EXCAVATIONS AT SUABAREI

EXPLORATIONS ON THE RIGHT BANK OF THE RIVER DAYA

(2014-2016)

FAA=>J GQI =N L=PJ =EG

ARCHAEOLOGICAL SURVEY OF INDIA
EXCAVATION BRANCH-IV, BHUBANESWAR
This work is dedicated to my young band of promising archaeologists and other devoted staff of the Excavation Branch-IV, Bhubaneswar
The Pre-historic investigations in Odisha are not a recent origin. It has started its journey since the time of V. Ball, when he discovered Palaeolithic tools from different localities in Odisha namely Kaliapata (near Anugul); Harichandrapur (near Talcher); District Dhenkanal and Bursapalli (Kudabaga) in Sambalpur district in the year 1873.

Since then, the Pre-historic researches carried out in Odisha either in a small scale and confined to a handful of limited excavations only. The excavations of Palaeolithic site at Kuliana in Mayurbhanj district in 1940s has the distinction of being the first ever Palaeolithic site to be excavated in the entire sub-continent followed by Kuchai, the first Neolithic site excavated in 1961-62 by B.K. Thapar. However, during the last two decades of last century and first decade of the present century, the pace of archaeological researches has been much accelerated. Accordingly, Sankerjang site was excavated by P. Yule and B.K. Rath in 1985-86, the first carbon dated Chalcolithic site in Odisha. But, the major breakthrough was achieved when B.K. Sinha excavated Golabai Sasan the Neolithic and Chalcolithic site in 1990-92. This excavation at site ushered in an era of further studies in Pre-historic archaeology in Odisha. Subsequently, a number of important sites have been excavated by various institutions viz., Khameswarpali, Hikudi by Sambalpur University; Baanga-Harirajpur by Utkal University; Talapada by Deccan College; Talagarh (Delthuda) by Revenshaw University, etc. But, Suabarei on the right bank of the river Daya is perhaps the eye opener and sequel to excavation at Golabai Sasan in respect of Chalcolithic and Neolithic researches in the state which has given a new dimension to Odishan prehistory to boost further research in future.

The major excavations at Suabarei, tehsil Pipili, District Puri has proved to be very important and thrown a new welcome light on the Neolithic and Chalcolithic cultures in the Mahanadi delta. The excavation has resulted in showing the Neolithic and Chalcolithic cultures with a clear cut hiatus in between. Again, significantly the site was re-occupied by Chalcolithic folk a phenomenon
was not discernible at Golabai Sasan excavations as its cultural material are mixed up and super-imposed with each other in the absence of the hiatus and created much confusion. Now this lacuna has at large been filled.

In fact, it was indeed imperative to place the finds discovered by the excavation for the public, for whatever their worth to enable them, particularly the scholars in the field of archaeology to study them and to evaluate and assess the conclusion drawn in the light of growing volume of archaeological evidences found elsewhere in Odisha. In the fitness of the things, the present desideratum is the outcome of the concerted effort of my band of devoted staff bearing with me the entire manuscript was meticulously prepared under my guidance. This illustrated report contains a thorough and detailed documentation of the cutting, stratigraphy, section, site and environment, ceramics and antiquities has been dichotomised into following ten chapters. The chapter-I deal with the introductory part of the work. In chapter-II, a brief description of the site and its environs has been given. The chapters-III and IV enumerate the cuttings and stratigraphy and the cultural sequence of the excavations respectively. A sketch of structural remains found from the excavations has been provided. In chapter-VI, an humble attempt has been made to document and analyse on the pottery of the excavated site. The chapter-VII elucidates the excavated antiquities. The subsistence pattern of the site has been vividly described in chapter-VIII. A brief summary of the results of the excavations has been given in chapter-IX. The last but the least importance is the description of the antiquarian remains retrieved from the explorations forms the chapter-X of the report.

Apart these, I am fortunate enough to incorporate the carbon dating analysis of Neolithic and Chalcolithic horizons of the site from Beta Analysis, California, USA and B.S.I.P., Lucknow as Appendix I and II respectively. Secondly, as per my invitation experts from P.G.R.I., Deccan College, Pune have inspected the site during excavation for study and collected various floral and faunal samples including the geomorphological data. Accordingly, their valued reports have been embodied as Appendix III, IV and V respectively. Besides, XRD and FT-IR analysis of the ceramics has been done at Physics Deptt. Lab, Utkal University has also been incorporated as Appendix VI. The Excavation
Branch-IV, Bhubaneswar perhaps for the first time in Odisha has incorporated the scientific analyses in an excavation report. I am hopeful, if published, this report would be a boon to the student, scholars and researchers not only in the field of prehistory of India in general but also of Odisha in particular.

Jeeban Kumar Patnaik  
Director of the Excavations and Explorations
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I would like to convey my sincere gratitude to Dr. S.B. Ota, Jt. Director General, Archaeological Survey of India, Dr. D.N. Dimri (Director Antiquities), Dr. Syed Jamal Hasan, Director Explorations and Excavations, (Retd.), Dr. P.K. Mishra, Regional Director, Eastern Region, (Retd.), Shri T.J. Alone, Shri A.K. Patel, Directors (Monuments) and Shri J. Sharma, Jt. Director General, ASI,
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Jeeban Kumar Patnaik
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CHAPTER-I

INTRODUCTION
INTRODUCTION

(A) Survey of previous works

It was V. Ball who brought Odisha into the pre-historic map of India when he reported his discovery of four Palaeolithic artifacts from Angul, Talcher, Dhenkanal and Bursapalli. Stirling has already emphasized the archaeological potentiality of the state from the historical point of view by referring to the antiquities around religious centres of hara-kshetra, purusottama-kshetra and the inscription at Udayagiri. About half a century after the discovery of Ball, Acharya and Banerjee drew attention to the potentiality of pre-historic archaeology of Odisha. The archaeological investigations of Acharya, Worman in the district of Mayurbhanj during 1930s resulted in the discovery of the well-known Palaeolithic site of Kuliana, which was subsequently excavated by N.K. Bose and Dharani Sen in 1940’s. This was the earliest excavation of a Palaeolithic site in the sub-continent where the Palaeolithic assemblage was studied for the first time in the context of geo-stratigraphic background. G.C. Mahapatra survey of Central and Northern Odisha showed the wider distribution of the Palaeolithic culture in Odisha beyond the district of Mayurbhanj. K.C. Tripathy has reported the discovery of Stone Age sites in South-western Odisha. During 1980’s the intensive field works of a host of scholars like S.C. Nanda, B.P. Singh, S.B. Ota, P. Mohanty, Rath and Bhattacharya have established beyond doubt the wide distribution of the rich Palaeolithic legacy of Odisha.

The excavation of the Neolithic site of Kuchai near Baripada in Mayurbhanj district during 1960s established the stratigraphic evidence of Neolithic phase associated with a coarse grit tempered ware and wild rice right above a
microlithic horizon. The works of R.N. Dash\textsuperscript{12} and P.K. Behera\textsuperscript{13} have further attested to the Neolithic cultural legacy of the state.

The sporadic discovery of copper artifacts un-associated with any type of stone implements and ceramics from places like Danoria in Dhenkanal, Khiching, Kshetra, Baghada, Bhograpir, Bamanghati and Panchpir in Mayurbhanj district, Sisupalgarh in Khordha district, Dasapalla in Nayagarh district and Sitabhinji and Thakurani in Keonjhar district has created doubts in the minds of some scholars like Mohapatra as to whether Odisha had experienced any proto-historic phase at all. However, the excavation of Sankerjang\textsuperscript{14} in 1985-86 in Angul district proved the existence of a copper-bronze age in Odisha. The site being predominantly a Neolithic one with the association of copper and bronze tools and bereft of potteries and other Chalcolithic cultural traits is considered to be burial site of the late Chalcolithic phase because of their association with large quantities of human skeletal remains. Scholars also try to establish a link between the Neolithic and Chalcolithic cultures of Jami (in Southern India) with that of the Chalcolithic stages of Pandu Rajar Dhibi in West Bengal. In the fitness of this, a brief account of the excavation at Sankerjang is given below.

The archaeological site at Sankerjang lying between $20^\circ52'$ North latitude and $84^\circ59'$ East longitude is situated at a distance of 13km from the district headquarters of Angul. The main group of mounds lies roughly 300m south-east of the peak of the Jaminia hill and north of a usually dry stream called Pandiani which is a tributary of Brahmani. The site is situated on the eastern fringe of the Athmallik hills and on a lateritic shelf at an altitude of some 200m MSL. The main group of mounds extend over an area of about 500x500m and is intersected by a cart track which also crosses the Pandiani. Three mounds were excavated, each of which, showed three strata atop the natural soil. The upper most stratum was composed of a detrical deflated gravel, followed below by another culturally sterile layer consisting of a packing of small quartzite sterile layer consisting of a packing of small quartzite chips and clay. The third and the final layer consisted of a reddish clayey soil which

yielded Neolithic axes, adzes, chisels, whetstones cum-corn-crushers, shouldered celts, ring-stones, flakes and worked out stone pieces. The copper objects recovered from this layer include bangles, chisel, celts, awl and copper pod, with evidences of working edge. Among other associated objects were a large quantities of human bones and beads of shell and steatite. The entire assemblage is bereft of potteries. The importance of Sankerjang lies not only in its Chalcolithic character but also having yielded the first Radiocarbon date for Odishan archaeological site i.e., 2590+BP (KN3755) (cal.795BCE) The teeth recovered from the excavation provide evidence for the existence of at least five children and four adults. From this small sample, it is inferred that they consumed food rich in soft carbohydrate, perhaps rice, grain or peas.

Scholars like P. Yule and R.N. Dash have argued differently regarding the use of bar celts. Yule argued that bar celts from Sankerjang were the earliest musical instruments in India and that they were similar to those in Vietnam. On the other hand, Dash pointed out that these tools of Sankerjang bear thrashing marks of grain and hence might have been used in pounding or corn-crunching or as mallets or even as nut-crackers.

Another metal age site reported recently was Kuan near Kanjipani in Keonjhar district. Artifacts were collected both from the surface and from the trial trenches dug up to 30cm which include large quantities of stone tools, potsherds, terracotta pieces, beads and actual ornaments. The stone tools comprised axes, adzes, ring stones, chisels, side scraper, blade and waste flakes made of altered basalt. Potsherds are too fragmentary, handmade, red in colour, grit tempered, coarse textured and not well-fired. Nine bangles and two rings constitute the metal objects. The bangles are all decorated with more or less similar scratched designs. The metal objects seem to be of bronze. According to Ray the overall culture of the site may be called Chalcolithic because of the association of stone tools with metal objects only.

Though, the doubts about the existence of Chalcolithic culture in Odisha has already been dispelled the picture with the available information but the picture still remains hazy due to the lack of evidences relating to subsistence economy.

15 Ibid.
settlement pattern and clear stratigraphic context as a culture between the Neolithic phase and the early Iron age. In this context, evidences retrieved from the excavations at Golabai Sasan\textsuperscript{17} in Khordha district goes a long way in resolving these issues and in establishing the Chalcolithic culture of Odisha in its proper stratigraphic context dating back to the second half of the second millennium BCE. The site of Golabai Sasan is situated on the left bank of the river Malaguni at a distance of 24km from the district headquarters of Khordha. The site was excavated during 1990-92 by the Excavation Branch-IV, Bhubaneswar of ASI. The excavator has worked out three distinct cultural phases on the basis of the cultural materials retrieved from the excavations of the mound measuring 200x200m approximately with a height of about 11m from the river bed. The cultural phases are-Pd-I- Neolithic, Pd-II- Chalcolithic and Pd-III- Early Iron Age. The Neolithic period is represented by only one specimen of bone tool and potsherds of both wheel made and handmade varieties. Material evidences of Chalcolithic period consist of antiquities in bone, stone, microliths, terracotta, copper and faience. Potteries of this period are generally wheel made and well slipped or burnished. The potteries are represented by very fine deluxe variety of wares. A radio carbon sample from the excavation has given the date of 4100±100BP or c. 2100±100BCE (PRL) to the Chalcolithic phase. The Period-III (Early Iron Age) is characterized by the use of iron featured by one iron celt and three pieces of iron. The other antiquities recovered from this period are bone tools, terracotta, stone and copper objects.

The excavations at Khameswaripali\textsuperscript{18} on the left bank of the river Mahanadi in Subarnapur district presents a more clear picture of a Chalcolithic culture. The excavation has yielded large quantities of potteries of wheel made, handmade, cord and reed impressed ware, thick sturdy red ware with varieties of decoration on the handles, simple red and black ware, burnished red and black wares along with burnished white painted black-and-red ware of the typical Chalcolithic type as found from Lothal, Rangapur, Pandu Rajar Dhibi, Chirand, Senuwar and Prakash. Such white painted black-and-red ware sherds have also been found from Nehena on the bank of river Sundar in Nuapada district in Odisha. The potteries are found in association with Neolithic celts bone tools and fragmentary


evidence of copper. Both the excavations at Golabai Sasan and Khameswaripali have given a new dimension to the study of proto-historic archaeology in Odisha so far as the Chalcolithic culture is concerned.

In the year 2013-14 the P.G. Department of Anthropology, Utkal University in collaboration with Deccan College, Pune under the direction of K.K. Basa has excavated the Chalcolithic mound of Baanga (Harirajpur) near Jatni in Khordha district. The excavation unearthed a single Chalcolithic culture. It also yielded a large number of typical black-and-red ware with grey ware, chocolate ware having similarity with the pottery of Golabai Sasan and Suabarei. The remarkable find of the season was two skeletons from the mound. A partially excavated large circular hut was also traced on plan only from the Chalcolithic horizon.

In 2014-15 a small scale excavation at Talapada by R.K. Mohanty of Deccan College, Pune brought to light another similar Chalcolithic settlement. The site is situated on the right bank of the river Malaguni in the midst of the paddy field, not far from Golabai Sasan (only 1.5km away from Golabai Sasan site). From the contour of the mound it appears to be a fortified settlement having perfect square fortification walls. The excavation has yielded a plenty of pottery and tools. The potteries are more or less akin to those of Golabai Sasan.

The excavation of yet another large mound called Talagarh or Deltihuda located on the right bank of river Mahanadi in the Athgarh tehsil of Cuttack district has also yielded evidences of Chalcolithic settlement.

Apart these, pre-historic explorations have been carried out by several institutions including the Bhubaneswar Circle of the Survey. The Bhubaneswar Circle had taken up problem oriented exploration in the middle stream of Brahmani river in the districts of Angul and Dhenkanal during 1999-2001 and again in 2006-07. The explorations have resulted in the discovery of large number of Chalcolithic sites.

So the explorations and excavations proved to be quite rewarding and put forward Odishan Chalcolithic culture in a firm footing.

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29 Personal communication with K.K. Basa.
30 Personal communication with R.K. Mohanty.
31 Personal communication with S.K. Acharya.
(B) Problems and objectives of the work

As discussed above, the doubt about the existence of a Chalcolithic phase in Odisha to some extent was cleared by the evidences retrieved from the evidences found at the sites like Sankerjang and Kuanra. However, the excavations conducted at Golabai Sasan in Khordha district in the coastal plains and the excavations at Khameswaripali in Subarnapur district in the middle Mahanadi valley successfully established the Chalcolithic culture in Odisha in its proper stratigraphic context and figured a place in pan-Indian perspective. So far as the coastal plain of Odisha is concerned, the distribution pattern of the Chalcolithic phase has not yet been established. The excavations at Golabai Sasan have yielded evidences continuously from the Neolithic period to the Iron Age. But it has not yielded any separate horizon for the Neolithic and the Chalcolithic phase. Only the excavation of Kuchai (1961) near Baripada in Mayurbhanj district by B.K. Thapar of ASI has established the stratigraphic evidence of Neolithic phase in Odisha associated with a coarse grit tempered ware and wild rice right above a microlithic horizon. The riddle about the existence of a separate horizon of Chalcolithic and Neolithic still goes on. Except a single specimen of bone tool along with wheel made and handmade potteries, the Neolithic phase at Golabai Sasan has not yielded any stone implements. Further, the mingling and superimposition of Neolithic elements with Chalcolithic materials create confusion and it becomes difficult to segregate the Neolithic as a separate cultural horizon. In the light of the above, significantly the excavations at Suabarei were conducted with the following aims and objectives in mind:

1. to know the cultural sequence of the site and to re-confirm the materials of the preliminary scrapping done on the mound by this office during last year i.e., 2013-14,
2. to correlate the material evidences of other excavated Chalcolithic sites of Odisha,
3. to know the distribution pattern of the Chalcolithic settlements along the Daya river bank and
4. to establish whether the Neolithic and Chalcolithic as a separate cultural horizon or not.

Keeping in view the aims and objectives mentioned above the excavations at the archaeological mound Suabarei were carried out under the direction of Jeeban Kumar
Patnaik, Superintending Archaeologist (I/C), assisted by Dibishada Brajasundar Garnayak, Deputy Superintending Archaeologist, Sanjay Panda, Ashis Ranjan Sahoo, Umakanta Bhoi, Assistant Archaeologists, Suvendu Kumar Khuntia, Surveyor, Bibhuti Bhusan Badamali, Draftsman, Rabindra Nath Sahoo, Photographer, Surath Kumar Bhoi, Store Keeper, Harekrushna Behera, Driver-cum-Mechanic, Bansidhar Behera, Kangali Barik, Chaitanya Behera, Subash Chandra Das, MTS, and the cooperation of the local villagers. The two seasons archaeological spade work has resulted in throwing new light on the Neolithic and Chalcolithic settlement in the coastal Odisha. The details of the results of the excavations are given in the ensuing pages of the report.
CHAPTER-II
THE SITE AND ITS ENVIRONS
THE SITE AND ITS ENVIRONS

Suabarei archaeological site is located in Lat. 20° 09’ 14” N; Long. 85° 48’ 33” E having 11.5m MSL is presently known for its historic antiquities from Neolithic to late Historical period through Chalcolithic period. In this context, the geographical and environmental set up in which the site situated is quite significant for early men’s settlement in the coastal region. The site is sandwiched in between the river Daya and rivulet Gangua on its right and left banks respectively in Poporanga panchayat of Pipili tehsil in Puri district at a distance of 24km from Bhubaneswar, the capital city of Odisha and about 40km North-west of Puri district headquarters and can be approached by road through NH-203 from Bhubaneswar towards Puri with a detour of 4km from Daisipatna (Jaisipatna) Chhak before Pipili (Map 1).

Map 1 : Location of the archaeological site
Legends associated with the site

Locally the site is known as Suabarei *huda* and believes to be the village of Kama-Brahmans in the past and another belief is that the site is the abode of evil spirit for which no one dare to visit the site in mid-day time or in night. Besides, according to local tradition, the nomenclature of the archaeological mound is derived from the mound of parrots (*Sua* in *Odia* means parrot and *Barei* in *Odia* means mound).

![Pl.1 A and B: Views of nesting place of Balisua](image)
In fact, the matter is well substantiated with that possibility. Because this mound is the nesting place for a type of tiny parrots locally known as Balisua (sand parrot) (Pl. 1 A and B). Recently, in 2015 the neem tree in the north-eastern corner of the mound was shortlisted as Daru Brahma for chaturdhamurti (Sri Jagannath, Balabhadra, Subhadra, Sudarsana) as a result, it became a sacred place for the locality.

Whatever be the legend associated with the site, it is clear from the spade work of archaeologists that the site is having rich archaeological potentiality and was occupied from Neolithic times to the late Historical period stretching over more than three thousand years to two thousand five hundred years.

**Geomorphology and soil types**

The geomorphology of the area where the archaeological site located comes under the southern Mahanadi delta. The geology of the area is dominated by the Tertiary and Pleistocene sediments of alluvial origin under a deltaic environment. The newer sediments mostly belong to the Mio-pliocene period created under lacustrine and lagoon conditions. The flood plain landscape has been formed out of the deposition of the alluvial sediments of the river Daya and rivulet Gangua (Map 2).

The landscape of the region can be divided into two major physiographic divisions i.e., deltaic fluvial plains in the eastern and the western parts of the fluvial plains which are occupied by the laterite outcrops in the form of uplands formed out of the weathering of the crystalline rocks of the hills and spurs of the Eastern Ghats.

The rocks available around the site are of Archaean formations comprising khondalite in west and north-east directions, charnockites and granite gneisses in west and south-west directions.

There are mainly three types of soils noticed in the region i.e., Alfisols, Aridsols and Entisols and the surrounding soil of the archaeological site is of Alfisols (the deltaic alluvial soils), these soils are generally deficient in P₂O₅ and N₂. The K₂O are fairly adequate, and pH varies between 6.5 and 7.3 (The soil pH value of the Suabarei archaeological mound varies from 6-8) and has been observed that these soils support paddy crops. This observation is true as corroborated with the continuing present agricultural practices. The excavation also revealed plant remains of domesticated varieties of rice, kulthi, green gram, black gram, lentil suggesting the prevalence of the same type of agricultural practices in the pre-historic (Chalcolithic)
times. Thus, the fertile track attracted the pre-historic man for dwelling and settling in this landscape from time to time.

**Hydrology**

So far as the rivers and drainage system is concerned, Suabarei is surrounded by the river Daya on the east and the rivulet Gangua on the west. The landscape along with the river Daya is flat and alluvial while further inland-west, there are
long ranges of rugged hills. The river Daya, in fact, is the dividing line between the alluvial plains and the inland lateritic hilly tract of the region\(^1\).

The Daya river, a distributary of Kuakhai, a sub-system of the Kathajodi branch of the Mahanadi river (Map 3 and Fig.1) runs due south for 12km and then makes a sharp turn westward for 7km and after that continues its course southward for the rest of its length emptying itself into the north-eastern corner of the Chilika lake about 60km from its off take. Two small rivers enter the Daya; the Gangua or Gandhavati just above the village of Kanti and the Malaguni or Mandakini river 2 or 3km below Kanas. Though, these two small rivers add a large volume of water to the Daya during the rain but the dominance of alluvial sediments of the deltaic environment is more due to the presence of high ground water table.

Map 3 : Mahanadi Delta System, After S.N. Tripathy \(et.al\).

\(^1\) N. Senapati, Orissa District Gazetteers; Puri, Govt. Press Cuttack, 1977, p.7.
Fig. 1: Satellite imagery showing the archaeological mound and the river channels
Present ground water resource

The average depth of ground water table below ground level of Puri and Khordha districts in 2011 is given below:

Table-1 : Average depth of ground water table of Puri and Khordha districts

<table>
<thead>
<tr>
<th></th>
<th>Puri</th>
<th>Khordha</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum 1.96m to maximum 8.70m in pre-monsoon</td>
<td>Minimum 2.57m to maximum 13.65m in pre-monsoon</td>
</tr>
<tr>
<td></td>
<td>Minimum 0.91m to maximum 7.78m in post-monsoon time</td>
<td>Minimum 0.68m to maximum 10.87m in post-monsoon time</td>
</tr>
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</table>

The average depth of ground water around (within 100m) the Suabarei archaeological site which is located in the border area of both the mentioned districts is about 5m in the pre-monsoon time in the western and southern sides and about 2 to 3m in the eastern side of the mound.

Present agricultural practices

The site under discussion is bounded by paddy fields in a rural set up on the alluvial plain. The region is thickly populated because of high soil fertility and well-known for bumper production of kharif rice (biali) and rabi crops of paddy, gram, pulses, groundnut, oilseeds, vegetables and potato etc. Paddy is the principal crop of the area followed by gram and pulses. Agriculture is the main stay of livelihood of the locals.

Besides, crop as a source of livelihood, fishing also played a vital role among few communities of the area. During rainy season, from Chilika lake varieties of fish, prawns, crabs and tortoise migrate to upstream of river Daya and its tributaries including Gangua in a large scale.

Thus, the subsistence economy of the people basically agriculture oriented supplemented by fishing. Rice is the principal diet allied with kulthi, green gram and black gram, etc.

Present climate

The area enjoys a humid tropical climate with hot summer, cool and dry winter. The maximum temperature is 42ºC and minimum temperature is 16ºC. The annual range of temperature is low. April to June is the hottest months when the maximum temperature of the day increases to nearly 43ºC. The sea breeze in the late

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1 Ministry of Environment, Forest and Climate change, Government of India.
afternoon brings a cooling effect and the nights remain windy and comfortable with occasional deviations. The winter is cool and the months of December and January are the coolest months in a year when the lowest temperature drops down up to 15°C to 16°C. The mean humidity is relatively high in the area both in the morning and the afternoon hours. The morning humidity varies from 71% to 87% and the afternoon humidity varies from 63% to 86%.

The south-west monsoon is the principal source of rainfall in the area under discussion receives a mean annual rainfall of 145cm and 85% is confined to the months of June to October. The rainfall very often accompanies with the passage of the tropical storms and depressions. The pre-monsoon months are often associated with the thunder storms and lightning. The area is vulnerable to the cyclones of the pre and post-monsoon period which bring devastation to the standing crops like betel vines, coconut and other plantations.

Depressions and cyclonic storms originating in the Bay of Bengal in the pre-monsoon and post-monsoon months pass through the region under discussion. The storms, particularly those in the pre and post-monsoon months cause heavy rain and high winds. Thunder and storm sometimes violently occurs in the pre-monsoon months of April and May.

**Present vegetation (floral)**

The ground flora is composed of a large number of herbaceous members like *Ceressa cretica, Indigofera aspalathoides, synosternon bassiforme, Stylosanthes fruticosa, Trianthema triquetra, Helietropium curassavicum* where there is no considerable accumulation of soil. *Solanum trilobatum* is fairly common among bushes and scrub jungles. Near present human habitation the trees found are shrubberies include the *Chakunda (Cassia spp), Pokasungha (Eupatorium), Cashew (Anacardium occidentale), Neem (Azadirachata India), Sajna (Moringa pterigosperma), Red cotton tree (Bambax ceiba), Tentuli (Tamarindus indica), Pipal (Ficus religiosa), Banyan (Ficus benghalensis), Tolo (Borassus flabellifer), Paldhua (Erythrine indica)* and the Date palm (*Phoenix sylvestris*), *Mehandi (Leptadenia retisculata), Gila (Caesalpini sepiaria), Amari (Ipomea bilibia), Siju (Euphorbia nivalia), Bel (Aegle marmelos), Bamboo (Bambusa arudinacea), Jamu (Eugenia gambolana) and other plant remains like Arakha, Kanta-Palasa, Bena, Kainchi kakudi, Bannalata, Maricha, Dudukoli, Lajakuli, Bannasebati, Chhanakuradi,
Bilualanja, Pani-Siuli, Jhum-jhumka, Ghodamardanga, Peeta Saga, Chatuaghasa, Kolathia, Baruna, Agara, Shola, Sahada, Motisagar, Gai-chirudi, Bana nalita, Airi, Kalama saga, Pataphuli, banana, green banana, Muga (green gram), Biri (black gram), Kulthi, Dhana (Oryza sativa), Badam (Ground nut), Patas, Patapuli, Hinjala, berry (barakoli), Gaba, Ashadhua, Bana-sorisa (wild mustard), Muchukani, Dandolia, Khira-samundra Apamarga, Karanja, Garuda, Sahada, Tulas, Aparajita, Duba, Suan (wild rice or stork).

**Present animal species**


**Archaeological environment**

The site is picturesquely situated on the alluvial deposit surrounded by famous historic antiquities and religious sanctuaries right from the early times to the present day. The important historical landmarks are a set of Asokan Edicts and rock-cut Asokan elephant dating back to the 3rd century BCE in the hillock of Dhauli at a distance of about 5km; Sisupalgarh fort dating back to the 3rd-4th century BCE about 10km; the architectural and sculptural remains of medieval temples very close to the site in the north-east direction (recent finding of an inscribed sealing read as “Jagadapala” datable to 1st century BCE); early historical material remains like knobbed ware dated from 1st/2nd century BCE to 3rd century CE at Arjungada (Pls.2-3) in the close proximity of the site in its southern direction; and the Buddhist remains of Labangiri and Kurkimundia in the western side hillocks show that the area around was very rich in human settlement and material culture from the Neolithic times to the present (Map 4).
Pl. 2: Terracotta sealing

Pl. 3: Knobbed ware
Map 4: Toposheet showing location of the archaeological site


Reconstruction of Neolithic and Chalcolithic environment

The beginning of human settlement in Suabarei started from the Neolithic period dated to cal. 3800BP (Beta analysis data) is characterised by the appearance of handmade, coarse gritty red ware ceramics and ground tool. The limited evidences of artifacts and bio-facts of the period did not help much to provide any conjectural view of the environment. It has also been observed that the Neolithic material remains confined to the central part of the existing mound, approximately 6m above the present MSL within an area of about 1100sq.m having half a meter of cultural deposit (Fig.2).

Following the hiatus of average varies from 30cm to 70cm again the site was re-occupied by the Chalcolithic folk, 7m above the present MSL within an area of about 5500sq.m in the incipient phase and slowly expanded up to half a kilometre in the late Chalcolithic period dated from cal. 3165BP to c. 2800BP. But the evidences of Chalcolithic period dated to cal. 3165BP gives a noteworthy habitational scenario of the site. The good numbers of floral and faunal remains revealed from the site show that a drastic change occurred in the lifestyle or existence pattern of Suabareians in the march from incipient farming, foraging, stock-raising of both plants and animals to a full-fledged settled living coexisted with fishing and hunting within five hundred years gap. In the Chalcolithic period, the site was highly occupied and settled as evidenced from rich and high concentration of material remains along with wild and domesticated varieties of rice, kulthi, green gram, black gram, lentil; faunal remains mostly of herbivorous animals such as of sambar (Cervous unicolour), spotted deer (Axis axis), barking deer (Mountiacus muntjak), mouse deer (Iragulus meminna), black buck (Antilope cervicapra), bison (Bos gaurus), nilgai (Boselsphus tragocamelus), rabbit (Lepas nigricollis), rat (Rattlus rattus), elephant (Elephas maximus), rhino (Rhinoceros unicornis), tortoise (Kachuga tactuma), goat (Capra hircus), dog (Canis familiaris), rohu fish (Labeo rohita), bhakura fish (Catla catala), tortoise (Kachuga tactuma) of three varieties locally known as badara, kathua and lunikurma.

The above floral and faunal remains suggest a thick and green forest, extensive grassy and grazing land, meandering rivers with alluvial agricultural land are existing in and around the site and had a moist deciduous forests in the western part and had a mangroves forest existed in the eastern deltaic area.
The Suabareians’ site catchment area during Chalcolithic period was approximately 5sq.km for daily subsistence (i.e., for fishing and agricultural product) and for their supportive livelihood they were exploited 50sq.km area as evidenced from shark teeth (exploiting zone=Bay of Bengal, 30 to 40km from the site), ochre colour nodules (exploiting zone=Udayagiri hillock within western fringe of Bhubaneswar-10 to 15km from the site). All these evidences show that during Chalcolithic period more strategic use of land and settlement systems emerged in the coastal Odisha in general and Suabarei in particular. Also long distance exchanges network prevailed during that time as evidenced from copper objects (may be procured from Chhota Nagpur plateau, Jharkhand); semiprecious stone beads like agate, carnelian, red jasper and quartz may be from the middle Mahanadi basin which is rich in minerals.
CHAPTER-III

THE CUTTINGS AND STRATIGRAPHY
THE CUTTINGS AND STRATIGRAPHY

Stratigraphy

The existing mound at Suabarei measures approximately 6300sq.m with a height of about 11.5m from the MSL and approximately at a height of 4.5m from the surrounding landscape (Pl.4A). There is a small pond on the western periphery of the mound and about 30-40% of the mound has been recently damaged badly by extracting the soil from the western slope of the mound for construction of the Daya river embankment. However, owing to the rich cultural findings during exploration in the year 2013-14, a section scrapping of the eastern bund of the pond juxtaposed to mound was carried out by Dillip Kumar Khamari, the then Superintending Archaeologist, Excavation Branch-IV, to know the stratigraphy and associated activities. The section scrapping resulted in revealing as many as four activity levels from the cultural deposit of about 3.30m divisible into 12 layers (Pl.4B).

During the field seasons 2014-15 and 2015-16 the eastern portion of the extant mound was taken up for archaeological spade work. Accordingly the index peg has been fixed at the centre of the mound where a banyan tree is situated and the whole mound has been divided into four divisions A, X, Y and Z (Figs.3-4). During the field season 2014-15 a total number of nine trenches (of 10x10m) namely, A2, XB1, XB2, XB3, YA2, ZA2, ZB2, ZC2 and ZB2 have been laid out and archaeological spade work were carried out in Qdts. 1 and 3 of A2, Qdt. 2 of XB1, Qdt.2 of XB2, Qdt.3 of XB3, Qdts.1, 2, 3 and 4 of YA2, Qdt.4 of ZA2, Qdt.2 of ZB2, Qdt.4 of ZC2, and Qdts.3 and 4 of ZD2. Similarly, during the field season 2015-16 a total number of five trenches namely, A1, A3, A5, B1 and XC3 were laid out and archaeological spade work were conducted in Qdts.2 and 3 of Trench A1, Qdt.3 of Trench A3, Qdt.3 of Trench A5, Qdt.1 of trench B1 and Qdt.1 of Trench XC3. Among the excavated trenches during 2014-15, a maximum depth of 6m and 6.2m have been excavated in Qdt.2 of Trench XB1 and Qdt.4 of Trench ZA2 respectively where the natural soil was reached showing an accumulation of 12 layers above the natural soil including a hiatus layer. In these two trenches a separate Neolithic horizon with a gap of sterile layer separating the Chalcolithic level was encountered. The Neolithic horizon is represented by a handful of coarse gritty handmade potsherds and a solitary dolerite chisel retrieved from Qdt.2 of Trench XB1. Nothing more can be surmised at present
Pl. 4 A: General view of the archaeological mound
Pl. 4 B: Section scrapping of the mound
from this horizon as there is paucity of cultural elements. Similarly, among the excavated trenches during the field season 2015-16, a maximum depth of 6.5m and 6.2m were reached in Qdt.2 of Trench A1 and Qdt.3 of Trench A3 respectively where natural soil was encountered with an accumulation of 12 and 11 layers respectively. The Chalcolithic level is represented by polished stone celts, fragments of copper, copper ring, copper fish-hook, antler, bone point, needle, charred bone pieces bearing cut marks, a pair of shark teeth, beads of terracotta, carnelian, agate, terracotta figurines, hopscotch etc. The ceramic assemblage comprises black-and-red ware, red slipped ware, chocolate slipped ware, polychrome painted ware, red ware, grey ware and black wares. The structural remains of the Chalcolithic level are represented by the circular mud huts in two phases which are traceable only on plan only. It may be mentioned here that the Neolithic horizon in the mound is confined to the central portion of the mound. However, the archaeological spade work conducted in the eastern, western and southern peripheries of the mound which did not yield any evidence of Neolithic culture below the Chalcolithic level (Pls.5-6).

