A Preliminary Study on Shells from Ille Rock Shelter

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Introduction

Several archaeological explorations and excavations at Ille Cave have been done since 1998 (Figure 1) (Dela Torre 1999; Hara and Cayron 2001; Jago-on 1998; Solheim 2000). In general, the archaeological potential of caves was first cited by Dr. Robert Fox (Fox 1970). The Ille excavation was led by Dr. Wilhelm Solheim II and the project was funded by the Philippine Rural Reconstruction Movement (PRRM), Southeast Asian Institute for Culture and Environment (SEAICE) and the Ten Knots Development, Incorporated. The archaeological team was composed of researchers from the Archaeology Division, National Museum of the Philippines, and graduate students of the University of the Philippines-Archaeological Studies Program (UP-ASP). The team opened a total of nine squares measuring 1x1 meter each. These were N1W13, N1W14, N2W13, N2W14, N3W13, N2W12, W N3W12, N412 and N3W3 (Figure 2). In each square, the cultural materials unearthed were plain and decorated earthenware sherds, stoneware and porcelain sherds, seeds, beads, animal bones, fish bones, human bones and stone tools including shell deposits (Dela Torre 1999).

The main objective of this paper is to analyze the shells deposited in Ille rockshelter. More specifically, this paper aims to identify the different shell species present in the rockshelter, to determine the total frequencies of each species per layer of each square and to relate the shells found in each stratigraphic sequence.

Humans have utilized mollusks (shells) as food, money, jewelry, decorations and tools. "They have figured prominently in paleobiological and biological studies, and have served as study organisms in numerous evolutionary, biomechanical, ecological, physiological and behavioral studies," (www.ucmp.berkeley.edu/mologis/mollusks.html).

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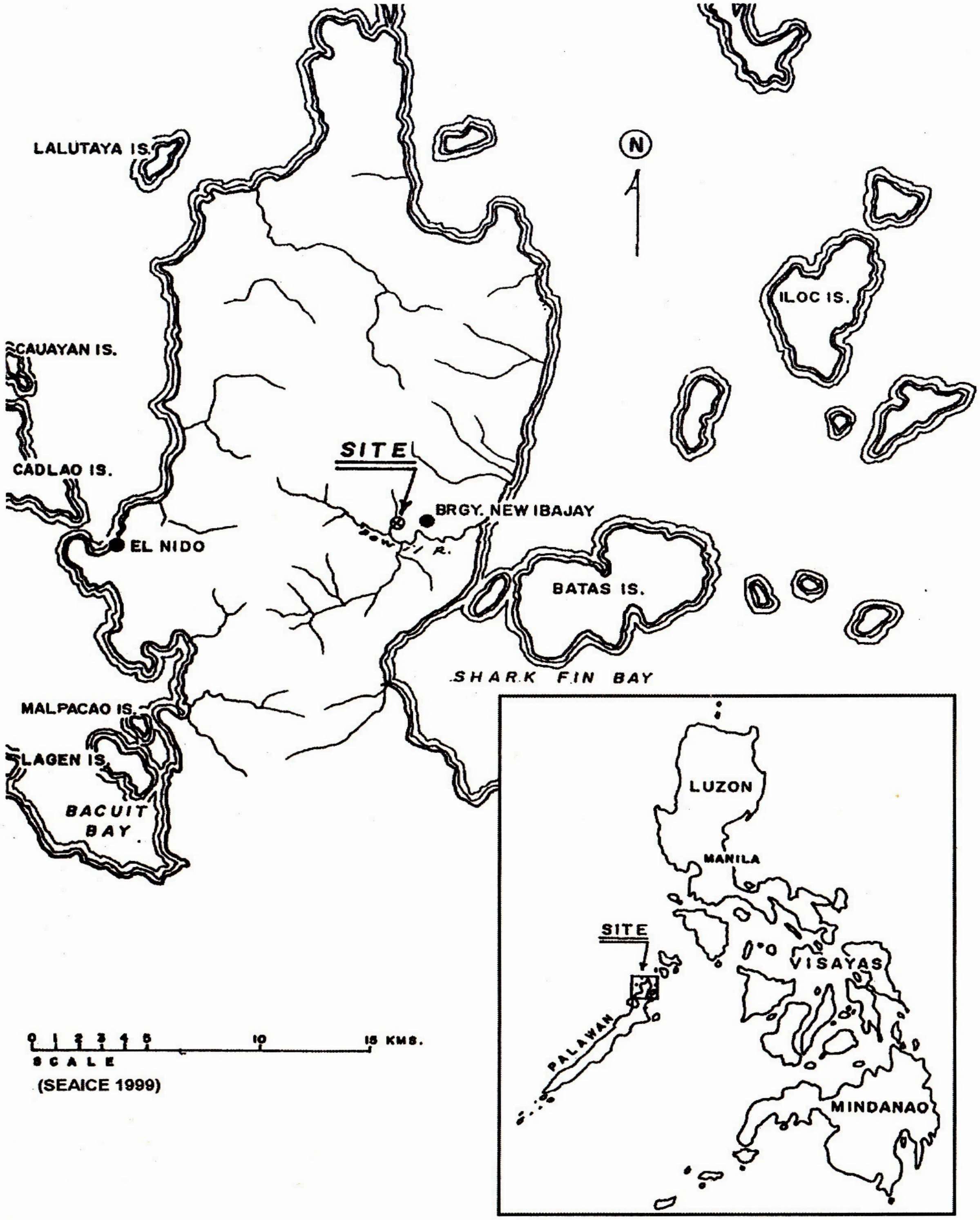


