New Perception to Proto History Burial Site in Andarawewa An Archaeological and Geochemical Prospection

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Abstract

The megalithic burial site at Galgamuwa Andarawewa is situated at Anamaduwa Secretariat Division in the North Western Province, Sri Lanka. It is evident that 2500 years ago the proto history people had settled in this region. For burying of bodies, they have constructed different types of burials in several places in this region. Thus, to examine the geochemical prospection soil samples from the context (n=12), the glass bead samples from the furnace (n=3) and slag (n=2) were analyzed using X-Ray Fluorescence (XRF) for 22 major and trace elements. For the archaeological prospection, new findings of proto-history burials were found in the excavation carried out at Andarawewa and also many archaeological evidences were found through the field survey and excavations such as beads, inscriptions, pots and shard and chisels. The elemental values of the slag show that, Pb (470-483 mg/Kg) and Cu (855-1083 mg/Kg) are very much higher than Upper Continental Crustal Values. The white part contains higher Pb and Cu than the dark part of the slag. The concentrations of halides F, Br and I are almost similar in the white (glass) part and dark (slag) part. The Pb, Cu and as in the glass beads of the Andrawewa furnace shows that they range between 390-2920, 275-1411 and 12-127 mg/Kg respectively. However, the Fe and Ti concentrations are much lower than in the contexts though P_2O_5 is higher in the bead samples. The soil samples from the contexts of the area does not show high values for almost all the measured elements. Thus, indicating that the soils are local while the beads may have been prepared with sands brought from other areas. The carbon dating has dated that this burial belongs to the period from 500- 507 B.C.

Key words: *Burial, Soil, Geochemical, Slag, Glass bead*

Introduction

Middle Daduru Oya basin and Middle Mee Oya Basin are the most important river basins in the proto historic period. Proto historic people had settled in these river basins before the 6th century B.C (Figure 1). They have introduced Iron and Copper Technology, Village Settlement, Paddy Cultivation, Tank and Irrigation System, Animal and Plant Domestication, Black and Red Ware, Red Ware, Black Ware Pottery making Methods, Beads Production Methods within this river basin (Seneviratne, 1984) and have been recorded in the current study as well as previous excavations. The middle Daduru Oya Basin in the North-Western regain of Sri Lanka is believed that it was first colonized by hunter-gatherers during the microlithic period (Mesolithic; Deraniyagala, 1992). The excavated Galgamuwa Andarawewa megalithic burial site is situated at Anamaduwa Secretariat Division in the North Western Province, Sri Lanka (Figure 1).

The western peripheral area of Anuradhapura is very important in identifying ancient human behavioural patterns. In the proto history period, proto-historic human has been settled in this region mainly to obtain minerals and due to favourable physical factors or topographic features and cultural or socio-economic factors. Velagedara Panirendawa is one of the valuable places of ancient time. Ancient People have identified a copper magnetite deposit in Panirendawa. Sri Lankan Geology Department has later identified a copper magnetite deposit that consists of 6 million tons in Panirendawa (Senaviratne 1995). However, this deposit has been identified before 2500 BP by people who lived in the proto historic period (Figure 1). They have mined copper from the surface level and transported the mined copper magnetite to be used in the production of iron and copper objects. This evidence is highly valuable for constructing ancient metal recourse pattern between these two basins. After the proto history period, specialized people established trade and metal production in this area (Seneviratne, 1985). According to evidence found in inscriptions, it was identified that they are Kabara (Iron smith) (Paranavitane, 1970), Chuda and Manikara (Paranavitane, 1970). These people produced metal objects and beads.

They distributed these items throughout Sri Lanka, distributors are a merchant and were named as Vanika or Vaniga (Paranavitane, 1970).

Objectives

To determine the historical events and technology that existed at a Proto History Burial Site at Andarawewa based on analysis of archaeological and geochemical context, using soil samples from the context and the glass bead samples of the furnace and slag.

