



# New Data on the Occupation and Culture of Toalean and Austronesian Speakers in Maros, South Sulawesi

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**Abstract.** This research aims to find out the cultural diversity and patterns of Austronesian and Toalean human occupation. The method used is survey and excavation in open locations and rock shelters. In addition, excavations were carried out at the Bulu Bakung open site, Sibokoreng and Cenra-cenranae rock shelter. The survey, which was conducted on four open sites, gave a contextual understanding of Austronesian artifacts associated with chert flakes as Toalean technology. As a result, the study showed that the entire site had surface findings that indicated occupancy from different populations. Dating analysis from stratigraphic layers in two rock-shelters shows the pure occupancy of Toalean in the Sibokoreng rock shelter in the range of 9135–8991 cal BP to 10160–9773 cal BP. Dating analysis from the stratigraphy of the Cendra-cenranae rock shelter in the range 5050–4855 cal BP has artifacts by Maros Point, blades, and microliths associated with pottery fragments and incisors. It is possible at the beginning of Austronesian speakers' arrival in Mallawa, to inhabit rock shelters and caves that have natural resources, especially the deer which they consume. The next phase is shown on open site occupancy at 2061 cal.BP with high-intensity pottery findings associated with pickaxes and chert flakes. The chert flakes on the open site and the association of blades, microliths, Maros Points, and pottery fragments in the Cenra-cenranae rock shelter and the slaughtering of human teeth illustrate the existence of two different types of cultural products; Toalean-Austronesian which can be interpreted as a trace of multiculturalism.

**Keywords:** Toalean · Austronesian · cultural diversity · Mallawa · multiculturalism

## 1 Introduction

This paper is the result of the previous year's advanced research with the theme of Toalean (Toala or Toalian) and Austronesian cultural contacts in the Mallawa Area, Maros Regency, South Sulawesi. It has a cave or rock shelter distribution and open sites. The research was focused on the Mallawa area, Maros Regency, South Sulawesi. Karstic environmental features of the area provide rock resources, landscapes, flora, fauna, and hydrological resources that are important in prehistoric life [10, 13].

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The existence of caves and rock shelters and open sites is a natural condition in the prehistoric life of this area. The Toalean can be assessed as a developed cultural expression related to the indigenous hunter-gatherer population that occupied the southwestern arm of the island of Sulawesi [12].

Research results in recent years have illustrated how early modern humans who had arrived at the end of the Pleistocene had symbolic behavior in the form of works of art in the form of rock drawings, carvings, and jewelry. Intensive research in the caves of the Maros-Pangkep Karst Region shows the age of the rock drawings with various shapes aged between 46 and 18 thousand years ago [2, 3, 6]. One of the images dated 43,000 years ago even shows a hunting scene as an illustration of the socio-economic conditions of early hunters at that time [3].

Occupation in the same area continued into the middle Holocene and resulted in a new innovation in the production of stone-chip technology known as the Toalean technological complex. The technological characters shown are the Maros Point and Sawlate types which are estimated to have developed between 8000 and 7000 years ago and may have lasted until the presence of Austronesian speakers in the past 4000 years [7, 19, 25].

Prehistoric archaeological researchers in South Sulawesi still believe that the markers of Toalean culture are Maros Point artifacts, geometric microliths, and blades [21, 14]. It is based on previous findings in Panninge Cave, which show a strict stratigraphy of the location of Maros Point associated with the human skeleton of 7200 BP [8]. Although Bellwood doubts the existence of Maros Point as a result of Toalean cultural products because it is often found together with pottery fragments [4, 5], Maros Point's findings at several sites in Mallawa reinforce their presence in the Toalean cultural layer, so that still interpreted as a marker of Toalean culture.

From a regional perspective, Bellwood assumed that Maros Point might be used by groups of hunter-gatherers after interacting and living side by side with Austronesians. Such a phenomenon is like the ethnographic relationship between the Agta hunter group and the Luzon Farmers who are close to the Philippines. Thus, according to Bellwood, it is unclear where Maros Point is in the context of the use of both races that once inhabited caves and rock shelters or inhabited open sites in South Sulawesi [5]. Maros Point's position as a product of Toalean culture is confirmed by its presence in several cave/rock shelter sites in Maros. Systematic research at the Leang Jarie site, Maros has found Maros Point, geometric microliths, and asymmetric microliths (backed points) in the soil layer 2, aged 8060–7960 BP [25].

The next cultural phase is marked by a number of artifacts resulting from the Austronesian culture that came through a wave of migration around 3500 years ago [24, 1] with cultural markers in the form of stone axes, pickaxes, grindstones, jewelry, and pottery. In previous studies, Austronesian sites have produced more dominating open areas, despite indications that the rock shelter is also inhabited by Austronesian-speaking populations. The main cultural characteristics that provide strong clues to the existence of dwellings in several caves/rock shelters in Mallawa are shown by the presence of the pickaxe and pottery on the surface. There are also several findings of pottery fragments in the excavation of Uttange 1 Cave associated with microliths [12].

Pottery is one of the technologies carried by Austronesian populations found in open sites and in the topsoil in caves or rock shelters [12]. The similarity of pottery in terms of decoration and the red slip shows the intensively intertwined network of the Mallawa pottery industry. The time span of using pottery in Mallawa represented by Bulu Bakung sites aged  $3580 \pm 130$  BP [22, 16]. This was made possible using local raw materials at the Bulu Bakung Site and its surroundings as evidenced by the suitability of the compound (XRF) [11].

The results of previous research indicated that there had been contact with the Toalean culture with Austronesians in Mallawa at 3274 cal BP, 3609 cal BP, 6013 cal BP, and 7134 cal BP. This cultural contact allows social and cultural interactions to occur [12]. Interaction could occur through dynamic relationships involving both individuals and human groups. Thus, the main problem in this paper is: what are the forms of settlement and culture produced by Toalean populations and Austronesian speakers?

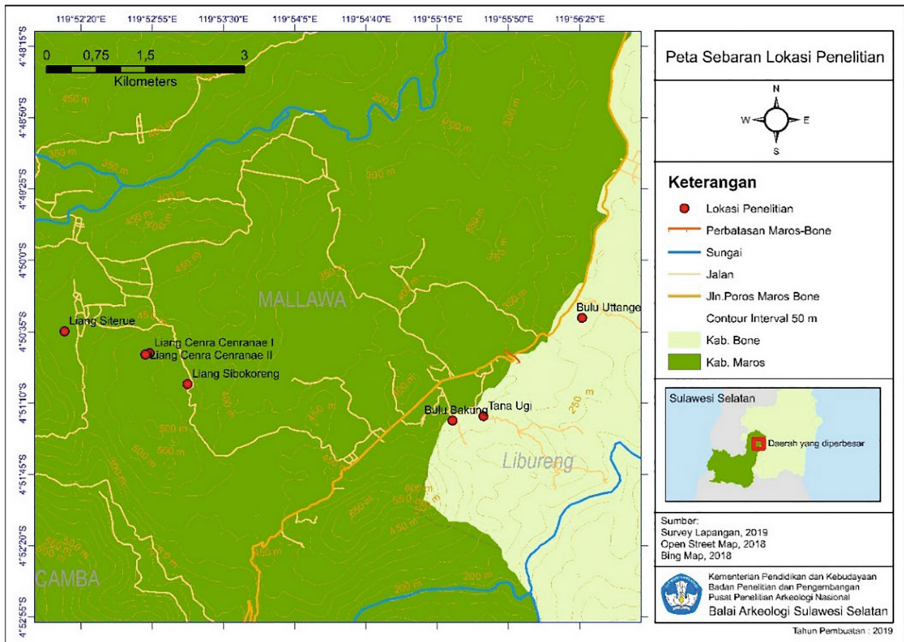
## 2 Materials and Methods

Further research that has been carried out in 2019 using survey and excavation methods. This survey is used to see the distribution of cave/rock shelters and open sites by observing the artifact potential that marks the intensity of occupancy of the two populations, namely the Toalean (Australomelanesid) with Austronesian (Mongoloid). In this case the identification of early Austronesian and Toalean cultural artifacts in the Mallawa area, Maros was identified. As it is known that the markers of Toalean culture have been blades, geometric microlites, and Maros Point. The Austronesian cultural markers are red slip pottery, jewelry, and embroidered stone artifacts (especially axes, pickaxes, and whetstone).

