sp.) were recovered throughout the stratigraphic sequence.

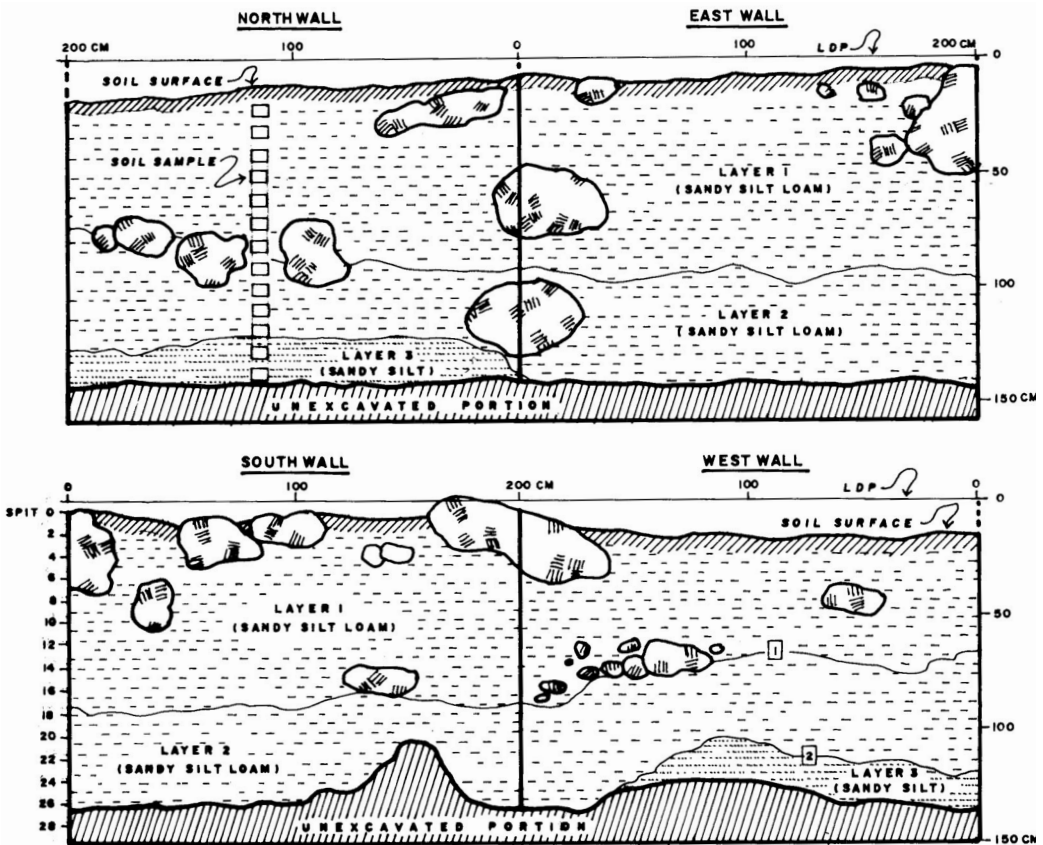


Fig. 9: Stratigraphy of Dalan Serkot Cave

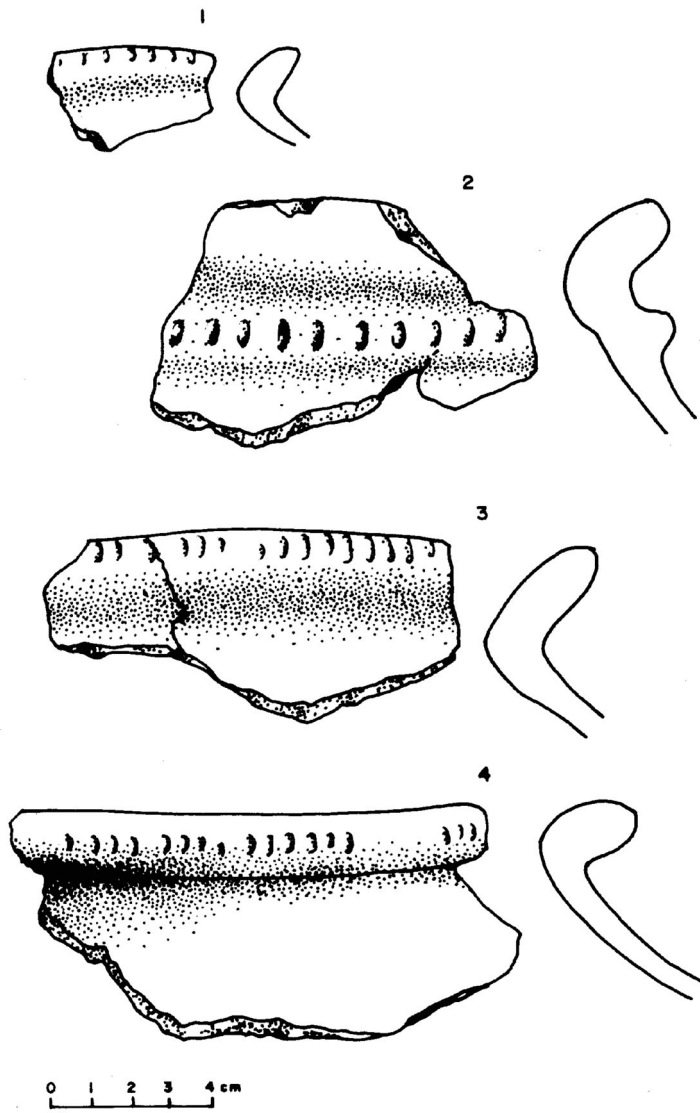


Fig. 10: Notched design on rims

Layer 3 was composed of an upper decomposing calcium carbonate deposit, and a lower volcanic ash layer. No cultural remains were recovered.

RESULTS AND DISCUSSION

Previous excavations (Mijares 2001; Mijares 2002; Ronquillo 1981; Thiel 1980; Thiel 1989) in the Peñablaca caves showed that there were two cultural units of archaeological

deposits. The lower contained lithic implements, animal bones and shells, while the upper contained the same but with the addition of earthenware sherds. The excavations of Eme, Callao and Dalan Serkot Caves also showed two cultural layers; a lower preceramic layer and an upper ceramic period layer. The 2003 excavations have also revealed differential use of caves through time. Callao and Dalan Serkot Caves were both burial sites during the Neolithic Period, but only Callao Cave appears originally to have contained burials associated with grave goods such as pottery, clay *lingling-o* earrings, and shell beads. The pottery included jars and bowls, some red-slipped, some black with incised decoration, and some brown.

