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Muthamizh Arignar Kalaignar Centenary
National Seminar
on
Reflections on Cultural Development :
An Archaeological Perspective
Proceedings

2023 November 22 and 23

Government of Tamilnadu
Department of Archaeology
Chennai - 600 008
2023 Tiruvalluvar year 2054

**Muthamizh Arignar Kalaignar Centenary
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Reflections on Cultural Development :
An Archaeological Perspective
Proceedings**

Editors

**Prof. K. Rajan
Dr. R. Sivanantham**

**Government of Tamil Nadu
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Investigating early iron finds from Mayiladumparai, Tamil Nadu

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Asaithambi, R. Venkataguru
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R. Sivanantham, Suresh Radha,
Madan Sundarraj and Uday Kumar

Abstract

The recent excavation of the habitation-cum-burial site of Mayiladumparai in Tamil Nadu in southern India carried out by Tamil Nadu State Department of Archaeology in 2021 met with ferrous metal finds that yielded very early radiocarbon dates for two charcoal samples with Accelerator Mass Spectrometry (C14-carbon dating) undertaken at Beta Analytic Testing Laboratory in Florida, USA. The trenches laid in the Locality-4 yielded dates at the depth of 104 cm and 130 cm of mid-range calibrated dates of 1615 BCE and 2172 BCE, ranking amongst some of the earliest known. The site is found in the terraces of the hillock *Sanarappanmalai* with a Neolithic and Iron Age habitation mound. The rock shelter on top of the hill yielded habitation material with a petroglyph and rock art. This paper reports some preliminary analyses of ferrous artefacts from undated contexts at Mayiladumparai to try to gain some insights into the status of the early finds and aspects of technology using preliminary technical studies such as X-Ray fluorescence analysis with archaeometallurgical researches initiated by the Prof Sharada Srinivasan as Principal Investigator under the DST-SHRI scheme at National Institute of Advanced Studies, Bengaluru.

Introduction

The excavated site Mayiladum Parai (12°26'29.0"N 78°19'52.9"E) is located 4 km west of Tograpalli village in Bargur Taluk, Krishnagiri District. Geographically the present excavated area falls under the uplands of Tamil Nadu situated at an elevation of 300 m to 1400 m (AMSL). It is part of the Mysore

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plateau, Bengaluru called Baramahal, which is characterized by hills such as Javadi, Thierthmalai, and Kalvarayans hills. The excavations were first carried out here under the leadership of Professor K. Rajan of the Department of Epigraphy and Archeology, Tamil University in 2003 (Rajan). The site has been again re-excavated in 2021 by the Tamil Nadu State Department of Archaeology.

The excavation of a habitation-cum-burial site at Mayiladumparai, revealed the continuous existence of four cultural phases namely Microlithic, Neolithic, megalithic and Early Historic. The rock paintings and engravings unearthed in rock-shelters along with the habitation mound were the most significant part of this excavation. The west facing cist burial represents the early forms of Megalithic architecture. The occurrence of Tamil-Brahmi inscribed potsherds demonstrated the cultural transformation from the Iron Age to the Early Historic period.

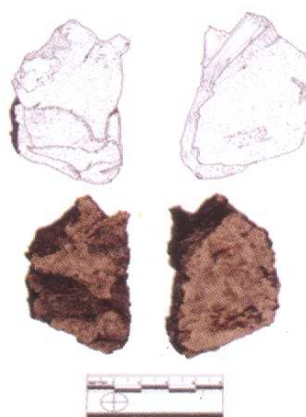
Preliminary non-destructive XRF analysis was done on three specimens as reported further from Iron Age megalithic contexts which however could not be dated by c-14 due to the absence of any datable material such as charcoal. A portable handheld vanta XRF machine was used which has the advance that samples in remote locations could also be studied as well as small samples to give a rapid indication of the overall presence of transition metal elements though it cannot detect light elements. However it must be cautioned that these only represent semi-quantitative surface analysis which gives an overall indication, but for true composition, the uncorroded core metal needs to be sampled which could not be done at this stage since the request was for non-destructive analysis. The NIAS team apart from Prof Sharada Srinivasan as Principal Investigator on the archaeometallurgical investigations included Mr Suresh Ratha who undertook fieldwork and Mr Madan Sundarraj who carried out the XRF analysis and Dr Uday Kumar with dinolite photography and drawings, and Ms Sheela.