Figure 1
Location map of Ille Cave, New Ibajay, El Nido, Palawan

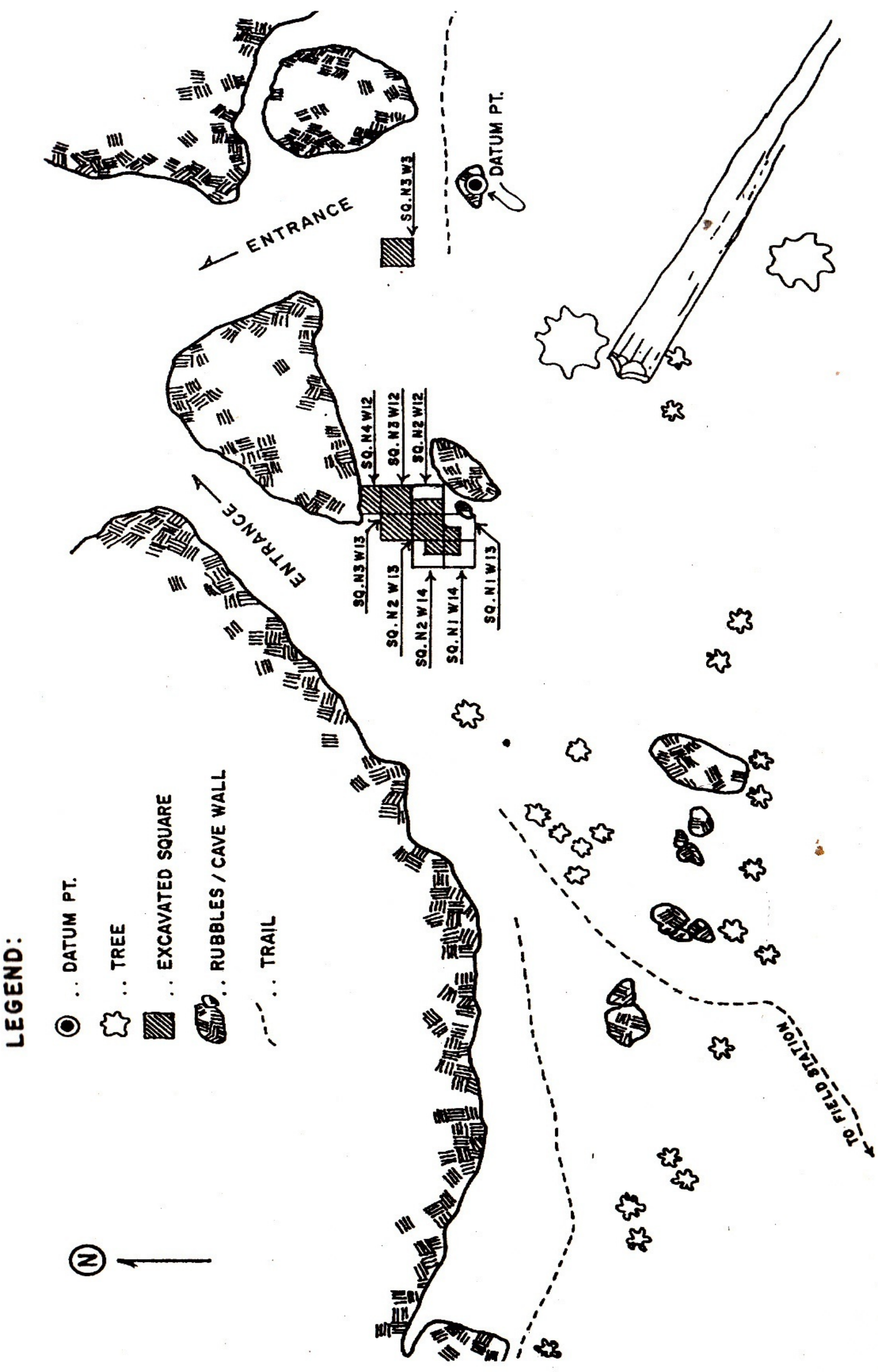


Figure 2
Rockshelter portion of Ille Cave, New Ibajay, El Nido, Palawan

Malacology is the study of mollusks and considered as the most diverse group, both in form and habitat. Mollusks have an unsegmented soft body; internal or external shell; mantle, the fold in the body wall that lines the shell; and muscular foot and/or tentacles. The group consists of the "familiar clams (*Bivalvia*), snail and slugs (*Gastropoda*) and octopuses (*Cephaloda*) and the not so familiar chitons (*Polyplacophora*), tusk shells (*Scaphoda*), *Solenogasters (Aplacophora)*, *Monoplacophorans*, and *Caudofoveatans*" (www.inhs.iuic.edu/cbd/main/geninfo/malaco.html).

Archaeological Researches on Shells in the Philippines

So far, there are two areas in the Philippines that underwent intensive shell studies in an archaeological survey and excavation. These are the lower reaches of Cagayan Valley in northern Philippines and Bolobok Rockshelter at Sanga-Sanga, Tawi-Tawi Province, in southern Philippines. Both were regarded as shell midden sites (Figure 3).

The Cagayan Valley has a high number of shell midden sites. They cover the municipalities of Lal-lo, Camalaniugan, and Aparri (Ogawa and Aguillera Jr. 1992). In 1972, the National Museum of the Philippines led by Alfredo Evangelista started an intensive archaeological excavation when they saw the exposed shell mounds and confirmed that these were culturally deposited. Associated with these heaps of shells were earthenware vessels and Chinese tradeware sherds. The shell deposits yielded beneficial information about the Neolithic period in Cagayan Valley (Cabanilla 1972).