Dalan Serkot, on the other hand, seems to have served as a secondary jar burial site. Many thick jar sherds were recovered, as well as sherds of other utilitarian vessels. Only human teeth, skull fragments and phalanges were retrieved. This could mean that only skulls and extremities were placed inside the burial jars. Eme Cave was a habitation/frequented site, and no human bones were retrieved. Earthenware sherds, mostly black without decoration, were recovered.

All three caves have a lower lithic assemblage with no ceramics. Eme and Dalan Serkot seem to have been continuously utilized, as there was no gap in either between the two cultural layers. In Callao Cave there was a culturally-sterile deposit between the two cultural layers. The lower lithic assemblage here, with an associated C14 date close to 25,000 years, is currently the oldest dated evidence for human occupation in Northern Luzon.

The earthenware vessels excavated from the Peñablanca Cave sites had three basic surface colours: red-slipped, black and plain brown. Decoration includes notching on the lip or carination on black sherds, and incision and punctuation on the red-slipped pottery. The notch designs on the black sherds are similar to those found in the Cagayan riverbank open sites of Bangag, Conciso and Nagsabaran. The designs on the red-slipped sherds are also similar to those in the Magapit and Nagsabaran sites.

Vessel forms retrieved from the cave sites are small-restricted vessel mostly with everted rims, unrestricted vessel, and large restricted vessel jars. There is no change in form that can be recognized in the cave sites pottery sequence. The morphological analysis of the Peñablanca Cave earthenware shows correlations with the earthenwares found in the valley open sites. Most rim forms described for the Peñablanca earthenwares are paralleled in the typology formulated by Ogawa (2002b, 2002c) for Irigayen and Conciso. Even some of the brown pottery rim forms from the Peñablanca Cave sites fit the rim form classification for the Cagayan Valley.

The following list gives Ogawa's typology for those red-slipped rims from Irigayen Site in Cagayan Valley that have equivalent forms in the excavated Peñablanca Cave sites (Ogawa 2002a). Each type has variations, as presented in Ogawa's original article.

- J1-** Everted rim of restricted vessel, not thickened, and slightly concave internally.
- J8-** Everted rim of restricted vessel, thickened at the neck, with a convergent lip.
- J11-** Inverted rim of restricted and neckless vessel. The lip has a very short eversion and the lip is rounded.
- B7** Everted rim of unrestricted vessel, with a very short and slightly inverted lip.

The following gives Ogawa's typology for those black pottery rims from Consiso Site, Cagayan Valley that have equivalent forms in the excavated Peñablanca Cave sites (Ogawa 2002b).

- J1-** Similar to J1 for the red-slipped pottery, but lacking the concave inner surface to the everted rim.
- J5-** Everted rim with a thickened lip (vessel shape uncertain).
- J9-** Everted rim with a convex inner surface and an outer thickening to the lip (vessel shape uncertain).
- J10-** Everted rim of a restricted vessel with a thickened neck and a rounded lip.
- J12-** Everted rim of a restricted vessel with an inflected rather than angular neck contour.
- J13-** Inverted rim of a restricted vessel with a thickened lip.
- B1-** Everted rim of unrestricted vessel, with a slightly thickened and widened lip.

These correlations are further supported by the petrographic analyses (Table 2). The inclusions in the sherds from the cave sites are derived from the igneous mineral-rich alluvial deposits that occur along the banks and flood plains of the Cagayan River. The further comparison with modern Atulu earthenware confirms this inference.

There were some trends observed when the mineral and rock fragment inclusions for the red-slipped sherds were compared with those in the other groups. The thin sections of the red-slipped sherds show a predominance of quartz and plagioclase grains. Presences and counts for minerals associated with igneous rocks—clinopyroxene, amphibole, biotite, and muscovite—were varied, but amphibole, which is typical of extrusive and plutonic rocks, is the most dominant.

The size frequencies for the inclusions in the red-slipped sherds show a bimodal distribution, with medium-sized sand particles dominating (Figures 11). There is quite a lot of variability in the fine sand-grade sizes, and the Nagsabaran red-slipped sherd stood out since it has more medium-sized sand particles and few very fine sand particles.

Comparing the overall matrices of the red-slipped sherds there are two subgroups, based on the colour and birefringence of the interior core fabric. The first has a dark brown to black colour in plane polarize light (PPL) with weak birefringence in the interior core. The second has a yellow brown colour (PPL) with moderate birefringence in the interior core. The first subgroup contains the Dalan Serkot, Nagsabaran and Andarayan red-slipped sherds. The second includes the Callao and Magapit red-slipped sherds.

Table 2: Description of ceramic fabric

Ceramic	Degree of sorting	Grain shape	Matrix porosity	Birefringence	Colour			
					Interior PPL	Interior XPL	Exterior PPL	Exterior XPL
Callao Red	Poorly sorted	Rounded to sub rounded and sub angular	Oriented channel voids and vugh, 2%	Moderate for interior and exterior	Yellow brown	Dark yellowish brown	Reddish orange	Red orange
Dalan Serkot Red	Poorly sorted	Sub rounded to sub angular	Oriented channel and vughs, 5%	Weak for interior and exterior	Dark orange brown	Black with streaks of red brown	Reddish brown	Red orange
Nagsabaran Red	Moderately sorted	Rounded and sub angular	Oriented channel; voids, 5%	Very weak for interior and weak for exterior	Black	Black	Red orange	Dark red orange
Andarayan Red	Poorly sorted	Rounded and sub angular	Oriented channels and vughs, 2%	Weak for interior and exterior	Dark brown	Black	Red orange	Dark red orange
Magapit Red	Poorly sorted	Rounded and sub angular	Oriented channels, 2%	Moderate for interior and exterior	Yellow brown	Dark brown	Red orange	Dark red orange
Callao Black	Moderately sorted	Sub angular to angular	Oriented channel voids, 5%	Weak for both interior and exterior	Reddish brown	Black	Reddish brown	Black
Dalan Serkot Black	Moderately sorted	Sub rounded to rounded and sub angular	Oriented channel voids, 3%	Moderate for interior and weak for exterior	Orange brown	Red orange	Reddish black	Black
Eme Black	Moderately sorted	Sub rounded to sub angular	Oriented channel voids, 2%	Moderate for interior and weak for exterior	Reddish brown	Red orange	Yellow brown	Dark yellowish brown
Nagsabaran Black	Moderately sorted	Sub angular to angular and rounded	Oriented channels, 5%	Weak for both interior and exterior	Yellowish brown	Reddish brown	Reddish brown	Black
Atulu	Poorly sorted	Sub rounded to rounded and sub angular	Oriented channels and vugh, 5%	Moderate for interior and exterior	Orange brown	Dark yellowish brown	Red orange	Dark red orange