Samples Details

1. Accession No.: MPI;MEG 06- BIS-03 (Axe broken)



Pic 01: Broken Axe pieces



Pic 02: Axe pieces, Drawing, Dinolite photography

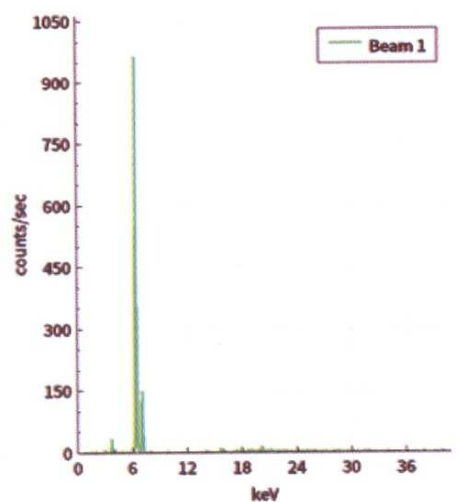
Broken pieces of an axe were recovered at 65 cm depth from a Megalithic pit burial enclosed with a cairn circle covered with a capstone. (MPI-MEG 06-BIS 03; 12°44'12.73"N 78°33'13.44"E). It was about length 7.5 cm, width 3.09 cm with average thickness of 3.54-3.2 and quite dense, although partly corroded, suggesting the prevalence of core metal. A magnet was used to detect the more iron-rich regions. Analysis was undertaken by non-destructive semi-quantitative x-ray fluorescence analysis using a portable handheld XRF machine, taken over more than five cross section on the sample, in the middle portion near a less corroded area. The analyzed composition of the corroded metal surface in a corner of the edge area indicated about 97% iron indicating that it is a well-made ferrous artifact with a fair amount of uncorroded core metal. The traces of silver, tin, lead and cobalt could be traced associated with the ferrous metal source. Traces of titanium and vanadium are also prevalent for which it cannot be determined if it related to either the metal or to the soil and corrosion without analysis of the base metal.

Samples Details

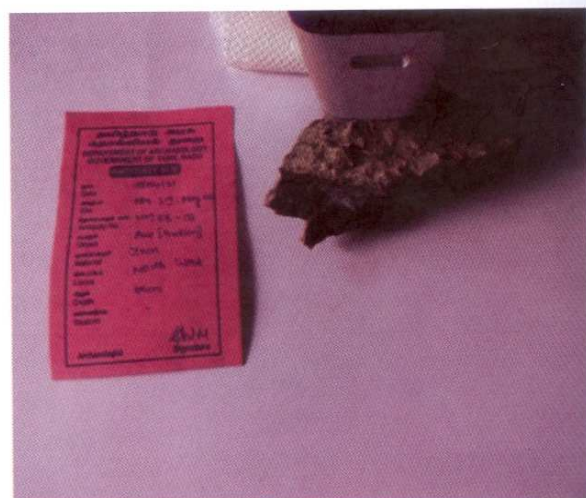
1. Accession No.: MPI;MEG 06- BIS-03 (Broken axe)

El	%
Ti	0.28
V	0.139
Cr	0.061
Fe	97.92
Sr	0.120
Zr	0.256
Pd	0.254
Ag	0.265
Cd	0.208
Sn	0.175
Sb	0.330

Table:O1 Trace Elements



Graph 01: Spectrum



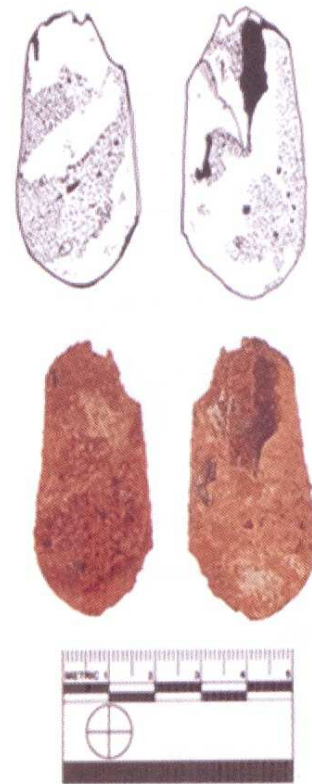
Pic 03: XRF beam aim on object, MPI;MEG 06- BIS-03

Samples Details

2. Accession No.: MPI; L, II MEG 13- BIS-09 (Knife piece)



Pic 01: Chisel piece



Pic 02:A,B Chisel drawing, dinolite

Photography

A well-shaped chisel piece was unearthed at the depth of 103 cm from cist burial having a round porthole on the eastern orthostat entombed with a carin circle (MPI; L, II MEG 13- BIS-09; 12°43'74.30"N 78°33'28.64"E) . Its length is 04.09 cm, width is 2.67, Average thickness is 1 to 0.5 cm The tip is narrowed and curved and it is fairly solid and highly rusted. More than five cross sections were analysed by XRF in the middle of the sample. Due to the light accretions and corrosion about 95.45 % iron was detected in the matrix. The significant presence of cobalt of 2.37 % was detected, as well as 0.28% manganese which would more likely be associated with ore sources. The significant presence of titanium of 1% and traces of strontium is noted which related to siliceous and clayey accretions although further investigation is needed of the core metal. Traces of zirconium are detected which may relate to the sandy burial conditions.