Furthermore, excavations were carried out at the Sibokoreng and Cenra-cenrae rock shelters, as an open site, namely Bulu Bakung (Fig. 1). The excavation is carried out by digging with a spit technique with an interval of 10 cm. The aim is to find out the dating of the site and the association of archaeological findings found in each soil layer of the excavation. The results of this excavation became the basis for knowing the age of each layer and the trend and intensity of artifacts using classification techniques. All the findings that have the characteristics of artifact technology are analyzed in each layer of soil in the excavation.

Artifact analysis was carried out to determine the cultural elements that dominated each layer of soil in the excavation. This analysis also observed the intensity and quantity of artifact findings in each layer of the excavation. In this case, analyzed the types of findings that dominate each layer of the excavation, both in the cave/rock shelter site and in the open site. This analysis certainly could add new data and will also maximize the analysis of the results of previous studies by expanding the study area (especially excavations in rock shelters and open sites).

Carbon analysis conducted by Beta Analytic, Miami, Florida, USA aims to determine the period of occupancy and the tendency to use artifacts that are indicative of certain cultural dominance in the stratigraphic layer of the former second occupancy of the population that once inhabited Mallawa, Maros. From the number of sites that were excavated, only a portion of the layers was analyzed by dating, because the findings of



**Fig. 1.** Map of prehistoric sites from the research 2019: rock shelters of Sibokoreng and Cenra-cenranae, Open sites of Lau Ale, Bulu Uttange, Tana Ugi and Bulu Bakung.

organic objects were only found on that layer. The findings in the same cultural layer or have the same period, can describe the occupational period of a human group.

Processing data on bone specimens found from the excavations in this study, specimens obtained from these sites were processed through two stages; the identification stage and the analysis stage. The identification stage is the descriptive stage, while the analysis phase is the calculation phase [27, 17, 18, 15, 20]. The descriptive stage was carried out, namely the identification of the specimen including the element, taxon, element side, taphonomy, burning traces, and artificial traces. The analyzes performed were the Number of Identified Specimens (NISP) and Minimum Number of Individuals (MNI), the processing of bone artifacts, the characteristics of the sharp side of the bone artifacts, and the frequency of burning and unburned artifacts.

### 3 Discussion

#### 3.1 The Artifacts from Open Sites and Rock Shelters in the Mallawa Area

Innovation of stone tools in the form of Maros Point and geometric microliths emerged in the Holocene phase together with stone artifacts that produced smaller flakes and more complex technology. Experts call this Holocene phase stone equipment an integral part of the Toalean cultural complex. Maros Point might function as an arrow or a spearhead in hunting. The general shape of the Maros Point is a flake with a tapered tip, bifacially

retained on both lateral parts so that it looks jagged. The base of the concave is also concave bifacially so that it looks winged [25].

Apart from Maros Point, the findings of older microliths over the age of 6000 are also considered markers of pre-neolithic culture [4]. It is suspected that microliths were still in use until the arrival of the Austronesians in Maros, Pangkep, and Bone within 3500 years. The presence of pottery is associated with microliths in Uttange 1 Cave [12] and the Balang Metti site in Bone Regency provides strong evidence of the technology and its use in the context of the final Toalean dwelling when the migration of Austronesian speakers arrived in Sulawesi [26].

Topographically, the open sites are located on hilltops. Overall findings of the four open sites, the Bulu Bakung site was the most complex among other open sites. Previous research also confirms the position of Bulu Bakung as a pure Austronesian site in the range of 3580 BP [22] and 2281 BP [9]. In the context of findings on the Bulu Bakung site, it was found that various types of artifacts were quite varied such as pottery fragments, pickaxes, stone axe, sharpening stones, and beads. However, it also has findings of shale made from chert and limestone silicified whose presence has a contextual relationship when it is found in the excavated soil layer. The results of the calendar were carried out in 2019 with charcoal samples obtained from spit 12 in the soil layer (layer) 2 with a depth of 110 cm aged 2060 cal BP. In this stratigraphic layer, there is an association of findings of pottery fragments, pickaxes, and chert material flakes.

Moreover, open sites such as Bulu Uttange and Lau Ale also have a very minimal discovery context, only in the form of fragments of pickaxes, pottery, and flakes. However, at the Tana Ugi open site, the findings are dominated by axes and pickaxes and no pottery fragments were found as is common in other open sites.

A survey at the Sibokoreng rock shelters site, found Maros Point, flakes, blades, whetstone, this stone, and pottery. Initially from the survey results we thought that this site would provide data that could be used as a reference for the meeting of two different races, the findings of each soil layer were dominated by shale, microlite, and Maros Point artifacts (which all of which are characteristics of Toalean culture).

### 3.2 Cultural Changes in Each of the Layers of Excavation

The excavation activities carried out in 2019 included four open sites (Lao Ale, Bukit Uttange, Tana Ugi, and Bulu Bakung) and two rock shelter sites (Sibokoreng and Cenra-cenranae). Of the six sites that were excavated, only three sites that had been dated were analyzed, namely Bulu Bakung (open site), *Sibokoreng*, and *Cenra Cenranae* rock shelters. This is because at other sites there are no organic objects that can be analyzed for the dating element.

Likewise, the artifact findings were minimal at three other open sites (Lao Ale, Bukit Uttange, and Tana Ugi). There are two that were excavated on the Bulu Uttange open site only had one layer with a type of flakes made from limestone silicified. Likewise, with the open sites of Tana Ugi and Lao Ale, only one layer was found with the discovery of sandstone cracks. The three open sites do not provide significant artifact data to be used as study material in addressing this research problem.

Likewise, artifact findings were very minimal at three other open sites (Lao Ale, Bulu Uttange, and Tana Ugi). There are two that were excavated on the Bulu Uttange

open site only had one layer with a type of flakes made from meta-limestone. Likewise, with the open sites of Tana Ugi and Lao Ale, only one layer was found with the discovery of sandstone cracks. Three open sites do not provide significant artifacts to be used as study material in answering the research problem.

Radiocarbon analysis can be seen in the following table (Table 1). To facilitate an understanding of the cultural characteristics of each layer of excavation (both open sites and rock shelters), the tendency for artifact findings in laying the soil of each site will be elaborated and subsequently placed in the stratigraphic age position.

### Sibokoreng Rock Shelter

At the Sibokoreng site, excavations measuring 3 x 1 m have been carried out, which are named T6 U4, T7 U3 and T3 U3 (Fig. 2, 3). Stone artifacts found at the Sibokoreng site are 11,563 with details: consisting of 1462 complete flakes (13.28%), 9824 (84.01%) debitage, flakes retouched 142 (1.28%), 62 flakes unretouched (0.56%), core stones 58 (0.52%) and other artifacts 15 (0.35%) (Table 2).

The most dominating material on this site is 73,15% (n = 8459) chert material, while other materials are 23,18% volcanic (n = 2680), 0,59% (n = 68) limestone silicified, 2,1% limestone (n = 251), andesite 0.1% (n = 12), clay stone 0.018% (n = 21), quartz 0.36% (n = 41) and jasper 0.27% (n = 31) (Table 3).

Modified flakes on the Sibokoreng site were found in 142 artifacts. Modification techniques that can be seen from the flakes retouch tools a number of 11 and 42 flakes un-retouch, 21 blades, 18 points, 13 microliths, 13 Maros points, two scrapers, and one serrated point (Fig. 4, 5).

Another finding that has an association with stone artifacts is pottery fragments. Based on the results of the identification and analysis of pottery found in three excavation squares in three soil layers in the Sibokoreng counted to 100 fragments. Whole pottery fragments are then divided according to their categories (Table 4 and Fig. 6).