The 1972 excavations were preceded by research teams from Japan. They started exploring the lower reaches of the area in 1982. They began excavating shell mounds as high as three meters in Magapit (Aoyagi et al. 1993) and Bangag (Tanaka 1997). This was then followed by a three-year archaeological project from 1999-2001 on the various shell midden sites (Dela Torre 2000, Garong et al. 2000 and Ogawa 2001). Aside from the Japanese efforts, foreign archaeologists from the US (Thiel 1989) and Taiwan (Tsang n.d.) are also notable.

Concerning Tawi-tawi, there was an initial archaeological excavation on Balobok Rockshelter conducted in 1966 by the National Museum of the Philippines. It was re-excavated in 1992 (Ronquillo, Santiago, and Tanaka 1992). This was a multicomponent site which included a shell midden that produced a considerable

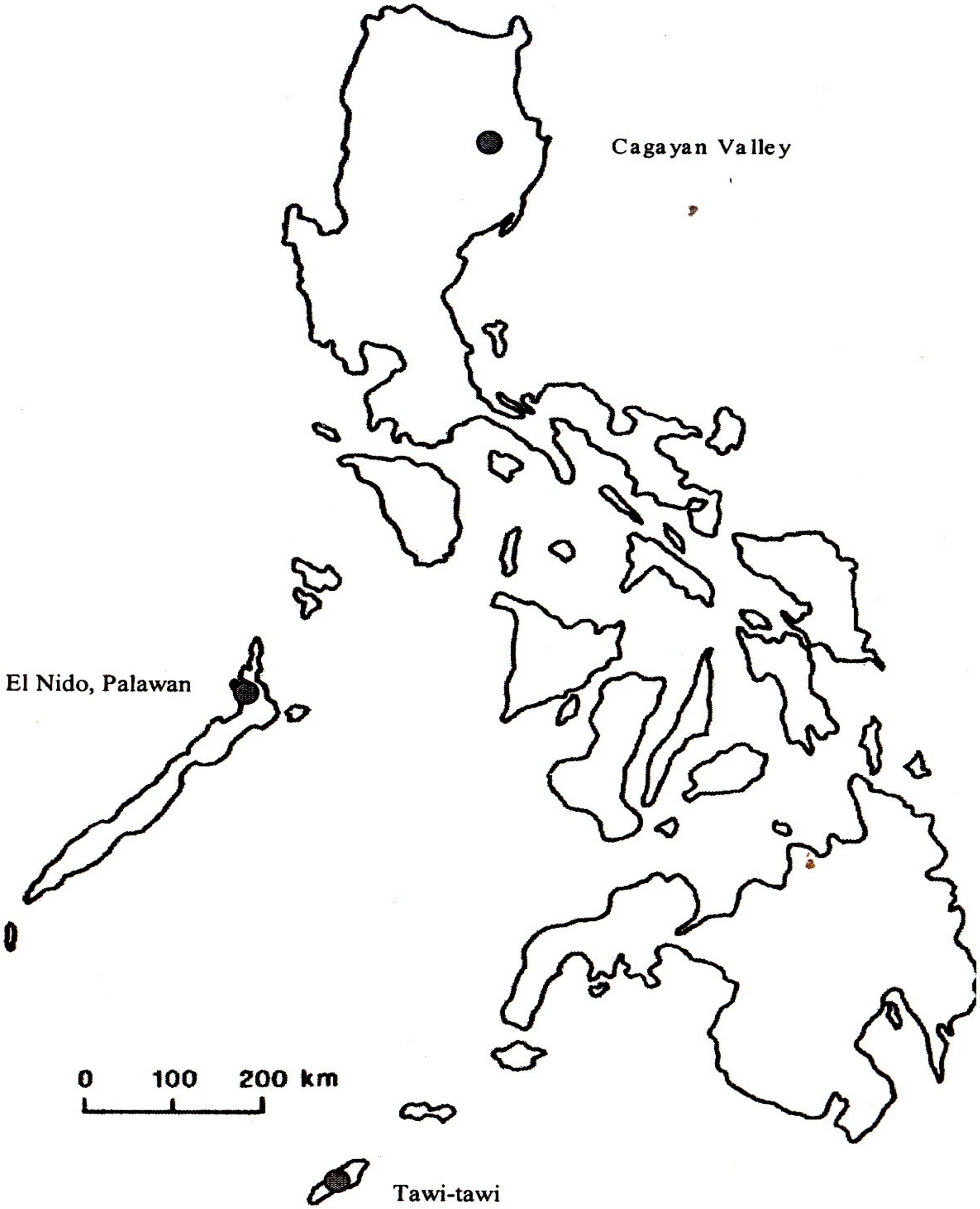


Figure 3
Shell midden sites in the Philippines

amount of zooarchaeological remains in all cultural layers. Bautista (2001) analyzed the shell remains for his masteral thesis. This was done for the first time in the Philippines. His study aimed to analyze the relationship between humans and animals in an archaeological context. He showed that the assemblage of animal remains provided a detailed picture of the exploitation and use of animals over the course of occupation of the rock shelter and was intentionally brought to the site by early man who used animals as food resource during the three phases of human occupation of the site (Bautista 2001: 157). Shell tools were found in the Balobok Rockshelter, particularly, tools made from *Tridacna gigas* using a flaking technology (Ronquillo 1998: 68). A variety of tools were made from shells, i.e., shell knives, scoops and adzes.