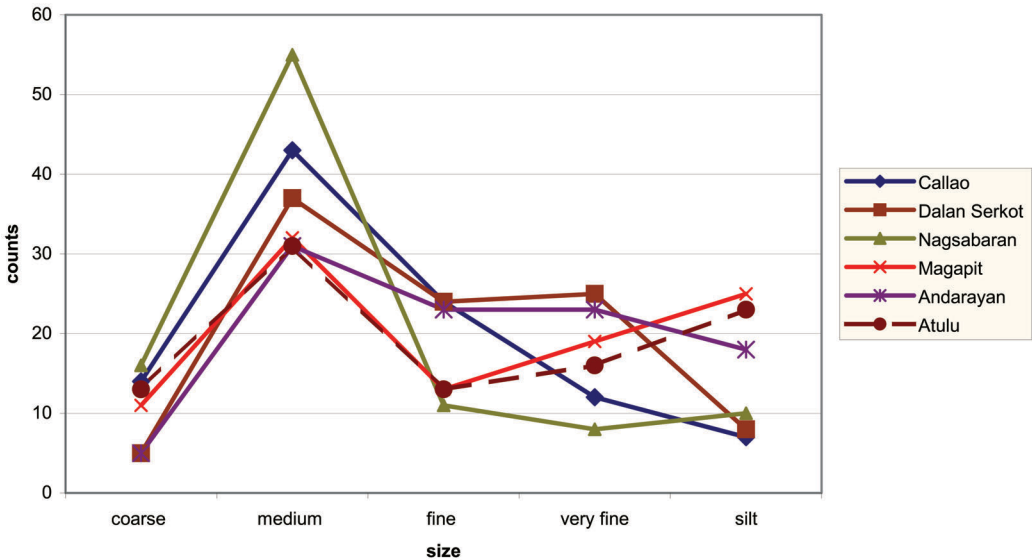


Fig. 11: Comparative size grain frequency for Red-slipped Pottery

The black pottery group also contains quartz and plagioclase as the major inclusions. It has the same igneous rock minerals as the red-slipped pottery, such as clinopyroxene, amphibole, biotite and muscovite. The Peñablanca black pots have more pyroxene mineral inclusions, whereas amphibole minerals are more common in the Nagsabaran black pottery.

The grain size counts for the black pottery are also bimodal in distribution, with coarser grain sizes predominating (Figure 12). The trends for all sites are close, with Eme black pottery exhibiting a finer average grain size.

The matrices of the Peñablanca black sherds are orange to reddish-brown in interior colour and mostly black in the exterior (PPL). The Nagsabaran black sherd is yellowish brown and reddish orange (PPL) in the interior and exterior respectively. All the black pots exhibit a low or weak birefringence in the exterior fabric.

The comparative size frequency data for the modern Atulu vessel were added to the comparative diagrams for red-slipped and black pottery. It is apparent that it could fit into either distribution. The Atulu pot also has the same mineral inclusions, dominated by medium-sized sand grains. An Atulu potter interviewed in October 2003 informed me that sand is added to the red clay used for making pots. They get their clay and sand in the alluvial plain just behind their houses. Since the grain size distribution for the Atulu vessel overlaps with those for the archaeological samples we can posit that prehistoric potters were also deliberately adding tempers to their clay. The bimodal size distributions could thus be recording the presence of other natural inclusions, as well as temper, in the clays used for making the pots.

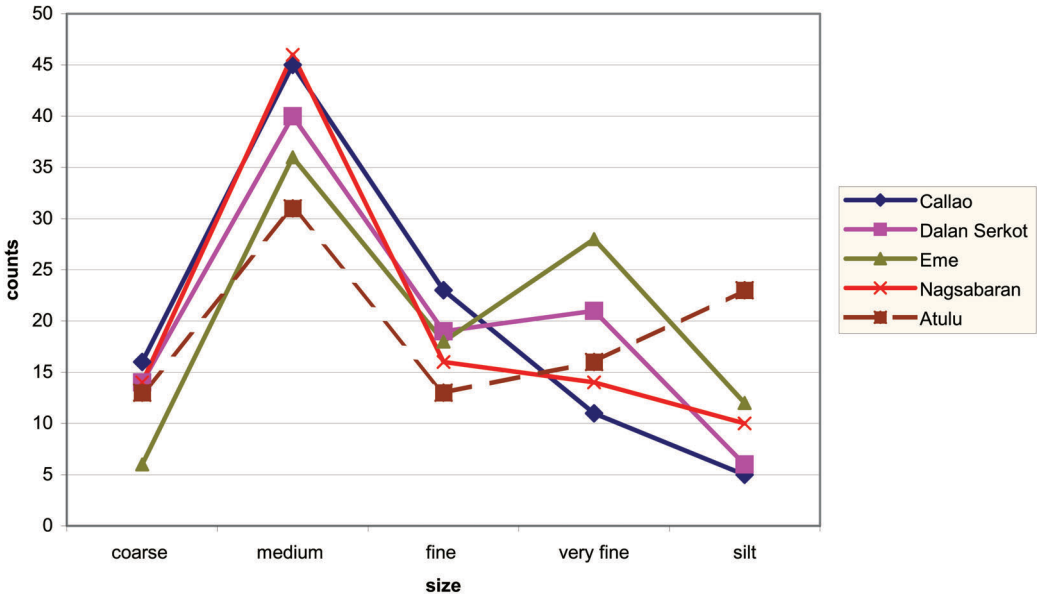


Fig. 12: Comparative size grain frequency for Black Pottery

The petrographic analysis of both the red-slipped and black pottery, from cave and riverbank sites, shows considerable affinity between the sites. There might be site-by-site variation in terms of types and amounts of mineral inclusions, but all were derived from sediments weathered from igneous rocks.

