

CHARACTERISTIC OF PREHISTORIC AUSTRONESIAN POTTERY AROUND LAKE SINGKARAK, SOLOK, WEST SUMATRA

Karakteristik Tembikar Austronesia Prasejarah di Sekitar Danau Singkarak, Solok, Sumatera Barat

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Abstract. *The karst environment with forests and lakes has the potential to be a source of water, food, and materials that are important to the human's ideal location for its inhabitants. Pottery shards found in surveys and excavations illustrate that the site became a place to settle with various human activities. This article aims to determine the characteristics of Austronesian pottery remains at the cave and open sites and determine the relationship with maritime culture around Lake Singkarak. The method used is qualitative, analyzing pottery fragments supported by laboratory analysis. The results of the analysis data note that the discovery of geometric patterns and red slips can illustrate the expertise of supporters in beautifying pottery and describe the cultural history and life of the makers.*

Keywords: *Singkarak Lake, West Sumatra, Natural Resources, Prehistoric Pottery, Austronesian*

Abstrak. Lingkungan karst dengan hutan dan dananya memiliki potensi sebagai sumber air, sumber makanan, dan sumber bahan yang penting dalam kehidupan manusia sehingga menjadi lokasi yang ideal bagi para penghuninya. Pecahan tembikar yang ditemukan pada survei dan ekskavasi menggambarkan bahwa di lokasi itu menjadi tempat yang baik untuk bermukim dengan berbagai aktivitas manusianya. Artikel ini bertujuan untuk mengetahui karakteristik dari tembikar tinggalan pendukung Austronesia di situs-situs gua maupun situs terbuka serta untuk mengetahui kaitannya dengan budaya maritim di sekitar Danau Singkarak. Metode yang digunakan adalah kualitatif dengan menganalisis pecahan tembikar yang ditemukan, serta ditunjang dengan analisis laboratorium. Dari hasil analisis dapat diketahui bahwa ditemukannya pola-pola geometris, dan slip merah, dapat menggambarkan keahlian pendukungnya di dalam memperindah wadah-wadah tembikar, dan dapat menggambarkan sejarah budaya serta kehidupan para pembuatnya.

Kata kunci: Danau Singkarak, Sumatera Barat, sumberdaya alam, tembikar prasejarah, Austronesia

1. Introduction

The karst environment surrounding Lake Singkarak is home to numerous caves and niches known as *ngalau* to the locals. Some of these caves are used for human activities. Lake Singkarak is the second-largest lake in Sumatra, covering an area of 129.7 square kilometers. It is located in two districts, namely Tanah Datar Regency and Solok Regency (Central Statistics Agency for Tanah Datar Regency, 2021; Central Statistics Agency for Solok Regency, 2021). Research on the niches and caves in Nagari Paninggahan and open sites in Nagari Muara Pingai-Nagari Saning Bakar, Solok, began in 2019 and continued until 2021.

Ngalau Baringin and Ngalau Carano are two caves in Jorong Kampung Tengah, Tabiang Biduak Hamlet, Nagari Paninggahan, Junjung Sirih District, Solok Regency. They are located approximately 220 m and 110 m west of Lake Singkarak. The karst environment and Lake Singkarak are rich in natural resources, including water and food sources that the community has utilized for generations. The water sources in the area include lakes, rivers, and springs. The Kalat and Air Berabab Rivers overflow and empty into the lake, creating wetlands used by the community as rice fields. The community also relies on Sumur Tiga Pancur and Polo Water springs as drinking water sources.

The food sources available in Lake Singkarak are various types of mollusks and fish. The types of mollusks that dominate and are still consumed today are *Corbicula moltkiana* and *Corbicula Javanica* (*pensi*-local name), then the mollusks *Anodonia woodiana* (*lokan/kijing*), *Melanoides tuberculata*/Family *Thiaridae* (*langkitang*), and the type *Filopalidona javanica* (*tutut*).

Then the types of fish include *Mystacoleucus padangensis* *Blkr* (*bilih*-local name), *Osteochilus brachmoides* (*asang*), *Macrones planiceps* (*baung*), *Oxyeleotris marmorata* (*betutu*), *Cyclocheilichthys de*

Zwani (*turiak*), and *Puntius Belinka* (*balinka*), as well as predatory fish species such as *Tor tambroides* (*gariang*) and *Hampala macrolepidota* (*sasau*). Likewise, in the past, the surrounding forest was an excellent habitat for hunted animals such as *Suidae*/pig and *Cervus*/deer.