For understanding the stratigraphy and socio-cultural activities of the site the trenches with the most characteristic features where natural soil was touched are described below:-

1. Section facing east

(i) Trench No. XB1, Qdt.2: This trench lies on the western part of the mound adjacent to the eastern bund of the small modern pond. Digging up to a maximum depth of 6.10m B.S revealed 12 layers above the natural soil (Pl.9). Layer (12) of the quadrant above the natural soil was found to be occupied by the Neolithic people as is revealed by the occurrence of limited number of crude variety of thin to medium handmade gritty potsherds of mostly red ware, a solitary grounded and polished chisel of dolerite along with very few charcoal pieces. No other evidence of Neolithic period was found from this layer. Above this, the layer (11) is a sterile layer of about 60cm which is light yellowish mixed with red in colour, sticky and compact in hardness devoid of any human artifacts. Just above the sterile layer, a thin flimsy layer of burning activities runs throughout the settlement; significantly, deliberate burning was done before the commencement of Chalcolithic occupation. Above the sterile layer the incipient Chalcolithic occupation starts from layer (10). The layer is ashy grey in colour, semi compact in hardness and composed mainly of ash mixed with clay.
Pl.5 : General view of the excavated trenches
Pl.6 : General view of the excavated trenches
The layer yielded a large number of potsherds of red ware, red slipped ware and black ware, a few of which are having nail tip and cord impressed designs. Layer (9) is associated with an ashy patch which has yielded potsherds of dull red ware, red ware, red slipped ware, grey ware, black ware, charred bones and a celt of dolerite. The layer is greyish in colour with red and yellowish bands/patches. The layer is compact in hardness and sticky in nature. The layer (8) has an ashy patch with two pits which yielded charred bones and potsherds of red ware, red slipped ware, black and red ware, black ware and black slipped wares. The layer Nos. (7) and (6) appear to belong to the most prosperous and mature Chalcolithic settlement. Layer (7) is yellowish in colour and semi-compact in hardness. The layer contains charred bones and potsherds of dull red ware, red ware, red slipped ware, chocolate slipped ware, black-and-red ware and black ware. A dump in the northern part of the quadrant containing ash, charcoal pieces, potsherds and charred bone were encountered. Interesting evidences of four miniature pots and ash lumps having rice husk impressions have been found from two pit activities (Pls.7-8). Above this layer structural activity in the form of a circular mud hut on plan was encountered in layer (6). The structure measures 2.60m in diameter from inner side with a wall of yellowish clay of 50cm in thickness. Although comparatively thin in thickness, the layer is reddish in colour, compact in hardness and composed of rammed pottery pieces and burnt clay nodules. Probably the pottery pieces and burnt clay nodules were rammed for giving strength to their structural activities as well as to save the same from erosion during rain and any possible capillary action.

The layer contains charred bones in association with potsherds of dull red ware, red ware, red slipped ware and chocolate slipped wares. The layer (5) is ashy grey in colour, compact in hardness and sticky in nature. It contains charred and un-charred bones and potsherds of red ware, red slipped ware, chocolate slipped ware and black ware. The layer (4) which is light grey in colour and compact in hardness has yielded a stone celt and potsherds of red ware, red slipped ware, black ware, black slipped ware, few black-and-red ware, charcoal pieces, charred animal bones and teeth. On the basis of material remains layer Nos. (5) and (4) are assignable to Chalcolithic period. The red slipped ware and chocolate slipped ware ceased to appear in layer (3) which is semi-compact in hardness and light grey in colour. It contains stone pieces, charred bones having cut marks along with potsherds of mostly red ware and grey ware. Layer (2) is found to be the last phase of the Chalcolithic period which
Pl.7: Miniature pots in a pit *in situ*

Pl.8: Rice husk impressions
SUABAREI (2014-16)
TRENCH NO. XB1, Qdt.2
(FACING EAST)

LEGEND

H umus-
Compact soil-
Semi compact soil-
Pottery-
Ash-
Virgin soil-

Fig. 5
Pl.9: Trench No. XB1, Qdt.2, section facing east
is very compact, hard and greyish to blackish in colour. It contains potsherds of mostly grey ware followed by red and black wares. Other findings of the layer include a broken muller, stone pieces and charred bones. Layer (1), which is sandy, silty, loamy and very loose in texture and appears to be mixed with very recent or modern activities. It contains laterite nodules, burnt clay and potsherds of mostly grey wares. From the excavation in this quadrant, significantly it is clear that the two separate horizons of the Neolithic and Chalcolithic periods with a gap in between the two are in existence (Fig.5).

(ii) Trench No. A1, Qdt.2: The trench is situated in the central part of the mound under the banyan tree from where starts the slope towards the east. A digging of maximum 6.5m B.S has yielded as many as 11 layers above the natural soil where the evidence of separate Neolithic and Chalcolithic horizons and structural activities were encountered. Above the natural soil the layer (11) which is semi-compact and yellowish in colour has yielded small quantity of medium to thin fabric grit tempered potsherds of red ware. This lower most layer is assignable to Neolithic occupation. Here the hiatus or the sterile layer was found in layer (10), which is dark grey in colour, semi-compact in hardness and comparatively thin in thickness. The Chalcolithic level starts with layer (9) and continued up to layer (7). The layer (9) has yielded very few pieces of red slipped wares. The layer is light yellowish mixed with grey in colour and semi-compact in hardness. Although a very few in number, the red slipped ware was found along with red ware. The layer (8) is reddish in colour and semi-compact in hardness. Comparatively more human activities in the form of potsherds, floral and faunal remains were found in layer (7), an admixture of yellow and ashy colour and semi-compact in hardness. Highest numbers of activities were found in mature Chalcolithic layer (6) which is loose in texture and greyish mixed with yellowish in colour. The layer contains charred animal bones, charcoal pieces and potsherds of red ware, red slipped ware, ill-fired dull red ware, chocolate slipped ware and few black wares. Plan of a circular mud wall was partially traced in this layer. The inner diameter of this structure measures about 3.35m (conjecturally) as only a partial segment of the circular structure is traced at the south-east corner of the quadrant. Its wall thickness is 42cm. This structure was also facing east as evident from a rectangular verandah traced in Qdt.1 of Trench B1, which is unique and first of its kind in Chalcolithic context in Eastern India. The verandah measures 2.00x1.35m.
In the western part of the circular structure an activity level having charred bones and potsherds was encountered. The important findings of this layer are two *in-situ* polychrome painted potsherds and elephant bones (Pl.10). From layer (5) to layer (4) also belong to Chalcolithic period. The semi-compact and greyish mixed with yellow coloured layer (5) contains charred bones and potsherds of red ware, red slipped ware, dull red ware, chocolate slipped ware and few black ware. A pendant made of burnt shark tooth and chert blades are important antiquities from this layer. The finding of shark tooth from this level indicates the fishing activity and the exploitation of aqua fauna by the Chalcolithic Suabareians in addition to hunting as their supplementary diet and their artistic excellence in the shape of re-use of shark tooth as pendant. Layer (4) is compact in texture and light yellowish in colour. The layer yielded ashy patches, charred bone fragments and potsherds of black-and-red ware, chocolate slipped ware, dull red ware and red slipped wares. Antiquities from this layer are grounded and polished stone celts and sling balls. The sling balls from this level suggest the change in hunting practices of avi-fauna in addition to the land animals. The layers (3) and (2) represent late Chalcolithic phase. Layer (3) is an admixture of clay, sand and silt and is semi-compact in hardness and light greyish in colour. The layer contains stone pieces, few charred bones and potsherds of dull red ware, red ware, red slipped ware, grey ware and black wares. Beads, sling balls, broken wheels of terracotta and polished stone celts are among the antiquities found from this layer. Layer (2), which is compact in hardness, greyish in colour and composed of mainly clay, contains laterite nodules, stone pieces and potsherds of red ware followed by grey and black wares. A terracotta hopscotch was found from this layer. Here also the layer (2) is the last layer of the Chalcolithic horizon. Layer (1) of very recent origin is sandy, silty, loamy and loose in texture. It contains fine sand particles, pellets, laterite nodules, cobbles and potsherds of mostly grey ware followed by red wares (Fig.6).

2. Section facing south

(i) Trench No. ZA2, Qdt.4: The trench is situated in the northern side of the existing banyan tree having sloppy towards the east. A total digging of 6.20m B.S has revealed 12 strata above the natural soil. Above the natural soil the layer (12) is light
yellowish to dark greyish in colour, compact in hardness and sticky in nature. This layer was found to be occupied by the Neolithic folk as evidenced from the occurrence of handmade, micaceous gritty potsherds of red ware. No other ingredient of Neolithic period was found from this layer. Above this layer runs the sterile layer (11) like that of Qd.2 of Trench XB1 which is compact, light grey in colour and devoid of any human activity. The incipient Chalcolithic occupation starts from layer (10). The layer is light yellow mixed with red patches in colour, compact in hardness and contains laterite nodules, charcoal pieces and less number of potsherds of red ware and red slipped ware. In the south-west corner of the quadrant some laterite nodules were found rammmed which suggests that the early Chalcolithic folk of the site prepared the ground above the sterile layer for living. Black-and-red ware started appearing along with the red and red slipped wares in layer (9), which is light yellow in colour, semi-compact in hardness and composed of clay and silt. Slightly little development was seen in the ceramics and faunal remains of layer (8) having ashy grey in colour, semi-compact in hardness and composed of clay and ash. The layer has yielded a polished stone celt and its debitage, debitage of carnelian, charcoal pieces, charred animal bones, fish bones and hopscotch. The ceramic assemblage of this layer consists of dull red ware, red ware, red slipped ware, black-and-red ware, black burnished ware and a few decorated potsherds. The layer (7) is light yellow in colour, semi-compact in hardness and composed of clay, silt and ash. The pottery collection of the layer includes red ware, red slipped ware, chocolate slipped ware, black-and-red ware and decorated potsherds. A bone point, charred bones, fragments of sand stone and laterite blocks were also found from this layer. The layer (6) is light brown in colour mixed with ash patches, semi-compact in hardness and composed of sand, clay, silt and ash. A polished stone celt, bead and antler needle are among the important findings of the layer. Besides, charred bones and charcoal pieces were also retrieved from the layer. The ceramic assemblage of the layer consists of dull red ware, red ware, red slipped ware, black-and-red ware and a few decorated potsherds. Hence, the layers (7) and (6) appear to be the prosperous and mature stage of the Chalcolithic settlement as evidenced from the cultural and structural remains of both the layers respectively.
Pl. 10: Elephant bone in situ
Pl.11 : Trench No. ZA2, Qdt.4, section facing south
The layer (5) is dark brown in colour, compact in hardness and composed of clay and silt seems to have been disturbed by a flood activity. Less number of potsherds consisting of dull red ware, red ware, red slipped ware, black ware, chocolate slipped ware and black-and-red wares were retrieved from this layer. Layer (4) having light grey in colour and loose in texture has yielded a polished stone celt and potsherds of red slipped ware, dull red ware, grey ware, black-and-red ware and potsherds having cord impressions. Besides, charcoal pieces and charred animal bone fragments were also found from this layer. The layer (3) is semi-compact, light grey in colour and an admixture of clay, silt and sand has yielded potsherds of dull red ware, red slipped ware, grey ware, black-and-red ware and potsherds with mat impressions. A shark tooth, hopscotch and charred animal bones were also retrieved from this layer. Here also the layer (2) is found to be the last phase of the Chalcolithic period which is very compact and blackish in colour. The layer contains potsherds of grey and red wares. A stone pivot was retrieved from this layer. Calcrete, laterite nodules and stone pieces were also retrieved from this layer. Layer (1) is sandy, silty, loamy and very loose in texture and whitish grey in colour appears to be mixed with recent or modern activities. It contains potsherds of mostly grey wares, fine sand particles, pellets, burnt clay, laterite nodules and cobbles (Fig. 7 and Pl. 11).

(ii) Trench No. A3, Qdt.3: The trench is situated in the southern highest point of the mound having sloppy towards the south-east. Here, the digging of more than 6m B.S has yielded nine layers above the natural soil belonging to the Chalcolithic period only. No Neolithic horizon was encountered in this trench. Above the natural soil the layer (9) is loose and ashy in colour. The layer contains charcoal and a very few numbers of red ware and red slipped ware. An activity level was traced with orange coloured patch, an oval shaped pit having yellow material and ashy black soil (see Pl. 12). It seems that some natural colour pigment for applying in polychrome ceramics probably was prepared in this area. However, no such evidence has so far been retrieved from this level. The layer (8) which is compact in hardness, sticky in nature and greyish mixed with orange red in colour did not yielded any remains. It may be a flood deposit. Layer (7) is compact, sticky and yellowish mixed with red in colour. The layer yielded a few potsherds of red ware, chocolate slipped ware and black ware. Like all the trenches mentioned earlier, in this trench also the layer (6) was found to be the prosperous and mature stage of the Chalcolithic period. The layer
is light grey in colour, loose in texture and consists of some ashy patches. The occurrence of charred animal bones (Pl.13) and fish bones suggest the exploitation of land and aqua fauna by the Chalcolithic folk. The ceramic assemblage of this layer includes red ware, red slipped ware and chocolate slipped ware.
Pl. 12: Partially exposed circular mud structure one above the other and evidence of pigment
Pl. 13: Elephant skull in situ
The south-east corner of the quadrant revealed partially segment of two circular structures one above the other (Pl.12). These structures are smaller in size. However, these two structures give a clear evidence of two structural phases. The Structural Phase-I is superimposed by a flood deposit followed by an ashy deposit over which rests the Structural Phase-II. The exposed thickness of the mud wall of Structural Phase-II measures 30cm whereas 10cm only is visible in Structural Phase-I. The ashy deposit over the flood deposits seem to have been deliberately done to overcome water capillary action from below as well as presumably to make the floor insect free by the Chalcolithic people before reinstallation of their structure over the flood deposits. Layer (5) is semi-compact in hardness, yellowish in colour and sticky in nature. In the north-western part of the quadrant an ashy patch composed of ash, charcoal, charred bones and potsherds of red slipped ware, chocolate slipped ware and dull red wares. Similarly, in layer (4) an ashy patch in the south-western part of the quadrant contained charred bones and potsherds of dull red ware, red ware, red slipped ware and few chocolate slipped wares. The layer is semi-compact in hardness and light yellowish in colour. In layer (3) which is semi-compact in hardness and brownish in colour potsherds of dull red ware followed by grey ware and a few red slipped wares with charred bones were found. The last Chalcolithic layer (2) having compact and greyish in colour contains stone pieces and potsherds of red ware followed by grey ware and few black wares. Terracotta sling balls, polished stone celt and fluted cores are among the antiquities found from this layer. The layer (1) appears to be mixed with recent or modern activities (Fig.8).

The stratigraphy of other excavated trenches is as under:-

1. Trench No. ZB2, Qdt.2, section facing east

Layer (1) represents modern or very recent activity. It is sandy silty, loamy and very loose in texture and whitish grey in colour. It contains fine sand particles, pellets, burnt clay and potsherds of mostly grey ware, laterite noodles and cobbles. A broken piece of muller/pounder, a pestle (?), sling ball have been found from this layer. Layer (2) is very compact, hard and blackish in colour. The layer is mainly composed of clay. It contains potsherds of grey, black-and-red ware, calcrete, laterite noodles and stone pieces. Fragment of a quern and terracotta sling balls were encountered in this layer belonging to late Chalcolithic period.
Layer (3) is semi-compact and light greyish in colour. The layer is an mixture of clay, sand and silt. Potsherds of dull red ware, red slipped ware, grey ware, black-and-red ware, charred bones and shell have been retrieved from this layer also belong to late Chalcolithic period.

Layer (4) is light grey in colour, semi-compact in texture and is composed of course sand, potsherds of red slipped ware, dull red ware, grey ware, black ware, black slipped ware, black-and-red ware, potsherds having cord impressions and decorations like nail tip design, vertical strokes, oblique slashes, etc. perforated ware; charred bone fragments including antler and charcoal pieces. Evidence of animal bones like cattle, pig, dog, cat, chital, sambar, deer, chausinga, etc.; along with pots suggestive of a probable animal burial probably of a dog and some fire activity were also noticed in this layer. This layer demonstrates the typical Chalcolithic culture.

Layer (5) is dark brown in colour. It is compact in hardness and composed of clay and silt. A dump consisting of ash patches was encountered in this layer which is sealed by layer (4). Potsherds of red ware, red slipped ware, dull red ware, black ware, chocolate slipped ware, black-and-red ware, perforated ware, decorative potsherds having designs like nail tip, cord impression, horizontal lines etc., charcoal, bone pieces, antler fragment, a celt of dolerite and a terracotta pendant were retrieved from this layer datable to Chalcolithic phase.

Layer (6) is ashy black in colour mixed with ash patches. It is semi-compact in hardness and composed of sand, clay, silt and ash patches. The ceramic collection of the layer includes typical mature Chalcolithic dull red ware, red ware, red slipped ware and black ware.

Layer (7) is brown mixed with black in colour. It is compact to semi-compact in hardness and composed of clay, silt and burnt clay. It contains potsherds of red ware, red slipped ware, black-and-red ware and decorated potsherds and few charred bones of Chalcolithic phase.

Layer (8) is ashy grey in colour belonging to early Chalcolithic period of the site. It is semi-compact in hardness and composed of clay and ash. The ceramic collection of this layer consists of red ware, red grey ware and black ware.

2. Trench No. XB3, Qdt.3, section facing south

Layer (1) is compact and light yellowish mixed with black in colour. The layer is composed of silt, clay and sand. The upper level of the layer is of modern or recent
activity and seems to be the eroded soil of the top portion of the mound. It consists of potsherds of mainly grey and black ware.

Layer (2) is very compact, hard and greyish in colour. The layer is mainly composed of clay and silt. It contains few laterite nodules, stone pieces, potsherds of grey, red ware, red slipped ware and black ware. A broken pounder and carnelian debitage were retrieved from this layer. The layer belongs to very late Chalcolithic origin.

Layer (3) is semi-compact and greyish black in colour. The layer is composed of mainly clay. Potsherds of red ware, grey ware and black ware have been retrieved from this layer also belong to late Chalcolithic period.

Layer (4) is an admixture of grey and yellow in colour, semi-compact in texture and composed of sand and silt. Potsherds of red slipped ware, red ware, black ware were found from this layer assignable to Chalcolithic phase.

Layer (5) is yellowish brown in colour and semi-compact in hardness. The layer contains two stone celts and potsherds of grey ware, black ware, red ware and red slipped ware. A white ash patch in east-west direction was encountered in this layer. Besides, a circular mud wall was clearly identified on plan belonging to mature Chalcolithic period.

Layer (6) is semi-compact in hardness and yellowish mixed with black in colour. White and black patches were encountered on the western part of the quadrant. The ceramic collection of the layer includes dull red ware, red ware and red slipped ware belonging to prosperous Chalcolithic settlement.

Layer (7) is also semi-compact in hardness and yellowish mixed with black in colour. However, the concentration of pottery is very high. White and black patches were encountered on the eastern part of the quadrant representing Chalcolithic phase.

Layer (8) is ashy black in colour. It is loose in hardness and composed of clay and ash. Burning activities were also encountered in this layer on the western part of the quadrant with charred animal bones. The ceramic collection of this layer consists of red ware, red slipped ware, black ware, black polished ware and chocolate slipped ware. A terracotta animal figurine probably of a dog and a stone celt were also retrieved from this layer assignable to Chalcolithic period.

Layer (9) is dark brownish in colour and semi-compact in hardness. No potsherd was found from this barren layer or hiatus.

Layer (10) is sticky and yellowish in colour and yielded only few gritty red potsherds of Neolithic period.
3. Trench No. ZC2, Qdt.2, section facing east

Layer (1) is compact and light yellowish in colour belonging to modern period. It contains sand, roots, grass, laterite nodules and potsherds of red ware, grey ware and few red slipped wares. Fragment of a stone pounder was recovered from the layer.

Layer (2) is very compact and greyish to black in colour. It contains few laterite nodules and potsherds of mainly red ware, grey ware and few red slipped wares. A celt of dolerite and a terracotta bead were retrieved from this layer of very late Chalcolithic period.

Layer (3) is semi-compact, sticky and dark grey in colour. The layer is composed of sand and silt. It contains a few laterite nodules, stone fragments and potsherds of red ware, red slipped ware and black ware. A celt of dolerite was retrieved from this layer belong to late Chalcolithic period.

Layer (4) is semi-compact and light grey in colour. The layer is composed of clay, ash and stone nodules. Some yellowish patches were also found in the north-west corner of the quadrant. The pottery assemblage of the layer consists of red ware, red slipped ware and black ware assignable to the last phase of the mature Chalcolithic period.

Layer (5) is semi-compact and light yellowish in colour. The layer is composed of calcrites, charred animal bones, few charcoals and potsherds of red ware, black ware and few black-and-red ware one of the characteristic wares of mature Chalcolithic phase.

Layer (6) is compact and yellowish in colour. A floor like activity rammed with laterite nodules with red burnt and ash patches was encountered in this layer. Besides, a circular mud wall on plan was also encountered. However, no potsherd was found from this Chalcolithic layer.

The mature Chalcolithic layer (7) is compact and light blackish in colour. The pottery assemblage of the layer consists of red ware, red slipped ware and few black-and-red wares including one celt of dolerite.

4. Trench No. ZA2, Qdt.1, section facing east

Layer (1) is loose in texture and whitish grey in colour. The composition of the layer is clay and sand. The layer contains stone nodules, brickbats and roots. The ceramic assemblage of the layer consists of grey ware, red ware and black wares of modern period.
Layer (2) is compact and dark grey in colour. The composition of the layer is silt and clay. The layer contains laterite nodules, sandstone fragments, calcretes, charred animal bones and potsherds of dull red ware, red ware, grey ware and black wares. One architectural fragment of sandstone was found from this layer caused by some pit activity in layer (1).

Layer (3) is semi-compact and light grey in colour and is composed of silt, clay and sand. The layer contains stone fragments, calcretes, animal bones and potsherds of dull red ware, red ware and black ware. Hopscotch, a terracotta sling ball and a bone point was also retrieved from the layer of late Chalcolithic period.

Layer (4) is semi-compact, yellowish in colour and composed of silty clay. The layer contains stone fragments, calcretes, animal bones and potsherds of red ware, red slipped ware, chocolate slipped ware, black ware and black-and-red ware of Chalcolithic culture.

5. Trench No. ZA2, Qdt.2, section facing east

As usual the layer (1) is of very recent origin at the site. Layer (1) is loose, brownish in colour and composed of sand and silt. It contains stone fragments and potsherds of dull red ware, red ware, grey ware and black ware.

Layer (2) is compact and greyish in colour. It contains laterite stone fragments and potsherds of dull red ware, red ware and grey ware. Three celts of dolerite were retrieved from this layer appears to be of late Chalcolithic phase.

Layer (3) is semi-compact and brownish in colour. It contains calcrete nodules and potsherds of dull red ware, red ware, red slipped ware and black ware also belongs to late Chalcolithic culture.

Layer (4) is semi-compact and yellowish in colour. It contains calcrete nodules, bones and potsherds of dull red ware, red ware, red slipped ware, chocolate slipped ware and few black-and-red ware of Chalcolithic period.

6. Trench No. ZC2, Qdt.4, section facing north

Layer (1) is semi-compact and whitish grey in colour. It contains laterite stone fragments, few brickbats and potsherds of red ware, grey ware and black wares. The layer belongs to modern or recent activities.

Layer (2) is compact, greyish in colour and composed of clay and silt. It contains stone fragments, bone pieces and potsherds of mainly grey and red wares. A bead of carnelian was retrieved from this layer assignable to late Chalcolithic period.
Layer (3) is compact and brownish in colour. Burning activities and ashy patches were encountered in this layer. The ashy patches have yielded charred bones, charcoal pieces, broken antler and ash lumps having rice husk impression. The pottery assemblage of the layer consists of dull red ware, red ware, red slipped ware, chocolate slipped ware and few black-and-red wares assignable to late Chalcolithic period. Layer (4) of Chalcolithic period is compact, sticky and light brown to yellowish in colour. The frequency of ceramic assemblage of the layer is same as of the previous layer but the quantity is less. Layer (5) is semi-compact and ashy to light black in colour. It contains ashy soil, charred bones, charcoal pieces and few potsherds of dull red ware, grey ware, red slipped ware and black ware belong to Chalcolithic period.

7. Trench No. ZD2, Qdt.4, section facing north
Layer (1) of modern or recent origin is semi-compact and brownish in colour. It contains stone fragments, cobbles and potsherds of grey and red ware. Layer (2) is compact and greyish in colour. It contains few laterite fragments and few potsherds of dull red ware and grey wares of late Chalcolithic period.

8. Trench No. ZD2, Qdt.3, section facing east
Layer (1) is loose in texture and brownish in colour. The layer contains stone fragments and potsherds of grey and red wares. The layer belongs to the modern or recent origin of the site. Layer (2) is very compact, sticky and grey in colour. The ceramic assemblage of the layer is grey ware, red ware and black ware assignable to late Chalcolithic phase of the site. Layer (3) is semi-compact and brownish to light grey in colour. Potsherds of grey ware, red ware and black ware were retrieved from this layer belonging to late Chalcolithic period. The Chalcolithic layer (4) is loose in texture and light brownish in colour. Potsherds of mainly red ware and black ware were retrieved from this layer. Layer (5) is semi-compact in texture and blackish in colour. Potsherds of mainly grey ware, black ware and red ware were retrieved from this layer.
9. Trench No. A1, Qdt.3, section facing east

Layer (1) is sandy, silty, loamy and loose in texture. It contains fine sand particles, pellets, laterite nodules, cobbles and potsherds of mostly grey wares followed by red wares. The layer is light greyish in colour and its behavior is sloppy towards the east. The layer belongs to the modern or recent origin of the site.

Layer (2) is very compact greyish in colour. The layer is mainly composed of clay. It contains laterite nodules, stone pieces and potsherds of red ware followed by grey and few black wares. Broken stone wheel and grinding stone belonging to the late Chalcolithic phase are the antiquities retrieved from this layer.

Layer (3) is compact in hardness and light greyish in colour. The layer is a mixture of clay, sand and silt. It contains stone pieces, few charred bones and potsherds of dull red ware, red ware, red slipped ware, grey ware and black ware. Pestle, net-sinker, polished stone celt and bone point were found from this layer. The layer can be assignable to late Chalcolithic phase.

Layer (4) is light yellowish in colour and semi-compact in texture. A pit activity in this layer was encountered with blackish loose soil, charred bone fragments, charcoal and potsherds of black and red ware, chocolate slipped ware, dull red ware and red slipped ware. Grinding stone and polished stone celts were among the antiquities recovered from this layer belonging to the last phase of the mature Chalcolithic period.

Layer (5) is semi-compact in hardness and yellowish in colour. It contains charred bones of animal, fish and birds. The pottery collection from the layer includes potsherds of red ware, red slipped ware, dull red ware, chocolate slipped ware and few sherds of black wares. A polished stone celt was found from this Chalcolithic layer.

Layer (6) is compact in hardness and yellowish mixed with grey in colour. The layer assignable to the mature Chalcolithic period contains charred bones, charcoal pieces and potsherds of red ware, red slipped ware followed by ill-fired dull red ware, chocolate slipped ware and few black wares. The important finding of this layer is the almost complete tracing of the upper part of a beautifully laid circular mud structure having entrance facing east. Detail description of the structure is given in the related chapter.
10. Trench No. A2, Qdt.1, section facing east

This modern origin layer (1) is sandy, silty, loamy and loose in texture. It contains fine sand particles, pellets, laterite nodules, cobbles and potsherds of mostly grey ware followed by red ware. The layer is light greyish in colour and its behavior is sloppy towards the east. A bead of carnelian of earlier period was retrieved from this layer.

The late Chalcolithic layer (2) is very compact and greyish in colour. The layer is mainly composed of clay. It contains laterite nodules, stone pieces and potsherds of red ware followed by grey and few black wares. The antiquity encountered in this layer is broken terracotta animal figurine.

Layer (3) is semi-compact in hardness and light greyish in colour. The layer is an admixture of clay, sand and silt. It contains stone pieces, few charred bones and potsherds of dull red ware, red ware, red slipped ware, grey ware and black ware also belonging to late Chalcolithic phase.

11. Trench No. A2, Qdt.3, section facing east

The very recent origin layer (1) is sandy, silty, loamy and loose in texture. It contains fine sand particles, pellets, laterite nodules, cobbles, a stone pounder and potsherds of mostly grey ware followed by red wares. The layer is light greyish in colour and its behavior is sloppy towards the east.

Layer (2) is very compact and greyish in colour. It contains laterite nodules, stone pieces and potsherds of red ware followed by grey and few black wares. The antiquity encountered in this late Chalcolithic layer includes pounder of sandstone.

Layer (3) is semi-compact in hardness and light greyish in colour. The layer is an admixture of clay, sand and silt. It contains stone pieces, few charred bones and potsherds of dull red ware, red ware, red slipped ware, grey ware and black ware. A Terracotta sling ball was found from this layer. This layer can also be assignable to the late Chalcolithic period.

Layer (4) is light yellowish in colour and semi-compact in texture. It contains potsherds of chocolate slipped ware, dull red ware and red slipped ware. The layer represents the last phase of the mature Chalcolithic period.

12. Trench No. A5, Qdt.3, section facing east

Layer (1) is sandy, silty, loamy and loose in texture. It contains fine sand particles, pellets, laterite nodules, cobbles and potsherds of mostly grey ware followed by red
ware. The modern or recent origin layer is light greyish in colour and its behavior is sloppy towards the east.

Layer (2) is very compact greyish in colour. The layer is mainly composed of clay. It contains laterite nodules, stone pieces and potsherds of red ware followed by grey and few black wares. The antiquities found from this layer are terracotta hopscotch and a core of chert. The layer belongs to the Late Chalcolithic period.

Layer (3) is semi-compact in hardness and light greyish in colour. The layer is a mixture of clay, sand and silt. It contains stone pieces, few charred bones and potsherds of dull red ware, red ware, red slipped ware, grey ware and black ware also of late Chalcolithic period.

Layer (4) is yellowish in colour and semi-compact in hardness. A dump activity was encountered with loose ashy material. The layer contains charred bones and potsherds of red ware, red slipped ware and chocolate slipped ware. A broken bone tool was found from this layer of Chalcolithic period.

Layer (5) is light greyish in colour and semi-compact in hardness. It contains charred bones, antler and potsherds of red ware, red slipped ware and chocolate slipped ware. A polished stone of red haematite was recovered from this layer of Chalcolithic period.

Layer (6) is semi-compact in hardness and yellowish in colour. It contains stone pieces, one or two pieces of charred bones and very few un-diagnostic potsherds of ill fired nature. Below this layer no remains were found.

13. Trench No. B1, Qdt.1, section facing east

Layer (1) is sandy, silty, loamy and loose in hardness. The layer contains stone pieces and potsherds of mostly grey ware followed by red ware. Colour of the layer is whitish grey and appears to be of modern or recent origin.

Layer (2) is greyish in colour, hard in texture, cracky and nodular in nature. It contains potsherds of red ware and grey ware of late Chalcolithic phase.

Layer (3) is semi-compact in hardness and brownish grey in colour. The late Chalcolithic layer consists of sand, stone nodules and potsherds of grey ware, red ware and red slipped ware.

Layer (4) is semi-compact in hardness and light yellowish in colour. It contains a few charred bones and potsherds of dull red ware, red ware, grey ware and red slipped ware of Chalcolithic period.
Layer (5) is yellowish in colour and compact in hardness. Potsherds of dull red ware and red ware in small quantity were found from this layer belonging to Chalcolithic period.

This Mature Chalcolithic layer (6) is compact and light yellowish in colour. A rectangular mud platform, which was attached with the circular mud structure traced in Qdt.2 of Trench A1, was traced in this layer. No further digging was carried out in this quadrant.

14. Trench No. XC3, Qdt.1, section facing east
Layer (1) is sandy, silty, loamy and loose in hardness belongs to modern or recent origin. Colour of the layer is whitish. Potsherds of grey and red ware were retrieved from this layer. A broken terracotta wheel was found from this layer.
Layer (2) is nodular, compact in hardness and grey in colour. Few charred bones and potsherds of red ware and grey ware were retrieved from this layer. A polished stone celt was found from this layer of Late Chalcolithic period.
Layer (3) is semi-compact in hardness and light grey in colour. One or two pieces of animal tooth and very less number of potsherds comprising of red ware and grey ware were found. Below this level onwards no remains were found.

15. Trench No. YA2, Qdt.2, section facing south
Layer (1) is brownish in colour, loose in texture and composed of sand, silt, clay, brickbats, laterite and sandstone nodules. Potsherds of mostly red ware and grey ware were found from this layer. The shapes include bowl, handi, storage jar, dish, etc. Fragments of saddle quern and pestle of sandstone were also noticed.
Layer (2) is greyish black in colour and semi-compact to compact in hardness. The ceramic assemblage of this layer is dominated by the grey ware followed by red ware. The shapes include handi, storage jar, bowl, miniature pot, vase, etc. Kitchen appliances like pestle and saddle of sandstone and a broken bead of carnelian were found from this layer. Besides, a floor level with evidence of a chullah (Pl.14) having its mouth prepared with the neck of a pot, saddle quern and storage pot was encountered in this layer.
Layer (3) is semi-compact in hardness and ashy grey in colour. The layer contains few charred bone fragments, stone pieces and potsherds of dull red ware, red slipped ware, black-and-red ware and black ware. The shapes include bowl, handi, miniature pot, lid, etc. In antiquity a celt and a stone polisher of dolerite are noteworthy (Fig.9).
Pl. 14: Chullah in situ
16. Trench No. YA2, Qdt.3, section facing south

Layer (1) is loose in texture, brownish in colour and composed of sand, silt, clay, brickbats, laterite and sandstone nodules. Potsherds of mostly red ware and grey ware were found from this layer.

Layer (2) is blackish in colour and semi-compact to compact in hardness. The ceramic types include grey ware, red ware and black ware. The shapes include bowl, carinated bowl, *handi*, storage jar, knobbed lid, crucible etc. Two cooper rings are the important finding of this layer. Two floor levels with storage jars sunk into ground were encountered from this layer.

Layer (3) is semi-compact in hardness and greyish black in colour. It consists of sand, clay and silt. It contains charred bone pieces, stone nodules and potsherds of dull red ware, red ware, black ware, red slipped ware and buff ware. The shapes are bowl, *handi*, storage jar, etc. A copper fish-hook and bone point indicating fishing and hunting activities of avi-fauna by the Chalcolithic people were found from this level.

Layer (4) is loose in texture and greyish black in colour. It contains laterite nodules, charred bones and potsherds of mostly dull red ware followed by, red slipped ware, black ware and chocolate slipped ware. The shapes include deep and shallow bowls, carinated bowls, *handi*, etc.

Layer (5) is semi-compact in hardness and ashy grey in colour. The layer contains ash, charred bones and potsherds of red ware, red slipped ware, black-and-red ware and black ware. The shapes include vase, plain and carinated bowls. Decorations on pottery include nail tip and wavy lines (Fig.9).

17. Trench No. YA2, Qdt.4, section facing south

Layer (1) is brownish in colour and loose in compactness. It contains charcoal pieces, laterite and sandstone nodules and potsherds of grey and red ware. The shapes include bowls, *handi*, storage jars, etc.

Layer (2) is greyish black in colour and semi-compact in hardness. The ceramic assemblage of the layer consists of grey ware and red ware. The shapes include bowl, storage, *handi*, etc. Celts of dolerite were found from this layer.

Layer (3) is greyish in colour and semi-compact in hardness. The layer contains charred bones and potsherds of dull red ware, red ware, red slipped ware, grey ware and black ware. The shapes include bowl, *handi*, vase, lid, etc. The decorations on the pottery include nail tip and wavy lines.
Layer (4) is brownish yellow in colour and loose in texture. The layer contains charred bones and potsherds of red slipped ware, black-and-red ware, dull red ware and black ware. The shapes include bowl, miniature pot, shallow dish, lid, etc.