The geology of the Cagayan Valley points to the source region for these igneous mineral-rich sediments. The upper geological strata of the Cagayan basin are composed of pyroclastic flow deposits. According to Mathisen and Vondra (Mathisen and Vondra 1983: 387):

The pyroclastic flows and detritus mobilized by water, lahar, flowed along topographic depressions from the Cordillera Central to the basin where they spread out on the alluvial fan and alluvial plain of the palaeo-Cagayan River.

The Upper member of the Ilagan Formation (Plio-Pleistocene) is composed of interbedded fluvial and pyroclastic deposits. The Pleistocene Awidon Mesa Formation is composed of welded tuffs and tuffaceous sediments and characterized by quartz, hornblende and sodic feldspar (Durkee and Pederson 1961). The Lal lo Formation is composed of "arenaceous, tuffaceous claystones and argillaceous, tuffaceous, fine grained sandstone" (Durkee and Pederson 1961).

The Cagayan River flows in a northward direction through these different geological formations. Andarayan and the modern pottery making area of Atulu are located over the

Awidon Mesa Formation. The shell midden sites are located over the Lal lo Formation.

The depositional processes in Callao and Dalan Serkot caves suggest that both the red-slipped and the black pottery might have been brought to the caves at the same time. The ceramic period in Dalan Serkot has a date of 3530 uncal. BP for both black and red slipped pottery, that occurs stratigraphically together. Red slipped and black pottery also occurs together at the lower silty clay layer at Nagsabaran, here dated to 3390 uncal. BP (Hung personal comm.2004)

Eme Cave did not have any red-slipped pottery, and here the black pottery assemblage is associated with flake tools, riverine shell, deer and pig bones. The cave was most likely used for habitation rather than burial. The black pottery in Eme cave is dated to 1980 uncal. BP, and this date correspond to others for the black pottery tradition found in the shell middens of the Cagayan Valley.

The similarities of the rim forms, surface treatments and petrographic qualities of the earthenware from the cave and the riverbank sites point to close affiliation of both assemblages. This could indicate interaction through exchange, presumably of pots traveling from the alluvial valley itself into the limestone uplands. This might also indicate exchange between lowland agriculturists and cave-using hunters and gatherers during the Neolithic.

The Cagayan Valley is rich alluvial plains with its shell midden in the lower reaches has been the subject of a continuous archaeological research. Joint archaeological research has been conducted by the National Museum of the Philippines with Japanese archaeologists, and later with Taiwanese archaeologists, on several of these shell middens along the Cagayan River in the vicinity of the town of Lal-Lo (Hung forthcoming; Ogawa 2002a; Tanaka 2002; Tsang and Santiago 2001; Tsang, *et al.* 2001) These shell midden sites generally have two depositional layers, a lower silty clay deposit dating to c. 3500 BP and the upper shell midden deposit dating to c. 2000 BP (see Table 3 for selected radiocarbon dates).

Hidefume Ogawa (Ogawa 2000; Ogawa 2002a; Ogawa 2002b; Ogawa 2002c) has hypothesized that there were four chronological phases of pottery development in Cagayan Valley prehistory. The first had red-slipped pottery, some with stamped decoration as found at Magapit. The second had red-slipped pottery without decoration, as that stratified below the shell midden levels in many of the alluvial open sites such as Irigayen. The third had black pottery with incised decoration, of the type excavated from the lower shell midden layers at Bangag and Catugan. The final phase had undecorated black pottery, found in most upper shell middens.

Kazuhiko Tanaka agrees with this general sequence of red-slipped to black pottery. He stated that there was replacement of the people who made the red slipped pottery by those who made the black pottery, and he believed that the former were Austronesians, though he did not identify the identity of the latter (Tanaka 2002:508). He further opined that there was a chronological gap between the red slipped pottery occupation and the shell middens

Table 3: Selected radiocarbon dates for Cagayan Valley sites

Site	Context	Date BP	Lab No.	Oxcal 2 sigma
Andarayan	AMS date on rice husk in a red-slipped sherd (Snow <i>et al.</i> 1986)	3400 ± 125	unknown	2050-1400 BC
Conciso	Upper shell layer—black pottery On animal bone (Ogawa 2002)	1220 ± 25	OOHM19	760-890 AD
Conciso	Lower shell layer—black pottery On animal bone (Ogawa 2002)	1240 ± 25	OOHM16	680-890 AD
Irigayen	Shell layer—black pottery Charcoal (Ogawa 2002)	1490 ± 35	O-W8700	430-650 AD
Irigayen	Silty clay layer—red-slipped pottery Charcoal (Ogawa 2002)	3025 ± 20	NUTA2-914	1240-1210 BC
Irigayen	Silty clay layer—red-slipped pottery Charcoal (Ogawa 2002)	3165 ± 25	NUTA2-913	1520-1390 BC
Nagsabaran	Upper shell layer—black pottery Charcoal (Tsang <i>et al.</i> 2001)	1470 ± 50	GX26797	430-670 AD
Nagsabaran	Lower shell layer—black pottery Charcoal (Tsang <i>et al.</i> 2001)	2150 ± 150	GX26806	550 BC-250 AD
Nagsabaran	Silty clay layer—red-slipped pottery Charcoal (Tsang <i>et al.</i> 2001)	3390 ± 130	GX28381	2050-1400 BC
Magapit	Red-slipped pottery (Aoyagi <i>et al.</i> 1991)	2720 ± 135	N5396	1300-400 BC

above, due to a high flooding phase of the Cagayan River (Tanaka 2004).

Tsang (2001) and Hung (in this issue) also agreed to the general chronology proposed by Ogawa. But Hung (personal communication 2004) disagrees with Ogawa's red slipped decoration sequence of decorated followed by plain. Nagsabaran has shown that the decorated red-slipped pottery in fact occurs in the same stratigraphic context as the undecorated.

I also do not agree with this general chronology for the Cagayan Valley pottery sequence. The recent excavation of Nagsabaran (Hung personal communication, 2004) and my examination of the archaeological inventory records for Bangag, Catugan and Irigayen points to a different story. The red slipped and black pottery was contemporaneous in the silty clay layer in these sites. Though the red slipped pottery tends to be more frequent in this early stratigraphic context, black pottery is already present. This differs from Ogawa and Tanaka's view that black pottery only appears in the shell midden context. It is unfortunate that most of their excavations were concentrated only in the shell midden layers, and rarely went beyond into the layers below. I also do not agree with Tanaka's (2004) view that

there was gap or a discontinuity between the red slipped and black pottery phases. The black pottery simply became dominant during the shell midden period, and red slipping declined in popularity.