Materials & Methodology

The archaeological excavation was carried out in Galgamuwa, Andarawewa Megalithic burial site during the end of 2017 after surveying where a natural hollow ('pathaha'), bead production site (Furnace) and monastery complex surrounding the burial site was identified. The burial site is extended to 14 acres and 34 cist burials were identified on surface level. Among these 34 burials, a new form of cist burial within the area of 14 hectares was found while two cist burials were selected for excavations. During the exploration, many places which had been used for iron or copper production has been identified. Two radiocarbon dates were taken, which was secured on charcoal and it was dated by Beta Analytic, USA; (Beta – 482665).

Soil samples (n=12) from the context, glass bead samples (n=3) from the furnace and two slag samples were transported in double-sealed bags to Shimane University Japan, after drying for 120 ^{0}C in an oven. Each sample was dried in an oven at 160 ^{0}C for 48 h and ground for 20 min in an automatic agate mortar and pestle grinder. Powdered samples (<63 μm) were compressed into briquettes under a force of 200 KN for 60s. The briquettes were then analyzed for selected major and trace elements using powder diffraction method as for Kimura and Yamada, 1996 using an XRF. Average errors for all elements are less than ±10% relatively. Analytical results for GSJ (Geological Survey of Japan) standard JSl-1 were acceptable compared to the proposed values of Imai et al. (1996).

Result and Discussion

Archaeological evidence

The protohistoric people sometimes had used a natural hollow (Sihala meaning 'pathaha') for their small-scale paddy cultivations in the protohistoric period (Senaviratne, 1996). Subsequently, developing this culture, they had converted the hollow into a small tank.

These burials were very rich in endeared metered in particular Black and Red Ware, Red Ware and beads made of glass, iron chisels and most of the cultured material were placed as offering in the pot. The two radiocarbons were dated using the cremated bone from the burial site dated to Cal BP. 2490 (507-500 Cal B.C), cal BP, 2378 (429 Cal B.C).

Glass chips in the slag samples are not inside the material, they are attached to the outer surface. Glass chips may be artificial, considering melt feature and small cavities. Iron concretion of hematite/limonite may have been easily procured using the Brown Earth and the Red Earth in northwest Sri Lanka (Senavirathne., 2007; Cooray., 1984).

Pottery

In this excavation, pottery collection have been found that dates to 500BC (Figure 2). The untitled pottery classification was conducted on the basis of predominate Color, Rim, Shape and Body shape. Subsequently, the results as per the classification system introduced nine pottery forms. These pottery forms were classified and categorized types (form) and based on a comparison with the Anuradhapura, Pomparippu (Begly, 1981), Kok-ebe and Pinwewa Galsohon Kannaththa pottery types (Table 1). According to the pottery conservation program, three early Brahmic letters were identified on the pot shard (Sinhala Tha, Tha and Sha, Figure 3). Previous Sri Lankan researchers have not found early Brahmi letters inside the proto history burial of their excavations (Paranavitane, 1970). Thus, this is very important as this is the earliest dating regarding of early Brahmi letters in Sri Lanka. Further, Beta analytic U.S.A

has dated this burial from 500- 507 B.C. Thus, this is very important as this is the earliest recorded date regarding for early Brahmic letters in Sri Lanka.

Geochemical Evidence

The XRF results of glass bead (Table 2) show that Pb and Cu are having very high values which are very much higher than UCC. The white part contains higher Pb and Cu than the dark parts. Also, iodine has been detected in the slag samples. The halides F, Br and I are almost similar in the white (glass) part and dark (slag) part.

If these are remains of glass production, the sands used for glass production should contain high contents of Pd, Cu and low Fe content (1.54-2.55 wt%). (Pb, Cu and Fe Upper Continental Crustal (UCC) values are 20, 25mg/kg and 5.04 wt%). The white part has higher Ca content and lower Fe content while the dark part has the opposite composition (Table 2). Arsenic is also high (18-34) compared to UCC of 4.8 mg/kg and the Zircon content is almost two times higher (337-391) than UCC (190mg/kg).