Ngalau Baringin and Ngalau Carano caves face northeast and have bright and open fronts, with a dry ground surface that makes them suitable for human activity. Unlike other caves around the lake, these caves are not damp, indicating that they were previously affected by the tides of the lake. Evidence of tidal lake water occurrence can be seen in Ngalau Carano, where a continuous layer of mollusk shells (*corbicula*) with a thickness of 10-20 cm was found repeatedly. This layer was identified due to the sedimentation process when lake water flooded the cave floor. By examining the bottom layer, it was discovered that there were at least two phases of flooding. As a result, using the cave is intermittent and is not recommended during wet periods. (Susilowati dkk., 2019, pp. 84-85). The cave is not used when wet but is otherwise available.

The inscriptions found around the lake provide evidence to support this claim. When the artifact was discovered submerged in the lake water, it was moved to a dry location in the west, approximately 15 meters from its original position. This relocation was a conservation effort by BPCB Batusangkar. The Paninggahan inscription dates back to the 14th century during the reign of the Pagaruyung Kingdom/Adityawarman. It was likely situated in a dry location because its purpose was to mark the king's territory.

On the hills of Nagari Saning Bakar, an open site shows signs of human activity. It is believed that the inhabitants built houses on stilts to live there permanently. The site is characterized by pottery shards mixed with scattered mollusks and obsidian (Susilowati dkk., 2021, pp. 37- 38). The large number of

mollusks scattered on the surface of the land is thought to be the result of geological processes caused by the tectonic movement of earth plates that formed Lake Singkarak. It differs from the caves or niches in Nagari Paninggahan, where most mollusks are believed to result from human consumption. The discovery of pottery shards in two locations, namely in caves/niches and open sites in the hills, is a fascinating subject for further study.

Pottery is frequently mentioned in Neolithic culture, associated with the migration of Austronesian and Austroasiatic speakers to the archipelago.

There are two theories about the prehistoric migration route of the Austronesian people to the archipelago. The first theory suggests that they took the eastern route, starting from Taiwan about 5,000 years ago, then moving southwards through the Philippines, North Kalimantan, Sulawesi, and finally reaching Maluku around 4,000 to 2,000 years ago (Bellwood, 2016, p. 14). The second theory suggests that they took the western route, starting from Vietnam, Peninsular Malaysia, Sumatra, and Kalimantan (western part), reaching Java about 4,500 to 4,000 years ago. During this period, migration was also carried out by the Austroasiatic-speaking people with a neolithic culture (Simanjuntak, 2016, p. 210). Noerwidi (2014, p. 3) stated that the development of neolithic culture in the archipelago was characterized by evolution, adaptation, and interaction between Austronesian and non-Austronesian speakers.

The culture brought by Austronesian speakers developed according to the environmental conditions. The Neolithic culture is associated with human expertise in cultivating plants and animals. Initially, they used sharpened stones and created various crafts such as pottery, weaving, clothing from bark, and many others. The cultural characteristics differ in water-related places, such as seas, rivers, and lakes. For instance,

the development of boat-making techniques and the construction of buildings on stilts. The Austronesian-speaking culture underwent a lengthy process until later, even into historical times.

The research problem can be divided into two parts based on the background information provided. Firstly, what are the characteristics of Austronesian pottery found in cave sites and open sites in Lake Singkarak, Solok Regency? Secondly, how is this pottery related to the maritime culture on the shores of the lake? This article aims to enhance the knowledge of Austronesian cultural heritage in the West Sumatra region by identifying the characteristics of Austronesian-speaking pottery in cave sites and open sites on Lake Singkarak, Solok Regency. Additionally, the article aims to explore the relationship between this pottery and the maritime culture on the shores of the lake.

2. Method

The method used in this study is qualitative and follows an inductive approach, moving from specific observations to general conclusions. The process involves three stages: data collection, analysis, and synthesis (Tanudirdjo, 1989, p. 34). The primary data collection stage has been completed through surveys and excavations. At the data analysis stage, various artifacts will be examined using morphological techniques, which involve analyzing the shape and decoration of the pottery found. It will be supplemented by petrography laboratory analysis and SEM (Scanning Electron Microscope) better to understand the elements and sources of the artifact material. The dating of the artifacts was carried out at the University of Waikato Laboratory using the AMS (Accelerator Mass Spectrometry) method. The next step is to study the data in the natural environment where the site is located, focusing on form, space, and time.

3. Result and Discussion

3.1 Result

The area around Lake Singkarak is a karst environment that has natural caves and niches. Some of these caves have been used for human activities with cultural layers, such as Ngalau Baringin and Ngalau Carano in Nagari Paninggahan. In the southern part of the lake, between Nagari Muara Pingai and Saning Bakar, there is a hilly stretch of land with a relatively large open area, which made it possible for human habitation in the past. The hilly part used to be a tropical rainforest with a variety of plants, some of which have now been turned into community fields with cloves (*Syzygium aromaticum*), citronella (*Cymbopogon nardus*), and avocado (*Persea Americana*).