Shell artifacts were also recovered from other sites like the Pilanduk cave in Quezon, Palawan, where archaeologists found the following materials: a small fragment of a *Meretrix sp.*; a shell with a hole drilled through the face, an *Arca sp.*; shell pendant; and a fragment of a *Placuna placenta* shell with a worked edge (Kress 1978: 68).

All the sites mentioned have provided information in understanding the past. These studies showed how people adapted to their environment. Likewise, they offered concrete evidence of how people utilized shells as a resource. For example, it was considered as a food supplement, where the meat was extracted from the shell to be eaten. Aside from this, shells were also used as ornaments to satisfy aesthetic needs (see Bautista 2001).

The Study Area

Ille rock shelter is located at Barangay New Ibajay (formerly Dewil) in the municipality of El Nido, Palawan. The Global Positioning System (GPS) reading is 11°11'46" N and 119°30'19" E' (Hara and Cayron 2001: 83). The area is situated near the eastern coast of El Nido. Imorigue Bay lies to the east, and the barangays of Mabini, Villa, Libertan and Villa Paz bound it to the south, west and north, respectively.

The site is inside a massive karst formation that is part of the general geology of El Nido, Palawan. The tower is approximately 25 meters high with the cave at the base of the formation overhang, which extends to about 10 meters from the mouth. The karst formation above the cave is fully covered by vegetation. The cave has two wide mouths about four to nine meters wide with minor cave windows. Inside the cave, the floor is relatively dry with some dampness from dripping. It is generally cooled by a constant breeze from inside.

In addition, the topography of the area is characterized by rolling hills and flat lands surrounded by rivers, creeks and streams. The land was primarily utilized for agricultural purposes and dominantly planted with rice and cashew trees. The archaeological materials recovered from the site include earthenware sherds, shell fragments and blue-and-white ceramic sherds.

Methodology

Among the nine squares opened during the past excavations, two squares, namely N3W3 and N3W12, were randomly chosen as a sample size for the analysis of shells. They were chosen as representatives for the east side and the west side of the area—square N3W3 for the eastern part and square N3W12 for the western part. These two squares contained the best samples that characterized the range of species of shells found in the area as well as provided us with clues of the environment in an earlier time.

Square N3W3 had a maximum depth of 60 cm while square N3W12 reached until 120 cm. For comparative purposes, the author analyzed the shells deposited only until 75 cm of square N3W12. Square N3W3 was divided into three layers (0-30 cm, 30-50 cm, and 50-60 cm) while square N3W12 also had three layers but different depth (0-30 cm, 30-52 cm, and 52-75 cm). The bottom layer was considered the oldest layer and the upper layer was considered the contemporary layer. The shells recovered and stored from these test pits were sorted and identified in compliance with Springsteen and Leobrera (1986) and Wye (1991).

The molluscan remains were sorted according to their class, namely univalves, a one-piece coiled shell and bivalves, two valves covering the right and left sides of the animal. The author also differentiated the shells' environment from freshwater and marine/estuarine species. Freshwater environment includes physical and biological aspects of freshwater. Lentic (standing water) and lotic (flowing water) are two basic types of freshwater habitats. Marine environment is considered to be those areas influenced by the sea while estuarine environment is a semi-enclosed body of water which has free connection with the open sea.

A quantification method was employed in this study called *Minimum Number of Individuals* (MNI). MNI is used to show the relative importance of represented species (Quintmyer 1985: 35). It is also the shell sample from the number of umbones of one side or the number of apices/spires/umbilici retrieved from the squares (Claassen 1998: 106).

There were conventional ways of acquiring the frequencies of the univalves and bivalves. For univalves, a whole shell was counted individually and for the fragments, only the aperture was considered by the author and counted as one. For bivalves, the left and right sections were counted separately. The part that has more sections will be the final frequency number of a particular bivalve shell species (see Claassen 1998; Quintmyer 1985).

After getting the frequencies of each shell species and classifying them according to their respective environments, a behavioral ecology paradigm was used. This helps in reconstructing, interpreting and explaining the past behavior of human societies (Kelly 2000). In this case, the foraging behavior of man was analyzed by using diet breadth model (diet diversity). This is done by ranking the shell species found in the site according to its importance and functions. Likewise, the richness (number of taxon present in an assemblage) and evenness (relative proportion of taxa represented) were also measured by:

(a) $$\mathbf{H = \frac{n \log n - f \log f}{n}}$$

H – heterogeneity of the sample size in a given layer
n – total number of sample size in a given layer
f – total number of each species in a given layer

(b) $$\mathbf{H\ max = \log n}$$

H max – maximum volume of species in a given layer
n – number of species found in the square

(c) $$\mathbf{J = \frac{H}{H\ max}}$$

J – evenness of the species in a given layer.
H – heterogeneity
H max – maximum volume of species in a given layer

Analysis of the Shells

The most predominant archaeological material recovered in Ille Rockshelter was shells. There were two types of shells found in the matrix, the univalve and bivalve shells. The univalves were *Melanoides torrulosa Bruguirre, Cerithidea obtusa, Chicoreus capucinus Lamarck,* Family Neritidae, *Terebralia sulcata Born* and *Telescopium telescopium.* The bivalves were composed of *Batissa violacea, Anadara granosa Linne, Gafrarium tumidum Röding* and *Saccostrea cucullata Born.*

The shells recovered came from freshwater and marine/estuarine environments. These are the following:

Freshwater Shells	Marine/Estuarine Shells	
Batissa Violacea	*Anadara granosa*	*Chicoreus capucinus*
Melanoides torrulosa	*Gafrarium tumidum*	Family Neritidae (*Genus Nerita*)
Family Neritidae (*Genera Neritodryas, Neritina* and *Septaria*)	*Saccostrea cucullata*	*Terebralia Sulcata*
	Cerithidea obtusa	*Telesopium telescopium*

In square N3W3 (Figure 4), there were three arbitrary layers. The layers were from 0-40 cm, 40-50 cm and 50-60 cm from local datum point (LDP).[2] Freshwater shell species dominated the pit especially in 40-50 cm. *Batissa violacea* was the most abundant species along with family Neritidae (marine/estuarine) which were the only taxa found in layer 50-60 cm.