**Table 1.** AMS dates on dispersed charcoal obtained at Mallowa, Maros, South Sulawesi, in 2019

Site	Square	Spit	Layer	Depth below datum (cm)	Dated material	Laboratory code	Date	Cal BP
Sibokoreng rock shelter	T7U3	7	2	70–80	hazelnut skin	Beta-535160	8160 ± 30 BP	9135–8991*
Sibokoreng rock shelter	T7U3	9	3	90–100	Charcoal	Beta-535161	8900 ± 30 BP	10160–9773**
Cenra-cenranae rock shelter	T5U8	4	2	60–70	Charcoal	Beta-535162	4430 ± 30 BP	5050–4855***
Bulu Bakung open site	B2S4	12	2	110–120	Charcoal	Beta-535163	2070 ± 30 BP	2061–1910****

\* 92.8% confidence interval, calibrated using the SHCAL13 (Beta Analytic 2019)

\*\* 95.4% confidence interval, calibrated using the SHCAL13 (Beta Analytic 2019)

\*\*\* 93.8% confidence interval, calibrated using the SHCAL13 (Beta Analytic 2019)

\*\*\*\* \*94.1% confidence interval, calibrated using the SHCAL13 (Beta Analytic 2019)



Fig. 2. Sibokoreng rock shelter and excavation process

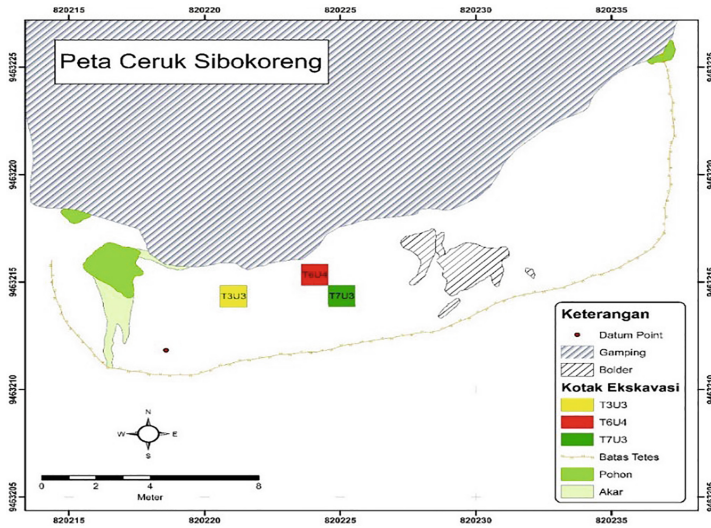


Fig. 3. The location of the three positions for excavation activities at the Sibokoreng rock shelter

**Table 2.** Classification and percentage of stone artifacts at the Sibokoreng Rock shelter.

Category	Number	Percentage
Debitage	1462	13.28%
Complete flakes	9824	84.01%
Flakes retouched	142	1.28%
Flakes unretouched	62	0.56%
Core	58	0.52%
Manuport	15	0.35%
Total	11563	100%

**Table 3.** Number and percentage of stone artifact material at the Sibokoreng

Material	Number	Percentage
Chert	8459	73,15%
Limestone	251	2,17%
Jasper	31	0,27%
Quartz	41	0,36%
Limestone Silicified	68	0,59%
Volcanic	2680	23,18%
Andesite	12	0.1%
Clay Stone	21	0.018%
Total	11.563	100%

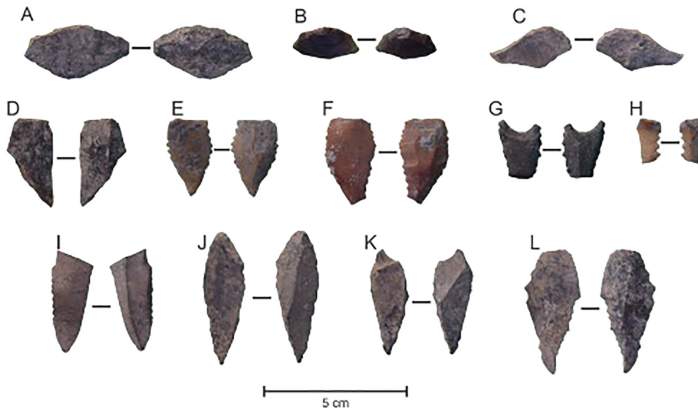
The association of pottery fragments with blade-type rock artifacts at layer 2 (9100 cal BP) and layer 3 (10160 cal BP) is very likely due to the hollow nature of the soil due to the interruption of chunks from the cave walls, allowing an object to infiltrate the soil layer. Thus, Sibokoreng rock shelter is a Toalean residence.

### Modified Specimens (Bone Artifacts)

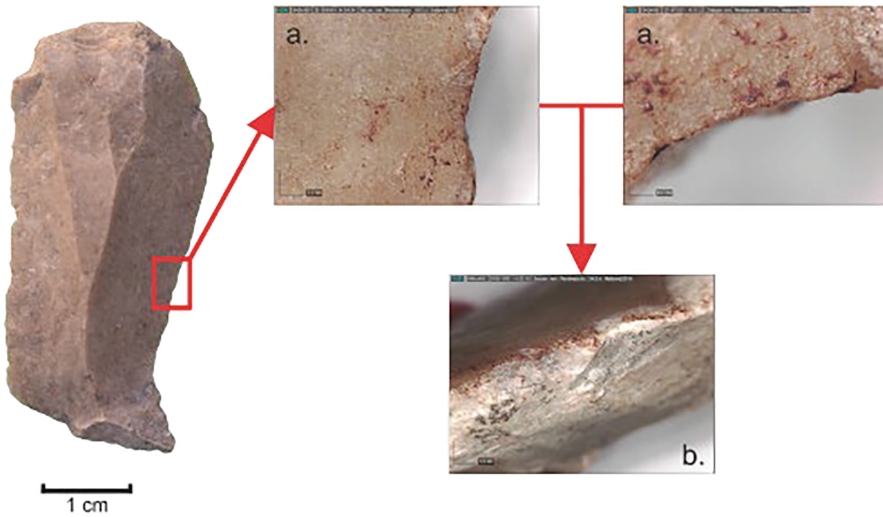
Modified specimens are pieces of bone whose form has undergone changes due to human action. Working stages and characteristics of bone artifact sharpening are done by breaking, flaking and retouching, scraping, sharpening, grinding, and cutting or slicing.

Identification and analysis of specimens from the Sibokoreng rock shelter came from three excavation squares. The name is T3U3, T6U4, and T7U3. The number of specimens found from the three squares is 1,021. The specimens come from three categories, namely unidentified specimens, identified specimens, and modified bones/bone artifacts (Table 5).





**Fig. 4.** Microlith (A, B, and C), Maros Point (E, F and G), Maros Point Frsagment (H), Maros Point Support (I) and Blade (J, K and L).



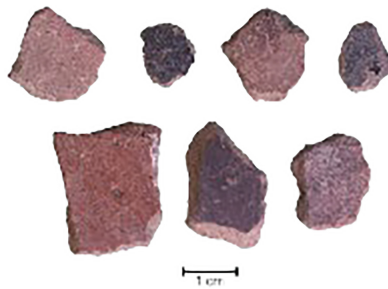
**Fig. 5.** Use-wear on the type of blade in the square of T7 U3 spit 4-layer 2.

**Identified Specimens**

There are 623 identified specimens found at the Sibokoreng Site. But in those numbers, there are 158 specimens whose taxa cannot be fully identified but whose elements can be identified. Therefore, these specimens were not included in the analysis of the number of individuals, as well as the 165 specimens of Suidae and eight of Ciroptera. The same family that has been identified to the level of genera or species.