The glass beads of the Andrawewa furnace slag shows that Pb, Cu and As range between 390-2920, 275-1411 and 12-127 mg/Kg respectively (Table 3). However, the Fe and Ti concentrations are much lower than in the contexts though P_2O_5 is higher in the bead samples. The soil samples from the contexts of the area do not show high values for almost all the measured elements (Table 3). Thus, indicating that the soils are local while the beads may have been prepared with sands brought from other areas. The carbon dating has dated that this burial belongs to the period from 500- 507 B.C.

According to comparison studies, Girbawa and Andarawewa furnace (Figure 4) can be dated as 3rd Century B.C. to 1st Century A.D. From the comparison studies using PCA and cluster analysis, it was evident that the Giribawa glass was very different from the South Indian glass. Surprisingly, given the geographic proximity, there was little overlap between the glass found at Mantai (Lankton, 2014; Wijepala 2019) and the Giribawa glasses, raising the possibility that the two sites were independent glass producers, or, possibly, were most active during different periods.

Iron Object

In the Andarawewa excavation, two iron chisels were discovered inside the burial pot and were dated to 500 B.C (Mendis, 2017) which may have been used by carpenters (Figure 5). The typological range and a number of metal object were found within the megalithic burials in Sri Lanka. The objects may be listed as knife, arrow- blade, nail (Senavirathne 2007). Most of these were used in hunting or as weapons (Senavirathne 2007). In Andarawewa excavation two iron chisels have been discovered inside the burial pot. These two iron chisels are dated to 500 B.C. It may have been used by a carpenter and not as a weapon. The raw material required for the production of iron implements may have been obtained from the locality itself. Iron concretion of hematite/limonite may be easily procured from Brown Earth and the Red Earth in North West Sri Lanka (Senavirathne 2007; Dahanayake 1979; Cooray, 1984). Such iron concretions can be used for smelting, and also as evidence Iron slag has been found near the Andarawewa burial site. According to Seneviratne, 2007 limonitic nodules has been in direct association with iron slag. Geological investigation has also established the vast deposit of magnetite at Vilagedara Panirendawa. This deposit can be the source used for production.

Beads

In this excavation, over 50 beads had been found by the excavation team (Figure 6). All beads are made by glass. During the exploration bead production site (Furnace) beyond north side of the burial site was identified. During the survey, a large amount of glass has been revealed as well as beehive-shaped furnaces were discovered, possibly for the primary production of raw glass.

Mineral and glass beads production had been introduced by proto-historic people to this basin. The furnaces were situated near the bank of the stream and by the canal constructed by Irrigation Department had destroyed it. According to previous survey at the site of Giribawa a large amount of glass as well as beehive-shaped furnaces, possibly for the primary production of raw glass were revealed. These two furnaces are of the same type and these two-furnace areas appear to be waste from primary glass production.

According to Lankton (2014), Giribawa samples were made from mineral soda glass with high alumina, variable potassia and lime, low cesium and low to moderate uranium. Comparing the chemical compositions of the new samples with those from previous analyses by Dussubieux (2001) and ourselves, there appears to be no significant difference in the range of values for individual oxides. In addition, there was no significant difference in composition between the beads and fragments at the site and the furnace samples, providing additional evidence that all or almost all of the glass found at the site was most likely made there (Lankton 2014)