To sum up, the stratigraphy clearly shows two separate horizons for the Neolithic and the Chalcolithic periods with a clear cut gap i.e., a hiatus in between the two. The gap between the two cultural levels was evidenced in layer (10) and in some trenches in layer (11). Besides, the sterile layer (hiatus) atop significantly a very thin burnt layer measuring about 1cm to 1.5cm of thickness shows burning of grasses running throughout the mound as evident from excavations. However, it is not clear whether it was burnt naturally or intentionally. Further, from the exposed stratigraphy and the cultural materials retrieved from it the Chalcolithic period may clearly be placed from layers (2) to (9) and to layer (10) according to the existence of the sterile layer. Layer (1) although used or disturbed during the modern period, may belong to the early historical people as evident from the knobbed wares and inscribed seal/sealing which are found in the upper level of the surrounding paddy fields around the mound. Keeping in view of the cultural materials, the layers (2) and (3) may be considered as late Chalcolithic phase, while layers (4) to (7) representing mature Chalcolithic stage when the culture was in flourishing state. The layers (8) to (9) and (10) are of incipient stage of Chalcolithic settlement. However, it may not be out of place to mention here that where the 1.6 hectare mound represents a bi-cultural settlement, on the other hand it surrounding and periphery of mound are replenished with early historical materials like seals, terracotta pendants, red polished ware, knobbed ware, etc.
<table>
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<tr>
<th>Period</th>
<th>Trenches</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A5</th>
<th>B1</th>
<th>XB1</th>
<th>XB2</th>
<th>XB3</th>
<th>XC3</th>
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**N.B:** NS=Natural Soil, UE=Un-Excavated
CHAPTER-IV

CULTURAL SEQUENCE AND CHRONOLOGY
CULTURAL SEQUENCE AND CHRONOLOGY

The entire cultural deposit of Suabarei above the natural soil can be divided into two periods, i.e., Period-I- Neolithic (layer 12/11) and Period-II- Chalcolithic (layers 10/9 to 2) with a clear cut hiatus between the two. On the basis of material remains especially with the existence of the circular huts, proliferation in the quantum of pottery, faunal remains both wild and domesticated species and antiquities, the Period-II can further be sub-divided into Period-IIA- Incipient Chalcolithic, Period-IIB- Mature Chalcolithic and Period-IIC- Late Chalcolithic (Fig.10).

Period-I (Neolithic)

The Neolithic period was traced in layer (12) in Trench XB1, Qdt.2 and ZA2, Qdt.4 and in layer (11) in Trench A1, Qdt.2 above the natural soil and below the sterile layer is represented by a solitary piece of ground tool and polished stone chisel (Pl.15) in association with grit tempered handmade potsherds of red ware (Pl.16)

No structural remains or any other developed forms of ceramic assemblage have so far been retrieved from this period. Besides, the diggings conducted in the Neolithic level did not yield any faunal remains so far. Radio carbon samples from the Neolithic level have given two dates of 3460± 30BP- Cal. BCE 1880 to 1690 or Cal. BP 3830 to 3640 (Beta-434012) and 1840± 100 BCE (BS-3913). Prior to this, the only radiocarbon dates available from the Neolithic deposits in Odisha was from the excavations at Hikudi\(^1\) on the left bank of the river Mahanadi in Subarnapur district of Odisha which has given two dates of 2241± 109 BCE (PRL- 2139) and 1745 ± 215 BCE (IP- 617). Though the Neolithic date of Suabarei is almost nearer to that of Hikudi but the Neolithic deposit of Hikudi is more developed than that of Suabarei as evidenced from its material remains in the form of fast wheel made pottery, bone and stone implements. On the basis of the available date or dates of other sites, the Neolithic level of Suabarei is assignable to c. 3900- 3500BP.

The hiatus above the Neolithic period and below the Incipient Chalcolithic Period-IIA may be assigned to a period of about 500 years.

Pl. 15: Neolithic stone chisel
Handmade coarse gritty red ware
Period-II (Chalcolithic)

Period-IIA (Incipient Chalcolithic)

The incipient Chalcolithic period can be observed from layers (10) to (8) in Trench XB1, Qdt.2 and Trench ZA2, Qdt.4 and from layers (9) to (8) in Trench A1, Qdt.2 and Trench A3, Qdt.3 above a sterile layer. In the above mentioned trenches and layers the ceramic composition is quantitatively and qualitatively increasing gradually up to the upper part of layer (8) so does the ceramic types. The study of faunal remains from the different layers of the Chalcolithic period also shows the gradual increase in the consumption of animal food. The findings of rice and horse gram in almost all the level shows that animals were hunted in a limited scale for consumption. The same is observed in layers (9) to (8) of Trench Nos. A1, Qdt.2 and A3, Qdt.3. Radiocarbon sample from this early Chalcolithic level has given a date of 2980± 30BP- Cal. BCE 1280 to 1115 or Cal. BP 3230 to 3065 (Beta- 434011). The bottom level of Chalcolithic deposit of Khameswaripali in Subarnapur district of Odisha has given a date of 1555± 60BCE (IP- 273)$^2$ and the middle level to 1065± 66 BCE (IP-307). On the basis of the available dates, this period of Suabarei can be assignable to a period from c. 3200-3000 BP approximately.

Period-IIB (Mature Chalcolithic)

The mature Chalcolithic period can be observed from layers (7) to (4) and appears to be the most mature and prosperous phase of the entire Chalcolithic phase in terms of the cultural and structural remains. The ceramic assemblage of this period is more prosperous than that of the previous period in which the black-and-red ware and decorative potsherds started their appearance. The most important feature of this period is the appearance of structural activities which were found in the form of circular mud hut in plan. The structural activities of this period are found in layer (6) and in its equivalent level as per the contour of the site which has yielded the evidence of as many as nine circular mud-huts on plan. These structures in the form of circular mud wall were traced in Qdt.2 of XB1, Qdt.3 of XB3, Qdt.2 of ZB2, Qdt.4 of ZA2 and Qdt.2 of ZC2 during the field season 2014-15; Qdts.2 and 3 of Trench A1 and Qdt.3 of Trench A3 during the field season of 2015-16. These structures are of varying dimension measuring from 2.60m to 3.35m inner diameter. In most of the cases, the huts have a floor of rammed red clay coated with a thin flimsy coat of ash

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$^2$ Ibid.
and charcoal and the wall made of yellowish clay or greyish clay which is clearly distinguishable from its surrounding soils. Although no postholes were found from the structures, the evidence of use of sun dried mud brick on the periphery of the circular mud wall along with clay lumps and the evidence of rectangular verandah in front of the house is unique and first of its kind in the Chalcolithic culture of eastern India. The evidence of rice (*Oryza sativa*) and horse gram (*Macrotyloma uniflorum*) increase in the quantity of hunting of animals, birds and fish can be seen in this period. A radiocarbon sample from this period has given a date of Cal. 860± 80BCE (BS-3915). This mature phase of Chalcolithic Suabarei can be placed between c. 3000 to 2800BP.

**Period-IIC (Late Chalcolithic)**

The late Chalcolithic period can be seen from layers (3) to (2). In layer (3) the ceramic types of the previous period are decreasing though continuing. The dull red ware is the dominating ceramic type. While coming to layers (2) and (1) only three ceramic types i.e., grey ware, red ware and black wares are available. However, the evidences of copper in the form of a fish-hook and a copper ring were retrieved from layers (3) and (2) respectively along with grounded and polished stone tools, terracotta objects and bone objects. The availability of terracotta sling balls (marbles), bone point and spear-head suggest increase of hunting of avi-fauna along with that of land animals. After layer (2), the layer (1) is appears to have mixed with recent or modern activities. In the absence of any scientific dates the late Chalcolithic phase of Suabarei can be placed between c. 2800-2600BP.

Thus, the material remains of Suabarei gives a clear cut evidence of Neolithic and Chalcolithic horizons with a hiatus between the two. If we calculate the available dates of the Neolithic period and the earliest date of the Chalcolithic period the hiatus is about 500 years. If we see the dates of the other important Neolithic and Chalcolithic sites of eastern India like Bihar, West Bengal and even the sites in North-east India and other excavated sites in Odisha, the dates of Neolithic and Chalcolithic levels of Suabarei well go almost in the same time bracket with a negligible difference of four to five hundred years.
### Table-3: Dating of Neolithic and Chalcolithic sites of Eastern India

<table>
<thead>
<tr>
<th>Name of the site</th>
<th>State</th>
<th>Culture</th>
<th>Radio carbon date</th>
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<tr>
<td>Chirand</td>
<td>Bihar</td>
<td>Neolithic</td>
<td>1760 ± 150 BCE 1680 ± 135 BCE</td>
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<tr>
<td>Senuwar</td>
<td>Bihar</td>
<td>Neolithic</td>
<td>1770 ± 120 BCE 1660 ± 120 BCE 1500 ± 110 BCE 1400 ± 110 BCE</td>
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<td>Burudih</td>
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<td>Neolithic</td>
<td>1401-837 (Cal.) BCE</td>
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<td>Sankerjang</td>
<td>Odisha</td>
<td>Chalcolithic</td>
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<td>Hikudi</td>
<td>Odisha</td>
<td>Neolithic</td>
<td>3449 ± 82 BP</td>
</tr>
<tr>
<td>Khambeswaripali</td>
<td>Odisha</td>
<td>Chalcolithic</td>
<td>Pd-IA- 3268 ± 51 BP  Pd-IB- 2888 ± 49 BP</td>
</tr>
<tr>
<td>Gobalai Sasan</td>
<td>Odisha</td>
<td>Chalcolithic</td>
<td>2106 ± 100 BCE</td>
</tr>
<tr>
<td>Suabarei</td>
<td>Odisha</td>
<td>Neolithic</td>
<td>3460 ± 30 BP(Beta) 2360BCE ±100(BSIP) 2980 ± 30 BP(Beta) 3155-3090BP(Beta) 3230-3065BP(Beta)</td>
</tr>
<tr>
<td>Pandu Rajar Dhibi and Mahishdal</td>
<td>West Bengal</td>
<td>Chalcolithic</td>
<td>1500-600 BCE</td>
</tr>
<tr>
<td>Nongpok Keithelmanbi</td>
<td>Manipur</td>
<td>Neolithic</td>
<td>4460 ± 120 BP</td>
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<tr>
<td>Napachik</td>
<td>Manipur</td>
<td>Neolithic</td>
<td>1450 BCE (T/L Date)</td>
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<tr>
<td>Dibru Valley, Dibrugarh</td>
<td>Assam</td>
<td>Neolithic</td>
<td>2210 ± 140 BCE</td>
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</table>
CHAPTER-V

STRUCTURAL REMAINS
STRUCTURAL REMAINS

The excavations at Suabarei brought to light several circular mud structures in addition to a highly developed ceramic industry, stone, bone and copper tools and implements. The community at Suabarei lived in a circular mud huts in a small groups who were subsisted with farming, hunting as well as fishing. These structures belong to mature phase of the Chalcolithic period (Fig.11).

Structural remains

The Chalcolithic settlements at Suabarei in the form of circular mud structures are evidenced mostly from layers (5) to (10). The occupational deposits of Chalcolithic period of Suabarei is 4.30m in XB1/Qdt.1, 3.50m in ZA2/Qdt.4, 2.80m in A3/Qdt.3 and 3.40m in A1/Qdt.3 has yielded the evidence of as many as nine circular mud-huts on plan. These are traced in Qdt.2 of XB1, Qdt.3 of XB3, Qdt.2 of ZB2, Qdt.4 of ZA2 and Qdt.2 of ZC2 during the field season 2014-15; Qdt.2 and 3 of Trench A1 and Qdt.3 of Trench A3 during the field season of 2015-16. They are of varying dimensions measuring from 2.60m to 3.35m inner diameter. In most of the cases, the huts have a floor of rammed red clay coated with a thin flimsy coat of ash and charcoal paste while the wall made of yellowish or greyish clay which is clearly distinguishable from its surrounding soils. In most of the cases, the post holes are missing which indicate that they might have used the superstructure without making any postholes and might rest the root part of the shaft at the inner part of the mud wall which in turn supports the superstructure. A brief description of the individual hut is given below for a better understanding of the settlement pattern of the period.

Structure No.1

The circular mud structure was located on the south-western corner of the Trench XB1/Qdt.2 at a depth of 1.72m from reference point. The plan of only half portion of the circular structure was traced and the remaining portions were still remaining underneath the western baulk. The structure measures 2.60m in diameter from inner side, with a wall of yellowish clay of 50cm in thickness. It belongs to the
occupational layer (6) and sealed by layer (5). The floor of the structure is rammed with tiny pottery pieces together with burn clay nodules. A circular patch was also traced at the centre of the structure which was probably used for putting some storage jar. An evidence of possible posthole is also noticed over the wall at the north-west corner of the structure (Fig.12).
Structure No.2

The structure no.2 was traced at the north-west corner of the Qdt.3 of Trench XB3. It was traced at the depth of 1.90m below the reference point. The inner diameter of the structure was 3m surrounded by a narrow yellowish clay mud wall measuring 20cm in thickness. The structure was found in the occupational layer (5) and sealed by layer (4).

Structure No.3

The circular mud structure was traced at the south-east corner of the Qdt.2 of Trench ZB2 at the depth of -2.40m below the reference point. The inner diameter of the structure was 3.20m with a mud-wall measuring 20cm in thickness. Ash with charcoal was noticed at the centre of the circular structure. These evidences indicate some sort of firing, cooking activities inside the hut. The structure was found in the occupational layer (5) and sealed by layer (4) (Fig.13).
Structure No.4

A badly damaged plan of another circular mud hut was partially traced in the north-west corner of ZA2/Qdt.4 at the depth of -1.88m below the reference point. Its remaining arms running towards the south-west corner was found badly damaged and hence could not be further traced. The exposed inner area of the circular structure is rammed with reddish earth granules and ash. The structure was found in the occupational layer (6) and sealed by layer (5). The inner diameter of the structure was 2.5m with a mud-wall measuring 40cm in thickness.

Besides, in layer (10) of this quadrant exposed a well rammed floor containing laterite granules, potsherds and charcoals at the south-west corner of the quadrant at the depth of -3.20m below the reference point. It was probably the first and beginning of habitational evidence of Chalcolithic people of Suabarei.

Structure No.5

A segment of a circular mud structure was traced at the north-east corner of the Qdt.2 of Trench ZC2. The inner diameter of the structure was 3.60m with a mud-wall measuring 40cm in thickness. Ash with some burning activities was noticed at the centre of the circular structure. The structure was found in the occupational layer (6) and sealed by layer (5) at a depth of 2.16m below the reference point.

Structure No.6

The best and almost complete circular mud structure was traced on plan in Qdt.3 of Trench A1. It was located almost at the middle of the quadrant, only some portion of the southern wall was coming under the baulk. The inner diameter of the structure is 3.20m and the maximum thickness of its mud wall is 42cm. This circular structure facing east has a beautiful entrance (opening) measuring 1.10m in width. The inner side of the mud wall is ingeniously strengthened by providing sun dried mud bricks and clay lumps. The use of mud brick on the hut was reported for the first time in the Chalcolithic cultural phase in Eastern India. One of the bricks measures 5 x 15 x 25cm in length, breadth and thickness respectively. The floor of the structure was well rammed and burning patches were quite discernible on the floor. Small convex projections at regular intervals at the inner portion of the wall as decorative element and a thin coat of ochre slip are also noticed at the inner surface of the wall which shows their artistic skill. The structure was repeatedly in use for a longer period as evidenced by some periodical alterations of the structure. Firstly, it is noticed two
to three number of coatings of ash-charcoal and clay at the floor level with a thickness of 3cm; secondly, a narrow clay bond is raised in front of the entrance over the flattened low height entrance bond made earlier and the soil is deliberately filled in between the floor and wall by which the convectional projections are not viewed from side except from the top (Pl.17 and Fig.14).
Structure No.7

Another circular mud structure was traced in Qdt.2 of Trench A1. The inner diameter of this structure measures about 3.35m (conjecturally) as only a segment of the circular structure is traced at the south-east corner of the quadrant. Its wall thickness is 42cm. This structure was also facing east as evident from a rectangular verandah traced in Qdt.1 of Trench B1. The verandah measures 2 x 1.35m (Pl.18 and Fig.14). The attached verandah with circular structures is very uncommon and rather rare not reported from any of the Chalcolithic sites of Eastern India so far.

Pl.18A : Circular mud structure in Qdt.2 of Trench A1

Pl.18B : Exposed verandah in Qdt.1 of Trench B1
SUABAREI (2014-16)
PLAN SHOWING CIRCULAR HUTS
TRENCH NO. A1, QHR. 2 & 3 AND TRENCH NO. B1, QHR. 1

Fig. 14
Structure Nos. 8 and 9

The Qdt. 3 of Trench A3, particularly the south-east corner of the quadrant revealed a partial segment of two circular structures one above the other. These structures were found in the occupational layer (5) and sealed by layer (4) at a depth of -1.81m below the reference point. These structures are smaller in size in comparison to the structures mentioned above. However, these two structures give a clear evidence of two structural phases. The Structural Phase-I is superimposed by a flood deposit followed by an ashy deposit over which the Structural Phase-II is resting. The exposed thickness of the mud wall of Structural Phase-II measures 34cm whereas only 10cm is visible in Structural Phase-I. Similarly, the diameter of the structure of Phase-I is 3.08m and the diameter of structure of the Phase-II is 3.90m. The ashy deposit over the flood deposits seem to have been deliberately done to overcome water percolation from below or to check any capillary action of water as well as to make the floor insect free by the Chalcolithic people before reinstallation of their structure over the flood deposits. This shows their skilful nature in arresting havoc or fury of water activities

Thus, the series of mud-huts unearthed from different layers reveal a uniform pattern of settlement right from the beginning to the end of the Chalcolithic period at Suabarei. The circular plan two of the huts are perfectly east oriented structures shows their meticulous work and knowledge of architecture. The evidence of mud-brick and convex designs at the inner side of the wall at a regular interval along with a coat of red ochre of the structure shows their artistic sense and said to be reported for the first time in Chalcolithic context in Eastern India.

In pan Indian context, such circular structures have also been reported from the excavations at Navdatoli, Inamgaon (Late Jorwe period), Walki in Maharastra; Khairadih in Uttar Pradesh; sites like Sonepur and Chirand in Bihar; Pandu Rajar Dhibi, Mahishdal, etc. in West Bengal. In Odishan context, circular mud structures have been reported from Golabai Sasan, Baanga (Harirajpur), Talapada in Khordha district and Talagarh in Cuttack district. However, like Golabai Sasan and other sites no clear cut evidence of postholes has so far been traced at Suabarei. Besides, the distance between the structures was probably intentionally maintained for easy movement of people and animals which again proves their civic sense. The use of sun dried bricks along with clay lumps found from the circular structure of Qdt.3 of
Trench A1 is unique so far as Odishan Chalcolithic context is concerned. Further, the size of the circular huts of Suabarei are smaller in dimension in comparison to other excavated Chalcolithic sites of Odisha like Golabai Sasan, Baanga (Harirajpur) and Deltihuda (Talagarh) probably because of their smaller settlement. The minimum and maximum inner dimension of the circular mud huts of Suabarei are 2.5m and 3.60m respectively, whereas those of Golabai Sasan are 3.9m and 7.9m. Likewise, the inner dimension of the circular mud structure traced at Baanga (Harirajpur) was found to be more than 4m (exact measurement is not available).
CHAPTER VI

THE POTTERY
THE POTTERY

The study of pottery is veritably the alphabet of archaeology. It is a good index of cultural continuity and change, their ubiquitous nature and lack of intrinsic value have indirectly helped the archaeologists and researchers by throwing light on every aspect of the site. Pottery analysis is developed into a specialised aspect of archaeology due to its durability and availability and as hardly affected by the micro-environment.

All objects that are made from clay and hardened by fire are termed ‘pottery’ or ‘ceramics’ a word derived from the Greek word keramos which corresponds to the French ceramique and the German keramik. The term pottery is used synonymously with earthen ware to denote all, ceramic substance which are not vitrified. A dictionary definition is simply objects of fired clay.

The invention of pottery is an important landmark in man’s march from prehistoric savagery to civilization. The occurrence of pottery is generally attributed to the Neolithic period when man first began to live a settled life. The evidence from West Asia shows that there is an earlier aceramic phase of the Neolithic when gourds and woven baskets were used as containers and for storage. On the basis of radiometric dates, the beginning of pottery can now be assigned to about 7000 BCE, but still earlier evidence came from Japan where the people of the Joman culture made pottery some thousand years much earlier.

Perhaps the strongest prima facie evidence for pottery’s utilitarian value is the fact that once the ceramic art had been invented or introduced in one place, it spread rapidly to other regions namely, Japan and China, peninsular South East Asia, Mediterranean, Indian sub-continent, Europe and Africa.

The study of pottery was neglected by earlier archaeologists in the last century. Only complete vessels found in excavations were preserved and the broken ones were rejected, not to speak of potsherds. It was Sir Flinders, Petrie, the greatest Egyptologist, who showed how important is the study of pottery for the reconstruction of ancient life style. Robert Furtwangler was the first to preserve painted pottery from excavations whereas, Petrie showed that even plain pottery is equally important. Thus, gradually pottery was recognized as an important artifact and in course of time came to occupy a unique position. The pottery found from ancient sites in large quantities,
do not change their forms or decorations after firing and even rim fragments can give us idea of the forms of the vessel.

Pottery vessels were prehistoric humans’ earliest efficient means for confining, storing, measuring, mixing, transporting, heating and cooling dispersible substances depending on the ability of humans to enclose space with baked clay. In common parlance most vessels are symmetrical and asymmetrical from top to bottom, they are relatively easily divided into systematically related parts. A simple pot will always have two sides (the inside and the outside) and one edge (the lip). The lip of pot is used as a reference for dividing line of the container into parts. All non-lip pots have shoulder which is the maximum circumference of the body. The bottom is the minimum circumference of the body and portions adjacent to the bottom from the base. All portions of the pot below the shoulder are the lower body. Parts above the shoulder are the upper body. Handles, spouts, legs, annular bases, and feet of pot depict animals, gods, humans or plants while the vases, flowerpots, wine, oil and water bottles added as appendages.

**Production steps and stages**

A general production sequence of preparing the pot is as follows:-

1. Obtaining of clay, 2. Preparation of clay, 3. Manufacturing of vessel, 4. Decoration of the vessel, 5. Drying of the vessel and 6. Firing of the vessel. Similar process of producing pots must have been followed by the Chalcolithic folk of Suabarei.

1. **Obtaining of clay**

Clay is an abundant material resource for Suabarei Chalcolithic people as the mound is located in the fertile plain in between river Daya and Gangua rivulet. They must have exploited the locally available well levigated clay around the mound. There are many different types of clay but Suabarei potters only use clays that have a certain range of properties. Some of the most important properties of usable clay include its ability to be shaped without cracking or breaking (this property is known as plasticity); its ability to be fired to the temperatures necessary to transform the raw clay into a ceramic material without distortion; and its ability to be used to produce repeatable results with the same treatment, so the potter can consistently produce the wares he wants.
2. Preparation of clay

The clay preparation is one of the important steps in processing to prepare a pot. Alluvial of river bank is often the most suitable material. Hence, the Chalcolithic people of Suabarei must have exploited the alluvial soil of Daya river and Gangu rivulet for pottery making. But, very often the clay needs special preparation for making pot with (a) well levigated structure, (b) coarse grained structure, or at times deliberately mixed with external agencies like husk, powdered stone, sand, grass or similar other material. During the course of excavation also potsherds having heterogeneous materials like sand, mica and rice husk impression have been retrieved at Suabarei which proves the use of external agencies as tempering material.

3. Manufacturing of vessel

The potteries of Suabarei are either of handmade or of wheel-made. The handmade potsherds are found only in the Neolithic level of Suabarei whereas, the potsherds of Chalcolithic Suabareians are completely of wheel made. The handmade pots were found to be made with using a mould or clay arrangement.

In wheel made pottery prepared clay is put at the central region of a heavy wheel fixed on a pivoted fulcrum. The wheel is given rotator motion first and then the mud is slowly pulled with the help of the thumb and the rest of the four fingers manipulating it. The centrifugal force on the mud in rotation helps to create a uniform circular shape. As a rule, almost all the wheel made pots can be made very thin and the thickness is uniform over the entire surface. The wheel helps in completing a shape but the rest of the treatments like burnishing and slipping are more time consuming and tedious job. Then lightly scratched designs are executed on the surface in such a manner that the lower slip is exposed on the scratched lines. The design is finally made permanent by firing. A colour wash can be given before or after firing and this forms yet another form of surface treatment. Similar methods might have been applied by the Suabareians as evidenced from the unearthed potsherds from the Chalcolithic level.

4. Decoration of the vessel

A pre-firing painting on pots are usually more permanent and subsequently the same painted designs may again be reinforced with another coat after firing. In rare instances a special glaze may be given after the painting. This glaze is prepared by
crushing tamarind seeds and cooking the powder in water. This solution is colourless and when spread on a painted surface; protects the paint in case it is done after firing and also renders the surface glazes like glass. Incised decorations which are commonly found in the potteries of the Chalcolithic level at Suabarei had been done before firing. These include simple nail depressions in a series or even horizontal lines scratched along the neck, criss-cross pattern, wavy lines, oblique strokes, pellet, fingertip and cord/mat impression.

Apart from the incised decorations, a very few potsherds having white paintings only and a few have polychrome paintings consisting of yellow, ochre and white colour. So far as polychrome paintings are concerned they were probably executed during post firing stage. In case of white paintings they were probably executed during pre-firing stage. This is why, the impressions of the designs are left rather than the pigment itself. The ochre pigment was extracted from haematite nodules evidences of which have been found from the excavation. So far as the white and yellow pigments are concerned presumably these were extracted by burning calcrites and fresh water mollusk shells and yellow haematite nodules respectively.

5. **Drying of the vessel**

After giving shape to the clay lumps on potter’s wheel into different forms of pots, the leather hard condition pots put in an open air under the shed for getting them dried. After that, the un-burnt pots are ready for putting inside the potter’s kiln.

6. **Firing of the vessel**

Although no potter’s kiln has so far been found at Suabarei to know the exact firing technique adopted by the Neo-Chalcolithic people of Suabarei. It is likely that the smooth and uniform texture of the potteries were achieved through an open hearth firing in the presence of uniformly controlled ventilation with a proper piling of the pots to be fired. Due to regulated firing clay usually turns into brick red colour. If the temperature seemingly was not high enough it may cause blotchy appearance on the surface and at times even if the surface had uniformly turned red there will always be a core within the thickness of the clay which will remain grey. It is only inadequately maintained temperature, duration and air circulation that the entire thickness of the clay turns red. The core of most of the potsherds of the Chalcolithic level at Suabarei is found to be grey in colour even though they are well fired. It is probably because of the nature of the local soil.
Shapes

A good number of shapes have been identified from the retrieved potteries of Suabarei excavation. These pottery shapes include vase, bowl, bowl on stand, basin, dish, handi, lead, knobbed lead, storage jar and miniature pots. Some bowls have been found with carination at the waist and some are having ring based. From the fracture pattern of the bowls on stand it appears that the stand was made separately and luted to the body.

Pottery of Neolithic period of Suabarei

The Neolithic potteries yielded from several explorations and regular excavations. In both the cases the associations with the Neolithic tools are taken as the basis or parameter of identification along with their primitive features. In the case of Suabarei excavation also the Neolithic horizon was found with handmade gritty potsherds of red ware in association with a solitary piece of ground and polished stone tool. The potteries are of handmade only and of medium to fine in fabric and texture. The ceramics are of red ware i.e., gritty micaceous red ware, of course not a single rim or base portion of any pot is found in this level.

Pottery of Chalcolithic period of Suabarei

The Chalcolithic horizon of Suabarei has yielded a good number of potsherds in the form of shape, colour and designs. In shapes, the potteries can be grouped into vase, bowl, bowl on stand, basin, dish, handi, lead, knobbed lead, storage jar, high necked pot and miniature pots. In colour it can be divided into red ware, dull red ware, grey ware, black ware, black slipped ware, red slipped ware, chocolate slipped ware, perforated ware and black-and-red ware, etc. Designs like simple nail depressions in a series or even horizontal lines scratched along the neck, criss-cross pattern, wavy lines, oblique strokes, pellet, fingertip and cord/mat impression are found on the potteries. So far as paintings are concerned only a few specimens are having white and polychrome have been retrieved from the excavation. All the potteries are of medium to thick fabric and texture, made of locally available well levigated clay, wheel made and both well and ill-fired varieties.

In Odisha, a good number of archaeological sites have been excavated and their material culture have been interpreted and analyzed mainly on the basis of the structural remains, sculptural wealth and epigraphical or numismatic evidence. Except
the excavation of Sisupalgarh and Lalitagiri, the study of the ceramics has been utterly neglected.

The basic approach/parameter to analyze the pottery of Suabarei is based on style, form and technology. The analysis is based on the clay, shape, function, texture, fabric, colour, wash, slip, burnish, hardness, size, incision, perforation and decorations, etc. Each pottery is being studied with minute details which include mouth, rim, neck, body sherds, base and their numbers and percentage are obtained. Particularly, the deep trenches i.e., which are encountered natural soil has been studied more comprehensively and the data are well reflected through following histograms and pie-charts to give a fair idea about the ceramic industry of Suabarei.

**Layer wise distribution of pottery**

**Trench XB1/Qdt.2**

<table>
<thead>
<tr>
<th></th>
<th>Layer (1)</th>
<th>Layer (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red ware</td>
<td>324</td>
<td>2430</td>
</tr>
<tr>
<td>Grey ware</td>
<td>704</td>
<td>1651</td>
</tr>
<tr>
<td>Black ware</td>
<td>41</td>
<td>126</td>
</tr>
<tr>
<td>Red slipped ware</td>
<td>1</td>
<td>755</td>
</tr>
</tbody>
</table>
Layer wise distribution of pottery
Trench XB1/Qdt.2

Layer (3)

Layer (4)
Layer wise distribution of pottery
Trench XB1/Qdt.2

- Layer (5)
  - Red ware: 118
  - Grey ware: 200
  - Black ware: 12
  - Dull red ware: 471
  - Red slipped ware: 1558
  - Chocolate slipped ware: 442
  - Black-and-red ware: 12
  - Black slipped ware: 58

- Layer (6)
  - Red ware: 0
  - Grey ware: 22
  - Black ware: 15
  - Dull red ware: 576
  - Red slipped ware: 960
  - Chocolate slipped ware: 405
  - Black-and-red ware: 4
Layer wise distribution of pottery
Trench XB1/Qdt.2

Layer (7)

Red ware  | Grey ware  | Black ware | Dull red ware | Red slipped ware | Chocolate slipped ware
---|---|---|---|---|---
0 | 42 | 26 | 612 | 1029 | 191

Layer (8)

Red ware  | Grey ware  | Black ware | Dull red ware | Red slipped ware | Chocolate slipped ware
---|---|---|---|---|---
0 | 40 | 10 | 253 | 603 | 58
Layer wise distribution of pottery
Trench XB1/Qdt.2

Layer (9)

Layer (10)
Layer wise distribution of pottery
Trench XB1/Qdt.2

- Dull red ware
- Red slipped ware
- Gritty Red ware
- Chocolate slipped ware
- Black-and-red ware

Layer wise distribution of pottery
Trench ZA2/Qdt.4

- Red ware
- Grey ware
- Black ware
Layer wise distribution of pottery
Trench ZA2/Qdt.4

Layer (2)

Red ware: 4729
Grey ware: 1858
Black ware: 146

Layer (3)

Red ware: 326
Grey ware: 531
Black ware: 5
Dull red ware: 5111
Red-slipped ware: 556
Chocolate-slipped ware: 59
Black-slipped ware: 4
Layer wise distribution of pottery
Trench ZA2/Qdt.4

**Layer(4)**

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red ware</td>
<td>201</td>
</tr>
<tr>
<td>Grey ware</td>
<td>99</td>
</tr>
<tr>
<td>Black ware</td>
<td>15</td>
</tr>
<tr>
<td>Dull red ware</td>
<td>1237</td>
</tr>
<tr>
<td>Red slipped ware</td>
<td>862</td>
</tr>
<tr>
<td>Chocolate slipped</td>
<td>140</td>
</tr>
<tr>
<td>Black-and-red ware</td>
<td>5</td>
</tr>
</tbody>
</table>

**Layer(5)**

<table>
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<tr>
<th>Material</th>
<th>Quantity</th>
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</thead>
<tbody>
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<td>Red ware</td>
<td>8</td>
</tr>
<tr>
<td>Grey ware</td>
<td>21</td>
</tr>
<tr>
<td>Black ware</td>
<td>2</td>
</tr>
<tr>
<td>Dull red ware</td>
<td>220</td>
</tr>
<tr>
<td>Red slipped ware</td>
<td>179</td>
</tr>
<tr>
<td>Chocolate slipped</td>
<td>18</td>
</tr>
<tr>
<td>Black-and-red ware</td>
<td>5</td>
</tr>
</tbody>
</table>
Layer wise distribution of pottery
Trench ZA2/Qdt.4

Layer (6)

Layer (7)
Layer wise distribution of pottery
Trench ZA2/Qdt.4
Layer wise distribution of pottery
Trench ZA2/Qdt.4

Layer (10)
- Dull red ware: 7
- Red slipped ware: 19
- Chocolate slipped ware: 13

Layer (12)
- Red slipped ware: 37
Layer wise distribution of pottery
Trench A1/Qdt.2

Layer (1)
- Red ware: 535
- Grey ware: 581
- Black ware: 48

Layer (2)
- Red ware: 2728
- Grey ware: 5453
- Black ware: 404
- Dull red ware: 689
- Red slipped ware: 25
Layer wise distribution of pottery
Trench A1/Qdt.2

Layer (3)

- Red ware: 137
- Grey ware: 172
- Black ware: 120
- Dull red ware: 2119
- Red slipped ware: 1212
- Chocolate slipped ware: 278
- Black-and-red ware: 1
- Black slipped ware: 4

Layer (4)

- Red ware: 39
- Grey ware: 10
- Black ware: 74
- Dull red ware: 1913
- Red slipped ware: 1989
- Chocolate slipped ware: 800
- Black-and-red ware: 4
Layer wise distribution of pottery
Trench A1/Qdt.2

Layer (5)

Dull red ware: 249
Red slipped ware: 138
Chocolate slipped ware: 84

Layer (6)

Red ware: 2143
Grey ware: 1583
Black ware: 748
Dull red ware: 24
Red slipped ware: 25
Chocolate slipped ware: 1
Layer wise distribution of pottery
Trench A1/Qdt.2

Layer (7)
- Dull red ware: 356
- Red slipped ware: 270
- Chocolate slipped ware: 146
- Black slipped ware: 6

Layer (8)
- Dull red ware: 44
- Red slipped ware: 30
- Chocolate slipped ware: 14
Layer wise distribution of pottery
Trench A1/Qdt.2

Layer (9)

Dull red ware  Red slipped ware  Chocolate slipped ware
12  21  20

Layer (11)

Handmade gritty red ware  Red slipped ware  Chocolate slipped ware  Black-and-red ware
62  0  0  0
Layer wise distribution of pottery
Trench A3/Qdt.3

Layer (1)

- Red ware: 1098
- Grey ware: 570
- Black ware: 21
- Dull red ware: 64

Layer (2)

- Red ware: 181
- Grey ware: 864
- Black ware: 41
- Dull red ware: 716
- Red slipped ware: 49
Layer wise distribution of pottery
Trench A3/Qdt.3

Layer (3)

<table>
<thead>
<tr>
<th>Ware Type</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red ware</td>
<td>19</td>
</tr>
<tr>
<td>Grey ware</td>
<td>48</td>
</tr>
<tr>
<td>Dull red ware</td>
<td>925</td>
</tr>
<tr>
<td>Red slipped ware</td>
<td>283</td>
</tr>
<tr>
<td>Chocolate slipped ware</td>
<td>103</td>
</tr>
</tbody>
</table>

Layer (4)

<table>
<thead>
<tr>
<th>Ware Type</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>Red ware</td>
<td>12</td>
</tr>
<tr>
<td>Grey ware</td>
<td>54</td>
</tr>
<tr>
<td>Black ware</td>
<td>15</td>
</tr>
<tr>
<td>Dull red ware</td>
<td>719</td>
</tr>
<tr>
<td>Red slipped ware</td>
<td>294</td>
</tr>
<tr>
<td>Chocolate slipped ware</td>
<td>137</td>
</tr>
</tbody>
</table>
Layer wise distribution of pottery
Trench A3/Qdt.3