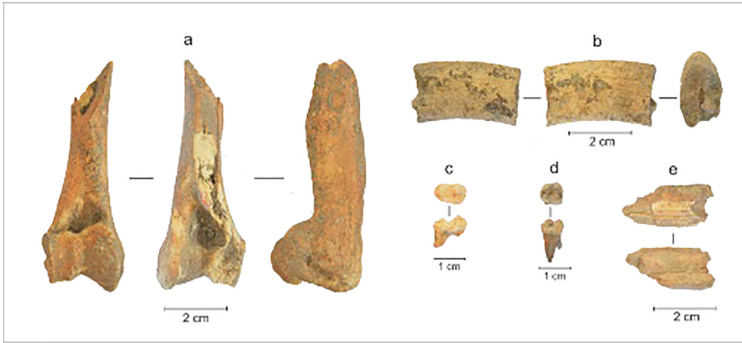
**Table 4.** Red Slip/Without Slip Pottery in the Sibokoreng

Squares and Layers	Red Slip	Without Slip
T3U3		16
1		16
T7U3	7	27
1		7
2	7	19
3		1
Total	100	

**Fig. 6.** Red Slip and Without Slip Pottery in the Sibokoreng rock shelter.**Table 5.** Specimens found at the Sibokoreng

Square	Fragment	Element	Bone Artifact
T3U3	42	106	14
T6U4	115	313	90
T7U3	106	204	31
Total	263	623	135

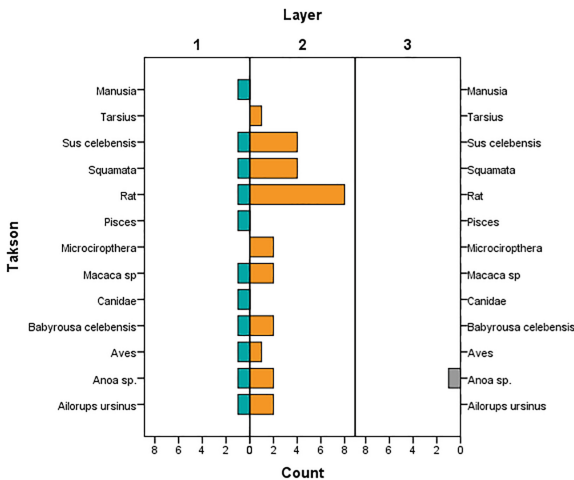
Identified elements from all specimens found were the forefoot (carpal), hind limbs, skull, mandible, maxilla, maxilla, humerus, forefoot I (ulna), forelegs II (radius), forelegs I (metacarpal), back toes I (metatarsal/metapodial), fingers (phalange), pelvic, vertebrate, ribs, wings (coracoid) (Fig. 7).



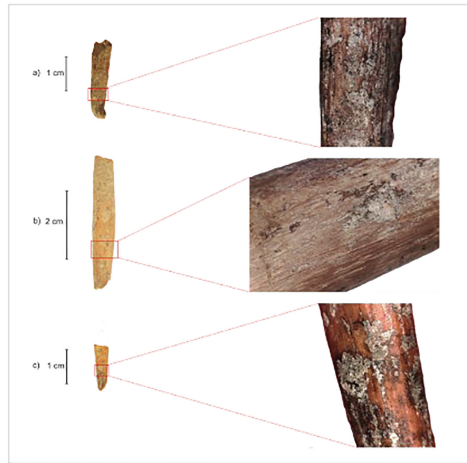
**Fig. 7.** a) Humerus Suidae (*Sus celebensis*/*Babyrousa celebensis*); b) canine teeth *Babyrousa celebensis*; c) teeth; d) molar teeth *Macaca sp*) *Sus celebensis* canine fragments.

Identified taxis; cuscus (*Ailurops ursinus*), anoa sp., babirusa (*Babyrousa celebensis*), Sulawesi wild boar (*Sus celebensis*), birds (*Aves*), monkeys (*macaca sp.*), dogs (*canidae*), insect-eating bats (*Microchiroptera*), snakes (*Sus celebensis*), birds (*aves*), monkeys (*macaca sp.*), dogs (*canidae*), insectivorous bats (*microciroptera*), snakes (*Sus celebensis*), birds (*aves*), monkeys (*macaca sp.*) squamata), rat, tarsier, fish, and human (Fig. 8).

The picture above shows that there are differences in the number of individuals found between Layer 1, Layer 2, and Layer 3. Significant changes found at Layer 3, only found one taxon with the number of one individual, namely *Anoa sp.* Based on the type of taxon found in Layer 1 and Layer 2, it appears to have differences in terms of taxon types. The difference is the presence of taxon found in Layer 1 but not found in Layer 2, and vice versa.



**Fig. 8.** Minimum Number of Individu (MNI) Sibokoreng Site.



**Fig. 9.** Traces of work on bone artifacts at the Sibokoreng site recorded through Dino lite: a) traces of contraction; b) trail sharpening; c) trace of sharpening.

Results analysis of individuals explained that in the older life phase in Layer 3, only one individual was found, namely *Anoa sp.* Then in Layer 1, based on the type of taxon there is no significant change compared to Layer 2, but based on the number of individuals there is a decrease in the number, especially for taxon *Sus celebensis*, Squamata, and rat.

Based on the analysis of individuals shows that Layer 2 is a phase that is more intensely occupied by its inhabitants compared to Layer 3 and Layer 1. This is supported by the number of individuals found in Layer 2 far more than in Layer 3 and Layer 1. In Layer 2 there are 28 individuals out of 10 taxes, in Layer 3 there is one individual from one taxon, while in Layer one there are 11 individuals out of 10 taxes.

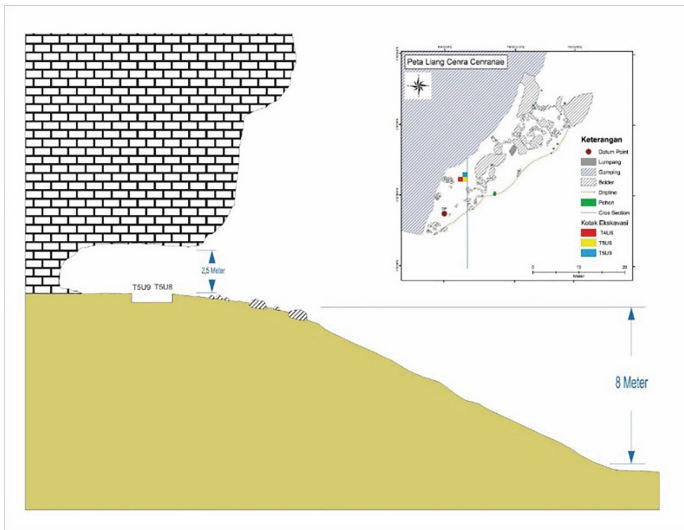


**Fig. 10.** Characteristics of sharp edges of bone artifacts in the Sibokoreng rock shelter; a) one sharp pointy side; b) has no sharpening; c) one smooth pointed edge.

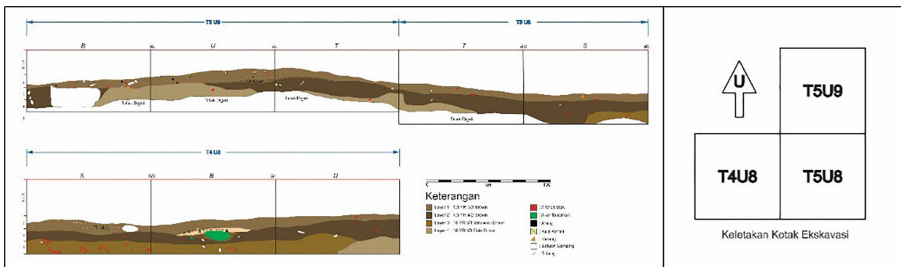
High activity in the production of bone artifacts for specific use purposes occurred during the Layer 2 settlement in Sibokoreng. Makers of bone artifacts in Layer 2 also seem to put forward the beauty aspects of bone artifacts. This was shown by the presence of bone artifacts with several traceable links (Fig. 9). The use of bone artifacts is more intense at Layer 2. Besides that, the presence of artifacts that do not have sharpness is likely to be related to damage while making or while in use. However, if you look at the size and morphology of the character of the artifact that does not have sharpness, it might also be related to a different function from the character of the artifact that has a sharp point (Fig. 10).