In order to answer the important questions of dates for glass production plus possible mechanisms for exchange of the finished products, the glass from Giribawa was compared with similar glass from other sites in Sri Lanka, including Mantai, Godavaya and Kuchchaveli, as well as with glass from Manikollai, a bead making centre in Tamil Nadu most likely importing glass from a variety of South Indian sources, using the multivariate statistical techniques of PCA and cluster analysis (ibid). As expected, the Giribawa glass was very different from the South Indian glass. Surprisingly, given the geographic proximity, there was little overlap between the glass found at Mantai and the Giribawa glasses, raising the possibility that the two sites were independent glass producers, or, possibly, were most active during different periods. There was one Sri Lankan site, Kuchchaveli on the eastern coast, where glass, in the form of drawn beads, was sufficiently similar to Giribawa glass to strongly suggest an exchange relationship (ibid). Twenty out of twenty-two Kuchchaveli samples overlapped with Giribawa, with only two more similar to glass from Mantai or possibly Manikollai. This similarity to Giribawa glass is quite remarkable since most sites thought to be trading or consumption sites, such as Kuchchaveli, usually, glass beads are from a variety of sources. The significance of this strong apparent relationship will no doubt be important for the interpretation of both Giribawa and Kuchchaveli. One immediate result is that now at least some evidence for dating the Giribawa production is available. The glass beads from Kuchchaveli came mainly from two layers; the first dated to the 1st to 3rd c. CE and the second from the 7th to 8th c. CE. There was Giribawa glass in both of these layers,

suggesting that glass production at Giribawa at least spanned the two periods (ibid). Whether Giribawa production began earlier or extended later we still do not know, but the Kuchchaveli dates are a very important step to interpret glass production at Giribawa and in Sri Lanka in general (ibid). According to comparison studies of Girbawa and Andarawewa furnaces, we could identify as same type and believe Andarawewa furnaces can be dated as 3rd Century B.C or before 3rd Century B, C

Conclusions

Glass chips in the slag samples are not inside the material, they are attached to the outer surface. Glass chips may be artificial, considering melt feature and small cavities. The iron concretion of hematite/limonite may have been easily procured using the Brown Earth and the Red Earth in northwest Sri Lanka. Thus, the materials for iron production may have been obtained from the locality itself. However, due to the very high extreme values of Pb, Cu, As and also Zn the sands to produce glass should have been brought from elsewhere since the contexts soils do not show very high concentrations for the same elements.

Brahmi letters have been identified on the pot shard. This is very important as this is the earliest dating regarding early Brahmi letters in Sri Lanka and the South Asian region. Based on the archaeological and geochemical evidence, it can be decided that the soils are local while the beads may have been prepared with sands brought from other areas. The carbon dating has dated that this burial belongs to the period from 500- 507 B.C.

The distribution pattern and the Chrono - culture context of the Megalithic site in Middle Daduru Oya and Middle Mee Oya basin reveal the following features. They have introduced Iron for productions for developing their culture found by the excavation evidence and three iron chisels were found inside the megalithic burial and they were not used as weapons but as tools.

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Tables

Form	Description
A	Haliya or Muttiya - Pot with Restricted and Inverted Upper Body with Everted and Flared Rim Zone
B	Attiliya or Halliya - Large Bowl with Wide Orifice
C	Deep Globular Bowl with Restricted Upper Body and Mostly Triangular Thickened Rim Halliya
D	Barani/Muttiya - Small Storage or Water Jug with Narrow and Short Neck and Globular Body
E	Baraniya - Huge Storage Vessel with Thick Walls and no Neck
F	Small Jug with Mostly lenticular Built Body a Narrow Orifice and High and Funnel Shaped Neck
G	Pattaraya - Begging Bowl with Narrow Neck and Globular Body
H	Conical Dish
K	Lid/Lid-cum-bowel

