Chapter – IV

RESULTS AND DISCUSSION

Introduction

The results obtained from the various analyses mentioned in Chapter- III are enumerated here. The results are classified under various heads, such as, typological, morphometric and are followed by the metallurgical and chemical analysis of representative samples. The chapter also includes a discussion on the contemporary megalithic tradition practiced by the Gondi tribe and the contemporary traditional ironsmiths (*Lohars*).

4.1 Typological Analysis

The artefacts from each site were classified under various groups based on their assumable functions or utility. This was followed by making an attempt to understand the concentration in and distribution of the artefacts amongst, the megalithic sites. Based on the distribution of specific artefacts it was possible to understand the variety of activities undertaken by the megalithic inhabitants of a specific site. The iron artefacts were classified into two broad categories namely utilitarian and ritualistic. First the artefacts were taxonomically classified as follows.

4.1.1 Taxonomic Classification

4.1.1.A Adze/ Rapi

It is a double-sided tool. The length of the tool is approximately four times the width. The two ends of the tool are shaped into fan shaped blades; one blade is broader than the other (Fig.4.1.A.1). The two blades are connected by a narrow shaft. the dimensions of the artefacts found from all the sites fall within the bracket (L: 148.65 x W: 13.71x Tk: 1.7 mm..) – (L: 145.9 x W: 21.47 x Tk: 3.35 mm..). The smallest adze represents the miniature form found from the excavated megaliths (Fig.4.1.A.2) . 188 adzes have been recovered from 8 sites, maximum number of adzes has been recovered from Mahurjhari (89) and only one has been recovered from Dhaulameti.

4.1.1.B Arrowhead

This is a projectile tool. It has a triangular body with two tanged ends, with a short shaft used for hafting to a bamboo shaft (Fig. 4.1.B.1). Earlier scholars like Banerjee (1927) describe arrowhead as a weapon of war and he describes them as '*ayomukham*' or '*ayoagraya*' which is interpreted as an implement tipped with *aya* or iron, to make it strong and sharp. The arrowhead recovered from Naikund has a long shaft with a small triangular head at one end (Fig. 4.1.B.2), however the arrowhead found from Borgaon had a hollow shaft for the bamboo haft to be inserted in (Fig. 4.1.B.3). The dimensions of the arrowheads found from the sites fall within the bracket (L: 52 x W: 5 x Tk: 5 mm.) – (L: 153.75 x W: 22.01 x Tk: 2.18 mm.). The number of arrowheads recovered from megalithic sites is rare, because of its fragile nature. Only six arrowheads were recovered from all the sites. Maximum arrowheads were recovered from Khairwada (2).

4.1.1.C Axe

It is a cutting tool. It comprises a head and a handle. All the axes found from the megalithic sites are double bevelled. The head consists of a broad cutting edge and the handle is the hafting end (Fig. 4.1.C.1, Fig. 4.1.C.2 and Fig. 4.1.C.3). Axes found from the Neolithic context are the precursors of the megalithic specimens. They are rectangular shaped, bifacially napped artefact with a bulb and a straight or convex bit. The dimension of the axes found from all the sites falls within the bracket of (L: 106.77 x W: 38:15 x T: 4.48 mm.) – (L : 224.51xW 39.88xTk : 5.82 mm.). We have different sizes within the same type. The smallest size is grouped under the miniature axe category. (Fig. 4.1.C.4) which was found from Khairwada (L: 38.70 x W: 23.30 x Tk: 4.12 mm.) within the same category we have the axes with the socket handle from Bhagimohari (Reg:2) which is a variant (Fig. 4.1.C.5). The variant is an axe with a short handle (referred earlier as Battle Axe) (Fig. 4.1.C.6). It can be described as the prototype of the double bevelled axe and only one specimen was found from Mahurjhari (Meg: 11). The head is circular with a broad cutting edge ending in pointed ends and the handle is rectangular and short. The axe is one of those three artefacts which have been recovered from all the eight sites. The maximum number of axe has been recovered from Maharjhari followed by Borgaon.

4.1.1.D Bangle

It is worn as ornament for adorning the body. The bangles are circlets with hollowed centre and the cross-section is also a circle with no visible ridges. Mahurjhari was the only site which brought to light the existence of the bangle (Fig. 4.1.D). Copper bangles are a common find in megalithic burials but this is the only evidence of an iron bangle. As the one found from Mahurjhari is broken, the accurate diameter is not known, however the cross-section is 3.30 mm.

4.1.1.E Bevelled Point

It is a workman's tool, majorly used by carpenters as a drilling tool. Bevelling is generally done to soften the edge of a tool to avoid or provide resistance to wear and tear. Both the specimens were recovered from Vyhad (Fig. 4.1.E).

4.1.1.F Borer

This pointed tool was probably used for drilling or enlarging an already existing hole. This was probably a component of the carpenter's tool set (Fig. 5.1.F). This implement can be grouped under workmen's tools. Only two borers have been reported one each from Mahurjhari and Dhaulameti.

4.1.1.G Chisel and Chisel Point

It is a long handled tool used for shaping metal objects, aids in wood carving and used for leather working. It has a long blade with a rectangular cutting edge and the other end is a tang. The tanged end is used for hafting into a wooden handle (Fig.4.1.G.1 and Fig. 4.1.G.2). The chisel point has a pointed cutting edge (Fig. 4.1.G.3). The dimension of the chisels found from all the sites falls within the bracket (L: 101.43 xW: 5.89 xTk: 1.75 mm.) – (L: 260.37 xW: 24.49 x Tk: 2.21 mm.). Highest number of chisels has been reported from Mahurjhari (32). Within this type, only one chisel (L: 61.29 x W: 13.48 x Tk: 1.6 mm.) (Fig. 4.1.G.4) found from a Mahurjhari Megalith has been categorised under Miniature Chisel.

4.1.1.H Dagger

It is a piercing tool, generally used as a weapon for defensive or offensive purpose. It has a long blade with the parallel sides converging into a point. The other end forms a triangular tang which is fitted into a hilt (Fig. 4.1.H.1, Fig. 4.1.H.2 and Fig. 4.1.H.3).This artefact has been recovered from all the megalithic sites except Khairwada and Dhamna Linga. 26 intact dagger blades have been found from the megalithic level, maximum (11) have been recovered from Mahurjhari.

4.1.1.I Digging Tool

The exact size of the tool is not known, however the hafting end is hollow and is horizontal to the working end. The working end is a curved blade, depressed in the middle formed by folded sides. Probably the tool was used like a spade or crowbar (Fig. 4.1.I). This tool is an exclusive find from Bhagimohari. Only two specimens have been found. The dimension of the intact specimen is 123.85 x 26.64 x 5.09 mm..

4.1.1.J Drill Point

It is a thin cylindrical object used as a punch. It is similar to a nail but it does not have a head. The pointed end is thinner than the head (Fig. 4.1.J). The only specimen has been found from Bhagimohari (BMR 53) from the habitation level.

4.1.1.K Engraver

It is a long cylindrical rod with one end hooked and the other end forms a pointed end. The pointed end is probably the hafting end. An engraver is a craftsman's tool mainly used by carpenters. The features are similar to the fish hooks found from Bhagimohari. However, it has been identified as an engraver by the excavators. Only one specimen (DMT: 22) has been found from Dhaulameti (Fig. 4.1.K).

4.1.1.L Fish Hook

It is a device used for catching fish. The metal wire is bent to form a hook. All the three available fish hooks are different from each other and have been found from Bhagimohari.

BMR E: It is rectangular in cross section. A flat iron strip was bent to form a pointed triangular hook at the end (Fig. 4.1.L.1).

BMR 7: A different forging method was used for making this. The hafting shaft is a rectangular strip and the same strip is forged and folded to form a circular cross-section, which renders the strip a pointed end (Fig. 4.1. L.2).

BMR 34: This is circular in cross-section. A metal wire is bent to form a loop and the end of the loop forms a pointed end (Fig. 4.1. L.3).

4.1.1.M Hoe

Hoe is comm.only known as a shovel. It is mainly used for digging and scraping purpose. It is long rectangular shaped where the sides converge at one end to form a circular bend. The working end is a broad blade with upturned sides (Fig. 4.1. M.1 and Fig. 4.1.M.2). Six specimens have been found from all the sites (NKD: 1, KRD: 2, BRG: 2, MHR: 1). None were reported from Vyhad, Dhamna Linga and Dhaulameti. The dimensions of the tool range from (L: 150.26 x W: 52.23x Tk:3.78 mm.) – (L: 199.77x W: 64.04x Tk:5.78 mm.).

4.1.1.N Horse Bit

A bit is related to equestrian breeding. The two roughly circular snaffle bits are interlocked with each other by a short rectangular solid flat metal rod known as mouth piece. The mouth piece is fitted inside the mouth of the horse and the bridle is attached to the looped ends. Earlier scholar like K.S. Ramachandran (1961) has categorized horse bits into 3 types:

Type 1: Simple bit with unbending mouth piece. The ‘a’ variant was earlier described as a stirrup by Rivett-Carnac (1879) however Ramachandran has described it as a horse bit (Fig. 4.1.N.1 and 4.1.N.2); the ‘b’ variant has been described as a simple rectangular bar with rectangular side circular loops to which rein strings were attached (Ramachandran, 1961 pp: 171) a similar horse bit was found at the site of Adichanallur by Alexander Rea and it was identified as an indeterminate object. Type 1b variant has been found from Mahurjhari (Fig. 4.1.N.3).

Type 2: This is a composite horse bit with a horizontal rigid mouth piece fitted with looped nose bands and its variants. This type of composite horse bit has not been found from the Vidarbhan Megalithic level.

Type 3: This type is a single-linked bits with circular looped ends to which the reins were attached a similar variant has been found from Sialk 'B' graves (Ramachandran, 1961 pp: 172)

25 intact horse bits have been found from the megalithic level, associated with copper horse face ornaments and *Equs cabalus* faunal remains. Maximum horse bits (15) have been reported from Mahurjhari, however none were reported from Dhamna Linga, Dhaulameti and Borgaon. The dimensions of the artefact vary between (267.98* 80.53* 5.64 mm.) – (122.76* 79.70* 4.09 mm.).

4.1.1.O Knife

It is a comm.on cutting tool. Its major purpose is cutting, chopping or slicing. It is roughly rectangular in shape with a rectangular cross-section. One lateral edge is sharp and the other edge is blunted. It has a tanged hafting end (Fig. 4.1.O.1, Fig. 4.1.O.2 and Fig. 4.1.O.3). A large number of blade fragments have been found, but the exact length of the actual blade is unknown. However, eleven almost intact knife blades have been found (MHR: 4, VHD: 3, NKD, DMN, DMT, BRG: 1 each) and their dimensions vary between (51.93*0.50*4.84 mm.) – (215.05*16.67*2.27 mm.).

4.1.1.P Ladle

This is a household utilitarian object. It is used for serving liquid food. It consists of two parts, a bowl and a vertical handle luted to it. Generally the vertical handle has spiral corrugated decorations on the shaft (Fig. 4.1.P). The depth of the bowl varies between 5.47 mm. – 6.50 mm. and the diameter of the bowl varies between 59.65 mm. – 62.50 mm.. The length of the handle varies between 207.39mm.- 213.50mm.. 24 specimens have been found, the highest number (10) has been found from Mahurjhari followed by Vyhad (8). Two ladles each have been recovered from (DMT, BMR and BRG). However none have been found from NKD, KRD and DMN.

4.1.1.Q Lamp Stand

This artefact is mainly grouped under the broad heading of ritualistic objects because they have been mainly found in association with burial goods; however they have been found from habitation context also. 103 specimens have been recovered, however NKD, KRD and DMT has brought to light no lamp stands. This object consists of two parts, one shallow bowl which is the holder. The holder is slightly depressed, but has no depth; a vertical hooked handle is luted to it (Fig. 4.1.Q.1 and Fig. 4.1.Q.2). Probably the handle was hooked to enable it to hang from a nail. Highest number of lamp stands has been recovered from Mahurjhari (66).

4.1.1.R Nail Parer

This tool has been identified as a utilitarian tool. Based on ethnographic observations, the utility of the tool has been associated with surgical purpose. It is a long sleek cylindrical rod, one end forms a thin triangular blade and the other end forms a point (Fig. 4.1.R). The artefacts vary in sizes representing different moulds were used. The dimension falls within the bracket (43mm.* 3 mm.) – (174.52 mm.* 4.09 mm.). The smallest one (43 mm.*3 mm.) represents the miniature form and it has been unearthed from Dhamna Linga (DMN 190A). This artefact has been found from all the sites. 151 intact nail parers have been found, maximum (61) have been recovered from Mahurjhari followed by Bhagimohari (46).

4.1.1.S Pan

Copper cauldrons have been reported from both Takalghat and Mahurjhari but two cauldrons of this type were found only from the site of Naikund. This iron cauldron can be described a cooking griddle with short vertical sides. The artefact **(NKD-5952)** was recovered from Megalith No. 7 (Loc-I), however it was fragmented, so no dimensions are available (Fig. 4.1.S).

4.1.1.T Ring

This object was found in association with axe or chisel. Two variants have been recorded within the same type. One variant has a circular cross-section (Fig. 4.1.T.1) and the other variant has a rectangular cross-section (Fig. 4.1.T.2). Type one is circular in shape and they were used as fasteners for a chisel i.e. for fitting the chisel while hafting. The second variant is the flat ring with rectangular cross-section and they were associated with axes and have been termed as fasteners. Altogether 13 intact ring fasteners have been reported from Vidarbha, the dimensions of type one variant fall within the bracket (18.26 mm. * 3.56 mm.) – (35.84 mm. * 7.32 mm.) and the dimensions of the type 2 variant falls within the bracket (32.17 mm. * 7.62 mm.) – (40.95 mm.*5.46 mm.).

4.1.1.U Rivet

It is a lasting mechanical clasp. Its main purpose is to join two metal sheets or one metal sheet with a wooden plank. It consists of a cylindrical shaft with one head. After inserting the cylindrical shaft into the drilled hole, the other end is flattened by beating it which makes another head (Fig. 4.1.U). This renders strength to the clasp. Very few specimens have been unearthed from the megalithic level. 3 rivets have been found the megalithic level, 2 from Mahurjhari and 1from Bhagimohari.

4.1.1.V Sickle

It is a commonly used agricultural tool, primarily used for harvesting grains. It has a semi-circular blade with a tanged end for hafting (Fig. 4.1.V.1, Fig. 4.1.V.2 and Fig. 4.1.V.3). Only 3 sickles have been unearthed from the megalithic level, 2 from Mahurjhari and 1 from Bhagimohari.

4.1.1.W Spear/ Spearhead

This object is grouped under the defensive category. It has a long blade of about 20 cm and the width of the blade ranges between 2.5 cm.- 4.5 cm. The working edge is a point formed by two converging sides of the blade (Fig. 4.1.W.1 and Fig. 4.1.W.2). The hafting end forms a tang which is inserted in the bamboo shaft, and the composite tool is used as a projectile tool. Only 9 specimens have been recovered from the megalithic level. Maximum number (4) has been recovered from Vyhad, However none was reported from Naikund, Khairwada, Dhaulameti and Mahurjhari.

4.1.1.X Spike

This tool is used for defensive and offensive purpose. It has a long shaft and the working edge has a long arrowhead (Fig. 4.1.X). This tool was possibly a hand held tool and was probably not hafted. Spikes were recovered only from Mahurjhari and Bhagimohari.

Out of the 20 intact spikes recovered from Mahurjhari, only two were found from the habitation level. Similar situation is noticed in Bhagimohari, where only one out of 10 specimens has been unearthed from the habitation level.

4.1.1.Y Wire

It can be described as a single flexible strand of metal with a circular solid cross-section. They have been found only from Bhagimohari and probably they were used during hafting, like hafting the arrowhead or spearhead to the wooden shaft. But their actual purpose can be only speculated based on ethnographic evidence.

Minor artefacts such as nails (Fig. 4.1.Z), rods and broken tangs of tools have been also found.

Fig.4.1.A.1 Adzes

Fig.4.1.A.2 Adzes

Fig.4.1.A Adzes

Fig4.1.B.1 Arrow Head

Fig.4.1.B.2 Arrow Head

Fig.4.1.B Arrow Head

Fig.4.1.C.1 Axe

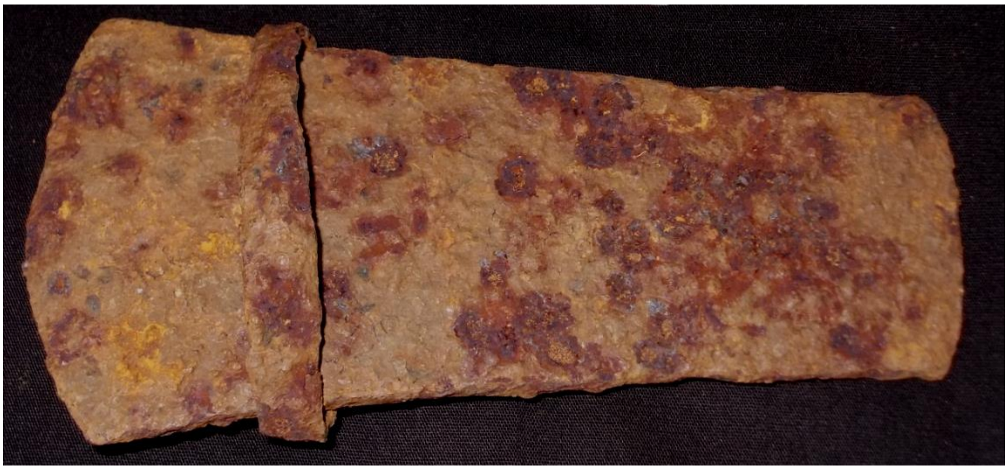


Fig.4.1.C.2 Axe

Fig.4.1.C.3 Axe

Fig.4.1.C.4 Axe

Fig.4.1.C.5 Axe

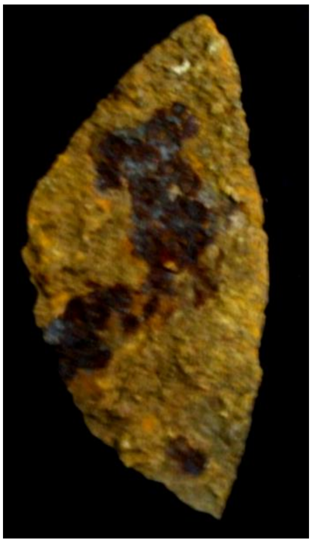


Fig.4.1.C.6 Axe

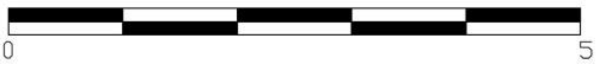


Fig.4.1.C Axe

Fig.4.1.D Bangle

Fig.4.1.E.Bevelled Point

Fig.4.1.F Borer

Fig.4.1.G.1 Chisel

Fig.4.1.G.2 Chisel

Fig.4.1.G.3 Chisel

Fig.4.1.G.4 Miniature Chisel

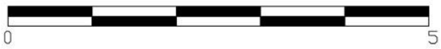


Fig.4.1.G Chisel

Fig.4.1.H.1 Dagger

Fig.4.1.H.2 Dagger

Fig.4.1.H.3 Dagger

Fig.4.1.H Dagger

Fig.4.1.I.Digging Tool

Fig.4.1.J Drill Point

Fig.4.1.K. Engraver

Fig.4.1.L.1 BMR E

Fig.4.1.L.2 BMR 7

Fig.4.1.L.3 BMR 34

Fig.4.1.L Fish Hook

Fig.4.1.M.1 Hoe

Fig.4.1.M.2 Hoe

0 5

Fig.4.1.M Hoe

Fig.4.1.N.1 Horse Bit

Fig.4.1.N.2 Horse Ornament

Fig.4.1.N.3 Horse bit

Fig.4.1.N.4: Linked Single Bit

Fig.4.1.N Horse Ornament

Fig.4.1.O.1 Knife

Fig.4.1.O.2 Knife

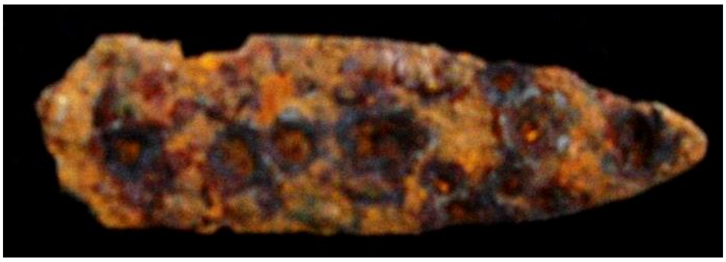


Fig.4.1.O.3 Knife

Fig.4.1.O Knife

Fig.4.1.P Ladle

Fig.4.1.Q.1 Lamp Stand

Fig.4.1. Q.2 Lamp Stand

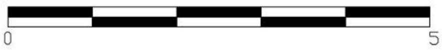


Fig.4.1.Q Lamp Stand

Fig.4.1.R.1 Nail Parer

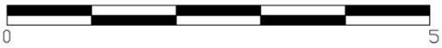
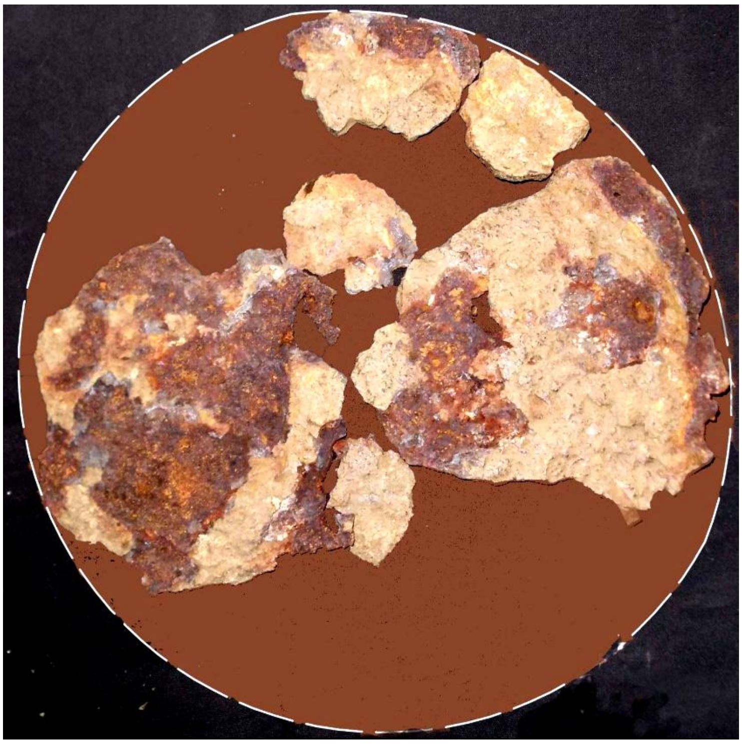


Fig.4.1.R Nail Parer



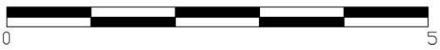


Fig.4.1.S Pan

Fig.4.1.T.1 Ring

Fig4.1.T.2 Ring

Fig.4.1.T Ring

Fig.4.1.U Rivet

Fig.4.1.V.1 Sickle

Fig.4.1.V.2 Sickle

Fig.4.1.V.3 Sickle

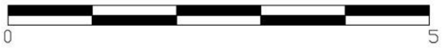


Fig.4.1.V Sickle

Fig.4.1.W.1 Spear Head

Fig.4.1.W.2 Spear Head

0 5

Fig.4.1.W Spear Head

0 5

Fig.4.1.X Spike

4.2 Distribution of Artefacts

Table 4.2.1: Distribution of artefacts

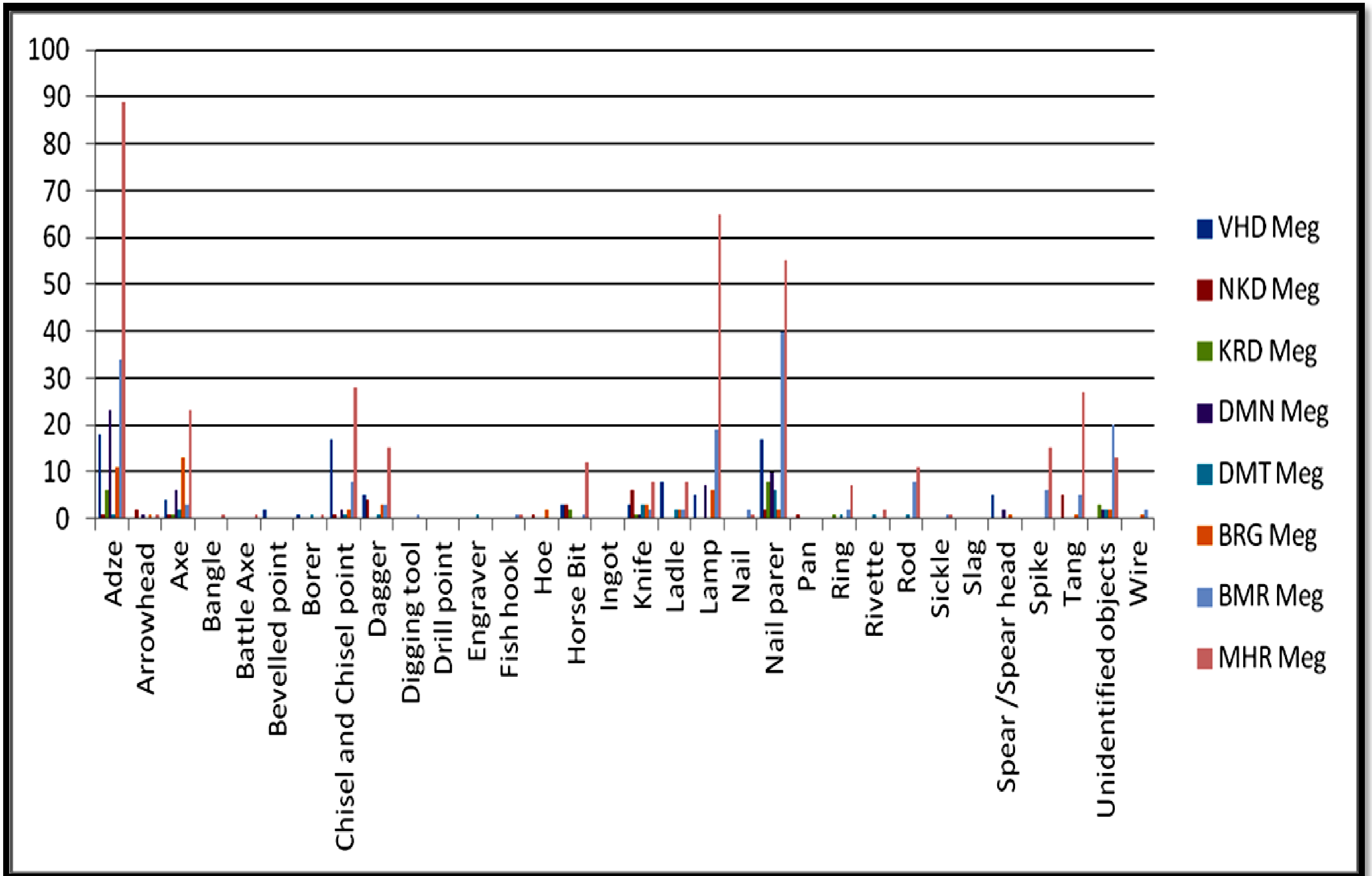
Artefacts	VHD	NKD	KRD	DMN	DMT	BRG	BMR	MHR	Total
Adze	18	3	7	23	1	11	36	93	192
Arrowhead	0	2	2	1	0	1	0	1	7
Axe	4	1	2	6	2	13	3	26	57
Bangle	0	0	0	0	0	0	0	1	1
Bevelled Point	2	0	0	0	0	0	0	0	2
Borer	1	0	0	0	1	0	0	1	3
Chisel and Chisel Point	17	2	4	2	1	2	10	34	72
Dagger	5	5	0	0	1	3	3	18	35
Digging Tool	0	0	0	0	0	0	2	0	2
Drill Point	0	0	0	0	0	0	1	0	1
Engraver	0	0	0	0	1	0	0	0	1
Fish Hook	0	0	0	0	0	0	3	1	4
Hoe	0	1	2	0	0	2	0	1	6
Horse Bit	3	3	3	0	0	0	1	15	25
Ingot	0	2	0	0	0	0	3	0	5
Knife	3	7	1	1	3	3	2	11	31
Ladle	8	0	0	0	2	2	2	11	25
Lamp	5	0	0	7	0	6	19	66	103
Nail	0	0	0	0	0	0	2	3	5
Nail Parer	17	2	9	10	6	2	46	62	154
Pan	0	2	0	0	0	0	0	0	2
Ring	0	0	1	0	1	0	7	9	18
Rivette	0	0	0	0	1	0	0	2	3
Rod	0	0	4	0	1	0	22	14	41
Sickle	0	0	0	0	0	0	1	2	3
Slag	0	3	0	0	0	0	0	0	3
Spear/Spear Head	5	0	0	2	0	1	1	0	9
Spike	0	0	0	0	0	0	10	20	30
Tang	0	5	0	0	0	1	7	31	44
Unidentified Objects	0	4	4	2	2	2	43	14	71
Wire	0	0	0	0	0	1	2	0	3
Total	88	42	39	54	23	50	226	436	958

Table number 4.2.1 shows the distribution of the artefacts amongst the 8 sites. Although the excavation at Mahurjhari (MHR) has brought to light the highest number of artefacts (436), still Bhagimohari (BMR) has revealed a variety of artefacts. While looking at the artefact distribution within the burial complex, we find three major implements occurring at all the burial complexes (**Graph: 4.2.1**). The first artefact adze, better known as *rapi* in the local language was found in abundance from all the sites and forms a major component of the megalithic iron tools. They have been found in large quantity from a majority of the megalithic burial sites, in comparison to the other artefacts. This suggests that adze held an important position in the beliefs and customs of the society, however earlier scholars have limited its importance only to the local iron industry (Park, 2012).

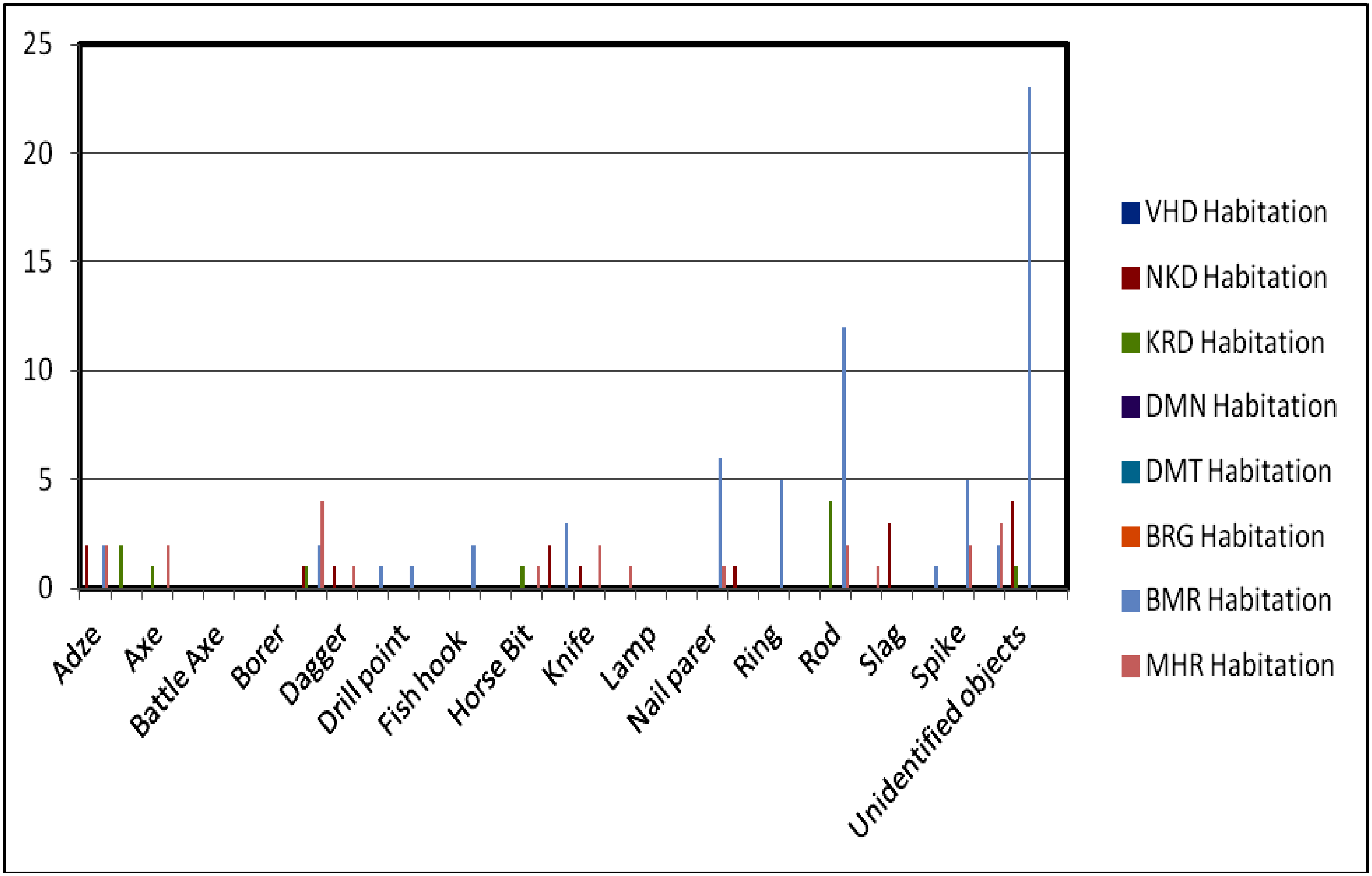
The second object, which have been found in large quantity from the burial context are lamp stands, however their occurrence in the habitation level is almost negligible. The negligible occurrence can be probably proved by labeling the artefacts as a ritualistic object.

Nail parer occupies the third position in the order of abundance and has been found from all the burial sites. They have been found in close association with adzes. Although we do not have any tool still in use comparable to adze, however we do have ethnographic analogies from a tribal society in Andhra Pradesh. During the 1950's and 1960's inhabitants of a remote village in Kurnool district used a similar tool for surgical purposes i.e. to perform minor surgeries (*Personal Communication, Ismail Kellellu 2012*). We do have ethnographic evidence of a tool similar to a nail parer and it is still used for a similar purpose in villages in Orissa (*pers. comm..: R.K Mohanty 2016*). The triangulated blade at one end of the tool suggests a similar use as the adze. In Orissa this tool is used by barbers to cut nails and the pointed end is used for removing ear wax. Probably in the archaeological context they had a similar purpose. It is important to note that they were found from both habitation and burial context, however 80% of the assemblage has been found from the burial context. The other artefacts are not equally distributed and have not been found from all the sites.

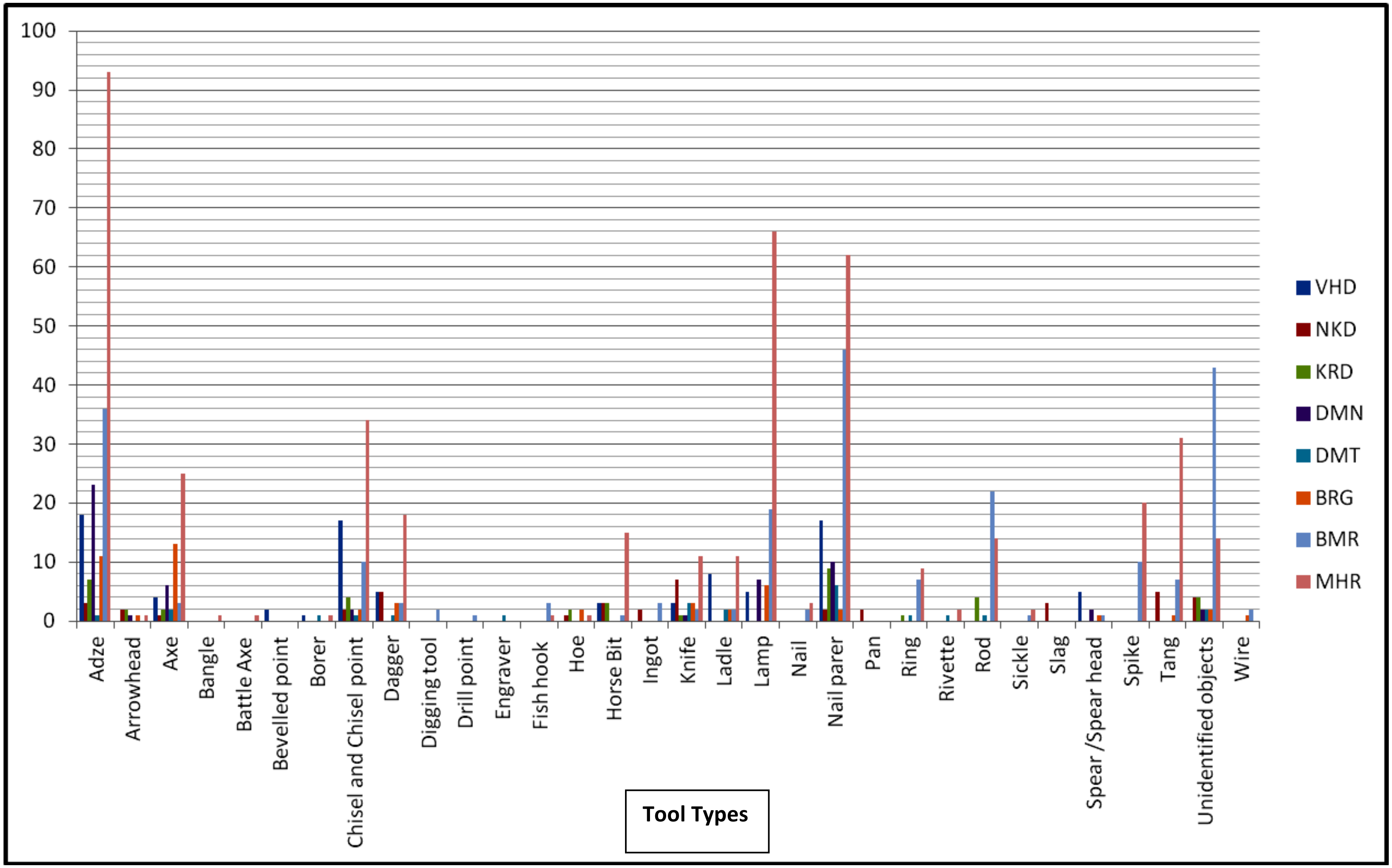
The difference in the nature of preservation of artefacts within the same geographical zone remains an enigma. Unidentified artefacts dominate the assemblage recovered from the habitation level. The number of adzes and nail parer recovered from the habitation level are corroded; rusted and very few of the artefacts still have an existing metallic core, whereas the same artefacts from the burial complex have a better degree of preservation. Due to the above mentioned problem unidentified artefacts dominate the habitation assemblage. Graph number 4.2.2 shows the distribution of the artefacts within the habitation complex. The second artefact in order of abundance is rod. However this cylindrical elongated object suggests no specific functional variety. The third artefact which dominates the assemblage is nail parer however it has been reported only from Bhagimohari and Mahurjhari. One of the interesting artefacts reported from the habitation level is fish hook. It was found from both the habitation level and the burial complex of Bhagimohari. Graph number 4.2.3 shows the combined tool assemblage yielded from the excavated Megalithic sites of Vidarbha, which shows the dominance of adze.



Graph 4.2.1: Graphical Representation of Artefacts Within the Burial Complex



Graph 4.2.2: Graphical Representation of Artefacts within the Habitation Complex



Graph 4.2.3: Graphical Representation of the total variety of Artefacts

4.3 Statistical Analysis of Artefactual Assemblage

Morphometric data of the artefacts was processed to understand the relationship between the parameters. It has been done using the R-software. This software helps in solving data-oriented problems as it involves a wide variety of statistical and graphical methods which includes linear and non-linear modelling, clustering and other statistical tests. It also produces high-quality graphs suitable for academic publications.

Artefacts were chosen keeping in mind that all the artefacts were under prolonged use and the dimensions recorded are the post-excavation available dimensions. Secondly only those artefacts have been considered which are intact and are more than 35 in numbers. If the total number of one artefact type is less than 3.6% of the total artefact assemblage (958), a statistical programme cannot be run. Only four artefacts were selected for morphometric analysis.

4.3.1 Adze

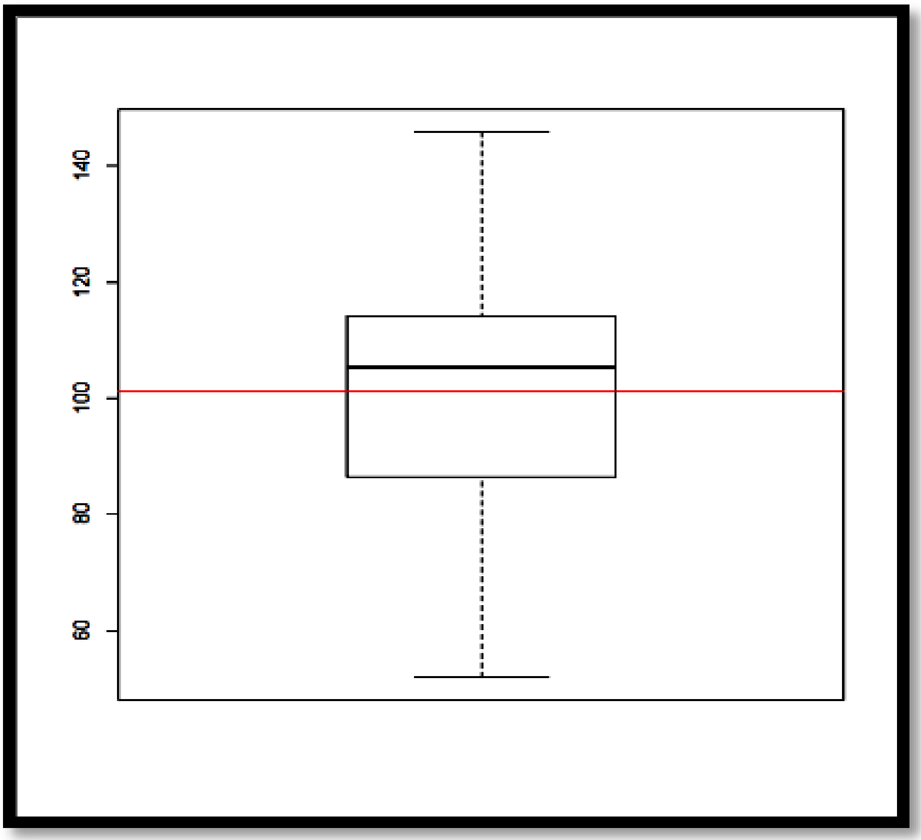


Fig.4.3.1.1: Box Plot for Adze Assemblage Showing No Outliers

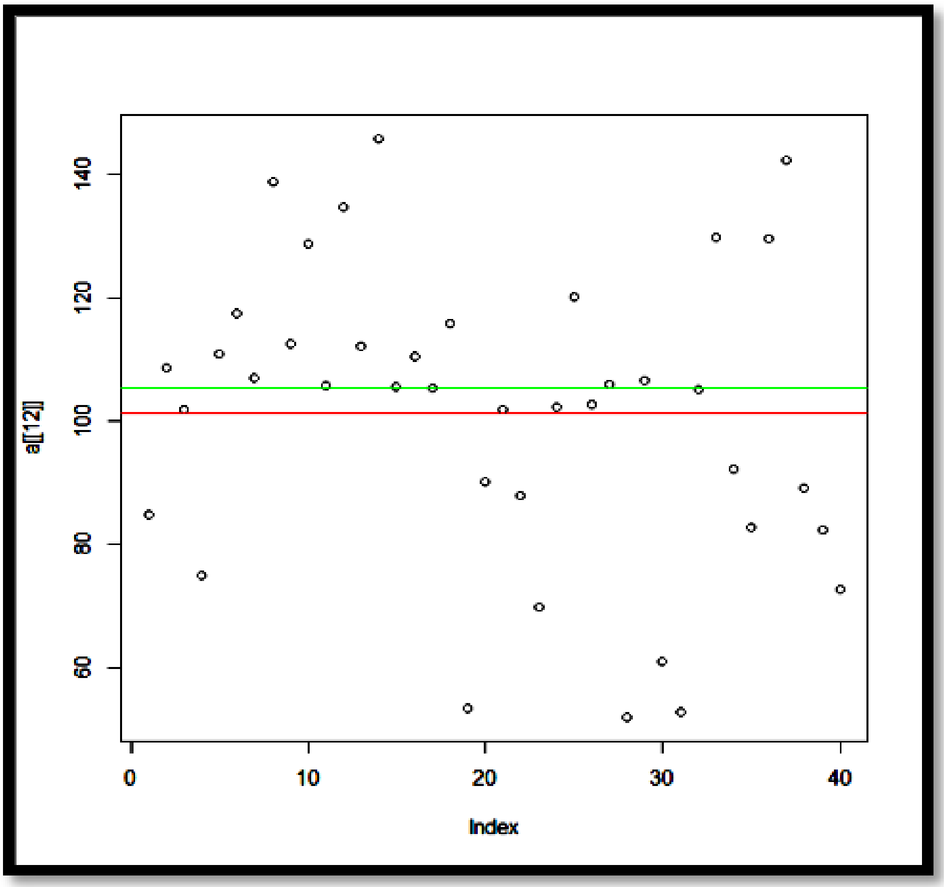


Fig.4.3.1.2: Scatter Plot Showing the Clustering of Artefacts

As mentioned in the section 4.1, adze or *rapi* is the most commonly found artefact from the Vidarbhan Megalithic context. Amongst the entire assemblage of 72 adzes, only 56 artefacts were intact and were selected for morphometric analysis. It is important to note that every artefact has undergone post-depositional damages, and artefacts measuring between 48 mm. – 55 mm. have all been grouped under the category of miniature adzes. Here again it is important to mention that all the miniature adzes were found from the burial context. The artefact from Dhamna Linga (DMN- R) measuring 145.9 mm. is unusually large to be wielded as a tool for surgical purpose and this artefact have been also found from the burial context.

In Fig. 4.3.1.1, we can see that there are no outliers in the length of the adze. The red line shows the mean (average of the length of all the artefacts) and black bold line shows the median (middle point) of the parameter length of the Adze. The Y-axis shows the length of the Adze. The box-pot shows no outliers suggesting all the adzes conform to a single bracket. The scatter plot Fig.4.3.1.2, shows how the different observations of length of the Adzes are scattered. The red line shows the mean and green line shows the median of length of the Adze. The Y-axis shows the length of the Adze and X-axis shows the breadth of the artefacts and the scatter plot shows a weakly negative correlation which suggests that when length increases, breadth of the artefact will decrease, however the change will not be distinctive. Using the same software co-relation coefficients were calculated between the parameters (length vs weight), (breadth vs weight) and (thickness vs weight). The scatter plot (Fig.4.3.1.3) plots the correlation coefficient between length vs weight which is 0.2537. It is weakly positively correlated, proving that with the increase in length weight will also increase but not distinctively. Similarly correlation coefficient was calculated between breadth vs weight which is 0.0961. The scatter plot (Fig.4.3.1.4) shows a very weakly positive correlation. So as the breadth of the artefact increases weight will also increase however the increase wouldn't be distinctive. This proves the megalithic smithers conformed to the standard, shape, size and weight as no major change is seen in the dimensions of the artefact adze studied from the Megalithic sites of Vidarbha.