Hung (Hung 2005) has postulated that there is a link between the Middle Neolithic of Taiwan at c. 4000 BP and the early Neolithic of Luzon, c. 3800. Eastern Taiwan shows an increase in red slipped pottery during this time, while in Luzon the earliest red slipped pottery was already present, as at Andarayan (Snow and Shutler, 1986). On the western side of Taiwan, the Fengpitou site has a pottery sequence that includes black pottery, clay lingling-o earrings, and spindle whorls, in a shell midden deposit (Chang 1969). The earliest radiocarbon dated layer that contains black pottery at Fengpitou is 3722 +/- 80 uncal. BP (Y-1580), or 3839 (3632) 3443 cal. BP (Spriggs 2003). This shows that black pottery was already present in southwestern Taiwan prior to shell midden formation in the Cagayan Valley, at c. 2000 BP.

I believe that the red slipped pottery with or without decoration, and associated black pottery, were already in use at least 3800 years ago in the Cagayan Valley. The red slipped pottery tradition might have come from eastern Taiwan, the black pottery from western Taiwan. This Neolithic cultural material package would also have included clay lingling-o earrings, spindle whorls, polished adzes, and shell and stone beads.

Going back to Peñablanca Cave sites, the flake tools from the lower preceramic (Cultural Layer 1) and upper ceramic horizons (Cultural Layer 2) do not differ in manufacturing process. This can be determined from the measurement shown in Figures 13, 14 and 15. The majority of the flakes retain surface cortex, indicating removal an early stage in the reduction sequence. No adzes were recovered, adzes being a tool often found with Neolithic earthenware pottery (Bellwood 1997).

The earliest lithic assemblage, at Callao Cave, was mainly manufactured on chert. The flakes were manufactured with simple percussion techniques. However, the recovery of more blade-like flakes in the preceramic period in Callao Cave could signify some variation in the lithic tradition through time. The possible evidence for a use of spear or arrow points from two blade-like flakes hints at a more formal lithic technology. Unfortunately, we don't have evidence yet from the Philippines for stone points made with the prepared platform techniques reported by Glover from late Pleistocene Leang Burung 2 in South Sulawesi, or the bifacial techniques reported by Bellwood for the Tingkayu industry from Sabah, or the backing and serrating techniques used in the Holocene Toalian industry of South Sulawesi (Bellwood 1988; Glover 1977; Glover 1981).

Around 6000 BP, there was a change in Cagayan to using both chert and volcanic rocks, particularly andesite. The Pinacanauan de Tuguegarao River, which bisects the Callao Limestone Formation, carries many cobble-sized volcanic rocks from outcrops in the Sierra Madre. Most of the flakes, especially those of andesite, carry varying amounts of cortex. The cortical surface of each pebble was probably used as striking platform in producing these