Table 1: *Pottery form Details*

Sample	Element	1	2
Remarks		Dark part	White part
Trace elements (ppm)			
As	Arsenic	18	**34**
Pb	Lead	483	**740**
Zn	Zinc	**40**	30
Cu	Copper	855	**1083**
Ni	Nickel	**21**	20
Cr	Chromium	**47**	32
V	Vanadium	**58**	38
Sr	Strontium	313	359
Y	Yettrium	**24**	17
Nb	Niobium	**11**	9
Zr	Zirconium	**391**	337
Th	Thorium	2	ND
Sc	Scandium	ND	ND
TS	Total Sulpher	ND	ND
F	Fluoride	**167**	120
Br	Bromine	2	2
I	Iodine	73	**96**
Cl	Chlorine	ND	ND
Major elements (wt%)			
TiO_2	Titanium dixide	**0.57**	0.36
Fe_2O_3	Ferrous Oxide	**2.55**	1.54
MnO	Mangonous Oxide	**0.08**	0.05
CaO	Calsium Oxide	1.65	**2.52**
P_2O_5	Phosperous Pentoxide	0.06	**0.11**

Table 2: *Trace element and Major oxide concentrations of glass bead*

Table 3 Trace element and Major oxide concentrations of Slag and Context soils

Sample	As	Pb	Zn	Cu	Ni	Cr	V	Sr	Y	Nb	Zr	Th	Sc	TS	F	Br	I	Cl	TiO_2	Fe_2O_3	MnO	CaO	P_2O_5
Slag																							
SLAB 01-A	127	2920	77	1411	58	25	57	424	22	8	273			780	56	8	252	1052	0.44	1.87	0.11	2.43	0.15
SLAB 01-C	12	390	66	275	17	57	93	305	22	10	240	2	7	832	226	2	2		0.87	4.71	0.19	1.93	0.13
SLAB 01-D	43	1281	57	886	19	52	66	495	19	8	172		7	899	182	4	66		0.58	3.56	0.16	3.40	0.30
Average	**61**	**1531**	**67**	**857**	**31**	**45**	**72**	**408**	**21**	**9**	**228**	**2**	**7**	**837**	**155**	**5**	**107**	**1052**	**1**	**3**	**0**	**3**	**0**
RUSL/AW																							
01 CON 01	3	25	39	25	32	100	130	276	18	8	219	4	15	1020	152	4	19		0.93	5.41	0.17	1.86	0.10
01 CON 03	3	23	39	27	36	93	130	270	20	10	221	5	15	893		4	13		0.90	5.64	0.16	1.72	0.05
01 CON 04	4	23	44	30	41	119	155	255	19	9	228	5	18	911	104	3	18		1.09	6.82	0.15	1.65	0.06
01 CON 4(B)	4	23	42	33	39	94	139	254	20	10	228	6	16	890	89	3	10		1.00	6.37	0.17	1.60	0.05
01 CON 15	4	24	41	29	36	95	133	240	20	10	213	5	16	890	253	3	14		0.98	6.16	0.10	1.55	0.05
02 CON 01	3	21	42	28	31	117	134	285	17	8	197	4	20	1194	121	5	18		0.96	5.42	0.19	2.11	0.13
02 CON 02	3	20	43	29	33	89	129	259	18	8	187	4	16	904	72	4	7		0.87	5.47	0.15	1.80	0.05
02 CON 04	3	19	44	33	34	100	122	850	20	8	8	9	18	1031		4	16		0.79	5.28	0.24	7.35	0.04
02 CON 06	3	21	39	27	34	133	147	260	14	8	167	2	18	867		3	23		0.99	6.45	0.28	1.73	0.04
02 CON 07	4	19	41	27	30	75	108	391	18	8	159	4	15	962	123	5	6		0.73	4.83	0.16	3.79	0.05
02 CON 11	4	18	31	22	21	145	144	187	12	7	178	4	13	844		3	22		0.88	6.17	0.24	1.48	0.04
Average	**3**	**22**	**40**	**28**	**33**	**105**	**134**	**321**	**18**	**8**	**182**	**5**	**16**	**946**	**131**	**4**	**15**		**1**	**6**	**0**	**2**	**0.06**
UCC	4.8	20.0	71.0	25.0	20.0	35.0	60.0	350.0	22.0	25.0	190.0	10.7	11.0	NA	557.0	1.6	1.4	0.0	0.5	5.04	0.100	4.2	0.150