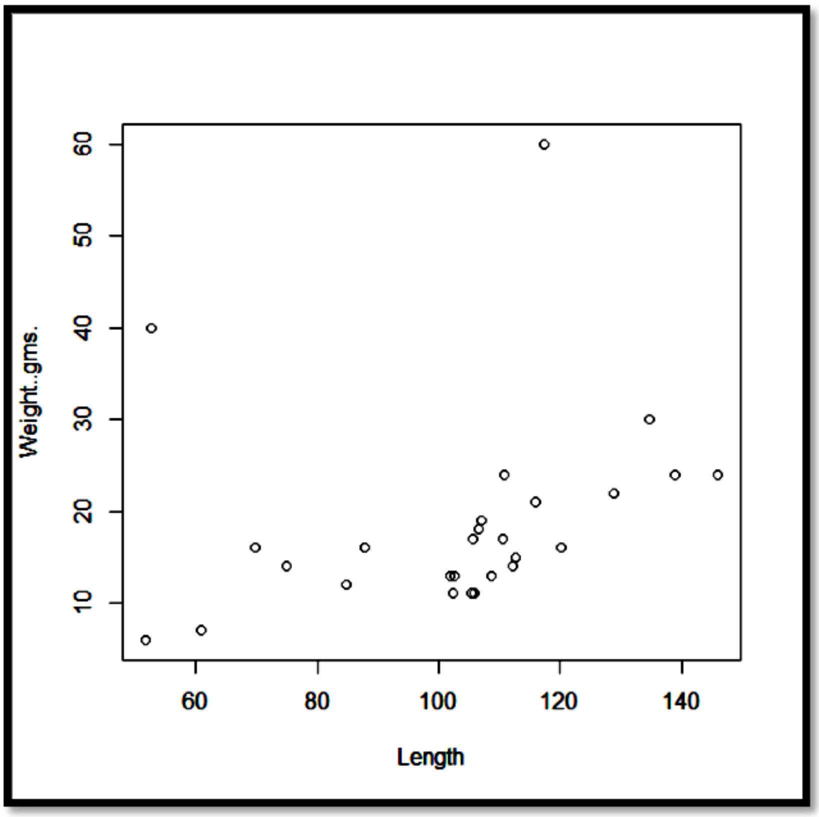


Fig.4.3.1.3: Scatter Plot Showing the Relation Between Length vs Weight

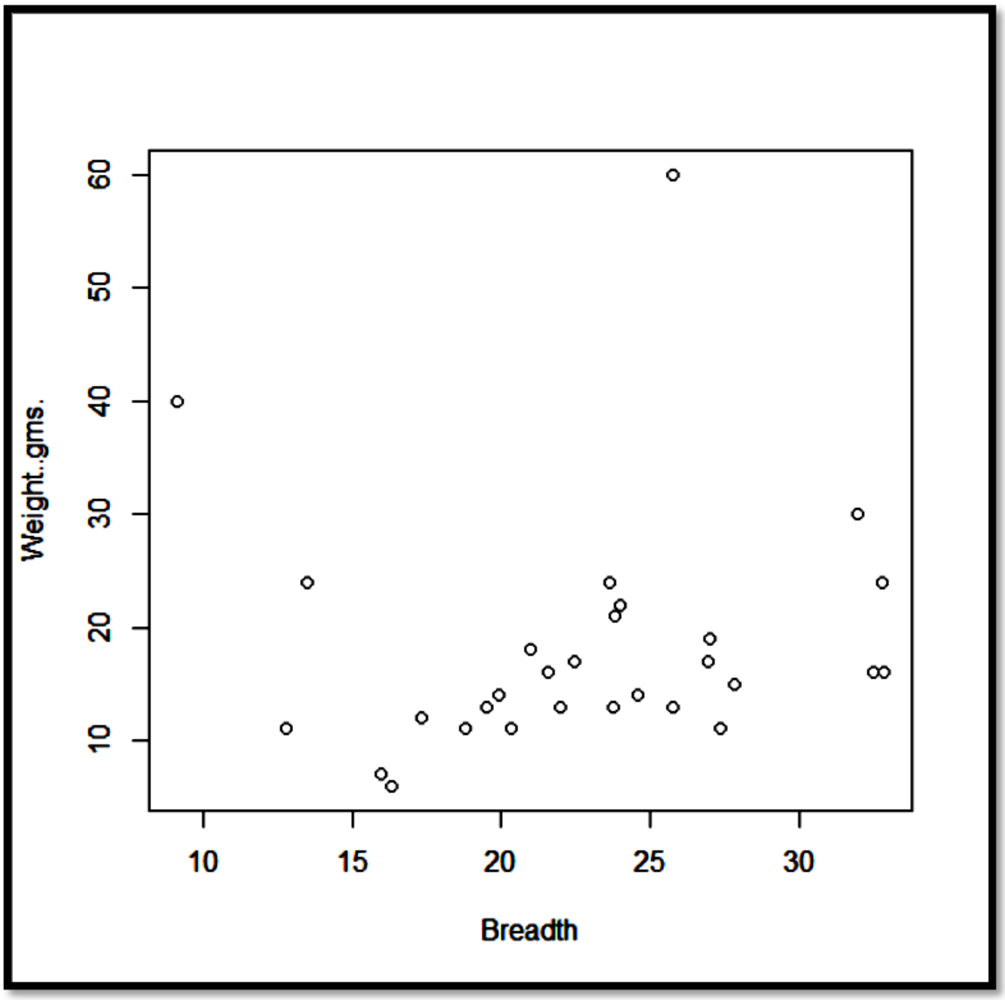


Fig.4.3.1.4: Scatter Plot Showing the Relation Between Breadth vs Weight

4.3.2 Axe

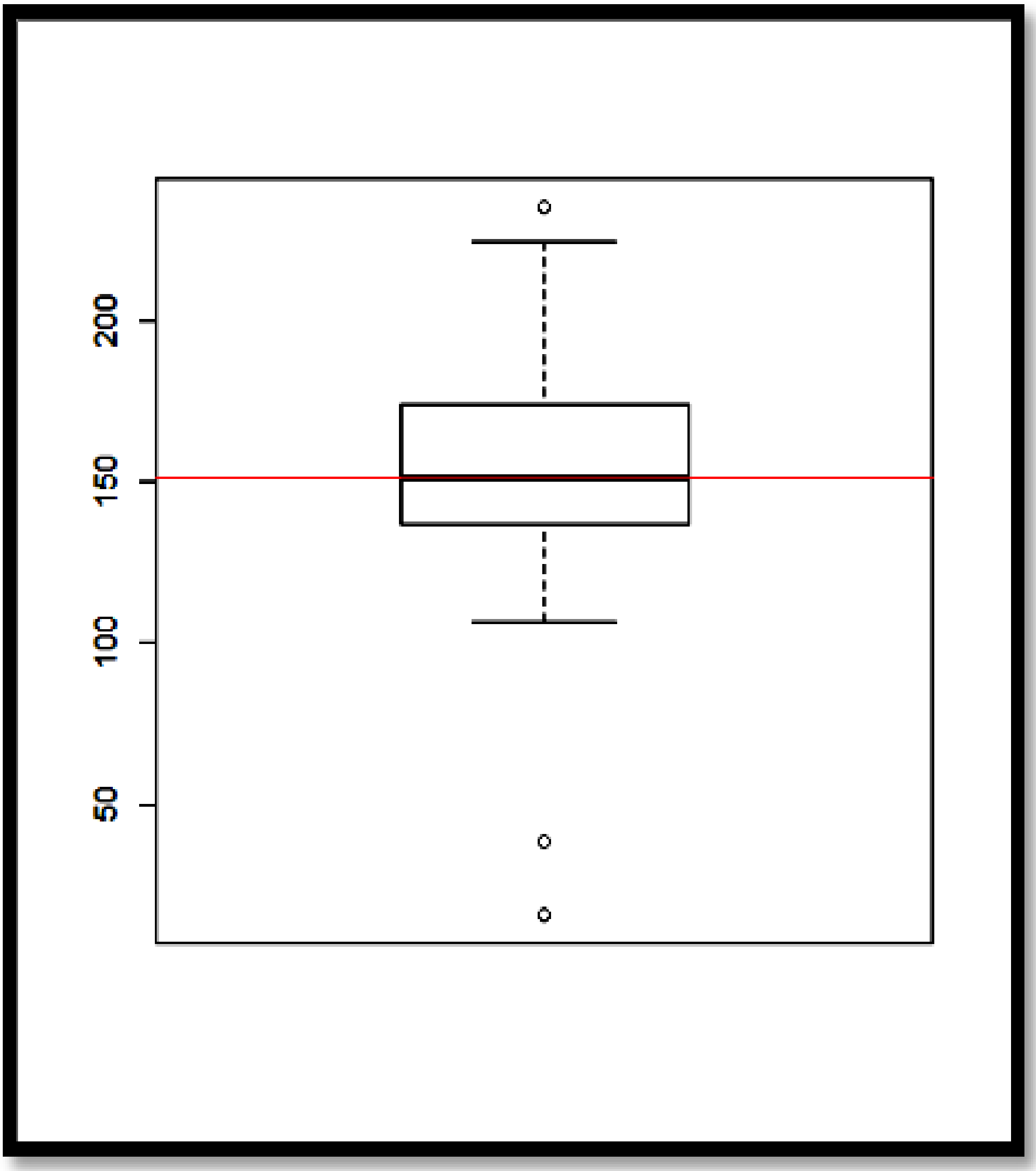


Fig.4.3.2.1: Box- Plot Showing the Outliers within the Axe Assemblage

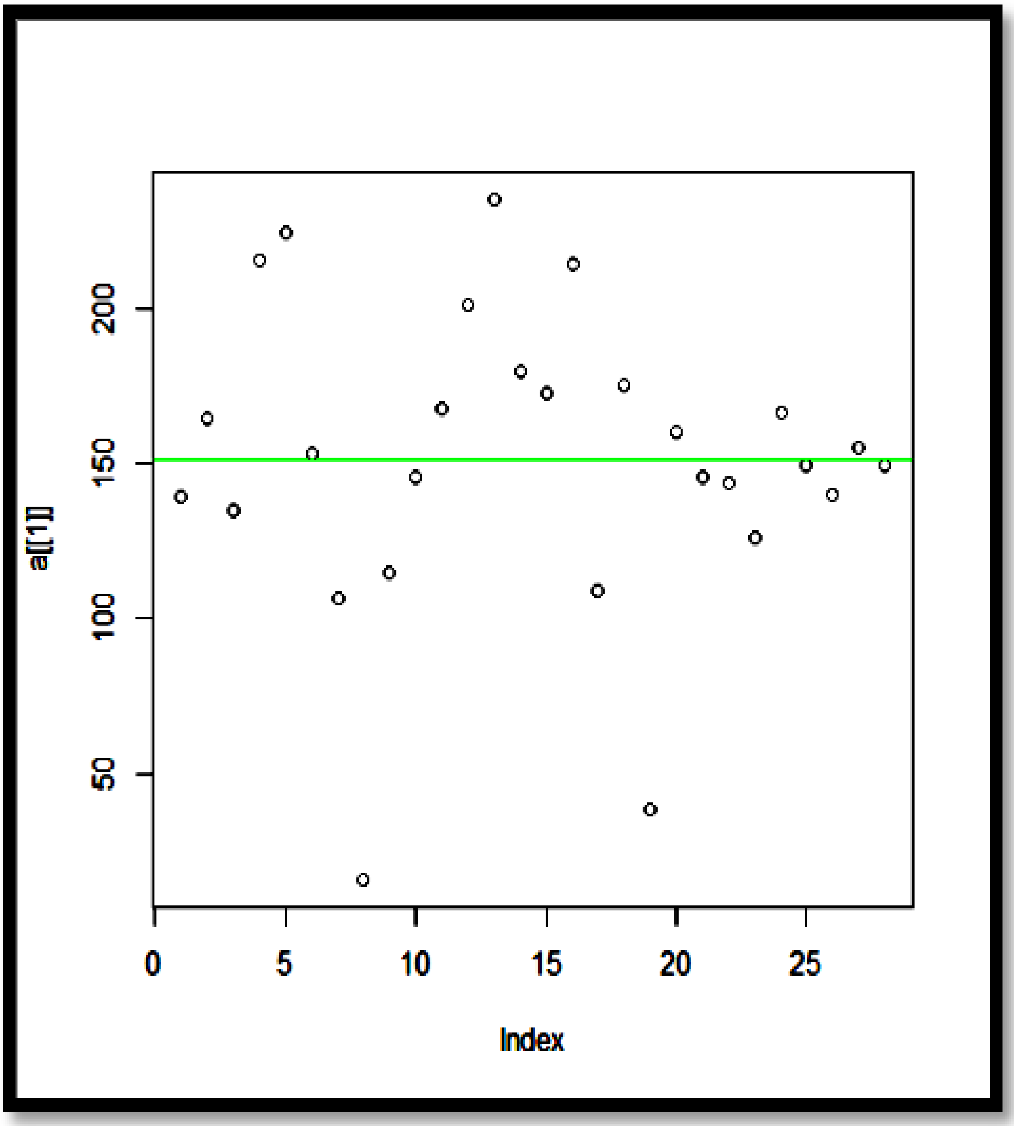


Fig.4.3.2.2: Scatter Plot Showing the Clustering of Artefacts

This group of artefacts (45) when analyzed shows that the artefacts from all the sites fall within a specific range and can be grouped within a single bracket. A box plot Fig. 4.3.2.1 clearly shows three outliers (16.01 mm., 38.70 mm. and 235.19 mm.), where length is the main parameter. Y-axis shows the length of the axes. Red line shows the mean and black bold line shows the median of the parameter length of the axe. The axe from Khairwada (KRD 6845) measuring 38.70 mm. has been classified as miniature axe because of its stark difference with the other 44 axes analyzed which conform to a certain dimension. The miniature axes were probably associated only with burials and they have been designated as ritualistic objects as they were associated only with funerary rituals.

The axes commonly found from all the sites fall within a single bracket of 200 mm. – 250 mm.. The maximum number of large axes was found from the site of Mahurjhari. They were concentrated in Megaliths number 7 and 3. The largest axe (MHR 6229) measuring 235.19 mm. was found from Megalith: 3. Dhamna Linga had only one axe falling within this bracket. These axes are of an unusual large size and were probably manufactured for a specific purpose. The scatter plot Fig. 4.3.2.2 shows how the different observations of length of axe are scattered. The red line shows the mean and green line shows the median of length of axe. The Y-axis shows the length of the axe and X-axis shows the serial number of observations. As the mean and median are same in this case, so we are seeing only the green line here.

On the basis of morphometric analysis it is probable that two sizes of moulds were used for casting, one below 200 mm. and the other 200-250 mm. The size below 200 mm. was the standard size as the artefacts of this range dominate the assemblage. The evidence of miniature axe within the megalithic context is restricted to funerary offerings. Correlation coefficient between the two parameters length vs weight is 0.4493which shows that the two parameters are positively correlated. The scatter-plot Fig. 4.3.2.3 shows a positive correlation that is with an increase in length, weight will also increase. Similarly the correlation coefficient (Fig. 4.3.2.4) between the parameters breadth and weight calculated is 0.8194. This show the parameters are strongly positively correlated that is if the breadth increases then the weight will sharply increase. The standard shape and size of the artefact has been strictly maintained by the smith as they conformed to the specific needs of society.

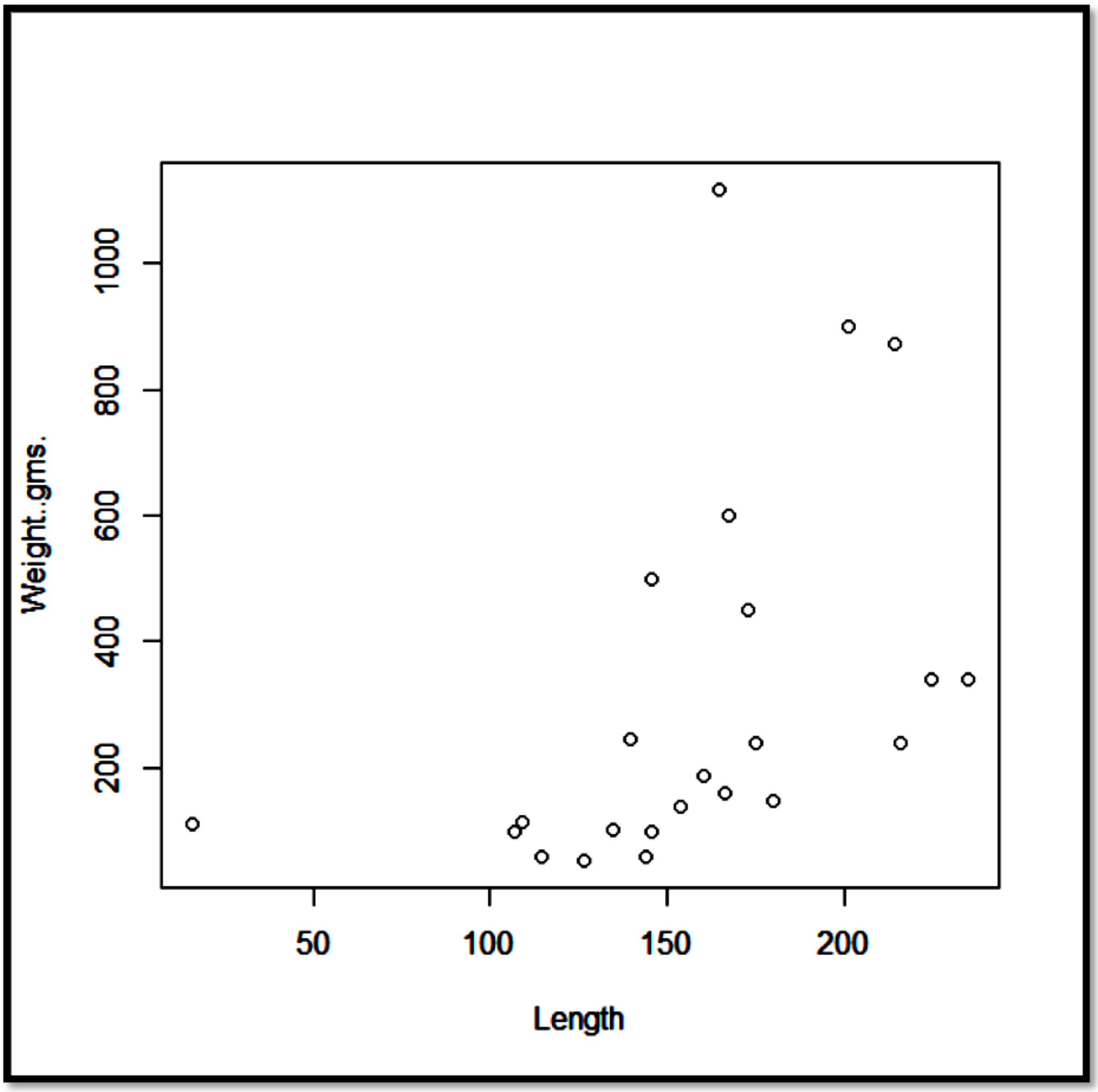


Fig.4.3.2.3: Scatter Plot Showing the Relation Between Length vs Weight

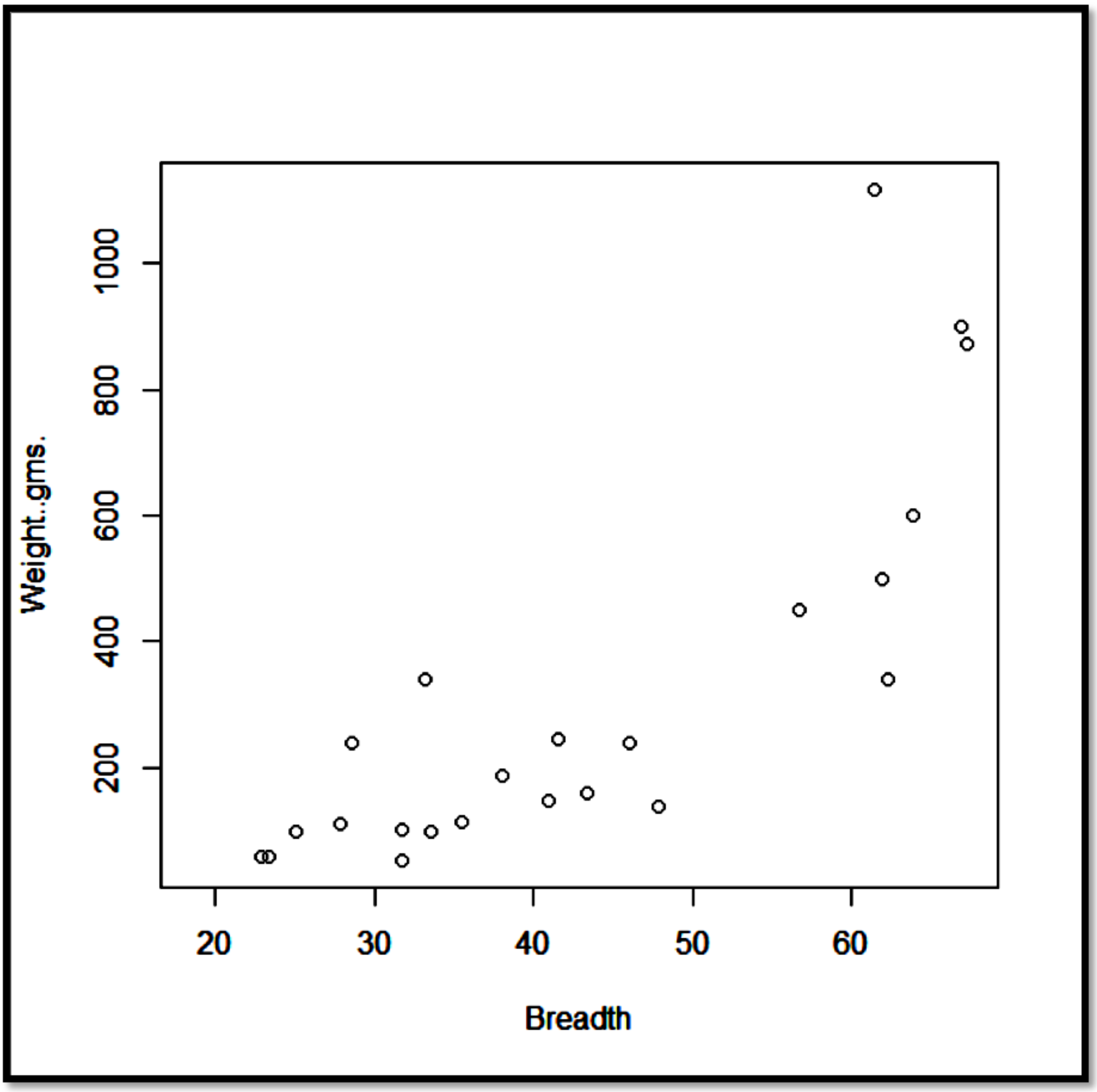


Fig.4.3.2.4: Scatter Plot Showing the Relation Between Breadth vs Weight

4.3.3 Chisel

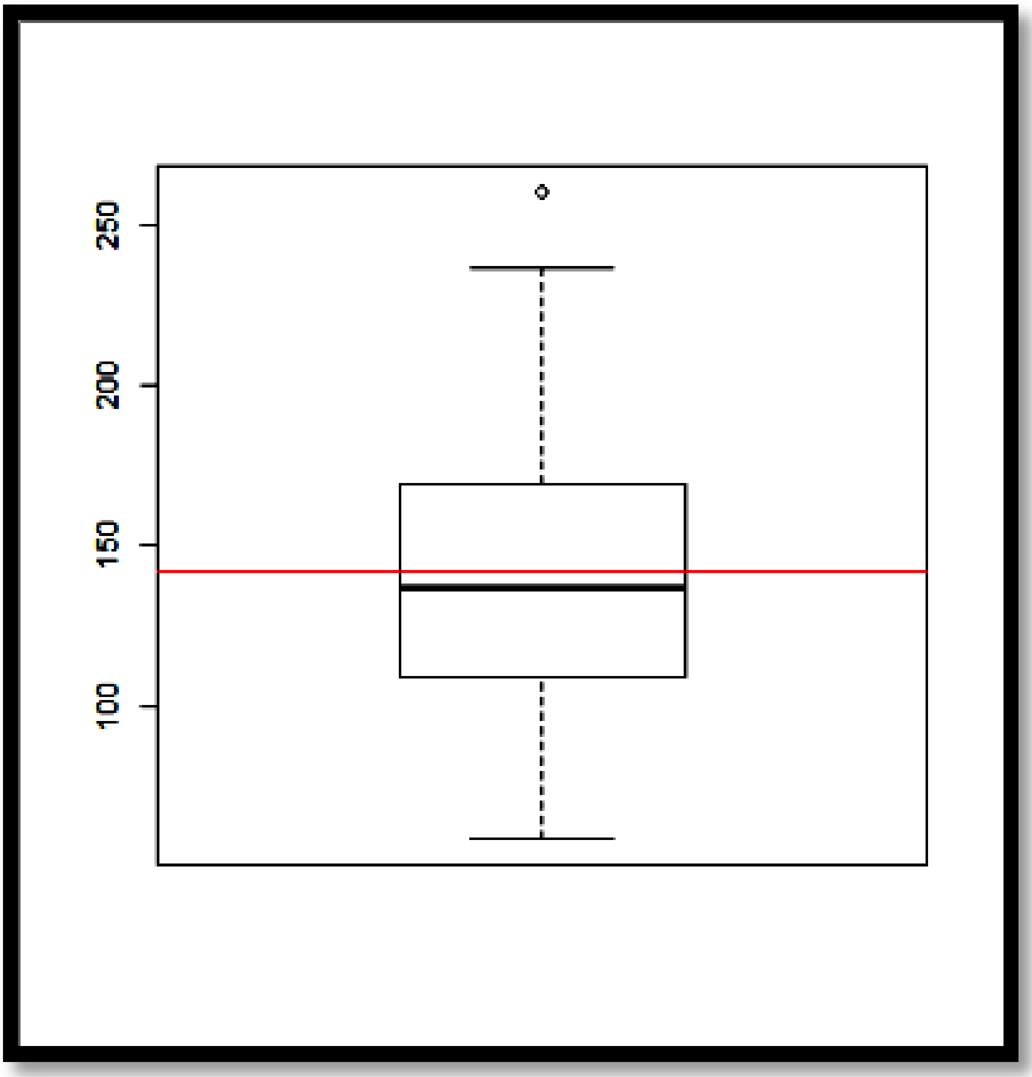


Fig.4.3.3.1: Box Plot Showing the Outliers within the Chisel Assemblage

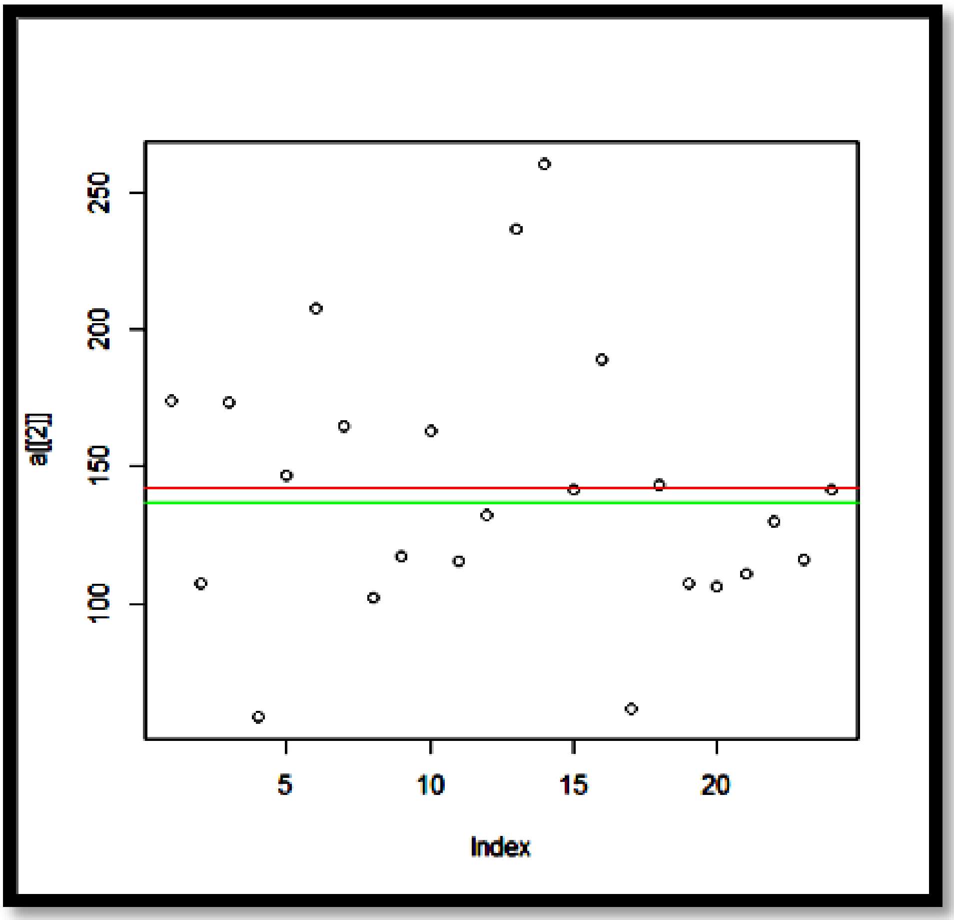


Fig.4.3.3.2: Scatter Plot Showing the Clustering of Artefacts

43 intact chisels were analyzed. The box- plot (Fig. 4.3.3.1) shows that KRD- 5915 has been calculated as the outlier. The chisel from Khairwada (KRD -5915) measuring 260.37 mm. in length has, does not fall into any cluster. The outlier denotes an artefact not conforming to the standard size probably suggesting a different make or made for a different purpose. The red line shows the mean and black bold line shows the median of the parameter length of the chisel. The Y-axis shows the length of the axe. The scatter plot: 4.3.3.2 shows how the different observations of length of chisels are scattered. It shows a negative correlation. The red line shows the mean and green line shows the median of length of the chisel. The Y-axis shows the length of the chisels and X-axis shows the breadth of the axes. An increase in the width of the artefact shows a decrease in the length of the artefact.

Secondly correlation coefficient was calculated between two sets of parameters, length vs weight and breadth vs weight. The correlation coefficient between length and weight was 0.7974 which is strongly positively correlated (Fig. 4.3.3.3). This implies that an increase in length induces a sharp increase in weight. On the other hand the correlation coefficient between breadth and weight is 0.4733 which is positively correlated (Fig. 4.3.3.4). This implies that an increase in the breadth of the artefact will show a marked increase in the weight of the artefact. This shows that the four dimensions of an artefact are related.

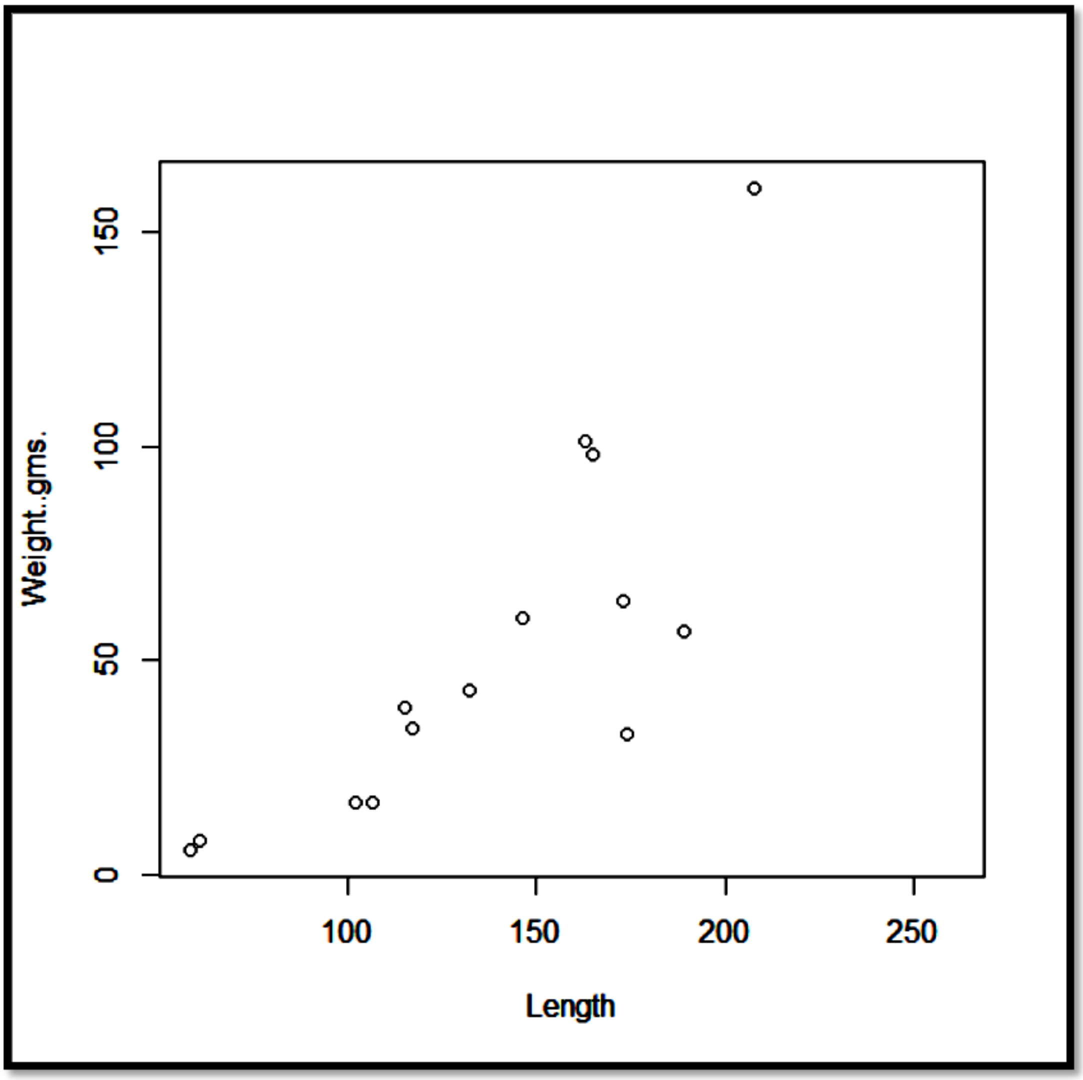


Fig.4.3.3.3: Scatter Plot Showing the Relation between Length vs Weight

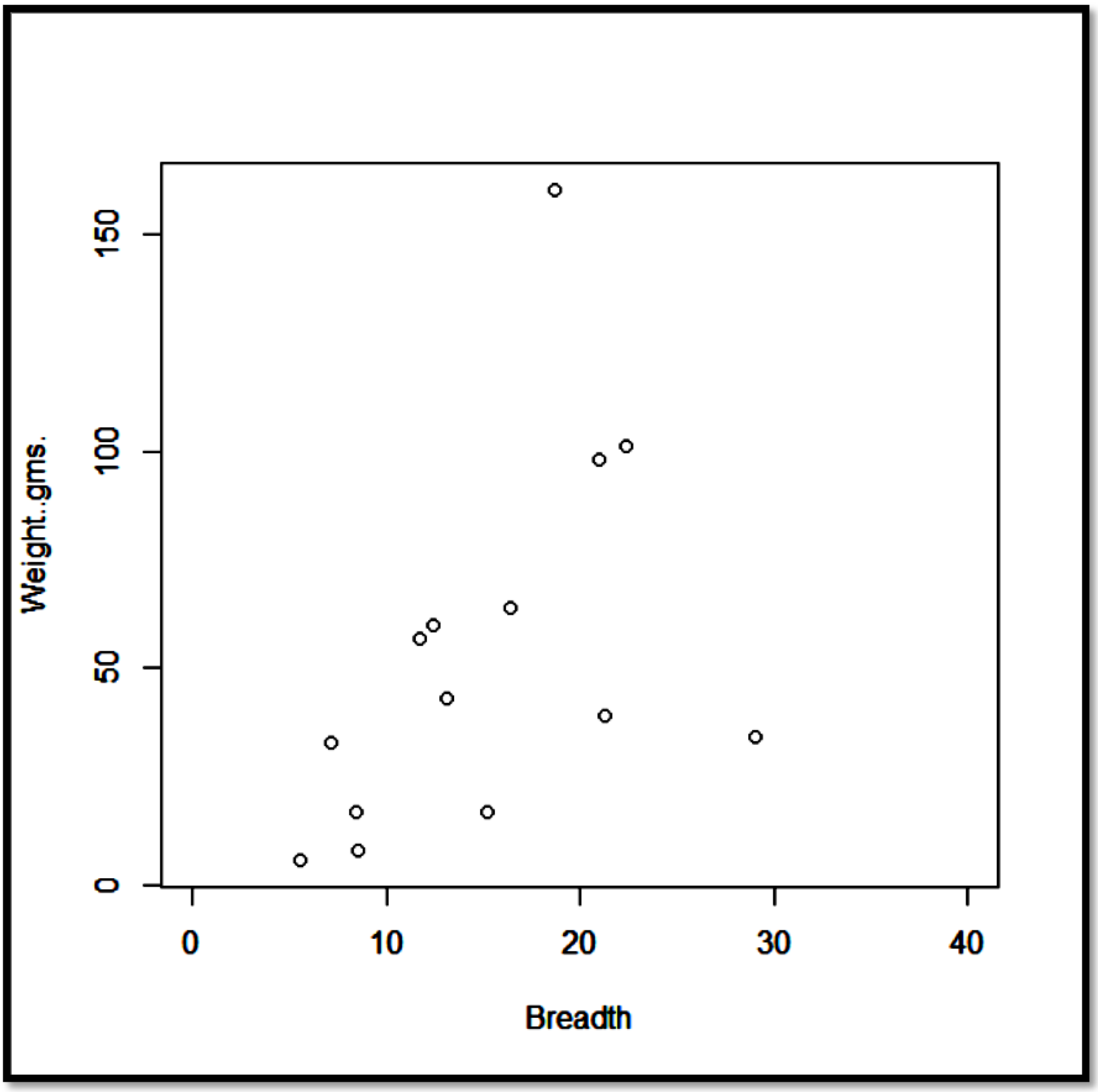


Fig.4.3.3.4: Scatter Plot Showing the Relation between Breadth vs Weight

4.3.4 Nail Parer

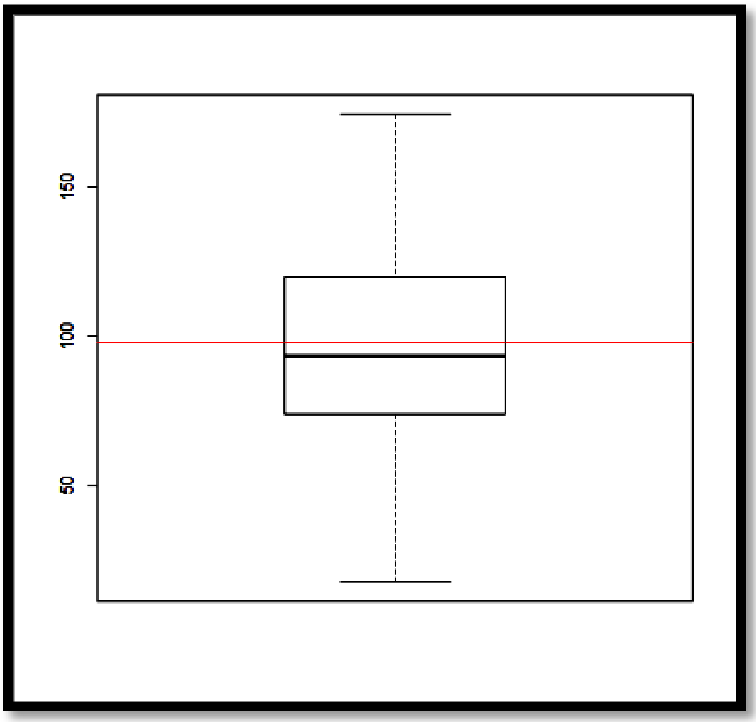


Fig.4.3.4.1: Box Plot Showing the Outliers in the Nail Parer Assemblage

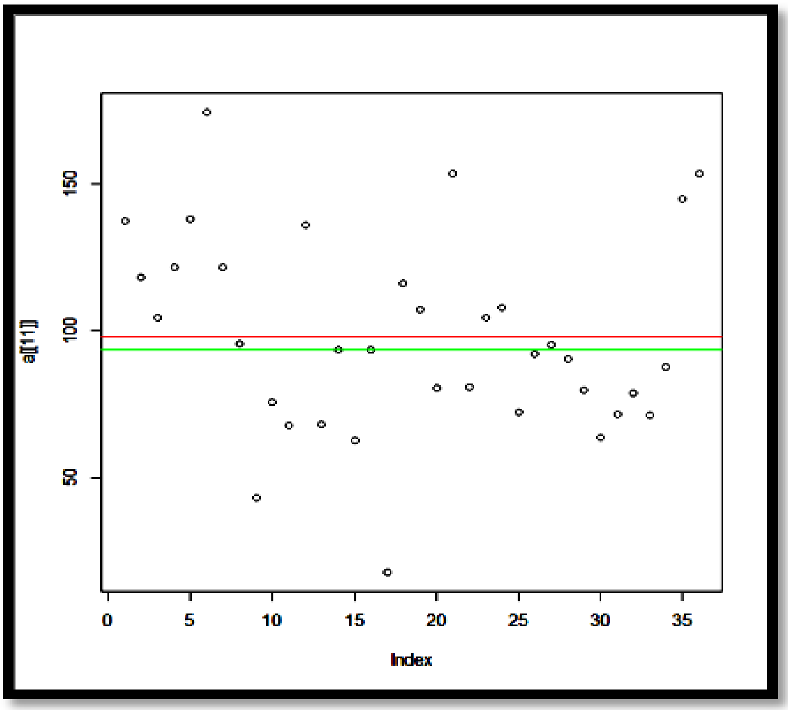


Fig.4.3.4.2: Scatter- plot showing the clustering of artefacts

The Box Plot (Fig. 4.3.4.1), shows no outliers when length of the Nail-Parers is taken as the parameter. Red line shows the mean and black bold line shows the median of the parameter length of the Nail-Parer. The Y-axis shows the length of the nail-parers. The scatter plot Fig. 4.3.4.2 plots the different observations of length of nail-parers in relation to the width of the triangular blade. The scatter plot shows a weakly negative correlation between the two parameters. The red line shows the mean and green line shows the median of length of the nail-parer. The Y-axis shows the length of the nail-parer and X-axis shows the width of the blade.

Secondly correlation coefficient was calculated between two sets of parameters, length vs weight and breadth vs weight. The correlation coefficient between length and weight was 0.1848 which is weakly positively correlated (Fig. 4.3.4.3). This implies that an increase in length induces an increase in weight however not a marked change is visible. On the other hand the correlation coefficient between breadth and weight is -0.8318 which is strongly negatively correlated (Fig. 4.3.4.4). This implies that an increase in the breadth of the artefact will show a marked decrease in the weight of the artefact.