N3W12 (Figure 5) had the same number of arbitrary layers as square N3W3, but the distribution was from 0-30 cm, 30-52 cm and 52-75 cm LDP below. Numerous freshwater and marine/estuarine shell species were found in the first layer of the pit, except for *Saccostrea cucullata.* In the second layer, the frequency of shells declines drastically for freshwater species except for *Batissa violacea.* The division for marine/estuarine species in the second layer also decreased excluding *Anadara granosa* and *Saccostrea cucullata* with no representative from family Neritidae. The number of shells recovered for both freshwater and marine/estuarine species had increased on level 52-75 cm except for *Cerithidea obtusa, Terebralia sulcata* and *Telescopium telescopium.* The same number of *Saccostrea cucullata* was uncovered in the second and third layers.

[2] The Local Datum Point (LDP) is measured and described from the primary Datum Point (DP) that is placed at the area to be excavated (Peralta 1978: 21).

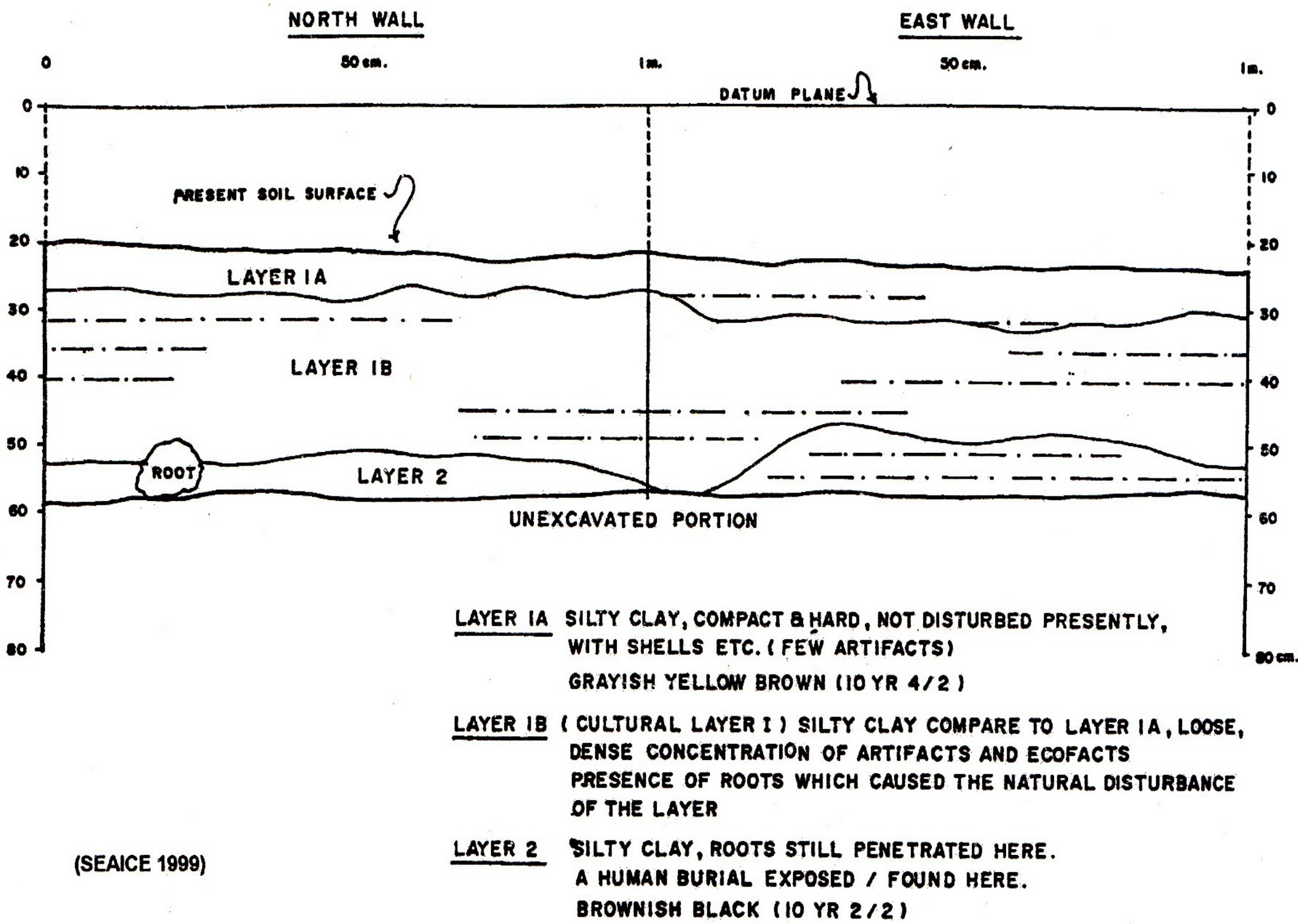
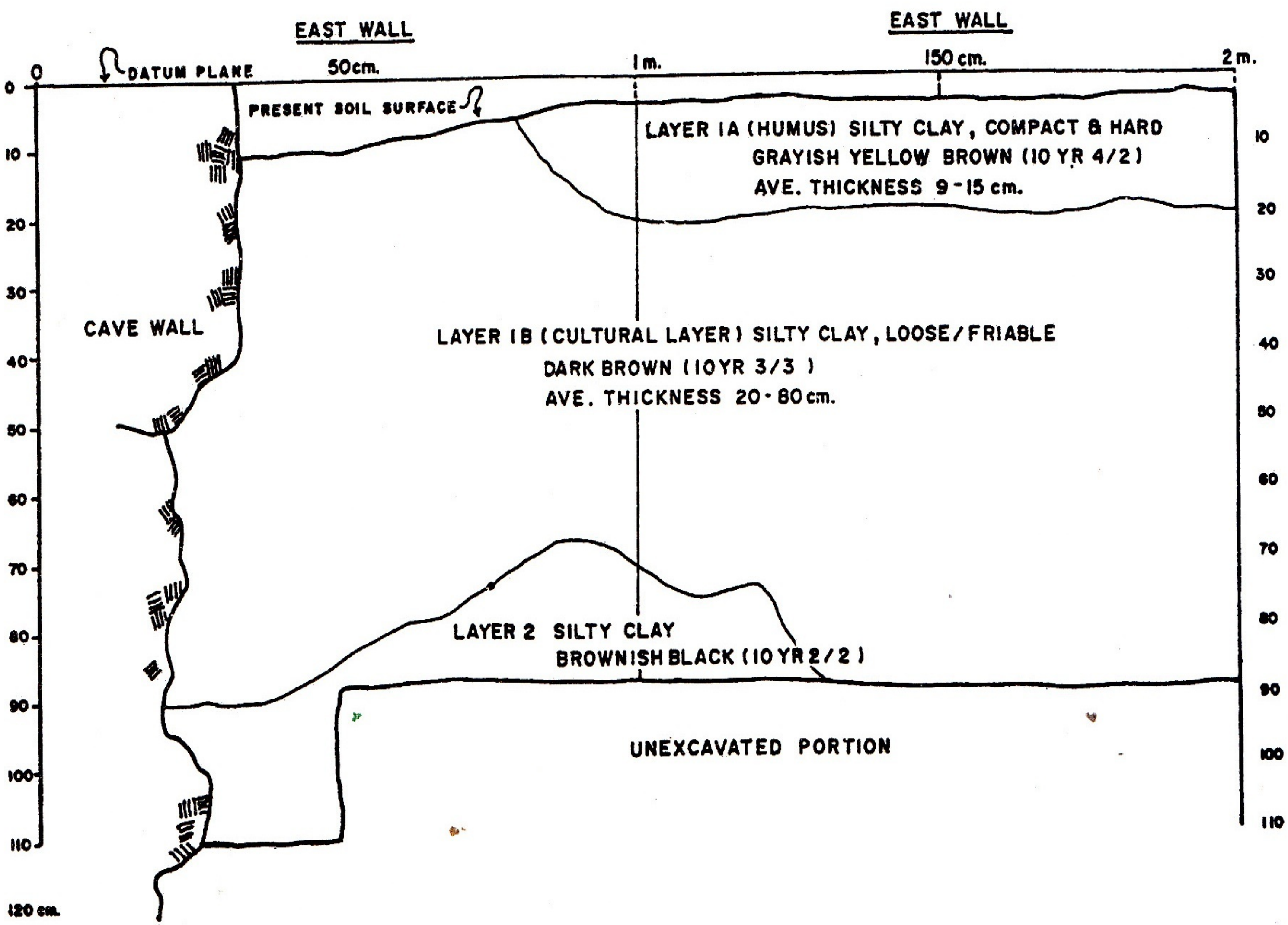