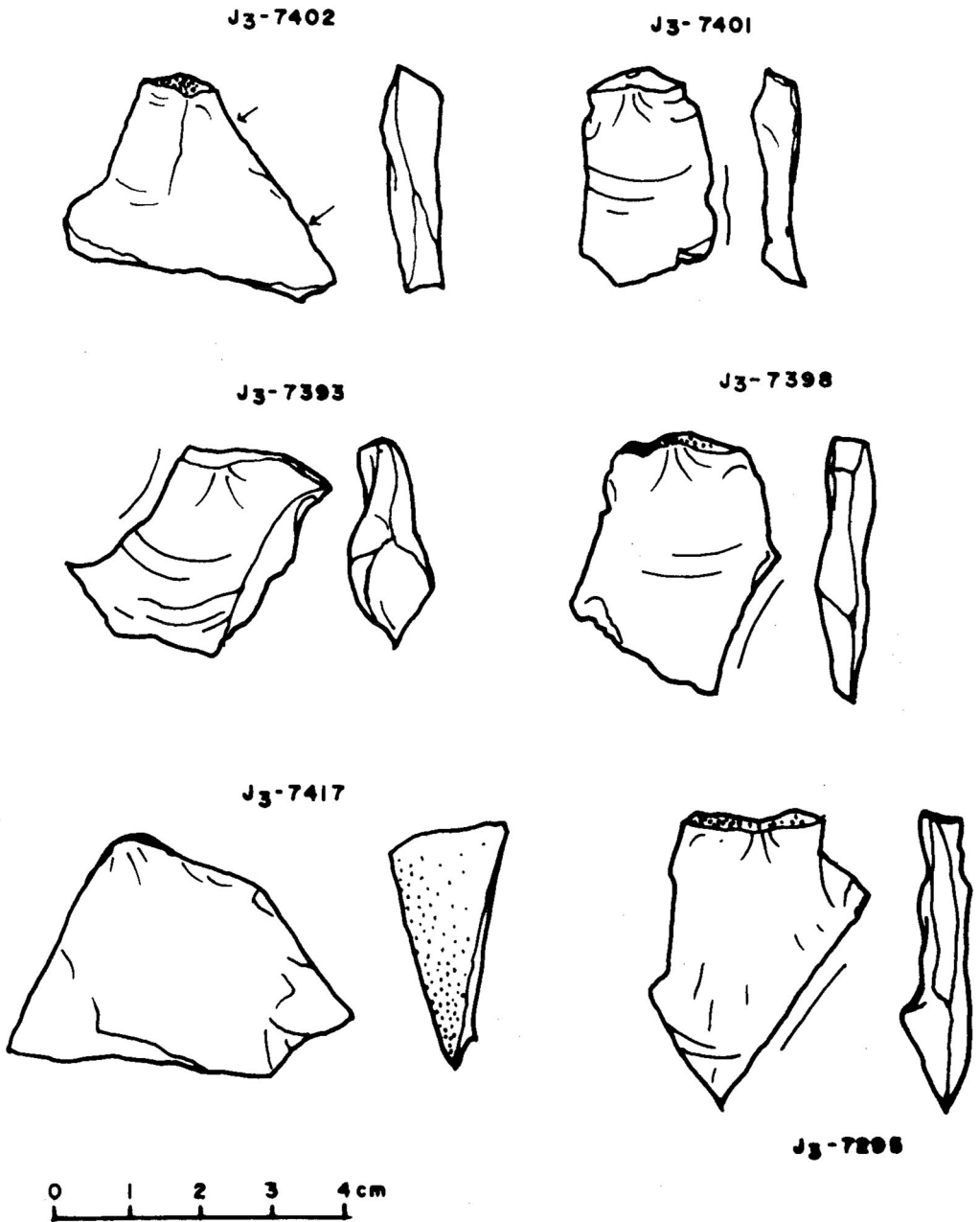


Fig. 13: Callao flakes from ceramic layer

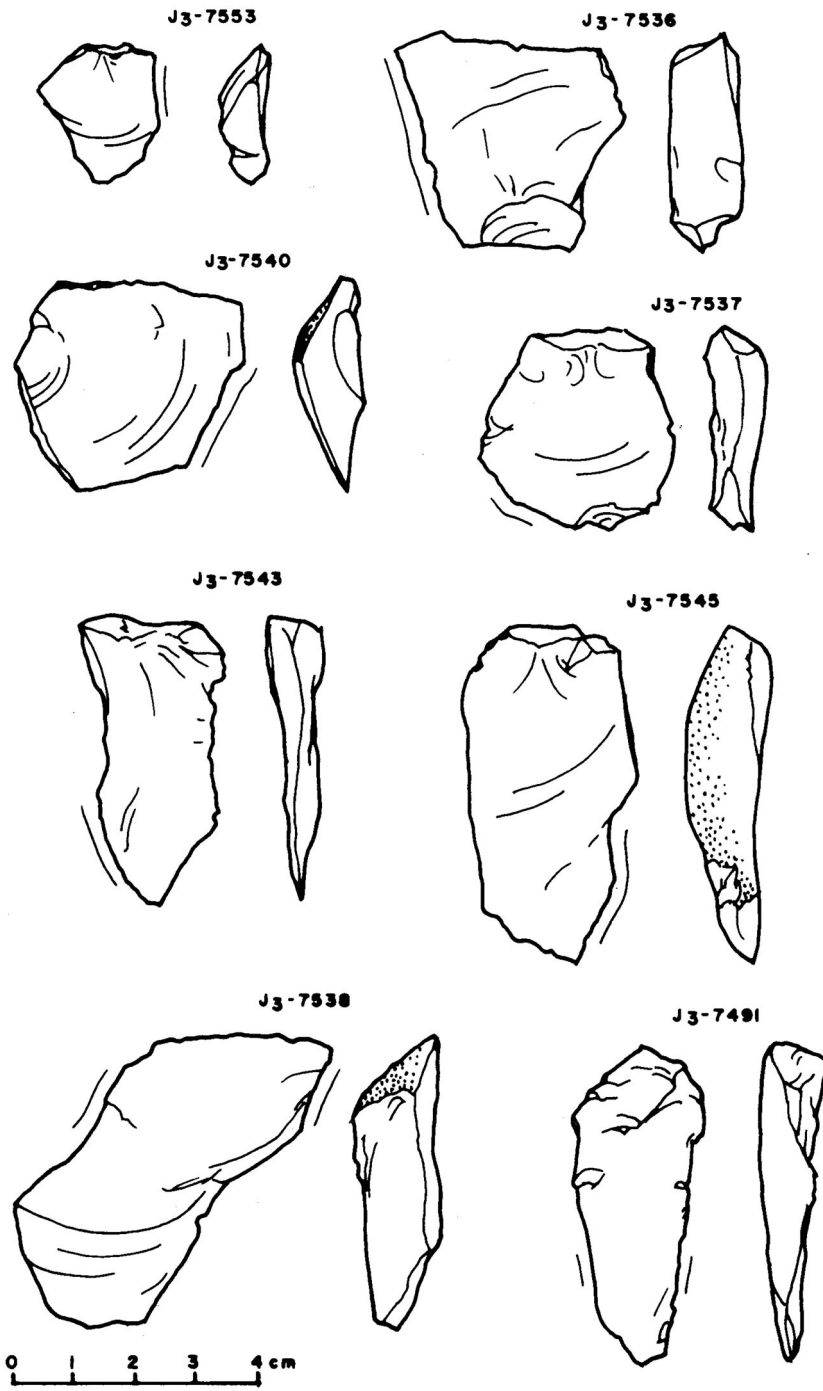


Fig. 14: Callao flakes from aceramic layer

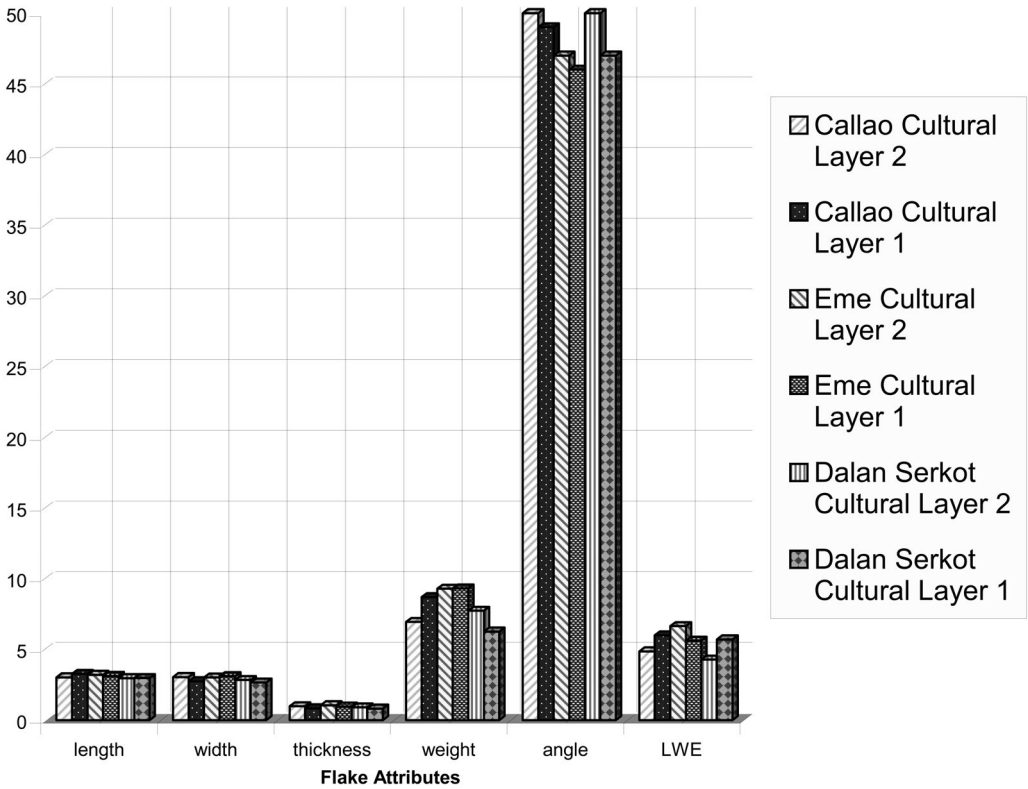


Fig. 15: Comparative Mean Value of Flake Measurements

flakes. This can be seen because most flakes have cortexed striking platforms.