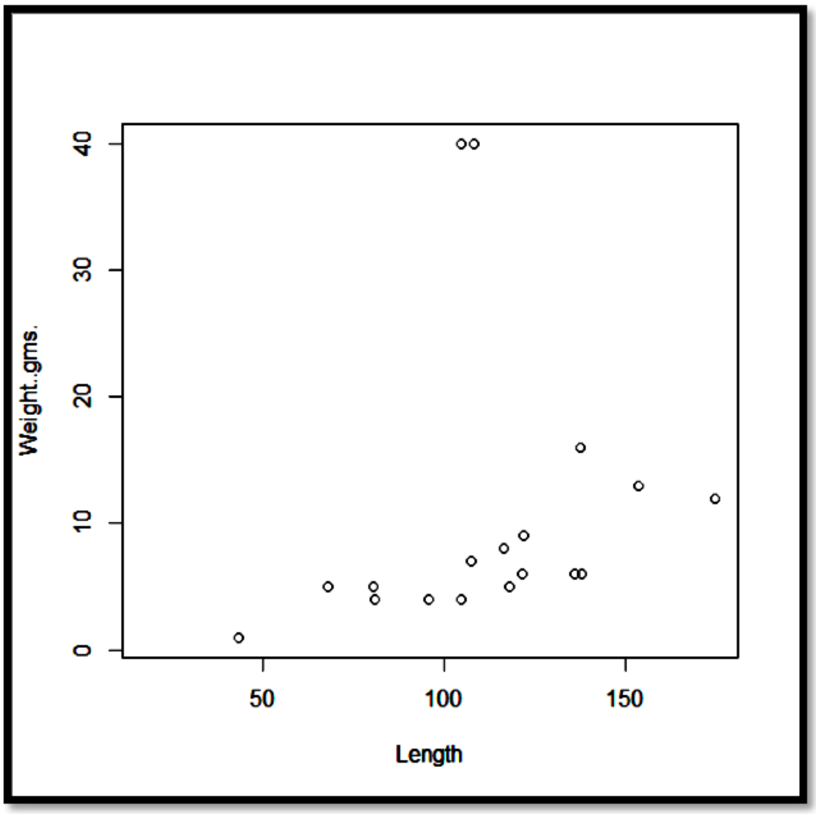


Fig.4.3.4.3: Scatter Plot Showing the Relation between Length vs Weight

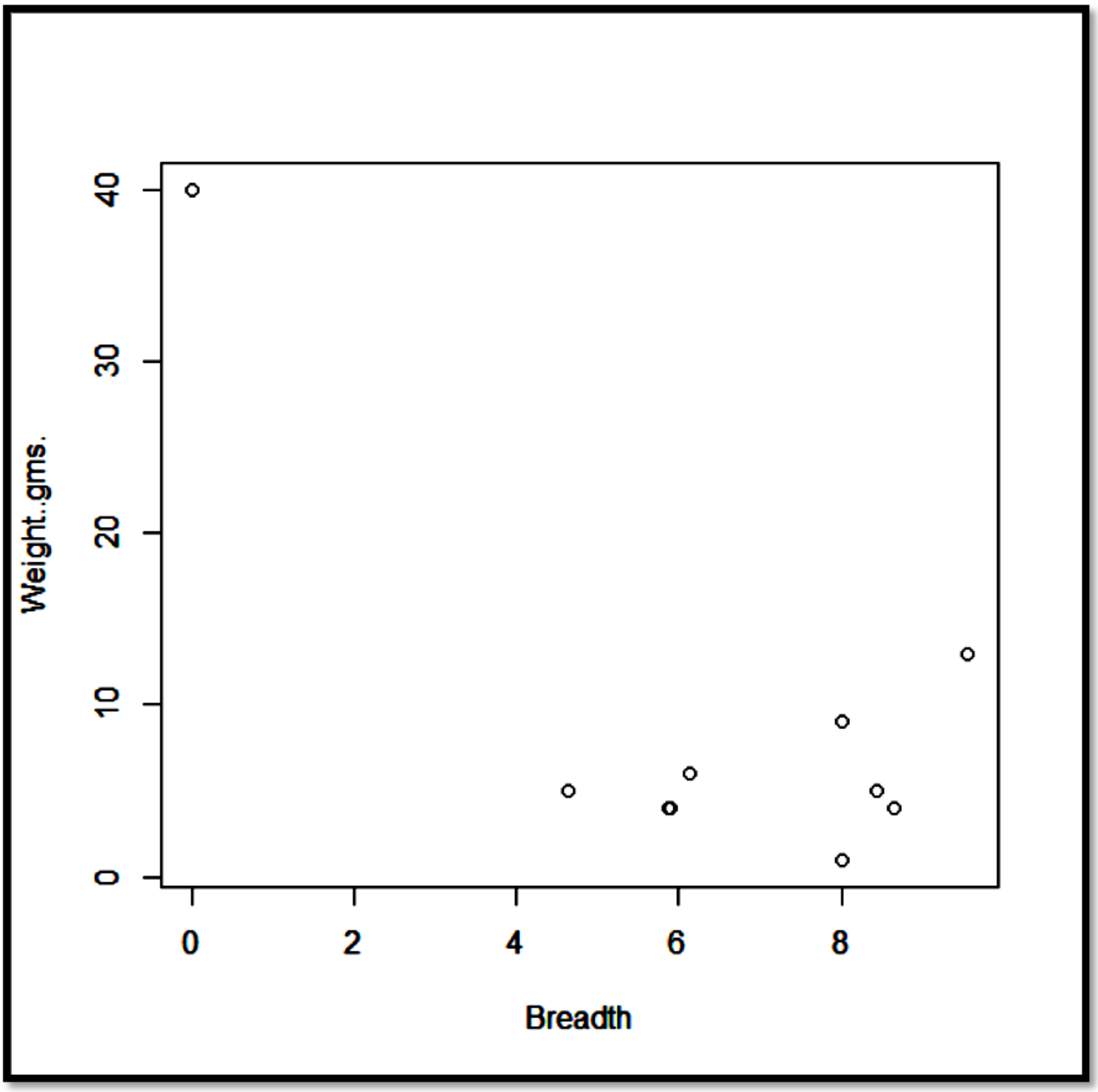


Fig.4.3.4.4: Scatter plot Showing the relation between breadth vs weight

4.4 Metallographic and Chemical Analysis

We have two categories under this heading; the first half includes the results of the archaeological artefacts which represent the entire artefact assemblage. Altogether 32 representative samples from (Table: 4.4.1) excavated Megalithic, Early Iron Age sites were analysed. Here wet chemical and EDAX data is included. The description of the microstructure both optical and scanning electron microscopy of each sample is included here. The second half of the chapter includes optical microscopic analysis of ethnographic samples (Table: 4.4.4)**,** which is followed by a brief interpretation of the metallurgical process**.**

Table 4.4.1: Representative Samples of Iron Artefacts from Early Iron Age

	Accession No	Artefact	Provenance	Length (mm.)	Breadth (mm.)	Thickness (mm.)	Description
a	**VHD 62**	Dagger	Meg: 1 Qdr: SE (central pit)	200.86	37.99	3.37	Straight Cutting Edge. Corroded Rusted Surface
b	**VHD 74**	Ladle	Meg: 1 Qdr: SE (central pit)	-	-	-	Vertical Handle Broken From the Luting End
c	**VHD 80**	Ladle	Meg: 1 Qdr: NE	-	-	-	
d	**VHD 50**	Chisel	Meg: 1 Qdr: SE (central pit)	99.33	11.73	5.84	Tanged End Broken. Use Wear Marks On Broader Section.
e	**VHD 33**	Adze	Meg: 1 Qdr: NE	-	-	-	
f	**VHD 24**	Ladle (vertical handle)	Meg: 1 Qdr: SW	-	-	-	All Broken Fragments
g	**VHD 16**	Adze	Meg: 1 Qdr: SE	-	-	-	Broken
h	**NKD 5866**	Nail Parer	LOCUS: II Meg: 7	110.81	-	6.11	Elongated Cylindrical Object Rod Like Object
i	**NKD 5861**	Nail Parer	Locality V Md 1 Tr: C1 Layer: 3	104.35	-	4.24	Elongated Cylindrical Object Rod Like Object
j	**MHR 6441**	Adze	Meg: 2 Qdr: NE	105.89	-	-	Broken
k	**MHR 6559**	Horse Bit	Meg: 29	247.67	22.79	5.54	
l	**MHR 6419**	Spike Blade	Meg: 8 Qdr: SW	153.56	11.4	2.14	
m	**MHR 6551**	Spearhead/ Dagger	Meg: 7 Qdr: SW	183.33	23.66	3.58	
n	**MHR 6490**	Nail Parer	Meg: 11 Qdr: NW	68.49	-	3.95	
o	**MHR 6446**	Adze	Meg: 17 Qdr: SW	67.53	28.79	1.95	
p	**MHR 6078**	Dagger	Tr: II Qdr: SW	170.12	12.85	3.6	Broken From The Tanged End.
q	**MHR 6031**	Adze	Meg: 7	61.11	37.57	1.37	Only The (Broken) Broader Working Edge
r	**KRD 5914**	Horse Bit (Type 1a)	?	-	-	-	Broken
s	**KRD 6841**	Arrowhead	Locus: II Tr: A Depth: 1.70 m 4	-	-	-	Broken
t	**KRD 6839**	Arrowhead	Locus: II Tr: A Depth: 1.15 m 3	-	-	-	Broken
u	**KRD 6819**	Nail Parer	Locus: I Meg: L9 SE Qdr	48.41	-	5	Broken From The Gripping End..
v	**KRD 6831**	Chisel	Locus: II Tr: A Depth: 1.30 m 3	59.56	-	-	Broken From The Tanged End.

w	**BRG 5804**	Lamp Stand	Meg: 35 NW	-	-	-	Lamp With Part Of The Circumference Broken- Handle At 90 Degree. Probably Used As Lamp Because The Handle Is Turned At An Angle To Aid In Hanging
x	**BRG 5762**	Spearhead/ Dagger	Meg: 35 NW Qdr	103.5	32.69	2.15	Functionally Can Be Identified As Short Dagger But Technologically It Could Be A Spearhead. The Length Is Small For A Dagger
y	**BRG 5762 B**	Knife Blade	Meg: 35 NW Qdr	76.83	25.33	1.46	Knife Blade Broken From Both Ends, Rusted And Corroded
z	**BMR 5809**	Adze	Meg : 2 South	49.8	17.65	2.12	Broken
a/	**BMR 173**	Rod	Tr - Y23408 Depth :40 cms.	-	-	5.46	Broken
b/	**BMR 151-52**	Tang	Meg 1 : Qdr : SE	145.49	5.21	4.58	Broken
c/	**BMR 136**	Nail Parer	Meg : 4 Qdr : SW	137.32	-	5.26	Very Regular, Spiral Corrugations On The Shaft
d/	**BMR 5833**	Handle fragment	Meg : 3 Qdr : SE 2	99.36	3.67	3.42	Broken
e/	**BMR 112**	Chisel	Locus - SE Cist Chamber 58 cms.	80.74	18.62	1.79	Broken From The Working Edge
f/	**BMR 130**	Spike (Broken)	Tr - D30213 Depth: 65 cms. 4	44.91	9.04	3.03	Broken

Description of the Artefacts

The artefacts chosen for metallographic studies were sampled from the various categories and the least rusted artefacts were chosen. The samples were clipped from the working edge as represented in the given figures (Fig.4.4.1.a, 4.4.1.b, 4.4.1.c, 4.4.1.d, 4.4.1.e, 4.4.1.f, 4.4.1.g, 4.4.1.h, 4.4.1.i, 4.4.1.j, 4.4.1.k, 4.4.1.l, 4.4.1.o, 4.4.1.p, 4.4.1.q, 4.4.1.r, 4.4.1.u, 4.4.1.v 4.4.1.b’). The results of the microscopic studies are enumerated below.