3.1.1 Location of pottery finds around Lake Singkarak

Two cave/niche sites in Jorong Kampung Tengah, Nagari Paninggahan, Junjung Sirih District, and Solok Regency show human activity. These sites are Ngalau Carano and Ngalau Baringin (Beringin Cave). Ngalau Carano is located at 0°39'56.0" South Latitude and 100°32'26.9" East Longitude, with an altitude of 383 m above sea level. On the other hand, Ngalau Baringin is located at 0°39'55.7" South Latitude and 100°32'22.7" East Longitude, with an altitude of 385 m above sea level. Ngalau Carano is closer to the lake than Ngalau Baringin. In the West Sumatra region, caves/niches are called Ngalau.

There is another site located in a hilly area, specifically in an open area between Muara Pingai (Junjung Sirih District) and Nagari Saning Bakar area (X Koto Singkarak District). The location coordinates are 00°42' 33.2" South Latitude and 100°33' 29.3" East Longitude, 620 meters above sea level. The location is a community-owned field (garden) where cloves (*Syzygium aromaticum*) and citronella (*Cymbopogon nardus*) are planted (Figure 1).



Figure 1. Singkarak Lake Hills open site is located on the border of Nagari Muara Pingai and Saning Bakar (Source: Susilowati et.al., 2021)

The University of Waikato Laboratory conducted a C14 analysis in 2019 to determine dating chronology. The analysis revealed a prehistoric to historical period for cave/niche sites, while open sites are yet to be dated. The decoration of the pottery and the location of findings in certain soil layers can be used as clues to describe the chronology.

The prehistoric era, also known as the Neolithic period, has been identified through C14 analysis of mollusk shell samples found in the seventh layer at Ngalau Carano. This period is estimated to be between 4500 to 4200 years before present. The area is scattered with decorative pottery and mollusk shells. The historical period is identified through charcoal samples found in the fifth layer, which dates back to 864 years before present. Similarly, at Ngalau Baringin, the historical period is identified through charcoal samples found in the second layer, which dates back to 137 years before present. The results of these findings are presented in the table below (Susilowati dkk., 2019 & 2021):

Table 1. Analysis result of AMS 2019 and 2021

| Sites | Code Wk | Result |
|-------------------------|---------|----------------|
| GCRN/2019/S1-2T2/(15) | 50419 | 4582 +/- 34 BP |
| GCRN/2019/S7-8B3-4/(4) | 50420 | 4252 +/- 32 BP |
| GCRN/2019/S3-4T1/lot 2 | 53622 | 864 ± 17 BP |
| GBRG S3T1/2019/S3T1/(5) | 53624 | 137 ± 17 BP |

Source: Susilowati, 2023

Notes: To date the cave accurately, we need to find other evidence supporting human activity around Lake Singkarak during prehistoric times. It is important because relying solely on mollusk shell samples can be unreliable, as the dating results may only indicate the presence of mollusk shells and not necessarily direct human activity.

It is interesting to note that pottery was discovered alongside andesite stone tools during prehistoric times. However, it was also found alongside shale and flake tools made of obsidian during the historical period. In addition to plain and decorated pottery fragments, fragments of Chinese ceramics from the Yuan, Ming, and Qing dynasties (14th-19th centuries), European (Dutch) ceramics from the 19th-20th centuries, and Dutch coins from the 18th-19th centuries were also discovered. The existence of the Paninggahan Inscription, located near the cave, supports the activities that took place during the historical period of the 14th century.

The arrangement of mollusk shells in Ngalau Carano cave suggests that the tides of the lake water once affected the cave, as evidenced by the alternating wet and dry conditions (Susilowati dkk., 2019) (Figure 2).



Figure 2. Carano Cave stratigraphic layers on the west wall of Box S1-2T2 (Source: Susilowati et.al., 2019)

The caves in Nagari Paninggahan are only accessible during dry conditions, which allows for a chronological understanding of the area's history. The lack of human habitation in Nagari Paninggahan is due to rising lake water,

and according to folklore, the ancestors of the people who once lived there resided in a higher area.

It has not been possible to obtain a chronology for the open site as no absolute dating has been carried out. However, the decoration on the pottery found at the site bears similarities to those found at Ngalau Carano. Pottery at open sites is also associated with obsidian deposits in large and small fragments, accumulating with mollusk shell fragments (*pensi*).

Two surveys were conducted in 2019 and 2021 at the border of Muara Pingai and Saning Bakar. Both surveys produced the same findings: decorated pottery and obsidian stones. In the 2021 survey, 45 obsidian stone samples and 18 pottery fragments were taken as samples. The pottery fragments are generally decorated with geometric motifs, while obsidian has various functions, such as materials, flaked tools, and flakes.