Layer (5)

Layer (6)
Layer wise distribution of pottery
Trench A3/Qdt.3

Layer (7)

- Red ware: 9
- Dull Red ware: 23
- Red slipped ware: 17
- Chocolate slipped ware: 4
- Black-and-red ware: 0

Layer (8)

- Dull red ware: 23
- Red slipped ware: 9
Layer wise distribution of pottery
Trench A3/Qdt.3

Table-4 : Distribution of pottery in Qdt.2 of Trench XB1

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Pottery types</th>
<th>Frequency of pottery</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Red ware</td>
<td>3118</td>
<td>12.85</td>
</tr>
<tr>
<td>2.</td>
<td>Grey ware</td>
<td>2896</td>
<td>11.93</td>
</tr>
<tr>
<td>3.</td>
<td>Black ware</td>
<td>312</td>
<td>1.28</td>
</tr>
<tr>
<td>4.</td>
<td>Dull red ware</td>
<td>8623</td>
<td>35.54</td>
</tr>
<tr>
<td>5.</td>
<td>Red slipped ware</td>
<td>7413</td>
<td>30.55</td>
</tr>
<tr>
<td>6.</td>
<td>Chocolate slipped ware</td>
<td>1655</td>
<td>6.82</td>
</tr>
<tr>
<td>7.</td>
<td>Black slipped ware</td>
<td>166</td>
<td>0.68</td>
</tr>
<tr>
<td>8.</td>
<td>Black-and-red ware</td>
<td>66</td>
<td>0.27</td>
</tr>
<tr>
<td>9.</td>
<td>Handmade gritty red ware</td>
<td>12</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>24261</strong></td>
<td><strong>99.96</strong></td>
</tr>
</tbody>
</table>

Table-5 : Distribution of pottery in Qdt.4 of Trench ZA2

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Pottery types</th>
<th>Frequency of pottery</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Red ware</td>
<td>5679</td>
<td>25.32</td>
</tr>
<tr>
<td>2.</td>
<td>Grey ware</td>
<td>3189</td>
<td>14.22</td>
</tr>
<tr>
<td>3.</td>
<td>Black ware</td>
<td>410</td>
<td>1.82</td>
</tr>
<tr>
<td>4.</td>
<td>Dull red ware</td>
<td>8841</td>
<td>39.42</td>
</tr>
<tr>
<td>5.</td>
<td>Red slipped ware</td>
<td>3602</td>
<td>16.06</td>
</tr>
<tr>
<td>6.</td>
<td>Chocolate slipped ware</td>
<td>613</td>
<td>2.73</td>
</tr>
<tr>
<td>7.</td>
<td>Black slipped ware</td>
<td>25</td>
<td>0.11</td>
</tr>
<tr>
<td>8.</td>
<td>Black-and-red ware</td>
<td>27</td>
<td>0.12</td>
</tr>
<tr>
<td>9.</td>
<td>Handmade gritty red ware</td>
<td>37</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>22423</strong></td>
<td><strong>99.96</strong></td>
</tr>
</tbody>
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Table-6: Distribution of pottery in Qdt.2 of Trench A1

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Pottery types</th>
<th>Frequency of pottery</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Red ware</td>
<td>3444</td>
<td>13.59</td>
</tr>
<tr>
<td>2.</td>
<td>Grey ware</td>
<td>6227</td>
<td>24.57</td>
</tr>
<tr>
<td>3.</td>
<td>Black ware</td>
<td>657</td>
<td>2.59</td>
</tr>
<tr>
<td>4.</td>
<td>Dull red ware</td>
<td>7525</td>
<td>29.69</td>
</tr>
<tr>
<td>5.</td>
<td>Red slipped ware</td>
<td>5268</td>
<td>20.79</td>
</tr>
<tr>
<td>6.</td>
<td>Chocolate slipped ware</td>
<td>2090</td>
<td>8.24</td>
</tr>
<tr>
<td>7.</td>
<td>Black slipped ware</td>
<td>28</td>
<td>0.11</td>
</tr>
<tr>
<td>8.</td>
<td>Black-and-red ware</td>
<td>11</td>
<td>0.04</td>
</tr>
<tr>
<td>9.</td>
<td>Handmade gritty red ware</td>
<td>62</td>
<td>0.24</td>
</tr>
<tr>
<td>10.</td>
<td>Painted pottery</td>
<td>25</td>
<td>0.09</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>25337</strong></td>
<td><strong>99.95</strong></td>
</tr>
</tbody>
</table>

Table-7: Distribution of pottery in Qdt.3 of Trench A3

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Pottery types</th>
<th>Frequency of pottery</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Red ware</td>
<td>791</td>
<td>5.82</td>
</tr>
<tr>
<td>2.</td>
<td>Grey ware</td>
<td>2064</td>
<td>15.2</td>
</tr>
<tr>
<td>3.</td>
<td>Black ware</td>
<td>77</td>
<td>0.56</td>
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<tr>
<td>4.</td>
<td>Dull red ware</td>
<td>6397</td>
<td>47.11</td>
</tr>
<tr>
<td>5.</td>
<td>Red slipped ware</td>
<td>2261</td>
<td>16.65</td>
</tr>
<tr>
<td>6.</td>
<td>Chocolate slipped ware</td>
<td>1979</td>
<td>14.57</td>
</tr>
<tr>
<td>7.</td>
<td>Black slipped ware</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8.</td>
<td>Black-and-red ware</td>
<td>4</td>
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</tr>
<tr>
<td>9.</td>
<td>Handmade gritty red ware</td>
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<td>0</td>
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<tr>
<td>10.</td>
<td>Painted pottery</td>
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<td><strong>Total</strong></td>
<td></td>
<td><strong>13577</strong></td>
<td><strong>99.95</strong></td>
</tr>
</tbody>
</table>

Table-8: Distribution of pottery in Suabarei mound

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Pottery types</th>
<th>Frequency of pottery</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Red ware</td>
<td>13032</td>
<td>15.22</td>
</tr>
<tr>
<td>2.</td>
<td>Grey ware</td>
<td>14376</td>
<td>16.79</td>
</tr>
<tr>
<td>3.</td>
<td>Black ware</td>
<td>1456</td>
<td>1.70</td>
</tr>
<tr>
<td>4.</td>
<td>Dull red ware</td>
<td>31386</td>
<td>36.66</td>
</tr>
<tr>
<td>5.</td>
<td>Red slipped ware</td>
<td>18544</td>
<td>21.66</td>
</tr>
<tr>
<td>6.</td>
<td>Chocolate slipped ware</td>
<td>6337</td>
<td>7.40</td>
</tr>
<tr>
<td>7.</td>
<td>Black slipped ware</td>
<td>219</td>
<td>0.25</td>
</tr>
<tr>
<td>8.</td>
<td>Black-and-red ware</td>
<td>108</td>
<td>0.12</td>
</tr>
<tr>
<td>9.</td>
<td>Handmade gritty red ware</td>
<td>111</td>
<td>0.12</td>
</tr>
<tr>
<td>10.</td>
<td>Painted potsherds</td>
<td>29</td>
<td>0.03</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>85598</strong></td>
<td><strong>99.95</strong></td>
</tr>
</tbody>
</table>
Pie-chart showing distribution of pottery

Xβ1/Qtlt.2

- Red ware: 31.1%
- Grey ware: 12.7%
- Black ware: 7%
- Doll red ware: 1%
- Red slipped ware: 1%
- Handmade gritty red ware: 1%

Pottery types: Red ware, Grey ware, Black ware, Doll red ware, Red slipped ware, Handmade gritty red ware

Number of potsherds:
- Red ware: 3118
- Grey ware: 2656
- Black ware: 322
- Doll red ware: 862.3
- Red slipped ware: 740.5

ZA2/Qtd.4

- Red ware: 16.6%
- Grey ware: 16.6%
- Black ware: 25%
- Doll red ware: 3%
- Red slipped ware: 14%
- Chocolate slipped ware: 2%

Pottery types: Red ware, Grey ware, Black ware, Doll red ware, Red slipped ware, Chocolate slipped ware

Number of potsherds:
- Red ware: 679
- Grey ware: 679
- Black ware: 810
- Doll red ware: 8941
- Red slipped ware: 350.2
- Chocolate slipped ware: 613

Pottery types: Chocolate slipped ware, Black slipped ware, Black and red ware, Handmade gritty red ware

Number of potsherds:
- Chocolate slipped ware: 613
- Black slipped ware: 25
- Black and red ware: 27
- Handmade gritty red ware: 37
Pie-chart showing distribution of pottery

<table>
<thead>
<tr>
<th>Pottery types</th>
<th>Number of potsherds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red ware</td>
<td>5444</td>
</tr>
<tr>
<td>Grey ware</td>
<td>6019</td>
</tr>
<tr>
<td>Black ware</td>
<td>697</td>
</tr>
<tr>
<td>Dull red ware</td>
<td>7525</td>
</tr>
<tr>
<td>Red slipped ware</td>
<td>5268</td>
</tr>
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<table>
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<td>Chocolate slipped ware</td>
<td>2090</td>
</tr>
<tr>
<td>Black slipped ware</td>
<td>28</td>
</tr>
<tr>
<td>Black and red ware</td>
<td>31</td>
</tr>
<tr>
<td>Handmade gritty red ware</td>
<td>62</td>
</tr>
<tr>
<td>Painted pottery</td>
<td>25</td>
</tr>
</tbody>
</table>

<table>
<thead>
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<th>Pottery types</th>
<th>Number of potsherds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red ware</td>
<td>791</td>
</tr>
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<td>Grey ware</td>
<td>2641</td>
</tr>
<tr>
<td>Black ware</td>
<td>77</td>
</tr>
<tr>
<td>Dull red ware</td>
<td>6397</td>
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<tr>
<td>Red slipped ware</td>
<td>2281</td>
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<table>
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<th>Number of potsherds</th>
</tr>
</thead>
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<td>Black slipped ware</td>
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</tr>
<tr>
<td>Black and red ware</td>
<td>4</td>
</tr>
<tr>
<td>Handmade gritty red ware</td>
<td>0</td>
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<tr>
<td>Painted pottery</td>
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</table>
Layer wise distribution of pottery shapes

**Layer-1**

<table>
<thead>
<tr>
<th>Pottery Types</th>
<th>Number of Potsherds</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vase</td>
<td>150</td>
<td>79.78</td>
</tr>
<tr>
<td>Bowl</td>
<td>03</td>
<td>1.59</td>
</tr>
<tr>
<td>Basin</td>
<td>02</td>
<td>1.06</td>
</tr>
<tr>
<td>Dish</td>
<td>02</td>
<td>1.06</td>
</tr>
<tr>
<td>Indeterminate shapes</td>
<td>31</td>
<td>16.48</td>
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</table>

**Layer-2**

<table>
<thead>
<tr>
<th>Pottery Types</th>
<th>Number of Potsherds</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vase</td>
<td>396</td>
<td>69.94</td>
</tr>
<tr>
<td>Bowl</td>
<td>15</td>
<td>2.94</td>
</tr>
<tr>
<td>Basin</td>
<td>06</td>
<td>1.17</td>
</tr>
<tr>
<td>Handi</td>
<td>01</td>
<td>0.19</td>
</tr>
<tr>
<td>Miniature pot</td>
<td>01</td>
<td>0.19</td>
</tr>
<tr>
<td>Dish</td>
<td>01</td>
<td>0.19</td>
</tr>
<tr>
<td>Indeterminate shapes</td>
<td>129</td>
<td>25.34</td>
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</tbody>
</table>
Layer wise distribution of pottery shapes

**Layer 3**

<table>
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<tr>
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<th>Number of potsherds</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vase</td>
<td>154</td>
<td>42.92</td>
</tr>
<tr>
<td>Bowl</td>
<td>64</td>
<td>16.15</td>
</tr>
<tr>
<td>Basin</td>
<td>03</td>
<td>0.66</td>
</tr>
<tr>
<td>Lead</td>
<td>05</td>
<td>1.10</td>
</tr>
<tr>
<td>Dish</td>
<td>01</td>
<td>0.22</td>
</tr>
<tr>
<td>Miniature pot</td>
<td>01</td>
<td>0.22</td>
</tr>
<tr>
<td>Bowl on stand</td>
<td>17</td>
<td>3.76</td>
</tr>
<tr>
<td>Storage jar</td>
<td>01</td>
<td>0.22</td>
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<tr>
<td>Indeterminate shapes</td>
<td>166</td>
<td>36.72</td>
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**Layer 4**

<table>
<thead>
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<th>Number of potsherds</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vase</td>
<td>216</td>
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</tr>
<tr>
<td>Bowl</td>
<td>149</td>
<td>25.38</td>
</tr>
<tr>
<td>Basin</td>
<td>12</td>
<td>2.04</td>
</tr>
<tr>
<td>Lead</td>
<td>09</td>
<td>1.53</td>
</tr>
<tr>
<td>Miniature pot</td>
<td>01</td>
<td>0.17</td>
</tr>
<tr>
<td>Bowl on stand</td>
<td>36</td>
<td>5.79</td>
</tr>
<tr>
<td>Storage jar</td>
<td>07</td>
<td>1.19</td>
</tr>
<tr>
<td>Dish</td>
<td>02</td>
<td>0.34</td>
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<tr>
<td>Indeterminate shapes</td>
<td>157</td>
<td>26.74</td>
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</table>
Layer wise distribution of pottery shapes

### Layer-5

<table>
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<th>Number of potsherds</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vase</td>
<td>26</td>
<td>54.16</td>
</tr>
<tr>
<td>Bowl</td>
<td>13</td>
<td>27.08</td>
</tr>
<tr>
<td>Bowl on stand</td>
<td>01</td>
<td>2.08</td>
</tr>
<tr>
<td>Indeterminate shapes</td>
<td>08</td>
<td>16.66</td>
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</table>

### Layer-6

<table>
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<th>Pottery Shapes</th>
<th>Number of potsherds</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vase</td>
<td>273</td>
<td>44.27</td>
</tr>
<tr>
<td>Bowl</td>
<td>56</td>
<td>29.33</td>
</tr>
<tr>
<td>Bowl on stand</td>
<td>06</td>
<td>4.03</td>
</tr>
<tr>
<td>Basin</td>
<td>89</td>
<td>5.58</td>
</tr>
<tr>
<td>Lead</td>
<td>07</td>
<td>3.33</td>
</tr>
<tr>
<td>Dish</td>
<td>08</td>
<td>0.05</td>
</tr>
<tr>
<td>Storage jar</td>
<td>01</td>
<td>0.81</td>
</tr>
<tr>
<td>Indeterminate shapes</td>
<td>37</td>
<td>6.06</td>
</tr>
</tbody>
</table>
Layer wise distribution of pottery shapes

**Layer-7**

<table>
<thead>
<tr>
<th>Pottery types</th>
<th>Number of potsherds</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vase</td>
<td>68</td>
<td>47.55</td>
</tr>
<tr>
<td>Bowl</td>
<td>33</td>
<td>23.87</td>
</tr>
<tr>
<td>Dish</td>
<td>01</td>
<td>6.91</td>
</tr>
<tr>
<td>Lead</td>
<td>11</td>
<td>7.69</td>
</tr>
<tr>
<td>Bowl on stand</td>
<td>09</td>
<td>6.29</td>
</tr>
<tr>
<td>Indeterminate shapes</td>
<td>21</td>
<td>14.68</td>
</tr>
</tbody>
</table>

**Layer-8**

<table>
<thead>
<tr>
<th>Pottery types</th>
<th>Number of potsherds</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vase</td>
<td>08</td>
<td>61.53</td>
</tr>
<tr>
<td>Bowl</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Indeterminate shapes</td>
<td>05</td>
<td>38.46</td>
</tr>
</tbody>
</table>
Layer wise distribution of pottery shapes

**Layer-9**

<table>
<thead>
<tr>
<th>Pottery types</th>
<th>Number of potsherds</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vase</td>
<td>13</td>
<td>24.52</td>
</tr>
<tr>
<td>Bowl</td>
<td>26</td>
<td>52.83</td>
</tr>
<tr>
<td>Knobbed lead</td>
<td>01</td>
<td>1.88</td>
</tr>
<tr>
<td>Miniature pot</td>
<td>01</td>
<td>1.88</td>
</tr>
<tr>
<td>Indeterminate shapes</td>
<td>10</td>
<td>18.86</td>
</tr>
</tbody>
</table>

**Layer-11**

<table>
<thead>
<tr>
<th>Pottery types</th>
<th>Number of potsherds</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vase</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Bowl</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Indeterminate shapes</td>
<td>62</td>
<td>100</td>
</tr>
</tbody>
</table>
Red ware

The red ware is the predominant type among the ceramic industry of Suabarei particularly in layer (1) and layer (2). Further, onwards its number decreases rapidly and almost completely disappeared in layer (7). In the Trench XB1/Qdt.2 red ware made its last appearance in layer (5) (118nos), whereas, on ZA2/Qdt.4 in layer (6) (12nos.), similarily in A1/Qdt.2 red ware is last found on layer (6) (05nos.) and in A3/Qdt.3 its last evidence at layer (7) (09nos.) The red ware is 12.85% in XB1/Qdt.2, 25.32% in ZA2/Qdt.4,13.59% in A1/Qdt.2, 5.82% in A3/Qdt.3 and overall 15.22% of the total ceramic industry of Suabarei.

Probably, this ware was used for day to day work for all purposes. They were found both in ill-fired and well fired made on slow to medium wheel. The ware was invariably thin to medium fabric having blackish grey cores and decorated with incised designs on the rims and shoulders. Most of the shapes of this ware include vase, bowl, basin, handi, storage jar, dish, lead and miniature pots. The vase becomes the predominant shape followed by bowl, basin, lead, storage jar, miniature pot, handi and dish (Pl.19). The percentages of these shapes are given below in tabular form citing Trench A1/Qdt.2.

Table-9 : Distribution of shapes of red ware

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Shapes</th>
<th>Total number of shapes</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Vase</td>
<td>350</td>
<td>52</td>
</tr>
<tr>
<td>2.</td>
<td>Bowl</td>
<td>85</td>
<td>12.63</td>
</tr>
<tr>
<td>3.</td>
<td>Basin</td>
<td>13</td>
<td>1.93</td>
</tr>
<tr>
<td>4.</td>
<td>Lead</td>
<td>08</td>
<td>1.18</td>
</tr>
<tr>
<td>5.</td>
<td>Storage jar</td>
<td>06</td>
<td>0.89</td>
</tr>
<tr>
<td>6.</td>
<td>Miniature pot</td>
<td>02</td>
<td>0.29</td>
</tr>
<tr>
<td>7.</td>
<td>Handi</td>
<td>01</td>
<td>0.14</td>
</tr>
<tr>
<td>8.</td>
<td>Dish</td>
<td>01</td>
<td>0.14</td>
</tr>
<tr>
<td>9.</td>
<td>Indeterminate shapes</td>
<td>207</td>
<td>30.75</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>673</td>
<td>99.95</td>
</tr>
</tbody>
</table>
Selected pottery description (Fig.15)

1. Fragment of a vase of red ware with an out-turned projected and flanged rim and tapering shoulders, of fine fabric, wheel made and well fired. A horizontal groove and a raised ridge is noticed at the bottom part of the rim.

2. Fragment of a vase of red ware with an out-turned projected and flanged rim and constricted neck. It is wheel made, of fine fabric and well fired.

3. Fragment of a storage pot with an out-turned projected rim, globular body, constricted but concave neck and two horizontal lines at the bottom portion of rim at the inner side. It is wheel made, of fine fabric and showing an oxidized core.

4. Fragment of a vase, slightly flared-out collared rim, concave neck and a ridge at the outer shoulder. It is made on fast wheel, of medium fabric and showing a semi-oxidized core due to ill-firing.

5. Fragment of a globular pot with an out-turned projected rim and short neck. It is of wheel made, of fine fabric and showing an oxidized core at the section.
6. Fragment of a vase with straight sided neck, oblique shoulders and projected and out turned rim. A ridge is marked at the shoulder of the potsherd on outer side. It is wheel made, of medium fabric and well fired.

7. Fragment of a vase with constricted concave neck, an outward projected rim with a ridge at the bottom of the rim at the inner portion. A horizontal groove is also noticed at the top of the rim at the inner side. It is wheel made, of fine fabric showing oxidized core.

8. Fragment of a handi of red ware with projected an out-turned and flanged rim, constricted neck and a ridge at the shoulder. It is of wheel made, of medium fabric and well fired. The thickness of the section is narrowed down from top to bottom.

9. Fragment of a vase of red ware with slightly an out-turned projected and flanged rim, possibly of globular body and constricted neck. The bottom portion of the rim particularly at the inner side is represented with a ridge. It is made, of fine fabric and well fired.

10. Fragment of a vase with an out-turned projected and flanged rim, constricted neck and oblique side. It is made of fast wheel, of fine fabric, well fired and its thickness at the section narrowed down from top to bottom.

11. Fragment of a handi of red ware with constricted neck, globular body and out-turned flanged rim. A horizontal line of groove is noticed at the bottom portion of the rim at the inner side. It is well fired, wheel made and of fine fabric.

12. Fragment of a high tapering neck of a pot of red ware and possibly with globular body, is made on slow wheel, of medium fabric and showing a semi-oxidized core.

13. Fragment of a bowl with tapering sides and slightly in-turned featureless rim. It is made on medium wheel, of coarse fabric and well fired but its core remains black in colour.

14. Fragment of a vase of red ware with an out-turned rim, oblique shoulder and concave neck. A series of short oblique incised lines are noticed at the shoulder. It is well fired, of medium fabric and made on slow wheel.
Grey ware

The grey ware is another predominant type among the ceramic industry of Suabarei. The numbers of grey wares are higher in layer (1) in comparison to red ware and in layer (2) it appeared as *vice-versa*. From layer (3) onwards its number decreases rapidly and completely disappeared in layer (10). In the Trench XB1/Qdt.2 grey ware made its last appearance in layer (10) (12nos), whereas, on ZA2/Qdt.4 in layer (9) (01nos.), similarly in A1/Qdt.2 the ware is last found on layer(6) (11nos.) and in A3/Qdt.3 its last evidence at layer(4) (54nos.) The grey ware is 11.9% in XB1/Qdt.2, 14.22% in ZA2/Qdt.4, 24.6% in A1/Qdt.2, 15.2% in A3/Qdt.3 and overall 16.79% of the total ceramic industry of Suabarei.

This ware was mostly of utilitarian character for day to day work for all purposes and few of them used for storage. They were found both in ill-fired and well fired made on slow to medium wheel. The ware was invariably fine to medium fabric having blackish grey cores and decorated with incised designs on the rims and shoulders. The shapes of this ware include vase, bowl, basin, storage jar and dish. The vase becomes the predominant shape followed by bowl, basin, storage jar and dish (*Pl.20*). The percentages of these shapes are given below in tabular form citing Trench A1/Qdt.2.
Table-10: Distribution of shapes of grey ware

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Shapes</th>
<th>Total number of shapes</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Vase</td>
<td>174</td>
<td>79.81</td>
</tr>
<tr>
<td>2.</td>
<td>Bowl</td>
<td>06</td>
<td>2.75</td>
</tr>
<tr>
<td>3.</td>
<td>Basin</td>
<td>06</td>
<td>2.75</td>
</tr>
<tr>
<td>4.</td>
<td>Indeterminate shapes</td>
<td>32</td>
<td>14.67</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>218</td>
<td>99.98</td>
</tr>
</tbody>
</table>

Selected pottery description (Figs.16-17)

1. Fragment of a vase of grey ware, constricted neck with an out-turned and flattened rim with slightly oblique sides, fine fabric and has fully oxidized core.

2. Fragment of a jar of grey ware with an out-turned, projected and flanged rim and tapering shoulder, fine fabric, bulbous shape with semi-oxidized core, three thin parallel grooves at the inner side of the rim.

3. Fragment of a vessel of grey ware with rounded flattened rim, constricted neck, bulbous body, medium fabric, fully oxidized core and having two simple thin parallel grooves inside section of the rim.
4. Fragment of a jar of grey ware with an out-turned, projected and flanged rim and tapering shoulder, medium fabric, bulbous shape with semi-oxidized core, one thick incised parallel groove at the inner part of the rim.

5. Fragment of a jar of grey ware with an out-turned projected and flanged rim and tapering shoulder with low neck, medium fabric, fully oxidized core, five thin parallel grooves at the inner portion of the rim.

6. Fragment of globular vase with low height concave neck, fine fabric with semi-oxidized core.

7. Fragment of a globular pot with short concave neck, flared rim and possibly has an elongated bulbous body, medium fabric with semi-oxidized core.

8. Fragment of a vase of grey ware with an out-turned rim, fine fabric, fully oxidized core with constricted neck and bulbous body.


10. Fragment of a globular vase with an out-turned rim, low neck and medium fabric with semi-oxidized core.

11. Fragment of a vase of grey ware with an out-turned, projected and flanged rim, slightly oblique sides, fine fabric, well fired having fully oxidized core and four thin parallel grooves are engrave at the inner face of the rim.

12. Fragment of a jar of grey ware with a constricted neck and an out-turned flanged rim, tapering shoulders, fine fabric and bulbous shape with fully oxidized core. Series of thin parallel lines/grooves are noticed below the neck at the outer surface and two deep groove lines marked parallel at the inner portion of the rim.

13. Fragment of a small deep basin with an externally curved collared rim and a broad ridge at the neck. A series of thin horizontal lines are also incised below the neck. It is of fine fabric, wheel made and well fired showing fully oxidized core.

14. Fragment of a small bowl of grey ware with featureless incurved rim, of fine fabric, showing a semi oxidized core and carination is noticed at the body part of the sherd.

15. Fragment of a vase of grey ware with a slightly thickened an out-turned rim, flat at the top, straight sides, of medium fabric and showing an incomplete oxidized core.
16. Fragment of a vase of grey ware with slightly an out-turned flattened rim, short concave neck, bulbous body, medium fabric, semi-oxidized core and having two thin parallel grooves at the inner section of the rim.

17. Fragment of a vase, bulbous body with an out-turned rounded flattened rim, constricted neck, medium fabric, fully oxidized core and having a raised ridge in between body parts and the rim at the inner side of the potsherd.
Fig. 17: Grey ware
18. Fragment of a shallow basin with slightly an out-turned flat rim, oblique sides, of medium fabric and showing an incomplete oxidized core.

19. Fragment of a globular pot of grey ware with short concave neck, flattened rim, possibly having bulbous body, medium fabric, and ill-fired showing semi-oxidized core.

20. Fragment of a globular pot of grey ware with short concave neck, flattened rim, possibly having bulbous body, fine fabric and well fired showing fully oxidized core.

21. Fragment of a small storage pot with straight sides, flanged out flat rim with two parallel thick groove lines at the top. It is wheel made, of medium fabric and well fired showing fully oxidized core.

22. Fragment of a jar of grey ware with an out-turned, projected, flanged rim and has tapering shoulders. It is bulbous in shape, wheel made, fine fabric and of well fired. Two thin parallel line groves are noticed at the inner side of the rim.

Pl.20 : Grey ware
Dull red ware

The dull red ware is the leading non-burnished/slipped category ware among the ceramic industry of Suabarei. Heterogeneous materials like husk and grit have been profusely used. The ware was invariably sturdy thick to medium blackish grey cores and decorated with incised designs on the rims. Some sherds of only red wash have also been recovered. These were found both ill-fired and well fired and made on slow to medium wheel. The ware is of medium texture and fabric (Pl.21).

The dull red ware appeared mostly in layer (2) in all the trenches except A3/Qdt.3 where it is found in layer (1). Its main concentration is found in between layer (3) and layer (6). Its number then decreases rapidly and almost completely disappeared in layer (10). In the Trench XB1/Qdt.2 the ware made its last appearance in layer (10) (55nos), whereas, on ZA2/Qdt.4 in layer (10) (07nos.), similarly in A1/Qdt.2 chocolate slipped ware is last found on layer (9) (12nos.) and in A3/Qdt.3 its last evidence at layer (9) (1242nos.) The chocolate slipped ware is 35% in XB1/Qdt.2, 40% in ZA2/Qdt.4, 30% in A1/Qdt.2, 47% in A3/Qdt.3 and overall 36.66% of the total ceramic industry of Suabarei.

Pl.21 : Dull red ware
The shapes of this ware include vase, bowl, basin, lead and dish. The vase becomes the predominant shape followed by bowl, basin, dish and lead. The vases are prepared by semi-levigated clay ill-fired and tempered with husk and grit. The rims are thickened turning either inward or outward. The bowls are featured either by the thick incurved rims or convex sided square-cut rims with a mild groove below the rim on the exterior surface. Spheroid bowls are frequently found. The percentages of these shapes are given below in tabular form citing Trench A1/Qt.2.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Shapes</th>
<th>Total number of shapes</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vase</td>
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<td>52.29</td>
</tr>
<tr>
<td>2</td>
<td>Bowl</td>
<td>30</td>
<td>13.76</td>
</tr>
<tr>
<td>3</td>
<td>Basin</td>
<td>04</td>
<td>1.83%</td>
</tr>
<tr>
<td>4</td>
<td>Lead</td>
<td>02</td>
<td>0.91%</td>
</tr>
<tr>
<td>5</td>
<td>Dish</td>
<td>03</td>
<td>1.37%</td>
</tr>
<tr>
<td>6</td>
<td>Indeterminate shapes</td>
<td>65</td>
<td>29.81%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>218</td>
<td>99.97</td>
</tr>
</tbody>
</table>

Distribution of shapes of dull red ware

![Distribution of shapes of dull red ware](image)
Selected pottery description (Fig.18)

1. Fragment of a shallow bowl with tapering sides and slightly in-turn flat rim. It is wheel made, of medium fabric and has showing oxidized core at the section.

2. Similar to Sl.No.1 except has a semi-oxidized core at the section.

3. Fragment of a vase with an out-turned projected flat rim, concave neck. It is made on slow wheel, of coarse fabric and has semi-oxidized core.

4. Fragment of a deep bowl of dull red ware with tapering sides, beveled-out flat rim. The edge of the rim bears a series of short horizontal cuts. It is wheel made, of fine fabric and well fired.

5. Fragment of a deep bowl with featureless flat edge rim and convex sides. A raised ridged is noticed at the inner part of the sherd and short vertical wavy lines at the edge of the rim. It is of medium fabric, wheel made and well fired, showing fully oxidized core at the section.

6. Fragment of a basin of dull red ware with projected and outward flat rim having a ridge at the middle and a regular punching (beaded) design at the top of the rim. The thickness of the section is narrowed down from top to bottom. It is well fired having fully oxidized core, of medium fabric and wheel made.

7. Fragment of a bowl of dull red ware with tapering sides, slightly out-turned flat rim and a horizontal groove mark at the neck. It is made on slow wheel, of medium fabric and has showing semi-oxidized core at the section.

8. Fragment of a shallow dish of dull red ware with convex side profile and beveled-in rim. It is of medium fabric, wheel made and well fired but has a dark black patch at the section. A series of incised vertical lines slanting to the left is noticed at the edge of the rim.

9. Fragment of a dish of dull red ware with convex sides and slightly beveled-out rim. The edge portion of the rim bears a band of incised hatched pattern. It is wheel made, of medium fabric and showing a semi-oxidized core at the section due to ill-firing.

10. Fragment of a dish with tapering sides and beveled-in flat rim. The edge of the flat rim is decorated with a series of short vertical wavy lines. It is well fired, of medium fabric and wheel made.
11. Similar to Sl.No.2.

12. Similar to Sl.No.8 except has a thin horizontal line on the outer section of the flat rim.

13. Fragment of a shallow bowl of dull red ware with oblique/tapering sides and has slightly an out-turned nail headed rim. It is wheel made, of medium fabric showing semi-oxidized core at the section.
14. Fragment of a vase with projected and out-turned flat rim, concave neck, a series of oblique incised lines at the shoulder, of medium fabric, well fired and made on slow wheel.

**Chocolate slipped ware**

The ware is called so because a thick coat of chocolate colour slip is applied on the exterior as well as on the interior sides of the pot before firing. Some of them are blackish in colour instead of chocolate colour due to heavy firing. The pots are all wheel-made and the texture and fabric are fine to medium. This ware appeared mostly in layer (2) and (3) of all the trenches and its highest concentration is noticed on layer (6). Its number then decreases rapidly and almost completely disappeared in layer (10). In the Trench XB1/Qdt.2 the ware made its last appearance in layer (10)(44nos), whereas, on ZA2/Qdt.4 in layer (10) (13nos.), similarly in A1/Qdt.2 chocolate slipped ware is last found on layer (9) (20nos.) and in A3/Qdt.3 its last evidence at layer (9) (273nos.) The chocolate slipped ware is 7% in XB1/Qdt.2, 3% in ZA2/Qdt.4, 8% in A1/Qdt.2, 15% in A3/Qdt.3 and overall 7.4% of the total ceramic industry of Suabarei. The shapes of this ware include vase, bowl, bowl on stand, basin, storage jar, dish, lead, knobbed lead, high necked pot and miniature pot. The vase becomes the predominant shape followed by bowl, bowl on stand, lead, dish, storage jar and miniature pot (Pl.22). The percentages of these shapes are given below in tabular form citing Trench A1/Qdt.2.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Shapes</th>
<th>Total number of shapes</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Vase</td>
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</tr>
<tr>
<td>2.</td>
<td>Bowl</td>
<td>135</td>
<td>22.09</td>
</tr>
<tr>
<td>3.</td>
<td>Bowl on stand</td>
<td>32</td>
<td>5.23</td>
</tr>
<tr>
<td>4.</td>
<td>Basin</td>
<td>01</td>
<td>0.16</td>
</tr>
<tr>
<td>5.</td>
<td>Lead</td>
<td>09</td>
<td>1.47</td>
</tr>
<tr>
<td>6.</td>
<td>Dish</td>
<td>02</td>
<td>0.32</td>
</tr>
<tr>
<td>7.</td>
<td>Storage jar</td>
<td>01</td>
<td>0.16</td>
</tr>
<tr>
<td>8.</td>
<td>Knobbed lead</td>
<td>01</td>
<td>0.16</td>
</tr>
<tr>
<td>9.</td>
<td>Miniature pot</td>
<td>01</td>
<td>0.16</td>
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<tr>
<td>10.</td>
<td>Indeterminate shapes</td>
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<td>20.62</td>
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<td></td>
<td><strong>Total</strong></td>
<td><strong>611</strong></td>
<td><strong>99.89</strong></td>
</tr>
</tbody>
</table>
Pl. 22: Chocolate slipped ware
Selected pottery descriptions (Figs.19-21)

1. Fragment of a vessel with high concave neck, an out-turned rim, semi-oxidized core due to ill-firing, medium fabric, both interior and exterior coated with chocolate slip and burnished, made on first wheel.

2. Fragment of a deep bowl with featureless rim with slightly tapering sides, medium fabric, semi-oxidized core due to ill-firing, made on first wheel, treated with chocolate slip and well burnished.

3. Fragment of a vase made on first wheel with high somewhat concave neck with slightly edge out featureless rim, medium fabric, semi-oxidized core due to ill-firing and chocolate slip applied both inner and outer face of the potsherd.

4. Fragment of a vessel made on first wheel with high concave neck, slightly out-turned rim, semi-oxidized core due to ill-firing, medium fabric, both interior and exterior portion of the potsherd coated with chocolate slip and burnished.

5. Fragment of a dish with an in-turned featureless rim, medium fabric, smoky core due to ill-firing and coated with chocolate slip.

6. Fragment of a vase with externally curved featureless rim with concave neck, medium fabric, semi-oxidized core coated with chocolate slip in both inner and outer surface of the sherd.

7. Fragment of a vase with extremely splayed out featureless rim with almost straight sides, medium fabric, semi-oxidized core due to ill-firing, both inner and outer surface of the potsherd is coated with thin slip of chocolate colour.