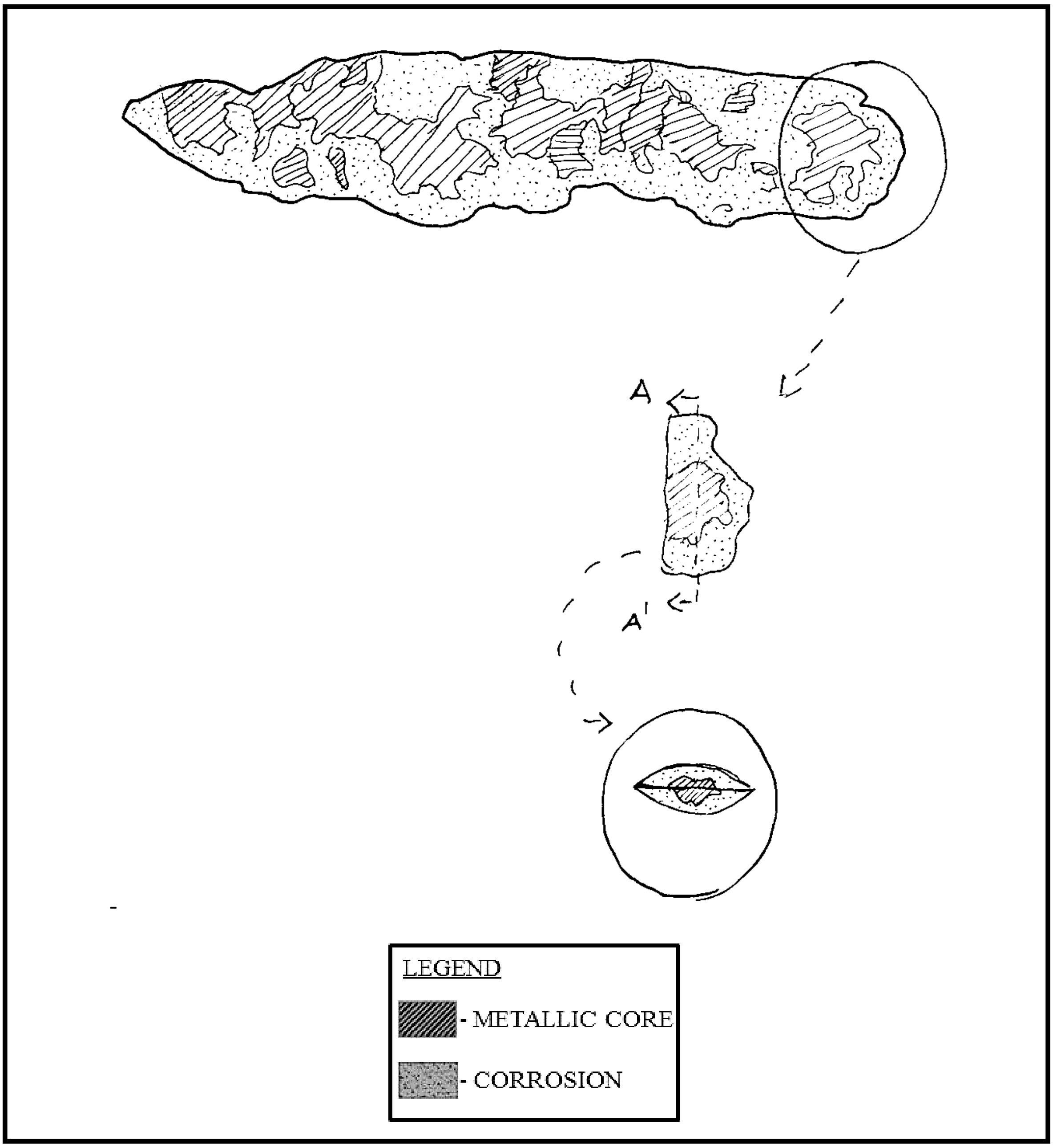


Fig.4.4.1.a: Sampled Section of VHD 62

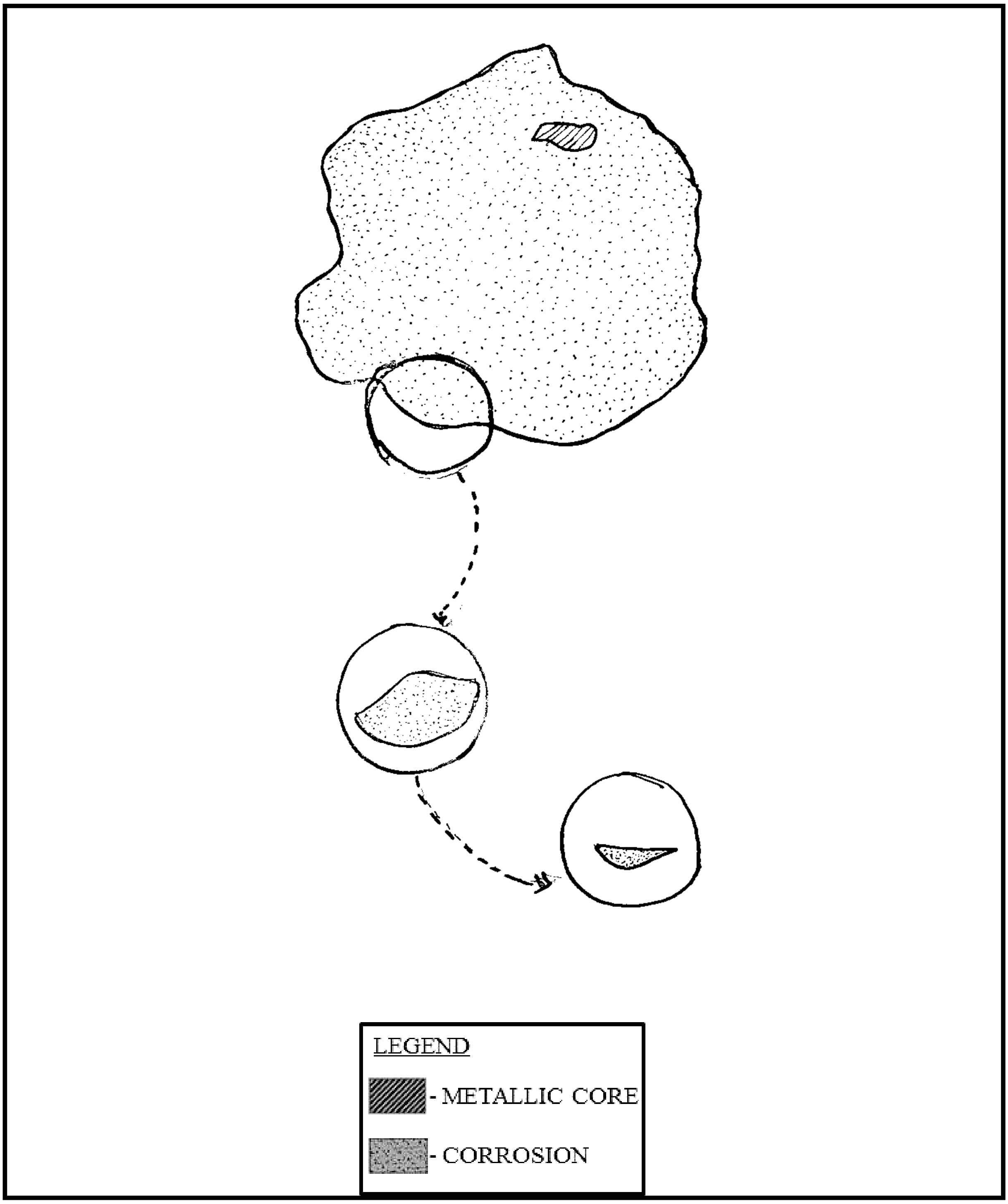


Fig.4.4.1.b: Sampled Section of VHD 74

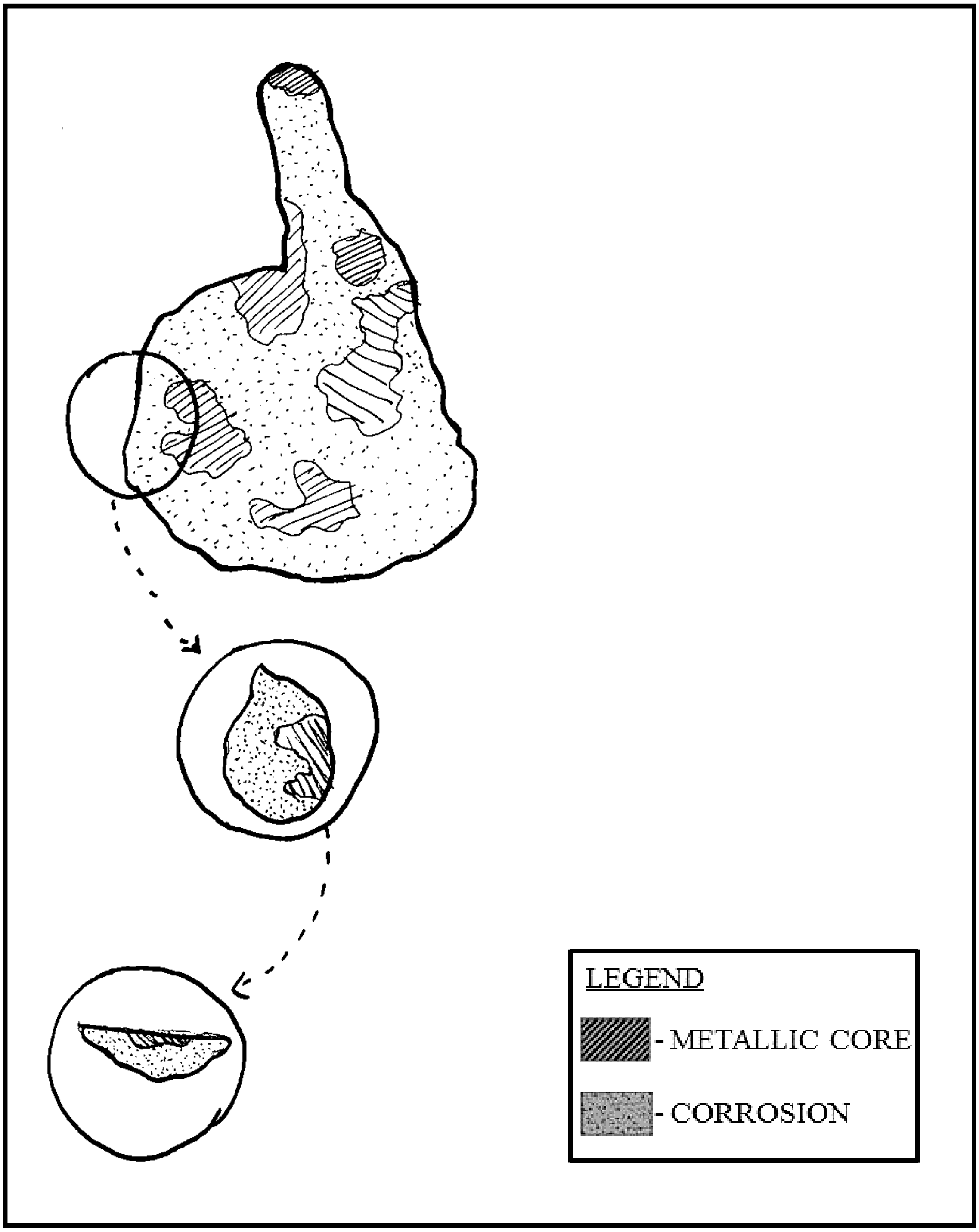


Fig.4.4.1.c: Sampled Section of VHD 80

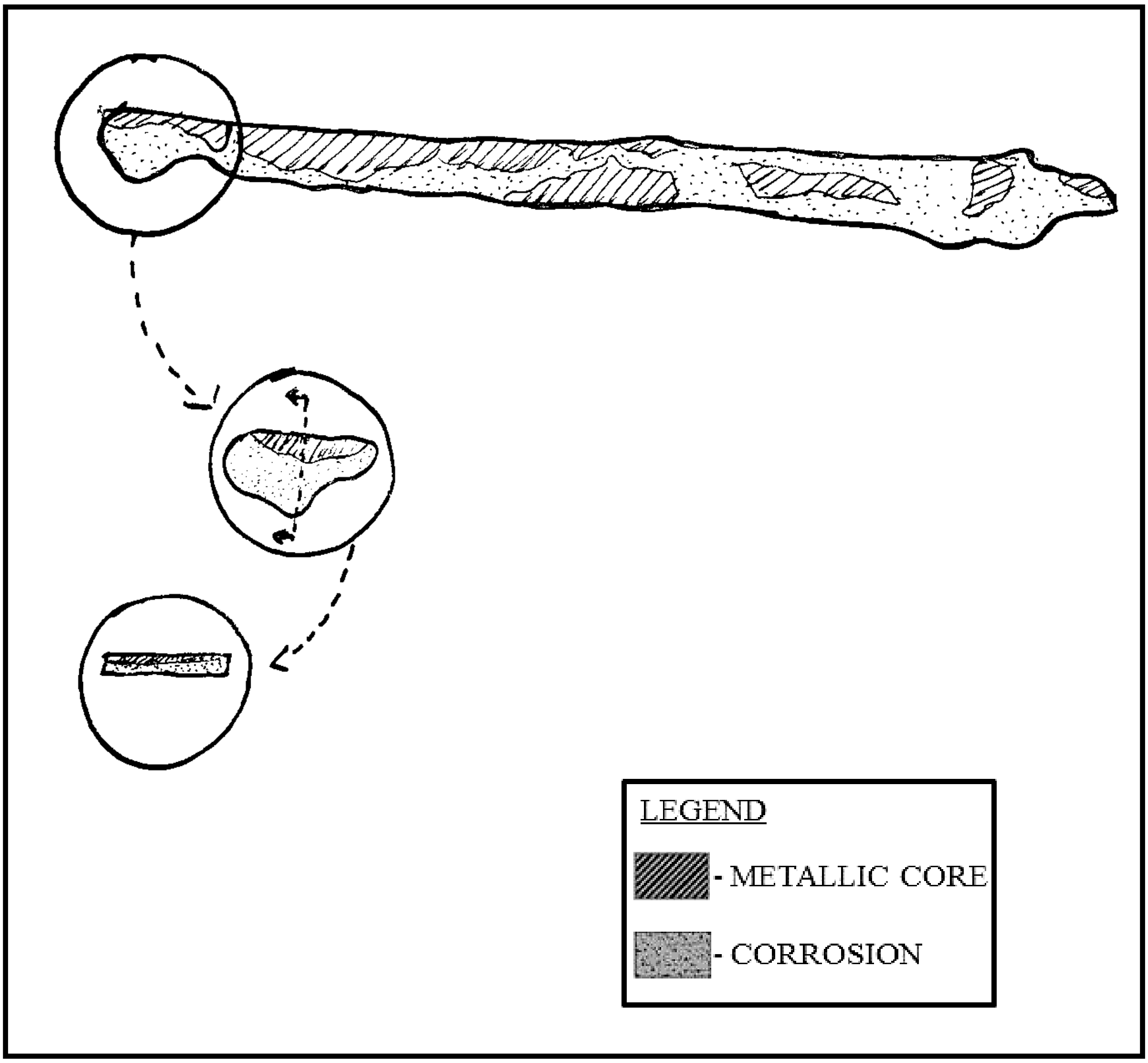


Fig.4.4.1.d: Sampled Section of VHD 50

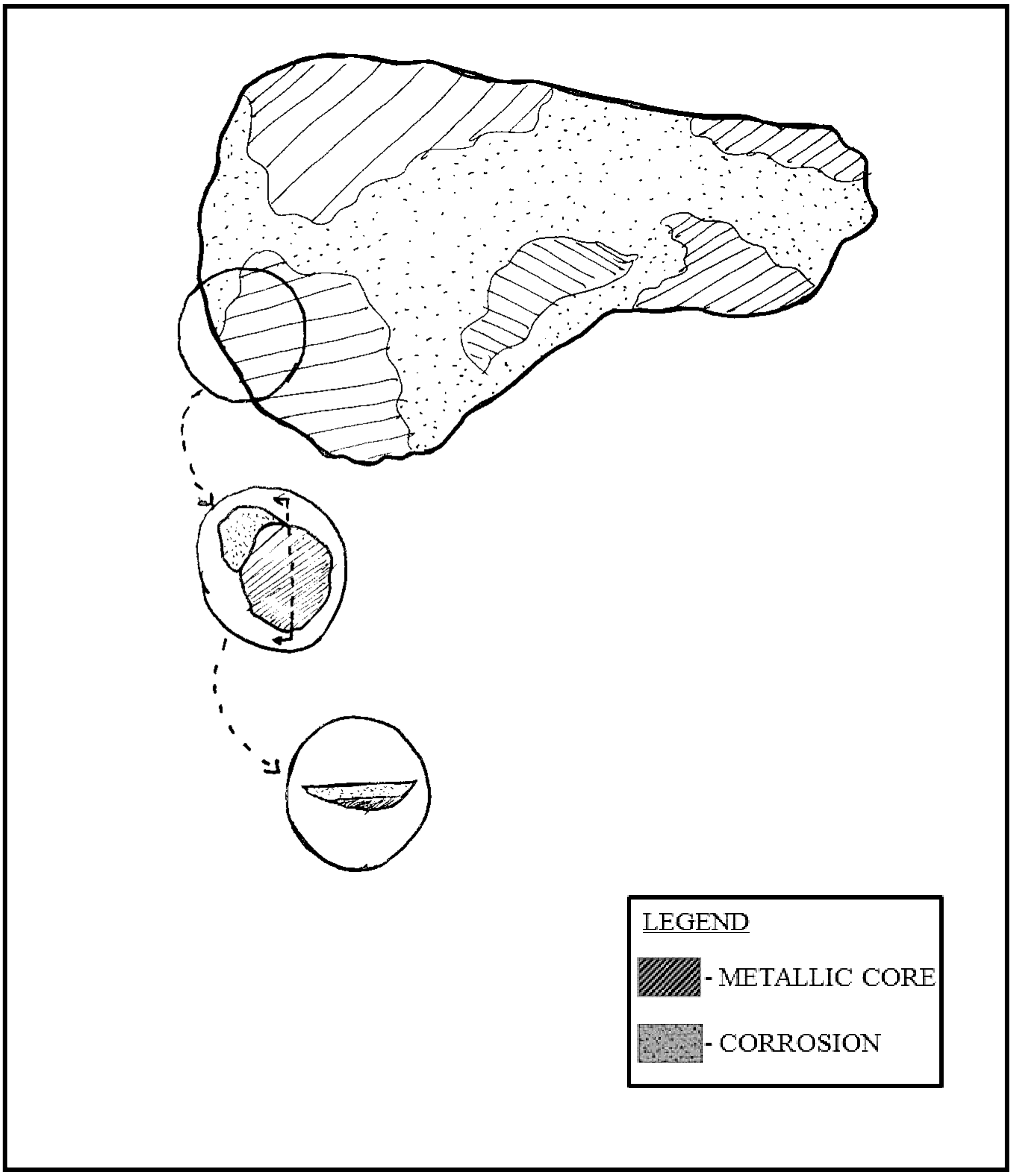


Fig.4.4.1.e: Sampled Section of VHD 33

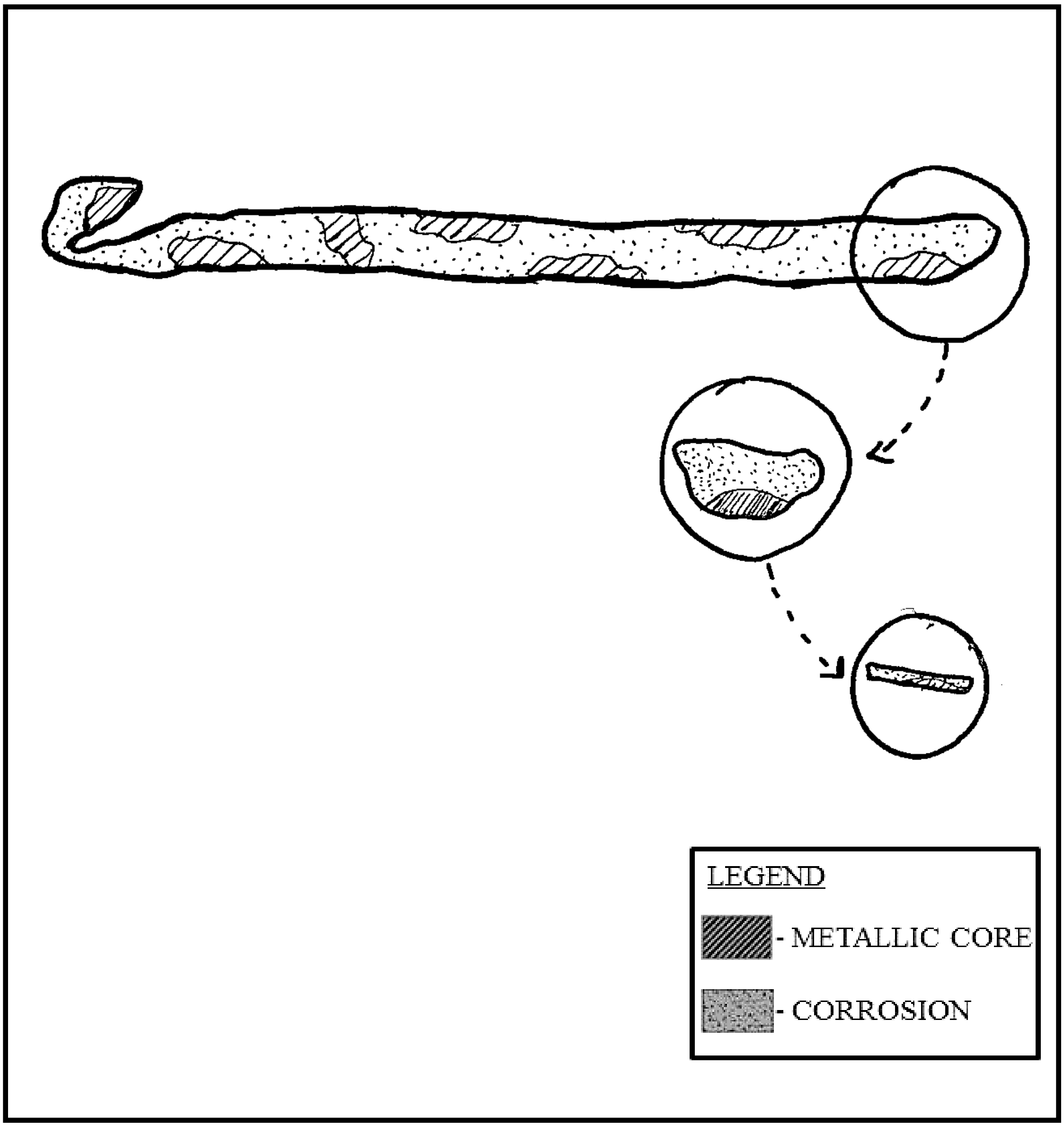


Fig.4.4.1.f: Sampled Section of VHD 24

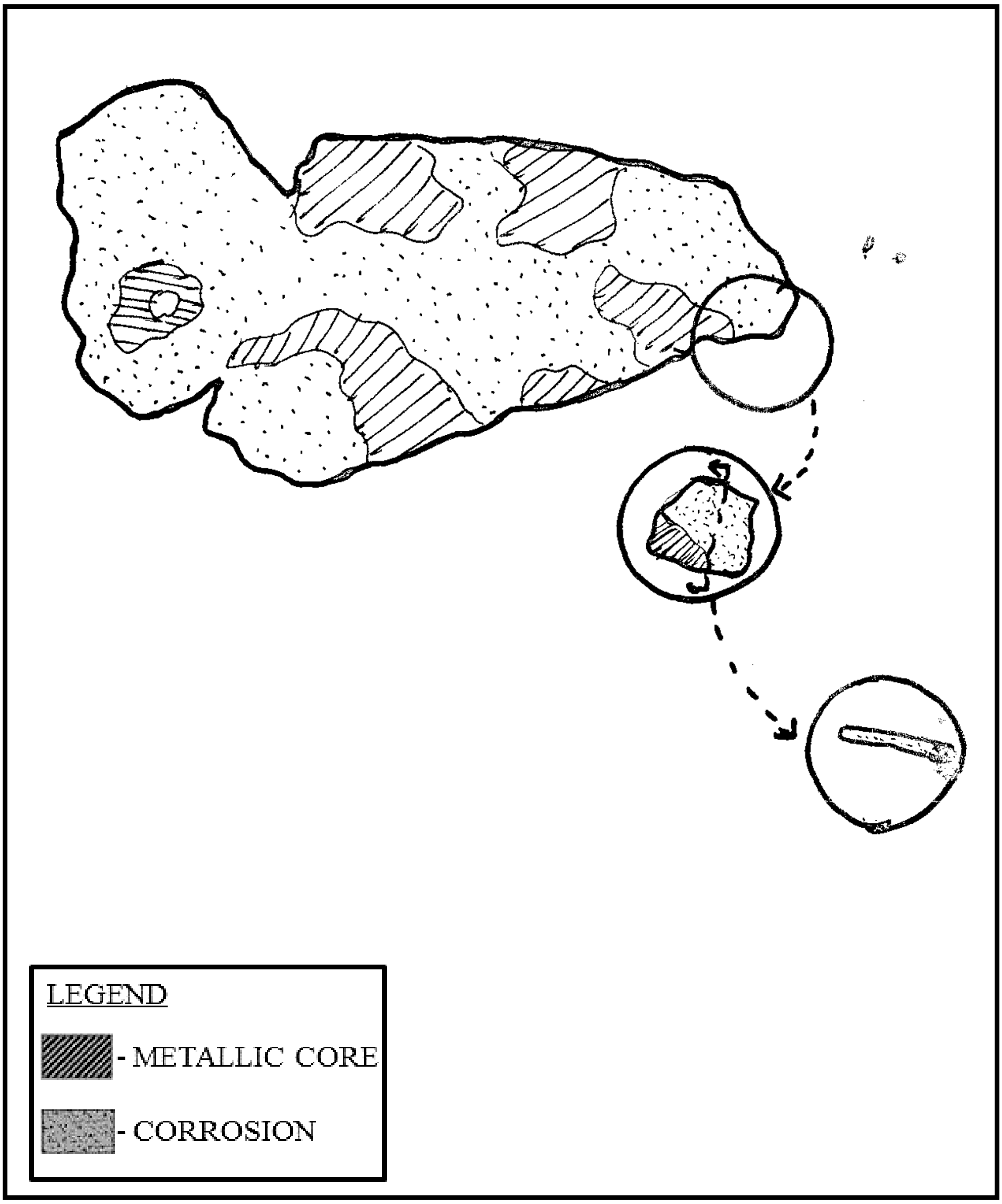


Fig.4.4.1.g: Sampled Section of VHD 16

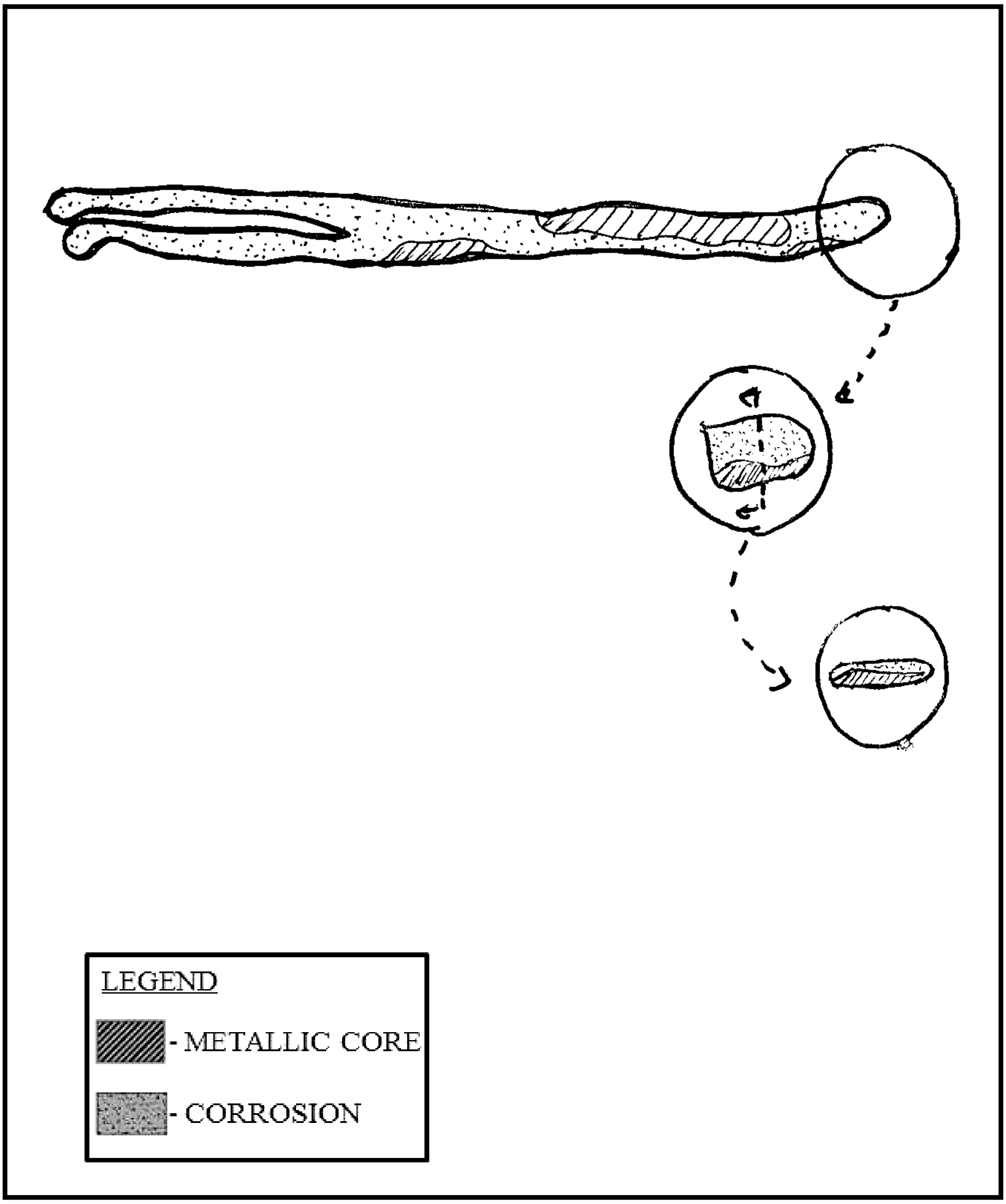


Fig.4.4.1.h: Sampled Section of NKD 5866

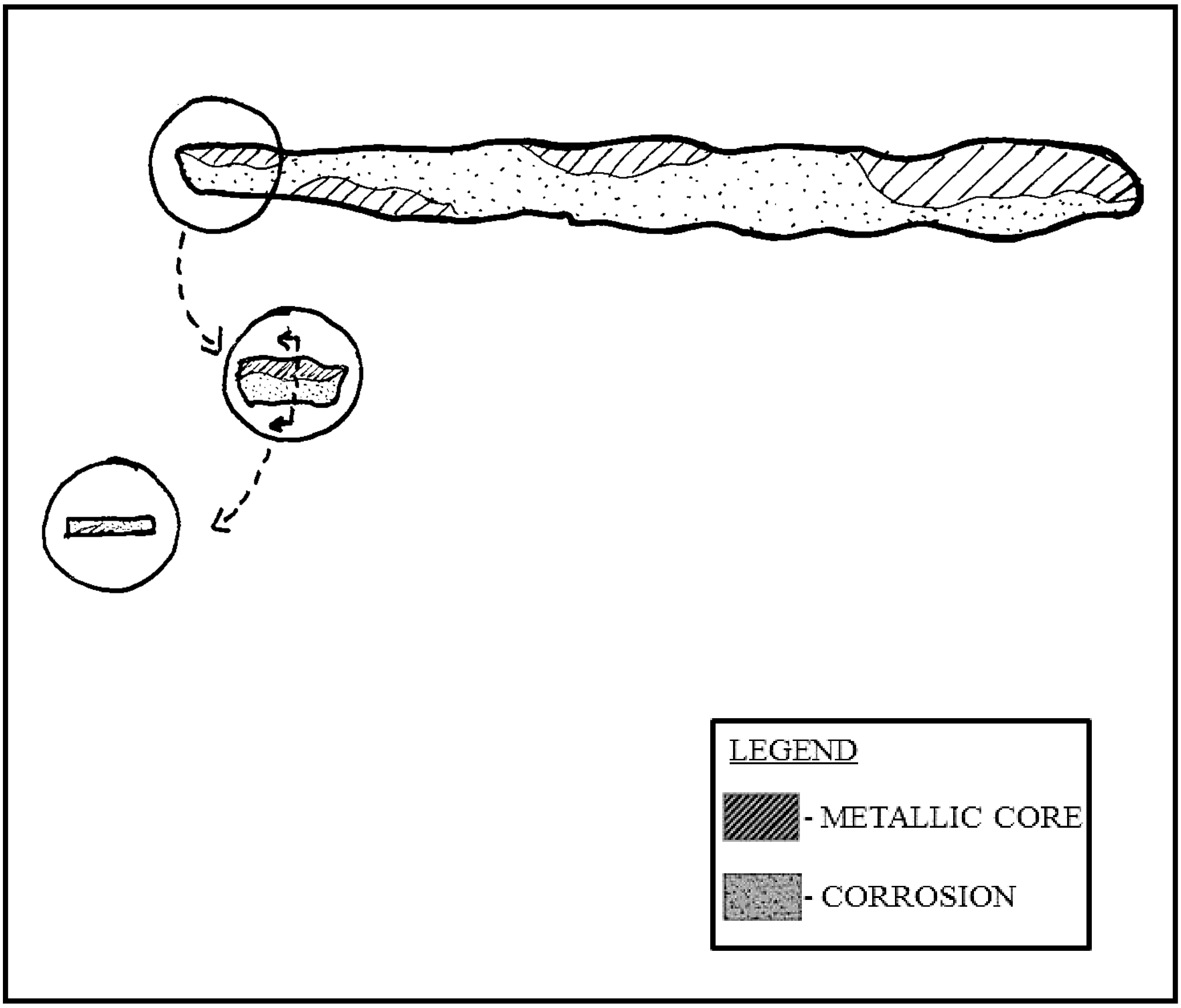


Fig.4.4.1.i: Sampled Section of NKD 5861

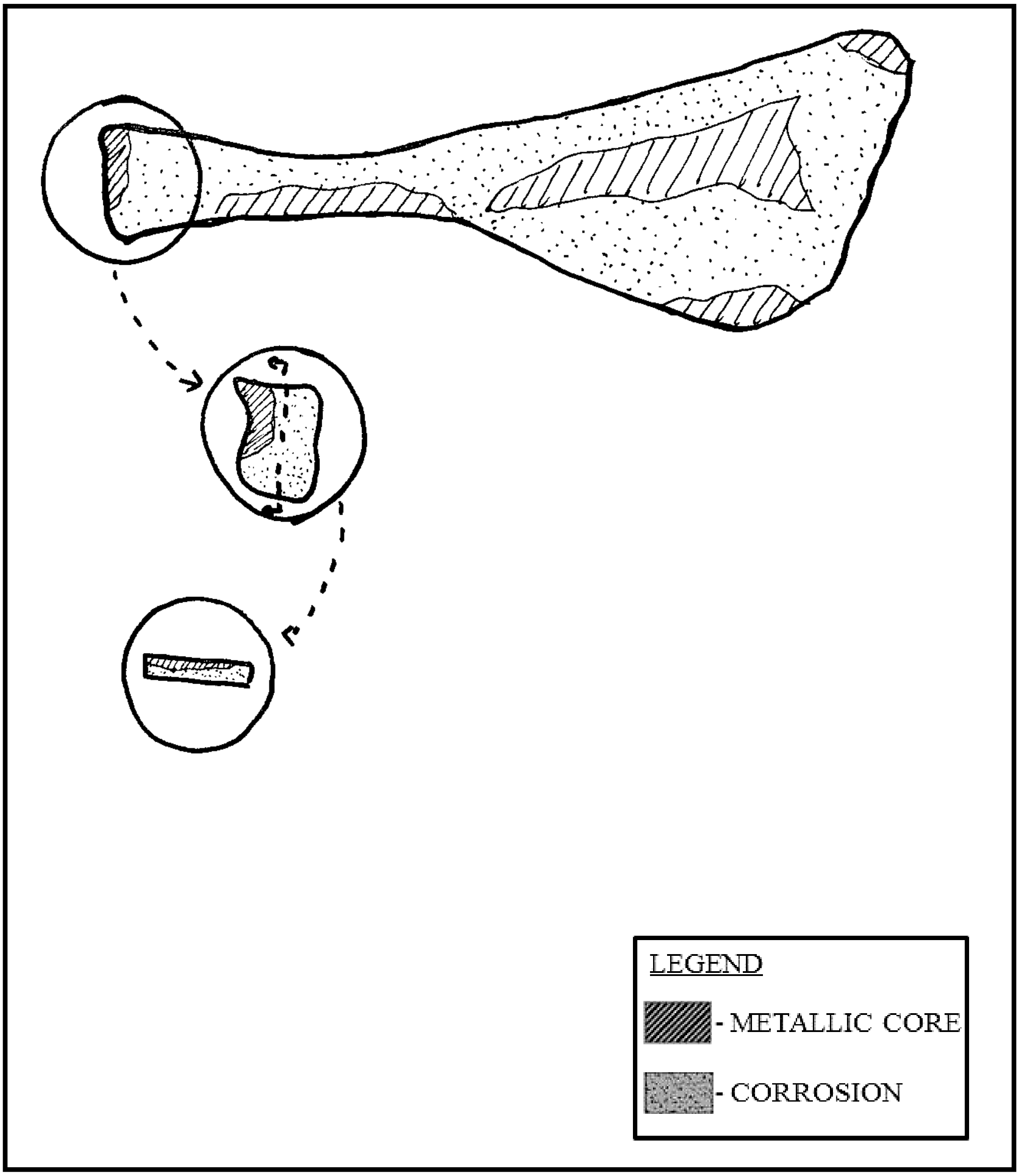


Fig.4.4.1.j: Sampled Section of MHR 6441

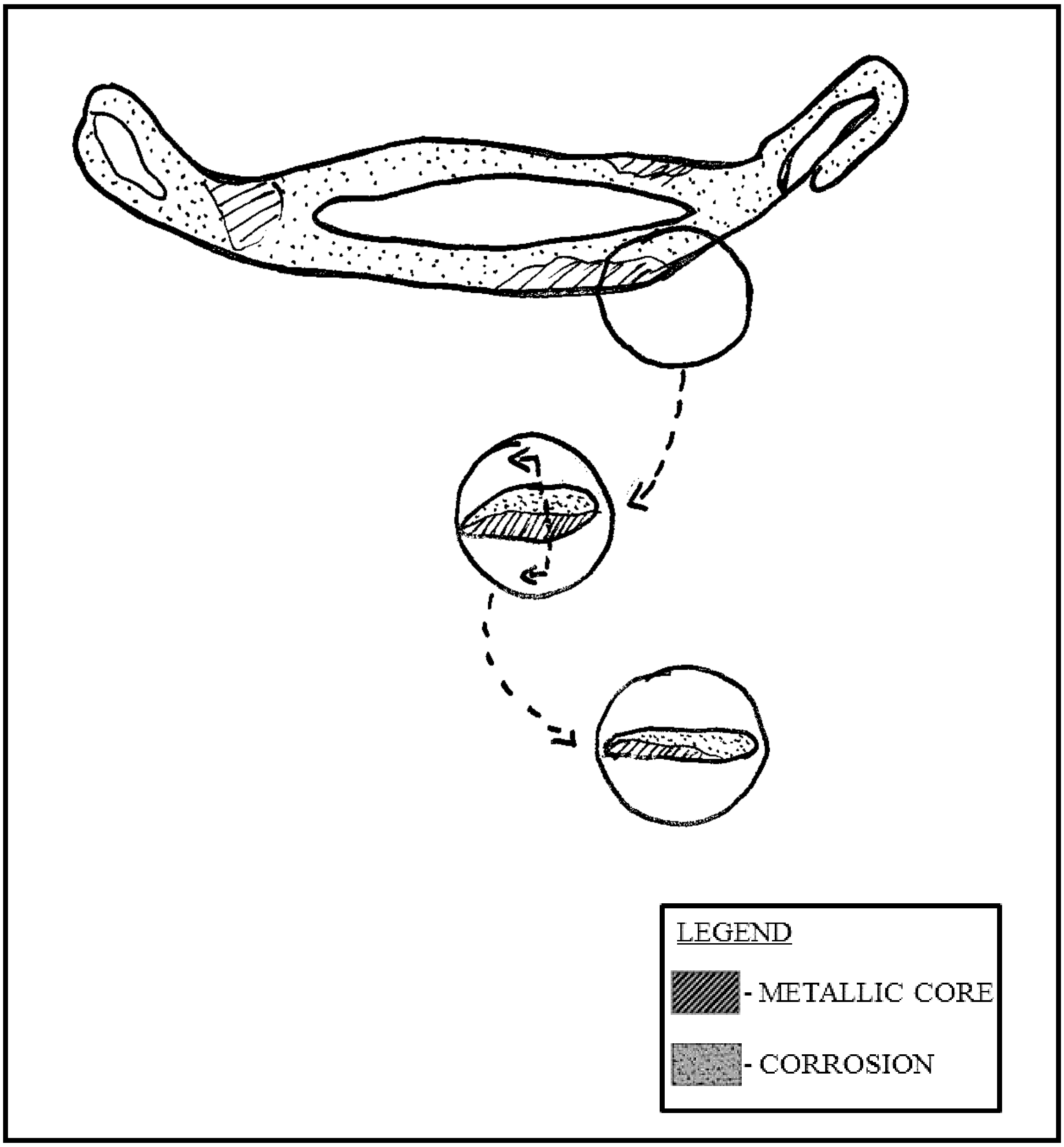


Fig.4.4.1.k: Sampled Section of MHR 6559

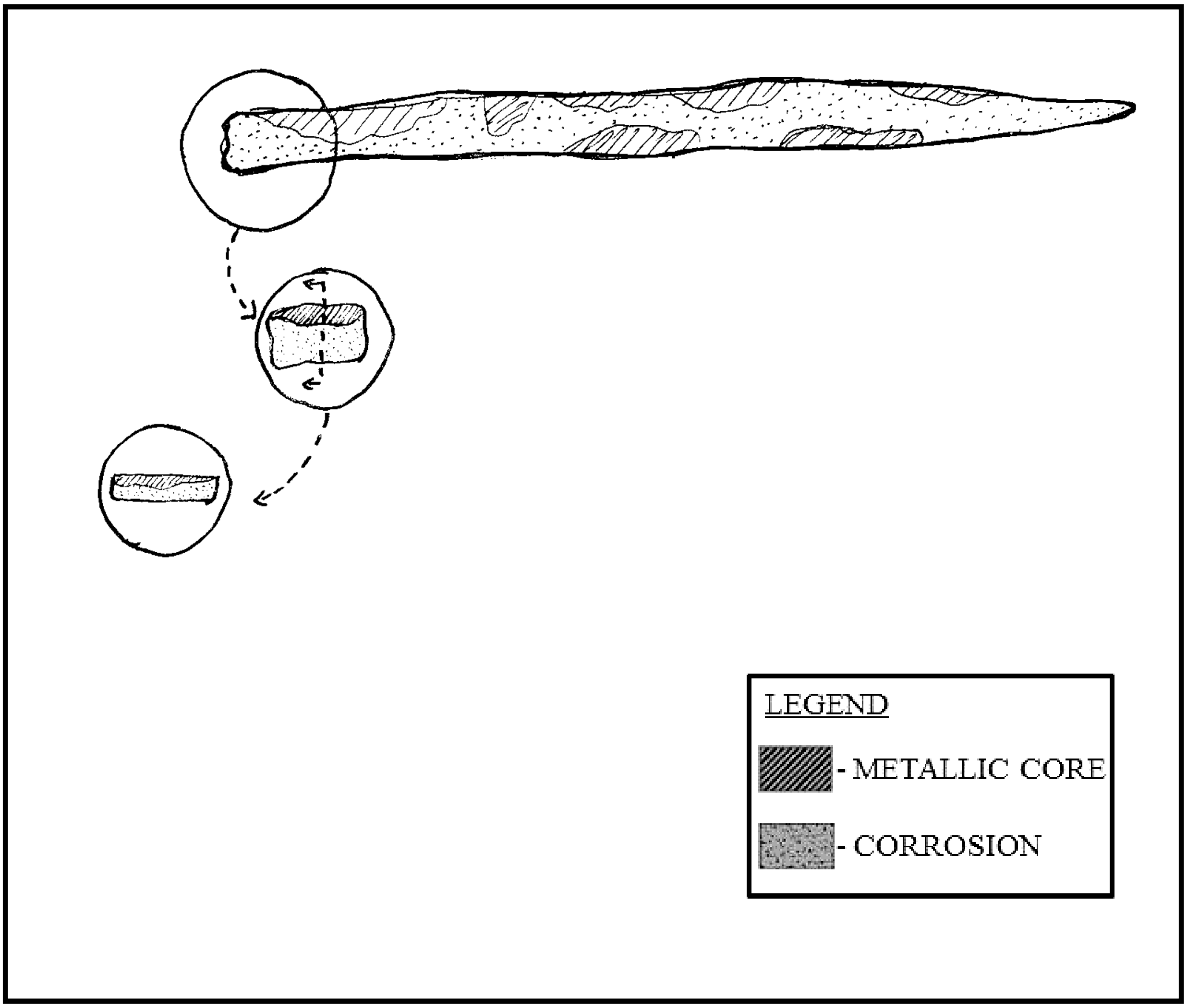


Fig.4.4.1.l: Sampled Section of MHR 6419

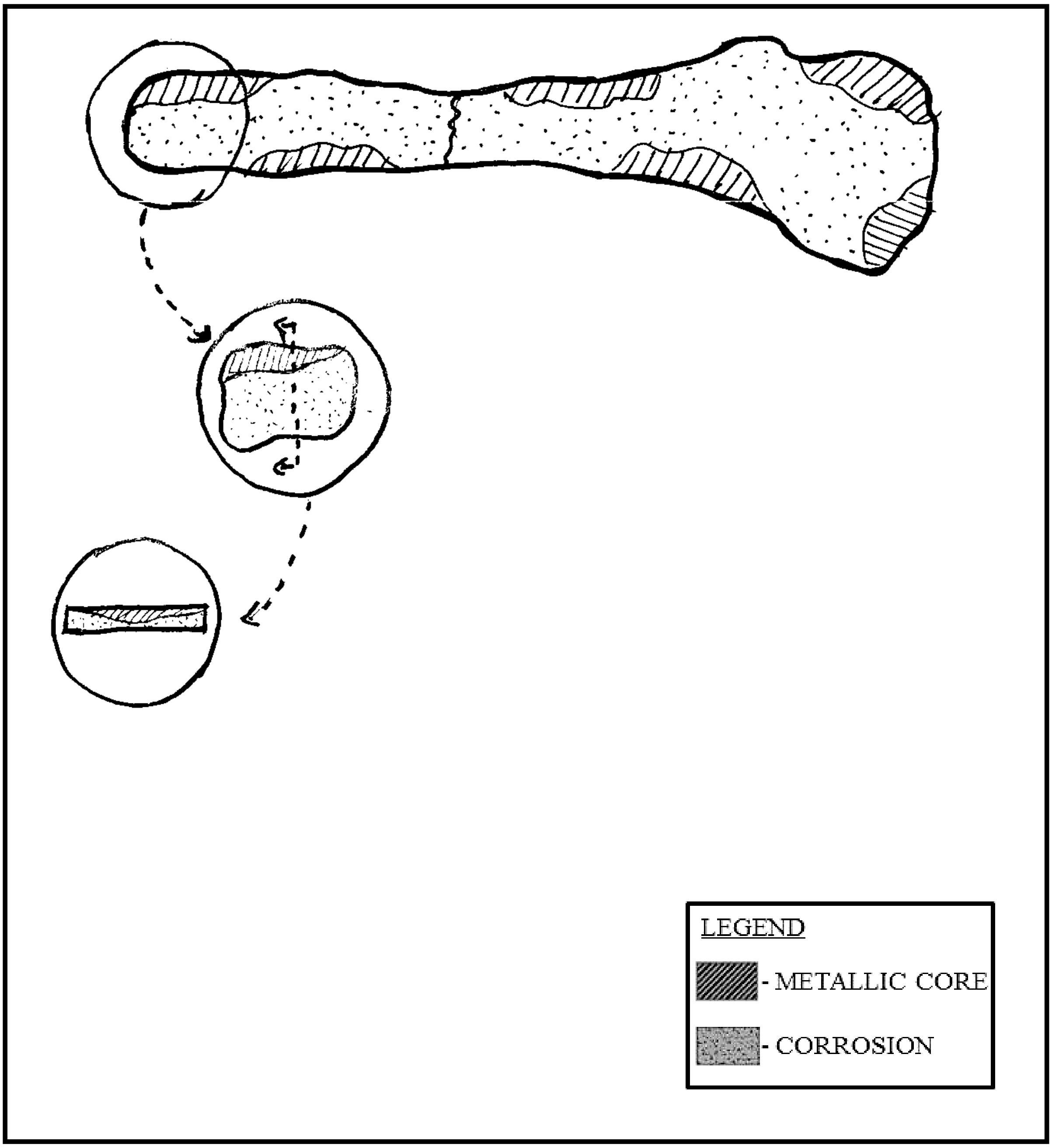


Fig.4.4.1.o: Sampled Section of MHR 6446

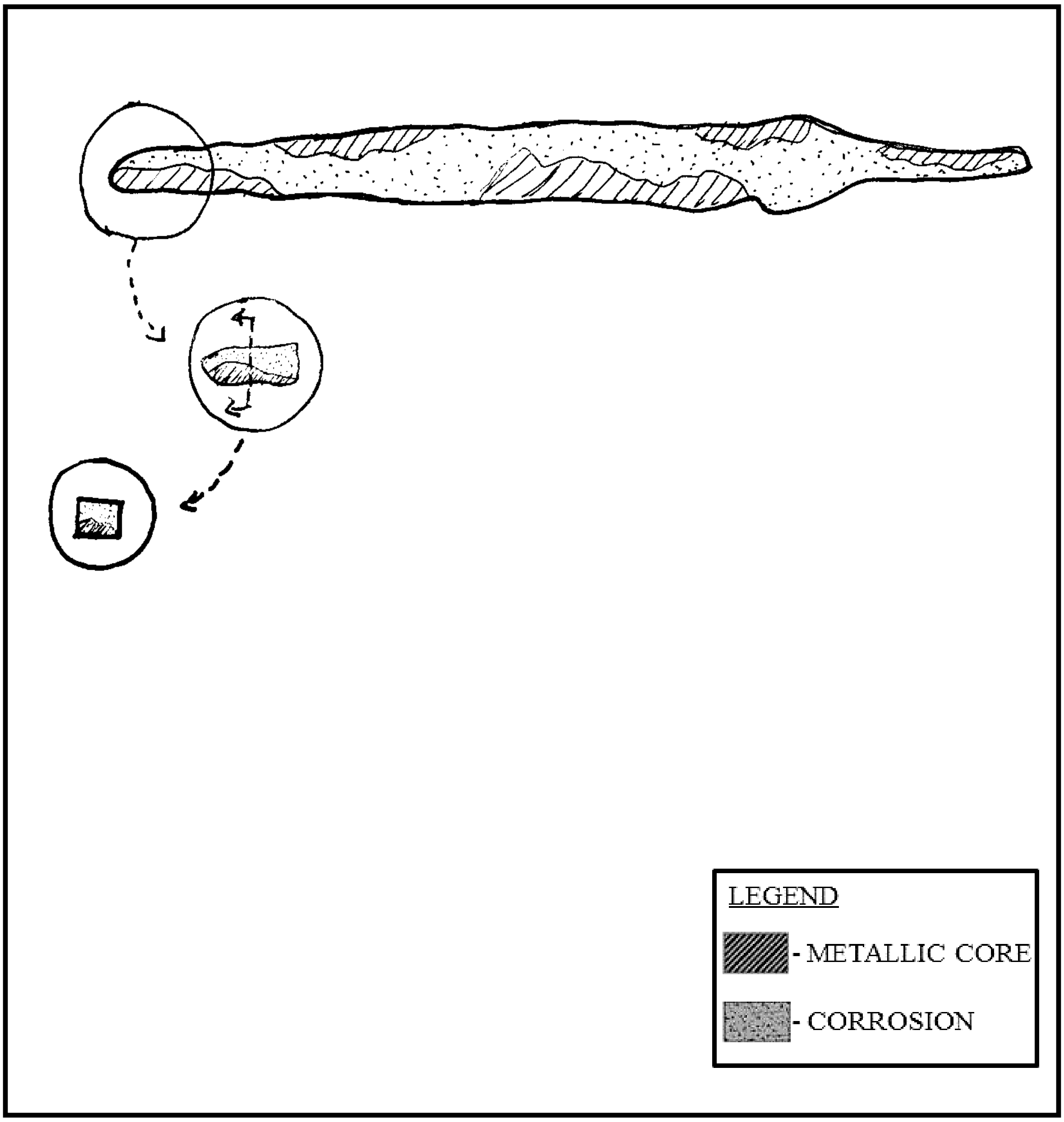


Fig.4.4.1.p: Sampled Section of MHR 6559

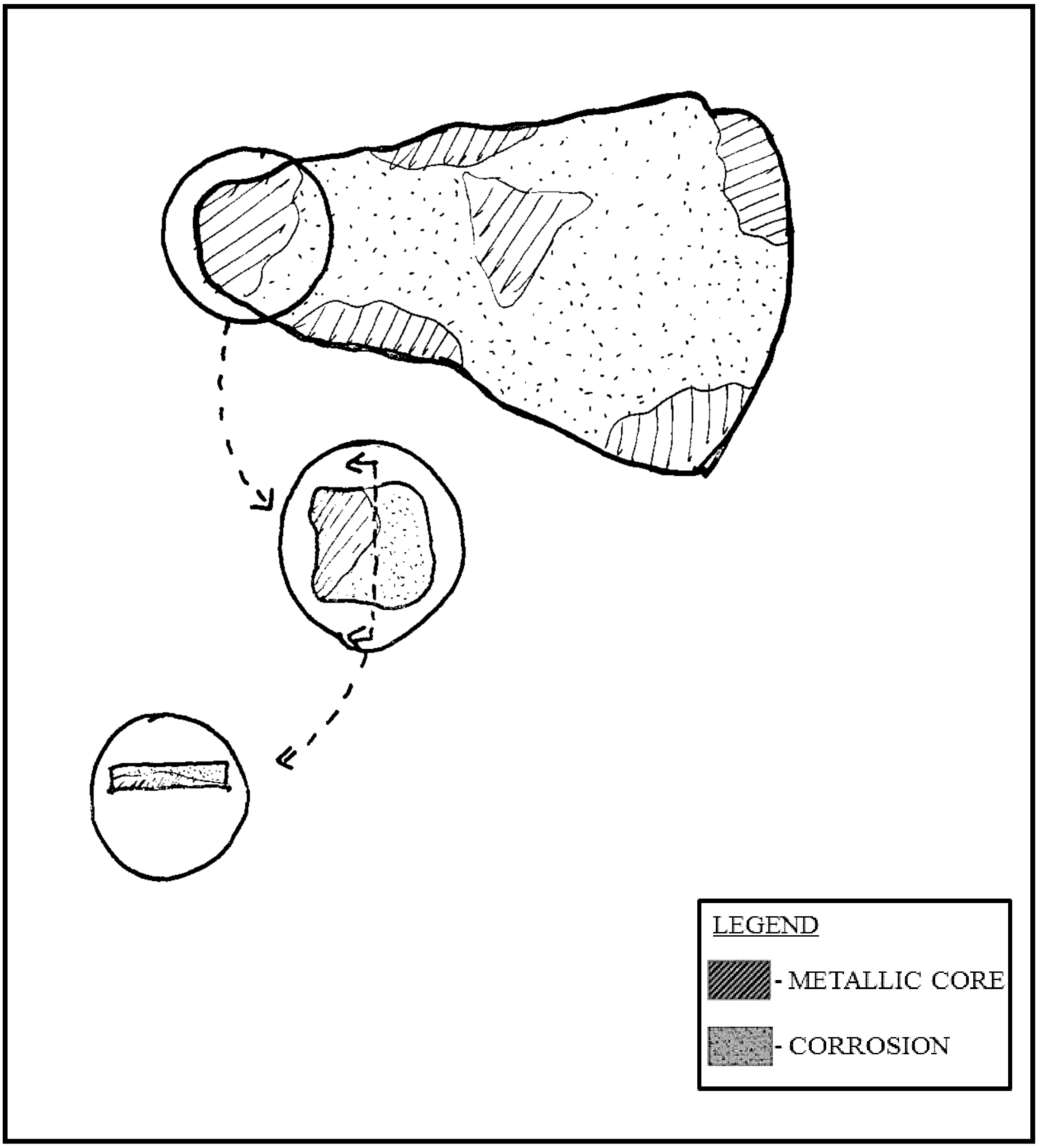


Fig.4.4.1.q: Sampled Section of MHR 6031

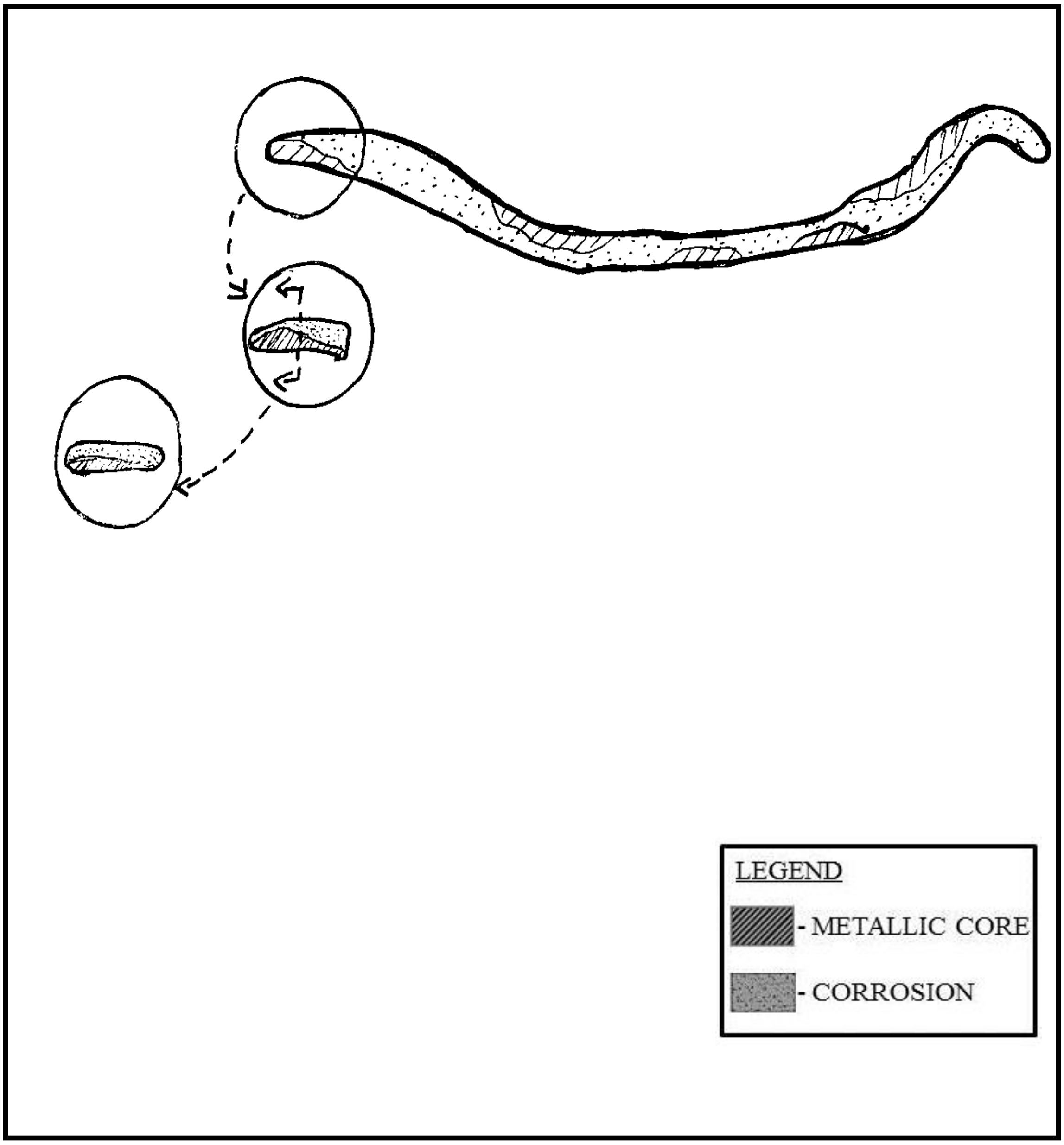


Fig.4.4.1.r: Sampled Section of KRD 5914

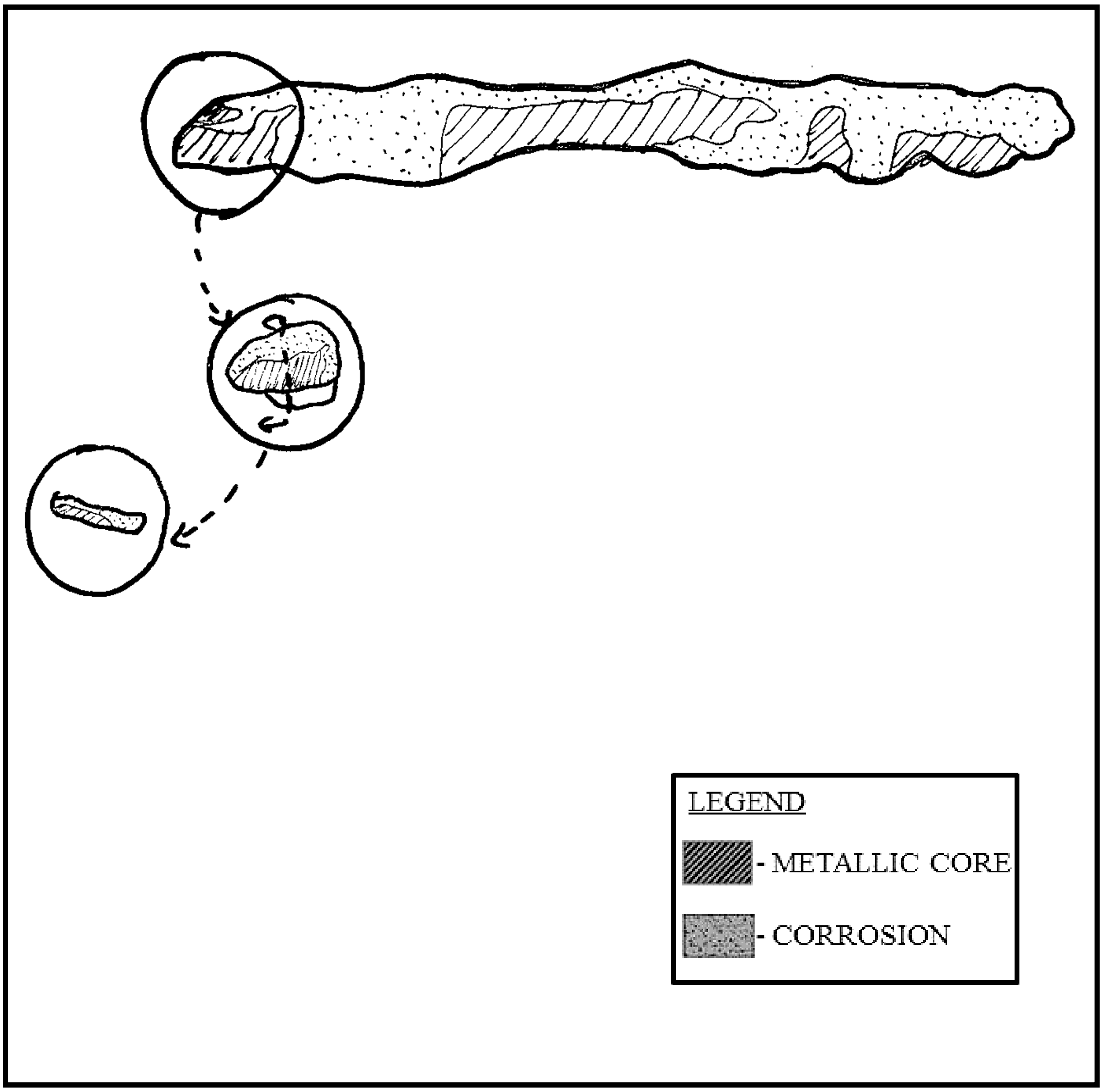


Fig.4.4.1.u: Sampled Section of KRD 6819

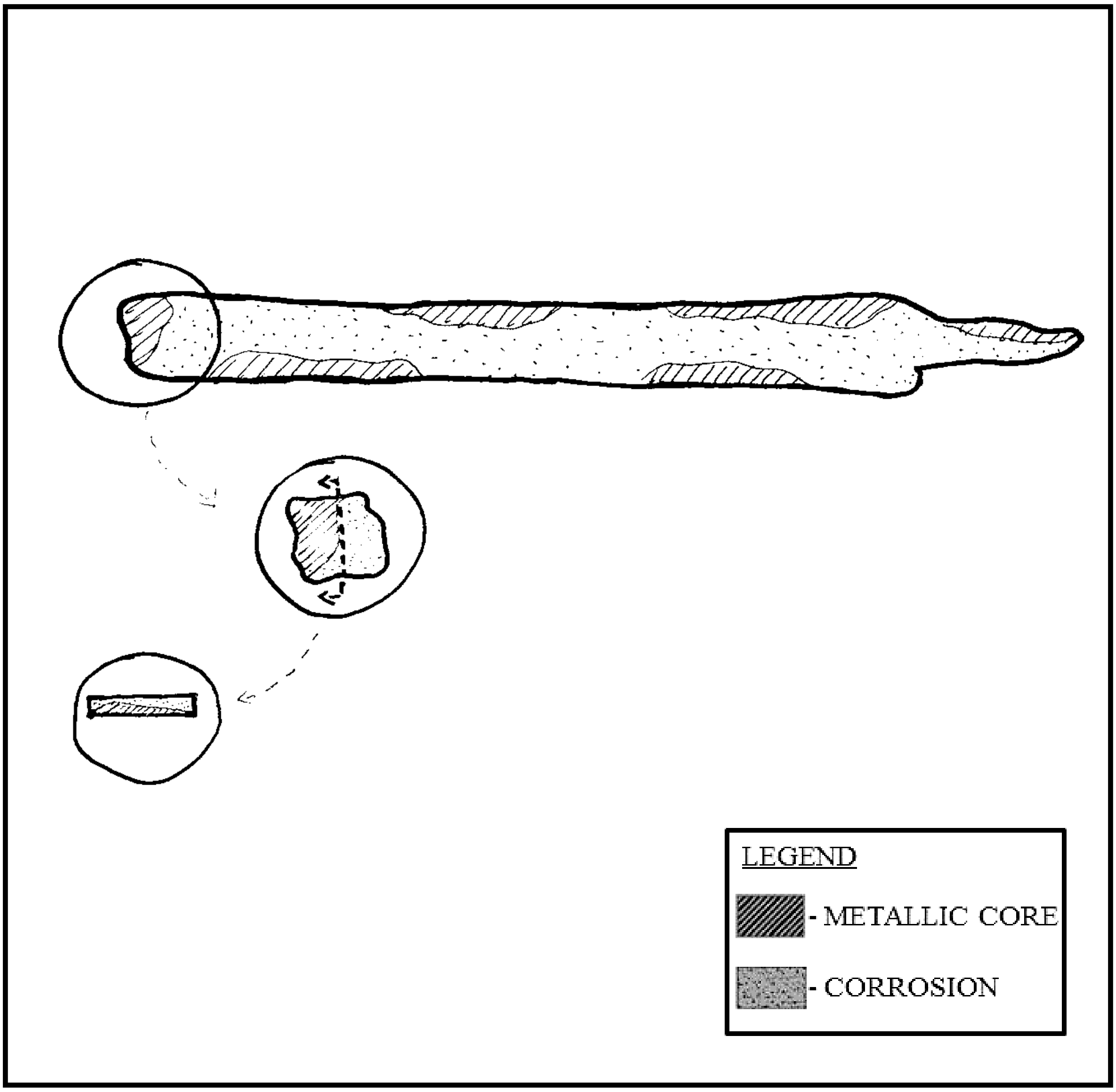


Fig.4.4.1.v: Sampled Section of KRD 6831

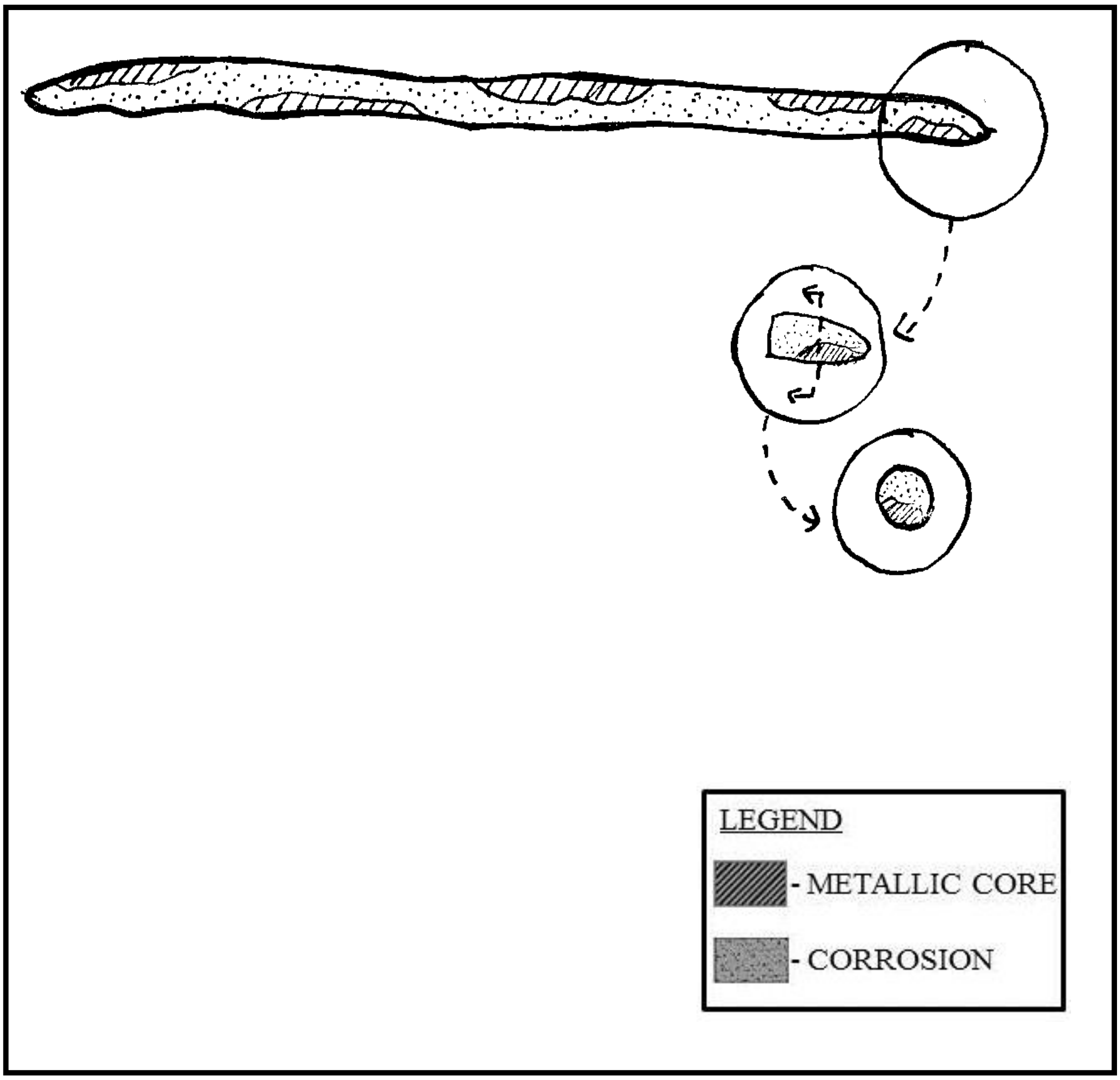


Fig.4.4.1.b': Sampled Section of BMR 151-52

VHD 62

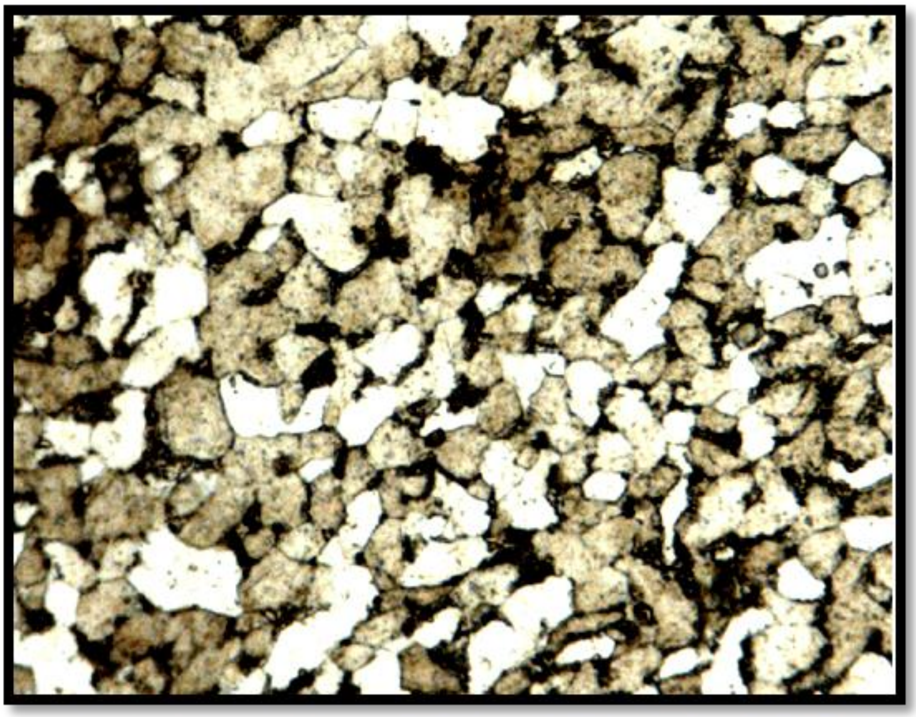


Fig. 4.4.a: Optical Micrograph of VHD 62 showing Ferrite-Pearlite Structure

VHD 74

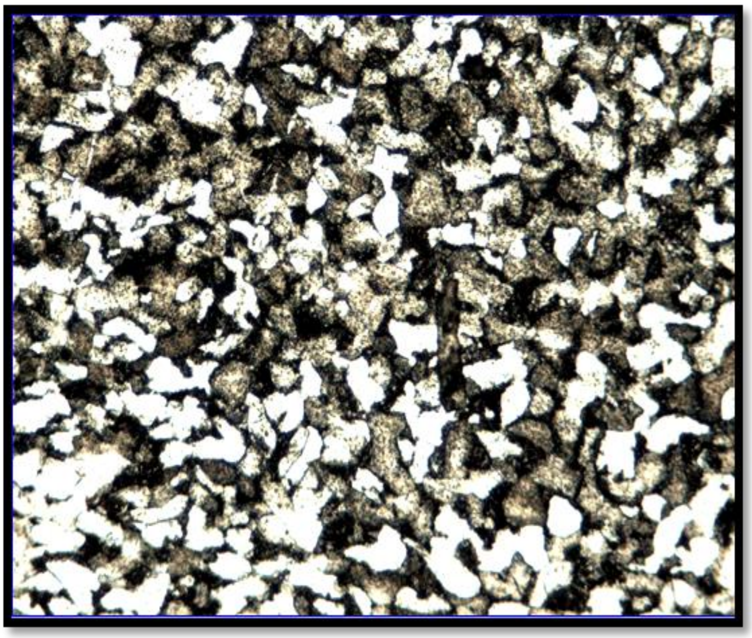


Fig.. 4.4.b: Optical Micrograph of VHD 74 showing Ferrite-Pearlite Structure

VHD 50

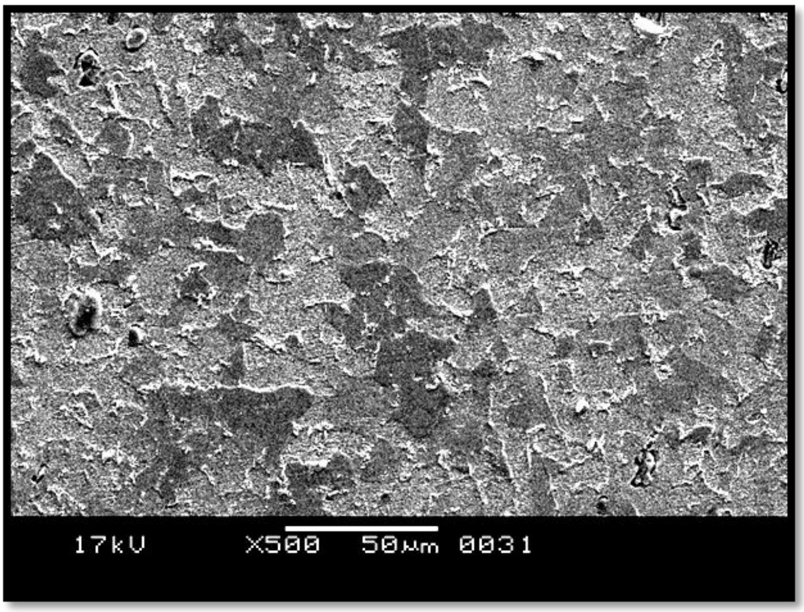


Fig. 4.4.A: SEM Micrograph showing Ferrite-Pearlite Structure

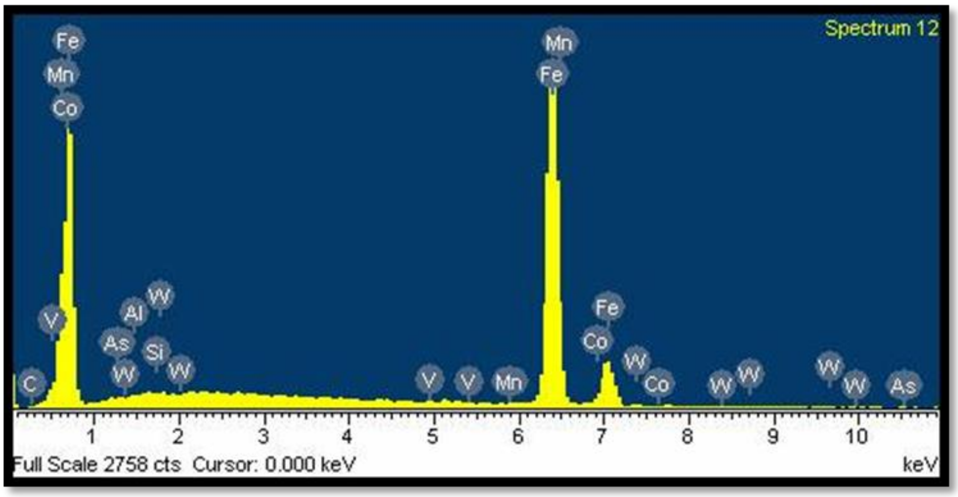
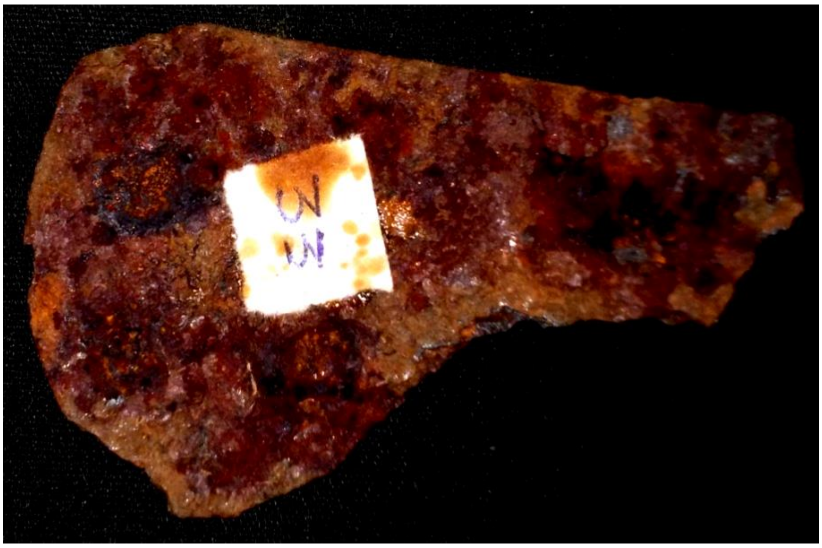


Fig.. 4.4.A.1: EDAX Composition Graph of Sample 50



VHD 33

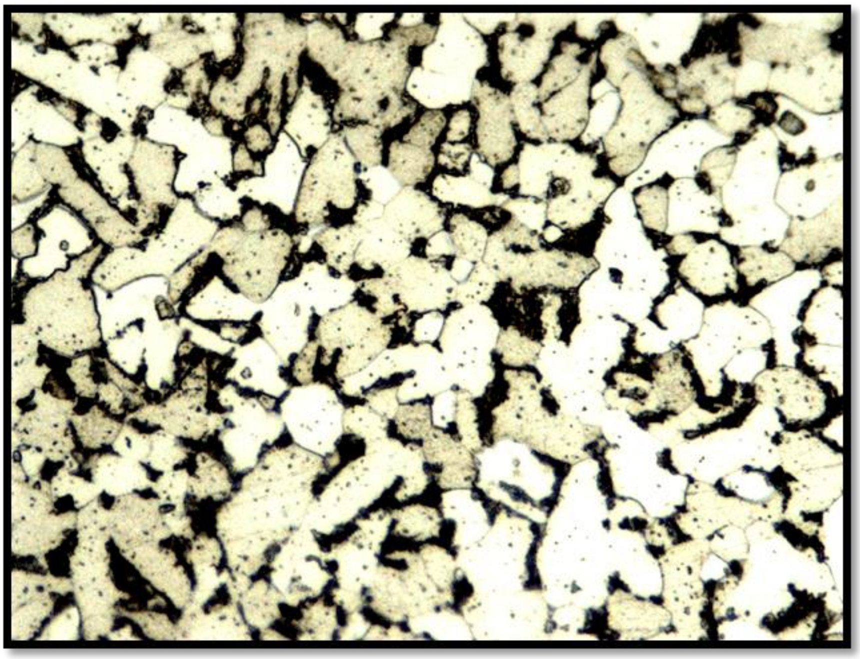


Fig. 4.4.c: Optical Micrograph of VHD 33 showing Ferrite-Pearlite Structure

VHD 24

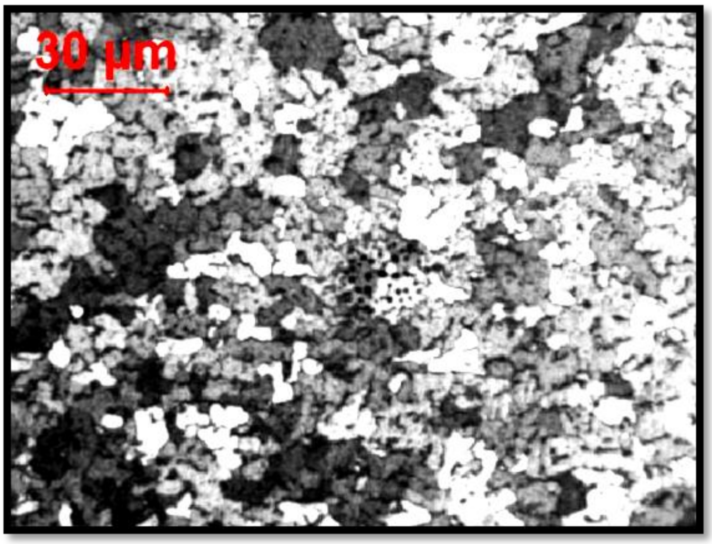


Fig. 4.4.d: Optical Micrograph of VHD 24 showing Ferrite-Pearlite Structure

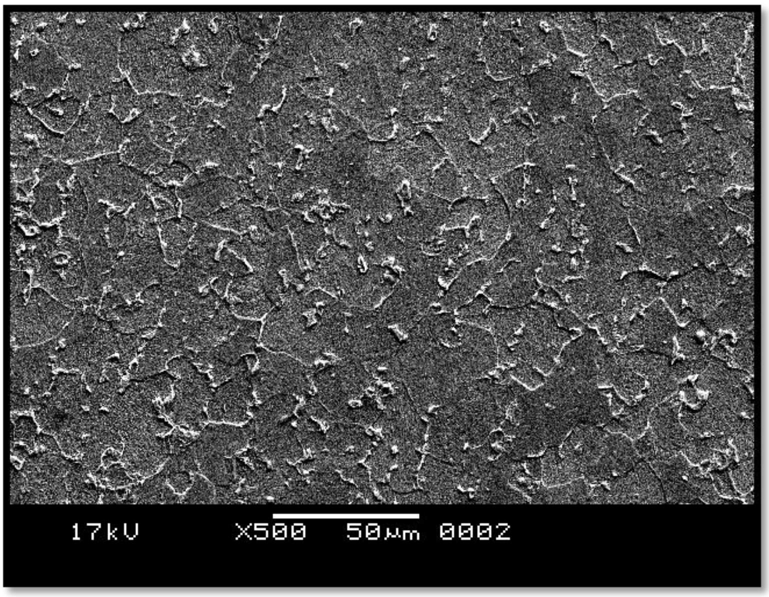


Fig. 4.4.B: SEM Micrograph showing Ferrite-Pearlite Structure

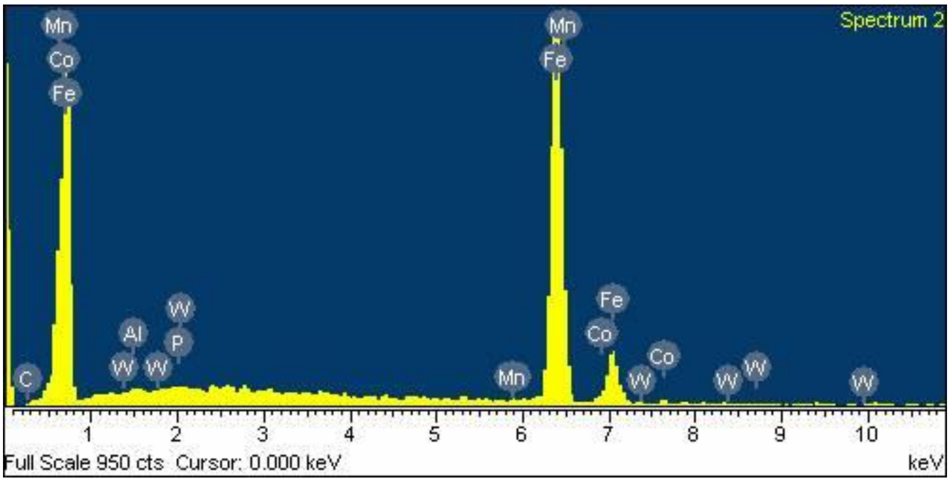
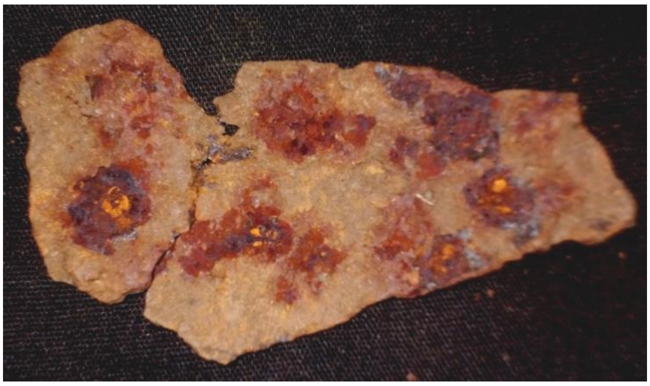