Figure 4
Soil stratigraphy, square N3W3 (Ille Cave, New Ibajay, El Nido, Palawan)



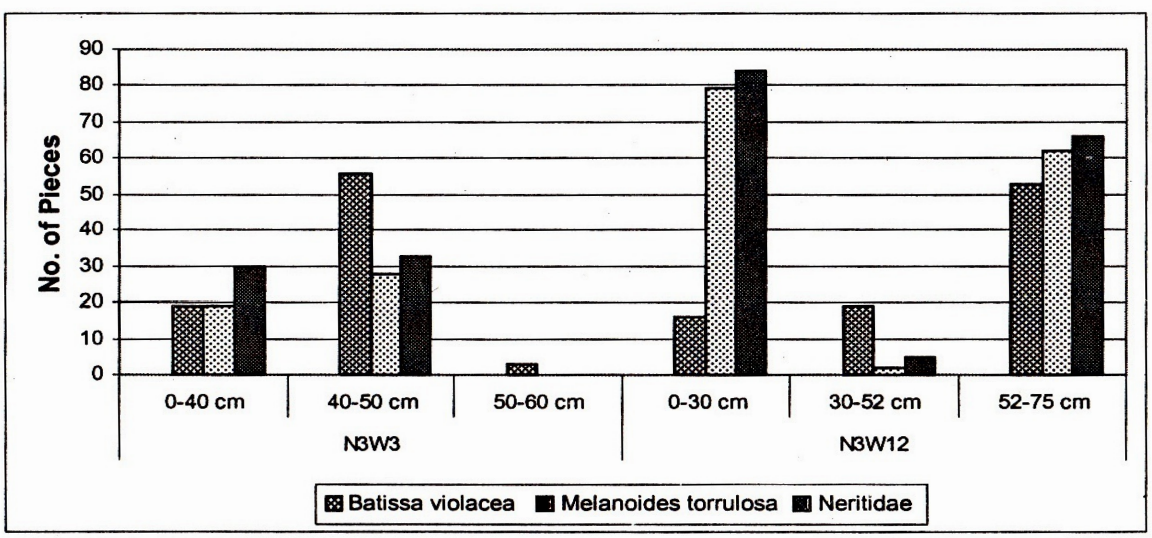
(SEAICE 1999)