8. Fragment of a high necked jar with splayed-out beaked rim, bulbous semi-oxidized body treated with chocolate slip and the outer portion of slip is fully weathered. It is made on fast wheel and of medium fabric.

9. Fragment of a vase with high neck, beaked out/spayed out featureless rim, possibly with elongated body and slightly rounded edge, made on first wheel, medium fabric, semi-oxidized core due to ill-firing, thin slip of chocolate colour both at the inner and outer surface.
Fig. 19: Chocolate slipped ware
Fig. 20: Chocolate slipped ware
Fig. 21: Chocolate slipped ware
10. Fragment of a vase made on first wheel coated with chocolate slip in both side has semi-oxidized core, medium fabric with high concave neck and splayed out featureless rim.

11. Fragment of a concave necked, small ovaloid vessel with slightly splayed out rim made on fast wheel treated with chocolate slip in both sides and is showing semi-oxidized core due to ill-firing. Sign of peeling off of slip is also noticed.

12. Fragment of a vase with splayed out featureless rim, slightly straight sides, medium fabric, semi-oxidized core due to ill-fired, made on first wheel.

13. Fragment of a deep basin with splayed-out externally flat rim, tapering sides and probably a rounded bottom. The fully oxidized body is treated with chocolate slip both in inner and outer side, of medium fabric and made on fast wheel.

14. Fragment of a deep basin with nail headed rim, short vertical sides with a horizontal ridge at the body part of the sherd and probably has a rounded bottom, made of fine fabric, oxidized core and burnished, is treated with chocolate slip.

15. Fragment of a basin with averted rim, tapering sides, made on fast wheel fully oxidized core due to well firing, fine fabric treated with chocolate slip on both inner and outer side of the potsherd.

16. Fragment of a small vase with featureless flared out rim, oblique sides, medium fabric, semi-oxidized core and treated with chocolate slip.

17. Fragment of a basin made on first wheel with averted rim and tapering sides, medium fabric, semi-oxidized core due to ill firing coated with chocolate slip on both sides.

18. Fragment of a shallow basin with featureless in-turned rim and tapering sides, medium fabric and made on first wheel coated with thin slip of chocolate colour.

19. Fragment of a base of a bowl having discular flat ring base, made of fast wheel, medium fabric and well fired. Both inner and outer side of the bowl is coated with a thin coat of chocolate slip during its leather hard condition.

20. Fragment of a base of a bowl having discular flat ring base, made of fast wheel, medium fabric and well fired. Both inner and outer side of the bowl is coated with a thin coat of chocolate slip during its leather hard condition.
The base is broken into many pieces and mended by adhesive. Sign of peeling off of slip is also noticed.

21. Fragment of a basin made on first wheel with everted rim and tapering sides, coated with thin slip of chocolate colour and burnished, medium fabric, semi-oxidized core due to ill-firing.

22. Fragment of a straight side bowl with a featureless flat rim and probably a rounded base, medium in profile showing coarse fabric, well fired with fully oxidized core. It is made on fast wheel and coated with chocolate slip on both sides.

23. Fragment of a low necked jar with out-turned rim, has a single line of incised groove at the neck and vertical incised lines at the rim, made on fast wheel, of medium fabric, showing semi-oxidized core due to ill-firing, chocolate colour slip is applied on both side of the potsherd.

24. Fragment of a low necked jar with an out-turned rim has a single line of incised groove at the neck and vertical incised lines at the rim, made on fast wheel, of medium fabric showing semi-oxidized core, both side of the potsherd coated with chocolate colour slip.

25. Fragment of a low concave neck small vessel with an out-turned flat rim with a ledge at the inner edge of the rim, of medium fabric, showing semi-oxidized core, a thin coat of chocolate slip is applied on both side of the potsherd.

26. Fragment of a deep basin with featureless flat rim and oblique sides, made on fast wheel, medium fabric, showing semi-oxidized core and treated with chocolate slip on both sides.

27. Fragment of a shallow basin with splayed out sides and flat rim. It has carination at the west and below which incised oblique lines are carved, showing an oxidized core due to well firing, of fine fabric, made on fast wheel and coated with deep chocolate colour slip on both sides.

28. Two fragments of a vase mended together has externally splayed-out collared rim having oblique nail tip designs at the top and a groove with ledge at the neck of the vase. It has concave neck, of medium fabric and well fired. Both side of the potsherd is coated with chocolate slip.

29. Fragment of a deep basin with short and flat out-curved rim and tapering sides, probably rounded at the base, made on fast wheel, medium fabric,
ill-fired showing semi-oxidized core and treated with chocolate slip on both sides.

30. Fragment of a jar with an out-turned thickened rim having slightly tapering sides, of medium fabric showing a semi-oxidized core due to ill-firing, treated externally with a thin coat of chocolate slip.

31. Fragment of a deep basin with splayed out internally beaked rim and a line of cord impression (?) is noticed on the top edge of the rim. It has tapering sides and rounded bottoms. Both inner and outer sides are coated with chocolate slip. It is of medium fabric, made on fast wheel and showing oxidized core due to ill-firing.

Perforated ware

Fragments of perforated vessels were retrieved in a limited number from the Chalcolithic level at Suabarei. The characteristic types of pots are largely fragmentary in nature and mostly found in between layers (4) and (6). The specimens reported from the site shows pre-firing perforation except the solitary piece of fragmented base of a bowl. The perforation were undertaken by pushing round implement or stick through the body invariably from the outside when the clay is in leather hard condition. After the perforation no efforts seems to have made to smoothen both the outer and inner edges. The holes are of different diameter, at times fallowing certain patterns and sometimes randomly on the pot. It mostly confined to certain part of the pot as evidenced by the finding specimens. All the specimens are of red ware, wheel turned, medium to fine fabric and texture. The surface is generally treated with a fine red slip/wash as its traces are noticed both on inner and outer side of the potsherds. The function of these perforated vessels might have been used for many purposes viz., storing food or other house hold material, steaming, boiling, roasting, sieving a variety of food products, as lamp cover or lead and may have utilized like an incense brazier or for ceremonial purpose (Pl.24).

Selected pottery description (Fig.22 and Pl.23)

1. A body-sherd of a perforated cylindrical vase, used for multi-purpose, has a thin coat of white colour wash (lime?), made on first wheel, medium fabric with semi-oxidized core showing smoky patches at the section of the potsherd.
2. A body-sherd of a perforated cylindrical vase, used for multi-purpose, made on first wheel, medium fabric with semi-oxidized core showing a thin colour smoky patch at the middle of the section of the potsherd.

3. Fragmented body-sherd of a perforated cylindrical vase used for multi-purpose, made on first wheel, medium fabric and ill-fired. Faint traces of red colour wash (ochre?) is noticed both on inner and outer surface of the sherd.

4. Fragmented body-sherd of a perforated cylindrical vase made on first wheel, medium fabric and ill-fired, traces of red colour wash (ochre?) is evidenced at the inner portion of the body-sherd.

5. A fragmented body-sherd of a perforated cylindrical vase having traces of red colour wash (ochre?) on both sides, made on first wheel, medium fabric and ill-fired.
Pl. 23: Perforated ware
Pl. 24: Base of a perforated pot
Black-and-red ware

The black-and-red ware is the hallmark of the ceramic industry of the Chalcolithic period and it is treated as the deluxe ware of this period. The outer surface is marked with a thick coat of red slip up to the neck while the inner surface and the rim portion of the outer surface is rendered with a burnished black surface. They are all made out of well levigated and medium to fast wheel. The ware is fine in texture and medium to thin in fabric. Besides, these classical varieties, some specimen of plain black-and-red ware are also found in this period. They are featured by red slip on the exterior and black slip in the interior but irregular patches of black slip is found on the exterior part of the pot. The vase becomes the predominant shape followed by bowl. Besides, small jar and dish of both shallow and deep varieties are also found at Suabarei.

The number of black-and-red ware is very scanty (108nos.) in the ceramic industry of the Suabarei. This ware appeared mostly in between layers of (2) to (8) of all the trenches. Its highest concentration is noticed in between layer (3) and layer (5). Its number then decreases slowly and almost completely disappeared in layer (8). In the Trench XB1/Qdt.2 the ware made its last appearance in layer (6) (4nos.) whereas, on ZA2/Qdt.4 in layer (8) (8nos.), similarly in A1/Qdt.2 this ware is last found on layer (6) (1no.) and in A3/Qdt.3 it evidences only in layer (7) (4nos.) The black-and-red ware is 0.27% in XB1/Qdt.2, 0.12% in ZA2/Qdt.4, 0.04% in A1/Qdt.2, 0.02% in A3/Qdt.3 and overall 0.12% of the total ceramic industry of Suabarei.

The percentages of these shapes are given below in tabular form citing Trench A1/Qdt.2.

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<th>Sl. No.</th>
<th>Shapes</th>
<th>Total number of shapes</th>
<th>Percentage (%)</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Vase</td>
<td>02</td>
<td>66.66</td>
</tr>
<tr>
<td>2.</td>
<td>Bowl</td>
<td>01</td>
<td>33.33</td>
</tr>
<tr>
<td>3.</td>
<td>Dish</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>03</strong></td>
<td><strong>99.99</strong></td>
</tr>
</tbody>
</table>
Pl. 25: Black-and-red ware
Pl.26: Black-and-red ware
Selected pottery description (Fig.23, Pls.25-26)

1. Fragment of a deep dish with slightly flared-out rim, tapering sides, medium fabric, made on fast wheel, well fired showing dark grey colour at the section. The outer rim and inner portion of the sherd is black and remaining portion has red slip is also noticed.

2. Fragment of a shallow dish with slightly in-turned flat rim and oblique sides. The inner and outer portion of the upper part of rim has blackish in colour and remaining due to inverted firing technique and remaining portions have red slip. It is made on fast wheel, well fired showing burnished grey core at the section and of medium fabric.

3. Fragment of a deep dish, oblique sides and slightly in-turned rim at the top. It is made on fast wheel, of medium fabric, well fired and coated with red slip except the rim which seems black in colour.

4. Fragment of a deep dish with slightly flared-out rim, tapering sides, medium fabric, made on fast wheel, well fired showing dark grey colour at the section. The right corner of the sherd at the exterior and fully the inner side has black colour and remaining portion has a coat of red slip.

5. Fragment of a shallow bowl with tapering sides and slightly in-turned flat rim. It is wheel made and coated with red slip except the rim which seems black in colour due to firing technique. It is made of medium fabric and well fired showing burnished grey in section.

6. Fragment of a deep dish with tapering sides and slightly in-turned flat rim. The inner portion is black in colour whereas the outer portion has a thin coat of red slip. It is made on medium wheel, of medium fabric and well fired having dark grey colour in the section.

7. Fragment of a vase with high concave neck and splayed-out featureless rim, made on fast wheel, fine fabric and well fired having dark grey section and red slip coating both inner and outer side. The rim portion (inner and outer side) is black in colour due to firing technique.
Fig. 23: Black-and-red ware
8. Fragment of a deep bowl/dish with tapering sides and splayed-out rims, made on fast wheel, of medium fabric and well fired showing burnished grey colour in section. The outer side except the rim is black and inner side coated with chocolate slip. Sign of peeling off of colour is noticed by way of small holes both inner and outer side of the potsherd.

9. Fragment of a vase with flared-out rim and has high concave neck. It is made on fast wheel, fine fabric and well fired. Light black colour is noticed at the outer corner left side of rim and inner side of the sherd and remaining portion coated with red slip.

10. Fragment of a shallow dish with slightly featureless in-turn rim and has coated with chocolate slip except at the rim portion, both inner and outer which is black in colour, made on fast wheel, fine fabric and has oxidized core showing dark grey in colour.

11. Fragment of a deep bowl, tapering sides but slightly in-turned rim at the top. It is made on fast wheel, of medium fabric, well fired having dark brown colour at the section. The outer side of the rim and inner portion of the full sherd is in black colour, whereas outer portion has peeled off red slip.

12. Fragment of a small jar with out-turned collared rim, globular body and short constricted neck. It is made on fast wheel, medium fabric, well fired. Peeling sign of slip is clearly noticed at the sherd. The outer rim portion and the inner side of the sherd are fully black in colour and the remaining surfaces has red colour.

**Red slipped ware**

The red slipped ware is another important pottery of the non-burnished variety in the ceramic industry of Suabarei. The ware is called so because a thick coat of red colour slip is applied on the exterior as well as on the interior sides of the pot before firing. The colour of the pot varied from light red to deep red colour depends on the basis of the thickness of the slip and firing. The pots are all wheel-made and the texture and fabric are fine to medium. Rims are decorated with incised wavy and vertically oblique lines.
This ware appeared mostly in between layer (2) and layer (10) of all the trenches except XB1/Qdt.2 where it made its first appearance in layer (1). Its highest concentration is noticed in layers (3), (4), (5) and (6). Its number then decreases and almost completely disappeared in layer (10). In the Trench XB1/Qdt.2 the ware made its last appearance in layer (10) (148nos), whereas, on ZA2/Qdt.4 in layer (10) (19nos.), similarly in A1/Qdt.2 this ware is last found on layer (9) (21nos.) and in A3/Qdt.3 its last evidence at layer (9) (353nos.). The red slipped ware is 30.6% in XB1/Qdt.2, 16.06% in ZA2/Qdt.4, 20.8% in A1/Qdt.2, 16.65% in A3/Qdt.3 and overall 21.66% of the total ceramic industry of Suabarei.

The predominant shapes of this ware are vase, bowl, bowl-on-stand, basin, lead, dish and storage jar. The vases have either splayed out or square cut or vertically thickened rims. Sherds are mostly of fine texture and medium fabric. The bowls have featureless out curved or everted or convex-sided rims. Lids with control knob are represented by featureless rims and incurved sides. The basins have featureless rims with weak groove decoration on the inner side. Jars have internally beveled everted or square cut rims. The carinated handis with their splayed-out, square-cut rims and mild grooves just above the neck are featured by incised designs (Pl.27).

The percentages of these shapes are given below in tabular form citing Trench A1/Qdt.2.

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Shapes</th>
<th>Total number of shapes</th>
<th>Percentage (%)</th>
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<td>38.84</td>
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<td>2.</td>
<td>Bowl</td>
<td>187</td>
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<td>3.</td>
<td>Bowl-on-stand</td>
<td>64</td>
<td>7.51</td>
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<td>4.</td>
<td>Basin</td>
<td>02</td>
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<tr>
<td>5.</td>
<td>Lead</td>
<td>13</td>
<td>1.52</td>
</tr>
<tr>
<td>6.</td>
<td>Dish</td>
<td>08</td>
<td>0.93</td>
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<tr>
<td>7.</td>
<td>Storage jar</td>
<td>02</td>
<td>0.23</td>
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<tr>
<td>8.</td>
<td>Indeterminate shapes</td>
<td>245</td>
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<td>Total</td>
<td>852</td>
<td>99.95</td>
<td></td>
</tr>
</tbody>
</table>
Pl. 27: Red slipped ware
Selected pottery description (Figs.24-25)

1. Fragment of a vase with externally flared out collared rim having oblique nail tip designs, short and concave neck with a horizontal groove below the rim. The slip is already peeled off, it is made on fast wheel, fine fabric but ill-fired as both smoky ash patches are noticed at the core part of the section.

2. Fragment of a shallow bowl with nail tip and beaked out rim, tapering sides, of fine fabric, well fired and has coated with a thin coat of red slip on either side of the potsherd.

3. Fragment of a highly tapering neck of a jar, projected and flared-out featureless rim. It has cylindrical and narrow neck but wide-open mouth. It appears to be wheel made, of medium fabric, well fired showing a dark black colour section at the core. Peeling off of slip is noticed and traces of red slip found in some places.

4. A high raised ring base with hallow inside of a bowl, of medium fabric, ill-fired and coated with thin coat of red slip both at the inner and outer part of the sherd.

5. Fragment of a vase with externally flared out flat rim, concave neck and a horizontal ridge at the shoulder. The pottery is of fine fabric, made on fast wheel, well fired showing dark grey core at the section.

6. Fragment of a vase with externally flared-out rim with a groove on the top and has a concave neck. A horizontal ridge with oblique cut lines is marked at the shoulder part of the pot. It is made on fast wheel, of medium fabric, well fired having a dark grey colour in section. A thin coat of red slip is applied on either side of the potsherd.

7. Fragment of a bowl having convex sides and in-turned featureless rim. It is made on fast wheel, of medium fabric, well fired having dark grey colour and has thin coat of red slip on either side of the sherd. Sign of peeling off of slip is also noticed at the outer portion of the bowl.

8. Fragment of a vase with high neck and flat rim executed with oblique nail tip designs at the top. A horizontal line of groove/ribling is noticed at the
neck and has convex side body. It is made on fast wheel, of fine fabric and well fired having dark grey section at the core.

9. Fragment of a basin, externally flared out collared rim with nail tip incised design at the top, tapering sides and section narrowed down from top to bottom. It is of medium fabric, well fired with a dark black core. A thin coat of red slip applied on either side of the pot.

10. Fragment of basin/bowl, medium fabric has externally collared rim with the designs of oblique incised lines and two bold ridges at the body. Made on fast wheel, it is well fired having a core of dark grey colour. A thin coat of red slip is applied on both side of the pot but sign of peeling off of colour is marked.

11. Fragment of a vase with an out-turned rim, short and concave neck and probably has a globular body. It is made on fast wheel, of medium fabric and well fired but have a narrow grey layer at the section. A thin coat of red slip is applied on both side of the sherd.

12. Fragment of a deep basin, out-turned collared rim but flat at the top with a narrow groove at the middle of it. The thickness of the section narrowed down from top to bottom. It is of wheel made, of medium fabric and well fired. A thin coat of red slip is applied over the sherd but few traces of it are only now traceable.

13. Fragment of a deep basin with an out-turned collared rim but flat at the top. The thickness of the section downward from top to bottom. The thin coat of red slip was washed out at the outer side but it traces can be noticed at the inner side. It is of wheel made, of medium fabric and well fired.

14. Fragment of a basin with a collared out-turned rim, flat at the top and a narrow groove on it. It is made on fast wheel, of medium fabric, well fired but has a thin grey core at the section. A thin coat of red slip is applied on either side of the sherd but sign of peeling off of colour is also noticed.

15. Fragment of vase with an out-turned, flared out rim and flat at the top, with concave neck, made on fast wheel and of fine fabric and well fired having dark black colour at the section. A thin coat of slip is applied on either side of the potsherd.
Fig. 24: Red slipped ware
Fig. 25: Red slipped ware
16. Fragment of a shallow bowl with flared out beaked rim. It is made on fast wheel, of medium fabric and well fired. A thin coat of red slip is applied on either side of the sherd but the inner side is more burnished. Peeling off of slip is also noticed on both side of the sherd.

17. Fragment of a vase having flared-out rim but flat at the top. It has a concave neck, globular body, made on fast wheel, of medium fabric and well fired showing a thick patch of grey colour at the section. A thin coat of red slip is only traces on the outer side of the potsherd.

18. Fragment of a shallow bowl with tapering sides and slightly an out-turned flat rim and a horizontal line at the rim top. It is of wheel made, of medium fabric and well fired. Most of the slip is peeled off but traces can be evidenced on either side.

19. Fragment of a vase with flat out-turned rim, constricted neck with a ridge at the shoulder and is coated with red slip. Made on fast wheel, of medium fabric and has a thick coarse grey ware although it is well fired and has metallic sound.

20. Fragment of a dish with tapering sides and slightly in-turned flat rim. It is wheel made, of medium fabric and well fired. A thin coat of red slip is applied on either side of the potsherd.

21. Fragment of a vase with flat out-turned rim, concave neck and coated with thin red slip. It is wheel made, of medium fabric and well fired. Sign of peeling off of slip is also noticed.

22. Fragment of a vase, high neck with straight sides and slightly-incurved featureless rim at the top. It is of medium fabric; wheel made and well fired having dark grey core at the section. Sign of peeling off of red slip is noticed both at the inner and outer surface of the sherd.

**Bases of pots (Figs. 26-27 and Pls. 28-30)**

1. Fragment of a high-necked pot is with tapering sides, slightly out-turned featureless rim. It has cylindrical and narrow neck and a raised ridge at the neck and wide-open mouth. It appears to be of wheel made, of medium fabric and well fired showing fully oxidized core. Peeling off of slip is noticed on the outer surface while traces of chocolate slip found in the inner
surface. The inner part of the neck appears to have been luted with lower part of the pot.

2. Fragment of a splayed out high raised ring base is with hallow inside of a bowl, of medium fabric, ill-fired and coated with chocolate slip both at the inner and outer surfaces of the sherd.

3. Fragment of a base of a bowl having discular flat ring base is made on fast wheel, medium fabric and well fired. Both inner and outer sides of the bowl are coated with a thin coat of chocolate slip during its leather hard condition.

4. Fragment of a splayed out base of a bowl with raised discular flat ring base is made on fast wheel, medium fabric and well fired. Both inner and outer sides of the bowl are coated with a thin coat of chocolate slip during its leather hard condition.

5. Fragment of a bowl with flat ring base of medium fabric, wheel made, ill-fired shows semi-oxidized core and is coated with chocolate slip both at the inner and outer part of the sherd.

6. Fragment of a bowl with discular flat ring base of fine fabric is made on fast wheel, well fired showing fully oxidized core and coated with chocolate slip both at the inner and outer parts of the sherd.

7. Fragment of a bowl with discular flat ring base of fine fabric, wheel made, ill-fired showing semi-oxidized core and impression of black patches are noticed at the back side of the flat base which shows the irregular firing technique. Peeling off of slip is noticed at the outer as well as at the inner surfaces while a few traces of chocolate slip found in the outer surface of the ring base.

8. Fragment of a high raised concave base of a bowl with hallow inside is made on fast wheel, medium fabric and ill-fired showing semi-oxidized core. Both inner and outer side of the bowl is coated with a thin coat of chocolate slip during its leather hard condition.

9. Fragment of a bowl with splayed out discular flat ring base, of fine fabric is made on fast wheel, well fired showing fully oxidized core and coated with chocolate slip both at the inner and outer part of the sherd.
Fig. 26: Chocolate slipped ware
Fig. 27: Black slipped ware (14), Red slipped ware (12 and 15) and Chocolate slipped ware (13, 16, 17 and 18).
10. Fragment of a high raised concave base of a bowl with hallow inside is made on fast wheel, medium fabric and ill-fired showing semi-oxidized core. Both inner and outer sides are treated with a thin coat of chocolate slip during its leather hard condition. Peeling off of slip is noticed at the outer surface of the sherd.

11. Fragment of a splayed out high raised base of a bowl with concave neck and hallow inside is made on fast wheel, medium fabric and ill-fired showing semi-oxidized core. Peeling off of slip is noticed both at the outer and inner surfaces of the sherd.

12. Fragment of a cup-on-stand or goblet of red slipped ware, having globular body, concave neck and button base is of medium fabric, made on fast wheel and ill-fired showing a semi-oxidized core. Both inner and outer sides are treated with a thin coat of red slip during its leather hard condition.

13. Fragment of a base of a bowl having discular flat ring base is made on fast wheel, fine fabric and well fired. Peeling off of chocolate slip is noticed at both inner and outer side of the bowl.

14. Fragment of a bowl with flat ring base of black slipped ware. It is of medium fabric, bulbous body, wheel made, ill-fired showing semi-oxidized core and coated with black slip both at the inner and outer parts of the sherd.

15. Fragment of a high raised base of a bowl with hollow inside and concave sides is made on fast wheel, medium fabric and ill-fired showing semi-oxidized core. Both inner and outer sides are treated with a thin coat of red slip during its leather hard condition.

16. Fragment of a base of a bowl having discular flat ring base is made on fast wheel, fine fabric and ill-fired showing semi-oxidized core. Peeling off of chocolate slip is noticed at both the inner and outer sides of the bowl.

17. Fragment of a high raised base of a bowl with hollow inside and concave sides, bulbous body, made on fast wheel, medium fabric is well fired showing fully oxidized core. Both inner and outer sides are treated with a thin coat of chocolate slip during its leather hard condition. Peeling off of slip is noticed at both the inner and outer side of the bowl.
18. Fragment of a splayed out base of a bowl having discular flat ring base is made on fast wheel, fine fabric and ill-fired showing semi-oxidized core. Peeling off of chocolate slip is noticed at the inner side of the bowl.
Pl. 29: Bases
Decorated pottery (Fig.28 and Pls.3-32)

1. Fragmentary shoulder part of a vase of dull red ware is with regular wavy lines in between two low elevated ridges. A row of oblique incised lines are also noticed just above the upper ridge. It is made on slow wheel, of medium fabric and showing semi-oxidized core at the section.

2. Fragmentary neck part of a narrow mouth jar of red slip ware, most of its slip is lost but traces of red slip are still present on the surface. The lower part of the fragment seems to be flattened manually by hands. A chain consisting of a series of oblique incised lines and below it small triangles hatched with oblique incised lines in regular interval are noticed. The lower part of the jar appears to be wheel made and the mouth/neck portion is luted to it and the jar becomes complete with two separate parts. Both hand and wheel is used for the construction of the pot, it is of medium fabric and well fired showing a fully oxidized core.

3. Fragmentary shoulder part of a vase of red slipped ware is with a chain of oblique incised lines at the neck portion and followed by regular wavy lines below it. Most of the slip of the sherd is lost but traces of red slip still exist on the surface. It is made on slow wheel, of medium fabric and ill-fired showing semi-oxidized core at the section.

4. Fragmentary shoulder part of a storage jar is with a raised flat ridge engraved with a series of oblique incised lines. It appears to be made on slow wheel, of medium fabric and has semi-oxidized core due to ill-fired.

5. Fragmentary shoulder part of a vase of red slipped ware is with two parallel chains of oblique incised lines at the neck portion and below which a rows of regular wavy line are engraved. Most of the slip of the sherd is lost due to weathering but traces of red slip are still exists on the surface. It is made on slow wheel, of medium fabric and showing semi-oxidized core at the section.

6. Fragmentary shoulder part of a vase of red slipped ware is with a chain of oblique incised lines at the neck portion and a regular wavy line engraved below it. Most of the slip is lost but traces of red slip still exist on its surface. It is made on slow wheel, of medium fabric and has fully oxidized core at the section due to well fired.
Fig. 28: Decorated pottery
Pl. 32: Decorated pottery
7. Fragmentary shoulder part of a pot of grey ware with an applique band forming irregular ridges by fingertip pressing is noticed at the neck. It is made on first wheel, of medium fabric and has fully oxidized core.

8. Fragmentary sherd is possibly of a straight sided bowl or basin with a series of wavy lines. It is a thick course dull red ware having composite material of sand, clay, mica and shell powder. It seems to be made on slow wheel, coarse fabric and well fired.

9. Fragmentary part of bowl of chocolate slipped with carination at the body is decorated with a series of oblique incised lines. It is made on fast wheel, of fine fabric and well fired.

10. Fragmentary shoulder part of a vase of dull red ware is with long and deep oblique incised marks below the neck portion. It is made on slow wheel, of medium fabric and ill-fired showing semi-oxidized core at the section.

11. Fragmentary sherd of a small bowl is with a rope designs on the ridge of the exterior, of medium fabric, with a semi-oxidized core and treated with a thin coat of chocolate slip.

12. Fragmentary part of a basin of chocolate slip with slightly out curved flat rim and the inner part of the rim is engraved with a series of oblique incised lines whereas, the outer surface is decorated with an irregular incised criss-cross forming diamond pattern filled with white pigment.

13. Fragmentary part of a large basin with slightly out-turned flat rim and the inner part of the rim is decked with two rows of triangles superimposed by horizontal incised lines. Similarly, the flat top of the rim on the outer surface is decorated with a chain pattern, formed by series of small incised horizontal lines. Two horizontal irregular ridges are provided making ripple design on the exterior surface. It is of medium fabric, made on slow wheel and ill-fired showing semi-oxidized core.

**Painted pottery**

The excavation at Suabarei yielded monochrome and polychrome painted wheel made potteries which are very less in number found in the Chalcolithic context. The monochrome painted pottery is basically white or yellowish red executed either on the chocolate slip or on the black of the pot slip. The polychrome pottery retrieved from the excavation is very uncommon and rare. The polychrome colours arrayed on
the pottery are white, yellow and hematite red (ochre pigment). It was also observed that the paintings on pottery are post firing in nature, for polychrome paintings found on the chocolate slipped ware (Pls.33-35).
Pl. 34: Painted pottery
The paintings are basically depicted on the rim, neck, shoulder and waist parts of the pot and are executed on its exterior surface. The decorative patterns are basically criss-cross, wavy line, vertical lines etc. The colour pigments are extracted from minerals like mangani-ferrous hematite for getting red colour, kaolin pigment for yellow and white colours. To substantiate the findings of used hematite nodules from the site in situ is significant which suggests that manufacture of painted pottery was practiced by the Suabareians.

Besides, the above mentioned potteries, viz., red ware, grey ware, dull red ware, red slipped ware, chocolate slipped ware, black-and-red ware and perforated ware, three more pottery types namely black ware, black slipped ware and cord impressed ware (Pl.36) are also found in the Chalcolithic level of Suabarei. In the entire four quadrants where natural soil was touched, the number of sherds was found increasing up to layer (3) after which its number started declining from layer (4) onwards. It contributed only 1.7% of the total ceramic assemblage. So far as shapes are concerned the vase constitute the dominant shape (55.46%) followed by bowl (21.09%), dish and lead (1.56% each) and miniature pot, bowl-on-stand and storage jar (0.78% each). In the above mentioned quadrant the black slipped ware were found in between layer (2) and layer (8), the maximum concentrate being between layers (3) to (5). It constitutes 0.23% of the total ceramic collection. The shapes include vase, bowl and storage jar.

Apart from it, a few numbers of knobbed leads, handmade crucibles and a small quadruped pot (Pls.37-39) have been unearthed from the excavation between layers (2) to (6) which seems to contain metallic residue. Although, the excavation did not yield any evidence of any copper furnace so far, it is likely that some sort of metal work was carried out here by the Chalcolithic people of Suabarei.

**Neolithic pottery**

A total number of 111 handmade potsherds were found from the Neolithic level which was encountered below the Chalcolithic level and sealed by a sterile layer. The potsherds are mostly of red wares, thin to medium in fabric, gritty and micaceous (Pl.40). No diagnostics sherds have been encountered so far. The sherds appear to be prepared by arrangement of soil in hand. It contributed 0.12% of the total ceramic collection of Suabarei. A solitary piece of ground stone tool was found in association with the handmade gritty sherds in layer (12) of Qdt. 2 of Trench XB1.
Pl.37: Knobbed leads
Pl. 40: Handmade coarse gritty red ware
CHAPTER-VII

ANTIQUITIES
ANTIQUITIES

Quite a few prehistoric sites have been excavated and explored in Odisha, which have brought forth object that help in the reconstruction of the material culture of the time. Suabarei site is one of them which unearthed antiquities from Neolithic and Chalcolithic periods, even if small in number the antiquities comprise of various types from excavation shows a proper setup and progress within the society. Though the objects are quite few, the actual evidence throws sufficient light on the technological progress achieved during the period of study.

The excavation yielded 118 antiquities from various levels. Taking into account of raw materials these antiquities can be categorized as stone, semi-precious stone, terracotta, metal and bone object. Some of them were used either as toy-objects or ornaments or household objects or ritualistic objects or implements of hunting and agriculture. Out of the total collection the stone objects is highly represented 56.89% followed by the terracotta objects 26.72%; bone objects 12.93%. In layer-wise, the distribution of antiquities is high in the layers (2) and (3) while layers (9) and (12) recorded the minimum percentage.

Stone objects (Figs.29-31)

The excavation has produced as many as 118 antiquities. Out of which 66 were grounded and pecked stone tools. The ground stone tools fall into the following categories; celt, adze, axe and tool edge polisher. These tools appear to have gone through five stages of preparation, viz., (i) primary rough flaking from the core to block out the tool, (ii) secondary fine flaking to regularize the form and to sharpen the edge, (iii) pecking and hammer dressing, (iv) edge grinding and (v) overall grinding. These tools were generally used for digging and agricultural purposes; description of specimens is given below. Besides, kitchen appliances like grinding stone, pounders, pestles, etc. have also been retrieved from the excavation. The descriptions are as under:-

Adzes

A total numbers of 12 adzes have been retrieved from the excavation. These are discussed as under:-

175
Fig. 29: 1- Celt (Ant. No. 22), 2- Fragmentary ground tool (Ant. No. 20), 3- Adze (Ant. No. 10) and 4- Axe (Ant. No. 28)
Fig. 30: 1- Axe (Ant. No. 17), 2- Celt (Ant. No. 21), 3- Adze (Ant. No. 19) and 4- Celt (Ant. No. 18)
Fig. 31: 1-Adze (Ant. No. 24), 2-Celt (Ant. No. 25),
3-Fragmentary digging tool (Ant. No. 05) and
4-Celt (Ant. No. 14)
Antiquity No. 03
Small and narrow dolerite adze has a rough and pointed butt end with a straight and sharp cutting edge. One of its broad faces is flat and polished, while the other is rough and polished only towards the curvilinear cutting edge. It is retrieved from Qdt.2 of Trench XB1, layer (4) at the depth of -1.15m. It measures 6.40 x 3.20 x 1.70 cm (l x b x t) with a weight of 52 gm. It is in good state of preservation (Pl.41-A).

Antiquity No. 04
The dolerite adze has a plano-convex section and a convex cutting edge, the butt end is missing. It was unearthed from Qdt.2 of Trench ZA2, layer (2) at the depth of -0.82m having 8.01 x 6.68 x 2.83 cm (l x b x t) in dimension with weight of 186 gm. It is in good state of preservation (Pl.43-D).

Antiquity No. 10
This light greyish dolerite adze is having a rectangular long section and an oblique convex cutting edge. It has a truncated and rectangular butt end. It was yielded from Qdt.2 of Trench ZC2, layer (2) at a depth of -0.40m. It measures 6.15 x 4.86 x 1.49 cm (l x b x t) respectively weighing 94 gm. It is in good state of preservation (Pl.43-C).

Antiquity No. 11
Small stone dolerite adze with a straight uni-facial cutting edge has a rounded butt end. One broad face is curved, while the other is comparatively less curved. It was reported from Qdt.1 of Trench YA2, layer (2) at a depth of -0.21m. It measures 4.50 x 3.03 x 1.37 cm (l x b x t) respectively weighing 166 gm. It is partly damaged in its working edge (Pl.42-D).

Antiquity No. 12
Much weathered small greenish dolerite thin adze has a truncated butt end and an elliptical long section, probably made out of thin river nodule. It has an oblique cutting edge. It was retrieved from Qdt.4 of Trench YA2, layer (2) at a depth of -0.60m. It measures 6.90 x 4.20 x 1.13 cm (l x b x t) respectively weighing 50 gm (Pl.41-D).

Antiquity No. 19
The worn out ventral surface of greyish dolerite triangular adze with truncated butt end has sharp uni-facial cutting edge. The dorsal surface is highly polished whereas the ventral is partially rough. It was recovered from Qdt.3 of Trench XB3,
layer (5) at a depth of -1.90m. It measures 5.68 x 5.00 x 1.47cm (l x b x t) respectively weighing 40gm (Pl.41-C).

Antiquity No. 24

An adze of blackish dolerite stone is roughly trapezoidal in shape. It’s one broad face is flat while other is curvilinear. The cutting edge is broken and chipped off. It was recovered from Qdt.3 of Trench XB3, layer (8) at a depth of -2.99m. It measures 6.23 x 4.77 x 1.53cm (l x b x t) respectively weighing 66gm. The working edge is also damaged (Pl.42-A).