Fig. 4.4.B.1: EDAX Composition Graph of VHD 24



VHD 16

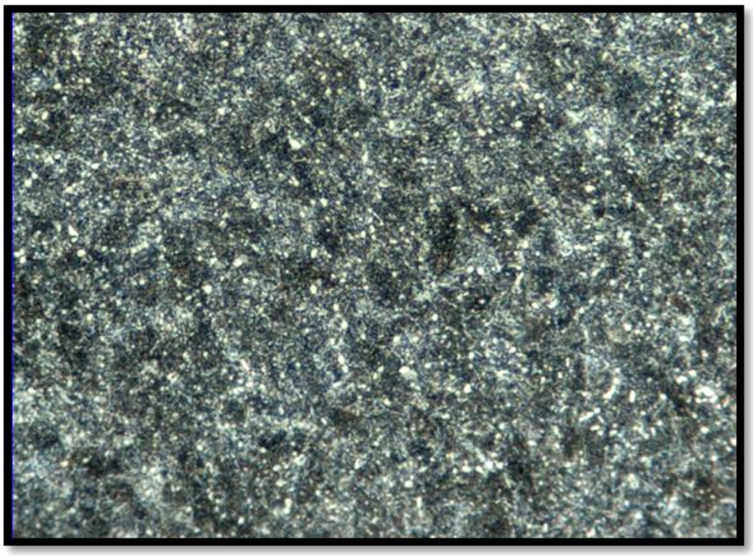


Fig. 4.4.e: Optical Micrograph of VHD 16 showing Ferrite-Pearlite Structure

NKD 5866

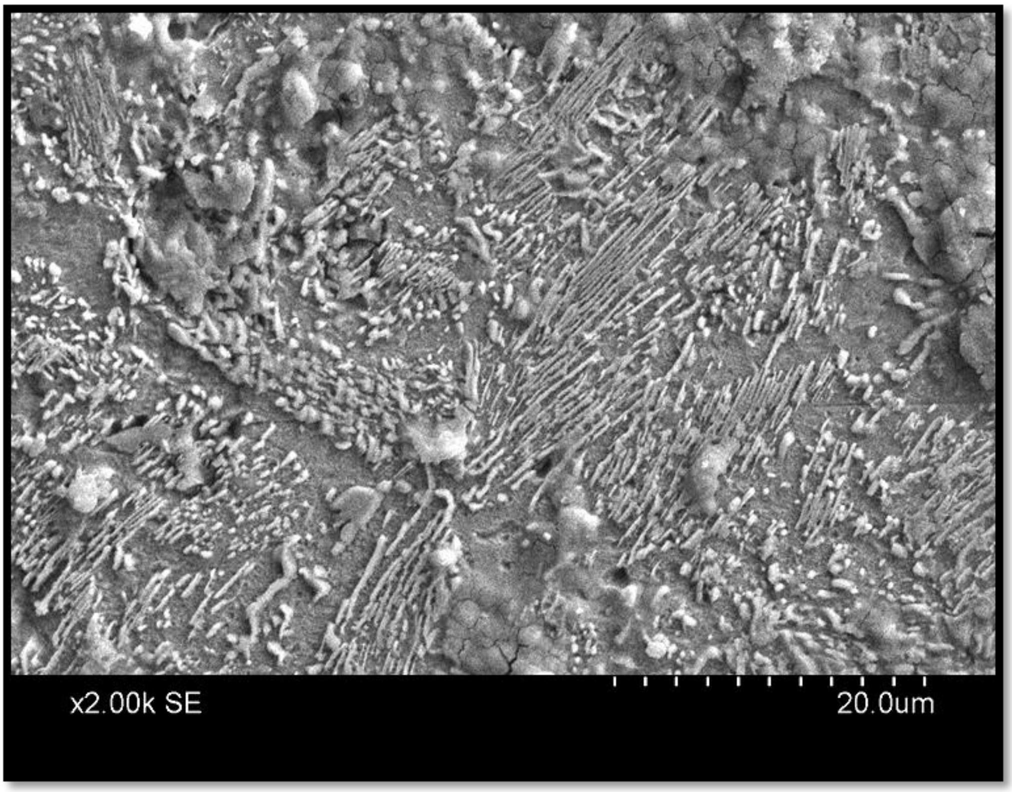


Fig. 4.4. C: SEM Micrograph Showing Lamellar Formation

NKD 5861

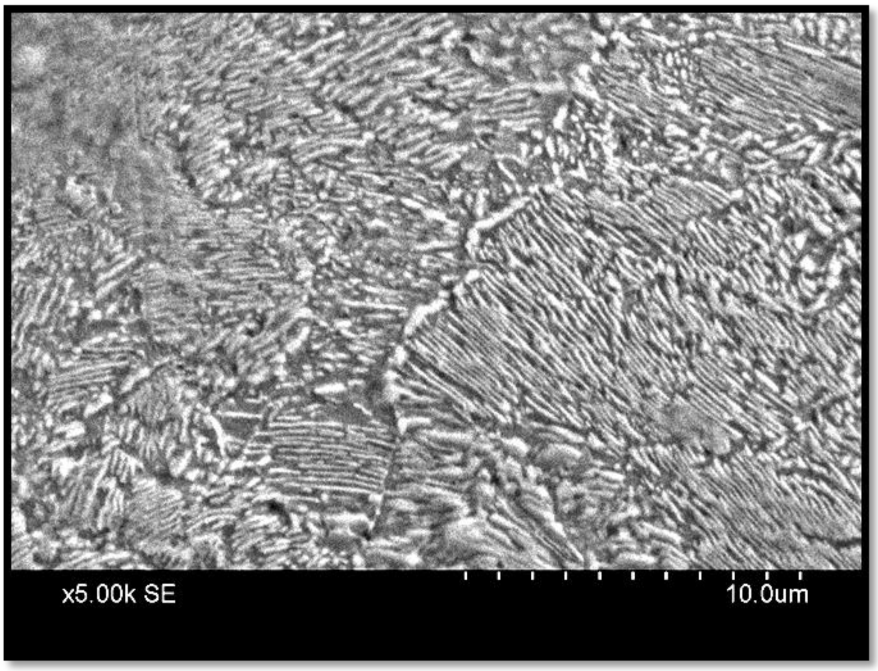


Fig. 4.4.D: SEM Micrograph Showing Lamellar Formation

BRG 5762

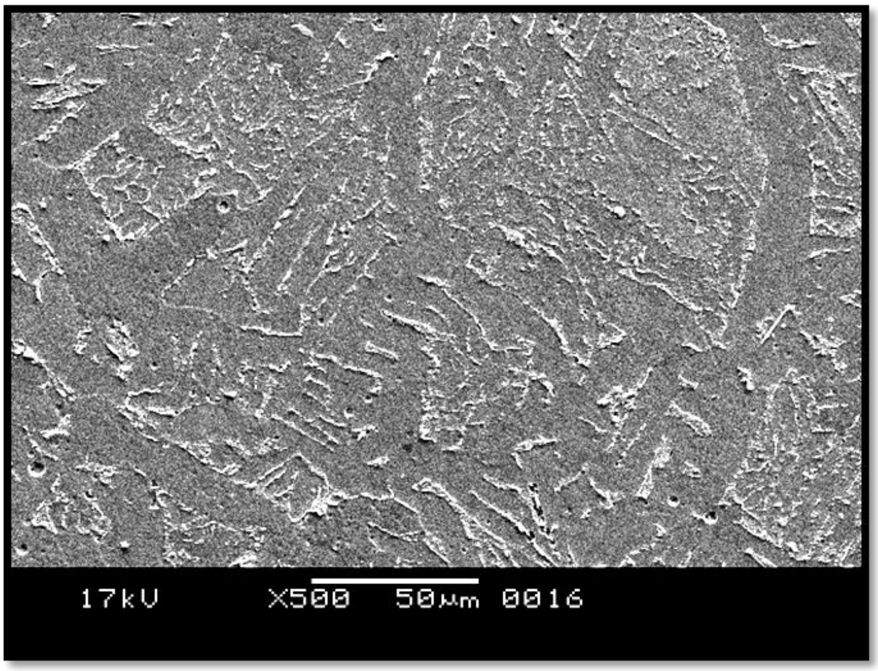


Fig. 4.4.E: SEM Micrograph Showing Lamellar Formation

BRG 5762 B

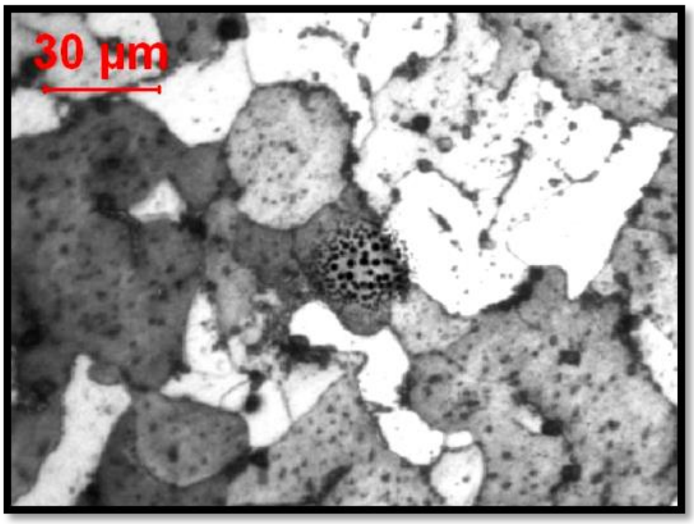


Fig. 4.4.f: Optical Micrograph of BRG 5762B showing Ferrite-Pearlite Structure

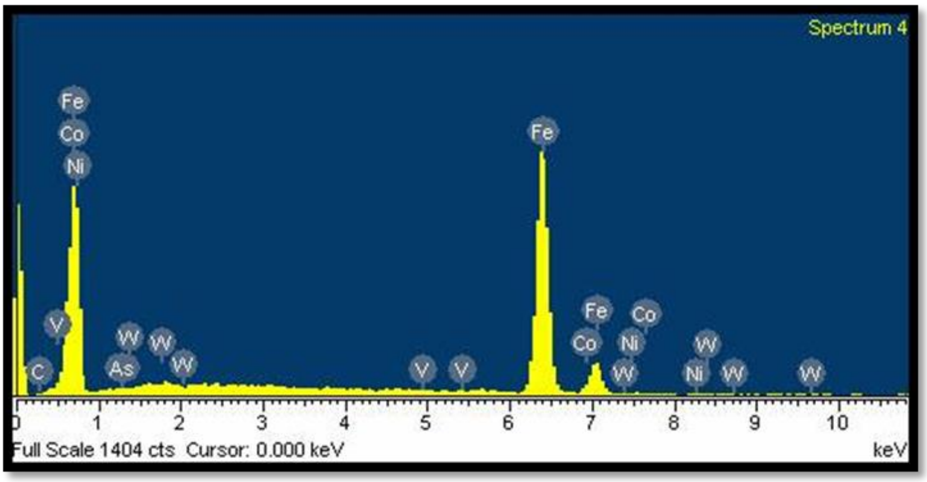


Fig. 4.4.C.1: EDAX Composition Graph of BRG 5762B

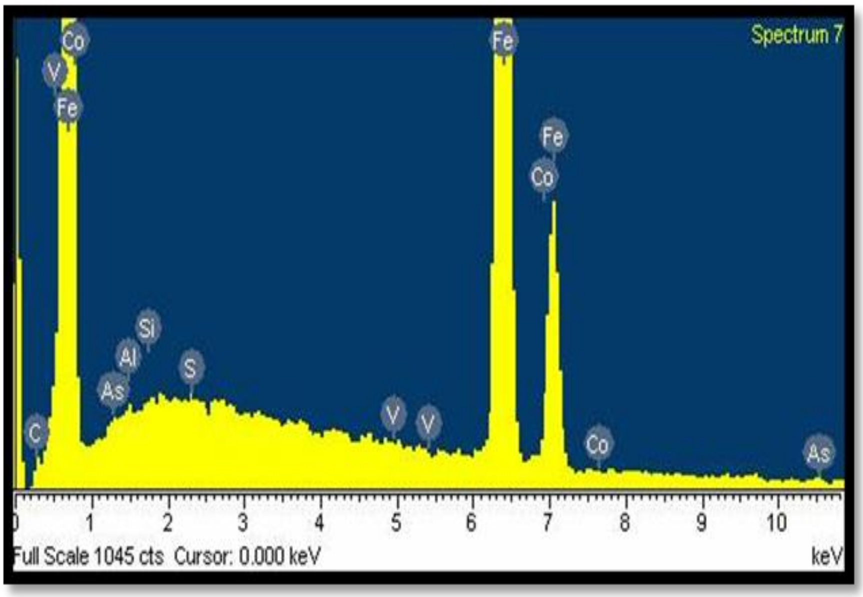


Fig. 4.4.F.1: EDAX Composition Graph of BMR-136

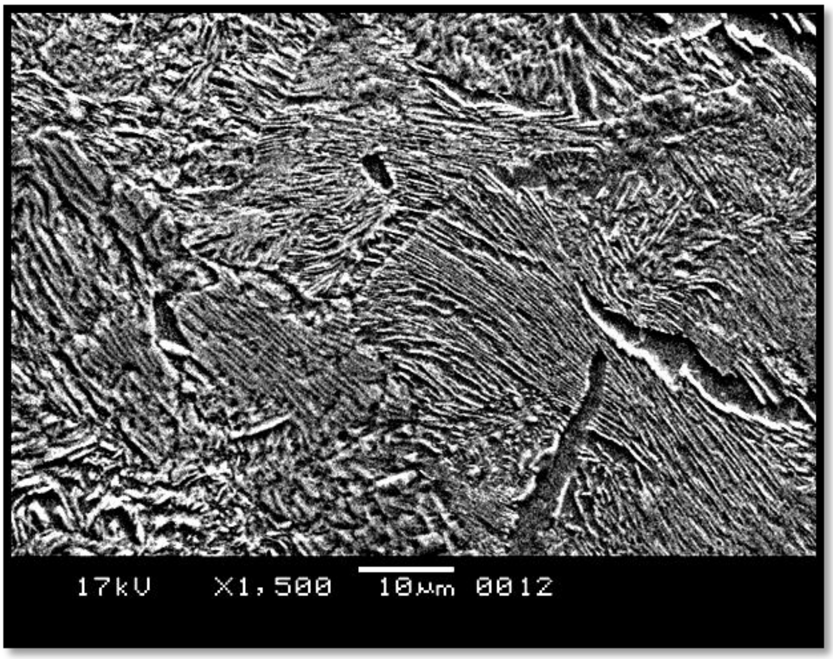


Fig. 4.4.F: SEM Micrograph Showing Lamellar Formation in BMR-136

MHR 6419

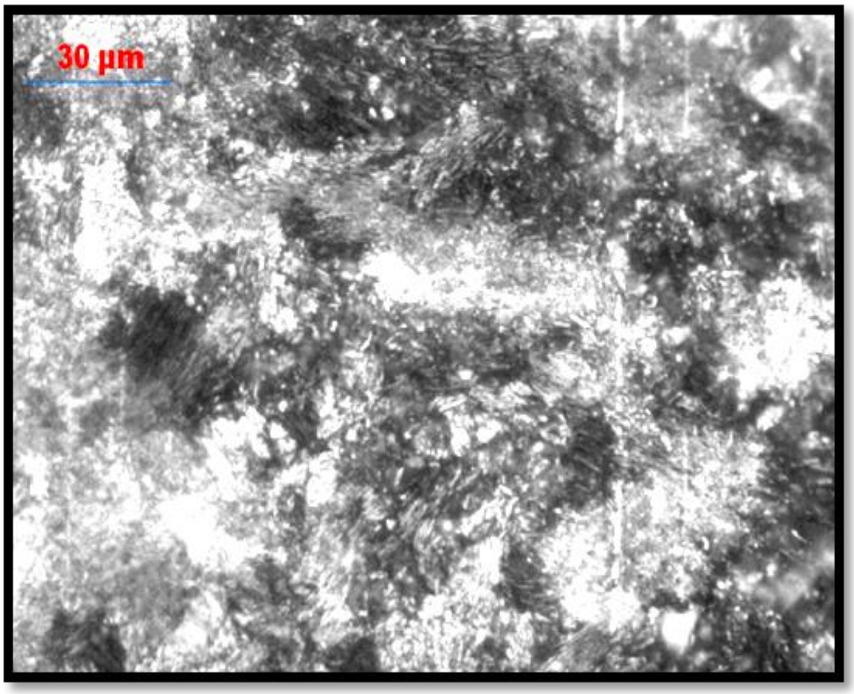


Fig. 4.4.g: Optical Micrograph Showing Lamellar Formation in MHR-6419

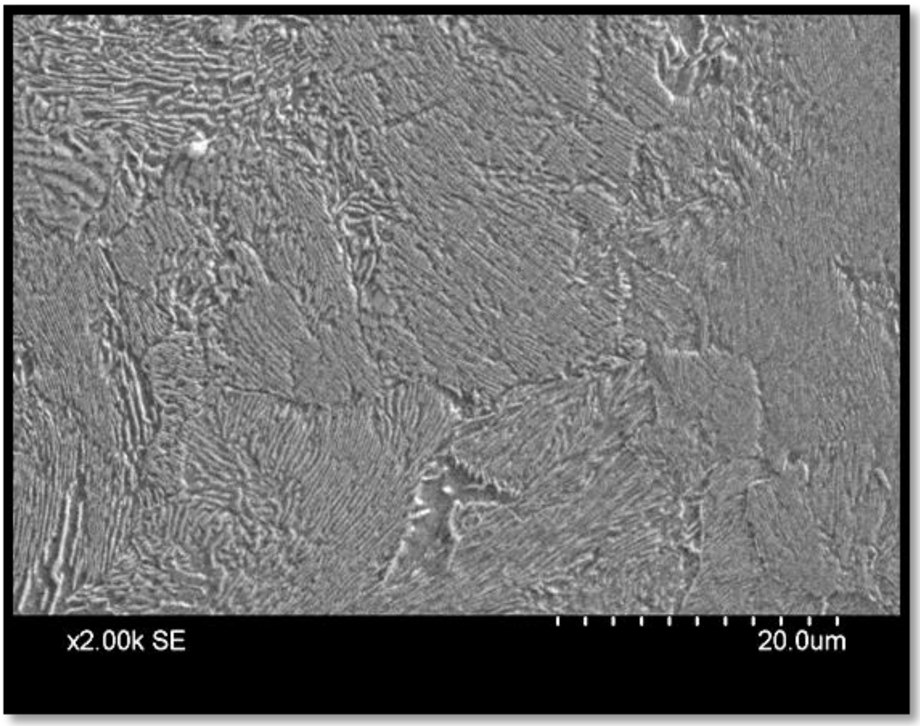


Fig. 4.4.G: SEM Micrograph Showing Lamellar Formation in KRD-6839

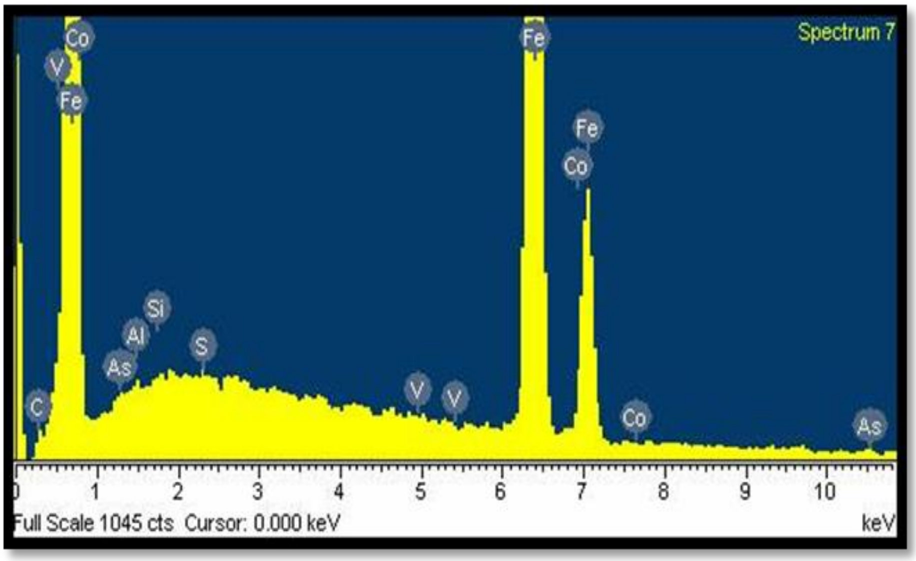


Fig. 4.4.G.1: EDAX Composition Graph of KRD - 6839

4.4.1 Evidences of Steeling

All the artefacts grouped under Table No 4.4.2 has shown evidences of steeling. The optical micrograph (Fig. 4.4.a) represents a hypo-eutectoid steel composition. It shows pearlite embedded in primary ferrite. To form the hypo-eutectoid composition, it starts with pure austenite along with dissolved carbon. After cooling, the austenite region forms two mixed region α + y and some Fe_3C (Cementite) are formed. The SEM micrographs (Fig. 4.4.C and Fig. 4.4.D) shows a pearlitic structure. It has a two phased lamellar formation composed of alternating layers of ferrite and cementite. This eutectoid phase is formed when the austenite solid solution decomposes at 727°c to form the two solid phases, ferrite (α) and cementite (Fe_3C). The lamellar formations show that the technique of steel making was being successfully practiced by the Megalithic Iron- smiths and the chemical composition also has similarity with present day commercial steel and has been discussed in detail in Section 4.5.

Table No 4.4.2: Chemical Composition of Samples Indicating Steel Technique

Sample No	C %	Fe %	Al %	Si %	S %	V %	Co %	As %	Mn %	W %	Tb %	P %	Mo %	Ni %	Micrograph No	SEM No	EDX No
VHD 62															4.4.a		
VHD 74															4.4.b		
VHD 50	2.96	94.25	0.34	0.97	0.26	0.02	2.51	0.68	0.47	0.11	12.6				-	4.4.A	4.4.A.1
VHD 33															4.4.c		
VHD 24	3.28	93.83	0.42				2.41	0.42	0.18	0.61	-	0.18			4.4.d	4.4.B	4.4.B.1
VHD 16															4.4.e		
NKD 5866																4.4.C	
NKD 5861																4.4.D	
BRG 5762																4.4.E	
BRG 5762 B	1.23	97.93	0.27	-	0.14	0.08	2.41	0.5		0.98		0.14	1.02	0.65	4.4.f		4.4.C.1
BMR 136	3.79	93.55	0.19	0.11	0.07	0.05	2.09	0.15	0.09	0.45						4.4.F	4.4.F.1
MHR 6419															4.4.g		
KRD 6839	3.37	93.35	0.26	0.13	0.01	0.25	2.07	0.15								4.4.G	4.4.G.1

4.4.2 Failed Attempts at Steel Technique

The sample enumerated in Table No. 4.4.3 have been grouped under the category of samples that were intended to be converted into steel but the Megalithic iron-smiths failed to achieve the desired results. The SEM micrographs (Fig. 4.4.2.A and Fig. 4.4.2.B) shows ferrite grains with iron carbide at grain boundaries. Steeling was attempted but the control on the absorption of carbon was not achieved properly yet as seen in the chemical compositions (Fig. 4.4.2.A.1 and Fig. 4.4.2.B.1).Similar attempts at steeling is revealed from the optical micrograph of KRD 5914. The micro-structure represents a matrix composed primarily by ferrite and a few colonies of pearlite in clear and dark colour respectively. The artefact was probably quenched because the microstructure shows the marker of a higher cooling rate, i.e. clear colour Widmanstatten ferrite and a dark colour pearlite. Due to the predominance of ferrite, it is inferred that the hardness of the structure was not elevated.

4.4.3 Evidences of Cast Iron

The samples enumerated in Table No. 4.4.4 have been classified as variants of Cast Iron. They have been identified firstly on the basis of their chemical composition and then the microstructures. The major difference between cast iron and steel is the presence of a high percentage of carbon (2-4%), associated with high silicon content. Carbon decreases the melting point of iron and induces the formation of graphites and silicon induces strength in the ferrite structure. However Grey Cast iron is formed when either one is high or the other is low. The existence of both manganese (Mn) and sulphur (S) as shown in Table No. 4.4.4 induces graphite formation and the presence of aluminium too promotes cementite formation but reduces the strength of the carbon. Usually all cast irons do contain phosphorous (0.03-1.5%), it forms a laminated constituent in white iron and it is the last region to solidify and it forms areas in the interstices of dendrites. However, phosphorous if present below 1%, does not affect the quality of the cast iron. The other elements that are added to cast iron are nickel, chromium; copper and molybdenum and sample number BMR 5809 have shown the existence of all the added elements except copper. However, we do get the presence of niobium and zirconium too. Nickel is usually added as it induces the properties of grey iron and chromium induces carbide formation. The presence of nickel and chromium together produces the desired closeness of the grain structure and molybdenum strengthens the matrix.

Cast iron when given heat treatment for stress relief results in dissolving of some graphite formations in austenite, which is followed by air cooling which leads to the formation of pearlite and have the same features as steel (Rollason,1973). However the composition is distinctive of cast iron. The optical micrograph (Fig. 4.4.3.a) of Sample No: BMR 5809 shows ferritic grain boundaries at high magnification along with graphite flakes. The micrograph shows dendritic structure typical of cast iron. Free graphite flakes are a characteristic component of non-alloyed and low–alloyed cast iron. However the SEM micrograph (Fig. 4.4.3.F) shows lamellar formation which resembles steel, which indicates that the sample was annealed.

SEM micrograph (Fig. 4.4.3.G) of sample number BMR 151-52 shows features of grey cast iron. The microstructural constituents other than graphite and transformed ledeburite are similar to steel, along with ferrite and pearlite. The chemical reaction involved in the formation of grey cast iron is as follows. At temperature t_1 the molten metal starts to solidify and austentite grains in the form of dendrites begin to form, enclosed by the molten metal, with the falling temperature, the molten metal cools and eutectic is formed. The eutectic composition consists of ledeburite, austentite and Fe_3C (Radzikowska, 2004).

The SEM micrographs of samples MHR 6446 (Fig. 4.4.3.A), MHR 6078 (Fig. 4.4.3.B), MHR 6031 (Fig. 4.4.3.C), KRD 6819 (Fig. 4.4.3.D) and KRD 6831 (Fig. 4.4.3.E) reveals the structure of white cast iron. At room temperature, the structure consists of primary dendrites of pearlite with interdendritic transformed ledeburite. The white portions are iron carbide also known as cementite (Fe_3C). This is formed when it is annealed at a temperature ranging between 800-950°C. This process was responsible for the formation of spheroidal graphite cast iron (Radzikowska, 2004).

4.4.4. Evidence of Wrought Iron

Only one sample (BMR 112) from the entire assemblage of iron artefacts has shown the usage of wrought iron. Wrought iron was made using the old puddling process. The process consists of melting of pig iron in a hearth lined with iron oxides. The impurities such as silicon, manganese phosphorous and carbon react with the iron oxide lining and form slag. The removal of the gangue material results in the increase of the freezing temperature of the metal and the metal solidifies to form a pasty mass which is combined with a considerable amount of slag. Then the mass was taken out and forged on the anvil which resulted in the elongation of the slag and forms stringers. This uniform distribution of slag stringers is visible in the optical micrograph (Fig. 4.4.4.a) where slag stringers are seen as inclusions within the ferrite matrix.

4.4.5. Evidence of utilization of pure iron

Pure iron contains no carbon and has minimal quantity of impurities such as phosphorous, silicon, manganese, oxygen and nitrogen. The optical micrograph of sample BRG 5804 B (Fig. 4.4.5) is similar to that of a pure metal. i.e. a built up of crystals of the same composition which is termed as ferrite (Rollason, 1973). The microstructure shows alpha ferrite grains with few slag stringers.

4.4.6: Samples with Unclear Microstructures

Samples BMR- 173, BMR-5833 and KRD – 6841 are extremely corroded in nature and there were minimal metallic core available for metallographic analysis. The microstructures are inconclusive and to elevate the problem of interpretation only one sample (BMR- 173) could be prepared for SEM-EDS analysis. The EDS graph of BMR-173 (Fig. 4.4.6.A.1) gives us the chemical composition as follows:

Carbon (C): 1.16%, Iron (Fe): 95.18%, Aluminum (Al): 0.25%, Silica (Si): 1.81%, Sulphur (S): 0.43%, Vanadium (V): 0.13%, Cobalt (Co): 0.13%, Manganese (Mn): 0.68%, Tungsten (W): 1.01%, Phosphorous (P): 0.12%, Chromium (Cr):0.21%, Niobium (Nb): 0.13%, Nickel (Ni):0.23%, Zirconium (Zr): 0.01%, Copper (Cu): 0.83%, Cerium (Ce): 0.65%, Terbium (Tb): 13.1%, Tantalum (Ta): 0.74%, Titanium (Ti): 0.25

The carbon content along with the other elements present such as phosphorous, Chromium, Nickel suggest that this sample was probably given the treatment of High Carbon Steel. However, the SEM micrograph (Fig. 4.4.6.A) does not reveal the lamellar formation marker of steel.

Sample Number BMR-5833 was extremely rusted and the metal left was mostly in the oxide form and was unsuitable for SEM, EDS preparation. The Optical micrograph (Fig. 4.4.6.B) shows some ferrite grains with probable traces of carburization. This microstructure does not say much about the sample and no other region in the sample was suitable for metallographic analysis. KRD 6841 was also of the same type and has a similar microstructure (Fig. 4.4.6.C) representing a matrix composed primarily by ferrite and a few colonies of pearlite in clear and dark colour respectively.

Table No 4.4.3: Chemical Composition of Samples indicating failed attempts at Steel Technology

Sample No	C %	Fe %	Al %	Si %	S %	V %	Co %	As%	Mn %	P %	Cr %	Nb %	Ni %	Zr %	Cu %	Micrograph No	SEM No.	EDX No.
MHR 6551	1.9	95.65	0.99	0.54	0.41	0.15	2.68	-	0.06	0.32	0.22	0.45	0.44	0.93	0.45	-	4.4.2.A	4.4.2.A.1
MHR 6490	3.64	95.37	0.27	1.23	0.12	-	2.52	0.61	0.12	0.28	-	-	-	-	-	-	4.4.2.B	4.4.2.B.1
KRD 5914	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.4.2.a		
BMR 130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.4.2.b		

Table No 4.4.4: Chemical Composition of Samples identified as Cast Iron

Sample No.	C %	Fe %	Al %	Si%	S%	V%	Co%	As%	Mn%	P%	W%	Cr%	Nb%	Mo%	Ni%	Zr%	Micrograph No	SEM No	EDX No
MHR 6446	3.35	96.87	0.18	0.21	0.12		1.48	0.02	0.07	0.22								4.4.3.A	4.4.3.A.1
MHR 6078	2.33	95.84	0.33	0.11	0.06		1.9	0.09	0.25	0.21	0.51							4.4.3.B	4.4.3.B.1
MHR 6031	3.13	95.43	0.43	0.05	0.07		2.57	1.19	0.51	0.14	1.2							4.4.3.C	4.4.3.C.1
KRD 6819	3.56	93.29	0.87	0.64	0.25	0.08	3.06	0.65	0.33	0.29	1.83							4.4.3.D	4.4.3.D.1
KRD 6831	5.14	94.2	0.32	-	0.29	-	1.84	0.18	0.32	0.15	0.63							4.4.3.E	4.4.3.E.1
BMR 5809	2.83	95.85	0.5	0.18	-	-	2.24	0.25	0.32	0.15	0.59	0.2	0.6	0.06	0.25	0.49	5.4.3.a	4.4.3.F	4.4.3.F.1
BMR 151-52	3.73	93.36	0.22	-	0.1	0.02	2.03	1.21	0.04	0.4	1.79							4.4.3.G	4.4.3.G.1