Figure 5
Soil stratigraphy, squares N4W12 and N3W12 (Ille Cave, New Ibajay, El Nido, Palawan)

Ranking the fresh water shell species (Table 1) was qualified through the following criteria: number of shells accumulated and presence in each given layer as well as the time given in meat processing. *Batissa violacea* was ranked first, followed by Neritidae, with *Melanoides torrulosa* ranked last. *Batissa violacea* was present in all layers for each square. It had a bigger meat shell and could easily be extracted. The shells are often used as scrapers as they have sharp edges (ventral margins) while being very strong. Second is family Neritidae, which garnered the highest frequency among the freshwater shell species. Perhaps this was the most favorite food shell during the early time. It is the only *Gastropod* that does not need to be processed in extracting the meat. Though it had a higher frequency than *Batissa violacea*, *Melanoides torrulosa* was placed last. It needed processing in taking out the meat shell. The spire should be broken off in order to extract the meat from the shell.

Table 1
Number of freshwater shell species in each arbitrary layer per test pit

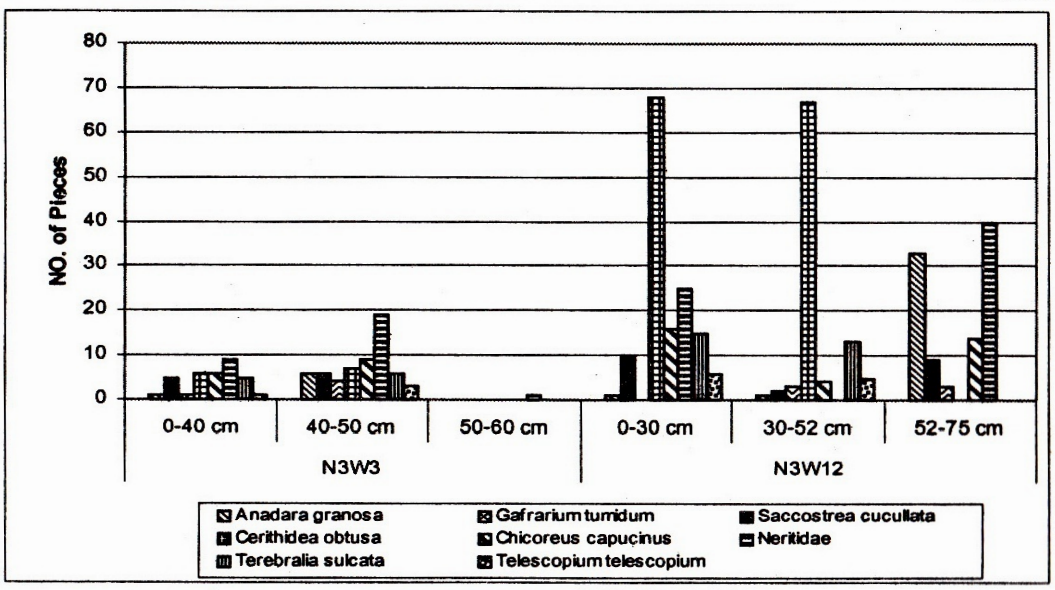
Test Pits	N3W3			N3W12		
Layer (cm)	0-40 cm	40-50 cm	50-60 cm	0-30 cm	30-52 cm	52-75 cm
Species						
Batissa violacea	19	56	3	16	19	53
Melanoides torrulosa	19	28		79	2	62
Neritidae	30	33		84	5	66



The same criteria was followed in categorizing the marine/estuarine shell species (Table 2). In this category, there were eight marine/estuarine shell species found. Most of the marine/estuarine *gastropods* were placed in the top three. These were Family Neritidae (1), *Cerithidea obtusa* (2) and *Chicoreus capucinus* (3). Next were the bivalves. At number 4 was *Anadara granosa*, followed by *Gafrarium tumidum* (5) and *Saccostrea cucullata* (6).. The remaining two *gastropods*, *Terebralia sulcata* and *Telescopium telescopium*, were ranked numbers 7 and 8, respectively.

Table 2
Number of marine/estuarine shell species in each arbitrary layer per test pit

Test Pits	N3W3			N3W12		
Layer (cm)	0-40 cm	40-50 cm	50-60 cm	0-30 cm	30-52 cm	52-75 cm
Species						
Anadara granosa	1	6		1	1	33
Gafrarium tumidum	5	6		10	2	9
Saccostrea cucullata	1	4			3	3
Cerithidea obtusa	6	7		68	67	
Chicoreus capucinus	6	9		16	4	14
Neritidae	9	19	1	25		40
Terebralia sulcata	5	6		15	13	
Telescopium telescopium	1	3		6	5	



Ranked number 1 was family Neritidae. This can be justified by giving the same reason as that for freshwater Neritidae shells. It had the second total number of shell species and was almost present in all layers of the squares. It may be concluded that the availability of the shell during earlier times was high. *Cerithidea obtusa* was ranked number 2. It belonged to family Potamididae (same family as *Terebralia sulcata* and *Telescopium telescopium*). It had the highest frequency among the marine/estuarine shell species especially in the two layers (0-30 cm and 52-75 cm) of square N3W12. The aperture of the shell was broken off in processing the shell meat. Most likely, the shell was probably always available as *Batissa violacea* and was the most favored mudflats and estuaries shell species. Number 3 was *Chicoreus capucinus*, which had an attractive developed sculpturing surface. It was readily available at all times and obtained a high number of the shell.