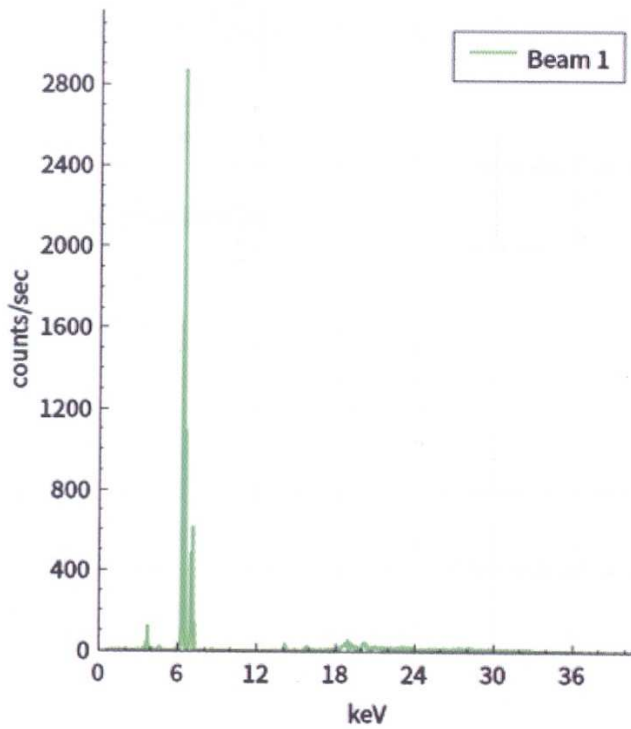
Spectrum and trace elements MPI; L, II MEG 13- BIS-09 (Knife piece)

El	%
Ti	1.09
Mn	0.281
Fe	95.46
Co	2.37
Ni	0.095
Zn	0.259
Sr	0.328
Zr	0.128

Table: O2 Trace ElementsPic



03: XRF beam aim on object
MPI;MEG 13- BIS-09



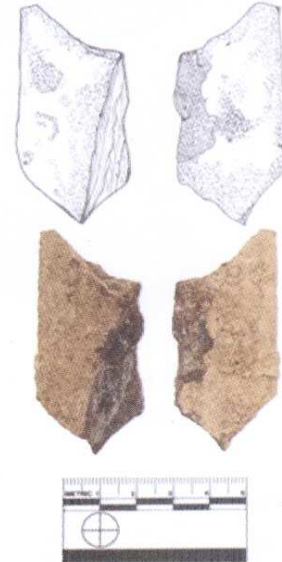
Graph; O2 spectrum

Samples Details

1. Accession No.: MPI, L-1, MEG 04- BIS-05 (Axe broken)



Pic 01: Iron Tool piece



Pic 02: A,B Tool piece drawing, dinolite photography

A piece of a broken tool or chisel was unearthed at the depth of 154 cm from a cist burial enclosed with carin packing and a heavy capstone. The U-shaped porthole is observed on the western orthostat (MPI; L, I MEG 04- BIS-05; 12°44'14.02"N 78°33'15.17"E) . Its length is 04.5 cm, width is 2.57 Average, thickness is 1.5 cm and it is fairly solid and lightly rusted. XRF analysis was done on more than five cross sections in the middle and corner of the sample. The sample matrix seems fairly uncorroded with 99.740 % iron. The presence of cobalt of 0.15 % was detected which may be related to iron source while strontium titanium may be related to siliceous and clayey accretions. Traces of zirconium are detected which may relate to the sandy burial conditions.

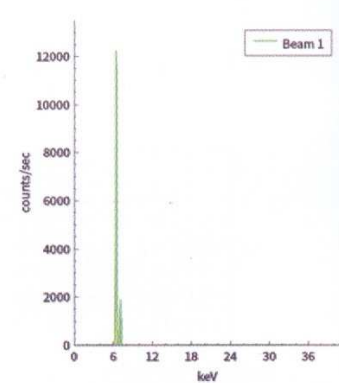
El	%	Carbon Steel
Ti	0.049	Resid. 0.2
Cr	ND	
Mn	ND	
Fe	99.704	
Co	0.150	Resid. 0.6
Zn	0.061	No Spec
Sr	0.022	Resid. 0.1
Zr	0.014	Resid. 0.1
Mo	ND	
Pb	ND	

Table: 03 Trace Elements

Spectrum and trace elements MPI, L-1, MEG 04- BIS-05 (Axe broken)