MHR 6551

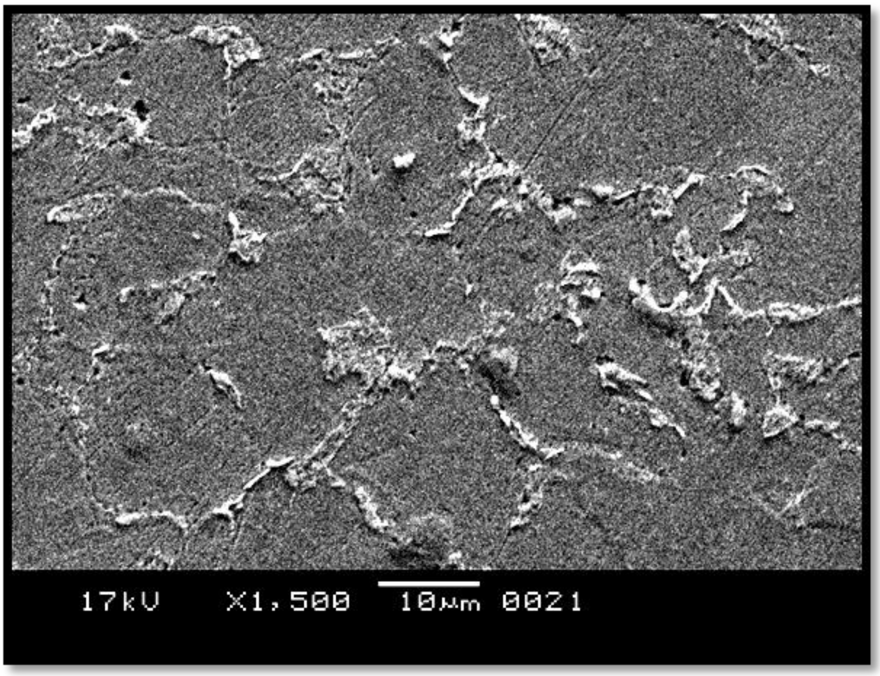


Fig. 4.4.2.A: SEM Micrograph showing the Grain Boundaries

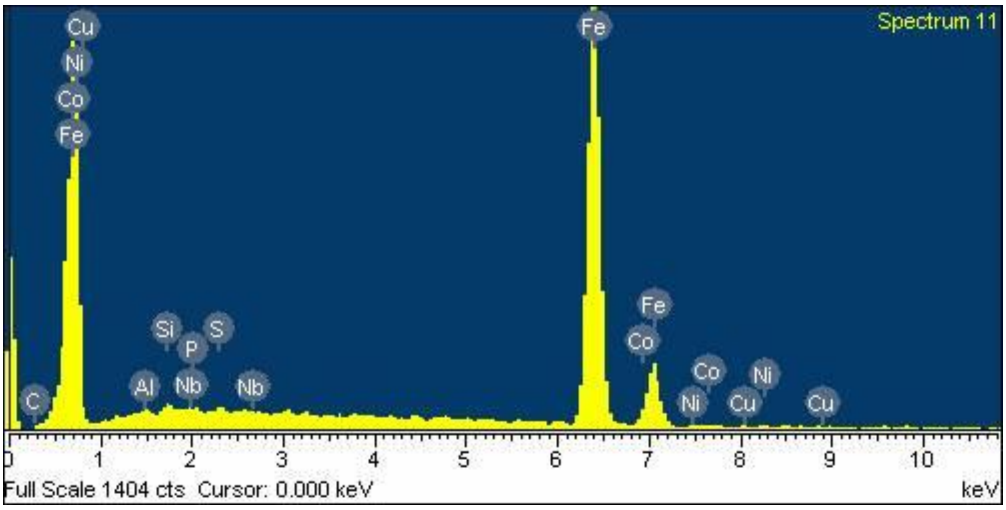


Fig. 4.4.2.A.1: EDAX Composition Graph of MHR-6551

MHR 6490

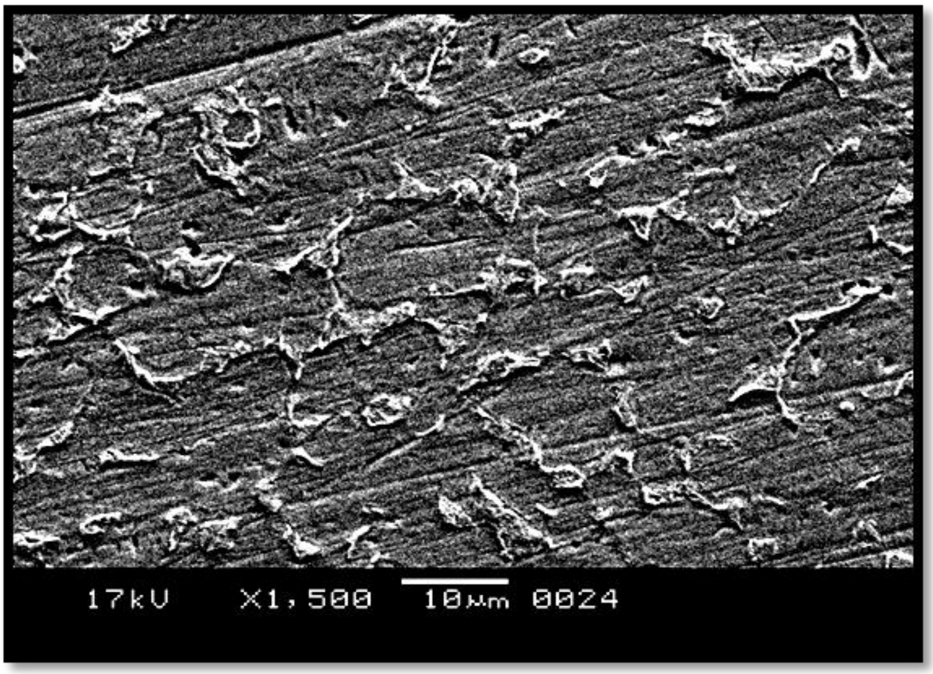


Fig. 4.4.2.B: SEM Micrograph showing the Grain Boundaries

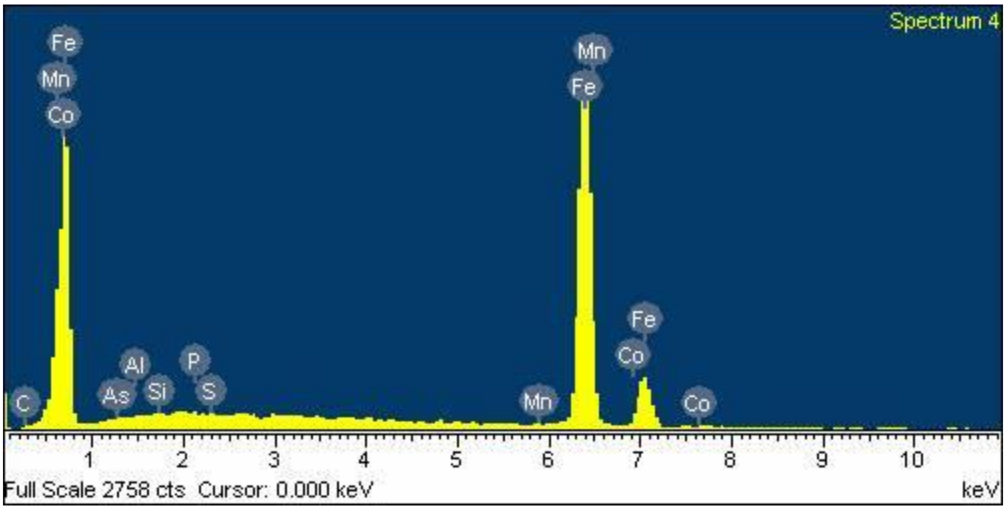


Fig. 4.4.2.B.1: EDAX Composition Graph of MHR-6490

KRD 5914

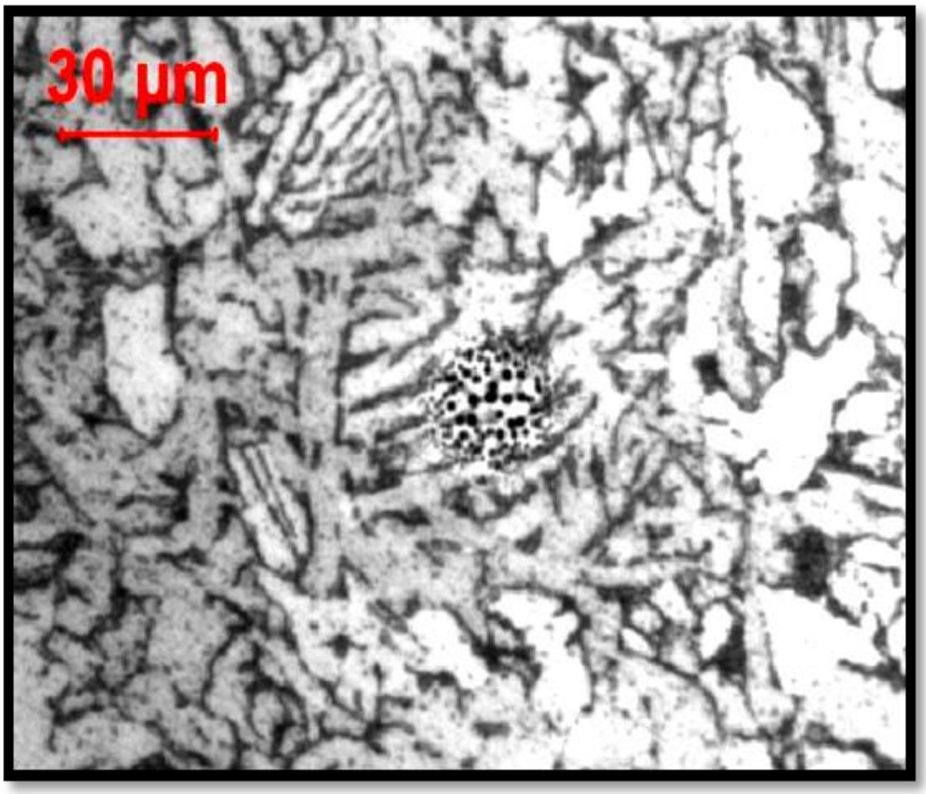


Fig. 4.4.2.a: Optical Micrograph of KRD-5914 showing the predominance of Ferrite

BMR 130

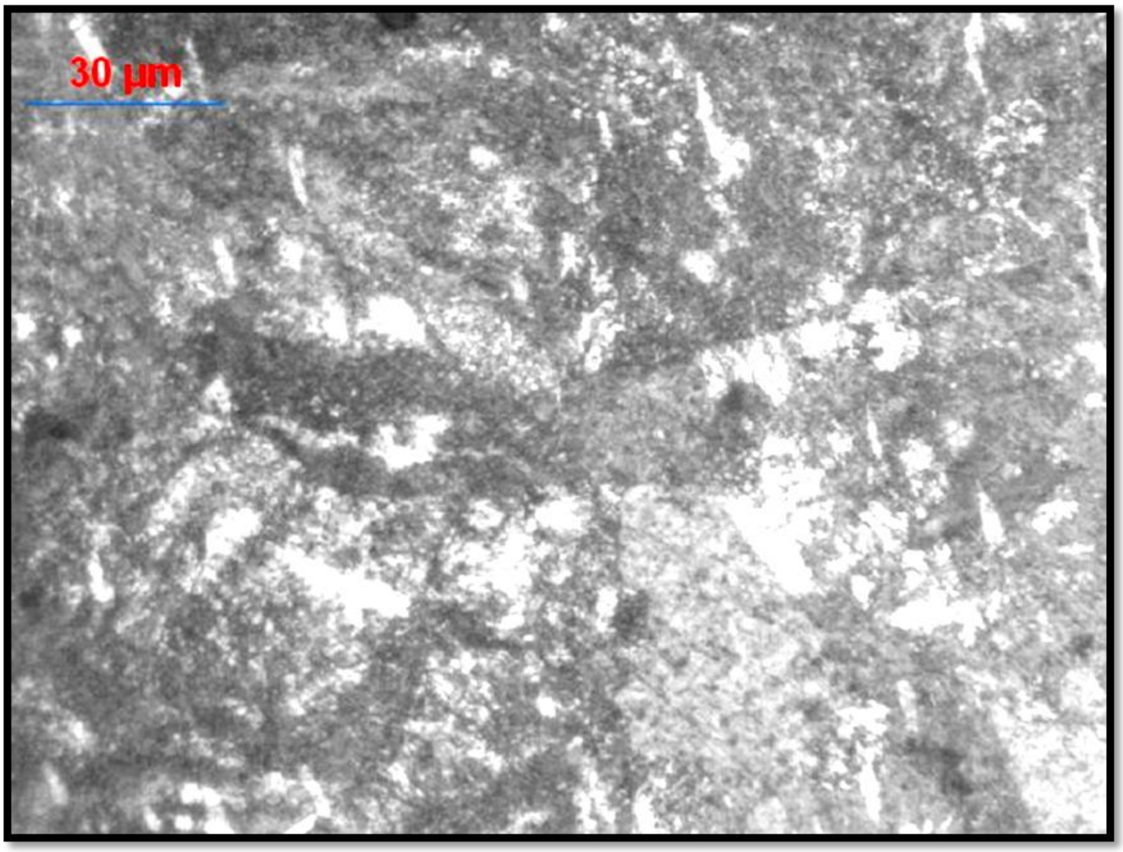


Fig. 4.4.2.b: Optical Micrograph of Sample BMR- 130

MHR 6446

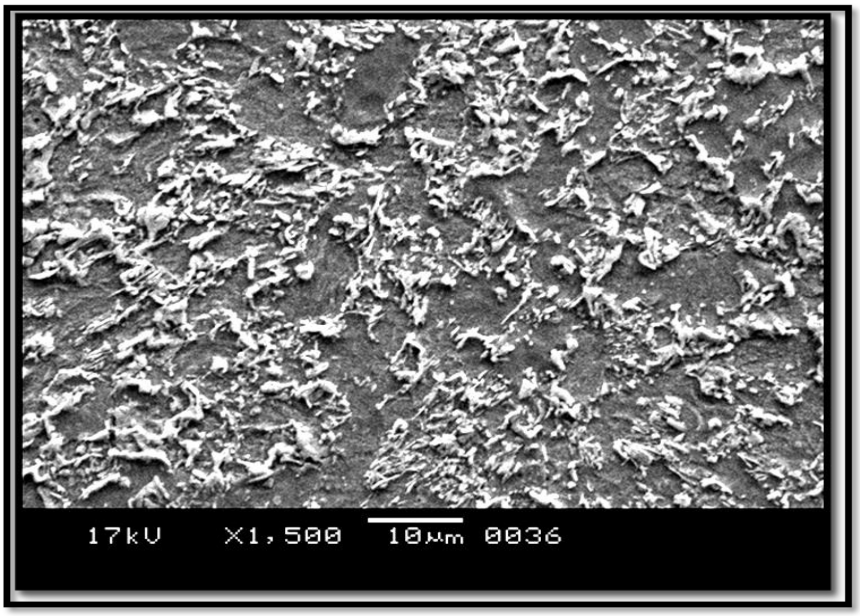


Fig. 4.4.3.A: SEM Micrograph showing ferrite boundaries with graphite flakes

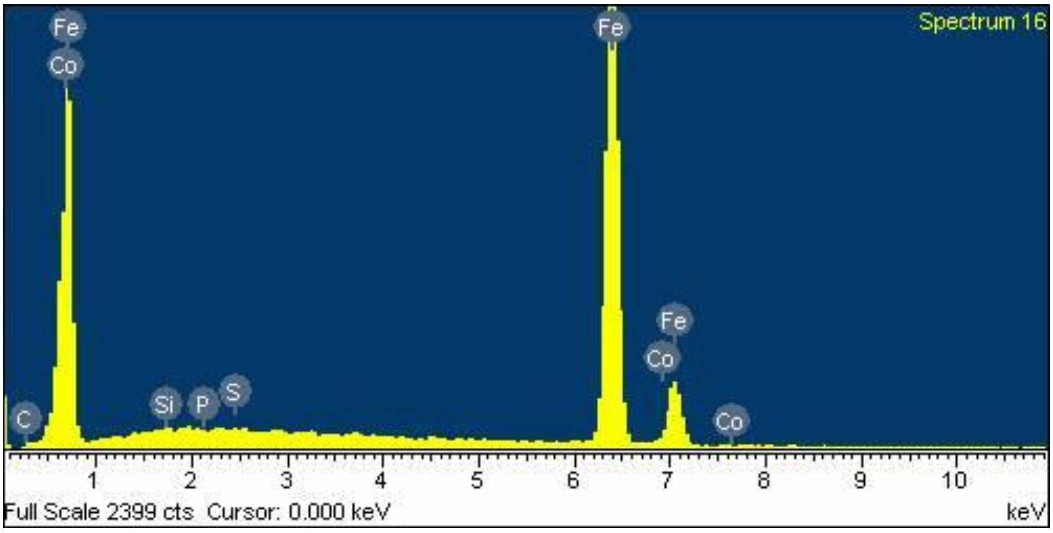


Fig. 4.4.3.A.1: EDAX Composition Graph of MHR-6446

MHR 6078

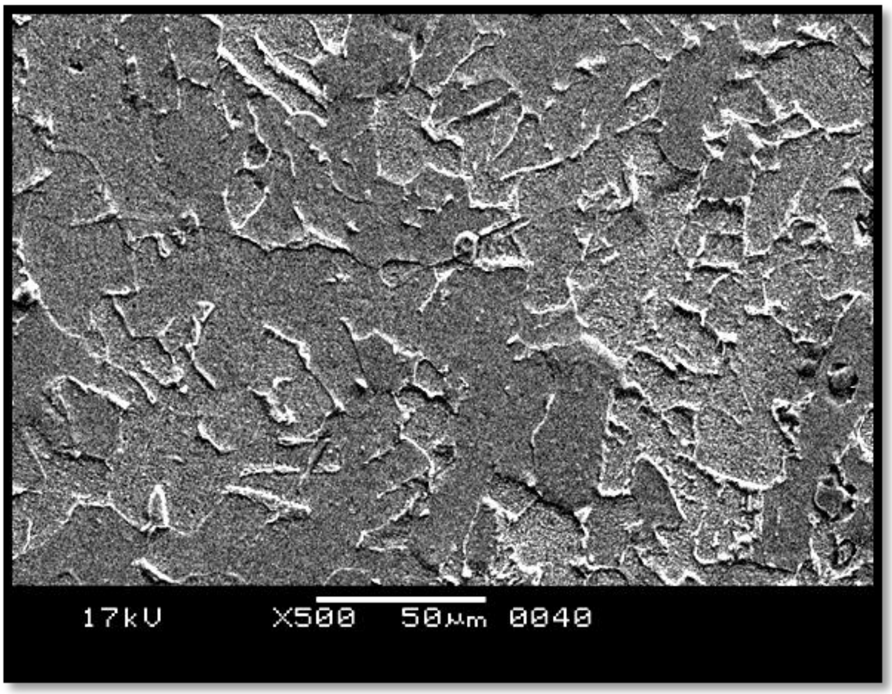


Fig. 4.4.3.B: SEM Micrograph showing White Cast Iron

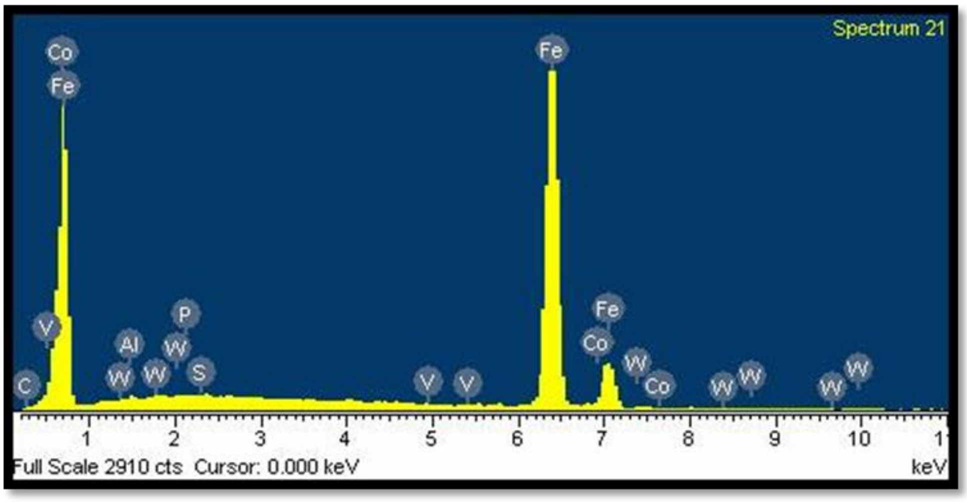


Fig. 4.4.3.B.1: EDAX Composition Graph of MHR-6078

MHR 6031

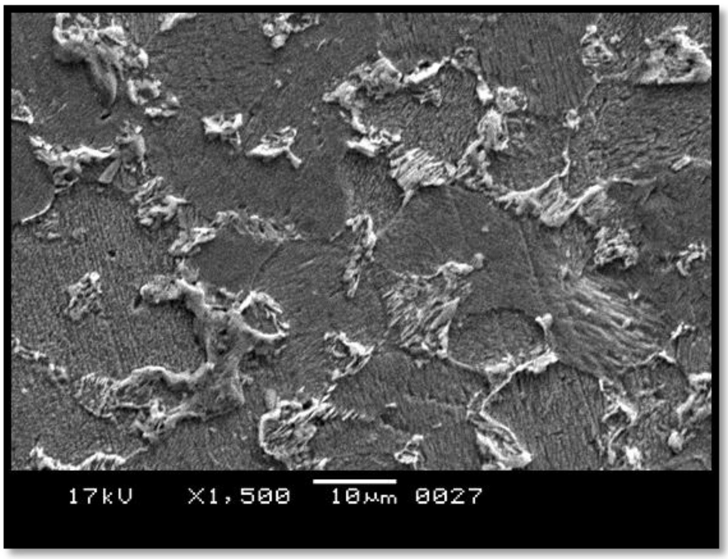


Fig. 4.4.3.C: SEM Micrograph showing White Cast Iron

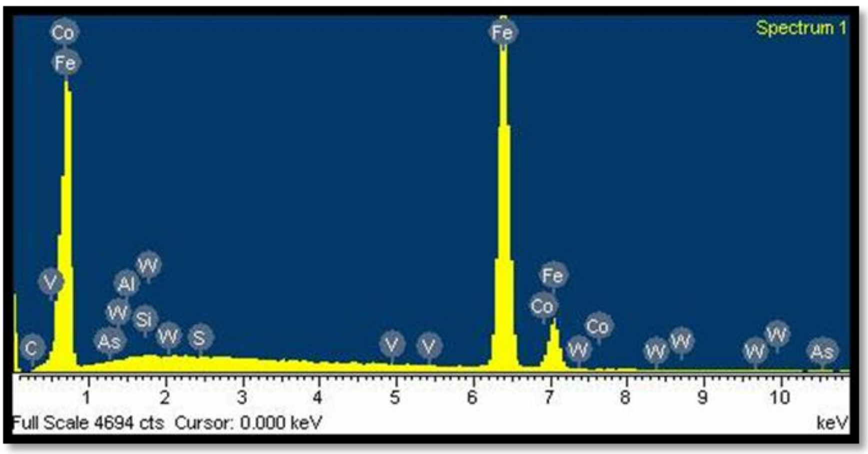


Fig. 4.4.3.C.1: EDAX Composition Graph of MHR-6031

KRD 6819

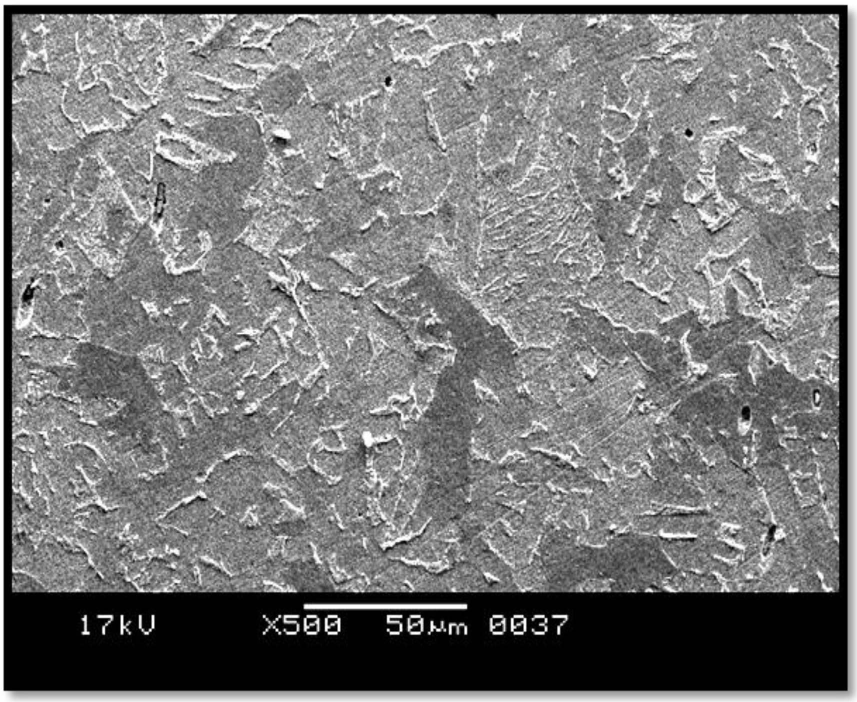


Fig. 4.4.3.D: SEM Micrograph showing White Cast Iron

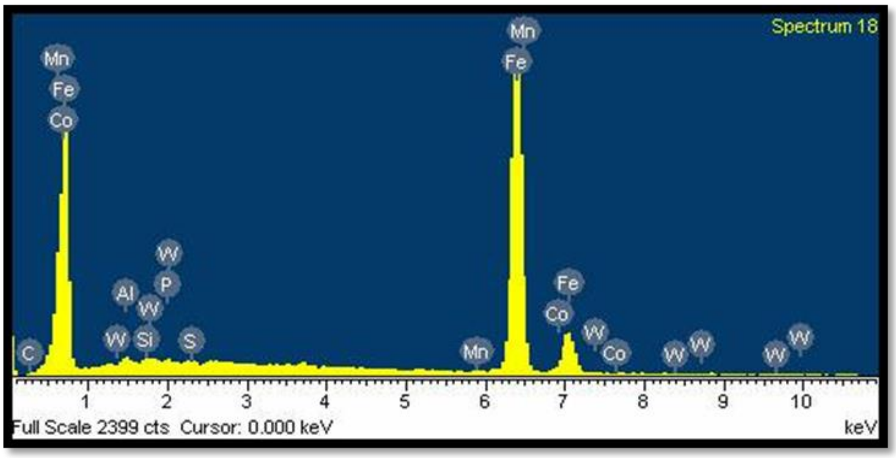


Fig. 4.4.3.D.1 EDAX Composition Graph of KRD -6819

KRD 6831

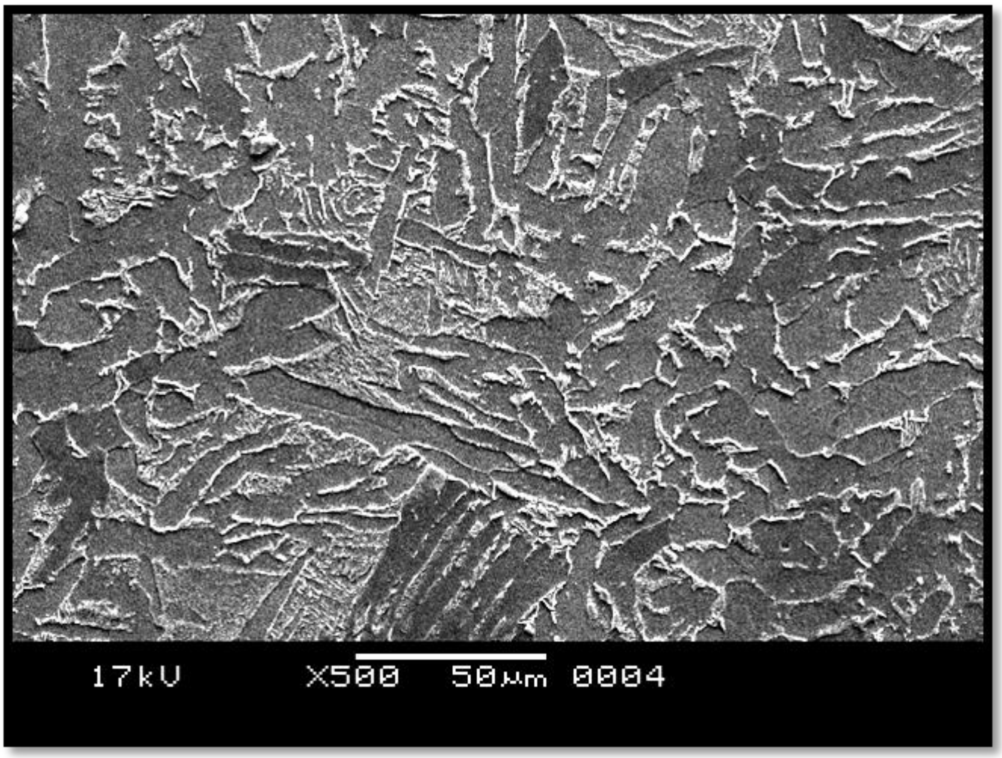


Fig. 4.4.3.E: SEM Micrograph showing White Cast Iron

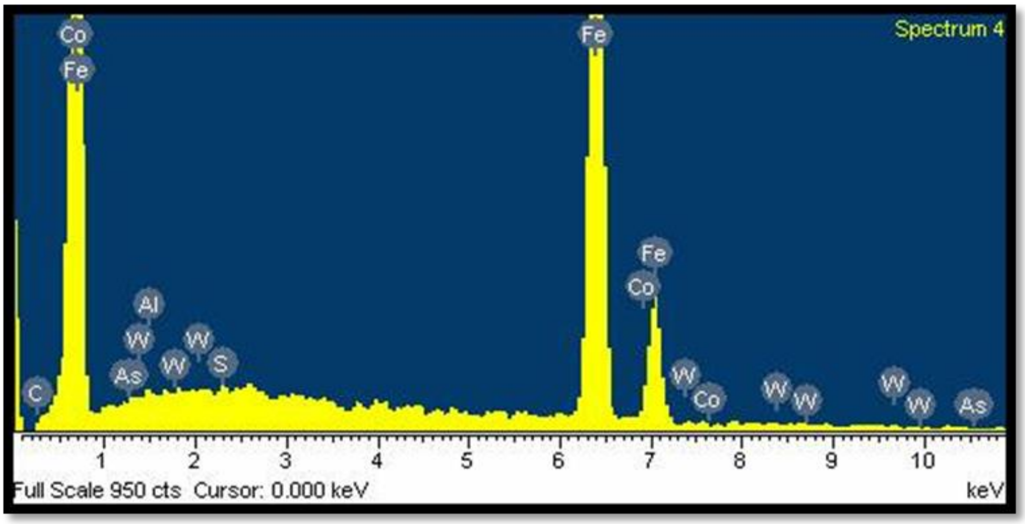


Fig. 4.4.3.E.1: EDAX Composition Graph of KRD- 6831

BMR 5809

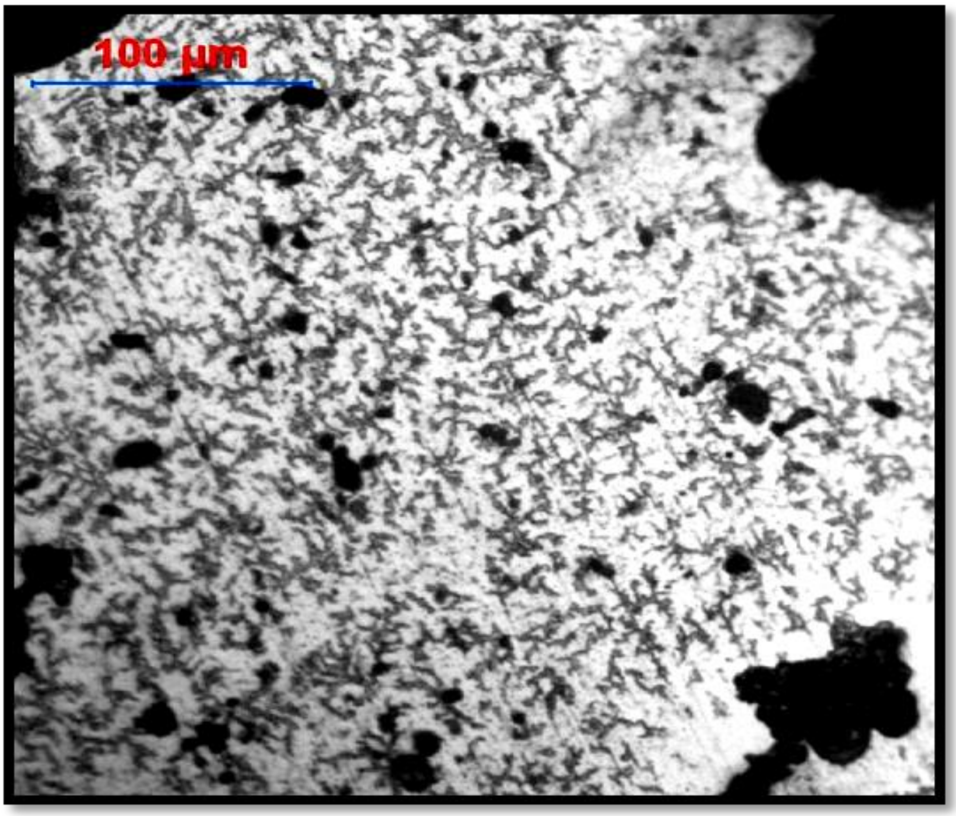


Fig. 4.4.3.a : Optical Micrograph showing Dendritic Structure

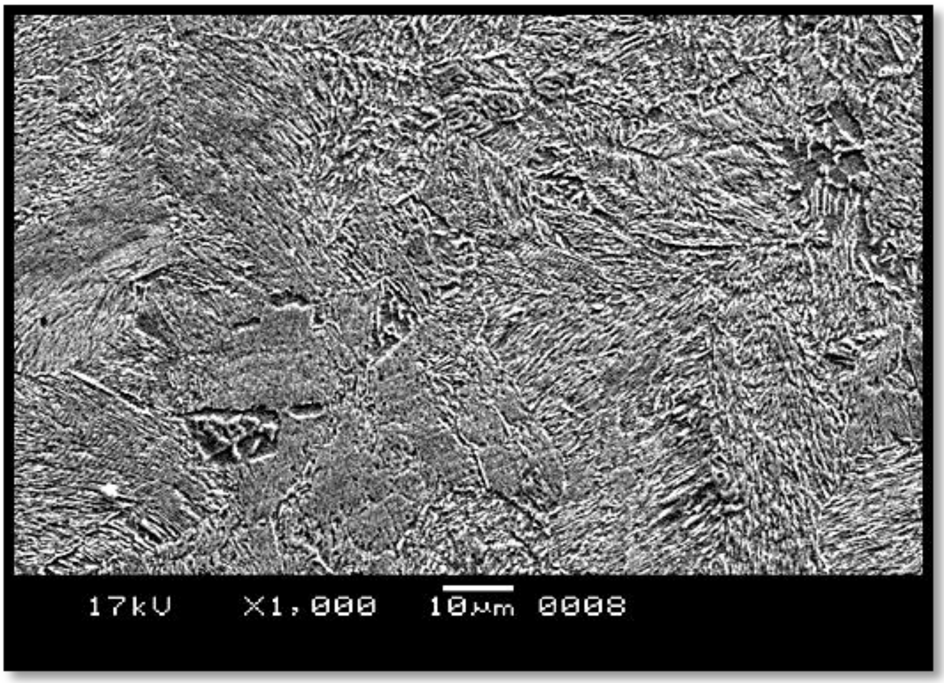


Fig. 4.4.3.F: SEM Micrograph Showing Lamellar Formation in BMR-5809

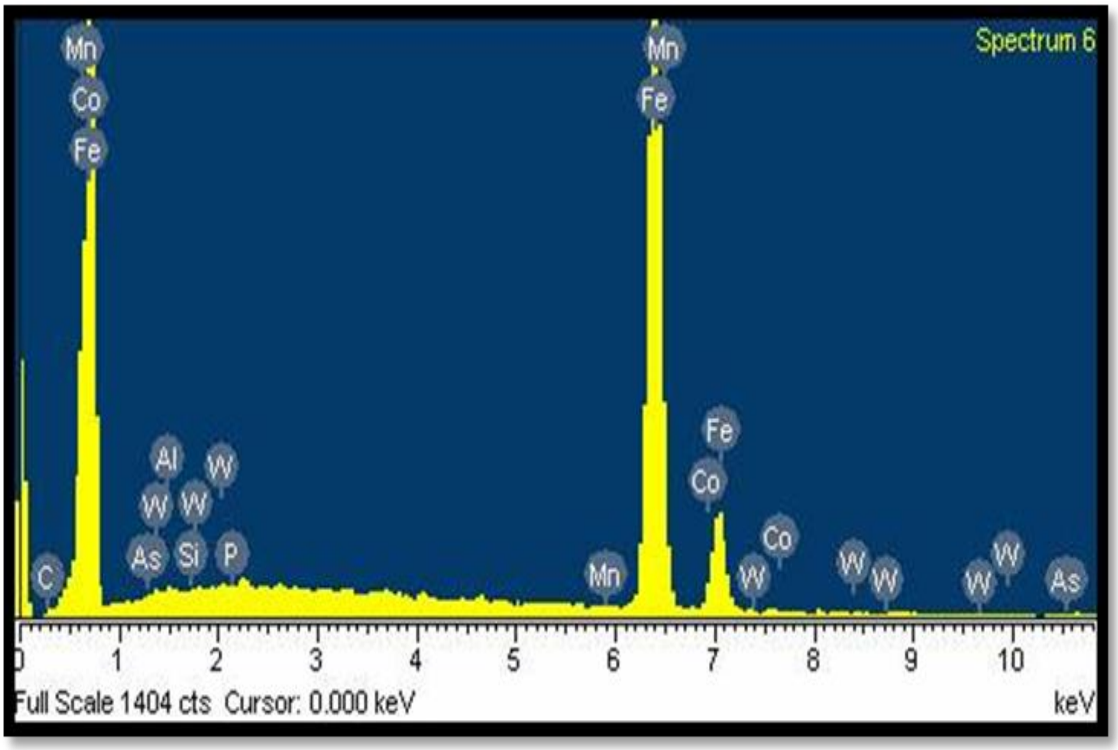


Fig. 4.4.3.F.1: EDAX Composition Graph of BMR-5809

BMR 112

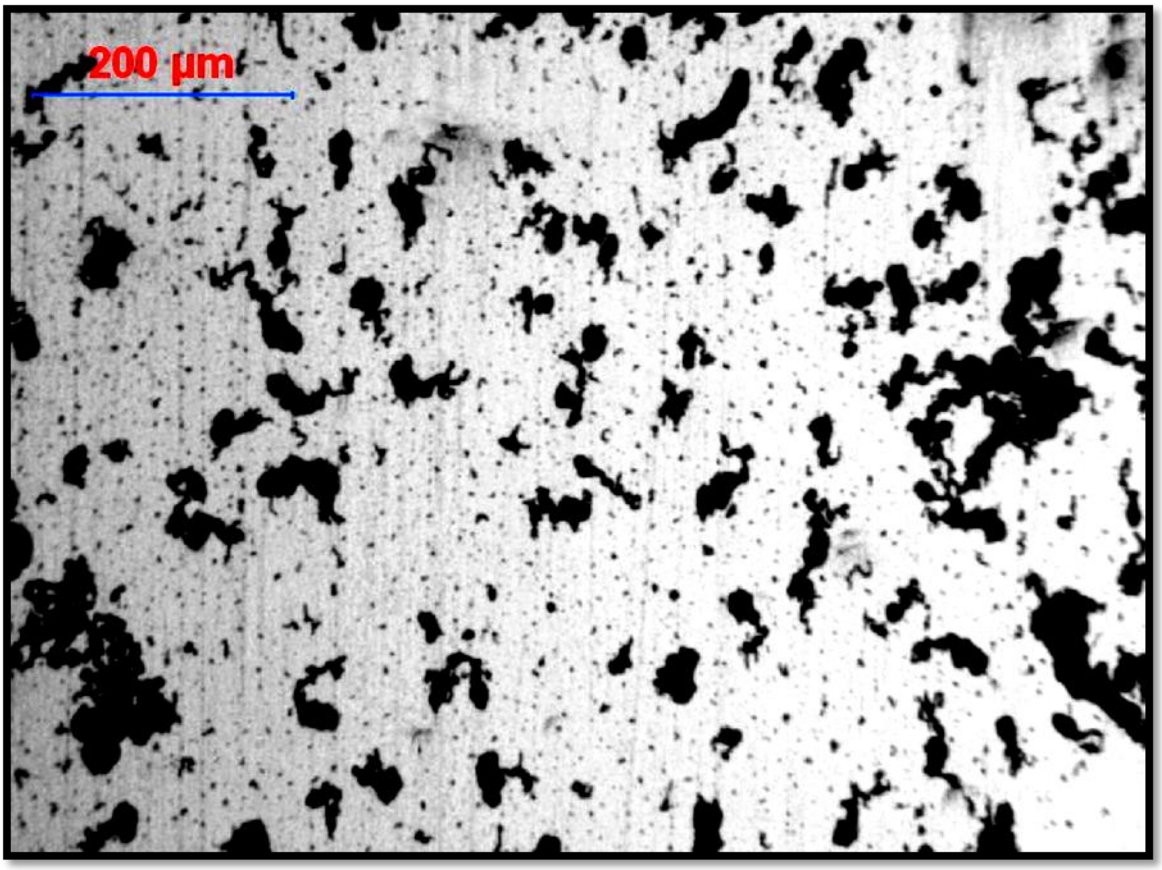


Fig. 4.4.4.a: Optical Micrograph showing a pure ferrite matrix with slag stringers

BRG 5804

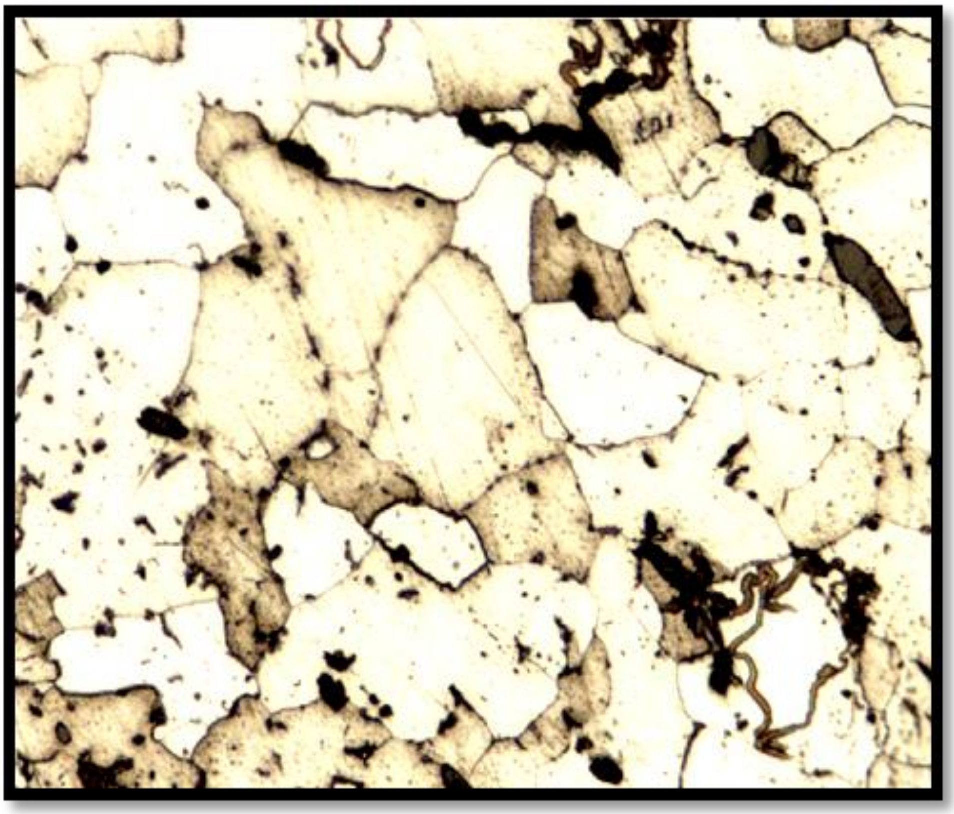


Fig. 4.4.5: Optical Micrograph showing pure ferrite structure

BMR 173

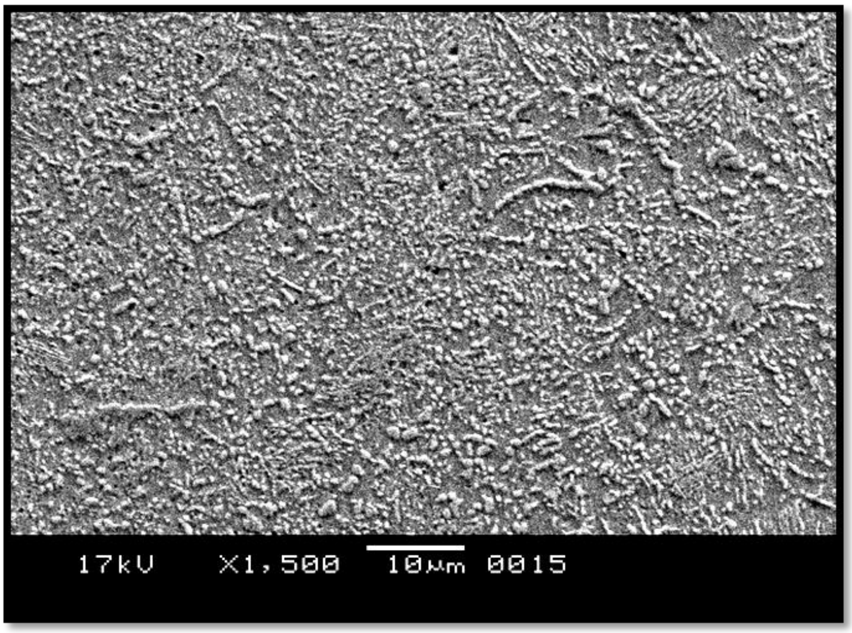


Fig. 4.4.6.A: SEM micrograph showing unclear grain boundaries

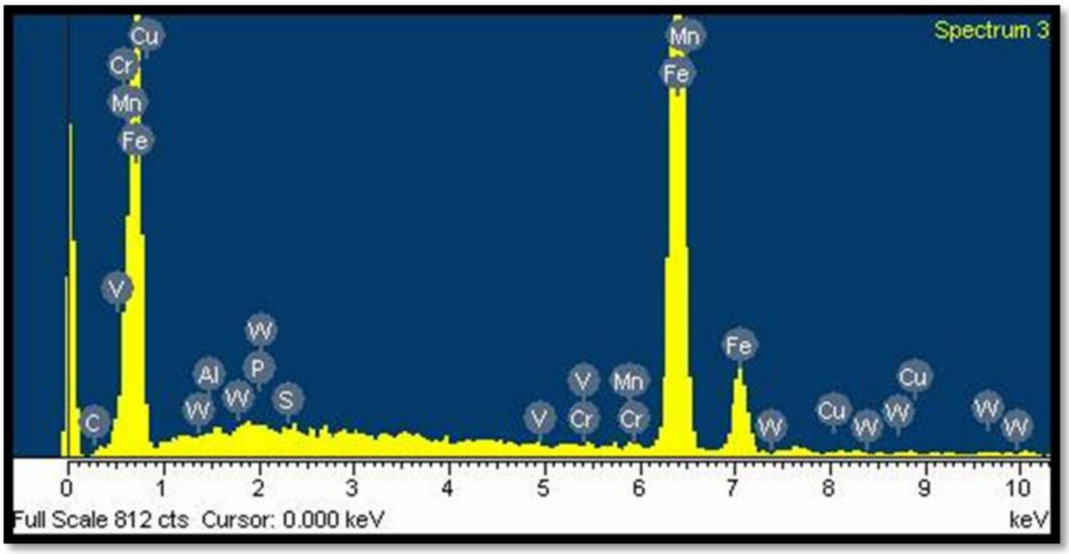


Fig. 4.4.6.A.1: EDAX Composition Graph of BMR-173

4.4.7: Metallographic Analysis of Experimental Samples

This section deals with the metallographic results of the ethnographic samples which were made by the traditional blacksmiths (*Lohar*) at the village of Ubali. Out of the 6 samples, sample number 3 was found from a local field and number 4 and 5 were made at the UBL-1 workshop. Objects from two separate workshops were analyzed so that if techniques and methods of fabrication make any change in the microstructure of the object then it could be identified and the changes observed could be interpreted in the archaeological context with ethnographic analogies. Sample number 3 was chosen for metallographic analysis, because of it being a locally made implement and it was made by reworking the locally available '*polat*'.

Table: 4.4.5 Details of Ethnographic Sample

Artefact No.	Artefact Type	Provenance	Length (mm.)	Breadth (mm.)	Thickness (mm.)	Weight (gms)
1	Axe	UBL 2	165	65	10	
2	Adze	UBL 2	160.77	80.52	2.33	100.68
3	Sickle	UBL (Personal artefact of a farmer)	355.72	29.47	1.83	119.26
4	Knife	UBL 1	249.26	28.73	2.31	119.97
5	Trowel	UBL 1	246.1	48.07	1.44	109
6	Nail Parer	UBL2	160.71	17.97	1.22	29.49

Sample No. 1 Axe

Fig.4.4.7.1. A: Axe (Experimental Artefact)

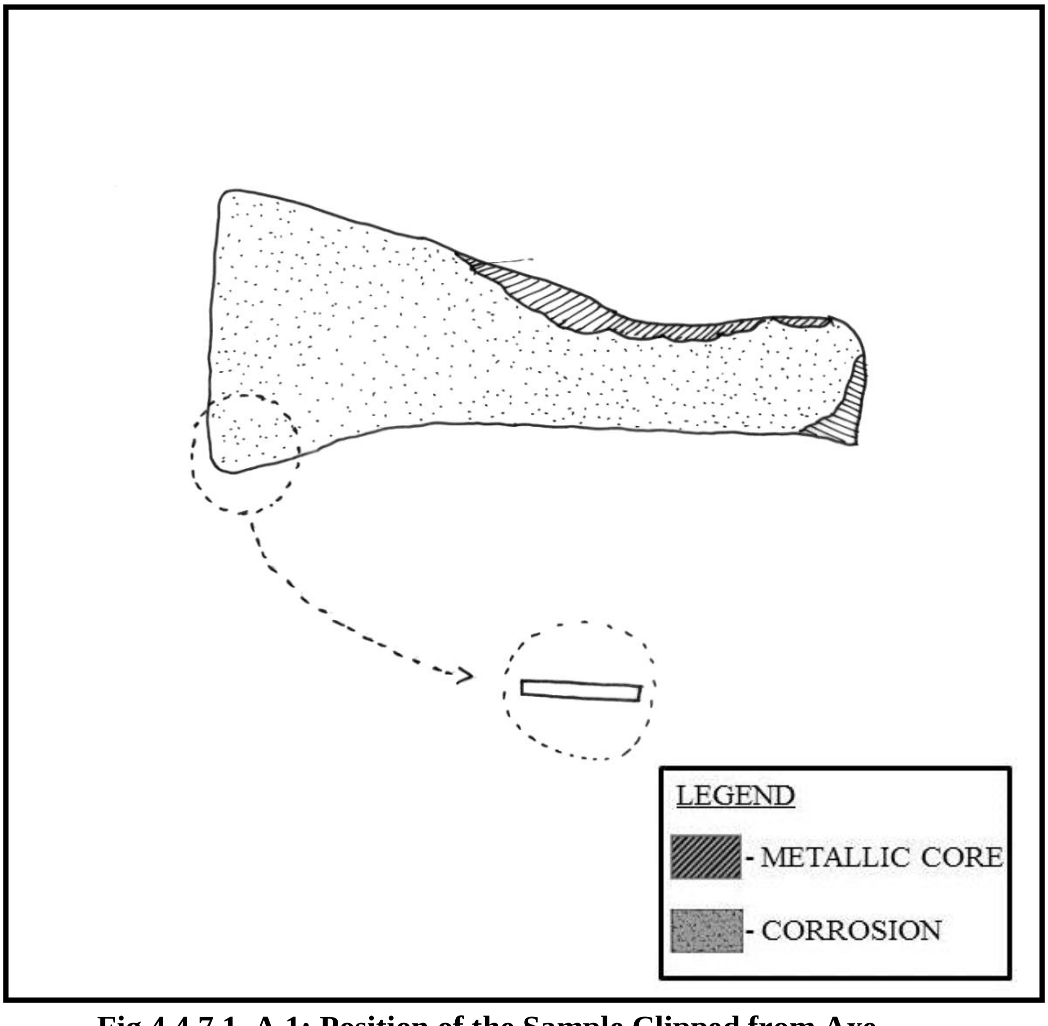


Fig.4.4.7.1. A.1: Position of the Sample Clipped from Axe

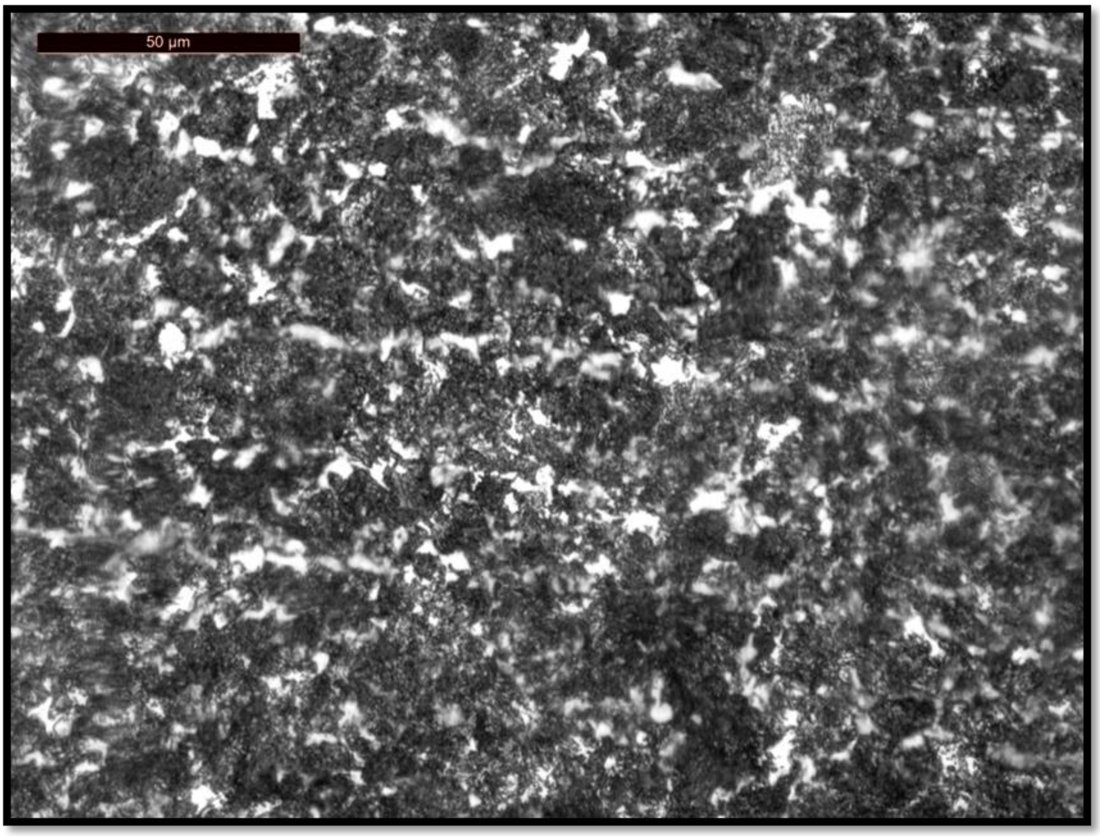


Fig. 4.4.7.1.A.2: Microstructure sowing eutectic cast iron

The optical micrograph (Fig. 4.4.7.1.A.2) shows that the artefact (Fig. 4.4.7.1.A) is made of eutectic cast iron. The sample was clipped from the cutting edge. The wear and tear process for this type of metal is slower than grey cast iron but faster than steel. The lines visible horizontally along the micrograph are markers of smithery activity, which denotes the artefact was forged on an anvil. The experimental sample was hot-worked on the anvil by the method of forging and annealing alternately. The annealing softens the metal and allows it to be forged for shaping the axe.

Sample No. 2 Adze

Fig.4.4.7.2. A: Adze (Experimental Artefact)

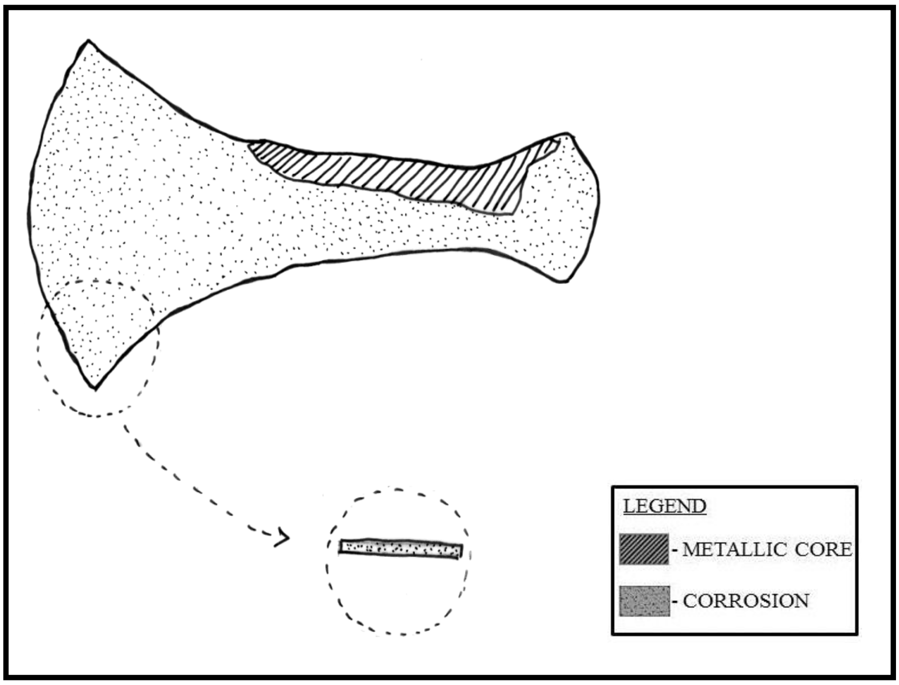


Fig.4.4.7.2. A.1: Position of the Sample Clipped from Adze

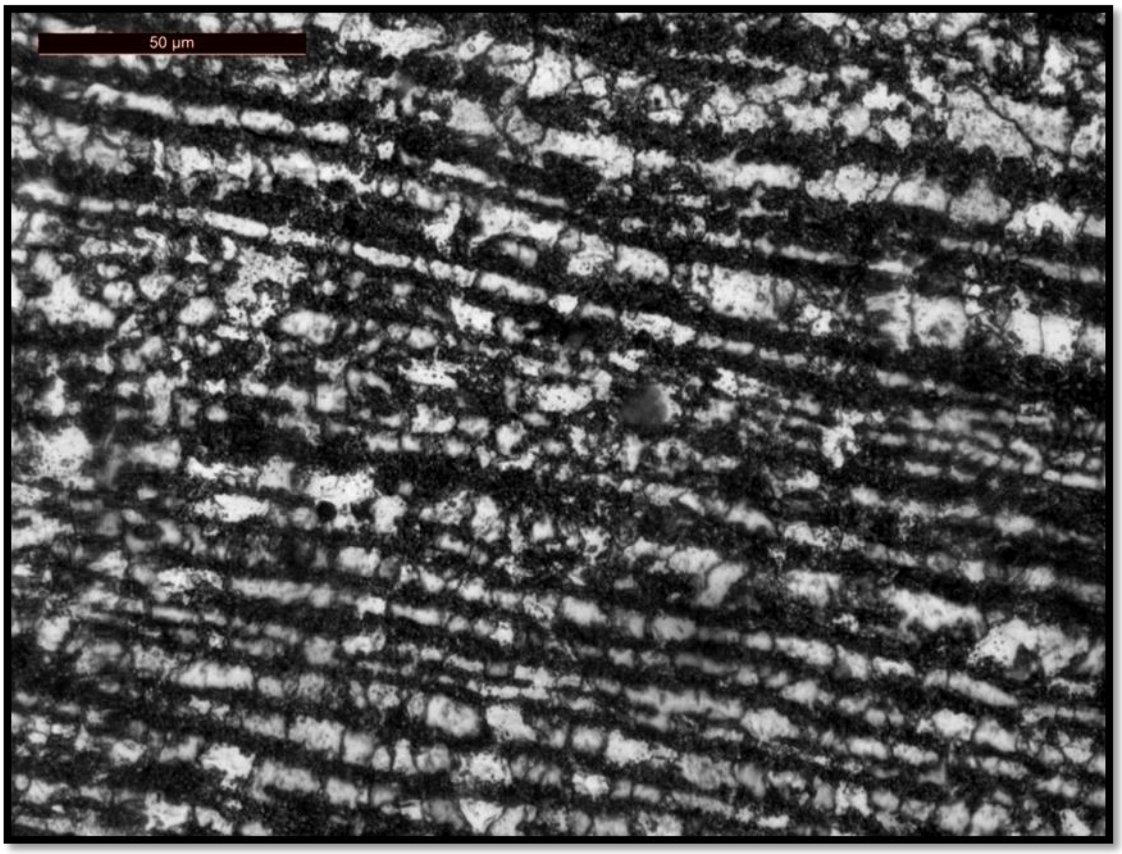


Fig.4.4.7.2. A.2: Optical Micrograph Adze (Experimental Artefact)

The optical micrograph (Fig. 4.4.7.2.A.2) of the artefact (Fig. 4.4.7.2.A) shows a ferrite structure and the artefact was carburized. The carburization was done using coal. Carburization is the process of carbon absorption from the decomposition of carbon monoxide of coal. Carbon is absorbed by the surface of the artefact. The dark regions show the effect of carburization. The sample was clipped from the broader blade (Fig. 4.4.7.2.A.1). The lines along the entire section show evidences of forging on the anvil.