3.1.2 Analysis of Decorative Pottery Motifs around Lake Singkarak

Fragments of decorative and plain pottery, including body, rim, tip, and lid handle, were discovered alongside stone tools in soil layers ranging from lower (prehistoric) to upper (historical period). These pottery fragments were part of various containers, such as vases, jars, jugs, and pot lids. The findings were made at a depth of 40 cm to 150 cm.

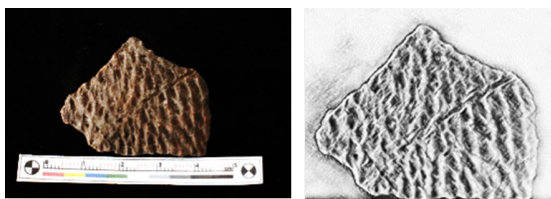
The analysis of decorative pottery found during excavation activities at Ngalau Carano and Ngalau Baringin revealed various decorative motifs. These motifs include geometric patterns such as stripes, rope, woven, mesh, round concave, and a combination of these motifs. The decorative motifs are found on the container's body, neck, and edges. The decorative techniques used are diverse, including impressed, incised, excised, and a combination of these and painting techniques, especially on red-slipped pottery.

The impressed technique is a method of decorating pottery by pressing a stamp with decorative patterns like rope and mesh and webbing onto the soft surface of the pottery (Rangkuti dkk., 2008, p. 16). The excised technique involves creating a hole by prying. The incised technique is used to scratch the soft surface of the pottery with a sharp or blunt object. Additionally, red and black slipped pottery was discovered with painted decorative shapes featuring thick lines encircling the container's body. Similarly, the black slipcovers the entire container.

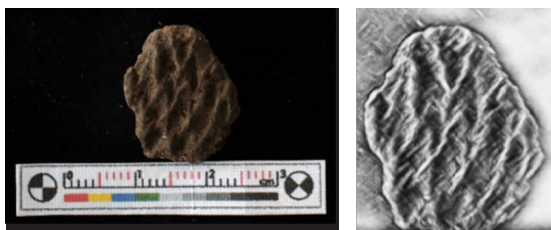
There are a lot of decorative pottery fragments that have been found. These fragments can be compared based on their decoration and decorating techniques. The decorative techniques used in ancient pottery are no longer used in modern pottery decoration. Nowadays, pottery is usually plain and decorated with red or black slips.

Archaeologists found decorative pottery fragments during excavations. They discovered 16 samples in Ngalau Carano, 62 in Box S1-2T2 (15), and 17 in S3-4T1 lot 2. Although the fragments are relatively small, ranging from 1.1 cm x 1.1 cm to 3.2 cm x 4 cm, the decoration is still clearly visible. Some examples of decorative pottery include:

a. Rope and line motifs using impressed and scratch techniques



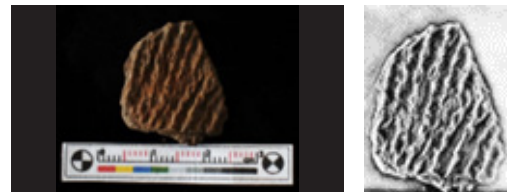
b. Mesh motif with impressed technique



c. Straight and cross-striped motifs with impressed and incised techniques



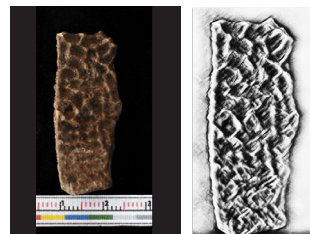
d. Striped motif with incised technique



e. Woven motif using impressed technique



f. Concave round motif with impressed technique



g. Irregular rope motif with impressed technique

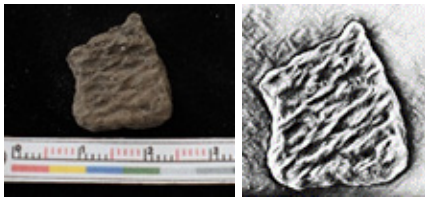


h. Rope, line, and concave round motifs with impressed and incised techniques

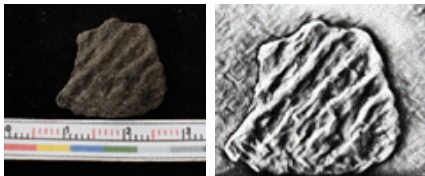


There are 18 samples of decorative pottery from the excavations at Ngalau Carano Box S7-8B3-4 (5), which are generally small in size, between 1.5 cm x 1.9 cm to 5.8 cm x 3.6 cm (Susilowati et al., 2020). The decorative traces, comprised of geometric patterns such as stripes, concave circles, ropes, webbing, and mesh, can still be identified. The decorative technique used is the impressed technique. Some examples of this decorative pottery are:

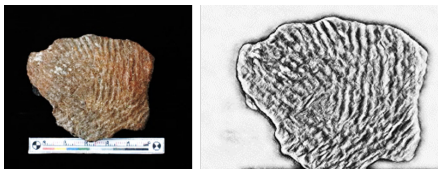
a. Mesh motif with impressed technique



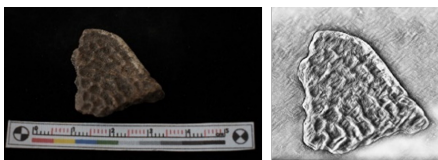
b. Striped motif with impressed technique



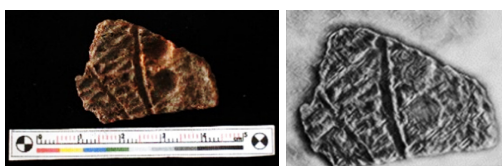
c. Irregular striped motif with incised technique



d. Rope, line, and concave round motifs with impressed and incised techniques



e. Concave round motif with impressed technique

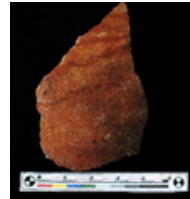


The decorative pottery found in Ngalau Baringin, such as Box S3T1 (5), amounted to 4 small pieces that ranged from 2.8 cm x 3.1 cm to 4.3 cm x 5.2 cm. Decorative traces can still be identified, including geometric patterns of lines. The decorative techniques used are impressed technique and red slip-painting by smearing it. The use of black slip is also known from the discovery of a jug fragment in Ngalau Baringin Kotak S4B1-2 spit 5. The examples of the decorative pottery are:

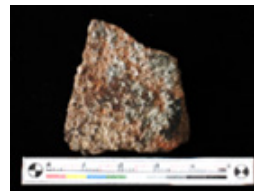
a. Striped motif with red slip



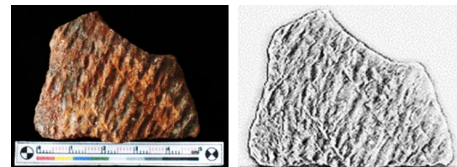
b. Striped motif with red slip



c. Rope motif (worn)



d. Striped motif with impressed technique



e. Black slip



The body fragments (plain and decorated) dominated this box, followed by the rim, base,

lid handle, and jug tip fragments. The pottery fragments had thin, medium, and thick vessel walls, sizes between 0.2 cm and 1.8 cm, and the edge diameter measured between 13 cm and 31 cm. From the thickness of the container, the edges, and the diameter of the edges, it is estimated that the pottery fragments are of pots, vases, jars, pans, pot lids, and jugs, among others, as in the example (Figure 3).



Figure 3. Examples of pottery with black and red slip (Source: Susilowati, 2023)

3.2 Discussion

To find out the elements of pottery and whether the pottery found at the excavation was local production, the researchers carried out petrographic and SEM analysis by comparing them with modern pottery produced today.

3.2.1 Petrographic Analysis

After conducting a petrographic analysis of 14 pottery samples at the CHONDRITE Media Copyright Information Engineering Laboratory in Yogyakarta, it was found that out of the four pottery samples from Ngalau Baringin, only 1 sample (S1-2B1/4) did not contain the element pyroxene. The other three samples contained pyroxene with a higher lithic element composition than clay minerals, except for one sample (S3T1/5), where the lithic elements were the same as clay minerals.

At Ngalau Carano, there were eight samples tested. Out of these, it was found that three samples did not contain the pyroxene element. On the other hand, five samples contained the pyroxene element but with a higher composition of clay mineral elements than other elements, including lithic elements.

It was discovered at the Muara Pingai site that one sample did not contain the

element pyroxene, while the other sample did. All samples generally have higher feldspar elements than quartz, opaque minerals, and pyroxene, except for one sample in Box S3T1/(5), which has high pyroxene elements. The incision color is generally reddish-brown (brick brown), except in Ngalau Baringin on S3T1/(5), which is dark brown. Overall *results are shown in the following table:*