Antiquity No. 29

The small triangular stone blackish dolerite adze with an elliptical long section has a rounded butt end with a curved cutting edge. It was retrieved from Qdt.3 of Trench A1, layer (4) at a depth of -1.79m. It measures 5.90 x 3.35 x 1.68cm (l x b x t) respectively weighing 40gm. The artefact is in good state of preservation (Pl.41-B).

Antiquity No. 32

The small stone blackish dolerite adze is roughly triangular in shape. Its working edge is mutilated on one corner. It has a rounded butt end with oval transverse section and an elliptical long section. It was retrieved from Qdt.3 of Trench A1, layer (4) at a depth of -2.13m. It measures 6.25 x 4.18 x 1.42cm (l x b x t) respectively weighing 50gm. It is partially broken in working edge (Pl.43-A).

Antiquity No. 34

The light grey roughly triangular dolerite adze has an elliptical long section and a rounded butt end and an unparalleled cutting edge. It was found from Qdt.3 of Trench A3, layer (2) at a depth of -0.35m. It measures 7.09 x 4.20 x 1.71cm (l x b x t) respectively weighing 68gm. It is in good state of preservation (Pl.42-C).

Antiquity No. 35

The dark greyish polished dolerite adze is broken from butt end. It has an oblique cutting edge with plano-convex transverse section. It was unearthed from Qdt.3 of Trench A3, layer (6) at a depth of -2.99m. It measures 6.57 x 5.85 x 2.00cm (l x b x t) respectively weighing 86gm (Pl.43-B).

Antiquity No. 112

The damaged dark greyish, polished trapezoidal dolerite adze is broken from its butt end. It has an oblique cutting edge. It was found from the surface during exploration of the excavated site Suabarei. It measures 3.80 x 3.30 x 0.80cm (l x b x t) respectively weighing 55gm (Pl.42-B).
Pl. 42: Adzes
Axes

A total numbers of 7 axes have been found from the excavation. These are discussed as under:-

Antiquity No. 06

It is a small dark greyish dolerite stone axe of trapezoidal shape having elliptical long section and rounded butt end with roughly straight cutting edge. It was found from Qdt.2 of Trench ZA2, layer (2) at a depth of -0.70m. It measures 4.35 x 3.79 x 1.60cm (l x b x t) respectively weighing 36gm. It is partially damaged at the butt end (Pl.45-C).

Antiquity No. 07

The tiny bifacial dolerite axe is with an oblique cutting edge and a truncated sharp butt end having lenticular long section. It was retrieved from Qdt.4 of Trench ZA2, layer (2) at a depth of -0.20m. It measures 5.49 x 3.04 x 1.70cm (l x b x t) respectively weighing 40gm. It is in good state of preservation (Pl.45-D).

Antiquity No. 09

The trapezoidal shape dolerite axe having rectangular long section and oblique cutting edge has a truncated rectangular butt end. It was reported from Qdt.3 of Trench YA2, layer (3) at a depth of -0.54m. It measures 6.46 x 5.00 x 1.78cm (l x b x t) respectively weighing 94gm. It is partially damaged (Pl.44-C).

Antiquity No. 17

Partially worn out in the working edge this bifacial greyish dolerite axe, has heavy truncated oval shaped butt end and a sharp rounded cutting edge. It was unearthed from Qdt.2 of Trench ZC2, layer (2) at a depth of -1.80m. It measures 10.03 x 8.61 x 3.28cm (l x b x t) respectively weighing 350gm (Pl.45-A).

Antiquity No. 23

The light greyish dolerite small bifacial axe has a rounded butt end with convex cutting edge it is now broken and chipped off. It was unearthed from Qdt.2 of Trench ZC2, layer (7) at a depth of -2.57m. It measures 5.00 x 4.24 x 1.43cm (l x b x t) respectively weighing 44gm. The working edge is damaged (Pl.44-B).

Antiquity No. 28

The dolerite axe has a trapezoidal shape with broad rounded cutting edge. The butt end is damaged badly. It was found from Qdt.2 of Trench A1, layer (3) at a depth
of -1.12m. It measures 7.01 x 6.36 x 2.58cm (l x b x t) respectively weighing 140gm. The artefact is heavily chipped off from the dorsal surface (Pl.45-B).

**Antiquity No. 30**

The small light grey roughly triangular ground stone axe with elliptical long section has a rounded butt end and an unparalleled cutting edge. It was found from Qdt.3 of Trench A1, layer (4) at a depth of -1.79m. It measures 5.30 x 3.80 x 1.30cm (l x b x t) respectively weighing 35gm. It is in good state of preservation (Pl.44-A).

**Celts**

A total numbers of 6 celts have been retrieved from the excavation. These are discussed as under:-

**Antiquity No. 14**

Fragment of a dark greyish stone celt has rounded bifacial cutting edge. Its butt part is missing. It was retrieved from Qdt.2 of Trench YA2, layer (3) at a depth of -0.38m. It measures 8.24 x 6.61 x 2.89cm (l x b x t) respectively weighing 130gm (Pl.46-A).

**Antiquity No. 18**

The small dark greyish dolerite trapezoidal shape celt with metallic lustre has a rectangular long section and transverse rectangular section. It has a truncated and rectangular butt end. It was excavated from Qdt.2 of Trench ZB2, layer (5) at a depth of -2.18m. It measures 4.27 x 3.75 x 1.23cm (l x b x t) respectively weighing 34gm. It is in good state of preservation (Pl.47-A).

**Antiquity No. 21**

Highly polished but badly damaged fragmented dolerite celt seems to have been broken from the centre. It has a convex cutting edge. It was recovered from Qdt.4of Trench ZA2, layer (8) at a depth of -2.60m. It measures 5.53 x 5.30 x 2.37cm (l x b x t) respectively weighing 82gm (Pl.47-C).

**Antiquity No. 22**

The heavily damaged medium size celt of green basalt with rectangular in shape has a sharp bifacial cutting edge with a rough oblong butt and elliptical section. Its sides are broken and chipped off. It was yielded from Qdt.2 of Trench XB1, layer (9) at a depth of -3.46m. It measures 8.21 x 5.97 x 3.41cm (l x b x t) respectively weighing 204gm (Pl.46-C).
Antiquity No. 25

The small dolerite chisel is retrieved from the Neolithic horizon. It has a rounded butt end. Its bifacial cutting edges are sharp and straight. It was recovered from Qdt.2 of Trench XB1, layer (12) at a depth of -5.00m. It measures 5.20 x 3.30 x 1.80cm (l x b x t) respectively weighing 48gm. It is fairly in good state of preservation (Pl.46-B).

Antiquity No. 33

The trapezoidal dolerite celt has a slightly curvilinear bifacial cutting edge with lenticular long section with a rectangular butt end. It was found from Qdt.3 of Trench A1, layer (5) at a depth of -1.98m. It measures 6.70 x 4.30 x 1.60cm (l x b x t) respectively weighing 72gm. It is in good state of preservation (Pl.47-B).

Stone polisher

Only one stone polisher (Pl.48) has been found from the excavation, which is discussed as under:-

Antiquity No. 15

Fragment of stone a polisher probably is for sharpening the tools like axes and adzes. Its sharpening platform is clearly visible. It was unearthed from Qdt.2 of Trench YA2, layer (3) at a depth of 0.38m. It measures 7.72 x 6.11 x 2.35cm (l x b x t) respectively weighing 194gm.

Unidentified ground tools

A total numbers of 12 unidentified ground tools have been retrieved from the excavation. These are discussed as under:-

Antiquity No. 01

It is a fragmentary greyish dolerite unidentified ground tool, broken from both the ends, except centre part found from Qdt.2 of Trench XC2, layer (3) at the depth of -1.12m. It measures 4.66 x 4.09 x1.59cm (l x b x t) weighing 40gm (Pl.50-A).

Antiquity No. 02

Fragment of a well-polished unidentified ground tool of blackish basalt. Except the butt end the remaining portion is broken and chipped off found from surface during excavation, it measures 5.68 x 5.71 x 2.71cm (l x b x t) respectively weighing 132gm (Pl.50-B).
Pl. 48: Stone polisher
Antiquity No. 05
Fragment of a stone ground tool. Its cutting edge is broken and pointed butt end is available. Its long section is elliptical and its transverse section is oblong. It was found from Qdt.2 of Trench ZA2, layer (2) at a depth of -0.60m. It measures 4.33 x 3.93 x 1.30cm (l x b x t) respectively weighing 26gm (Pl.50-C).

Antiquity No. 08
Partially damaged uni-facial pointed tool of blackish dolerite is having a convex dorsal surface with a middle ridge. The ventral surface is flat and flaked. It has a broad, flat and oval butt end. It was found from Qdt.1 of Trench YA2, layer (2) at a depth of -0.14m. It measures 9.13 x 4.76 x 2.66cm (l x b x t) respectively weighing 150gm (Pl.49-D).

Antiquity No. 13
Unfinished ground stone tool is having tapering rounded butt end and dorsal surface; being convex it has two ridges and fine polish while its ventral surface is comparatively plain. The cutting edge is unfinished. It is in good state of preservation. It was excavated from Qdt.3 of Trench XB3, layer (2) at a depth of -0.59m. It measures 7.92 x 5.08 x 2.54cm (l x b x t) respectively weighing 166gm (Pl.50-D).

Antiquity No. 16
Unidentified ground stone tool is with polish on one surface while the other surface has flaked notch marks. It seems to be an unfinished tool possibly used for digging. It was excavated from Qdt.4 of Trench ZA2, layer (6) at a depth of -2.06m. It measures 7.20 x 4.10 x 2.20cm (l x b x t) respectively with a weight of 153gm. It is in good state of preservation (Pl.51-A).

Antiquity No. 20
The butt end of a dolerite ground tool has one side of the surface with polish whereas the opposite side is rough. It was recovered from Qdt.3 of Trench XB3, layer (5) at a depth of -1.90m. It measures 6.02 x 4.56 x 2.30cm (l x b x t) respectively weighing 92gm. The object is badly damaged (Pl.51-B).

Antiquity No. 26
Butt portion of an unidentified fragmented stone ground tool has a rounded butt. The cutting edge of tool is missing. It was found from Qdt.2 of Trench A1, layer (3) at a depth of -1.10m. It measures 4.90 x 3.60 x 1.80cm (l x b x t) respectively weighing 45gm (Pl.51-C).
Pl.49 : Unidentified ground tools
Pl.50 : Unidentified ground tools
Pl. 51: Unidentified ground tools
Antiquity No. 27

Damaged butt portion of an unidentified stone ground tool has rectangular butt end with rectangular section. Cutting edge of the tool is missing. It was found from Qdt.2 of Trench A1, layer (3) at a depth of -1.10m. It measures 6.42 x 5.00 x 1.49cm (l x b x t) respectively weighing 66gm (Pl.49-C).

Antiquity No. 31

The trapezoidal ground dolerite tool with lenticular transverse section has a rectangular butt end whereas its cutting edge is missing. It was recovered from Qdt.2 of Trench A1, layer (4) at a depth of -2.31m. It measures 7.48 x 6.00 x 2.00cm (l x b x t) respectively weighing 100gm. It is damaged and mutilated (Pl.51-D).

Antiquity No. 36

Butt portion of an unidentified dolerite ground tool has curvilinear butt end with roughly plano-convex transverse section. The surface treatment of the tool is uneven while the cutting edge of the tool is missing. It was found from Qdt.1 of Trench XC3, layer (2) at a depth of -0.44m. It measures 7.10 x 4.70 x 2.10cm (l x b x t) respectively weighing 90gm. It is in mutilated and damaged condition (Pl.49-B).

Antiquity No. 113

Butt portion of an unidentified ground tool of dolerite has curvilinear butt end with roughly plano-convex transverse section. The surface treatment of the tool is uneven. The cutting edge of the tool is missing and mutilated. It was recovered from the surface during exploration of the excavated site Suabarei. It measures 6.40 x 4.50 x 2.70cm (l x b x t) respectively weighing 80gm (Pl.49-A).

Grinding stones

A total numbers of 4 grinding stones have been unearthed from the excavation. These are discussed as under:-

Antiquity No. 37

It is a worn out small grinding stone (rough sandstone), flat from the working side with a curvature in upper surface. It was found from Qdt.4 of Trench ZB2, layer (1) at a depth of 0.70m. It measures 7.08 x 5.07 x 3.45cm (l x b x t) respectively weighing 186gm (Pl.52-D).
Antiquity No. 77

The plan and section of the partially defaced grinding stone (sandstone) is rectangular with smooth surface all around. It was found from Qdt.3 of Trench A1.
layer (2) at a depth of -0.35m. It measures 9.00 x 6.10 x 4.00cm (l x b x t) respectively weighing 300gm. It is in good state of preservation (Pl.52-B).

Antiquity No. 79
The damaged and mutilated truncated grinding stone (sandstone) has smooth surface, its one face of the stone is flat due to regular use. It was found from Qdt.3 of Trench A1, layer (3) at a depth of -0.58m. It measures 4.30 x 4.40 x 3.50cm (l x b x t) respectively weighing 105gm. It is in good state of preservation (Pl.52-C).

Antiquity No. 83
The shape of the stone (khondalite?) is square in plan having fine polished section. It was retrieved from Qdt.3 of Trench A1, layer (4) at a depth of -1.79m. It measures 4.60 x 4.10 x 3.10cm (l x b x t) respectively weighing 125gm. It is in good state of preservation (Pl.52-A).

Pounders
A total numbers of 3 pounders have been retrieved from the excavation. These are discussed as under:-

Antiquity No. 38
The stone pounder (sandstone) is sub triangular in plan and oval shape in section with smoothen surfaces except one side which is undulated. It was recovered from Qdt.2 of Trench ZB2, layer (1) at a depth of -0.11m. It measures 6.33 x 4.44 x 3.84cm (l x b x t) respectively weighing 170gm. It is fairly in good state of preservation (Pl.53-C).

Antiquity No. 43
The fine grained sand stone is probably used as pounder-cum-pestle. It is roughly trapezoidal in plan. It has three flat polished surfaces. It was found from Qdt.3 of Trench A2, layer (1) at a depth of -0.12m. It measures 7.41 x 4.90cm (l x b) respectively weighing 124gm. It is partially damaged (Pl.53-B).

Antiquity No. 45
The irregular shape stone tool made of sandstone is oblong in plan and oval in section, probably used as pounder-cum-pestle. It was found from Qdt.1 of Trench ZA2, layer (1) at a depth of 0.26m. It measures 7.24 x 5.70 x 3.80cm (l x b x t) respectively weighing 206gm. It is worn out and heavily weathered (Pl.53-A).
Pestles

A total numbers of 7 pestles have been retrieved from the excavation. These are discussed as under:-

Antiquity No. 39

The rectangular shape pestle (sandstone) has roughly elliptical section. Its larger flat surface from one side is smoothed by rubbing or grinding while the opposite face is undulated. It was found from Qdt.2 of Trench ZB2, layer (1) at a depth of -0.26m. It measures 11.30 x 6.95 x 3.45cm (l x b x t) respectively weighing 450gm. It is partially worn out (Pl.55-A).

Antiquity No. 40

The damaged miniature pestle (sandstone) is rectangular in plan with oblong section. It was found from Qdt.4 of Trench ZB2, layer (1) at a depth of -0.10m. It measures 8.92 x 4.27 x 3.15cm (l x b x t) respectively weighing 182gm. It is partially damaged (Pl.54-C).

Antiquity No. 41

The semi rectangular pestle (sandstone) with its section is oblong. Both of its surfaces are convex and well-polished. It was found from Qdt.2 of Trench XB1, layer (2) at a depth of -0.12m. It measures 8.22 x 6.37 x 4.31cm (l x b x t) respectively weighing 280gm. It is partially damaged and eroded (Pl.55-D).

Antiquity No. 42

The pestle made of coarse sandstone is plano-convex in shape and in section. Its flat surface is rough and irregular while the curvature surface is polished. It was found from Qdt.2 of Trench XB1, layer (2) at a depth of -1.60m. It measures 11.56 x 7.60 x 4.16cm (l x b x t) respectively weighing 512gm. It is partially damaged (Pl.55-B).

Antiquity No. 44

The stone pestle (rough sandstone) is rectangular in plan with oval section. One of the faces of the tool is flat and smooth while rest portion is rough. It was found from Qdt.2 of Trench ZC2, layer (1) at a depth of 0.18m. It measures 3.09x 3.7 x 3.2cm (l x b x t) respectively weighing 202gm. It is partially damaged (Pl.55-C).

Antiquity No. 46

The shape of the pestle’s plan (sandstone) is rectangular while its section is oblong. The upper and lower surfaces are smoothed. It was found from Qdt.2 of
Pl. 54: Pestles
Trench ZD2, layer (1) at a depth of -0.13m. It measures 8.00 x 5.25 x 3.95cm (l x b x t) respectively weighing 104gm. It is in good state of preservation (Pl.54-B).

**Antiquity No. 47**

The shape of the coarse grained sandstone pestle’s plan is trapezoidal; its transverse section is oblong. Both faces of pestle are convex and polished through prolonged use. It was found from Qdt.3 of Trench XB3, layer (2) at a depth of -0.27m. It measures 7.57 x 4.00 x 2.50cm (l x b x t) respectively weighing 276gm. It is partially damaged (Pl.54-A).

**Fluted cores**

Two numbers of fluted cores have been retrieved from the excavation. These are discussed as under:-

**Antiquity No. 86**

The greyish chert core contains flake scars taken out of it. It was recovered from Qdt.3 of Trench A3, layer (2) at a depth of -0.97m. It measures 2.4 x 1.4cm (l x b) respectively weighing 6.06gm. It is in good state of preservation (Pl.56-B).

**Antiquity No. 87**

The quartz fluted core having flake scars on the surface was found from Qdt.3 of Trench A3, layer (2) at a depth of -1.10m. It measures 2.7 x 2.9cm (l x b) respectively weighing 22.52gm. It is in good state of preservation (Pl.56-A).

**Stone flake**

The stone flake of chert which has been unearthed from the excavation is as under:-

**Antiquity No. 89**

Raw material for extracting stone tools was found from Qdt.3 of Trench A5, layer (2) at a depth of -0.45m. It measures 5.90 x 3.80 x 1.70cm (l x b x t) respectively weighing 35.09gm. It is in good state of preservation (Pl.57).

**Haematite nodule**

Only one haematite nodule has been found from the excavation which is discussed as under:-

**Antiquity No. 92**

The haematite ochre nodule is flat and roughly rectangular in shape and possibly used for extracting ochre colour. It was retrieved from Qdt.3 of Trench A5 layer (5) at a depth of -2.26m. It measures 7.80 x 6.80 x 1.70cm (l x b x t) respectively weighing 153gm. It is in good state of preservation (Pl.58).
Pl. 56: Fluted cores
Pl. 57: Stone flake

Pl. 58: Haematite nodule
Chert blades

A total numbers of three blades have been retrieved from the excavation. These are discussed as under:-

Antiquity No. 107

Parallel sided chert bladelet broken into two pieces and mended. It has plain medial ridge with sharp margins. It was found from Qdt.2 of Trench A1 at layer (5) at a depth of -2.24m. It measures 2.50 x 0.70 x 0.30cm (l x b x t) respectively weighing 0.5gm (Pl.59-C).

Antiquity No. 114

Parallel sided chert bladelet having plain medial ridge with sharp edges was found from Qdt.2 of Trench A1 at layer (5) at a depth of -2.24m. It measures 2.30 x 0.90 x 0.20cm (l x b x t) respectively weighing 0.54gm. It is in good state of preservation (Pl.59-A).

Antiquity No. 115

Parallel sided chert bladelet having plain medial ridge with sharp edges was unearthed from Qdt.2 of Trench A1 at layer (5) at a depth of -2.24m. It measures 1.90 x 0.70 x 0.10cm (l x b x t) respectively weighing 0.22gm. It is in good state of preservation (Pl.59-B).

Net-sinkers

Two number of net-sinker made from stone have been found from excavation. These are discussed as under:-

Antiquity No. 78

The half survived portion of a sandstone net-sinker having circular in circumference with a central perforation, one surface being smooth, whereas the other is rough and chipped off. It was recovered from Qdt.3 of Trench A1, layer (2) at a depth of -0.55m. It is 4.10cm in diameter and 1.00cm thickness, weighing 13.33gm (Pl.60-B).

Antiquity No. 88

Circular net-sinker of sandstone having square shaped perforation at the centre was found from Qdt.3 of Trench A1, layer (3) at a depth of -0.56m. It is 15.05cm in diameter and 2kg in weight. At present, the object is damaged and mended for preservation (Pl.60-A).
Pl. 59: Chert blades
Semi-precious stone beads

The excavation yielded four numbers of semi-precious stone beads. It consists of carnelian, banded agate, red jasper and quartz. These are discussed as under:-

Antiquity No. 48

Long truncated drum shaped quartz bead has round perforation. Its outer surface has polished treatment. It was recovered from the camp area (surface finding). It measures 1.50cm in length, weighing 1.49gm. It is in good state of preservation (Pl.61-A).

Antiquity No. 50

Standard pear shaped carnelian bead moderately reddish in colour has circular perforation at the centre. It was found from Qdt.1 of Trench A2, layer (1) at a depth of -0.40m. It measures 1.70 x 0.89cm (l x b) respectively weighing 1.160gm. It is badly damaged (Pl.61-B).
Antiquity No. 51

Damaged, barrel shaped truncated jasper bead, has a central perforation. It is highly polished and shining. It was found from Qdt.4 of Trench ZC2, layer (1) at a depth of -0.25m. It measures 0.70 x 0.58cm (l x b) respectively weighing 0.53gm (Pl.61-D).

Antiquity No. 52

Damaged, long barrel shaped truncated bead made of banded agate is having a central perforation. It has highly polished and shining surface. It was retrieved from Qdt.2 of Trench YA2, layer (2) at a depth of -0.58m. It measures 1.01 x 0.58cm (l x b) respectively with weight 0.53gm (Pl.61-C).

Terracotta objects

Terracotta making is a very flourishing industry right from the pre-historic time. During this period the terracotta industry flourished and reported from all the explored and excavated sites. The excavation produced as many as 31 terracotta objects of animal figurines, beads, wheels, sling balls, net-sinker and hopscotch. The descriptions are as under:-
Sling balls

A total number of 13 sling balls have been retrieved from the excavation. These are discussed as under:-

**Antiquity No. 55**

The spherical shaped ill-fired terracotta sling ball (marble) is partially chipped off and its cracks are visible on the outer surface. It was retrieved from Qdt.2 of Trench ZB2, layer (1) at a depth of -0.26m. It measures 2.00cm in diameter and 11.30gm in weight. It is in fragile condition (Pl.63-C).

**Antiquity No. 56**

The spherical shaped ill fired terracotta sling ball (marble) may be used as catapult. It was found from Qdt.2 of Trench ZB2, layer (3) at a depth of -0.72m. The object is 2.20cm in diameter and 14.20gm in weight. It is in good state of preservation (Pl.63-A).

**Antiquity No. 57**

Roughly spherical terracotta sling ball has one flat surface only. It is semi oxidized in nature having cracks noticed on its flat surface. It was found from Qdt.4 of Trench ZA2, layer (3) at a depth of -0.84m. It is 2.00cm in diameter and 5.80gm in weight. It is fragile and badly damaged (Pl.63-G).

**Antiquity No. 58**

The light greyish spheroid terracotta ball has an uneven surface. It was found from Qdt.2 of Trench ZB2, layer (4) at a depth of -1.62m. It is 1.08cm in diameter and 6.70gm in weight. It is in good state of preservation (Pl.63-B).

**Antiquity No. 59**

The terracotta spherical sling ball is medium fired and light grey in appearance. It was found from Qdt.2 of Trench ZB2, layer (4) at a depth of -1.66m. It is 1.09cm in diameter and 9.27gm in weight. It is in good state of preservation (Pl.63-D).

**Antiquity No. 60**

The terracotta spherical sling ball is medium fired and light grey in appearance. It was found from Qdt.2 of Trench XB1, layer (2) at a depth of -0.35m. It is 1.06cm in diameter and 3.50gm in weight. It is in good state of preservation (Pl.63-E).
Antiquity No. 61

The fragile and mutilated terracotta spherical sling ball is medium fired and light grey in appearance. It was found from Qdt.1 of Trench YA2, layer (1) at a depth of +0.10m. It is 2.00cm in diameter and 3.54gm in weight (Pl.63-F).

Antiquity No. 62

The terracotta spherical sling ball is medium fired and light grey in colour. It was found from Qdt.3 of Trench XB3, layer (2) at a depth of -0.71m. It is 1.74cm in diameter and 5.58gm in weight. It is in good state of preservation (Pl.62-D).

Antiquity No. 63

The damaged terracotta spherical sling ball is medium fired and light grey in appearance. It was found from Qdt.2 of Trench ZB2, layer (5) at a depth of -2.18m. It is 2.20cm in diameter and 8.30gm in weight (Pl.62-B).

Antiquity No. 64

The fragile terracotta spherical sling ball is medium fired and light grey in appearance. It was found from Qdt.3 of Trench A2, layer (3) at a depth of -0.65m. It is 1.09cm in diameter and 5.96gm in weight (Pl.62-C).

Antiquity No. 82

The terracotta spherical sling ball is medium fired and light blackish in appearance. It was found from Qdt.2 of Trench A3, layer (3) at a depth of -1.12m. It is 1.70cm in diameter and 4.86gm in weight. It is in good state of preservation (Pl.62-E).

Antiquity No. 84

The terracotta sling ball is spherical medium fired and light greyish in colour was found from Qdt.3 of Trench A3, layer (2) at a depth of -0.72m. It is 1.78cm in diameter and 5.00gm in weight. It is in good state of preservation (Pl.62-F).

Antiquity No. 85

The terracotta sling ball is sphere-shaped, medium fired and light greyish in colour was found from Qdt.3 of Trench A3, layer (2) at a depth of -0.92m. It is 2.29cm in diameter and 12.00gm in weight. It is in good state of preservation (Pl.62-A).
Pl. 62: Terracotta sling balls
Pl.63: Terracotta sling balls
**Hopscotches**

A total number of 8 hopscotches have been unearthed from the excavation. These are discussed as under:-

**Antiquity No. 65**

It is made out of a medium fabric black ware potsherd, roughly circular and incompletely dressed and rough in nature. It was found from Qdt.4 of Trench ZB2, layer (2) at a depth of -0.20m. It is 2.00cm in diameter and 0.33cm in thickness and 1.57gm in weight. It is in good state of preservation (Pl.65-C).

**Antiquity No. 66**

Hopscotch made out of ill-fired red ware sherd is circular in plan with an uneven surface. It was found from Qdt.4 of Trench ZA2, layer (3) at a depth of -0.54m. It is 3.40cm in diameter and 0.87cm in thickness and 10.68gm in weight. It is in good state of preservation (Pl.65-B).

**Antiquity No. 67**

Hopscotch made of ill-fired medium fabric red ware sherd, with circular circumference. It was found from Qdt.4 of Trench ZA2, layer (3) at a depth of -0.52m. It is 4.12cm in diameter and 1.13cm in thickness and 21.91gm in weight. It is in good state of preservation (Pl.65-A).

**Antiquity No. 68**

The button shaped blackish terracotta hopscotch with circular profile seems to be handmade by pressing and pinching technique. Its surface treatment is rough and of medium fabric. It was found from Qdt.4 of Trench ZB2, layer (3) at a depth of -1.16m. It is 1.80cm in diameter and 0.55cm in thickness and 1.98gm in weight. It is in good state of preservation (Pl.65-D).

**Antiquity No. 69**

The hopscotch is prepared from a dull red potsherd, its outer surface being smooth and semi-circular in profile. It was found from Qdt.1 of Trench ZA2, layer (3) at a depth of -0.71m. It is 5.00cm in diameter and 1.00cm in thickness and 28.18gm in weight. It is in good state of preservation (Pl.64-D).

**Antiquity No. 71**

Hopscotch is made out of medium fabric red ware sherd, circular in circumference. It was found from Qdt.2 of Trench ZA2, layer (7) at a depth of
-2.20m. It is 2.50cm in diameter and 0.49cm in thickness and 2.58gm in weight. It is in good state of preservation (Pl.64-C).

**Antiquity No. 76**

Damaged pottery hopscotch is prepared from a potsherd having circular in circumference with smooth outer surface. It was recovered from Qdt.2 of Trench A1 at layer (2) at a depth of -0.52m. It measures 2.78cm in diameter, weighing 4.00gm (Pl.64-B).

**Antiquity No. 90**

The hopscotch is prepared from a stone, its outer surface being smooth and circular in profile. It was found from Qdt.3 of Trench A5, layer (2) at a depth of 0.45m. It is 4.50cm in diameter and 0.80cm thickness weighing 30.00gm. It is in good state of preservation (Pl.64-A).

Pl.64 : Stone and terracotta hopscotches
Pl. 65: Terracotta hopscotches
Terracotta wheels

A total numbers of 4 wheel of terracotta have been found from the excavation. These are discussed as under:-

Antiquity No. 70

It is an unfinished wheel having dimple marks in the centre on both faces. It was found from Qdt.2 of Trench ZB2, layer (5) at a depth of -2.18m. It is 1.80cm in diameter and 0.70cm in thickness and 8gm in weight. It is in good state of preservation (Pl.66-D).

Antiquity No. 73

The terracotta wheel is handmade in medium fabric and roughly circular with a central perforation. It was found from Qdt.2 of Trench ZB2, layer (5) at a depth of -2.02m. It is 2.5cm in diameter, weighing 4.62gm. It is in good state of preservation (Pl.66-C).

Antiquity No. 81

The fragile and badly damaged, half survived terracotta wheel having roughly circular in circumference has a central perforation with irregular and chipped off surface. It was found from Qdt.2 of Trench A1 at layer (3) at a depth of -1.15m. It measures 6.00 x 4.80 x 1.60cm (l x b x t) respectively weighing 55.74gm. It is in good state of preservation (Pl.66-A).

Antiquity No. 91

Damaged, part of a wheel or net-sinker having circular in circumference with a central perforation, has flat surface. It was found from Qdt.1 of Trench XC3, layer (1) at a depth of -0.20m. It measures 4.60 x 2.20 x 1.20cm (l x b x t) respectively weighing 14.23gm (Pl.66-B).

Terracotta figurines

Three number of animal figurines made from terracotta have been found from excavation. These are discussed as under:-

Antiquity No. 72

The terracotta animal figurine seems to be the head portion of a horse decorated with wavy incision marks to show the anatomical features (maine) in its snout and neck. Left ear of the object is intact while its right ear broken. It was found from Qdt.4 of Trench ZA2, layer (2) at a depth of -0.89m. It measures 4.80cm in length weighing 29.16gm. The broken snout part of the figurine has been mended (Pl.67-B).
Antiquity No. 75

It is a small hand modelled semi-oxidized animal figurine of a puppy having flat base, may be used as a decorated table object. It was retrieved from Qdt.1 of Trench A2, layer (2) at a depth of -0.56m. It measures 5.80cm in length, weighing 48.78gm. It is in good state of preservation (Pl.67-C).

Antiquity No. 80

It is a hand modelled fine fabric and well-fired animal figurine of a dog. Its hind part is broken and mutilated. It was found from Qdt.3 of Trench XB3 at layer (8) at a depth of -2.94m. It measures 4.20 x 2.10cm (l x b) respectively weighing 12.82gm (Pl.67-A).

Terracotta beads

Three number of terracotta bead have been found from excavation. These are discussed as under:-

Antiquity No. 49

Areca nut shaped terracotta bead with centrally perforation across is made of medium fabric clay. It is semi-oxidized in nature. It was retrieved from the surface in the southern part of the mound. It measures 2.24cm in length and 2.44cm in breadth, weighing 14.67gm. It is partially damaged (Pl.68-A).

Antiquity No. 53

Terracotta spherical bead with a central perforation across is made of medium fabric clay and well fired. One of its perforations is slightly bigger than the other perforation. Colour of the bead is dull red. The object is in good state of preservation. It was found from Qdt.2 of Trench ZC2, layer (2) at a depth of -0.58m. It measures 1.08 x 1.07cm (l x b) respectively, weighing 5.61gm (Pl.68-C).

Antiquity No. 54

Terracotta spherical bead with central perforation across is made of medium fabric clay and well fired. One of its perforations is slightly bigger than the other perforation. Colour of the bead is reddish. The object is in good state of preservation. It was found from Qdt.2 of Trench A1, layer (3) at a depth of -1.10m. It measures 2.40 x 1.09cm (l x b) respectively and its weight is 7.11gm (Pl.68-B).

Terracotta tablet

The tablet of terracotta which has been unearthed from the excavation is as under:-
Pl. 68: Terracotta beads

Pl. 69: Terracotta tablet
Antiquity No. 74

The terracotta small greyish discoid tablet has a concave surface, found from Qdt.4 of Trench ZA2, layer (8) at a depth of -2.60m. It is 1.45cm in diameter, weighing 16gm. It is in good state of preservation (Pl.69).

Antler/Bone objects

A total of 15 antler/bone objects have been recovered from the excavations. Both polished, and unpolished or crude and developed types have been found. The tools are made on antlers, semi-mineralised bones. The entire assemblage of the bone tools can be divided into three categories taking into account their use and utility. They may be categorised under hunting tools, household tools and digging tools. The bone objects are of points, spearhead, needle, canine teeth, antlers and stylus. The descriptions are as under:-

Antlers

Six antlers have been unearthed from excavation. They are discussed as under:

Antiquity No. 94

Fragment of an antler and only the tip portion is survived. It was found from Qdt.2 of Trench XB1 at layer (2) at a depth of -0.38m. It is 2.00cm in length and weighing 1.46gm (Pl.70-B).

Antiquity No. 95

A damaged, barrel shaped antler having circular section was found from Qdt.2 of Trench XB1, layer (3) at a depth of -0.48m. It measures 3.03 x 1.00cm (l x b) respectively and weighing 6.82gm (Pl.70-C).

Antiquity No. 96

The tool is prepared from an antler. One sides of the object is grinded in order to make it flat. It is broken from both ends. It was recovered from Qdt.2 of Trench ZA2, layer (2) at a depth of -0.85m. It is 3.05 x 1.00 x 0.70cm (l x b x t) respectively and weighing 3.69gm (Pl.70-A).

Antiquity No. 98

A fragment of an antler may be used as a digging tool. It is tapered upwards to form a point, but the point is blunted out due to extensive use. It was found from Qdt.2 of Trench ZB2, layer (4) at a depth of -1.14m. It is 7.30x 1.50 x 1.00cm (l x b x t) respectively in length and weighing 14.17gm (Pl.71-C).
Pl.70 : Antlers

Pl.71 : Antlers
Antiquity No. 99

Damaged long barrel shaped root portion of an antler and has a transverse circular section. It was unearthed from Qdt.2 of Trench ZB2, layer (5) at a depth of -2.02m. It is 7.05cm in length, weighing 23.80gm (Pl.71-A).

Antiquity No. 100

Fragment of an antler and only tip portion is survived. It was found from Qdt.1 of Trench ZA2 at layer (3) at a depth of -0.71m. It is 1.07 x 0.70 cm (l x b) respectively and weighing 1.28gm (Pl.71-B).

Canine tooth

One canine tooth of a wild animal has been unearthed from excavation which is discussed as under.-

Antiquity No. 104

A crescent shaped canine tooth of a quadruped animal was recorded from Qdt.3 of Trench A2, layer (4) at a depth of 1.13m. It is 2.08cm in length, weighing 1.82gm. It is in good state of preservation (Pl.72).

Pl.72 : Canine tooth

Spear heads /Arrow-heads

Only two spear heads/ arrow heads and a point of bone which have been recovered from excavation is discussed as under:-
Antiquity No. 97

The spear head made from a piece of antler is well-polished and dark brownish in colour. It’s both ends are damaged. The shaft is slightly narrower in the bottom and may be used for hafting. It was recovered from Qdt.2 of Trench XB1, layer (2) at a depth of -0.49m. It is 2.08 x 0.90cm (l x b) and weighing 2.64gm (Pl.73).