Table 3: *Trace element and Major Oxide concentrations of Slag and Context soils*

Figures

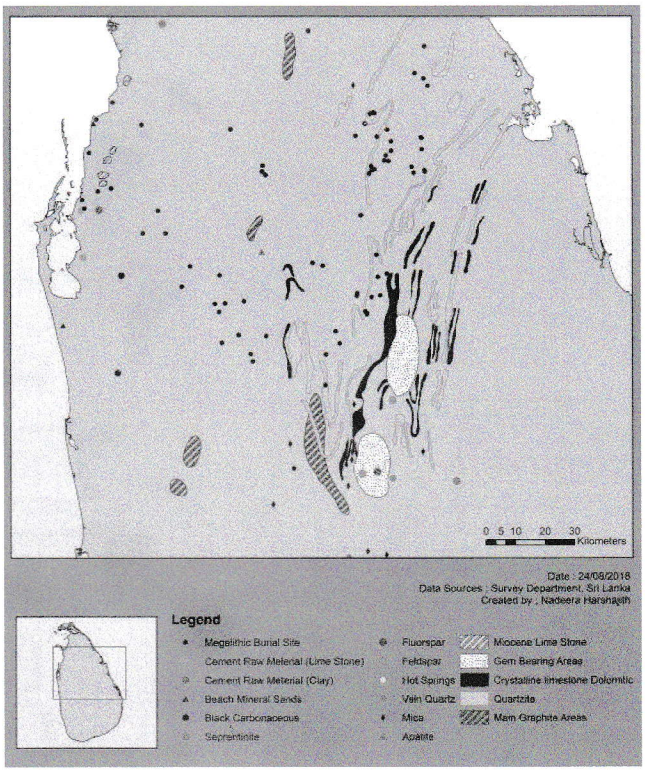


Figure 1: *Mineral Resources established surrounding the Megalithic Burial site*

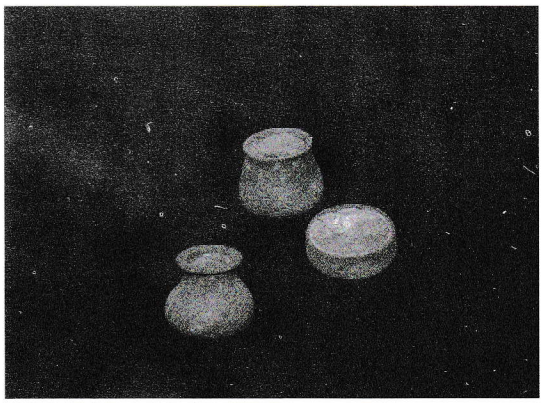
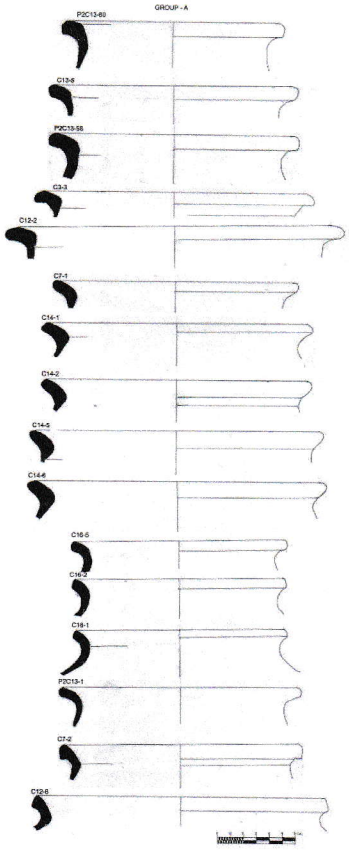