Table 2. Analysis result of AMS 2019 and 2021

| NO | Sites | L (%) | F (%) | K (%) | P (%) | MO (%) | ML (%) |
|-----|--------------------------------|-------|-------|-------|-------|--------|--------|
| 1 | Ng. Carano/ S3-4T1/(6) | 20 | 30 | 7 | 1 | 2 | 40 |
| 2* | Ng. Carano/ S3-4T1/lot2 | 35 | 25 | 9 | - | 1 | 30 |
| 3 | Ng. Carano/ S1-2T2/(2) | 30 | 25 | 7 | 1 | 3 | 35 |
| 4* | Ng. Carano/ S1-2T2/(7) | 20 | 25 | 7 | - | 3 | 45 |
| 5 | 1) Ng. Carano/ 2) S1-2T2/(13) | 15 | 20 | 3 | 5 | 2 | 55 |
| 6 | 3) Ng. Carano/ 4) S7-8B3-4/(3) | 20 | 15 | 2 | 5 | 3 | 55 |
| 7 | Ng. Carano/ S7-8B3-4/(4) | 15 | 25 | 3 | 2 | 5 | 50 |
| 8* | Ng. Carano S7-8B3-4 (5) | 55 | 9 | 15 | - | 1 | 20 |
| 9 | Ng. Baringin S1-2B1/(4) | 45 | 10 | 1 | 7 | 2 | 35 |
| 10* | 5) Ng. Baringin/ 6) S1-2B1/(4) | 30 | 20 | 9 | - | 1 | 40 |
| 11 | Ng. Baringin S3T1/(5) | 40 | 7 | 1 | 10 | 2 | 40 |
| 12 | Ng. Baringin S3T1 (5) | 65 | 10 | 3 | 2 | 5 | 15 |
| 13 | Muara Pingai (P)1 | 30 | 15 | 2 | 5 | 3 | 45 |
| 14* | Muara Pingai (P)2 | 25 | 10 | 5 | - | 5% | 55 |

Source: Susilowati, 2023

Notes:

* = does not contain pyroxene

without * = contains pyroxene

L=LITHIC; F=FELDSPAR; K=QUARTZ; P=PYROXENE; MO=OPAQUE MINERAL; ML=CLAY MINERAL

The grains in this material are made up of volcanic material of a base-intermediate composition. The presence of lithic, feldspar minerals, pyroxene, and quartz characterizes this material. Lithic in sandstone can provide specific information about the rock origin of sedimentary deposits because it has distinctive characteristics. Lithic generally originates from the outer part of the earth's

crust, which experiences rapid uplift and erosion. Mountain ranges and volcanic areas have more lithic sources than basement rocks (Anggajatiwidiatama 2013).

Pyroxene is a group of inosilicate minerals commonly found in igneous and metamorphic rocks. Its structure consists of a single chain of tetrahedral silica, and it crystallizes in monoclinic and orthorhombic forms. The general chemical formula for pyroxene is $XY(Si,Al)_2O_6$, where X represents calcium, natrium, aluminium, iron⁺², magnesium, and small amounts of zinc, manganese, and lithium. Y represents chromium, aluminium, iron⁺³, magnesium, manganese, scandium, titanium, vanadium, and iron⁺² (Morimoto et.al., 1989).

The above composition shows that the pottery samples obtained from Ngalau Baringin, Ngalau Carano, and Muara Pingai have similar six elements, especially lithic. However, some samples that lack the pyroxene element indicate differences in the location from where the pottery material was taken. It is important to note that in pottery making, additional materials or tempers such as sand and other clay are also required apart from the primary clay. This fact is known through comparative/ethnoarchaeological pottery-making studies in Galo Gandang. The difference in ingredients is what causes slight variations in the pyroxene elements.

It is believed that the pottery found at the site was made by the local people in the past. The pottery found at the site can be classified into two types: without pyroxene elements and with pyroxene elements. The geological conditions of the area around Lake Singkarak contain volcanic material that contains pottery elements. Although there may be slight differences in the location where the materials for making the pottery were taken, they were still sourced from around Lake Singkarak in the past.

Basic materials like clay mixed with sand are needed when making pottery. In

some cases, husks are used instead of sand. However, in West Sumatra, the technique involves mixing sand and water, stirring and pounding it until it becomes moldable. Sand can be found on riverbanks or around lakes, and the sand mixture contains quartzite.

3.2.2 SEM analysis on pottery around Lake Singkarak

The pottery in a fragmented state was found along with obsidian fragments and mollusk shells at survey location 3 (the Muara Pingai-Saning Bakar border). Generally, the decorated parts are on the body, handle, and lid. Apart from the open sites on Saning Bakar hills from the research in 2021, pottery samples were also taken from excavations in 2019 in Ngalau Carano, Ngalau Baringin, Galo Gandang pottery workshop (source of material), and clay in the rice fields around the cave in Nagari Paninggahan, Solok Regency. Decorative pottery mostly has geometric patterns. LIPI's SEM results on pottery are summarized in the following table:

Table 2. Results of Scanning Electron Microscope (SEM) Pottery

| Sites | MgO | Al ₂ O ₃ | SiO ₂ | SrO | K ₂ O | CaO | TiO ₂ | Fe ₂ O ₃ |
|------------------------------|-----|--------------------------------|------------------|------|------------------|-----|------------------|--------------------------------|
| *Saning Bakar /P | 0.5 | 32,4 | 34,9 | 11,9 | 1,3 | 1,1 | 3,8 | 14,1 |
| *Ng. Baringin S1-2B1/4 | 0,5 | 16,5 | 54,7 | 14,3 | 2,1 | 3 | 0,6 | 8,2 |
| Galo Gandang | 1,7 | 26,4 | 57 | -- | 1 | 1,5 | 2,1 | 10,4 |
| Ng. Carano S3-4T1/10 | 5,9 | 14,5 | 51,3 | -- | 3,7 | 9,4 | 1,9 | 13,2 |
| Ng. Carano S4B1-2/5 | 0,9 | 20,2 | 60,7 | -- | 2,8 | 5,3 | 0,6 | 9,6 |
| Ng. Carano S7-8B3-4/4 | 1,8 | 22,2 | 55,7 | -- | 3,1 | 6,5 | 0,5 | 10,3 |
| Tanah liat sawah Paninggahan | 0,8 | 23,5 | 59 | -- | 3,7 | 4,5 | 0,6 | 8 |

Source: Susilowati, 2023

Notes:

* = with stonsium

without* = without stronsium

MgO= Magnesium oxide; Al₂O₃= Aluminium oxide (Alumina); SiO₂= Silicon dioxide (Silica); SrO= Stronsium oxide (Strontia); K₂O= Potassium oxide; CaO = Kalsium oxide (quicklime); TiO₂= Titanium dioxide (Titania); Fe₂O₃= Ferric oxide (Hematite).

The laboratory analysis results show that the pottery samples from Ngalau Carano have the same elements as the clay samples from Paninggahan, which shows that the pottery used clay materials around the site. The Galo Gandang pottery shows that even though it has the same 7 elements, there are differences in the composition of Ngalau Carano and Paninggahan rice fields, which have less K₂O and CaO composition. It indicates the possibility that the pottery materials were not obtained from a pottery workshop as a source of materials. Pottery from Ngalau Baringin (Paninggahan) and Saning Bakar contains one missing element, SrO (Stroxin), found in Ngalau Carano and Paninggahan clay. This condition explains that the pottery from Ngalau Baringin and Saning Bakar came from workshops (material sources) outside Paninggahan, though it is still around the shores of Lake Singkarak.

3.2.3 A Perspective on the Decorative Motifs of Pottery Around Lake Singkarak

From the results of surveys and excavations, the pottery in this area found that many used geometric motifs, red slips, and black slips. In general, these decorative motifs are decorative motifs that are often used on Austronesian pottery, on neolithic (prehistoric) sites, and historical sites in other regions of the archipelago. Traces of the technique for making pottery are known to use the massaging technique (hands) and the palming technique (wooden tools as the facing and stone as the base).

In making pottery, massage, and paddle-anvil techniques can create depressions on the inside of the pottery. The massage technique results in more minor depressions that follow the shape of the basin, while the paddle-anvil technique produces more significant depressions that follow the shape of the stone used as the base. These depressions may not be visible if the pottery is polished or smoothed on the inside.

Making pottery involves applying clay in an elongated shape on the neck, attaching it along the neck, shaping it, and trimming it. The manufacturing technique is still simple, and the drying method involves sunlight. The burning method used is still open burning. This pottery-making tradition is still being developed today, particularly at the pottery-making center in Galo Gandang, Tanah Datar, West Sumatra. The incised technique is one of the old techniques still being used today.

Pottery-making techniques such as massage, paddle-anvil, and decorative techniques featuring geometric motifs and red slips are commonly found at neolithic sites in the archipelago. For instance, Kalumpang (3,800 BP - 400 AD) is a neolithic site where these techniques were used (Figure 4). Red slip pottery and rope-decorated pottery are typical products of prehistoric Austronesian-speaking cultures. These two types of pottery are found in separate areas. Red slip pottery is spread across Taiwan, the Philippines, eastern Indonesia, and the Pacific region (Spriggs 1989 in Simanjuntak, 2015, p. 30). On the other hand, rope-decorated pottery is found in China, Taiwan, and Mainland Southeast Asia, as well as in Sumatra and Java (Simanjuntak, 2015, p. 32).