Sample No. 3 Sickle

Fig.4.4.7.3. A: Sickle (Local made Artefact)

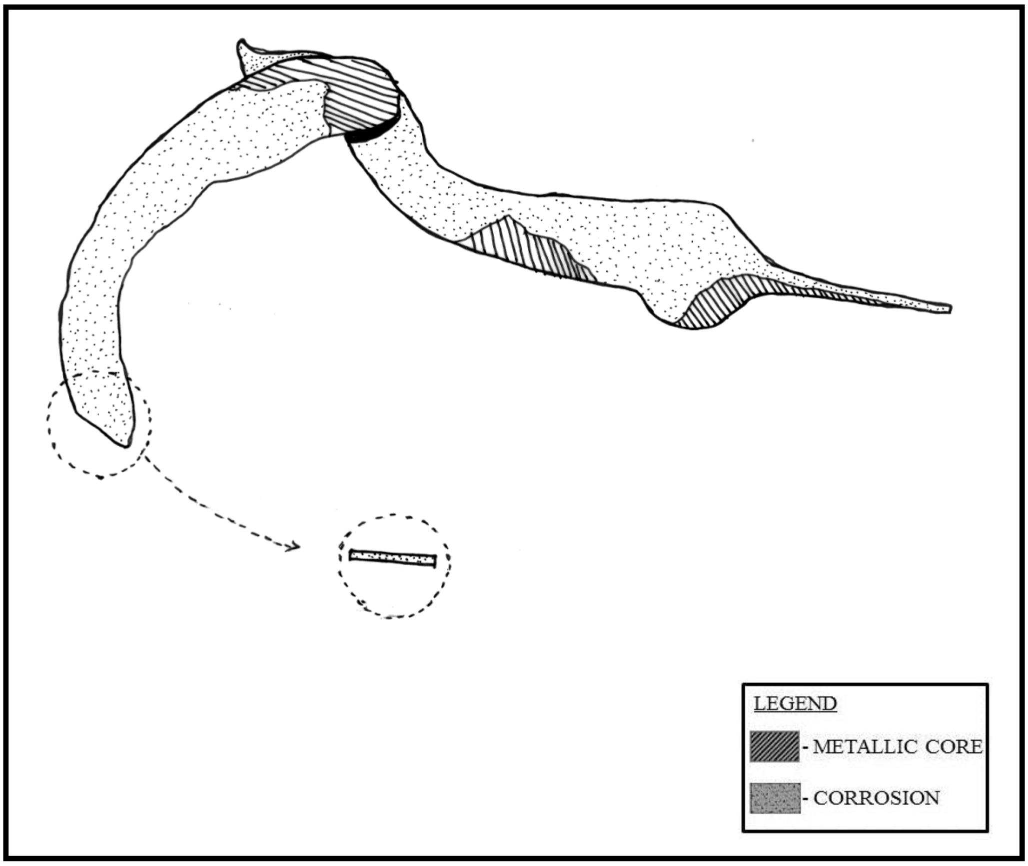


Fig.4.4.7.3. A.1: Position of the Sample Clipped from Sickle

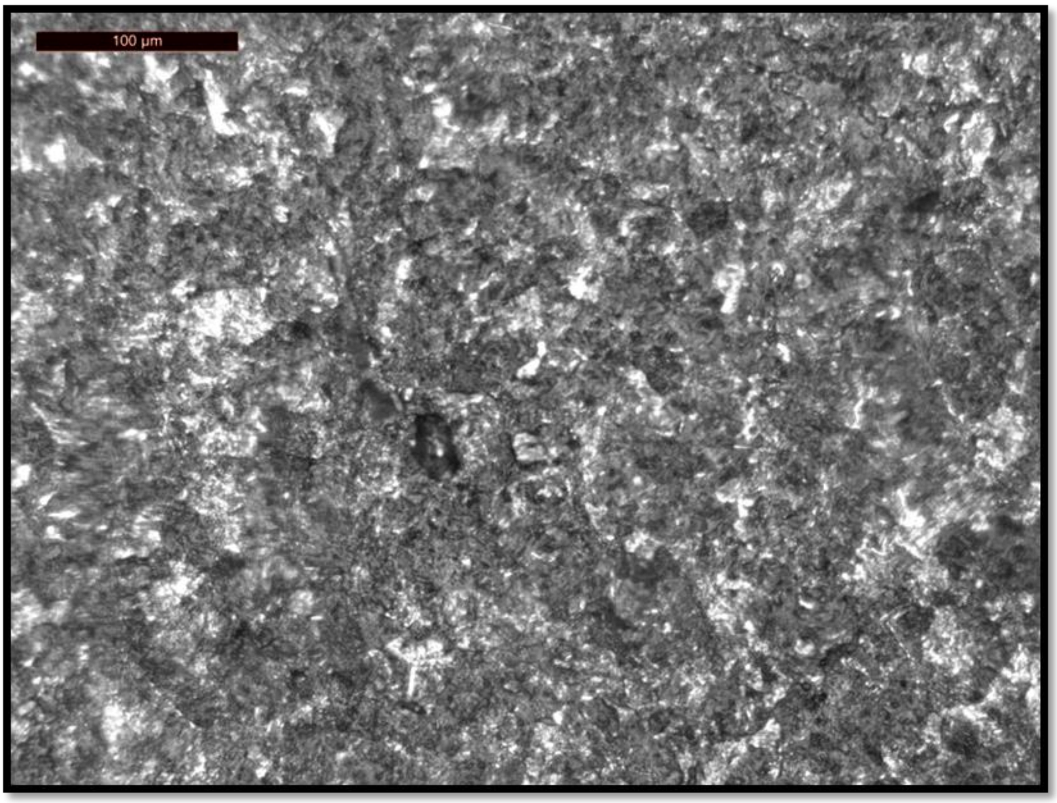


Fig.4.4.7.3. A.2: Optical Micrograph of Sickle (Local Made Artefact)

The optical micrograph (Fig. 4.4.7.3.A.2) shows that the implement (Fig. 4.4.7.3.A) was case – carburized after the entire process of fabrication. Only the outer face and the cutting edge had been converted to low-carbon. The microstructure reveals ferrite boundaries with martensite formation. The implement was first forged then it was quenched so that the temperature reduces drastically and this rendered the outer most part of the sample to cool fast enough to form martensite. The sample studied was clipped from the reaping end (Fig. 4.4.7.3.A.1).

Sample No. 4 Knife

Fig.4.4.7.4. A: Knife (Experimental Artefact)

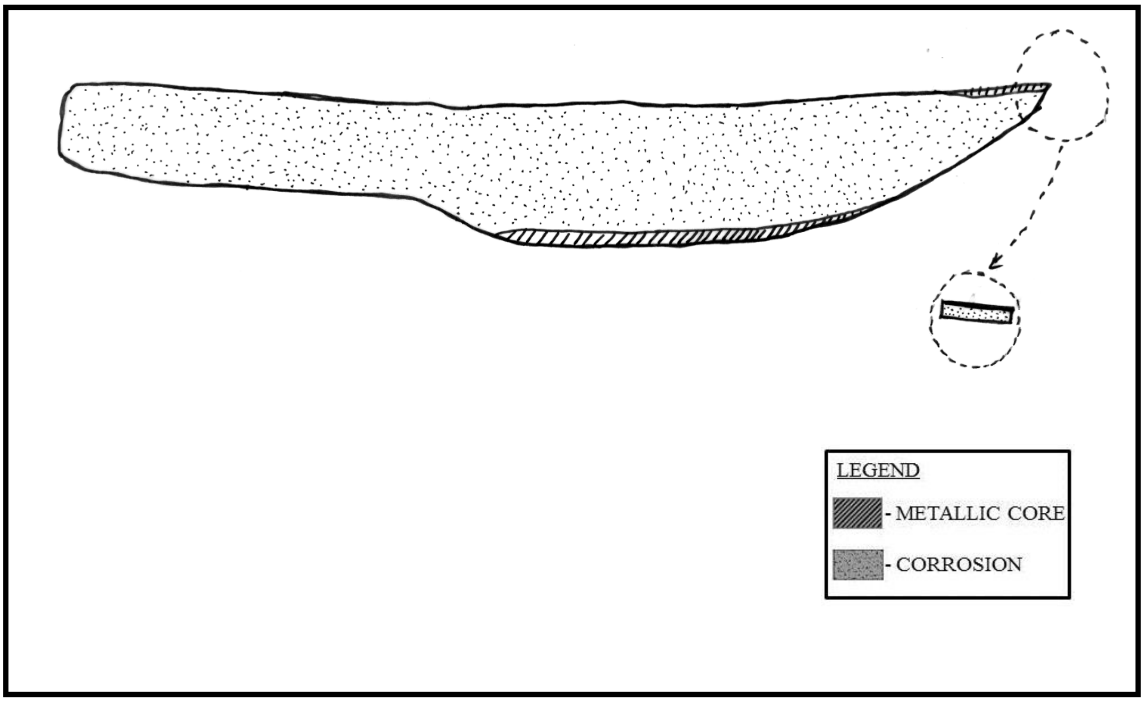


Fig.4.4.7.4. A.1: Position of the Sample Clipped from Knife

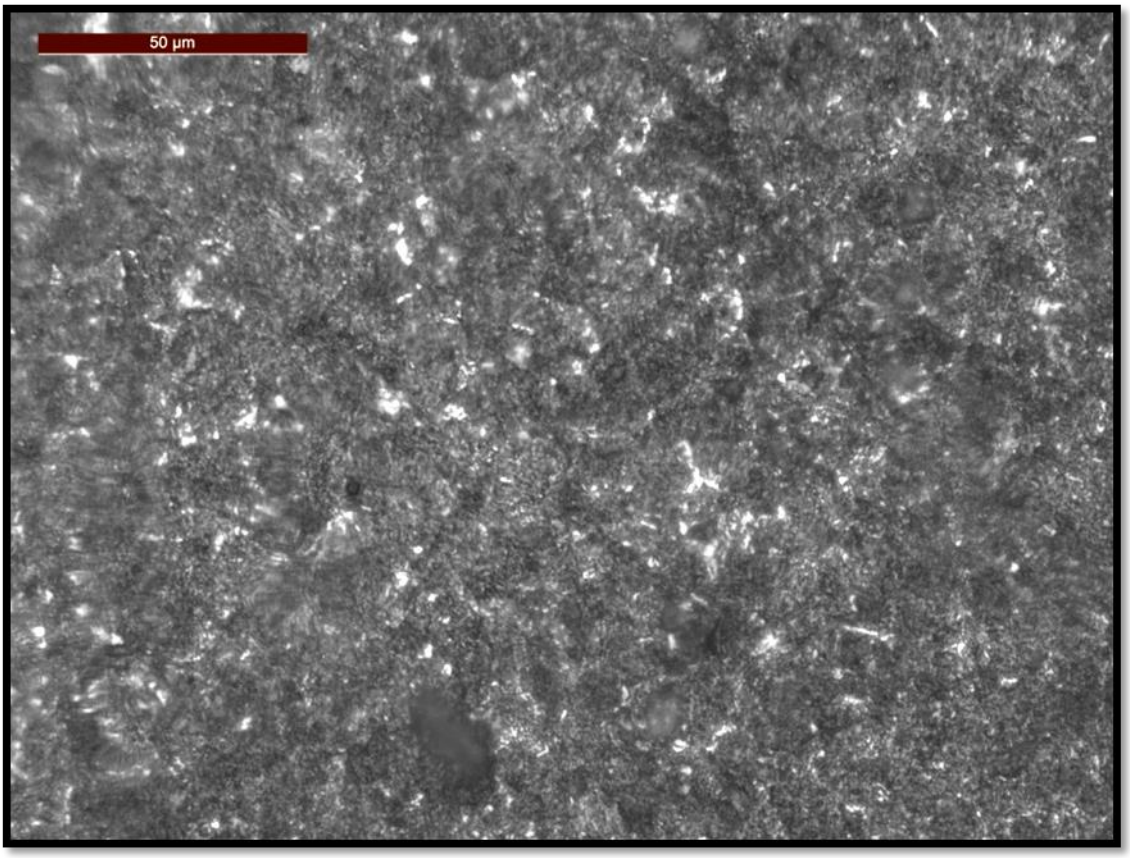


Fig.4.4.7.4. A.2: Optical Micrograph of Knife

The optical micrograph (Fig. 4.4.7.4.A.2) shows a network of ferrite grains with martensite formation. This microstructure reflects the entire process of manufacturing the artefact (Fig. 4.4.7.4.A). The artefact was carburized for hardening and then it was annealed for fast cooling, which led to the formation of martensite structure. The artefact was over-carburized as the sample exhibit over-heated structures. The sample was cut from the pointed end where the backed end and the circular cutting edge converge (Fig. 4.4.7.4.A.1).

Sample No. 5 Trowel

Fig.4.4.7.5. A: Trowel (Experimental Artefact)

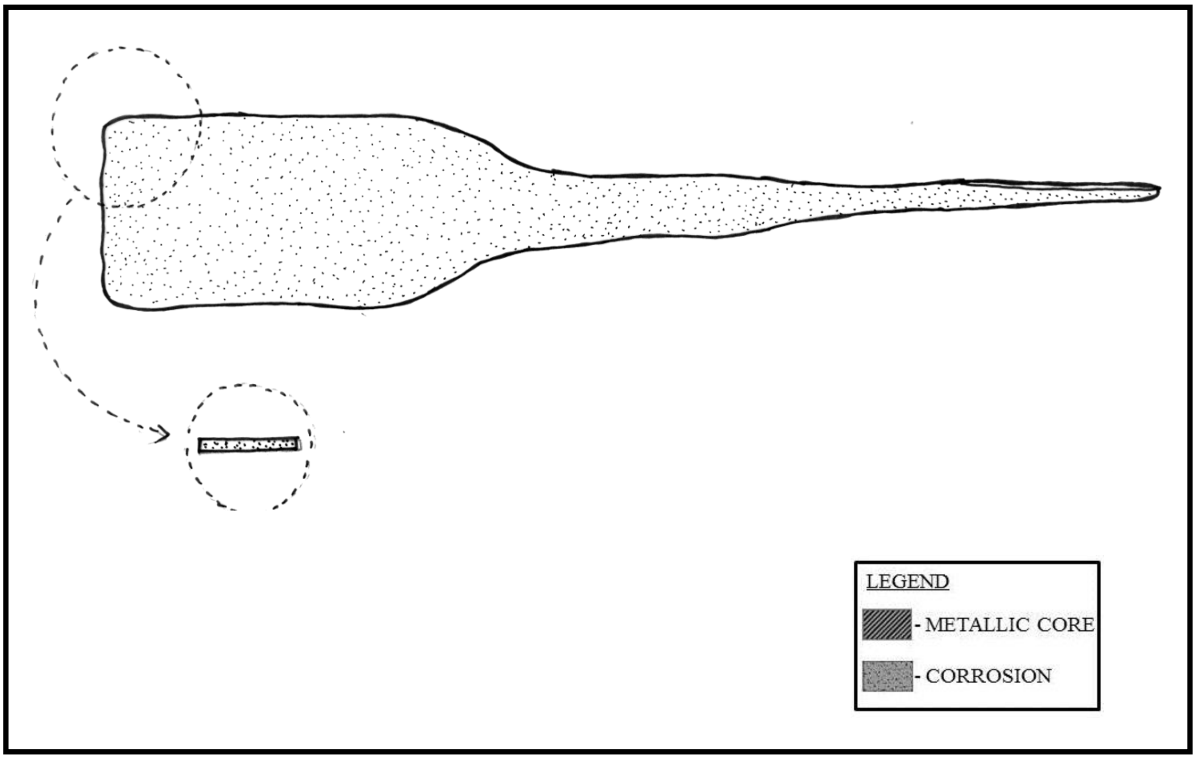


Fig.4.4.7.5. A.1: Position of the Sample clipped from Trowel

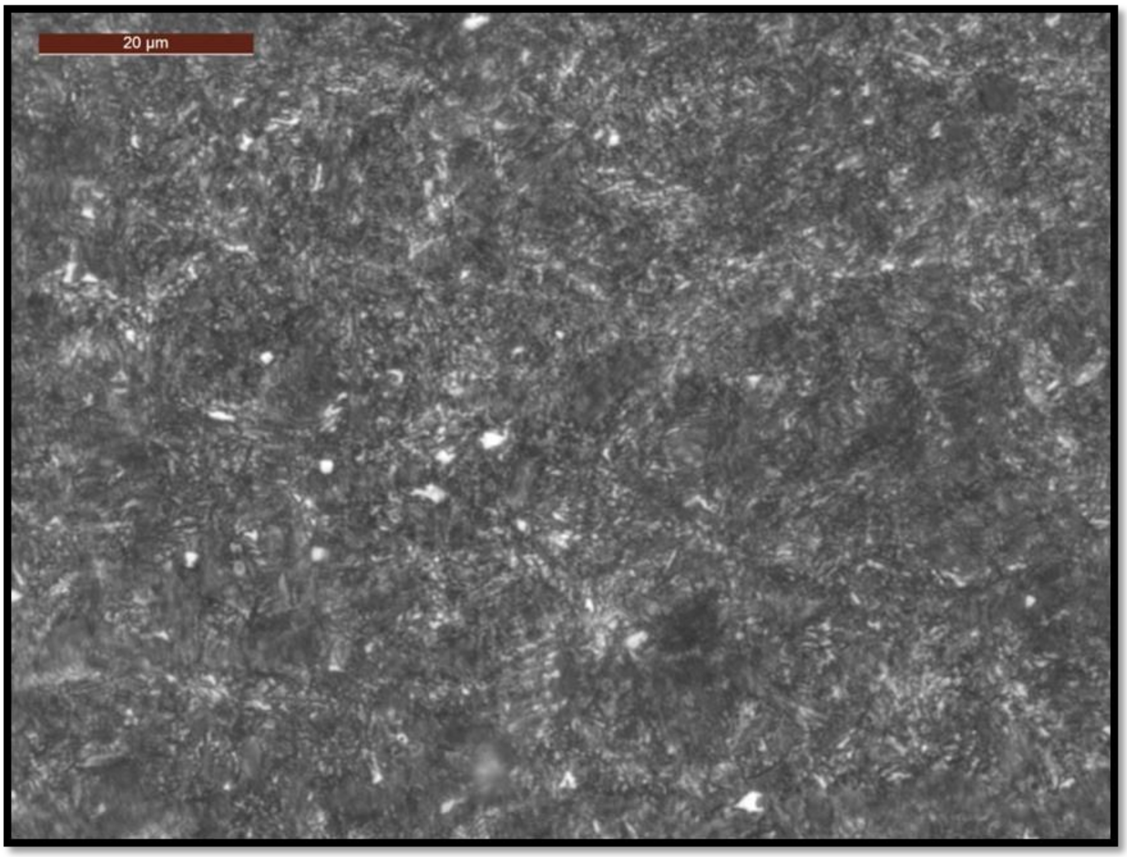


Fig.4.4.7.5. A.2: Optical Micrograph of Trowel

The optical micrograph (Fig. 4.4.7.5.A.2) of the artefact (Fig. 4.4.7.5.A) shows ferrite pearlite microstructure, in certain areas lamellar formation is visible which is a marker of steel. The experimental tool was made by the process of alternate forging and annealing. The absorption of carbon i.e. carburization was refined by water quenching. The entire section shows martensite formation. The sample was cut from the digging end (Fig. 4.4.7.5.A.1).

Sample No. 6 Nail Parer

Fig.4.4.7.6. A: Nail Parer (Experimental Artefact)

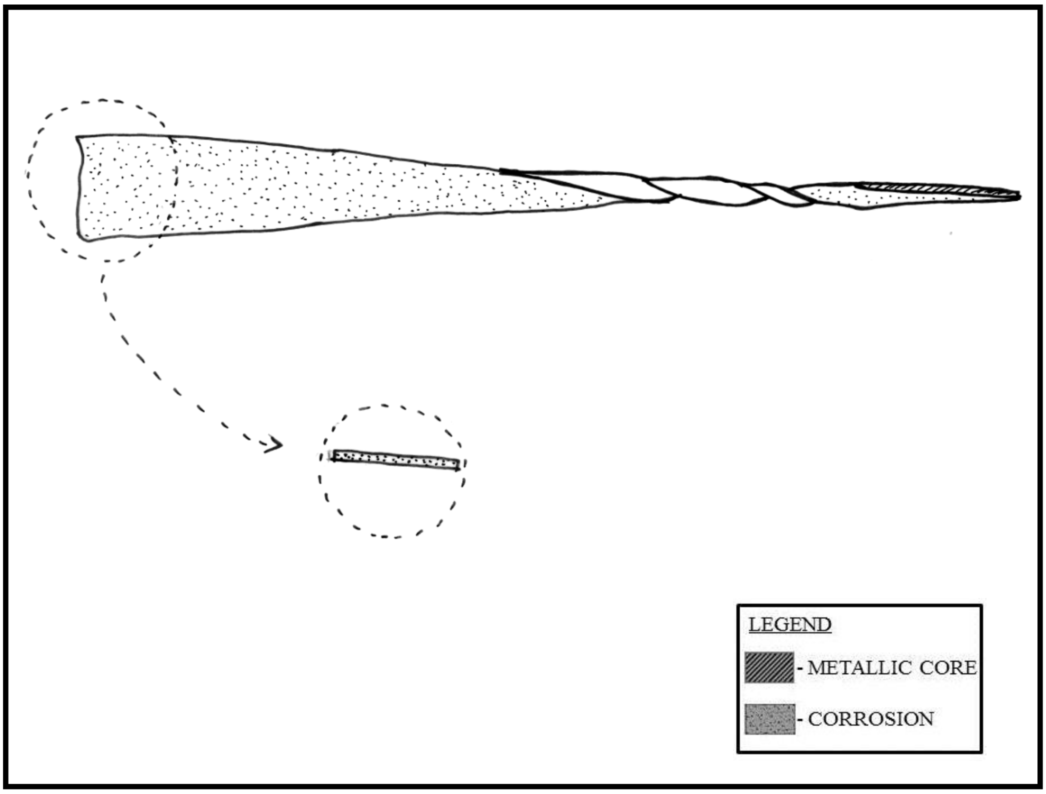


Fig.4.4.7.6. A.1: Position of the Sample Clipped from Nail Parer

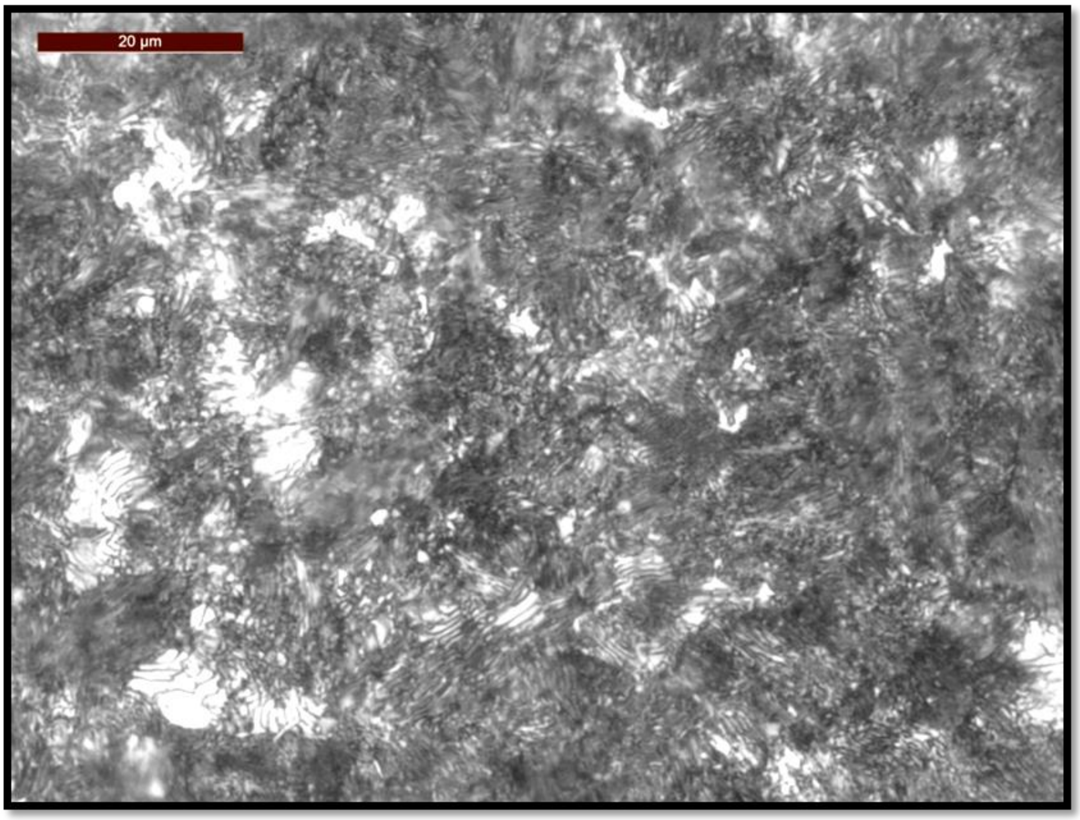


Fig.4.4.7.6. A.2: Nail Parer (Experimental Artefact)

The optical micrograph (Fig. 4.4.7.6.A.2) of the experimental sample (Fig. 4.4.7.6.A) clearly shows pearlite formation which denotes it as steel. We do have martensite formation on the upper surface of the sample as the object was quenched only on the outer surface. The artefact was quenched for hardening, which is denoted by martensite formation. The sample was clipped from the triangular cutting edge, as that end was selectively carburized and forged for sharpening.

4.5 Compositional Analysis

Interpretation of the chemical composition data is important and necessary for interpreting the technical know-how prevailing in past societies. The primary stage of metallurgical activity involves locating economical ore sources, choosing of a suitable flux, followed by the smelting activity. The next stage of metallurgy involves addition of suitable metals for alloying process and smithery. The smelting procedure required the knowledge of preparing a furnace. Furnace preparation involved the selection of a suitable refractory material. The degree of advancement of the smelting technique is projected in the chemical composition of the artefacts, through the percentage of iron content and other elements in the artefacts.

Based on the chemical composition of the artefacts, probable ore sources utilized by the megalithic iron smelters can be identified. We do not have a full compositional analysis of magnetite ore from the Vidarbha region, however the magnetite ore from the region (Bankura District. West Bengal) have been analysed. According to Samanta (2015), the magnetite ore is predominated by the presence of magnetite (Fe_3O_4), ilmenite ($FeTiO_3$), hercynite (Fe Al_2O_4), magnesio-hercynite ((FeMg) Al_2O_4) and other minor minerals associated are maghemite (Fe_2O_3), rutile (TiO_2), chalco-pyrite ($CuFeS_2$), chalcolite (Cu_2S), cobaltite (CoAsS), gersdorffite (NiAsS), millerite (NiS), pseudo-brookite ($FeTiO_5$), silicates (SiO_2) and elements like vanadium, chromium and zirconium.

The composition of magnetite ore have a striking resemblance to the chemical composition of KRD 6831, VHD 10 and VHD 21F (Table:4.5.1). However other minerals namely Mn, W, Nb, Ce, Tb, Ta and B which are present in the samples do not occur in the magnetite ore. The presence of titanium in the samples is a clear indicator of the usage of magnetite ore for smelting. The elements which do not comply with the magnetite ore fall within the Rare Earth Elements group. However minerals like Mn, W, Nb, Ce, Tb, Ta and B are being used as alloying metals to improve fatigue, creep and several other mechanical properties of steel (Collins, et.al. 1961, Linebarger and McCluhan, 1981). Every alloying metal has specific effect on the formation of steel. Elements like chromium, tungsten, titanium, columbium, vanadium, molybdenum and manganese form carbides which form cementite structures in steel. However elements like manganese, nickel, cobalt and copper tend to stabilize austenite formation. On the other hand elements like chromium, tungsten, molybdenum, vanadium and silicon stabilize ferrite formation, as they are more soluble in α-iron rather than in γ-iron. Manganese (Mn) (0.3-0.8%) is used as an alloying element in steel making as it reduces oxides and it reduces the negative effects of the iron sulphides formed. However if the Mn content rises above 1.8%, it reduces the ductility of the metal. Similarly nickel (Ni) when added it aids in increasing the rate of cooling of carbon steel. Steels having 0.5% Ni have similar properties as carbon steel but have more strength due to finer pearlite formation (Rollason, 1973). Chromium (Cr) also has the same effects as nickel, but steels having more than 15% chromium carbides $(Cr\ Fe_3)C_2$ are easier to be worked on. Usually a combination of Ni and Cr is used for alloying as nickel renders strength and ductility and chromium provides resistance to wear and tear. Molybdenum is also used in combination with Ni and Cr as it further aids in increasing the tensile strength of steel and serves the purpose of reduction of brittleness (Rollason, 1973). Samples in Table No: 4.4.3 show the existence of Ni and Cr as alloying elements.

Vanadium (V) has been found in all the analyzed samples, it was used in combination with other alloying elements. Vanadium forms carbide (V_4C_3) and increases the mechanical properties of heat treated steel. It reduces the tempering effects and induces secondary hardening. Tungsten (W) has been used in almost all the samples except MHR 6446, MHR 6490 and MHR 6551 as alloying agent. Tungsten reacts with carbon to form either WC or W_2C or with iron to form Fe_3W_3C or Fe_4W_2C. The properties of tungsten refine the grain structure and provide resistance to decarburization during cold working. Cobalt (Co) has been found in all the samples. It has a high solubility in α and γ iron but weak carbide formation properties (Rollason, 1973). The other element found is Boron (B), however it has been found in only 3 samples namely KRD 6831, VHD 10 and VHD 21F. Present day metallurgical activity in U.S.A involves the addition of 0.003-0.005% boron to fine grained steel for increasing the tensile strength of steel. Usually Boron is used along with Molybdenum (Rollason, 1973).

The use of the above mentioned alloying elements in making steel is known from present metallurgical practice, however the non-presence of the alloying elements either in the ores present in the surrounding areas or their natural availability in the vicinity have led to a few questions. Firstly the alloying elements in question fall in the category of rare earth elements and are found in specific zones such as placers, however in India the beach sand deposits are the most important rare earth deposits. Placers are mostly found along recent or ancient shorelines. The beach sand deposits are composed of monazite, ilmenite, rutile, zircon, silimanite, garnet, leucoxene and magnetite and they are located along the coastline of Tamil Nadu, Kerala, Andhra Pradesh and Maharashtra (Krishnamurthy and Gupta, 2016). The use and importance of the rare earth elements as alloying agents in making steel was reviewed by Wauby in 1978. However, its existence in the megalithic iron age artefacts have raised the question, 'Were they deliberately added?' The question remains unanswered as we do not have evidences of failed attempts while smelting. However it can be suggested that smelting and production of good quality steel was the end result of a series of trial and error methods as suggested by the samples analysed in Section 4.4.2.

The second question raised from the chemical data is that of the ore provenance. Deriving the ore provenance from the chemical composition of an artefact is an incorrect method. Metal specially iron is recycled and reused over a long period of time. Present day *Lohars* collect iron scrap from the surrounding zones and re-melt them together for making new artefacts. These newly made artefacts have ores from different zones and can never be identified. Similar is the case for the iron artefacts found from the Megalithic sites of Vidarbha. The degree of corrosion talks about the C-transformations and N- transformations undergone by the artefacts. There are anomalies in the chemical compositional data as the corrosion of an artefact is not homogeneous.

These compositional data let the archaeologists design models proposing the different stages of development of metallurgical activities based on the usage of native metals and the addition of alloying metals and the trace element data aids in locating the probable sources of ores. The table number 2.1 in chapter 2 gives a vivid description of the iron sources in the Maharashtra region, although a complete chemical compositional data of all the deposits are not provided. It is clearly mentioned that the magnetite deposit in Khursipur Bhandara district has titanium content and Hughes (1873) mentions that the deposit named Lohara in Chandrapur district had magnetite deposit along with hematite and was utilized by the indigenous iron smelters

(*Maharattas*). Iron ore containing titanium is a marker of Titaniferrous Magnetite ore, therefore the samples BMR 173, MHR 6551, VHD 10, VHD 21F and KRD 6831 were probably made by smelting the ore from the magnetite deposits of either Khursipur deposit in Bhandara district of Lohara in Chandrapur district (Table No: 4.5.2).

Vidarbha region only has two magnetite deposits whereas hematite deposits are more in number. The largest iron ore deposit (hematite) in Maharashtra is reported from Surajgarh in Gadchiroli district and the second largest is Lohara in Chandrapur district which is known for both hematite and magnetite. Due to their location in a political volatile area, detailed chemical composition data is not available. The economic value of the deposits are analysed based on the iron content. Therefore only the iron content of the haematite deposits from Gadchiroli and Chandrapur region have been analysed and not the minor or trace elements (Table: 4.5.2).

Table Number 4.5.2: Magnetite Deposits in the region of Vidarbha, Maharashtra.

Magnetite Deposit	District	Fe %	Si%	Al%	Ti%	P%	V%
Khursipur	Bhandara	54.66	-	-	11.05	-	0.65
Lohara	Chandrapur	63.1-69.23	1.51	0.95	Trace	0.024	

(DID, 2006)

Table Number 4.5.3: Hematite Deposits of Vidarbha, Maharashtra

Hematite Deposits	District	Fe%	Al%	Si%	P%	S%
Surajgarh	Gadchiroli	63.75-66.59	0.43-1.47	0.84-2.84	0.017-0.076	0.010-0.032
Fuser	Gadchiroli	60.87-69.81	-	0.0023-1.407	0.002	
Dewalgaon	Gadchiroli	66.09				
Damkod–Meta I	Gadchiroli (Damkod-Wadvi Hill range deposit)	64.51				
Damkod – Meta II		65.23				
Wadwai Meta		62.83				
Matvarsi		64.73				
Chotta Wadwai		63.13				
Udakoti		62.56				
Mesmeta		65.91				
Kakadguda Meta		-				
Gurunger Meta		-				
Pipalgaon	Chandrapur District	69.62				
Asola	Chandrapur District	56.77	1.29	3.844	0.08	0.11

(DID, 2006)

4.6. Ethnographic Survey

This segment has been divided into two sections. The first section describes the ethnographic account of the contemporary traditional ironsmith community known as the *Lohars* and the metallurgical methods adopted by them. The second section enumerates the practices that are similar to the Megalithic traditions practiced by the contemporary Gondi tribe of Gadchiroli, Vidarbha.

4.6.1 Contemporary Traditional Iron Blacksmith

The traditional blacksmiths community of Maharashtra belongs to the *Gaddi Lohar* community, a sub-caste of the *Lohar* community. The name '*Lohar*' has a root in the

Sanskrit word lauha- kara which means a worker in iron (*Russell, 1916).* Over the years they have lost the knowledge of earlier practices and techniques of metal working. Originally they were a migratory group and travelled in a *gadi* (a bullock cart), however the major part of the nomadic community have settled in the vicinity of rural villages. Although they trace their origin to the Vedic god *Vishwakarma* yet their social position is lower than even a menial caste.

A few nomadic *Lohar* groups can still be encountered in the region of Vidarbha and are identified by their '*gadis*' loaded with tents and livestock. These nomadic groups render service to the villagers by the mode of barter system. Russell and Hiralal (1916) give a vivid description of the Lohar community during the colonial rule. According to a prevalent tradition, Lord Vishwakarma had twelve sons and the eldest was the founder of the Lohar community. The eldest son had cursed his younger siblings that they would never be able to practice their trade without him providing the implements. During the colonial rule, the Lohar community was included in the Nomadic Tribe (NT) category. Presently every village has at least one settled *Lohar* family. Villagers preferred the *Lohar* who was known as the 'S*uddha Lohara'* (pure - ironsmith) because according to them their products were pure and sturdier in comparison to the other settled Lohar who was known as the '*Lohara Nakkala'* (duplicate iron-smith) and their products were inferior in quality and would never survive the entire harvesting season. Both the *Lohars* were interviewed and it was revealed that the '*Lohara Nakkala'* was comparatively new to the field of smithery. They were apprentices to an original *Lohar* earlier. Therefore they were not *Lohar* by caste but by profession. However the '*Suddha Lohara'* was from a family of Lohar*s* and he was a *Gaddi Lohar* by caste. Therefore the same object made by the two *Lohars* differed in quality, because of the difference in experience and understanding of the raw material.

Artefacts of the same type from the archaeological context show different degrees of preservation, some are more rusted, whereas some are encrusted but have an intact metallic core. Probably these differently preserved artefacts signify usage of ores of different composition smelted under varied conditions which resulted in the variations in the percentage of impurities. Selection of the correct ore, correct flux and the correct method of smelting are required for preservation of the iron artefacts

Although every village has a resident *Lohar*, and the nomadic *Lohars* set up their seasonal camps every 3 to 4 months. An area separated from the main habitation, located near a water body is designated as the area for their seasonal camps. While undertaking the surveys, a travelling *Lohar* group was encountered. They are basically semi-nomads and interestingly follow a route which covers all the Megalithic sites of Vidarbha and generally set up their camps in the vicinity of the Megalithic sites.

4.6.1.1 Description of a Seasonal *Lohar* Camp

The nomadic *Lohars* camps are generally identified by temporary shelters constructed using colourful cloths or plastic sheets. They travel in bullock carts which are loaded with their basic amenities like utensils and livestock. They prefer to set up their temporary camps near perennial water sources so as to facilitate constant water supply for their livestock (Fig. 4.6.1.1.a). Their camps are set up only during the dry season as their smithy furnace is open air with a tarpaulin as the only defense against the blowing winds (Fig. 4.6.1.1.b and Fig. 4.6.1.1.c).

They still follow the ancient method of barter system of exchange. This mode of barter was prevalent from the period of colonial rule and details of exact exchange is known from the account of Russell and Hiralal (1916), where they write a village *Lohar* mends or makes iron agricultural implements in lieu of twenty pounds of grains per 15 acres of land held by each cultivators, a handful of grain at the sowing time and a sheaf at the harvest time. It also clearly states that if a *Lohar* was asked to make a new implement, s/he was always provided with charcoal and iron.

The colonial record holds great value for archaeologists because it clearly mentions that the tradition of local iron-smelting had already died out and imported iron was used. This proves there was a flourishing traditional iron-smelting craft industry in this region during the early stages of the colonial period.

The present rate of exchange follows a similar pattern. The *Lohars* sharpen and repair agricultural tools in exchange for food grains, however for making new tools they barter with livestock. For example, one hoe for two chickens, one axe and one hoe for one goat and so forth. The concept of money in exchange of goods is still not so prevalent. However when they sell goods at the nearby weekly market they do so in lieu of money, as they have to purchase scrap iron for their smithy purpose.

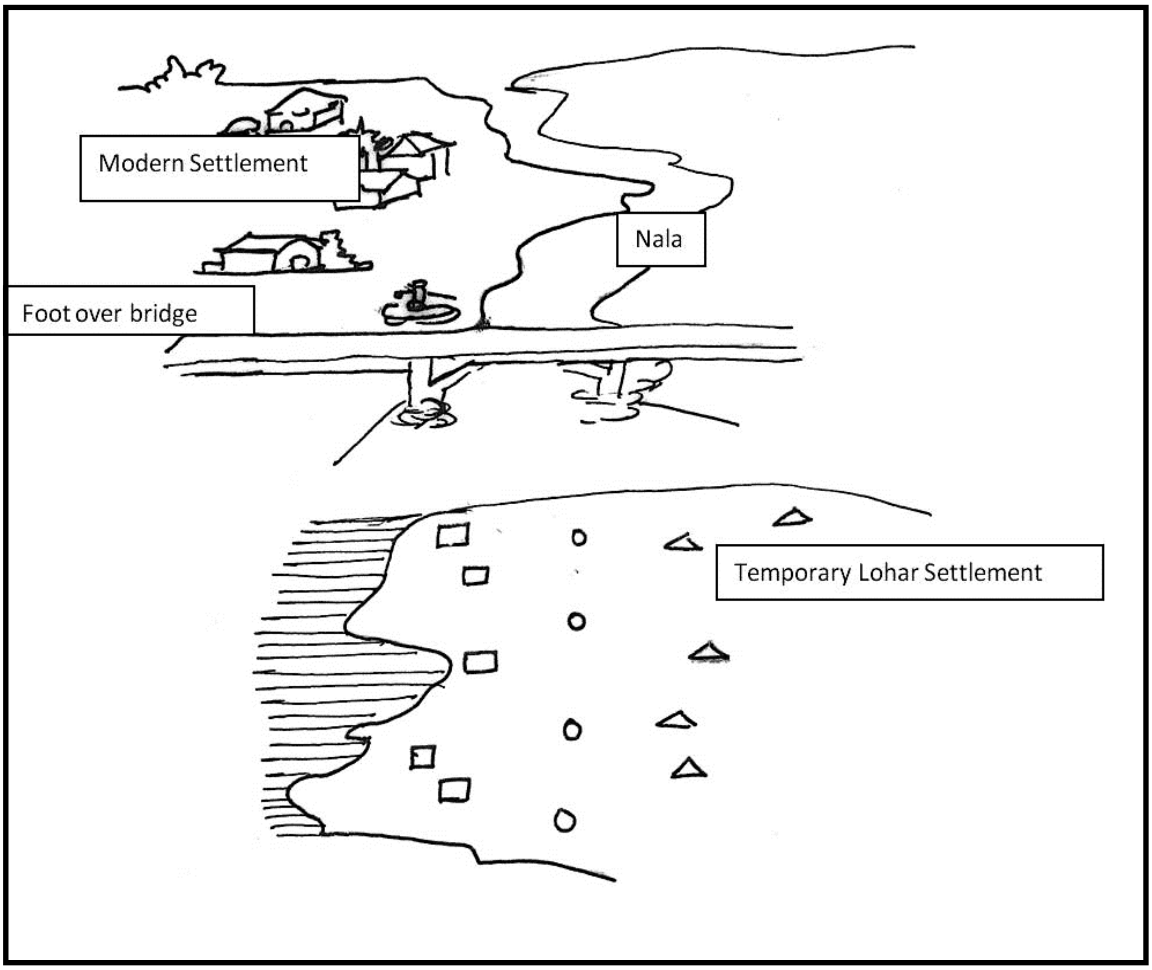


Fig.4.6.1.1.a: Layout of a Seasonal Lohar Camp

Fig.4.6.1.1.b: Temporary Settlement of Lohars

Fig.4.6.1.1.c: Nomadic *Lohar* performing Smithy Activity

4.6.1.2 Description of the Indigenous Iron–Smelting Procedure

In 1873, indigenous or 'native' furnaces for iron smelting used by the *Maharattas* in Chanda Central province were recorded by Theodore W.H. Hughes (G.S.I, 1873). Present day Chandrapur was known as Chanda during the British regime. According to the report, the native iron smelters preferred utilizing the anhydrous haematite (Table: 4.6.1.2.1) deposit because of its high ferric content (69.2%). Lohara deposit has the highest ferric content in this region and similar deposits were also available at Dewalgaon and Gunjwahi. The native furnaces recorded were found at Chikli, Gulab-bhuj, Metegaon from Muhl tehsil and also from Armori, Dewalgaon, Injhewara located in Bhrahmapuri tehsil. Only through this record of Hughes, we get an insight to the furnaces used and also the procedure they adopted.

Hughes gives a vivid description of the furnaces used by the *Maharattas.* According to him they were 6ft in height, due to the upward elongation of the front face of the furnace. There is a feed hole through which the ore is fed. The height of the actual working shaft varies from 4'6" to 5 ft. and the cross section of the furnace is a cone, its internal diameter diminishing from 1'6" up to 3 quarters of a foot at the height of 36 inches above the hearth. The hearth slopes towards the face and the bloom is taken out through the face. The tuyeres were 9" in length and the cross section reduces from one opening to the end. The larger opening had a diameter of 1.5" inches and the smaller opening a diameter of $3/4^{th}$ of an inch. The bellows were hand-worked.

The smelted iron was referred to as *kit* by the iron smelters (*Maharattas*). *Kit* was a mass of spongy iron with slag and charcoal as inclusions. The mass of spongy iron to be used and sold as malleable iron had to undergo two stages of refining.

The first stage of refining was done by the smelters themselves. They reheated it in a furnace, and then forged it. During the forging process the maximum amount of slag is removed and in this process the spongy mass of iron is consolidated into a compact bloom. This process reduces the spongy mass of iron weighing 14 seers to 10 seers, as 4 seers of impurities are removed during forging. This entire process of reduction consumes around 20 seers of charcoal. After the first stage of refining the bloom (*chul*) is cut into portions and sold to the iron smiths (*Lohars*).

The second stage of refining was done at the *Lohar's* workshop. Here the bloom was further forged and its weight was further reduced to 1/3rd or even half. The refined bloom was then forged into a variety of household and agricultural implements. The ore used by the native smelters had a similar composition to the Early Iron age Megalithic iron tools. However we have no record of the indigenous smithy techniques or the method of procurement of raw material.

Table 4.6.1.2.1: Chemical Composition of Anhydrous Haematite of Lohara Deposit (Analysed by Mr David Forbes) (Hughes, 1873)

Element	Amount (%)
Iron (Fe)	69.2
Oxygen (O)	29.4
Manganese sesquioxide (Mn_2O_3)	0.1
Silica (Si)	0.8
Alumina (Al)	0.4
Lime (CaO)	0.05
Magnesia (Mg)	Trace
Sulphur (S)	0.01
Phosphorous (P)	0.005

4.6.1.3 An Account of the Settled Lohar Community

While undertaking a survey around the Megalithic site of Vidarbha two settled *Lohars* were located. One belonged to the category of '*Suddha Lohara'* (pure-ironsmith) and the other was a '*Lohara Nakkala'* (duplicate iron-smith). The workshop of '*Lohara Nakkala'* has been numbered as (UBL 1). UBL stands for the megalithic site (Ubali :*21°16' 32.43"N 78° 51' 30.61"E Elevation: 356 m above sea level*) and present day village in which these *Lohars* are settled and the Nomadic Lohar's seasonal camp was also located here.

The first workshop (UBL-1) was of Sriram Mahote. He was a Lohar by profession and not by caste. He had learnt the craft from his father-in law who was a *Lohar* by caste. After the period of apprenticeship, he had set up his own workshop in Ubali village. Here we can notice a spatial change, the art of iron-smithery was learnt in Ghorad (Kalmeshwar Taluk) and he being the carrier of the knowledge shifted from Ghorad to Ubali. The tools made by him are mainly agricultural implements like knife, axe, chisel, sickle (*darati),* hoe *(sabbal),* long peg without the dog head (*eyyat)* and trowel (*pavsi*.) Labour specialization is evident as he is a full time blacksmith and both the man and his wife took turns at the anvil while forging. Russell (1916) has reported women used to help by blowing the bellows and held onto the hot air bellows while the main *Lohar* forged using a hammer.