**Cenra-Cenrae Rock Shelter**

On this site three excavations; T4U8, T5U8 and T5U9. The T4U8 has a depth of up to 4 spits (50–60 cm) (Fig. 11, 12). The findings of stone artifacts at the Cenra-cenrae site can be seen in the following Table 6, 7:



**Fig. 11.** Site plan and excavation positions at the Cenra-cenrae rock shelter



**Fig. 12.** Stratigraphy of excavations at cenra-cenrae rock shelter

**Table 6.** Classification and percentage of total stone artifacts at the Cenra-cenranae rock shelter

Category	Number	Percentage
Debitage	7,375	97%
Flakes retouch	105	1%
Flakes un-retouch	78	1%
Core	27	1%
Total	7,585	100%

**Table 7.** Number and percentage of stone artifact material at the Cenra-cenranae rock shelter

Material	Number	Percentage
Chert	6,010	79%
Jasper	3	0.02%
Quartz	2	0.01%
Limestone silicified	11	0.03%
Vulcanic	1,536	20%
Andesite	2	0.01%
Clay Stone	15	0.03%
Total	7,585	100%

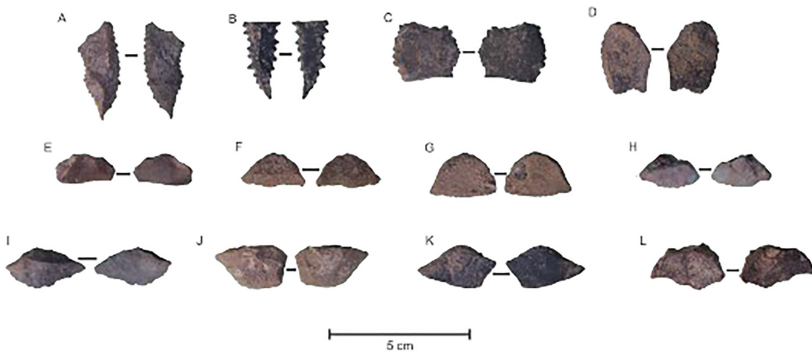
Retouch flakes found on the Cenra-cenranae rock shelter are characterized by retouched technology, and the results of the analysis show that microliths and Maros Points are found in layers 2 and 3 of each excavation (Table 8 and Fig. 13, 14 and 15).

Furthermore, based on the identification and analysis of pottery vessels in the excavation at the Cenra-cenranae rock shelter, the total number is 107. In the T4U8 Layer 1 and 2 squares, the total number of potteries without slips is 68. In layer 2 and 3 pottery without slip, there are five. In the square T5U8, red slip pottery found only in layer 2 amounted to 2, while the pottery without slip in layer 1, 2, and 3 amounted to 23. Then in the square T5U9, the pottery that was red glazed on layer 1 amounted to one, without slip amounted to three, and in layer 2 the pottery without slips found amounted to five (Fig. 16).

**Table 8.** Number of flakes modification of Cendra-cenranae rock shelter

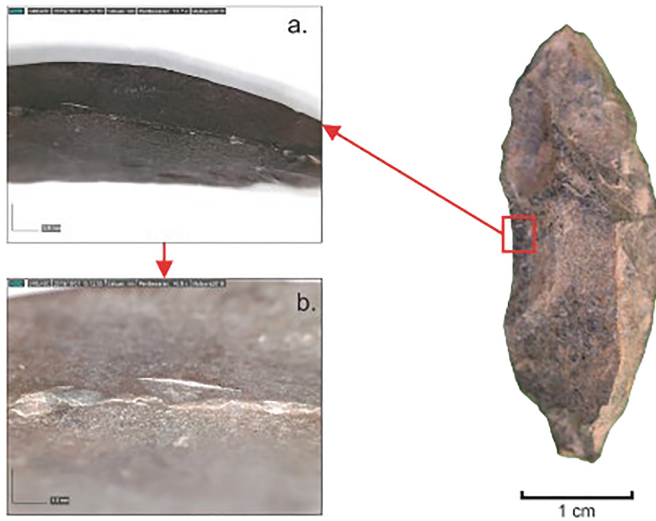
Square	Layer	Modification				
		BL	MP	MC	FL	UI
T4U8	1				3	
	2			18	24	2
	3		1	9	11	2
T5U8	1	2			2	
	2	1	3	4	5	6
	3		2	2	1	3
T5U9	1					
	2		4			
Total		3	10	33	46	13

**Notes:** BL (Blade), MP (Maros Point), MC (Microlith), FL (Flakes), UI (unidentified)

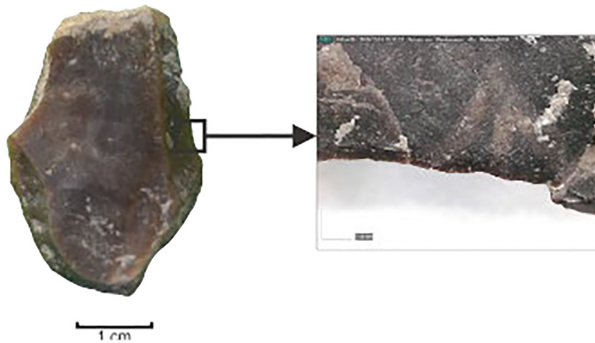


**Fig. 13.** Maros Points (A and B), Maros Point Fragments (C), Maros Point Support (D) and Microlith (E, F, G, H, I, J, K, and L).

Results of the identification and analysis of bone specimens that have been found at the Cenra- cenranae come from three excavation squares, namely T4U8, T5U8, and T5U9. The number of specimens found from all three squares was 1,638. The specimens come from the categories of unidentified specimens, identified specimens (elements and taxon), and modified specimens/bone artifacts (Table 9).



**Fig. 14.** One of the blade artifacts that have damage is Snap finding T5 U8 spit 2 layer 1.

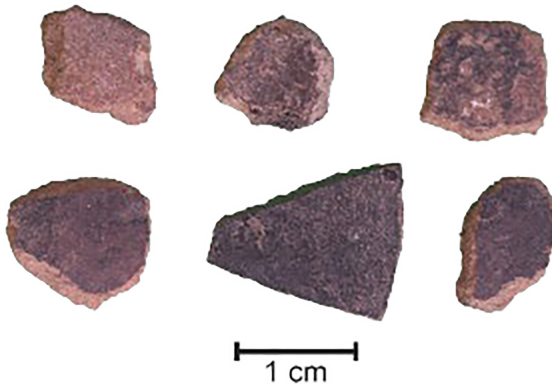


**Fig. 15.** Trace of gloss on a flake of T5 U8 spit 2-layer 2.

### Identified Specimens

Specimens that can be determined by elements and taxon from the Cenra-cenrae are 208. The specimens come from the skull, mandible, teeth, spine, humerus, forelimb bone I (ulna), forefoot II (radius), hind limb I (tibia), hind limb II (fibula), forefoot joints (carpal), hind limbs (tarsal), forelimbs I (metacarpal), back fingers (metatarsal), and toes (phalanges) (Fig. 17).





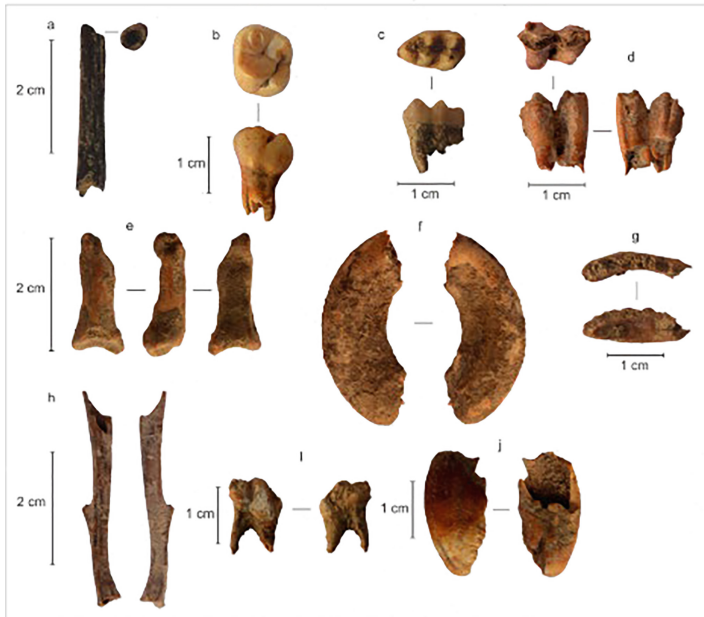
**Fig. 16.** Red and Without Slip Pottery at the Cenra-cenranae rock shelter.