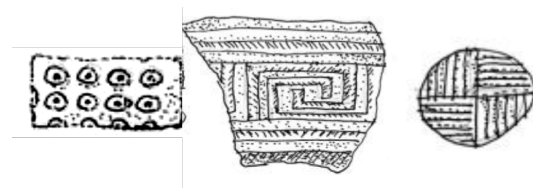


Figure 4. Decorative motifs on Kalumpang pottery (Source: Bellwood, 2000)

Traces of neolithic culture can be observed in the cave sites in the Paninggahan area of Solok Regency, situated on the shores of Lake Singkarak. These techniques have been developed from prehistory to history and continue to evolve, showcasing the growth of local culture over time.

Neolithic sites in the archipelago are often linked to the migration of Austronesian

speakers who arrived around 4000-2000 years ago. These speakers are believed to have taken the eastern route, which involved traveling from Taiwan to the Philippines, Sulawesi, Kalimantan (north), and Maluku. Meanwhile, the western route involved traveling from Vietnam to Peninsular Malaysia, Sumatra, Kalimantan (western part), and finally to Java around 4500-4000 years ago. The chronology of Ngalau Carano and Ngalau Baringin sites matches the Austronesian migration from the west around 4500-4200 years ago. However, there is a need for better dating for other sites, such as Muara Pingai-Saniang Bakar, which are located on high ground. The shell samples used for dating in the cave need to be improved, as the dates may be related to the presence of mollusks rather than direct human activity.

The Austronesian Protohistory began around 2000 years ago and continued until the 4th or 5th century AD. After that, it entered into historical periods, starting from the Hindu-Buddhist era and continuing until later times (Simanjuntak, 2015, pp. 26-28). The phases were also experienced by Austronesian speakers around Lake Singkarak, as evidenced by their pottery findings.

During the Neolithic period, Austronesian speakers spread from Taiwan and brought their culture, which included grain farming, domestication of dogs and pigs, and pottery with rounded bottoms. The pottery was decorated with red slips, stamps, scratches, and string marks with lips folded outwards. They used stone adzes, bark-beating stone tools, and net-weight stones (Bellwood, 2000, p. 313). Nets were essential in environments near water, such as seas, rivers, and lakes. Interestingly, no stone tools weighing nets were found, but decorative net patterns were discovered on pottery at sites on the shores of Lake Singkarak.

The survey conducted in the Saning Bakar hills discovered decorative pottery. The pottery was adorned with striped, rope, and

mesh patterns, similar to the ones found in Ngalau Carano. The net pattern is commonly found on pottery around Lake Singkarak, both on the banks and in the hills. Generally, the decorative pottery patterns that developed on the shores of Lake Singkarak are geometric patterns such as stripes, ropes, nets, woven, and round concave using incised, excised, and impressed techniques. Pottery with red and black slips was also found, and the development of this technique continues to this day. The manufacturing techniques used are hand massaging and paddle-anvil techniques, traditions that continue today in West Sumatra.

The Paninggahan people have a long tradition of making boats using Surian wood, which grows around Singkarak. They used to make dugout canoes and boats made from whole trees (Figure 5). Although traces of mortar boats can still be found today, people no longer make them because the materials are increasingly difficult to obtain. Instead, they have been replaced with plank boats whose shape has mostly stayed the same as mortar boats. The community around Lake Singkarak still relies on fishing and looking for mollusks/*pensi* to fulfill their daily needs or to sell. They utilize the natural resources of Lake Singkarak to support their daily lives and provide a livelihood for their people. One known type of fish is *Bilih* (*Mystacoleucus Padangensis Blkr*). At least the livelihoods of the people around Lake Singkarak can now be used as a comparison in getting a picture of the past.



Figure 5. Utilization of boats/*biduak* (dug-out canoe) on Lake Singkarak
(Source: Susilowati, 2021)

4. Conclusion

Austronesian pottery often featured decorative motifs such as stripes, ropes, nets, woven patterns, round concave shapes, red slips, and black slips. These motifs were commonly found on prehistoric and historical sites around Lake Singkarak.

The use of excised, impressed, and slip-painting techniques to create decorative pottery is often linked to the arrival of Austronesian speakers in the archipelago. The evidence found in this area suggests that the shores of Lake Singkarak were where Austronesian speakers settled and introduced their neolithic culture, which later developed into historical times. Pottery makers still use the traditional method of using red and black slips in their creations. They also continued to use old techniques, such as massaging and palming the clay with a wooden bat and stone base. Additionally, the steaming process still involves the use of stones.

The decorative motifs used in the past and present reflect the skills and daily lives of the people who support them. The rope and woven patterns illustrate that equipment such as boat mooring ropes and woven containers for fishing were made to meet daily needs. Similarly, a net motif indicates that nets are essential equipment for fishermen, both in the past and present, to catch fish and collect *pensi*/mollusks in the lake environment.

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Singkarak Lake Hills open site is located on the border of Nagari Muara Pingai and Saming Bakar (Source: Susilowati et.al., 2021)