All of the flakes from the three caves studied have no intentional retouch during this period (6000–3500 BP). This signifies that the prehistoric people were not concerned with curating flakes, and had sufficient raw material simply to knock off a new flake rather than retouch one that had become blunt or dull from usage. Though there are a few blade-like flakes from this period, they are very few and show no further modification. The more “formal” stone implements from the previous Late Pleistocene seem to discontinue, and a simpler, more expedient lithic technology persisted (Mijares 2002).

The same raw materials and the same simple hard hammer percussion technique persisted, even after the introduction of pottery from the Cagayan Valley about 3500 years ago. At Eme Cave, flake tools were still associated with earthenware pottery at around 1900 BP. The previous research by Thiel (1980), and Ronquillo (1981) in other Peñablanca caves confirms the long continuing existence of this unchanging flake industry.

Usewear analysis of flakes from the preceramic layers (Figure 16) shows that most were used on hard contact materials, possibly bamboo and/or rattan, which are ubiquitous in the region. These activities might have included the manufacture of spears, bamboo knives, traps, or the making of mats. Some flakes were used in meat processing, as they exhibit soft contact use wear attributes. Bones of pig (*Sus*) and deer (*Cervus*) were associated with the assemblages. This range of use wear was also observed on the flakes recovered from the ceramic layers.

Based on current data, the Peñablanca cave sites in the lower foothills of the Sierra Madre were inhabited by hunting and gathering groups at least 25,000 years ago. These people used a simple flake tool technology either to process meat or to manufacture other wooden tools, such as perhaps bamboo knives or spears. Similar groups continued to inhabit the area, and probably after 3500 years ago started to establish exchange relationships with the Austronesian farming communities who were establishing themselves in the Cagayan Valley. The hunters and gatherers were able to receive exchange goods such as earthenware pottery, shell beads, and clay earrings from the lowland communities.

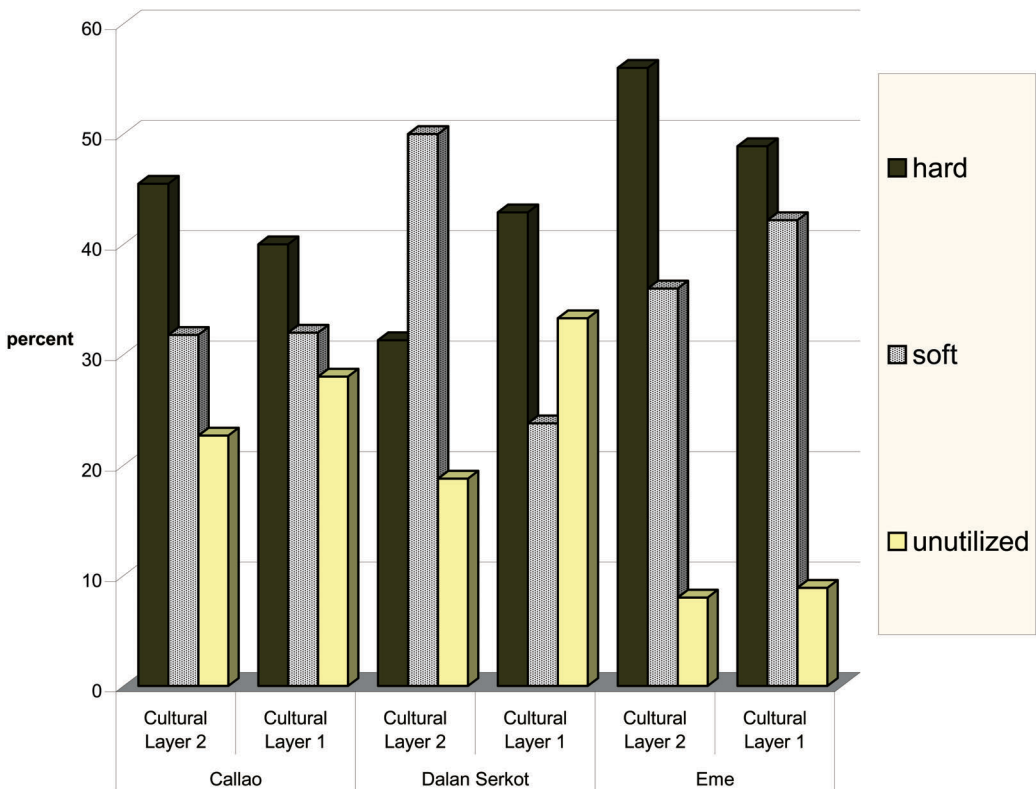


Fig. 16: Comparative Contact Materials

Identification and analysis of the faunal, floral, and soil micromorphology samples from the Peñablanca Cave sites is still on-going. Hopefully, the results of these analyses will help in our understanding of what happened in the area during the Upper Paleolithic and Neolithic Periods.

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REFERENCES

Aoyagi, Yoji, *et al.*

- 1993 Excavation of Hill Top Site, Magapit Shell Midden in Lal-lo Shell Middens, Northern Luzon, Philippines. *Man and Culture in Oceania* 9:127-155.

Bellwood, Peter

- 1988 *Archaeological Research in South-Eastern Sabah*. Kota Kinabalu: Sabah Museum Monograph 2.
1997 *Prehistory of the Indo-Malaysian Archipelago*. Honolulu: University of Hawaii Press.

Chang, K. C.

- 1969 *Fengpitou, Tapenkeng, and The Prehistory of Taiwan*. New Haven: Yale University Publications.

Cuevas, Maharlika

- 1980 Preliminary Report on the Archaeological Excavation conducted at Callao Caves. *In* Manuscript of the National Museum. Manila.