The beliefs and customs practiced by them also aid us to draw some understanding of the intangible elements present within a culture. The *Lohars* by profession do not believe in any form of idol worship, their main god is *Bhavani* and they believe she resides within the workshop itself. The *Lohars* associate Bhavani with iron smithy because of her association with weapons which were sharp enough to cut any demon into multiple pieces. Goddess Bhavani is invoked before the furnace fire is lit.

The second workshop (UBL-2) is that of Tulsiram Sitaramji Mojankar, he is from the category of '*Suddha Lohara'* (pure ironsmith). He was the most sought after blacksmith in the entire village. He is a *Lohar* by caste and iron-smithery has been practiced and perfected by the family over many years. The Mojankar family also manufactures tools as per the need of the village inhabitants. The most comm.on agriculture implements made by him are sickle (*darati*), spade, hoe and axe, as the livelihood of the rural Vidarbha is dependent on agriculture and cash crop like orange. Demand for specific tools vary from season to season, digging tools are more in demand during the summ.ers as well-digging is a comm.on activity in this arid dry region and agricultural tools are in demand during the winter and monsoon season. However it is important to note that the number of new tools made every year is much less than that of the mending of old tools.

Labour specialization is visible and the tradition of iron-smithy is handed down from one generation to another. The present main Lohar, Tulsiram Sitaramji Mojankar had started learning the art of iron smithy at the age of 8. According to him, an apprentice is initiated to the art by first teaching how to distinguish between dry coal and damp coal as this is the most important raw material. Then he is taught how to light the furnace without making too much of smoke because smoke spoils the quality of the iron. An apprentice is introduced to the real art of iron- smithy only after the age of 18. Then he is taught to differentiate between the types of iron (*polat*, *loha* and *lokhand*) used for various types of tools and their degree of strength. Based on their training and years of experience, the products made by them vary in quality. The 'duplicate *Lohar*' was known in the settlement for his fragile tools, according to the cultivators, the axe that was made and sharpened by him, broke from the working end after striking one single blow with it. This proves the forging technique was incorrect, and the quenching time was not appropriate as it had made the metal brittle. Whereas the Mojankar *Lohars* are well-known for their long-lasting implements, and residents of villages in the vicinity of Ubali, namely Ghorad, Mohgaon, Savli and Vathoda buy their agricultural implements from him.

A *Lohar* starts his day's work by invoking Ma Bhavani, the symbol of *Ugra* or ferocity. The anvil is personified as Goddess Bhavani, which is the primary component of the *Lohar's workshop*. *Lohars* slaughter chicken on the day of *Diwali*, *Urvadi*, *Dussera and Nagpanchami* and offer the main organs like heart and liver to Goddess Bhavani and the other parts are cooked and eaten by the family. Before the offering is made the anvil and the other iron smith's tools are worshipped by applying ochre powder and lighting camphor, incense sticks and an earthen lamp.

4.6.1.4 Description of a *Lohar's* workshop

The workshop described here is UBL-2. The workshop was located in the front yard of his house; the same space was shared by livestock like hens and goats. It was a covered area (1m 75 cm wide and 4 m in length), however the super structure was temporary in nature (Fig. 4.6.1.4.a). The furnace is constructed using brick and lime plaster and every three months a new coat is applied. The blower is a machine with a handle and has to be manually turned and it is attached to the furnace. The handle of the blower is rotated to generate oxygen. Coal is placed in the furnace and smoke is generated. Once the coal becomes red-hot the smithy process is begun. The temperature of the fire is understood by the *Lohar* based on the colour of the flame and charcoal (Fig. 4.6.1.4.b and Fig. 4.6.1.4.c) and there are no tuyeres as they create a smoky furnace. The furnace is on the left hand side of the smith and the anvil is right in front of him and the tub of water used for quenching is on the left.

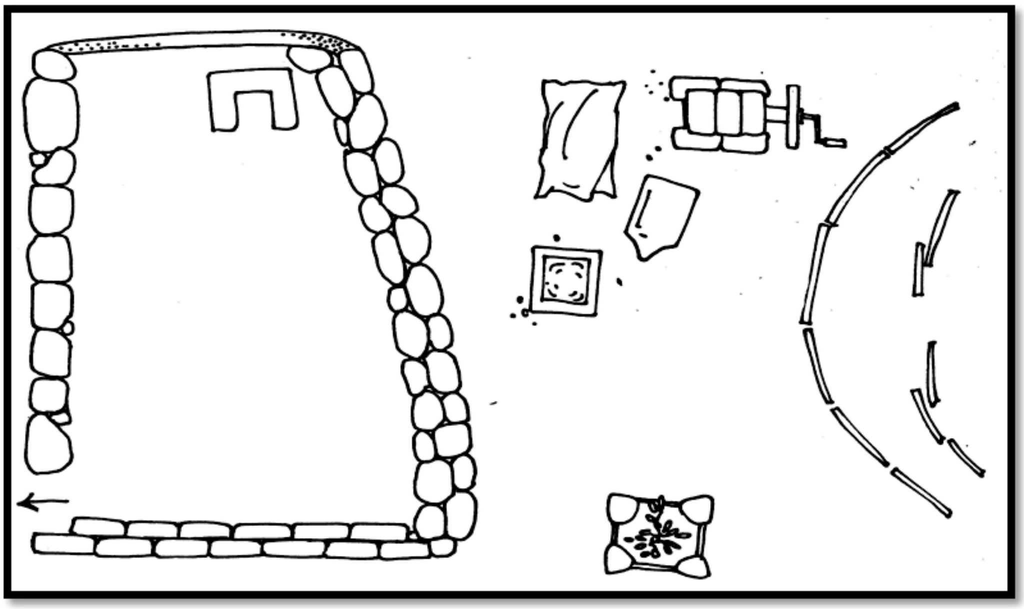


Fig.4.6.1.4.a : Line Drawing of UBL - 2

Fig. 4.6.1.4.b Blower Attached to the Brick Furnace

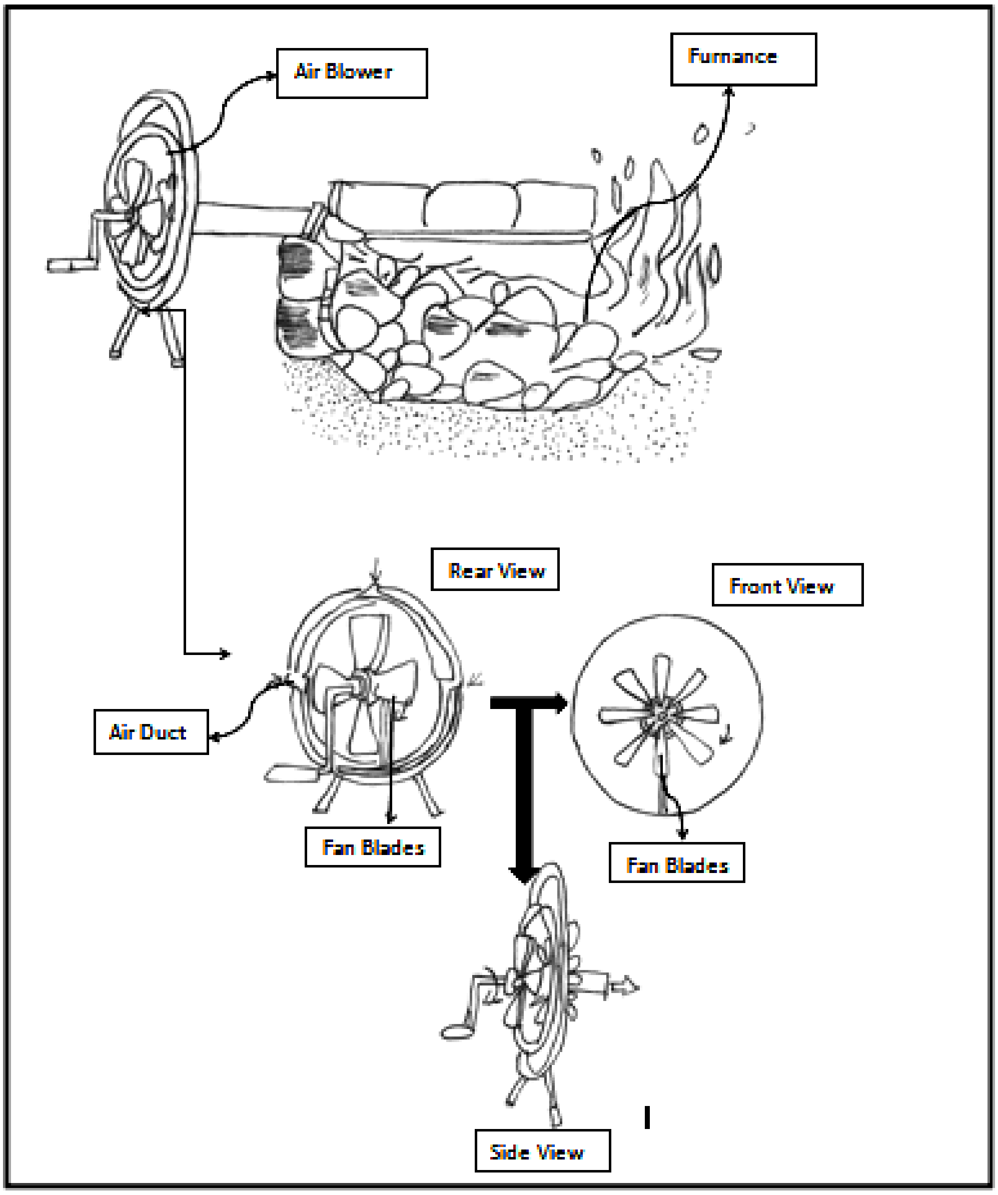


Fig.4.6.1.4.c: Details of the Furnance

The present day furnaces in the iron and steel industry have a thermocouple attached to it which helps in measuring the temperature inside the furnace; however the traditional iron-smiths entirely depend on the colour of the flame and their years of experience to understand the temperature inside the furnace.

4.6.1.5 Process for Making Specified Tools

After the furnace is lit, a Lohar waits for the generated smoke to subside and then starts with the smithy activity. This researcher wanted to record the entire process of making a tool similar to those found from the megalithic sites, so it was pre-decided that the Lohar should make an adze, an axe and a nail parer. Axe was a common implement for the Lohar however he had to be shown a sketch of the other two implements and he made them according to the sketches.

4.6.1.5.1 Adze

A solid iron rectangular strip was first selected and it was heated in the furnace till red hot (30 minutes approximately) (Fig. 4.6.1.5.1.a). While it was in red-hot condition, it was forged on the anvil (Fig. 4.6.1.5.1.b). Forging was done for shaping out the artefact. However, forging was continued only till the iron strip was in red-hot, and then it was again annealed. Annealing is heating the iron strip till it became red-hot. Alternate annealing and forging helped to shape the artefact, while forging flattens the strip. The duration of the process depends on the hardness of the '*polat*' (iron strip). During the alternating process a *kanas* (chisel) was used to cut out the shape by placing the chisel vertically on the sheet and then hammering from above (Fig. 4.6.1.5.1.c). This process was repeated 9 times till the exact shape could be cut. The shaped iron strip was again placed inside the furnace to attain red-hot condition (Fig. 4.6.1.5.1.a), then the quenching process starts. First the broader blade was dipped in a trough filled with cold water, this hardens the surface, then the same process was repeated for the narrower blade (Fig. 4.6.1.5.1.d and 4.6.1.5.1.e). The degree of quenching is understood by the change in the colour of the red-hot surface. If the red-hot surface changes to pink, then the harness is minimal, if green then it's comparatively high but the smith always aimed for the white colour which showed that it had attained its maximum hardness. The degree of hardness cannot be quantitatively stated; it is a qualitative measure.

Fig.4.6.1.5.1.a: Rectangular Strip Being Heated to Red Hot Condition

Fig.4.6.1.5.1.b: Cut Shape Being Forged in Red-Hot

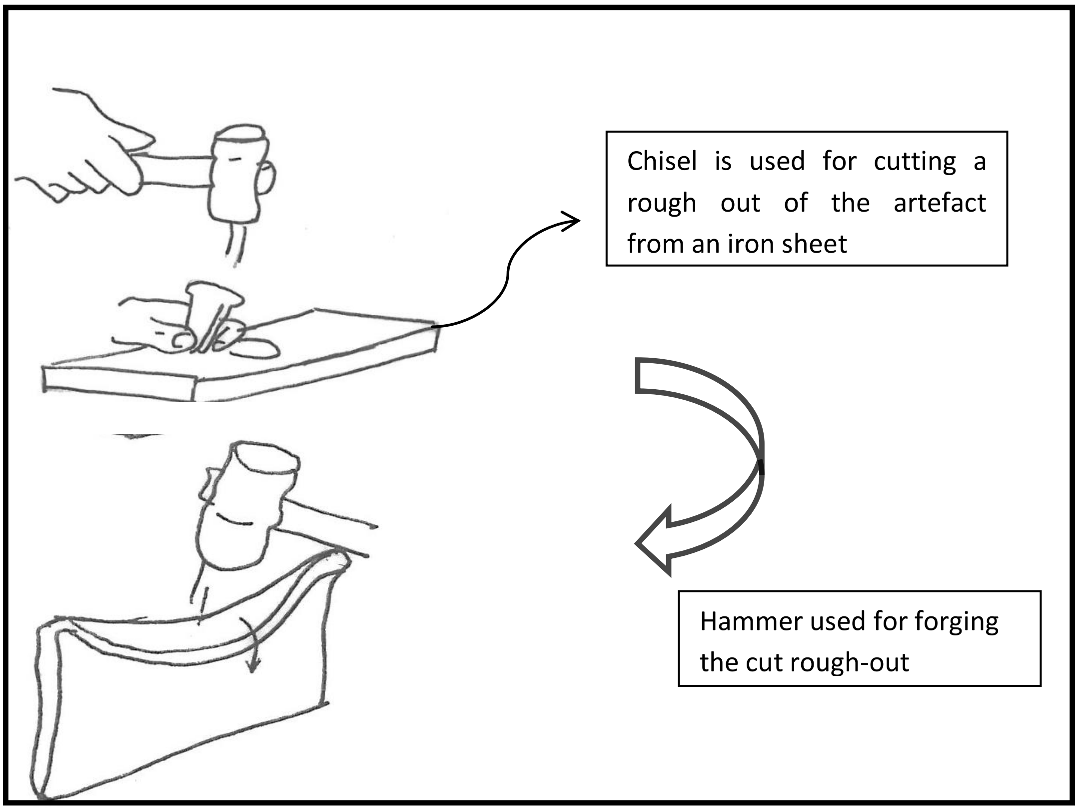


Fig.4.6.1.5.1.c: Forged Sheet is Cut Using a Chisel

Fig.4.6.1.5.1.d: Quenching of the Broader Blade

Fig.4.6.1.5.1.e: Quenching of the Narrower Blade

4.6.1.5.2 Nail Parer

The iron strip selected for this object was square in cross section and 160.7 mm. in length. It was first heated till red-hot and then forged to reduce the cross-section, that is, to make it thinner. The forging was alternated with the annealing process. This made the strip malleable enough to be shaped. While forging, the sides were folded to make it thin, so that two ends of the strip converged to form a triangle. Then the shape of a triangular blade is achieved after hammering on one end of the cylindrical shaped strip and then by using a chisel the sides were cut to make a triangle. The next step was to form the corrugations, this was done by first heating it to red-hot then the strip was fixed between two tongs and then they were twisted to give it a spiral look (Fig. 4.6.1.5.2.a). Then the other end of the tool which was supposed to be pointed was re-heated and forged to make a point. After the tool was finally shaped, both the ends were again brought to red-hot condition and were hardened by quenching.

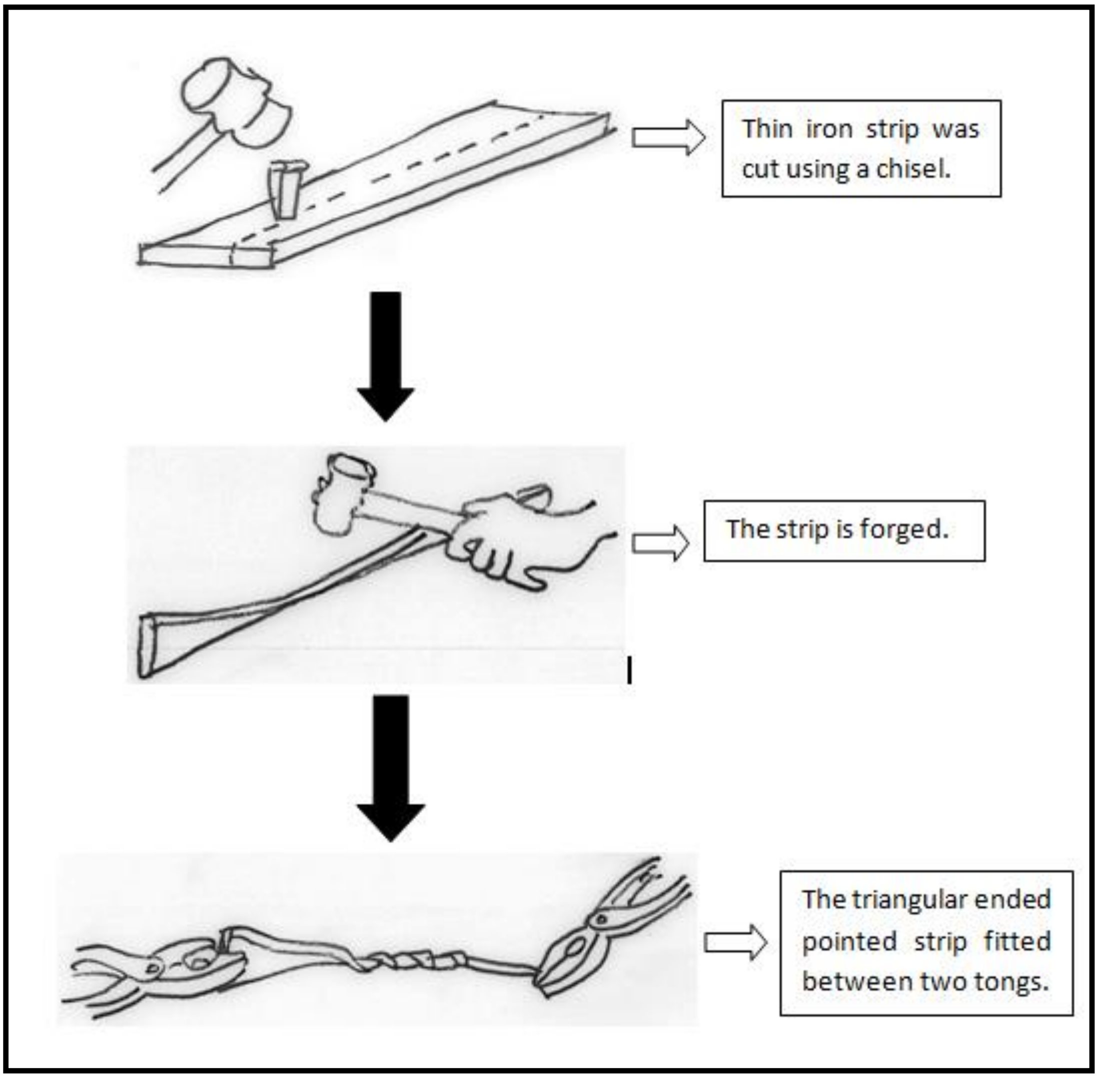


Fig. 4.6.1.5.2.a: Stages of Nail Parer Production

4.6.1.5.3 Axe

In the archaeological context, axes are always associated with fasteners; however this axe was made without fasteners. It had a rectangular cutting edge with an elliptical butt for hafting. However modern day farmers prefer using axes with a hollow end for hafting. To make this implement, first a long thick polat strip was chosen with a rough elliptical end (Fig. 4.6.1.5.3.a).

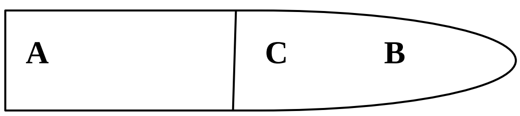


Fig.4.6.1.5.3.a: A polat strip showing the segmentation.

After a suitable *polat* strip was chosen, then only segment B of the strip was heated till red-hot condition (Fig. 4.6.1.5.3.b). First segment A and B was detached from point C using alternately forging and annealing. This entire process of detaching took approximately sixty minutes. First segment B was brought to red-hot condition at around 750 °c which took twenty minutes (Fig. 4.6.1.5.3.c), then it was brought to the anvil for forging and it was forged only until it was red-hot (approximately five minutes). The *Lohar* hamm.ered only at section C (Fig. 4.6.1.5.3.d) so that it could be detached. This entire process was repeated twice. Due to constant forging segment B took a curved form which was subsequently detached by constant hamm.ering and by using a chisel for cutting through the metal (Fig. 4.6.1.5.3.e).

After segment B was detached then it was again annealed to red-hot condition (Fig. 4.6.1.5.3.f) so that it could be hammered and the curved form could be restored to a flat section (Fig. 4.6.1.5.3.g). Then the hafting end which already had a rough semi-circular shape was made into a proper semi-circular edge by folding the sides using the forging method (Fig. 4.6.1.5.3.h and Fig. 4.6.1.5.3.i). Then the cutting edge C was sharpened. For this only section C was annealed to re-hot stage (Fig. 4.6.1.5.3.j) and further forged to make a thinner section (Fig. 4.6.1.5.3.k). Due to constant hamm.ering during the process of detachment, it was already thin but to make a sharp edge, annealing of only section C was required, which was followed by quenching in cold water to harden the surface (Fig. 4.6.1.5.3.l).

This ethnographic survey provides us with an insight to the traditional ironsmith's method of working and the beliefs and customs of the Lohar community.

Fig.4.6.1.5.3.b: Annealing in Process

Fig.4.6.1.5.3.c: Segment B in Red-Hot Condition

Fig.4.6.1.5.3.d: Forging of Segment B in Red-Hot Condition

Fig.4.6.1.5.3.e: Detachment of Segment B Using a Chisel

Fig.4.6.1.5.3.f: Detached Segment B Annealed for Changing the Curved Form

Fig.4.6.1.5.3.g: Detached Segment B Forged in Red-Hot Condition

Fig.4.6.1.5.3.h: Annealing of Butt End for the Folding Process

Fig.4.6.1.5.3.i: Butt End in Red-Hot Condition

Fig.4.6.1.5.3.j: Annealing of Section C

Fig.4.6.1.5.3.k: Sharpening of Cutting Edge (C)

Fig.4.6.1.5.3.l: Quenching of Section C

4.6.2 Living Megalithic Traditions

In recent times the Gond community continues the tradition of erecting a memorial stone on the mortal remains of the deceased. Other than the *Gonds* , the *Gadabas* and *Bondos* of Orissa, *Korkus* of Mahadeo and *Kurumbas* of Nilgiri and *Lepchas* in North-Eastern India also practice megalithism (Geetali, 1999 and 2001-02). The habitat of the Gondi tribe is spread across the sates of Madhya Pradesh (Bastar District, Mandala, Chhindwara and Betul), Chattisgarh, Maharashtra (Chandrapur and Gadchiroli district) , Andhra Pradesh (Adilabad region) and Orissa (in and around Kalahandi region) (Mehta,1984). Gunther Dietz Sontheimer while describing the stone pillars *(uras-kal)* erected by the **Madiya** clan of Bastar district, remarked these as erected to lay at rest the '*shadowy soul'* and as a symbol of power of the deceased ('*erecting of the power of the deceased*'). The concept of ancestry worship is well reflected in the animistic religion of the Tamia Gonds. Fears of ghosts are present amongst the Gonds. The worship of the dead evolved from the concept of ghosts, and ghost souls are comm.only known as *Hanal* (Grigson, 1949:223) According to Gondi folklore, death was a magical phenomenon, female spirits were regarded as the malevolent and male spirits were identified as benevolent.

This present study deals with the Gond community of Gadchiroli district of Maharashtra.

4.6.2.1. Lifestyle and Occupation of the Gond community

Records show that the *Bada Maria Gonds* and the *Chota Maria Gonds* preferred the forested tracts for habitation. They survived on hunted animal meat and plant products. However their hunting activity suffered a setback due to the government rules of forest conservation. Present *Bada Madia Gond* community still engage in hunting; but they hunt only small prey such as wild rats, hare, squirrels and so forth. The use of bow and arrow and sling balls for trapping prey is a common practice (Fig.Nos: 4.6.2.1.a and 4.6.2.1.b).

The *Chota Maria Gonds* have migrated to the plains and have adopted a settled lifestyle. Their main occupation encompasses making toddy and mahua (country liquor). Agaria tribe which was a later inclusion in the Gondi community, engaged in iron-smelting (Elwin,1942), presently *Chota Maria Gonds* also engage in iron smithy and agriculture.

According to the British chroniclers, *Gonds* introduced iron metallurgy into the Indian sub-continent because *Bura-Deo* the main god of the Gondi community, was worshipped in the form of iron balls strung from an iron chain, later *Gonds* from the Mandla region started worshipping *Bura-Deo* in the form of an iron doll. Before *Bura-Deo* came into existence, they had an entire pantheon of tribal gods (*Deo*) such as *Pharsi Pen* (Battle-Axe God), *Palo* and so forth, each god and goddesses were made of iron and shaped in the form of a spear-head.

Each *Chota Maria Gond* settlement has one iron smith; however the settlement (*Duba Guda*) surveyed had only one iron smith belonging to the *Wadde* clan. The present one is *Dolu Wadde* who is 40 years old and he became an apprentice to his father at the age of 8. He mainly recycles the old agricultural implements and mends them. The implements manufactured are dependent on the demands of the farmers and they are restricted for use within the settlement and never sold at the market. The concept of surplus production still doesn't exist in this society. This *Wadde Lohar* exchanges his tool through barter system, for example one axe for a sack of rice or to mend one sickle he is given one fowl.

According to *Dolu Wadde,* iron was earlier smelted on the *pada* locally; however with the advent of industrialization this practice was discontinued. Therefore with time iron smelting has become a lost art, and the knowledge of traditional smithy is gradually disappearing. Nowadays iron strips are acquired from the nearest town i.e. Hemalkasa and the smith forges variety of artefacts from it by hot working. His products are mainly dependant on the needs and requirement of the society, therefore his products range from knife, sickle, hoe, axe, etc. However the same metal is used over and over again to forge different products as acquiring of new iron sheets every time is expensive. The provenance study if attempted would be redundant if attempted here it is because the smelted iron has travelled over a span of space and is not locally produced.

4.6.2.2. Religion Practiced by the Gondi Community

Nothing is known about the religious beliefs of the *Bada Maria Gonds* of Gadchiroli region. Earlier the entire tribe was segregated into clans and sub-clans. The number of clans is identified based on the region they occupy. The *Abujhmaria Gonds* of Bastar district, Madhya Pradesh are divided into various sub-clans on the basis of their revered animal like *Nagvans* or Cobra race, *Behainsa* or Buffalo race, *Netam* or *Dog* race and so forth (Chowdhary, 2000).

The *Gonds* residing in the Chandrapur and Gadchiroli region were also divided into clans based on the number of gods worshipped by them, for example, seven god group worshipped the porcupine, six god group worshipped the tiger and so forth (Russell, 1916). Primarily *Gonds* believed in animism, therefore animal worship played an important role in the religious pursuits.

With the advancing of belief system these revered animals became totem symbols of the clans. These totem symbols were used as designs for menhirs. Earlier menhirs were designed with the totem symbol of a cock, ram dog (Fig.No: 4.6.2.2.a) and so forth.

Bura Deo, the tribal god mentioned in the British chronicle, is no more worshipped by the *Bada Maria Gond* or *Chota Maria Gond* of Gadchiroli district. The main god worshipped by them is *Lingoba,* who is regarded as the protector of the Gonds. The *Lingoba* idol (L: 1 m x W: 250 cm) is a wooden sculpture (2 dimensional) and has anthropomorphic features (Fig. 4.6.2.2.b). However due to the absence of any permanent structure for shielding the idol from natural elements, the wooden sculpture has undergone physical changes and will eventually get destroyed. Gondi people offer terracotta objects such as horse and elephant figurines (Fig. 4.6.2.2.c) and the offerings are similar to those offered to a village god named *Dharmaraj* in West Bengal region.

4.6.2.3: Funeral rites of the Bada Maria Gonds

The aim of recording a *Bada Maria Gond* settlement was a difficult task as their zone of occupation falls within the Naxalite area. The *Bada Maria Gonds* restrict their occupational area to the heavily forested uplands. The account on the *Bada Madia Gonds* has been based on an interview of a *Bada Maria Gond* woman (Fig. 4.6.2.3.a) encountered while exploring the *Chota Maria Gond* settlements in the plains.

It was necessary to plot the death rituals of both the clans as they project variations within the same spatio-temporal phase. On the death of a person residing in the settlement, the entire village gathers to prepare the corpse for the last rites. The corpse is kept within the house of the deceased for one day. On the next day, the corpse is given a bath and is placed on a wooden bier which the clansmen carry to the burial ground which is always on the east of the settlement. While other clansmen follow the funeral procession beating drums and singing songs, few amongst them select the area for digging the pit. After digging the pit, a coffin is constructed by placing stone slabs. Inside this stone lined coffin, the body is placed in an east-west orientation and then it is covered by another stone slab (Fig. 4.6.2.3.b and 4.6.2.3.c). Then the pit is filled with soil.

The mortuary practice performed by the *Bada Gonds* is entirely based on an interview of a Gondi woman Zuri Pungati. The *Bada Maria Gond* mortuary architecture is similar to the dolmenoid cist, a typical southern Megalithic style found at the site of Brahmagiri (Wheeler,1948) Although, the *Bada Maria Gonds* are docile, they do not prefer to share much information about their practices and livelihood. During the colonial period, the Gonds used to inter, along with the corpse, few pieces of cloth, the deceased person’s own clothes and some money. According to their belief the money would pay for the passage fare of the spirit to the other world. Sometimes along with the above-mentioned objects an iron ring was placed on the chest (Russell, 1916), but we have nothing mentioned about the belief, probably it was related to *Bura Deo* the tribal god mentioned in the earlier colonial records. We do not have any information available as to whether the corpses are still buried along with burial offerings.

Fig.4.6.2.1.a: Bada Maria Gond with his Bow and Sling Ball

Fig.4.6.2.1.b: Sling Balls used for Trapping Prey

Fig.4.6.2.2.a: Menhirs Ornate with Bull, Bird and Cock Motif.

Fig.4.6.2.2.b: Idol of *Lingoba* Worshipped at Duba Guda Village

Fig.4.6.2.2.c: Terracotta Figurine Offerings Along with a Neolithic Celt

Fig.4.6.2.3.a: *Bada Maria Gond* Woman (Zuri Pungati) Coming Back from a Hunt

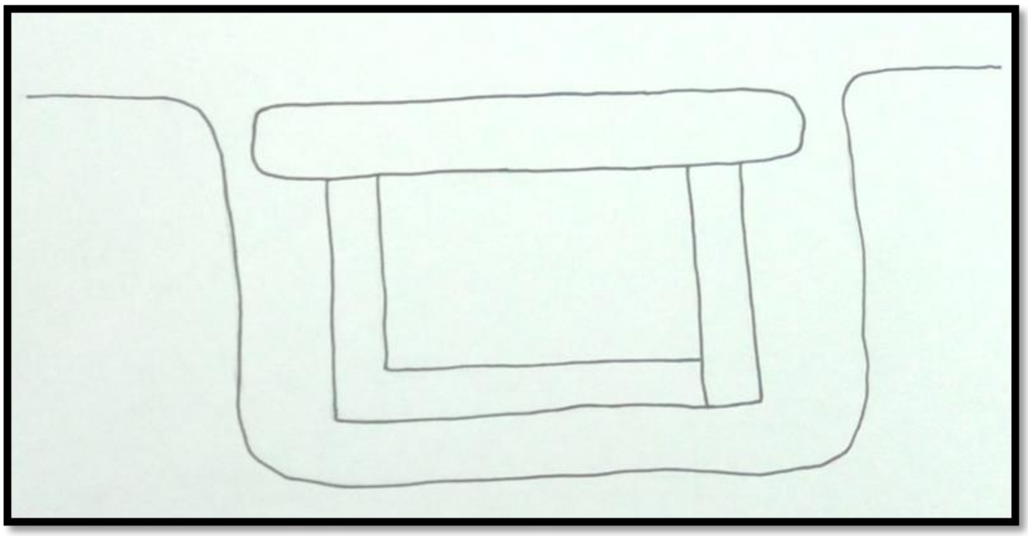


Fig.4.6.2.3.b: Side View of a Bada Maria Gond Burial

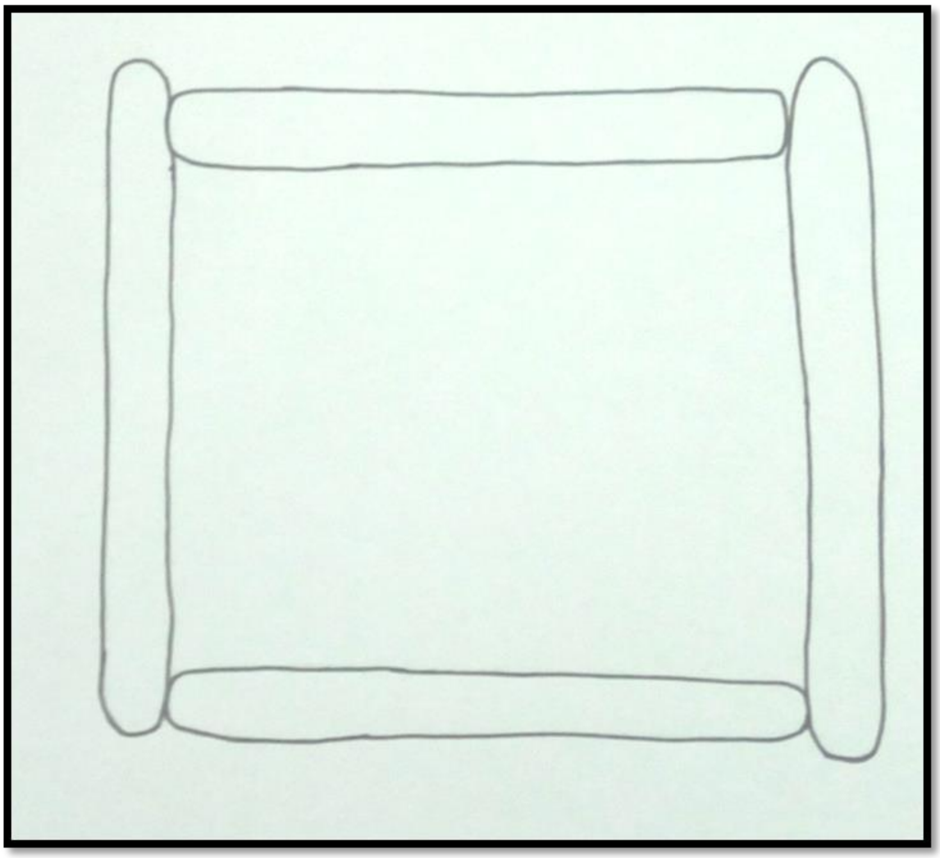


Fig.4.6.2.3.c: Top View of a Bada Maria Gond Burial

4.6.2.4: A Detailed Study of the Chota Maria Gonds of Bhamragad District.

Three *Gondi* settlements were surveyed and diverse people were interviewed with the help of an interpreter. An interpreter was required as the language spoken by the locals is *Gondi* which is a distinct dialect. It is interesting to note that although they reside in Maharashtra, they speak Telugu and not Marathi. The knowledge of Telugu can be assigned to its close proximity to Telangana. All the *Chota Maria Gond* settlements are located near the border of Maharashtra and Telangana. Gadchiroli is separated from Telangana by river *Pranhita.* The interpreter was a Gondi boy, named *Ramadu Dolu Wadde* who spoke all the three languages. He was from the *Chota Maria Gond* clan residing in *Duba Guda* village of *Bhamragadh* District. *Duba Guda* village has a population of about 100 individuals belonging to the *Wadde* clan. This settlement has a continuing tradition of constructing megaliths in memory of the deceased soul. The megaliths (erected long stone slab) are constructed near the settlement, but always outside the boundary of the settlement (Fig. 4.6.2.4.a). The memorials of this settlement were erected 19 ft away from the human habitation.

Fig.4.6.2.4.a: ***Chota Maria Gond*** **Woman in Front of the Menhirs and Dolmens Erected Beside the Boundary of the Duba Guda Village**

4.6.2.4.1 Social and Cultural Customs of the *Chota Maria Gonds*

Two settlements (Bejurpalli and Duba Guda) located in Bhamragadh district were selected for the present study. Earlier researches were done on the other Gondi settlements (Hemalkasa, Lahiri, Gollaguda and Zareguda) located within the same district (Geetali, 1999). The *Chota Maria Gonds* due to their exogamous nature are not allowed to marry within their own sect, however over the years the basic division of sect has lapsed as the multiple numbers of gods have all been clubbed into one god known as *Lingoba*. Free mixing amongst both the genders has been prevalent from the colonial period and the marker of this free mixing is the construction of *Gotalghar* (Russell, 1916). *Gotalghars* is a large house constructed specifically made for unmarried boys and girls to retire for the night and it was made on the fringe of the settlement (Fig. 4.6.2.4.1.a).

Fig.4.6.2.4.1.a: ***Gotalghar*** **at the Gondi settlement of Bejurpalli, Gadchiroli**

Gonds believe in marriage with mutual consent and female gender has an upper hand in choosing their partners. A girl could decline or agree to a marriage proposal and the boy's family had to pay money to the girl's family if they wanted the girl's hand in marriage (Bride's Price). Sometimes the boy had to work as a slave for the girl's family to win the girl's hand in marriage. The marriage customs are different from those followed in Hindu culture. The bride goes to the bridegroom's village and amongst the Maria Gonds the ceremony is simple, the couple and other young members engage in singing and dancing and country liquor occupies an important position in all ceremonies be it mourning or merriment. However due to acculturation few Hindu customs have been adopted like rubbing of turmeric powder on the bodies of the couple. Customs vary amongst clans, the Maria Gonds of Chandrapur and Gadchiroli; make the newly wedded couple stay in a separate house for an entire night. The other people make merry outside the house and dirty the entire area. The couple was supposed to wake up early the next day and clean up the entire area, whereas Gonds in Mandla district believe the bridegroom or somebody from his family has to pass a stone through an iron ring strung on a bead necklace before the wedding can be solemnized. That same bead necklace remains as marker of her marital status. The *Gondi Lohar* community had an important role to play in the wedding ceremony as the iron ring which was the hurdle that a bridegroom had to cross, had to be always made by a *Gondi Lohar* and in lieu of the iron ring he was given a buffalo, cow or calf (Russell, 1916). However, recently the act of passing a stone through the iron ring has been discontinued.

4.6.2.4.2: Concept of Death and Death Rituals Amongst the *Chota Maria Gonds*

Death plays an important role in the life of the *Chota Maria Gonds*. According to the colonial record, the concept of *churel* was prevalent amongst them. If a woman died during child birth, she would be transformed into a *churel*, so to avoid attacks on innocent people, she was cut open and her corpse was buried in the jungle outside the settlement.

If a child died then it was interred within an earthen pot and buried inside a refuse pit within the boundary of the house, according to their belief, the corpse would be converted into a *bir* (spirit) by the witches if they get hold of the body (Russell, 1916). Child burial within terracotta sarcophagus has been found from the Early Iron Age, Megalithic context of Vidarbha at the site of Dhamna Linga.

Deaths under normal circumstances were treated in a different way, according to the colonial record earlier the corpse were buried within the house they lived as they believed in reincarnation, similar burial practice has been observed within the Chalcolithic context of Daimabad (Sali, 1986).However burial within the house was stopped around 1905, they had a designated burial ground outside the settlement, after the corpse was carried to the burial ground, the corpse was buried and everything used by the deceased, along with the earthen pots were left alongside the grave.

They maintained a mourning period of three days after which a cow or a bullock was sacrificed and the blood was offered to the deceased. After the sacrificial ceremony the mourners consumed the meat of the animal and drank liquor. Although no annual ceremony for ancestor worship is mentioned in the colonial records, after a short period of time a memorial stone was erected in the memory of the adult deceased. First the roughly cut rectangular stone was erected then turmeric and oil was applied and a chicken or pig was sacrificed. Then a stone bench was also erected in front of the menhir as they believe it was where the dead man would sit. It is clearly mentioned the size of the stone varied according to the importance of the deceased. If the death was caused under unnatural circumstance like epidemic or accident then a long heap of stones with or without a flat topped post in the middle was constructed along the roadside (Russell, 1916).

The *Chota Maria Gonds* till date perform the ritual of erecting memorial stones for the deceased, however there are visible changes. The burial ground is still located on the outskirts of the settlement and the corpse is carried on a wooden bier to the burial ground, but no witch hunting or searching for the witch is conducted as acculturation have led to the disappearance of many customs and rituals. A 2 m deep pit is dug, along with the body a silver bangle which was worn by the deceased is also interred with it. It is an established belief that the silver would be utilized towards the expenses for transportation to the next life. Earlier an iron ring was placed on the chest.

After the corpse is interred into a pit, rice is thrown on the corpse and then covered with boulders and soil. Four wooden carvings are placed at four ends of grave which can be interpreted as anthropomorphs. These anthropomorphic figures in relation to dolmens are found from the megalithic contexts of southern India (Rajan, 1998). Near the burial, offerings such as country liquor (*toddy*), boiled rice offered on palm leaves, slippers, clothes and aluminum vessels used by the deceased. Along with the other offerings a pipe used for making *toddy* is also kept for use by the deceased. Eventually a charpoy is kept on the grave resting on the four anthropomorphs (Fig. 4.6.2.4.2.a).

Fig.4.6.2.4.2.a: *Chota Maria Gond* Fresh Primary Burial with a Charpoy Laid On Top and the Anthropomorphic Figures alongside the Burial

4.6.2.4.3: The Tradition of Erecting Memorial Stones

The *Gondi* community in Duba Guda village is inhabited by two sects (*Wadde* and *Telami*) of the *Chota Maria* clan. They have separate areas for memorial erection and they are near to the settlement but always outside the boundary of the settlement. The memorial ground of the *wadde* clan was 19 ft away from the settlement (Fig. 4.6.2.4.3.a**)**.

Fig.4.6.2.4.3.a: Memorials of the *Wadde* Clan along the Boundary of the *Duba Guda* Village

Over the years, the same general burial locations are reused for subsequent burials of members of the same family. The menhirs are erected on the 13th day (*Teravi*) after the death; however, the time period between the death and the erection of the memorial depends on the financial and social status of the deceased. After the erection of the memorial, multiple fowls are sacrificed and the blood is offered to the deceased. After the sacrifice the meat of the birds is cooked and a feast is arranged for the clan members. Both, the number of fowls sacrificed and the feast depends on the financial status of the person's family. Different architectural style is adopted for the two genders. They erect a menhir if it is a male (Fig. 4.6.2.4.3.b) and in case of a female they construct a dolmen (Fig. 4.6.2.4.3.c). The megaliths of an entire family are constructed alongside each other. The earlier mentioned concept of erecting a stone bench in front of the menhir for the spirit to sit has acquired a new meaning as they denote the memorial erected for the female gender.

We have evidence of wooden *uraskals* (menhirs but made of wood) from the Gondi settlements at *Hemalkasa* and *Lahiri*, however the settlements surveyed in this work brought to light menhirs erected using sand stone rectangular blocks, and recently some have been constructed using cement. Usage of cement as raw material reflects change in human behavior regarding usage of natural material (Fig. 4.6.2.4.3.d). Not only the construction material but also the motifs have undergone a major transformation over the years. However, with the onset of the second half of the twentieth century, the decorative motifs have also changed from totems to anything that the deceased person fancied. (Fig. 4.6.2.4.3.d and Fig. 4.6.2.4.3.e) shows menhirs with aeroplane motifs, while interacting with the village members it was understood that the deceased members fancied airplanes. As mentioned earlier, the *Maria Gond* tribe was originally divided into clans based on the number of gods worshipped by them, and each clan had a specific animal as totem and earlier these totems were used as designs for menhirs, however the effect of acculturation can be seen through the usage of aeroplanes as designs. However the erection of dolmens has remained the same, where a sand stone boulder is laid horizontally on three sand stone boulders kept perpendicularly. The cement menhirs are rare occurrences.

The *Chota Maria Gond* inhabitants till date collect stones and boulders from the nearby stream for constructing the primary burial tumulus (heap of stones) which has similar features to the cairn burials found during the Megalithic Culture. The chronology of the menhirs erected can be also understood from its varying architectural style

Fig.4.6.2.4.3.b: Menhirs from two Clusters at Duba Guda Village

Fig.4.6.2.4.3.c: Dolmens Erected in Memory of the Female Gond at *Duba Guda*

Fig.4.6.2.4.3.d: Recently Erected Menhir Using Cement

Fig.4.6.2.4.3.e: Menhir with an Aeroplane Model on Top

4.6.2.4.4: Burial Practice of the *Pradhan Gond* tribe

Duba Guda village is also inhabited by the *Pradhan* clan of the Gondi tribe, but they have a separate settlement. Their primary burial practice is similar to the *Bada Maria Gond*, they construct a dolmenoid cist by digging a pit and then erecting the stone slabs in a rectangular form and the corpse is laid inside the rectangular box and then the entire circular pit is filled using soil, pebble and cobbles and small boulders. The filling forms tumulus on the surface and the exterior look is similar to a *Chota Maria Gond* primary burial (Fig. 4.6.2.4.4.a).

Fig.4.6.2.4.4.a: Different Types of Primary Burial by the *Pradhan Gonds*

It is important to note that that the *Pradhan* clan was a later inclusion into the Gondi tribe and hold the important position of a religious-medicinal man. The present *pradhan* head is Ramchandra Alam who has a three-roomed house with a thatched roof and an enclosed courtyard which is also used as an animal pen. The enclosed courtyard has a designated area where the family menhirs and dolmens are erected (Fig. 4.6.2.4.4.b). The erection of memorials within the living quarters has a parallel in the archaeological context. A human burial was encountered within a multiple-roomed house in Daimabad during the regional Chalcolithic phase (Jorwe Culture).

Fig.4.6.2.4.4.b: Menhirs and Dolmens Erected within the Family Courtyard

4.6.2.4.5: Belief of Life after Death and Concept of Ancestry Worship

Gonds have no idea about heaven or hell, because they do not believe in any particular place where the spirits abode. According to their belief, after the soul leaves the human body they just linger around the place where they originally lived and acted as guardian spirits and have considerable influence on the well being of the inhabitants (Russell, 1916). Therefore if the settlement was inflicted by any calamity or disease they would sacrifice a fowl or cow and propitiate the ancestors. Ancestry worship plays an important role in the well being of the Gonds.

One of the major Gond festivals is *Chaitrai*, which celebrates the season of new fruits and cereals. On the day of the festival the new grains such as urad and other pulses are first offered to the village god and the ancestors and then a goat is sacrificed. After the offering then the new crops can be consumed by the villagers. Similar sacrifices are performed on the day of *Nawakhai* (festival of new rice). Till date a newly married couple before entering the house visits the comm.unal memorial erection area and seeks blessing for their new life and ancestor worship is also practiced on occasions of *Dusshera* and *Diwali* (Fig. 4.6.2.4.5.a).

Fig.4.6.2.4.5.a: Adornment of a Dolmen Near the Communal Ancestral Worship Area