Figure 2: *Brown and Red Ware Pottery Andarawewa*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C13-5
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C3-3
C12-2
C7-1
C14-1
C14-2
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C14-4
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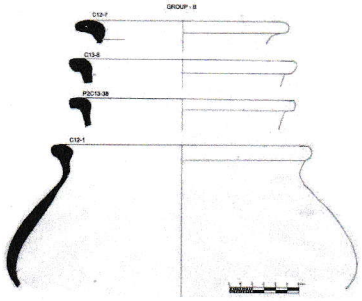
C16-2
C18-1
P2C13-1
C7-2
C12-6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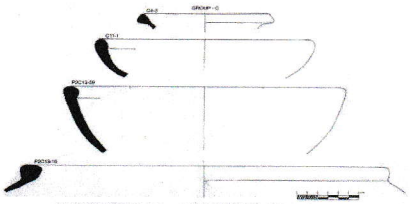
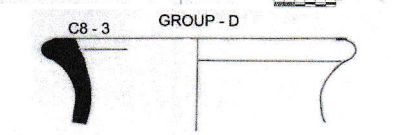
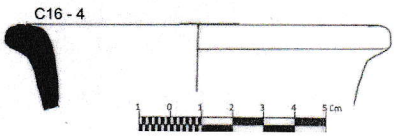
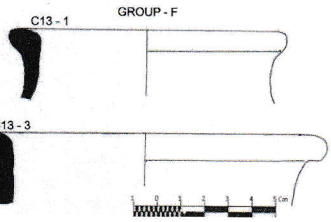
C13-1




C8 - 3
GROUP - D


C16 - 4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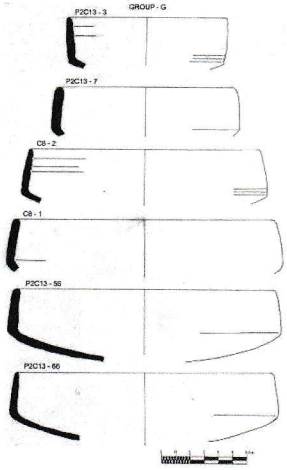
GROUP - F
C13 - 3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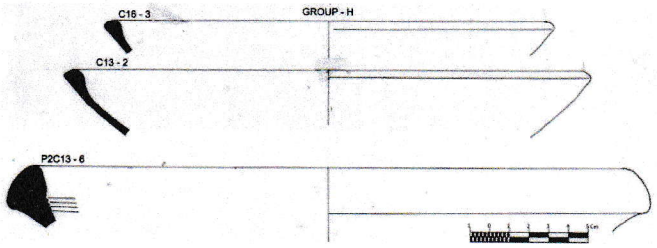
GROUP - G
P2C13 - 7
C8 - 2
C8 - 1
P2C13 - 55
P2C13 - 66