**Table 9.** Specimens of the Liang Cenra-cenranae rock shelter

Square	Unidentified Specimen	Element and Taxon	Bone Artifacts
T4U8	922	135	24
T5U8	384	51	7
T5U9	92	23	1
Total	1,398	209	32

The taxon that can be identified is dominated by land animals; Sulawesi wild boar (*Sus celebensis*), Sulawesi deer pig (*Babyrousa celebensis*), deer (*Cervus sp.*), Birds (*aves*), monkeys (*Macaca sp.*), Snakes (*squamata*), rat (rat), dwarf cuscus (*Strigocus celebensis*), and monitor lizard (*Varanus sp.*). The identification of specimens at this site also known the existence of specimens derived from human elements (Fig. 18).

The results of the MNI analysis of specimens found at the Cenra-cenranae show two cultural layers (Layer 2 and 3) whose taxon and individual numbers can be analyzed. The reason Layer 1 could not be included in this analysis was that at the identification stage, there were no specimens that could represent a particular taxon.

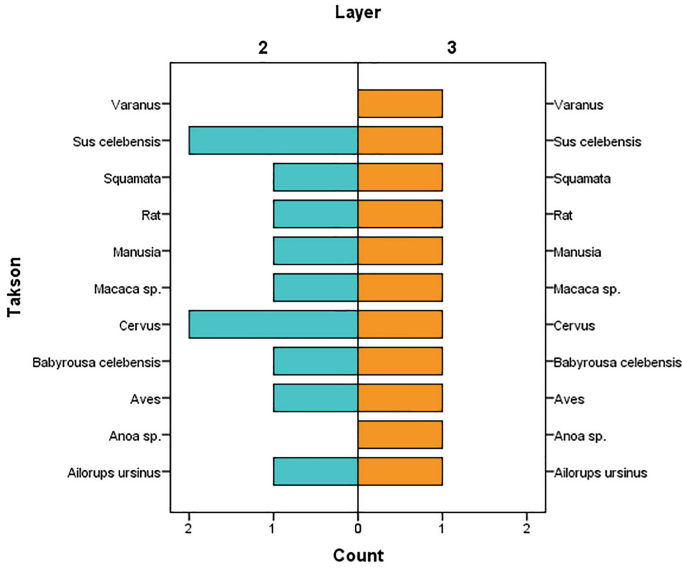


**Fig. 17.** a) bird long bone (*aves*); b) human upper molar 2 teeth; c) monkey 3 molar teeth (*macaca sp.*); d) deer molar 3 teeth (*cevus sp.*); e) phalanges cuscus (*ailorups*); f) Upper incisor babirusa celebensis teeth; g) mandible snake (*squamata*); h) tibia rat; i) premolar teeth anoa sp.; j) upper incisor teeth of Sulawesi wild boar (*Sus celebensis sp.*).

The MNI image above shows that there are fewer taxon types in Layer 2 compared to the taxon types found in Layer 3. However, in Layer 2 there are two types of a taxon that have more individuals than the same taxon in Layer 3. Taxon these are *Sus celebensis* and *Cervus sp.* Which amounts to two in Layer 2 and one in Layer 3.

### Modified Specimens

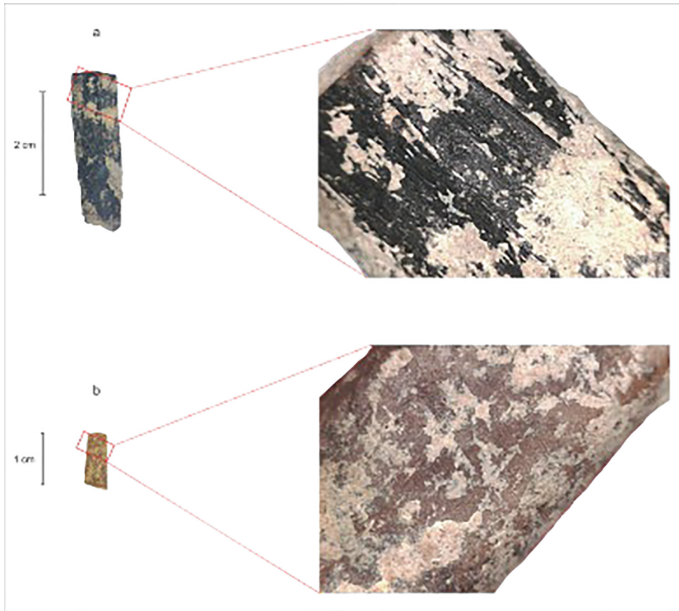
Modified specimens were found in 32 at the Cenra-cenranae. It is characterized by traces of modification in the form of conchoidal, blasting or splintering, contraction, and sharpening. The results of the identification and analysis of the processing stages of bone artifacts at the Cenra-cenranae were carried out in three stages, firstly characterized by the presence of artifacts that only leave conchoidal traces on the sides of bone artifacts. Conchoidal imprints are formed due to the release of bone due to collisions with hard objects carried out in direct percussion through punch mark activity (Fig. 19). The existence of artifacts with these traces is only found in Layer 2.



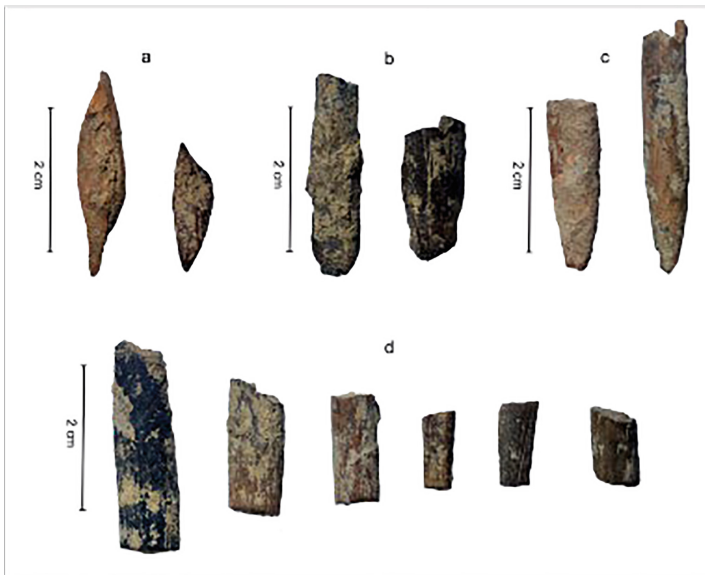
**Fig. 18.** *Minimum Number of Individu (MNI) of The Cenra-cenraeae rock shelter.*

The second stage is the process of making or chipping, shaving, cutting, and grinding. At this stage, the workmanship characteristic inherent to many artifacts is found in Layer 3. In this Layer, all four workmanship impressions have been found, namely, most workmanship impressions are shrunk. In Layer 2, the greatest number of steps in the second stage of the work is traced. In Layer 1 only cut marks are found.

The last stage of work is characterized by traces of the morphology or refinement of the morphology of the artifacts so that the artifacts look very different from the artifacts that have not experienced this process (Fig. 20). Artifacts with these characteristics are found each of two in Layer 2 and 3.



**Fig. 19.** Indications of work on bone artifacts at the Cenra-cenranae; a) scrape; b) grind.



**Fig. 20.** Characteristics of sharp edges of bone artifacts at the Cenra-cenranae; a) two sharp pointed edges; b) one sharp pointy side; c) one fine pointed edge; d) has no sharpening.