Antiquity No. 101

The arrow-head is made out of a solid bone. It is prepared by scraping and grinding. It has a solid triangular section. The shaft tapers top-wards to form a fine point. It was found from Qdt.3 of Trench YA2, layer (2) at a depth of -0.26m. It is 4.00 x 0.84 x 0.68cm (l x b x t) respectively and weighing 3.31gm. It is in good state of preservation (Pl.74-A).

Antiquity No. 103

Fragment of a brownish bone point one end of which is broken while another retains a sharp point. It was found from Qdt.4 of Trench ZA2, layer (7) at a depth of -2.27m. It is 2.05 x 1.20 (l x b) respectively, weighing 1.26gm (Pl.74-B).

Bone tools

Three bone tools have been found from excavation. They are discussed as under:-

Antiquity No. 102

The partly damaged tool prepared either from an antler or rib bone of deer is round on all sides and to make the sides flat. Subsequent grinding is done at the top to make it a short sharp pointed edge. The surface of the needle is highly polished with a circular perforation near the butt end. It was unearthed from Qdt.4 of Trench ZA2, layer (6) at a depth of -2.01m. It is 5.34 x 0.63 x 0.36cm (l x b x t) respectively and weighing 1.82gm (Pl.75).

Antiquity No. 105

The stylus broken into two pieces has been mended for preservation. It is made of antler with pointed edge. It has sharp flat butt end having elliptical section. It was recorded from Qdt.3 of Trench A1, layer (3) at a depth of 1.18m. It is 10.00 x 0.90 x 0.50cm (l x b x t) and weighing 7.60gm (Pl.76).
Antiquity No. 108

The unidentified bone tool has pointed edge with sharp flat butt end and elliptical section. It was found from Qdt.3 of Trench A5, layer (4) at a depth of -1.96m. It measures 5.00 x 1.70 x 0.50cm (l x b x t) respectively weighing 11.38gm. It is in fair condition.
Pl. 75: Needle
**Shark teeth**

Two pendants of Shark teeth are recovered from the site are less compare to other materials but valuable to reconstruct the maritime relation of the Suabareian in the Chalcolithic period.

All the objects retrieved from the excavation are valuable, even if they are less in quantity. They are associated with the daily life of the Suabareians for better life or can say to satisfy their biological and social needs and adapting themselves to the environment. These remains help us to reconstruct the past life, their belief, custom and tradition, craft specialisation, political and social organization. The detail accounts of the antiquities are followed by a statistical chart at the end.

**Antiquity No. 93**

Triangular shaped pointed tooth of Shark manipulated by scraping and rubbing may be used for a pendant. It was found from Qdt.4 of Trench ZA2, layer (3) at a depth of -0.87m. It measures 1.80 x 1.50cm (l x b) respectively weighing 0.42gm. It is in good state of preservation (Pl.77-B).

**Antiquity No. 106**

Triangular shaped pointed tooth of Shark manipulated by scraping and rubbing, having circular perforation at the centre. It was found from Qdt.2 of Trench A1, layer (5) at a depth of 2.19m. It measures 1.70 x 1.70 x 0.30cm (l x b x t) respectively weighing 0.52gm. It is in good state of preservation (Pl.77-A).

**Copper objects**

Six specimens of copper objects viz., ring, fish-hook and a coin with thick greenish incrustations have been retrieved from the excavation, one each in layers (1), (2) and (3) and from surface.

**Antiquity No. 109**

A small circular fragile and heavily corroded finger ring made of copper was unearthed from Qdt.3 of Trench ZA2, layer (2) at a depth of -0.52m. The diameter of the artefact is 2.05cm and weighing 9.00gm (Pl.80-B).

**Antiquity No. 110**

A ½ Pice British-India coin of 1862, the obverse side having portrait of Queen Victoria was found from Qdt.2 of Trench XB1 at layer (1) at a depth of -0.20m. The
diameter of the coin is 2.00cm and weighing 2.77gm. It is in good state of preservation (Pl.78 A and B).
Pl. 78 A: British-India coin (Obverse)

Pl. 78 B: British-India coin (Reverse)

Pl. 79: Fragmentary piece of a miniature copper pot
Pl.80: Copper objects
Antiquity No. 111

It is a fragile curved fish-hook made up of copper wire. It was found from Qdt.2 of Trench YA2, layer (3) at a depth of -0.82m. It is 2.40cm in length and weighing 0.056gm (Pl.80-D).

Antiquity No. 116

A small circular bi-cone shaped finger ring made of copper found from the surface during exploration of the excavated site Suabarei. The diameter of the ring is 1.90cm, weighing 19.00gm. It is in good state of preservation (Pl.80-A).

Antiquity No. 117

A well preserved small circular bi-cone shaped finger ring made of copper unearthed from Qdt.3 of Trench YA2, layer (2) at a depth of -0.57m. The diameter of the ring is 1.80cm, thickness is 0.60cm and weighing 4.48gm (Pl.80-C).

Antiquity No. 118

It is a damaged and fragmentary piece of a miniature pot made up of copper retrieved from Qdt.4 of Trench ZC2, layer (2) at a depth of -0.35m., weighing 1.15gm (Pl.79). The extant piece of the miniature pot measures 2.13 x 0.54 x 0.15cm(l x b x t) respectively.
Table-15 : Layer wise distribution of antiquities (stone objects)

<table>
<thead>
<tr>
<th>Stone objects (Ground tools)</th>
<th>Layers (1-12)</th>
<th>Surface findings</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Celt</td>
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</tr>
<tr>
<td>Axe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adze</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unidentified ground tool</td>
<td></td>
<td></td>
<td>03</td>
</tr>
<tr>
<td>Unfinished ground tool</td>
<td></td>
<td>01</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>00</td>
<td>12</td>
<td>06</td>
</tr>
<tr>
<td><strong>Miscellaneous stone objects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grinding stone</td>
<td>01</td>
<td>01</td>
<td>01</td>
</tr>
<tr>
<td>Stone polisher</td>
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<td></td>
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</tr>
<tr>
<td>Pounder</td>
<td>01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pounder-cum- pestle</td>
<td>02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pestle</td>
<td>04</td>
<td>03</td>
<td></td>
</tr>
<tr>
<td>Hopscotch</td>
<td></td>
<td>01</td>
<td></td>
</tr>
<tr>
<td>Net-sinker</td>
<td></td>
<td>01</td>
<td>01</td>
</tr>
<tr>
<td>Fluted core</td>
<td></td>
<td>02</td>
<td></td>
</tr>
<tr>
<td>Stone flake</td>
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<tr>
<td>Blade</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Semi-precious bead</td>
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<td>01</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>10</td>
<td>10</td>
<td>03</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>10</td>
<td>10</td>
<td>03</td>
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Total 66
Table-16 : Layer wise distribution of antiquities (terracotta objects)

<table>
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<tr>
<th>Terracotta objects</th>
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<tr>
<td>Sling ball</td>
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<td>--</td>
<td>13</td>
</tr>
<tr>
<td>Hopscotch</td>
<td>--  02  04  --  --  --  01  ---  --  --  --  --</td>
<td>01</td>
<td>07</td>
</tr>
<tr>
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<td>---  ---  ---  ---  ---  ---  ---  01  ---  --  --  --</td>
<td>--</td>
<td>01</td>
</tr>
<tr>
<td>Animal figurine</td>
<td>--  02  --  --  --  --  --  01  ---  --  --  --</td>
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<td>03</td>
</tr>
<tr>
<td>Net-sinker</td>
<td>01  --  --  --  --  --  --  --  --  --  --  --</td>
<td>01</td>
<td>01</td>
</tr>
<tr>
<td>Wheel</td>
<td>--  --  01  --  01  --  --  --  --  --  --  --</td>
<td>02</td>
<td></td>
</tr>
<tr>
<td>Unfinished wheel</td>
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<td><strong>01</strong></td>
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</table>

Total | 31
Table-17 : Layer wise distribution of antiquities (bone objects)

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<th>Bone objects</th>
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<td></td>
</tr>
<tr>
<td>Point</td>
<td>-- 02</td>
<td>01 -- -- -- -- --</td>
<td>03</td>
</tr>
<tr>
<td>Spear head</td>
<td>-- -- 01 -- --</td>
<td>-- -- -- -- --</td>
<td>01</td>
</tr>
<tr>
<td>Unidentified bone tool</td>
<td>-- -- 01 -- --</td>
<td>-- -- -- -- --</td>
<td>01</td>
</tr>
<tr>
<td>Stylus</td>
<td>-- -- 01 -- --</td>
<td>-- -- -- -- --</td>
<td>01</td>
</tr>
<tr>
<td>Needle</td>
<td>-- -- -- -- 01</td>
<td>-- -- -- -- --</td>
<td>01</td>
</tr>
<tr>
<td>Shark teeth pendant</td>
<td>-- -- 01 01 --</td>
<td>-- -- -- -- --</td>
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<td>Canine tooth</td>
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<td>01 01 -- -- --</td>
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</tr>
<tr>
<td></td>
<td>Total</td>
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</table>
Table-18: Layer wise distribution of antiquities (copper objects)

<table>
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<th>Copper objects</th>
<th>Layers (1-12)</th>
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<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Ring</td>
<td>--</td>
<td>02</td>
<td>---</td>
</tr>
<tr>
<td>Coin</td>
<td>01</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Fish-hook</td>
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<td>01</td>
</tr>
<tr>
<td>Fragmentary miniature pot</td>
<td>--</td>
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<td>--</td>
</tr>
<tr>
<td>Total</td>
<td>01</td>
<td>03</td>
<td>01</td>
</tr>
<tr>
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</table>
CHAPTER-VIII

SUBSISTENCE PATTERN
SUBSISTENCE PATTERN

The subsistence pattern of Suabarei has been reconstructed through the palaeo-floral and palaeo-faunal remains retrieved from the Neolithic and Chalcolithic strata. The material evidences from Neolithic period provide a very sketchy picture to reconstruct the subsistence economy of the Suabaireans due to paucity of materials while on the other hand, the retrieved cultural material from Chalcolithic period is very rich and helpful to have a perspective view on the subsistence economy of the settlement. The origin and development of culture noticed within a time bracket of 3200BP to 2600BP having different stages of economic developments. In the beginning of the Chalcolithic period every aspect of culture was in incipient form and gradually developed into mature stage and at the terminus of the Chalcolithic period the cultural deposit was found to be declined. Around c. 3000BP to c. 2800BP the site was in flourishing stage as corroborated by the evidence of different craft specialisations.

Farming and stock raising

Towards the end of the Pleistocene and during the advent of Holocene period, a drastic change took place in the environment which forced the hunter and food gatherer to adopt a symbiotic relationship with animals and crops, which ultimately led them towards the stage of foragers. The archaeo-botanical evidences from the Suabarei site suggest that the area played a key role in the process of domestication of rice crop, its cultivation and ultimate stock raising. The excavation in 2014-16 established stratigraphic evidence of domesticated variety of rice (Oryza sativa L.), kulthi, horse gram (Macrotyloma uniflorum (Lam.) Verdc.), green gram (Vigna radiata), since the beginning of Chalcolithic period till its end. The people consumed both the domesticated as well as wild varieties of rice. This is apparently evident from the presence of charred grains of wild rice and rice husk impression on burnt clay lumps. The other crops grown were horse gram, green gram, black gram, kulthi, etc. Since the site is situated on the east coast, need of water for agriculture might not have been an issue as the region gets maximum annual precipitation. For cultivation purpose, it is likely that antlers or some stone and wooden implements might have been used for making furrows for paddy field. A number of charred antlers and stone tools retrieved from the excavation indirectly throw light on the use for preparing the agricultural fields. The evidence of agricultural practice from the
cultivated variety of rice also indicates that the division of labour prevailed among men and women for agriculture.

**Pastoralism**

The archaeological evidence of the origins and evolution of pastoralism or cattle domestication in the region remains hazy. But it may be mentioned here that the importance of pastoralism lies with growth and prosperity of agriculture. As agriculture and pastoralism are dependent each other without the help of domesticated animal farming would be unthinkable. Hence, the available data suggest that the Suabareians depended mainly upon six varieties of domesticated species (cattle, buffalo, goat, pig, dog and cat) for their subsistence. The first four species were for their consumption as food directly and indirectly or may be used for some other agricultural purpose. The presence of remains of pigs show that they were used by the people only for consumption during the time of drought/flood or any other natural disasters and also might be used for barter system. The fauna like dog and cat noticed at the site were not used as food species but for petting. To add to it, the unique finding during the excavation was of a dog burial associated with miniature pots and other animal bones might be kept as offering goods and object indicating strong attachment of Suabareians with dog. The evidence is also substantiated from the finding of terracotta dog figurines from the excavation. It is one of the important findings that reflect man-animal relationship in the Chalcolithic community. Although no cat burial or terracotta figurine of cat found but the faunal evidence suggested that cat might be used as pet animal next to dog.

The increasing in the percentage of animal bones during the mature phase of the Chalcolithic period of Suabarei suggests that the dependence on non-vegetarian diet was more than that of agricultural food. The evidence of pastoralist from the remarkable series of domesticated faunal remains of cattle, buffalo and the dog and cat provide us first hand evidence of different types of species within the community. The presence of cattle and buffalo with its higher milk production may have been a key element of predictability and stability that allowed them for a settled life.

**Hunting and fishing**

The archaeological evidences at Suabarei suggest that the Chalcolithic community was subsisted primarily on farming, stock raising, hunting and fishing. The faunal remains retrieved from the excavations shows the exploitation of a good
number of wild as well as domesticated animals along with avi-fauna and aqua-fauna (Pls.81-86). The occurrence of the bones of cattle, sheep/goat and pig suggest that these animals were reared for domestic purpose and simultaneously also formed a part of their diet. Apart from it, the folk also consumed the meat of the wild animals like sambar, deer, chital, chausinga, black buck, hare, etc. which were probably available aplenty during the period under review. Besides, the faunal remains of wild mammals like elephant, wild buffalo, nilgai, sambar, spotted deer, four-horned antelope, gazelle, wild pig, common squirrel, hare and rat, birds of common crane, black partridge, cattle egret and pond heron suggest that their passion for diverse type of animal hunting and fowling were in practice. The faunal remains associated with stone and bone implements like stone blades, celts and bone points and arrow-head corroborated the hunting practice of the people during Chalcolithic period of the region. The Suabareians also consumed adequate meat in their daily diet as noticed in the each strata of the excavated trenches, but the evidence of consumption of big animals was less in the later period as the less faunal remains were encountered in the late phase of Chalcolithic period. It was quite less in quantity when compared to the early level and their numbers gradually dwindled with the passing of time and were replaced more by fish and fowl or small games. This indicates their change of food habit which may be due to the lack of big fauna or may be the apathy prevalent within the society, as for hunting of a big animal requires involvement more people. Possibility of sharing or distribution of meat among the inhabitants of Suabarei was also noticed from the evidence of cut marks in the bone. A large numbers of floral and faunal remains revealed from the site exhibit that a drastic change took place in the lifestyle or subsistence pattern among the Suabareians in their march from incipient farmer gradually to the full-fledged settler much substantiated with fishing and hunting.

Besides agriculture, hunting and pastoralism, fishing also remained another important part of their livelihood. They have exploited the nearby flowing river Daya and the Gangua rivulet for fishing purpose. The unearthed faunal remains of aquatic species associated with instruments like copper fish hook and stone and terracotta netsinkers show their passion and craving for fishing. As many as five varieties of fish species, three varieties of turtle and a unique evidence of Shark teeth justify their wide varieties of consumption of aqua-fauna from both fresh water and brackish water i.e., sea. The Shark tooth alone signifies the exploiting zone of the Suabareians up to the
sea in the Chalcolithic period directly or indirectly via trade exchange system and throws an indirect light on probable sea link. Shark tooth in the Chalcolithic context has also been found from the excavation of Golabai Sasan in Khordha district of Odisha.
Pl.83 : Faunal remains
Pl.85: Fish bones
Tool kit

The available ground and polished stone tools like adzes, axes, chisel, etc. might have been used for cutting trees, for making wooden implements, bone tools and for agricultural use. The tiny blades of chert might have been hafted in wood or bone for making composite tools like knives, sickles, etc. The use of copper was found in the form of a fragmentary miniature pot, rings and a fish-hook only. The animals were hunted for food and their bones and even the antlers were used for making different types of tools and implements like point, arrow-head, needle, stylus, etc. The bone tools like point and arrow-head along with the terracotta sling balls or marbles were probably used for hunting avi-fauna or small games. The antlers were also used for making tiny tools like needle and stylus apart from their probable use for making furrows in the agricultural fields.

Pottery making

So far as technology is concerned, the Chalcolithic Suabareians had made considerable advance in ceramic technology which is reflected from the excavated ceramic assemblage. The different types of pottery available from the excavation are multi utilitarian purpose useful for cooking, drinking and storage. All the ceramics of
Chalcolithic period are found to be of wheel turned, well fired and prepared out of well levigated clay. The ceramic types consist of black-and-red ware, red slipped ware, chocolate slipped ware, black burnished ware, simple black ware, grey ware, red ware and dull red wares. A variety of shapes like vases, plain bowl, ring based bowls, bowls-on-stand, handi, storage jars, dishes, dishes-on-stand, knobbled lids, etc. have been identified. The findings of different types of bowls in the ceramic assemblage of the site indicate that the Chalcolithic people of Suabarei also prepared and consumed liquid food. The pottery are found decorated with incised decorations like nail tip, oblique strokes, criss-cross, wavy lines and even with cord and reed impressions. Only a handful of bowls are found painted with white pigments and a few among these are found painted with polychrome paintings. From the fracture/breaking pattern of the bowls-on-stand and knobbled lids it is revealed that the stands and the knobs were made separately and luted to the body during the pre-firing stage. All these indicate their technological as well as artistic advance par excellence.

The colours used in the chocolate slipped ware, red slipped ware and even in the monochrome and polychrome paintings were probably extracted from hematite or other such type of minerals by exploiting the same within the radius of the site. Although no potter’s kiln has so far been found from the excavation, nevertheless, the evidences of ochre coloured stone and soft yellow material were traced in a working level of mature Chalcolithic period which were probably used in the pottery. About half a kilometre north of Suabarei site another archaeological site named Sahada Mundali Dhipa, now razed to ground for cultivation has yielded dabbers used in pottery making. It is likely that the existence of potter’s workshop was at Sahada Mundali Dhipa where the colours used in the pottery were supplied by the close by Suabareians. Further, presently, the pottery making is still continuing in the nearby villages of Basantpur Sasan and Kalyanpur Sasan as a living tradition.

**Upholstery work**

Although the excavation has not yielded any perishable leather product from the site but the tools like bone needle, bladelet, thumbnail scraper, justify some short of hide work or upholstery existed at Suabarei. The findings of bone needle made of either from an antler or rib bone of deer having round on all sides with sharp pointed edge and with a circular perforation near the butt end suggesting stitching of animal hide for clothes. Secondly, the findings of sharp parallel bladelet on chert having plain
medial ridge with sharp margins and thumbnail scraper, which are generally used for removing and cutting of skin are of good indicator for the hide work.

**Structural activities**

The Chalcolithic Suabareians lived in circular mud huts with rammed floor the evidences of which have been found in the mature Chalcolithic period. The evidences of the use of sun dried bricks along with clay lumps in the construction of the circular mud wall and the provision of a rectangular porch in front of the house indicates that these houses were meant for some important persons of the tribal community. In the absence of the analysis of the presence of nitrogen and phosphorus contents in the soil of other circular huts it is not possible to say at this juncture whether these huts were used for human habitation or for keeping domestic animals. Although no evidence for human burial has so far been found at Suabarei, the evidence of burying their pet animal, probably dog, was found in a trench in the form of bones arranged with miniature pots. As it has been observed by some scholars that single level sites are a characteristic of a tribal organization and the two level site hierarchy suggests a chiefdom society, the evidences from Suabarei indicates the site to the former one precisely because the chief criterion of a chiefdom society like fortification, temple, granary, etc. has so far not been retrieved either from Suabarei or from other excavated Chalcolithic sites of Odisha. Circumstantially, the available data lead one to believe that the Chalcolithic Suabareians were probably the aborigine/tribal community.

**Trade mechanism**

On the basis of the available non-local goods at the site, inferences can be drawn about the *status quo* of economy of the Chalcolithic community of Suabarei. In order to obtain raw material for the purpose of stone tools and implements they might have exploited the resources available in the vicinity or within a radius of five to ten kilometers or probably there might have been a network of intra-regional and inter-regional exchange system in which large centres like Golabai Sasan, Anlajodi, etc. may have served as focal points and as re-distributive centres as well. The non-local goods retrieved from Suabarei like chert, copper, chalcedony, etc. must have been acquired probably during special occasions when they met during fairs or probably there must have been some exchange mechanism for obtaining non-local materials in lieu of the others. It may be mentioned here that the copper used in the copper objects
found from the excavation at Kuanr in Keonjhar district of Odisha is available at Musabani in Singhbhum area of present Jharkhand state as known from the archaeological-metallurgical study. Since there is no copper mine in Odisha, it can be presumed at present that the copper objects retrieved at Suabarei and other Chalcolithic sites of particularly coastal Odisha was imported from the Singhbhum area of present Jharkhand through some exchange mechanism.

**Metallurgy and other miscellaneous creativity**

It is not clear from the excavation whether the copper objects were manufactured at Suabarei or they were imported from other sites readymade. Except some tiny crucibles no any other evidence of copper smithy has so far been found from the site. The retrieved terracotta animal figurines indicate their artistic skill for preparing the terracotta toy type of their domestic animals. The broken terracotta and stone wheels indicates the use of cart for transportation of goods. They loved to decorate themselves by wearing different types of beads as known from the discovery of terracotta and carnelian beads as well as from the pendant made out of roasted shark tooth. The terracotta and stone hopscotches found from the site indicate the sporting activity of the Chalcolithic kids. Their artistic excellence is also reflected in the decorative types found in the ceramics in the form of incised nail tip design, oblique strokes, wavy lines, criss-cross lines, etc. Their highest mark of artistic manifestation is reflected in the monochrome and polychrome painted potteries in which different natural/mineral colour pigments have been used. It is likely that in pottery decoration they were using bone stylus as evident from a solitary example of a stylus found from the site.

To sum up, the subsistence economy of Chalcolithic Suabarei is the reflection of rural based agricultural-cum-pastoral settlement. The Chalcolithic scenario witnessed the agricultural revolution. The stage of savagery, hunter, food gatherer has come of the age and men become more sedentary, forager or stock raiser and civilised which paved way for shaping the future revolution.
CHAPTER-IX

SUMMARY OF RESULTS
AND EMERGENT PICTURE
SUMMARY OF RESULTS AND EMERGENT PICTURE

The cultural deposit of Suabarei can be divided into two periods, i.e., Neolithic and Chalcolithic. On the basis of the material remains especially with the existence of the circular huts, proliferation of the quantum of varieties of pottery, faunal remains, both wild and domestic species, antiquities the strata (layers 7 to 4) of the excavation is termed as mature phase of Chalcolithic culture. But in the absence or prior to emergence of such antiquities, structural activities, in adequate floral and faunal remains, the early level (layers 9 to 8) can be marked as incipient Chalcolithic phase. Similarly, the upper level (layers 3 to 2) the cultural evidences were found gradually degenerated or dwindled; hence called as late Chalcolithic phase.

The subsistence economy of the people basically agriculture oriented was supplemented by hunting and fishing. Their food habit is also discernible from the excavated cultural materials. The people were both vegetarian as well as non-vegetarians; rice being their principal diet. The plant remains like wild and domesticated variety of rice, kulthi, green gram, black gram, lentil were also found along with faunal remains of domestic animals like cattle, sheep/goat. Besides, the charred bones of wild animals like deer, sambar and other wild antelopes. Again the Chalcolithic folk were fond of eating fish and tortoise, etc. as evidenced from fish bones and tortoise shells.

The people were also skillful in fishing as evident from the available copper fish-hook, fish bones, tortoise shells and interestingly recovery of Shark fish teeth of which one having a perforation at the centre for reuse as pendant. This also indicated their fishing network not only confined to the rivers and nalas but also extended to sea. The fishing was further testified by the presence of stone and terracotta net-sinkers.

A plenty of wild animal bones like elephant, wild antelopes, sambar, deer and other wild animals were retrieved. Besides, the remains of domesticated animals like cattle, sheep/goat was also found from the excavation. Dog seems to be their favourite pet animal as is evident from a burial with animal bones and arranged with miniature pots around probably filled with grave goods within. This evidence is also corroborated by the finding of fragmentary terracotta figurines of dog.
The excavations also revealed the housing pattern of circular huts of different dimensions. The mud lump and mud bricks for the first time were reported from Chalcolithic level huts in Odishan context. Further, one of the huts is having a projected porch with an entrance in east. Both the sun dried mud brick and the porch are unique, uncommon and first of its kind reported from a proto-historic excavated site in Odisha. The huts were made of traditional wattle and daub with bamboo splinters and vine reeds. The floor of the huts was also found decorated with multi colour washes. It was also observed that the huts of the upper level were laid over thick deposit of ash beneath of which there is another circular hutment. It clearly shows that the lower level huts washed away by the floods over which a thick deposit of ash which was deliberately laid to protect from further water activities. Then the huts of the upper level were constructed as a full proof against damage of water. The available of the series of hearths in the late Chalcolithic period (in the upper layer) points to some sort of community cooking.

The lithic industry of Suabarei consists of plain and fluted cores, parallel sided blades of mostly crypto-crystalline material i.e., chert; polished stone tools like celts, adzes, axes and edge sharpener of possibly blackish and dark greenish dolerite. The adzes are more in number than other tools. The edge sharpener had a groove on its wider edge to be fitted to the edges of the adzes for sharpening. Besides, in the upper level kitchen appliances like pounder and grinding stones were also retrieved. Bone tools were also found mainly made of charred bones to provide more compactness, tensility and strength. The tools include points on antler, arrow-head, long points, needle and stylus. They were meant for multipurpose use. Metal implements like copper rings, fish-hook, fragments of miniature pots, etc. are among the noteworthy findings. Besides, the number of miniature crucibles found to attest the knowledge of metallurgy of the then period. Terracotta objects were represented by fragmentary crude animal figurine (dog), hopscotch and sling balls. The beads of faience, carnelian, agate, etc. were also found from the excavation.

Pottery craft is also a unique feature of Chalcolithic culture at Suabarei. They developed a very distinguished ceramic industry of rare texture and fabric. Made of well levigated clay, fast wheel turned, these were well fired and burnished. (A) The pottery are primarily red slipped ware, chocolate slipped ware, black slipped ware, dull red ware, red ware, black-and-red ware, grey ware, red perforated ware, and interestingly occurrence of polychrome painted pottery similar to those of Golabai
Sasan and Khameswaripali. The polychrome painted pottery retrieved from the excavation is very uncommon and rare. These are post-firing in nature consisting of white, yellow and hematite red. The retrieved specimens are found on chocolate slipped wares. (B) The represented typologies are vase, bowl, bowl-on-stand, ring based bowl, basin, *handi*, elongated necked pots, miniature pots, knobbed lids, four legged tiny pot, etc. (C) Pots are decorated with designs like oblique lines, incised lines, nail tip, elongated dots, sigma dots, incision over appliqué bands and they are confined to the shoulder and neck of the pot. (D) Post-firing paintings in red ochre and yellow colour are confined to red slipped, black slipped and chocolate slipped ware. Again pre-firing white paintings are found with black slipped ware. The painting designs are straight, horizontal lines, oblique lines, vertical lines, wavy lines and criss-cross pattern, etc. The paintings are executed in the neck and shoulder of the pots (Finding of a haematite nodule/ochre substantiates its use in pottery painting and painting on floor of huts). All this activities on the potter’s craft attest to the artistic temperament and aesthetic sense of the Chalcolithic people of Suabarei.

From the excavations at Suabarei a tentative picture of stratigraphy of Odisha from prehistoric period to Early Historical period is emerged. The hiatus between Kuchai and Sisupalgarh albeit has been narrowed down but not bridged fully from the excavations of Golabai Sasan in the last part of last century. But the excavations at Suabarei have filled that gap between Chalcolithic and Early Historical period.

The Chalcolithic community of Suabarei seems to have practised barter system for their subsistence. The presence of metal implements, stone tool kit, chert blade tools which were not locally available at the site or nearby. In order to procure those raw materials, they must have bartered their surplus goods like grains, fish, etc. Hence, the possible prevalence of barter system during the period under review cannot be ruled out. The Suabarei site has proved to be a rural agrarian settlement subsisted by farming, stock raising of both plants and animals which is further supplemented by fishing and hunting.

At Golabai Sasan the picture of Chalcolithic and Neolithic cultures are hazy and sketchy as both the Neolithic and Chalcolithic cultures are intrusive in nature and superimposed one above the other thereby creating a lot of confusion. But the excavation at Suabarei has eliminated that confusion as there is clear-cut long gap between Neolithic and Chalcolithic phase. The carbon date of Chalcolithic layer of Golabai Sasan gives a date of 2100±100BCE (PRL). But there is no C14 date of
Pl. 87: Evidence of palaeo-channel
Neolithic period. The excavator has speculatively fixed the date of Neolithic to be 2300BCE approximately.

But on the other hand Suabarei dates have been obtained from Beta Lab. in respect of Chalcolithic i.e., 1215-1020BCE equating the date of Khameswariipali. Similar is the case with the date of Neolithic culture of Suabarei (Beta Analytic 1750BCE) simulating the date of Hikudi in Subarnapur district. This date has given us a picture of emergence of sedentary settlement spreading over coastal as well as hinterland of Odisha. Though contemporary in date, the Neolithic horizon at Hikudi, the other excavated site in middle Mahanadi valley in Odisha, the Neolithic folk were much developed, evidenced from the wheel made pottery whereas, in contrast, the Neolithic pottery of Suabarei is handmade, coarse and rough in texture and of course with a handful of materials only. The excavation at Suabarei has also indicated palaeo-climate and environment as evidenced from the recurrence of annual inundations and change of the course of river as the palaeo-channel has been noticed juxtaposed to the ancient settlement (Pl.87). Domestication of rice was also established right from Neolithic to Chalcolithic period.
CHAPTER-X

EXPLORATIONS ON THE RIGHT BANK OF THE RIVER DAYA FROM TIRIMAL TO ITS CONFLUENCE I.E., CHILIKA LAKE
Explorations on the right bank of the river Daya from Tirimal to its confluence i.e., Chilika Lake

The river Daya, a distributary of the river Kuakhai of the Mahanadi system studded with numerous archaeological sites and remains on its serene banks, originates at Saradeipur (near Badahati) near Bhubaneswar, the capital town of Odisha. It is joined by the Malaguni river below Golabai Sasan, a well-known Chalcolithic site and flows through Khordha and Puri districts before debouching into the north-eastern corner of the Chillika lake, almost 37km (23miles) from its origin.

Important historical milestones associated with the river Daya are the Asokan elephant at Dhauli which is the earliest art specimen not only of Odishan but also of Indian History; secondly, the river witnessed the major historical event like Kalinga war of 261 BCE which not only transformed Asoka from Chandasoka to Dharmasoka which veritably laid the foundation for growth and spread of Buddhism in this region; thirdly, the major landmark being the Early Historical fortified settlement of Sisupalgarh.

Further, the right bank and the catchment area of the river Daya is dotted with numerous Chalcolithic/Early Historical sites preceding Historical period. Keeping in view of its importance, the right bank of the river Daya from its origin (Saradeipur to Tirimal) has already been explored by Dillip Kumar Khamari, the then Superintending Archaeologist, Excavation Branch-IV, Bhubaneswar in 2013-14. It is therefore, imperative to explore the remaining portion of the river bank from Tirimal to Chilika (right bank) covering a distance of 39km and a width of space 9-10km in order to ascertain the distribution pattern of Neolithic/Chalcolithic settlement, if any, in this area as the already excavated sites of Golabai Sasan, Baanga-Harirajpur and Talapada all the excavated sites in this region have revealed a rich sequence of cultural succession. It may be noted that explorations of Khamari during 2013-14 has already brought to light three Chalcolithic sites viz., Tirimal, Anlajodi and Suabarei; of which Suabarei site was selected and excavated thoroughly by this Branch during 2014-16. Keeping all these potential aspects in view further exploration was planned, confining to the right bank of the river Daya and restricting the operational area to about 8 to 10km between the right bank of the river Daya and East-Coast Railway line.
During the Survey as many as 81 villages were thoroughly surveyed out of which 37 villages have yielded antiquarian remains ranging from Early Historical period to medieval period (see Maps 1-2). A detailed report of the explorations is given in the succeeding pages.
Location/Village-Jorkani
Tehsil/District-Delanga/Puri
Monuments/Site-Bimalakshi temple
Geo-coordinate-(20° 4’ 17” N; 85° 40’ 48”E)

Antiquarian Remains:
The village Jorkani is situated about 5km from Ghordia. The Bimalakshi temple has a small RCC shed in which a beautiful metal sculpture of Mahisasuramardini is being worshipped as its presiding deity. On the basis of iconographical features the sculpture can be assigned to c. 18th/19th century CE.

Image of Mahisasuramardini
Location/Village-Jorkani
Tehsil/District-Delanga/Puri
Monuments/Site-Maa Kshetramani temple
Geo-coordinate-(20° 4’ 13” N; 85° 40’ 45”E)

Antiquarian Remains:
The village Jorkani is situated about 5km from Ghordia. The Kshetramani temple is a small RCC *pidha* structure where some unidentified sculptures of late medieval period are found worshipped.

General view of the temple

Unidentified images
Location/Village-Baraput/Gadabadaputa
Tehsil/District-Kanasa/Puri
Monuments/Site-Siddha Mallikeswar temple
Geo-coordinate-(20° 02’ 58” N; 85° 39’18”E)

Antiquarian Remains:
The village Gadabadaputa/Baraput is situated about 5km from Mandarabasta. The temple consists of a *rekha vimana* and *pidha jagamohana*. The presiding deity of the temple is a circular *yonipitha* without *lingam* fronted by a *nandi* in the *jagamohana*. The exterior of the temple wall is adorned with usual *parsvadevatas* like Ganesa, Kartikeya and Parvati in their respective directions. The *navagraha* panel is placed over the lintel and Gajalaxmi is placed over the *lalata-bimba*. The temple complex has also sculptures of Narasimha, *deulacharini*, stone slab depicting *linga* worship and other architectural fragments including a *dola-mandapa* of laterite outside the temple complex. The sculptures and architectural members are assignable to c. 17th/18th century CE.
Location/Village- Baraput/Gadabadaputa  
Tehsil/District- Kanasa/Puri  
Monuments/Site- Gadadurga temple  
Geo-coordinate-(20º 02’ 55” N; 85º 39’ 04”E)  

Antiquarian Remains:  
The Gadadurga temple is situated near the Siddha Mallikeswar temple inside the village. The temple has a recently built *pidha deul* fronted by a flat roofed pillared *mandapa*. Significantly, the temple houses some unidentified ancient sculptures which are being worshipped as the presiding deities.

General view of the temple

Unidentified presiding deities
Antiquarian Remains:
The village Pandiabili is situated on the Bisiapara-Tirimal road. The Dadhikhai temple is a small recently built structure. Inside the temple a hero stone dated to late medieval period was found worshipped.
Location/Village-Matiapara/Gadamatiapada
Tehsil/District-Kanas/Puri
Monuments/Site-Maheswari temple
Geo-coordinate-(20° 01’ 55” N; 85° 39’ 13”E)

Antiquarian Remains:
The village Gadamatiapada is situated about 1.5km from Behenta. Though the Maheswari temple is a recently built flat roof structure but some of the architectural members and few potsherds of late medieval period are found near the temple.