C16 - 3
GROUP - H
C13 - 2
P2C13 - 6

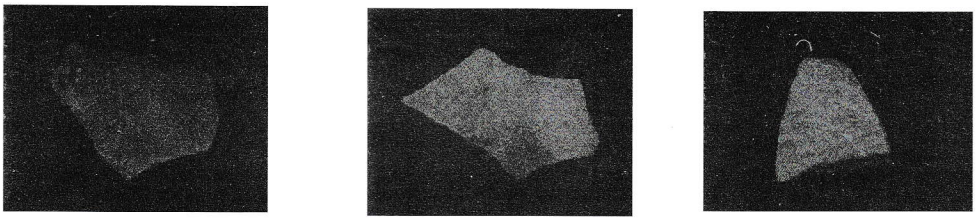


Figure 3: *Brhamic Letters on potshard*

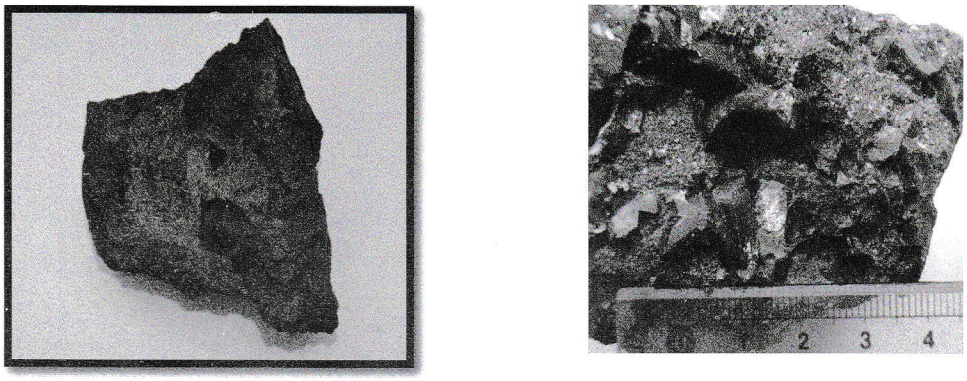


Figure 4: *Part of furnace Andarawewa*

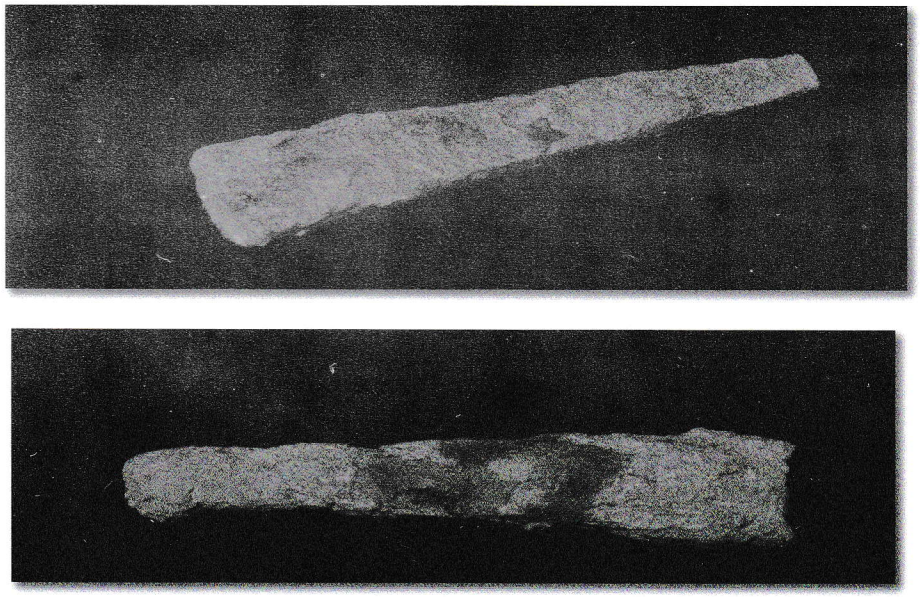


Figure 5: *Iron Chisels Andarawewa*

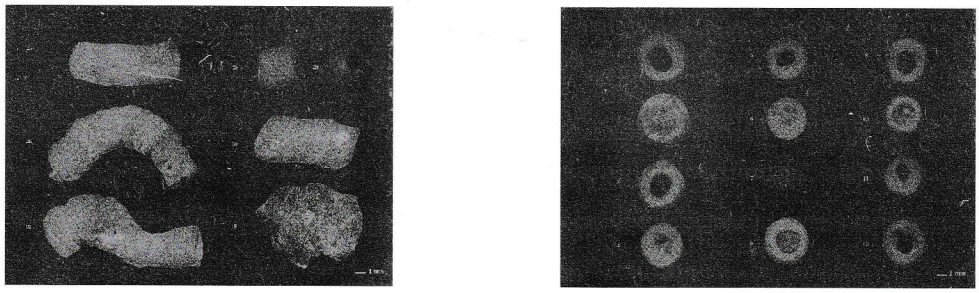


Figure 6: *Glass Beads Andarawewa*