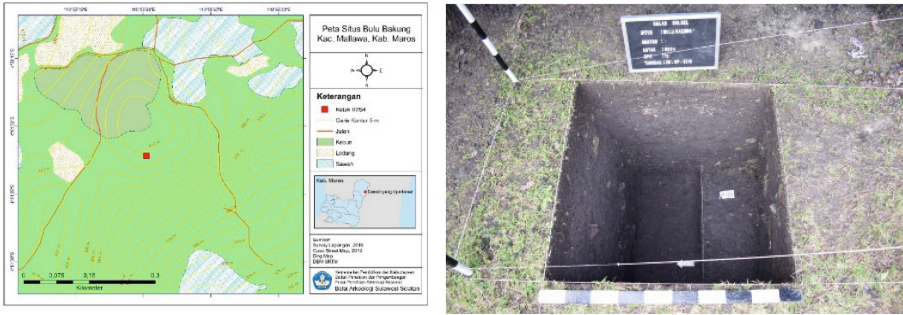


Fig. 21. Map of the Bulu Bakung (open site) and excavation

Table 10. Classification of chert flakes at Bulu Bakung site

Artifact Category	Number	Percentage
Pickaxe	111	75%
Chert Flakes	23	16%
Pickaxe	6	4%
Core Stone	3	2%
Manuport Fragments	1	1%
Manuport	4	3%
Total	148	100%

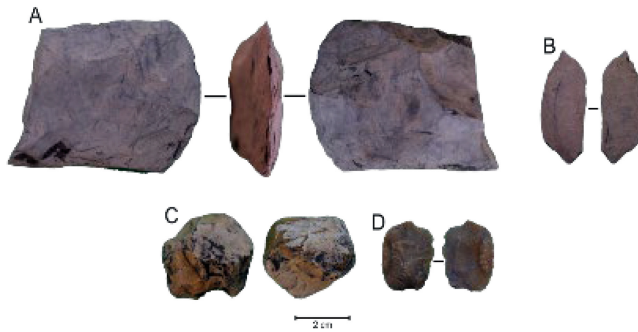
**Bulu Bakung (Open Site)**

At the Bulu Bakung site, excavation has been carried out at the foot of the hill with the name B4S2. Excavation is carried out until the 12th spit with a depth of 120 cm and there are two layers (layer) (Fig. 21). Stone artifacts found from this excavation were 148 (Table 10). Most rock artifacts were found in layer 2 with a total of 113, while layer 1 was only 35. The dominant material used was claystone with a percentage of 80% (n = 118), then chert with a percentage of 20% (n = 24). The classification shows that there are several types of artifacts: shale, chert shale, pickaxe, core stone, manuport, and manuport fragments. The large number of pickaxes found indicates that the intensity of making pickaxes at the Bulu Bakung site tends to be higher compared to the manufacture of other types of artifacts.

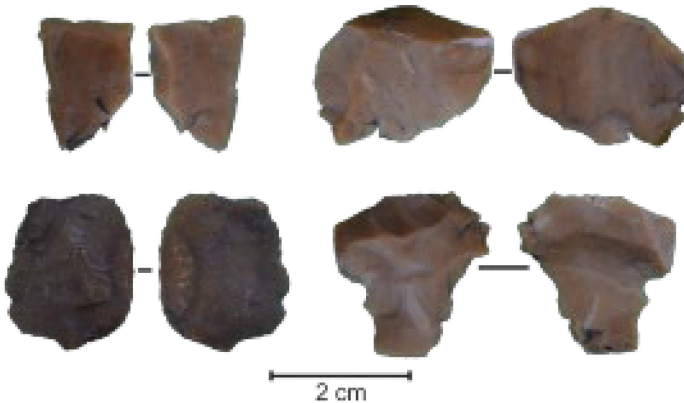
Specifically, pickaxes found on the Bulu Bakung site counted to 6 (4%). The manufacturing technique used is that almost the entire surface is scraped and leaves the base as a place to bond the stalk. The sharpening technique is done by sharpening the edges of the surface. Six pickaxes were found to have intact conditions with an average size range of 62.07 mm in length and 41.79 mm in width (Fig. 22).

Chert flakes are dominated by whole flakes with a percentage of 54% (n = 14), 31% chips (n = 8), left lateral 4% (n = 1), and core stones 11% (n = 3). The average size of chert flakes at the Bulu Bakung site is 26.77 mm long, and 26.55 mm wide, and no modified chert flakes were found (Fig. 23).

Moreover, the results of the identification and analysis of pottery amounted to 6,912. In Layer 1 found 13 pottery red slips and no-slip totaling 354. On layer 2 found 487 pottery red slips and 2,602 without slips. Based on this number, pottery was found in Layer 1 which has a motive of 1 and 366 fragments without motifs, in layer 2 found 62 patterned fragments and 3,027 without motifs (Table 11 and Fig. 24, 25).



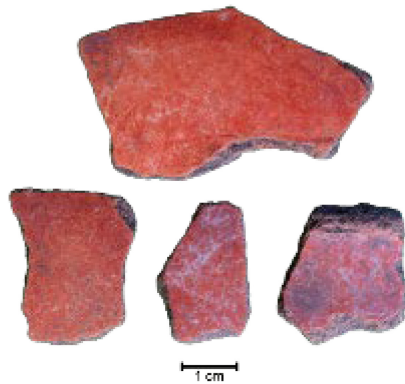
**Fig. 22.** Pickaxe on spit 10 layer 1 (A), pickaxe shale (B), Core on spit 1 layer 1 (C) and flakes made from chert spit 2 layer 2 (D).



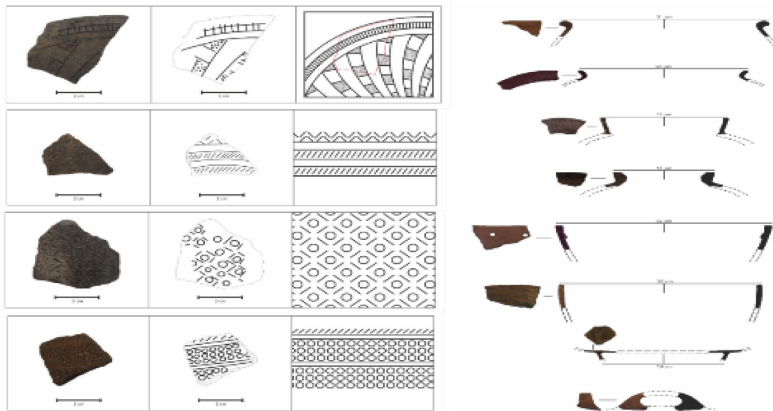
**Fig. 23.** Findings of flakes on the excavation at Bulu Bakung site.

**Table 11.** Frequency of excavation pottery fragment in Bulu Bakung site

Layer	Red Slip	Without Slip	Motif	Without Motif
1	13	354	1	366
2	487	2,602	62	3,027
Total	500	2,956	63	3,393



**Fig. 24.** The pottery with red slip on Bulu Bakung Site.



**Fig. 25.** Several types of motifs and pottery reconstruction at Bulu Bakung open site.

Results of animal bone specimen analysis found on Bulu Bakung as many as 12, derived from pigs (*Suidae*). The elements found came from incisor roots and molar fragments (Fig. 26).



**Fig. 26.** Lower incisor fragments of *Sus sp.*

### 3.3 Cultural Diversity

Austronesian speakers tend to choose caves or rock shelters as initial dwellings. Caves and rock shelters that are not far from water sources or near rivers are ideal choices because they contain food sources such as fish and shells. Excavation results found blades, microliths, and Maros Point associated with 107 pottery fragments. Association findings were found in layer 2 depth of 60–70 cm with a date of 5050 cal BP.