Pic 04: XRF Aiming of object
MPI;MEG 13- BIS-09



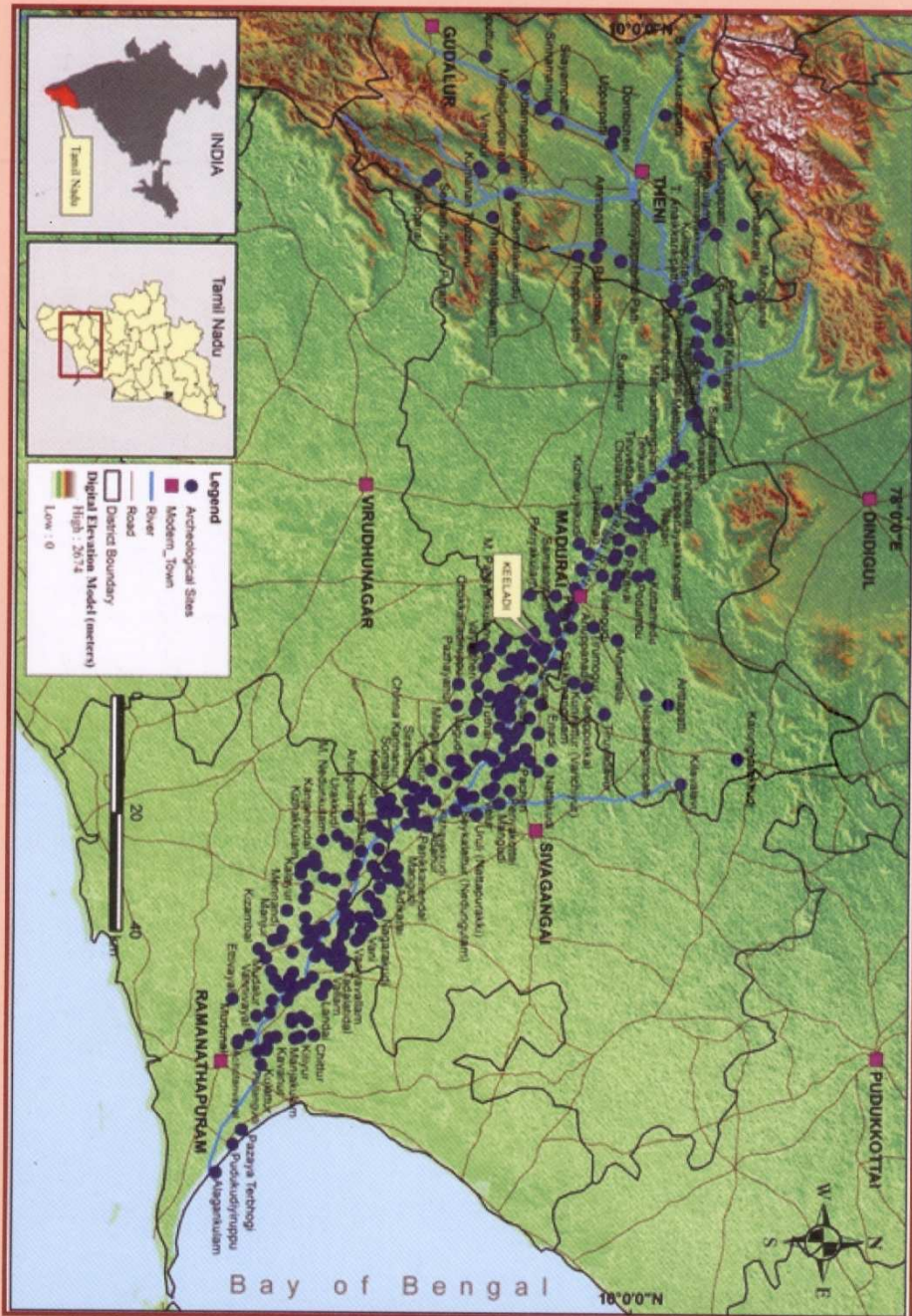
Graph; 03 spectrum

Conclusions

The preliminary investigations of undated samples from megalithic burials at Mayiladumparai by XRF surface analysis was undertaken showing that the samples though corroded on the surface, still contain a good amount of metallic iron attracting a magnet. Dinolite photography reveals that the samples were generally well shaped such as the curved chisel edge, and the tool piece with straight sides. The trace elements detected are also interesting, all the samples showed a detectable amount of cobalt which usually partitions with metal and hence may be indicative of the ore source that was smelted to get the metallic iron. Manganese traces can also be diagnostic of the ore. Further investigations could throw light on whether the rare earth minerals of zirconium and strontium are from the clayey and sandy soils. Such XRF analysis also points to the potential of trace element analysis for provenance studies both of the iron and of the burial conditions.

Acknowledgements

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