Durkee, E., and S. Pederson

- 1961 Geology of Northern Luzon. American Association Petroleum Geologists Bulletin 45: 137-168.

Glover, I.

- 1977 The Late Stone Age in Eastern Indonesia. *World Archaeology* 9(1):42-46.
1981 Leang Burung 2: An Upper Palaeolithic Rock Shelter in South Sulawesi, Indonesia. *Modern Quaternary Research in Southeast Asia* 6:1-38.

Hung, Hsiao-chun

- 2005 Neolithic Interaction between Taiwan and Northern Luzon: The Pottery and Jade Evidences from the Cagayan Valley. *Journal of Austronesian Studies*, 1(1):109-133.

Mathisen, Mark Evan

- 1980 Plio-Pleistocene geology of Central Cagayan Valley, Northern Luzon Philippines. Ph.D. Dissertation, Iowa State University.

Mathisen, Mark Evan, and C. F. Vondra

- 1983 The fluvial and pyroclastic deposits of Cagayan Basin, Northern Luzon, Philippines— An example of non-marine volcanoclastic sedimentation in an interarc basin. *Sedimentology* 30:369-392.

Mijares, Armand Salvador

- 2001 An Expedient Lithic Technology in Northern Luzon, Philippines. *Lithic Technology* 26(2):138-152.
2002 The Minori Cave Expedient Lithic Technology. Quezon City: University of the Philippines Press.

Ogawa, Hidefumi

- 2000 Introduction: The excavation of Lal-lo shell midden. *In* Excavation of Lal-lo Shell Middens. H. Ogawa, ed. Pp. 1-15. Tokyo: Tokyo University of Foreign Studies.
2002a Archaeological Research on the Lower Cagayan River. Tokyo: Tokyo University of Foreign Studies.
2002b Chronological Context of Non-Decorated Black Pottery Phase from Lallo Shell Middens—Analysis of the Black Pottery from Conciso Site in the Lallo Shell Middens, Northern Luzon, Philippines. *In* Archaeological Research on the Lower Cagayan River. H. Ogawa, ed. Pp. 103-115. Tokyo: Tokyo University of Foreign Studies.
2002c Chronological Study on the Red-slipped Pottery of Lallo Shell Midden Special Reference on the non decorated Red-slipped Pottery under the Shell Middens. *In* Archaeological Research on the Lower Cagayan River. H. Ogawa, ed. Pp. 79-101. Tokyo: Tokyo University of Foreign Studies.
2002a Chronological Study on the Red-slipped Pottery of Lallo Shell Midden Special Reference on the non decorated Red-slipped Pottery under the Shell Middens. *In* Archaeological Research on the Lower Cagayan River. H. Ogawa, ed. Pp. 79-101. Tokyo: Tokyo University of Foreign Studies.

- 2002b Chronological Context of Non-Decorated Black Pottery Phase from Lallo Shell Middens—Analysis of the Black Pottery from Conciso Site in the Lallo Shell Middens, Northern Luzon, Philippines. *In* Archaeological Research on the Lower Cagayan River. H. Ogawa, ed. Pp. 103–115. Tokyo: Tokyo University of Foreign Studies.

Ronquillo, Wilfredo

- 1981 The Technological and Functional Analysis of Lithic Flake Tools from Rabel Cave, Northern Luzon Philippines. Volume 13. Manila: Anthropological Paper.
- n.d. Preliminary Results of the Technological Analysis of Rabel Cave Lithic Materials. *In* Manuscript of the National Museum. Manila.

Ronquillo, Wilfredo, and Rey Santiago

- 1977 Archaeological Caves and Open Sites Exploration at Peñablanca, Cagayan Province. *In* Manuscript of the National Museum. Manila.

Spriggs, Matthew

- 2003 Chronology of the Neolithic Transition in Island Southeast Asia and the Western Pacific: A View from 2003. *The Review of Archaeology* 24(2):57–80.

Tanaka, Kazuhiko

- 2002 Ceramic Chronology in Northern Luzon: Typological Analysis of Pottery from the Lallo Shell-midden. Dissertation, University of the Philippines.
- 2004 The Continuity and the Gap of the Occupation of Shell Midden Sites in the Lower Reaches of the Cagayan River, Northern Luzon. *In* Southeast Asian Archaeology: Wilhelm G. Solheim II Festschrift. V. Paz, ed. Pp. 158–183. Quezon City: University of the Philippines Press.

Thiel, Barbara

- 1980 Subsistence Change and Continuity in Southeast Asian Prehistory. Ph.D. Thesis, University of Illinois at Urbana-Champaign.
- 1989 Excavation at Musang Cave, Northeastern Luzon, Philippines. *Asian Perspectives* 28(1):61–81.

Tsang, Cheng-hwa, and Rey Santiago

- 2001 Recent Archaeological Studies in Northern Luzon and Their Implication for the Prehistoric Relationship between Taiwan and the Philippines. International Conference on Austronesian Cultures: Issues relating to Taiwan, Taipei, 2001.

Tsang, Cheng-hwa, Rey Santiago, and Hsiao-chun Hung

- 2001 Preliminary Report on the 2nd Excavation of Nagsabaran Site. *In* Annual report of the Asian-Pacific Project of Academia Sinica. Taipei.

Wernstedt, F. L., and J. E. Spencer

- 1967 *The Philippine Island World*. Berkeley, California: University of California Press.

菲律賓呂宋島北部 Peñablanca 洞穴遺址的考古

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為瞭解較晚期舊石器文化到新石器文化的演變，在2003年發掘了呂宋島東北部，貝拿布蘭加（Peñablanca）石灰岩地區的三個洞穴遺址。在艾姆（Eme）、卡勞（Callao）和達蘭史考（Dalan Serkot）洞穴的發掘，發現有位於下層的石片器組合（25,000–6000 BP），及位於上層的陶器組合與持續的石片器（2000 BP）。這次的發掘也發現這些洞穴在新石器時代曾有過不同的用途，像是墓地和重複使用的現象。從洞穴採集陶器破片的型態與岩石成分去分析，顯示出這些陶器與卡加延（Cagayan）河谷遺址出土的陶器有相似性。不過對石片器的製作技術和使用痕跡分析，顯示出其形制和功能在不同時代並無不同。

關鍵字：菲律賓考古，舊石器時代，新石器時代，軟陶，石片分析，洞穴遺址