The findings of several pottery fragments in the rock shelter/cave provide clues that perhaps at the start of the arrival of the Austronesians in Mallawa, Maros inhabited a rock shelter/cave. This phenomenon is not limited to the archipelago, but within the scope of Southeast Asia in general. The fact of proof of occupancy is always found in the top layer of the cave, although generally classified as thin. If they do not find caves or rock shelters in the distribution area, they inhabit open landscapes on the plains or hillsides close to water sources. An example of such dwellings are found in Passo (North Sulawesi), the Neolithic complex of Purbalingga (Central Java), Karangnungal, Tasikmalaya (West Java), and Kendeng Lembu, Jember (East Java) [24].

Based on the artifacts on layer three of the Sibokoreng, microlith, and Maros Point are technological features of the Toalean stone tool culture which are cave dwellers in the Maros-Pangkep karst group before the arrival of Austronesian speakers in South Sulawesi. Thus, the intensity of findings in layer three is the Toalean cultural layer. The Sibokoreng dating in the excavation of layers 2 and 3 has found several rock artifacts of microlith and Maros Point types aged 10,160 - 9,100 cal BP. Pottery fragments on both layers indicate erosion or infiltration caused by soil structure which is loose soil and contains many non-compact limestone boulders. In comparison, such soil conditions were also found in studies in Leang Jarie, Maros. Dating data and the presence of pottery in Leang Jarie in the soil layer measuring 8,000 years ago but mixed with Neolithic layers aged between 3,500–2,800 cal BP due to erosion that occurred on the cave floor [25].

Based on the analysis of stone artifacts and animal bones, the types of findings in layer three in the Cenra-cenranae are different types in layer three in the Sibokoreng. Characteristic findings on layer three in Cenra-cenranae have similarities in layer two in

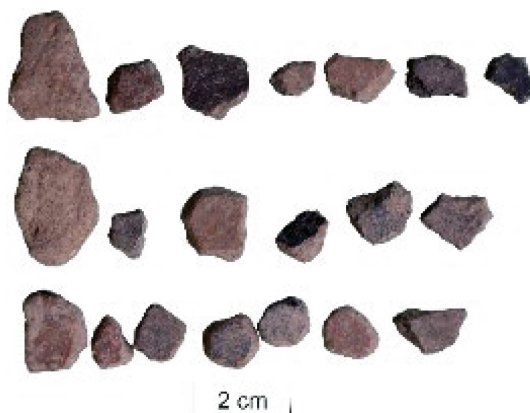


the Sibokoreng site. The similarity can be seen in the form of bone tools that are burned, shaved, or that have undergone a sharpening process. Likewise, pottery is found in each layer. Therefore, although the cultural layer shows the technology of stone artifacts with the characteristics of Toalean technology, it appears that different cultural characteristics are generally used by the Austronesian human culture. The indications for Austronesian elements are seen in Layer 2 with a date of 5050 cal BP with an indication of the association of pottery (Fig. 27), blades, microliths, Maros Point, and flakes made from chert. However, it is emphasized once again that this calendar still needs to be tested in the future.

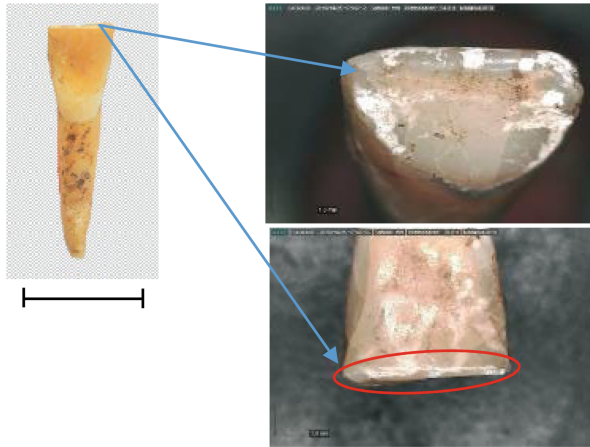
In the stratigraphic layer, 5050 cal BP in Cendra-cenranae is the discovery of human incisors that have been flattened (dental trimming) (Fig. 28) and the findings of deer bone (*Cervus* sp.) fragments (Fig. 29). As a comparison, evidence of tooth decay by the Austronesian population was also found at the Loyang Mandale and Loyang Ujung Karang sites, in Central Aceh. Most of the thirteen human skeletons aged 4000 - 3000 BP at these sites had damage to the incisors caused by dental trimming activity so the incisors became flat [28].

The Surveys and excavations at the Bulu Bakung open site both earlier [11] and in 2019, show a high intensity of findings, reflecting occupancy in open areas. Unlike the findings in rock shelters in the same area, the findings at the Bulu Bakung Site (open site) are only in the form of stone artifacts and pottery. Potteries are more dominant with several findings of as much as 6,372 compared to the stone artifacts of as much as 148. Types of stone artifacts consist of fragments of pickaxes, pickaxes, and chert flakes.

Based date using a sample on layer two, the age of the Bulu Bakung Site occupation is 2060 cal BP. It means that the people who inhabit the Bulu Bakung are Austronesian-speaking people who enter the mainland Sulawesi region perhaps in the next migration. When compared with the findings in a cave/rock shelter dominated by Toalean artifacts, this means that at that time there was an area that was intensively populated by Austronesian speakers which might occur in the next wave of farming activities [23]. As with



**Fig. 27.** Several pottery fragments (including red slips) were found in layer 2 of the Cenranae rock shelter excavation with a depth of 60–70 cm associated with blades, microlites, Maros Point, microlites, retained shales, and human teeth with a date of 5050 cal BP.



**Fig. 28.** Human incisors found in Layer 2 of the Cenra Cenranae rock shelter excavation at a depth of 60–70 cm with a date of 5050 cal BP prove the existence of dental decay.



**Fig. 29.** Associated deer bone (*Cervus* sp.) fragments with the stone artifacts, pottery, and human teeth in the Cenra Cenranae in layer 2 with a date of 5050 cal BP.

layer two, the characteristic findings on layer one show the same things. The findings in the form of pickaxes and pottery that dominate show this site is used by Austronesian speakers.

## 4 Conclusion

The survey results show the dominance of Austronesian-style artifacts such as pottery, pickaxes, and stone axes. In addition, flakes of chert and limestone were found, all of which showed Toalean technology. Overall surface findings both on the open site and in the rock shelter have indications of having been inhabited by two different populations, namely the population of Toalean and Austronesian.

The excavation shows the dominance of Toalean artifacts in the Sibokoreng rock shelter aged 10,160 – 9135 cal BP. The layer of soil in the Sibokoreng excavation is a layer of the Toalean culture and does not have strong evidence of interaction between the two different races.

Several findings in the Cenra-cenranae rock shelter consisting of Maros Point, blades, and microliths associated with pottery. Although pottery fragments were also found in stratigraphic layers aged 5050 BP, they cannot be interpreted as a form of cultural interaction. The dating results are classified as very old to place the position of Austronesian arrivals at the Cenra-cenranae rock shelter, so it still needs to be re-examined in the future.

However, with these data, it is very likely that initially the Austronesian population that arrived in Mallawa Maros occupied niches that relied on food sources from rivers (such as fish and shellfish) as well as animals that lived on land. It is possible that at the beginning of the arrival of Austronesian speakers in Mallawa, they inhabited niches and caves that had natural resources, especially the deer they consumed. Ethnographic data show that deer and pig hunting was carried out by the Mallawa population around 30 years ago, carried out collectively by men.

In the next cultural phase, Austronesian-speaking populations prefer dwellings on open sites. The survey findings at four open sites provide an understanding of the contextual findings of Austronesian artifacts (pickaxes and pottery) associated with flakes made from chert. If you look at the association of findings at the Bulu Bakung site excavation layer with an age of 2060 cal BP, it shows that there are two different types of culture; Toalean (chert flakes) and dominated by Austronesian cultural findings, especially pickaxes and pottery fragments. This phenomenon is an indication of Austronesian cultural dominance in open areas such as the hills in Mallawa. The presence of chert flakes also provides information on the presence of Toalean elements at the Bulu Bakung Site, which also means that Austronesian populations continue to use flakes to support their activities. This phenomenon might be interpreted as the occurrence of multiculturalism in Mallawa.

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