Anadara granosa was placed number 4 because of the accumulated total number of the shell and was highly consumed in the oldest period. Additionally, it can be observed that the preferred second shell was *Anadara granosa* in layer 52-75 cm at square N3W12. Ranked number 5 was *Gafrarium tumidum*. The shell was present in all layers especially at the bottom. This signified that the shell was part of their food resource in the early period. *Saccostrea cucullata* was placed number 6 even if it had the smallest total number of shells. As with the other marine/estuarine bivalve shells mentioned, *Saccostrea cucullata* was a part of food resource in the early period. The remaining shell species were *Terebralia sulcata* (7) and *Telescopium telescopium* (8). They were ranked number 7 and 8 because no shells were retrieved in square N3W3 at 50-60 cm and square N3W12 at 52-75 cm. They were only present during the latter period. Though they had higher frequencies than *Saccostrea cucullata* (based on Table 2), the shell meat needed to be processed first before eating.

Evenness is the equitability with which these resources (i.e., shells) are used (Reitz and Wing 1999: 234). It is a concept of heterogeneity measurement from the degree to which species are equally abundant. The evenness of a given layer is always equivalent to 1. Comparing these two squares in their respective environments, it can be observed that the distribution of shell species in freshwater is more even than in the marine/estuarine shells. Moreover, the shells in square N3W3 per layer were widely distributed than square N3W12. However, square N3W3 lacked the bottom layer (50-60 cm).

Table 3
Evenness of each layer among shell species

Test Pits	N3W3			N3W12		
Layer (cm)	0-40 cm	40-50 cm	50-60 cm	0-30 cm	30-52 cm	52-75 cm
Species						
Freshwater						
H	0.400	0.457	0	0.405	0.438	0.475
H max	0.477	0.477	0.477	0.477	0.477	0.477
J	0.978	0.958	0	0.848	0.918	0.997
Marine/Estuarine						
H	0.797	0.834	0	0.548	0.454	0.579
H max	0.903	0.903	0.903	0.903	0.903	0.903
J	0.833	0.924	0	0.607	0.503	0.641

The frequency of each shell varies per layer due to other factors: first, it may indicate environmental changes due to the speed and nature of Dewil River and the distance of Ille rock shelter to the sea. It can be observed that square N3W12 had more shell deposits than square N3W3. Using a spatial analysis in the site would explain that the western part of the rock shelter was occupied more perhaps as a habitation area. Another observation concerns the processing and meat extraction patterns as seen in human induced breakage patterns. Bivalves are easily processed. The shell size is largely whole and the shell meat is bigger and can be easily extracted compared with the *Gastropods*. That is why *Batissa violace*a is the most consumed shell food. It is said that this was a commonly used food throughout Southeast Asia and the Pacific. Except for *Neritids, Gastropods* had to be broken into half. An example would be *Telescopium telescopium* which is always broken into half. In *Melanoides torrulosa*, the spire is often broken off while in the case of *Cerithidea obtusa*, the aperture is broken off.

In summary, Batissa and Neritidae are the best choices for their quality based on the diet-ranking of shells from Ille Rockshelter. Although they are not the most represented in terms of frequency, and although the volume of shell that can be foraged is relatively fewer than other species, both are available through time. Accordingly, to maximize the foraging effort and to satisfy their dietary requirements, the other lower ranked shell species were then acquired.

Discussion

There were nine major types of shells found in Ille rockshelter. The shells came from freshwater and estuarine/marine environment. *Batissa violacea* was the most preferred freshwater mollusk food for subsistence during the early times. *Cerithidea obtusa* and family Neritidae species were the most consumed mollusk food coming from a marine/estuarine environment.

The information showed how shells were being discarded and why they accumulated in one place. This may be explained by looking at the architectural features that surround Ille. There was an old river terrace at the southern edge of the cave where it gradually dropped westward towards the floodplain of the rice paddies. During the Pleistocene age, the continental shelf around Northern Palawan was exposed and the land was extensive (see Springsteen and Leobrera 1986). The channel of the Dewil River preserves the evidence of a highly dynamic fluvial system. This explains the abundant shell remains recovered from the area. Humans easily collected the shells because the river was very close to the site.

Ille rock shelter can be considered as a shell-bearing midden site. It generated a wide range of activities based on the material culture discovered in the site. The early inhabitants of Ille were indeed foragers. This is almost certain given the absence of agricultural plant remains such as rice on the site. They searched for food that they processed and deposited in the rock shelter.

In addition, the rock shelter provided a suitable place for shelter. The formation of the cave was conducive for habitation. The sherds of pottery, animal and human bones, seeds, beads and other cultural deposits unearthed clearly showed human habitation. They may have camped inside, or made it a permanent residential place or they may have done both.

A study of shells in an archaeological site is very relevant. It has cultural significance. It elucidates the lifestyles of people in Ille Cave and how they utilized the resources in and around the rock shelter. It shows the availability of food supply and a culture history may be created out of it. More importantly, the data presented in the study can still be used for further research like ascertaining the diet of the early people, determining the seasons of shell fishing, and reconstructing the paleoenvironment, their economic use, depositional and post depositional processes. This future direction of research will give a better idea of the environmental conditions at the time the site was occupied in antiquity, hence, a clearer vision of the community as it was then.

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