General view of the shrine

Stone pivot
Location/Village- Behenta
Tehsil/District- Kanas/Puri
Monuments/Site- Gatiswar Mahadev temple
Geo-coordinate- (20° 02’ 37” N; 85° 40’ 05” E)

Antiquarian Remains:
The village Behenta is situated about 2km from Birakesharpur. The temple has a recently built *pidha vimana, pidha jagamohana* with a flat roofed pillared *mandapa*. The *navagraha* panel is placed over the lintel. The exterior wall is having the *parsvadevatas* like Ganesa, Kartikeya and Devi (?). The temple complex has also a stepped well and an image of Parvati. Outside the temple complex grey potsherds are also found. The sculptures and stepped well are attributed to late medieval period.
Antiquarian Remains:

The village Mahatapala is situated about 1.5km from Haripur village near the south-eastern railway line. The site Satabhaya is located on the outskirt of the village where about 15 laterite stone slabs depicting hero stone and linga worship are lying scattered in an open field. Each stone slabs measures about 3 to 5 feet in height. They are arranged in 4 rows. The hero stones as well as stone slabs depicting linga worship are datable to c. 16th century CE.
Location/Village- Anda
Tehsil/District- Khordha/Khordha
Monuments/Site- Maa Mangala Temple
Geo-coordinate- (20° 05’ 11” N; 85° 37’ 37”E)

Antiquarian Remains:
The village is situated on the Khordha-Mandarabasta road. The small recently built temple has houses a four-armed female deity (Parvati) in standing posture along with a standing lion dated to late medieval period.

General view of the shrine

Parvati
Location/Village-Sadheigada
Tehsil/District-Khordha/Khordha
Monuments/Site-Bahandipa Huda
Geo-coordinate-(20° 03’ 28” N; 85° 36’ 53”E)

Antiquarian Remains:
The village Sadheigada is situated on the Mandarabasta-Brajamohanpur road. The mound Bahandipa Huda is located amidst paddy field with a height of about 3 to 4m from the surrounding area and measures about 110-120m in diametre. Potsherds of red ware and grey wares, probably of Historical period, are found on the surface.
Antiquarian Remains:
The village Saradhapur is situated about 4km from Mandarabasta. The Bhimeswar temple has a *rekha vimana* and a flat roofed *jagamohana*. The outer temple walls are adorned with the *parsvadevatas* like Ganesa, Kartikeya and Parvati in their respective directions. The *nagagraha* panel is placed over the lintel and Gajalaxmi over the *lalata-bimba*. Architectural and pillar fragments are found in the temple complex. The temple can be safely dated to c.15th/16th century CE.
Location/Village-Saradhapur
Tehsil/District-Khordha/Khordha
Monuments/Site-Medina and Mugupadar sites
Geo-coordinate-(20º 02’ 01” N; 85º 36’ 42”E)

Antiquarian Remains:
The sites of Medina and Mugupadar are located on the outskirts of the village Saradhapur. Both the sites have yielded potsherds of red ware and black ware and possibly assignable to medieval period.

General view of the archaeological mound

Potsherds lying on the archaeological mound
Antiquarian Remains:
The village Motari is situated about 1.5km from Saradhapur. The Gatiswar temple has a recently built *pidha deul* and a flat roofed pillared porch is attached to the site. Apart from the sculptures of Ganesa and Kartikeya as *parsvadevatas*, the temple complex has a beautiful image of Astikajaratkaru which can be assigned to c. 14th/15th century CE.
Location/Village-Sanput/Gadasanaputa
Tehsil/District-Kanas/Puri
Monuments/Site-Dahani Gadia
Geo-coordinate-(20º 02’ 26” N; 85º 38’ 04”E)

Antiquarian Remains:
The village Gadasanaputa is situated about 1.5km from Motari and the site Dahani Gadia is located on the outskirts of the village near a seasonal nala connected to the Rajua river. The late medieval site has yielded potsherds of grey ware and red ware as well as burnt brick fragments.

General view of the site

Potsherds lying on the surface of the site
Location/Village-Lokapala
Tehsil/District-Kanas/Puri
Monuments/Site-Jhara Pokhari
Geo-coordinate-(20º 03’ 38” N; 85º 38’ 42”E)

Antiquarian Remains:
The village is situated near Mandarabasta. The site at the outskirt has laterite and sandstone slabs depicting linga worship and hero stone. According to the local villagers there were many such stone slabs but are now missing due to the excavation of soil for a canal. These stone slabs are datable to c.15th/16th century CE.
Location/Village-Ramchandi
Tehsil/District-Khordha/Khordha
Monuments/Site-Ramachandi temple
Geo-coordinate-(20° 03’ 37” N; 85° 35’ 30”E)

Antiquarian Remains:
The village Ramchandi is situated on the left side of the East Coast Railway line near Tapang Railway Station. The Ramchandi temple having a *pidha vimana* and fronted by a flat roofed pillared *mandapa* houses a crudely executed six-armed stone image of Mahisasuramardini which can be assigned to c. 18th/19th century CE.
**Location/Village:** Harpada/Hadapada  
**Tehsil/District:** Khordha/Khordha  
**Monuments/Site:** Kayan Tela (Kadalibari)  
**Geo-coordinate:** (20° 02’ 14” N; 85° 35’ 25”E)

**Antiquarian Remains:**

The village Hadapada is situated about 2km from Tapang Railway Station and the site Kayan Tela or Kadalibari is located in the last part of the village having tamarind and banyan trees. The site measuring about 300 x 200m is yielding potsherds, pestles, grinding stones, etc. probably of Early Historical period.

![General view of the archaeological mound](image1)

![Mace-heads and potsherds](image2)
Location/Village-Dhaulimuhan
Tehsil/District-Khordha/Khordha
Monuments/Site-Nilakantheswar temple
Geo-coordinate-(20º 02’ 16” N; 85º 35’ 30”E)

Antiquarian Remains:
The village is situated on the East Coast Railway line. The Nilakantheswar temple has a *rekha vimana* and a *pidha jagamohana*. The highly placed niches of the exterior wall of the main temple contain the *parsvadevatas* like Ganesa, Kartikeya and Parvati. On the basis of architectural and iconographical features, the temple and the sculptures can be assigned to c. 16th/17th century CE.
Location/Village-Bhogpur
Tehsil/District-Khordha/Khordha
Monuments/Site-Pandabaghar Cave
Geo-coordinate-(20º 02’ 40” N; 85º 35’ 02”E)

Antiquarian Remains:
The village Bhogpur is situated about 1.5km from Naranagada village. The Pandabaghar Cave is located on a hillock which on the verge of extinction due to heavy stone quarrying activities. The rock cut cave measuring 1.20m in height, 2.05m in width having an inner space of 3.60m to 3.76m. The cave contains engravings of human figures, animal figures, swastika, inscriptions, etc. the cave is datable to c. 12th/13th century CE.
Location/Village-Bhogpur
Tehsil/District-Khordha/Khordha
Monuments/Site-Palaghara Mandapa
Geo-coordinate-(20° 02’ 24’’N; 85° 34’ 59’’E)

Antiquarian Remains:
The site is situated on the outskirt of Bhogapur village on the way to Hadapada. The Palaghara mandapa is a high stone platform with beautiful decorative motifs. There are niches in all direction without any object. The pancharatha platform is decorated with gajavyala motifs, amorous couple, etc. On the basis of architectural style the platform can be assigned to c. 15th/16th century CE.
**Location/Village**: Balabhadrapur/Gadabalabhadrapur  
**Tehsil/District**: Kanasa/Puri  
**Monuments/Site**: Palaghara Mandapa  
**Geo-coordinate**: 19º 4.282”N; 85º 40.809”E

**Antiquarian Remains:**
Gadabalabhadrapur is situated on the confluence of the Malaguni and Daya rivers. The site has yielded the remains of a small fort of late medieval period. Remains of a stone elephant, pillar fragment and potsherds have been found from the site.

![Monolithic elephant and pillar fragment](image)

Confluence of the river Malaguni with the river Daya
Antiquarian Remains:

The village Jajpur is located about 3km from Nirakarpur on the new Jagannath road. The existing east facing Ranganath temple is dedicated to Lord Siva and consists of a rekha vimana and pidha jagamohana over a common low platform. Except the Vishnu image, the other parasvadevatas are fragmented deulcharini and a four armed dancing Ganesa. Besides, the other antiquarian remains of the complex are fragmented amalaka, pillar fragment, broken part of female figures and a four armed Uma-Maheswar image are found scattered all around the temple. On the basis of iconographical features of the sculptures the temple can be safely assignable to c.14th/15th century CE.
Vishnu
Lakshmi and Garuda (?)

Nandi
Location/Village: Jajpur (Rengata Malisahi)
Tehsil/District: Tangi/Khordha
Monuments/Site: Charchikai temple
Geo-coordinate: (20° 00’ 05.8”N; 85° 33’ 12.1”E)

Antiquarian Remains:

The village Jajpur is located about 3km from Nirakarpur on the new Jagannath Road. It is a recently built RCC shrine adjacent to the Ranganatha temple, Rengata Malisahi facing south. The shrine houses two seated six-armed images of Chamunda as presiding deities Charchikai and four fragmented images of Vishnu, nayika and a headless Buddha figure in dhyanamudra. On the basis of iconographical features, the sculptures can be safely assignable to c. 11th/12th century CE.
Chamunda

Vishnu and other sculptural remains

Dhyani Buddha, head missing
Location/Village-Jajpur (Rengata Malisahi)
Tehsil/District-Tangi/Khordha
Monuments/Site-Mashani Padia (cremation ground)
Geo-coordinate-(20º 00’ 05.8”N; 85º 33’ 12.1”E)

Antiquarian Remains:
The mound is situated towards the north-east of the village Rengata Malisahi having a height of about 1m from the surrounding level. The surface of the mound has yielded potsherds of red and grey wares. The mound is named so because presently it is being used as the cremation ground by the villagers. On the basis of potsherds the mound can be dated back to late medieval period.
Location/Village-Dibyasinghapur/Divyasinghapur
Tehsil/District-Kanasa/Puri
Monuments/Site-Gopinath temple
Geo-coordinate-(19º 59’ 31.5”N; 85º 34’ 14.3”E)

Antiquarian Remains:

The village is situated about 5km from Nirakarpur via Jajpur in Kanasa tehsil of Puri district. This east facing temple consists of a *pidha deul* fronted by a recently built RCC pillared *mandapa*. The temple houses a black chlorite image of Gopinatha i.e, Lord Krishna and metal images of Radha-Krishna, Bal-Krishna and Durga over a high decorated pedestal. The guardian figures Jaya and Bijaya are delicately carved on the main door jambs. The temple also contains traditional wooden chariots for rituals. On the basis of legends associated with the temple and the iconographical features of the images the temple can be dated back to c.15th/16th century CE.

General view of the temple
Facade of the deul

Jaya

Vijaya
Presiding deities

Metal images of Radha-Krishna

Krishna

Vishnu
**Location/Village**-Dibyasinhapur/Divyasinghapur  
**Tehsil/District**-Kanasa/Puri  
**Monuments/Site**-Balunkeswar temple  
**Geo-coordinate**-(19º 59’ 31.5”N; 85º 34’ 14.3”E)

**Antiquarian Remains:**

Located about 50m south of Gopinath temple, is a modern *pidha vimana* and *jagamohana*. The presiding deity is a *shaktipitha* without *lingam*. The *parsvadevatas* are four-armed Ganesa, Kartikeya and Parvati in the south, west and north respectively. A beautiful *nandi* image is also placed in the *jagamohana*. On the basis of iconographical features of the images, the temple can be dated back to *c.16th/17th* century CE.
Location/Village: Dibyasinhapur/Divyasinghapur
Tehsil/District: Kanasa/Puri
Monuments/Site: Polakhai temple
Geo-coordinate: (19º 59’ 31.5”N; 85º 34’ 14.3”E)

Antiquarian Remains:
The *pidha* temple located at the middle of the village, enshrines a number of fragmented unidentified images. An open *mandapa* with a highly embellished *torana* is found on the south-west corner of the temple. An architectural member engraved with a panel of hero stones is also noticed under a *pipal* tree near the temple. The temple with sculptures are datable to c. 15\(^{th}\)/16\(^{th}\) century CE.

![General view of the temple](image1)
![Hero stone](image2)
![General view of the *mandapa*](image3)
![Close view of the decorated pillar of the *torana*](image4)
Location/Village-Santrapur/Samantraipur
Tehsil/District-Kanasa/Puri
Monuments/Site-Krushneswar temple
Geo-coordinate-(19° 59’ 14.2”N; 85° 34’ 21.1”E)

Antiquarian Remains:

The village is situated about 6km from Nirakarpur in Kanasa tehsil of Puri district on the left side of the new Jagannath road. A renovated temple located in the middle of the village enshrines a miniature temple in half buried condition as Siva lingam. A newly built shed of laterite blocks at the back side of the temple preserves a number of fragmentary architectural members and sculptures. A four armed broken image of Mahisasuramardini Durga is worshipped as Maa Mangala under a small RCC structure near the temple. The structure and sculptures are datable to c. 17th/18th century CE.
Antiquarian Remains:
The temple is located about 8km from Nirakarpur in Kanasa tehsil of Puri district on the right side of the new Jagannath road. It consists of a *rekha vimana* and a *pidha jagamohana*. This east facing temple is slightly leaning towards south. The *parsvadevatas* of the temple are crudely executed four-armed Ganesa, Kartikeya and Parvati. The presiding deity is a *lingam* within a circular *yonipitha* fronted by a stone *nandi*. The temple and the sculptures are datable to c. 16th/17th century CE.
Location/Village-Patajoshipur/Pattajoshipur
Tehsil/District-Kanasa/Puri
Monuments/Site-Gopinath temple
Geo-coordinate-(19° 59’ 03.5”N; 85º 34’ 37.1”E)

Antiquarian Remains:
The temple is located about 7km from Nirakarpur in Kanasa tehsil of Puri district on the right side of the new Jagannath road. It consists of a pidha vimana fronted by an elongated flat roofed jagamohana. The sanctum enshrines three pairs of Radha-Krishna images and a low height pillar surmounted by a Garuda image in anjalimudra. Two large size rampart lions are placed in front of the jagamohana as guardian figures. On the basis of iconographic features the temple can be dated back to c. 18th century CE.
**Location/Village:** Shodhapur (Baladeba Sahi)  
**Tehsil/District:** Kanasa/Puri  
**Monuments/Site:** Siddhabaladeba temple  
**Geo-coordinate:** (19° 59’ 10.8”N; 85° 34’ 36.0”E)

**Antiquarian Remains:**

The east facing temple is having a *rekha vimana* and a *pidha jagamohana*. The *parsvadevatas* are Bhu-varaha, Trivikrama and an unidentified image. On the basis of temple architecture and iconographical features of the images, these can be placed in between c. 16th-17th century CE.

![General view of the temple](image)

Trivikrama  
Bhu-varaha
Antiquarian Remains:
The temple Aiswaneswara is located about 9km from Nirakarpur in Kanasa tehsil of Puri district on the left side of the new Jagannath road. The temple consists of a rekha vimana, a pidha jagamohana and two later added pillared mandapas. The presiding deity of the temple is a shaktipitha without lingam. Two decorated nandis are placed in the jagamohana. The parsvadevatas of the temple are Ganesa, Kartikeya and Parvati. Besides, an image of Bhu-varaha is also noticed in one of the niches of the later added mandapas. The vimana and jagamohana can be dated back to 16th century CE on the basis of its architectural designs and the iconographical features of the parsvadevatas. The two later added structures are dated to 1929 CE as per the inscription inscribed on the wooden rafter of the structure.
Ganesa
Kartikeya
Parvati
Bhu-varaha
Location/Village-Shrimakundapur
Tehsil/District-Kanasa/Puri
Monuments/Site-Krushna temple
Geo-coordinate-(19° 58’ 51.6”N; 85° 35’ 16.0”E)

**Antiquarian Remains:**
This temple is about 20m south-east of the Aiswaneswar temple on the right side of the new Jagannath road. The single deviated form of *pidha* structure has the presiding deity as Gopinatha. The image is carved out of black chlorite stone and is about 5 feet in height. On the basis of iconographic feature of the image it can be dated back to c. 17th/18th century CE.
Antiquarian Remains:

The temple is situated on the right bank of the Malaguni river, a tributary of river Daya. The temple consists of a pidha deul and a jagamohana over a low height plinth within a rectangular prakara wall. It is state protected monument. The outer walls of the temple are embellished with sculptures of religious, secular and decorative motifs. The images include nayikas with various postures holding musical instruments, erotic couples, vyala figures, image of Brahma, Krishna, Maheswari, Vishnu, etc. The presiding deity of the temple is an image of Krishna of black chlorite and Radha of metal. The parsvadevata images are Bhu-varaha, Tri-vikrama and Narasimaha. On the basis of architectural style of the temple it can be assigned to c. 16^{th}/17^{th} century CE.
Presiding deities over a decorated pedestal

Radha-Krishna as presiding deity

Vishnu dwarapala

Main entrance
Gopi vastraharana by Krishna

Gajavyala

Mithuna

Mithuna

Male figure with braided hair

Nayika with musical instrument
Antiquarian Remains:
The village is situated about 2km from Nirakarpur on the right side of new Jagannath road. This east facing temple is a single *pidha* temple of recently built but houses a number of loose sculptures both of Brahmanical and Buddhist affiliations. The presiding deity of the temple is *Siva lingam* within a circular *yoni pitha*. The *parsvadevatas* of the temple are four-armed Ganesa and Kartikeya and an eight armed Mahisasuramardini Durga. The other antiquarian remains of the site are Buddha in *vyakhyanamudra*, Buddha in *bhumisparsamudra*, fragmentary image of Tara, Jambhala, image of Ganesa, broken Anantasayi Vishnu, votive stupa and other sculptural and architectural fragments. The village itself including the temple is placed over a late medieval mound. Therefore, numbers of potsherds particularly of red, grey and black ware are found throughout the village. The sculptures are datable between *c.13th - 16th centuries CE.*
Yonipita without linga

Nandi

Ceremonial mandapa
Ganesa

Uma-Maheswara

Mahisasuramardini

Votive stupa
Buddha in *vyakhyanamudra*

Buddha in *dhyanamudra*

Jambhala

Tara

Fragmentary sculptures
Location/Village-Gopinathpur
Tehsil/District-Tangi/Khordha
Monuments/Site-Siddheswara temple
Geo-coordinate-(19º 58’ 58.9”N; 85º 33’ 57.1”E)

Antiquarian Remains:
The village is situated about 3km from Nirakarpur on the left side of new Jagannath road. This west facing temple consists of a rekha vimana and a pidha jagamohana. The parsvadevata images are Ganesa, Kartikeya and Parvati have been placed in the south, east and north respectively. On the basis of architectural style and iconographical features of the sculptures, the temple can be dated back to c. 17th/18th century CE.
Location/Village-Lendo  
Tehsil/District-Tangi/Khordha  
Monuments/Site-Ladukeswara Temple  
Geo-coordinate-(19º 58’ 45.9”N; 85º 33’ 06.5”E)

Antiquarian Remains:

The village is situated about 3km from Nirakarpur via Lendo on the right side of new Jagannath road. This east facing temple consists of a rekha vimana and a pidha jagamohana. A number of loose sculptures have been found inside the temple complex includes deulacharini, Kartikeya, hero stone, Ganesa, amorous couple, Astikajaratkaru and some other unidentified images. A votive stupa is also noticed lying outside the temple complex. On the basis of architectural style and iconographical features of the sculptures, the temple can be dated between c. 14th- 16th century CE.

General view of the temple

Yonipitha without linga
Astikajaratkaru
Mithuna
Votive stupa
Antiquarian Remains:

The village is situated about 4km from Nirakarpur and 2km from village Lendo. This deviated form of *pidha* temple houses Radha-Krishna as its presiding deity placed over a high pedestal. The image of Krishna is carved out of black chlorite stone while that of Radha is *astadhatu*. The *parsvadevatas* are images of Bhu-varaha, Narasimha and Trivikrama. The temple is fronted by a Garuda pillar. On the basis of a stone inscription attached on the inner wall of the *jagamohana*, the temple is assignable to c. 17th century, i.e., 1689 CE.
Garuda pillar  
Radha-Krishna as presiding deity  
Dattatreya  
Dattatreya
Bhu-varaha

Inscribed tablet

Narasimha

Trivikrama
Antiquarian Remains:

The village Areri is situated about 5km from Lendo chowk and on the right side of the Lendo-Bhushandpur road. This modern temple preserves an image of Trivikrama and fragmented Uma-Maheswar image inside the sanctum along with a circular Shaktipitha as presiding deity. A votive stupa and an image of Uma-Maheswar are also noticed outside the temple. A decorated nandi image has been placed inside the jagamohana.
Votive stupa

Uma-Maheswar

Trivikrama

Nandi
Location/Village-Khuntiabanpur
Tehsil/District-Kanasa/Puri
Monuments/Site-Vishneswar temple
Geo-coordinate-(19º 57’ 07.3”N; 85º 34’ 17.3”E)

Antiquarian Remains:

The village Khuntiabanpur is situated about 8km from Lendo chowk and on the right side of the Lendo-Bhushandpur road. The recently built yajna mandapa in front of the Vishneswar temple preserves a beautiful image of Avalokiteswara. The image is highly embellished with floral and faunal motifs along with pancha-dhyani Buddhas at the top of the stone slab. The temple as well as the image can be assigned to c. 13th/14th century CE.
**Location/Village**- Sahupara/Sahupada  
**Tehsil/District**- Kanasa/Puri  
**Monuments/Site**- Balunkeswar temple  
**Geo-coordinate**- (19º 57’ 21.5”N; 85º 35’ 03.4”E)

**Antiquarian Remains:**

The temple is situated in the middle of the village Sahupada and about 8km from Lendo chowk, on the left side of the Lendo-Bhushandpur road. The temple is a newly built *pidha* structure but an image of four-armed Vishnu is worshipped in front of the temple as Mangala. Besides, a head part of Vishnu image is also placed near the Mangala shrine. On the basis of iconographic features, the image can be dated back to c. 14th/15th century CE.
Antiquarian Remains:

The temple is situated in the outskirt of the village Malisahi and about 15km from Lendo chowk, on the right side of the Lendo-Bhushandpur road. The temple consists of a rekha vimana and a pidha jagamohana within a rectangular laterite prakara wall. The parsvadevata niches are filled with the images of Parvati, Kartikeya and Ganesa in the north, west and south respectively. Besides, an image of Astikajaratkaru, Narasimha and Kartikeya are also found in the temple complex. The temple and images are datable to c. 15th/16th century CE.
Location/Village-Dia
Tehsil/District-Tangi/Khordha
Monuments/Site-Ganesa temple
Geo-coordinate-(19º 59’ 0.11”N; 85º 32’ 25.3”E)

Antiquarian Remains:
The village Dia is situated about 1.5km from Nirakarpur on the left side of East Coast Railway line. The temple is a recently constructed but two numbers of Ganesa images and three numbers of pillar fragments are found outside the temple. On the basis of iconographical features the images can be dated back to c. 15\textsuperscript{th}/16\textsuperscript{th} century CE.
Location/Village - Dia
Tehsil/District - Tangi/Khordha
Monuments/Site - Harachandi temple
Geo-coordinate - (19° 59' 0.11"N; 85° 32' 25.3"E)

Antiquarian Remains:
The village Dia is situated about 1.5km from Nirakarpur on the left side of East Coast Railway line. The temple is a recently constructed but houses two four-armed female deities as Parvati (?) of 19th century CE.
**Location/Village:** Kapileswar  
**Tehsil/District:** Tangi/Khordha  
**Monuments/Site:** Kapileswar temple  
**Geo-coordinate:** (19° 58’ 38”N; 85° 32’ 9”E)

**Antiquarian Remains:**

The village Kapileswar is situated about 2.5km from Nirakarpur via Dia on the left side of East Coast Railway line. The east facing temple consists of a *rekha vimana* and a *pidha jagamohana* within a spacious compound. The presiding deity of the temple is a circular *yonipitha* without *lingam*. The *parsvadevatas* are Parvati, Kartikeya and Ganesa in the north, west and south respectively. The door lintel of the temple is engraved with *navagraha* slab and Gajalakshmi is depicted in the *lalata-bimba*. The temple complex contains seven numbers of square based octagonal *lingams* in a row over a common platform. A broken image of Bhairava is also noticed near the *linga* platform. The *jagamohana* of the temple contains a highly stylised *nandi*. Besides, an image of four-armed Vishnu is also placed in front of the *jagamohana*. On the basis of legends, architectural style and iconographical features it can be dated back to c. 16th century CE.

![General view of the temple](image_url)
Bada portion of the vimana

Yonipitha without linga

Navagraha panel over the lintel
Gajalakshmi as crest figure on a lintel

Stylised nandi

Row of Siva lingams
Antiquarian Remains:

The village Biritoi is situated about 5km from Nirakarpur via Kapileswar on the left side of East Coast Railway line. The temple has a pidha vimana and flat roofed elongated jagamohana. The presiding deity is a circular sakti pitha without lingam. The jagamohana contains a decorative nandi. The parsvadevatas are Ganesa, Kartikeya and Parvati in their respective directions of the temple. Besides, images of Ganesa, Bhairava, Kartikeya and a deula charini are housed in a platform known as Savitri mandapa. Apart that unidentified female figures and amlaka fragments are also found in the temple complex. On the basis of iconographic features the sculptures can be assigned to c. 16th/17th century CE.
Shaktipitha without linga

Nandi

Kartikeya

Parvati

Ganesa

Unidentified sculpture
General view of Savitri mandapa

Deulacharini

Bhairava

Ganesa

Laterite amalaka
Antiquarian Remains:

The village Gadakharada is situated about 7 km from Nirakarpur on the left side of Nirakarpur-Bhusandpur road. This temple is newly constructed but an image of Kartikeya and an unidentified image are found under a banyan tree near the temple. On the basis of iconographical features the sculptures can be assigned to c. 18th/19th century CE.
**Location/Village:** Garkharad/Gadakharada  
**Tehsil/District:** Kanas/Puri  
**Monuments/Site:** Maa Chandi temple  
**Geo-coordinate:** (19º 57’ 12.5”N; 85º 31’ 43.2”E)

**Antiquarian Remains:**

The village Gadakharada is situated about 7km from Nirakarpur on the left side of Nirakarpur-Bhusandpur road. This temple is newly constructed *pidha* structure but preserves a broken eight-armed Mahisasuramardini image. On the basis of iconographic features, the image can be dated back to 15\(^{th}/16^{th}\) century CE.
Location/Village-Garkharad/Gadakharada
Tehsil/District-Kanas/Puri
Monuments/Site-Laxmi Narayan temple
Geo-coordinate-(19º 57’ 12.5”N; 85º 31’ 43.2”E)

Antiquarian Remains:
The village Gadakharada is situated about 7km from Nirakarpur on the left side of Nirakarpur-Bhusandpur road. The temple consists of a *pidha vimana* and a *jagamohana* which houses six pairs of Radha Krishna images of metal, two numbers of Krishna, five numbers of Bal Gopal images and *salagramas*.

General view of the temple

Presiding deities

Radha-Krishna

Salagramas
Location/Village-Kankapur
Tehsil/District-Kanas/Puri
Monuments/Site-Swapneswara Temple
Geo-coordinate-(19º 56’ 55.5”N; 85º 32’ 07.3”E)

Antiquarian Remains:
The village Kankapur is situated about 9km from Nirakarpur on the left side of Nirakarpur-Bhusandpur road. The temple has a recently built *pidha vimana* and fronted by a flat roofed RCC pillared *mandapa*. Two numbers of hero stones and same numbers of stone slabs depicting *linga* worship have been found within the temple complex and can be assigned to *c. 17<sup>th</sup>/18<sup>th</sup> century* CE.

General view of the temple

Slabs depicting *linga* worship and hero stones
Location/Village- Urmukhi/Abhayamukhi
Tehsil/District - Kanas/Puri
Monuments/Site- Jagannath temple
Geo-coordinate- (19° 56’ 15.7”N; 85° 30’ 07.3”E)

Antiquarian Remains:
The village Urmukhi is situated about 14km from Nirakarpur on the left side of Nirakarpur-Bhusandpur road near Bhusandpur. The temple consists of *pidha deul*, flat roofed elongated *jagamohana* and pillared open *mandapa*. The presiding deities of the temple are Lord Jagannath, Balabhadra and Subhadra. On the basis of architectural style the temple can be assigned to c. 18th century CE.
APPENDICES

Appendix-IA

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = 0.81, lab. mult. = 1)

<table>
<thead>
<tr>
<th>Laboratory number</th>
<th>Beta-334012 : SHR118</th>
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</table>

Conventional radiocarbon age: 3460 ± 30 BP

Calibrated Result (95% Probability): Cal BC 1680 to 1650 (Cal BP 3630 to 3640)

Intercept of radiocarbon age with calibration curve: Cal BC 1750 (Cal BP 3700)

Calibrated Result (85% Probability):
- Cal BC 1870 to 1945 (Cal BP 3820 to 3705)
- Cal BC 1810 to 1830 (Cal BP 3750 to 3730)
- Cal BC 1770 to 1740 (Cal BP 3725 to 3660)
- Cal BC 1710 to 1670 (Cal BP 3680 to 3660)

Database used: INTCAL13

References:

Beta Analytic Radiocarbon Dating Laboratory
4980 S.W. 74th Street, Miami, Florida 33165 • Tel: (305) 262-6597 • Facs: (305) 262-6594 • Email: beta@radiocarbon.com
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = -24.9 o/oo : lab. mut = 1)

Laboratory number: Beta-434011 : SBR10A

Conventional radiocarbon age: 2980 ± 30 BP

Calibrated Result (95% Probability): Cal BC 1260 to 1115 (Cal BP 3230 to 3065)

Calibrated Result (88% Probability): Cal BC 1280 to 1160 (Cal BP 3210 to 3140)
Cal BC 1175 to 1160 (Cal BP 3125 to 3110)
Cal BC 1145 to 1130 (Cal BP 3066 to 3050)

Database used: INTCAL13

References:


Beta Analytic Radiocarbon Dating Laboratory
4685 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)663-5197 • Fax: (305)663-5944 • Email: beta@radiocarbon.com
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12 = 20.3 e/oo lab: multi = 1)

Laboratory number: Beta-435457 | SRRSB

Conventional radiocarbon age: 2300 ± 30 BP

Calibrated Result (95% Probability):
- Cal BC 1265 to 1140 (Cal BP 3155 to 3090)
- Cal BC 1130 to 1005 (Cal BP 3090 to 2955)

Calibrated Result (68% Probability):
- Cal BC 1120 to 1020 (Cal BP 3070 to 2070)

Database used:
INTCAL13

References:

Beta Analytic Radiocarbon Dating Laboratory
4905 S.W. 74th Court, Miami, Florida 33155 • Tel: (305) 661-6161 • Fax: (305) 661-0684 • Email: betadaradate.com
On Mon, Jun 6, 2016 at 3:33 PM, CHANDRA MOHAN NAUTIYAL <cmnautiyal@yahoo.co.uk>
1. BS-3913, SBR/14-15/ 01,  595 cm, charcoal
   Cal Age: 2350 BC +/- 100 yr (one sigma)

2. BS-3914, SBR/14-15/02, 445 cm, charcoal
   Cal Age: 1840 BC +/- 100 yr (one sigma)

3. BS-3915, SBR/14-15/03, 172 cm, charcoal
   Cal Age: 860 BC +/- 80 yr (one sigma)

Plack.
Appendix-III

Report on the
Plant Economy of the Suabarei Archaeological Site,
District Puri, Odisha

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Dept. of Archaeology,
Deccan College Post-Graduate and Research Institute,
Deemed University, Pune–411006
Email: psatishnaik@gmail.com

Introduction

Archaeobotany deals with the study of plants remains used or cultivated by people in ancient times, which have survived in the context of archaeological deposits. The recovery, analysis and interpretations of plant remains provide evidence for co-evolution of plants and people interactions. It also contributes to past food economy and palaeoenvironmental studies. There is a lot of scope for archaeobotanical research in Odisha because plenty of archaeological sites belong to all cultural periods are inhabited and less systematic sampling and flotation undertaken (Thapar 1978; Harvey et al. (2006). Vishnu-Mittre (1974, 1976) reported rice remains and wild rice impressions on ceramics from Kuchai in Mayurbhanj district. He has also traced the origins and history of agriculture in Indian sub-continent. (Vishnu-Mittre 1977, 1978) Fuller (2002) attested that the archaeobotanical evidence form Odisha is lacking.

Harvey et al. (2006) carried out archaeobotanical studies at the Neolithic-Chalcolithic sites at Golabai Sasan and Gopalpur. They have retrieved rice, pulses like horse gram, pigeon pea, green gram and black gram with millets like Paspalum and Panicum sp. which are the weeds of rice crops at Golabai Sasan. Subsequently, they have also reported horse gram and pigeon pea from Neolithic levels of Gopalpur. They have pointed out that the pigeon pea is likely to have originated in the same region. The fertile coastal plain of Odisha, drained by some important rivers and their tributaries provide ideal environment for summer as well as winter crops (Mohanty et al. (2013). In connection with the efforts made by above mentioned scholars, present archaeobotanical investigations provide insights of food habits and agricultural system at Suabarei.
Dr. Jeeban Kumar Patnaik, Superintending Archaeologist, ASI Excavation Branch – IV, Bhubaneswar conducted excavations at Neolithic-Chalcolithic site at Suabarei, (20°09’ 14” N, 85°48’ 33” E) in Puri district of Odisha during 2015-16 season (Fig.1). The author has participated in the excavations on invitation for botanical, environmental and palaeoenvironmental studies, an archaeobotanical account of which has been given herewith. The systematic collection of plant remains has been taken up at the excavation site with a view to obtain a broader understanding of the ways in which ancient settlers exploited vegetational resources of the region. The plant remains resulted from certain human depositional activities. However, it is difficult to mention with certainty how and through what sort of activity the material got carbonized and came into the deposits. These plant remains are studied in detail with respect to morphological and anatomical aspects of seeds and fruits.

Materials and Methods

The archaeobotanical remains were meticulously collected by visual inspection from the habitational deposits during the course of excavations. Two methods are adopted.

1. Dry Sieving: The habitational deposits of different occupational levels were passed through the sieve provided with a mesh of 1.0mm mesh size. The sieve was used to recover large sized grains. The sieved soil samples collected from every stratum (approximately 20kg.) were taken to the water source for wet sieving.

2. Wet Sieving: Water flotation technique in the form of wet sieving was employed for representative soil samples from all the levels of the habitational deposits in order to recover the organic remains. In water floatation, a difference in density of organic and inorganic materials is utilized to achieve separation of organic remains from the soil matrix, which greatly enhances both the quantity and quality range of the botanical material that can be recovered archaeologically. The flotation technique was essentially a modification of the procedure developed by Streuver and adopted by Steward and Robertson (1973).

The soil samples from a wide range of deposits at different depths were immersed in water containing tub. It resulted in release of carbonized botanical material from the soil and floating to the surface, where it was scooped out using 200 micron mesh size and hand-operated sieves. Special care was taken to see that no organic materials howsoever minute are lost through the mesh. The residual matter
was thoroughly examined for grains as well as for other organic material. The recovered carbonized materials were, therefore, sorted out, preserved in mesh and dried without directly exposing it to the sunlight and stored in plastic vial to avoid mechanical damage. The botanical materials were collected from all levels of habitational deposits, belonging to all cultural periods and for tracing agricultural history at the site.

All the botanical remains were segregated and categorized under low power Stereo-binocular (LEITZ WETZLAR) microscope in the laboratory. It has been found that the grains, seeds and fruit seeds that burnt slowly, retained their shape and fine morphological details. The grains were critically studied and identified on the basis of external morphological features, photographed satisfactorily under a low power research microscope (WILD PHOTOMAKROSKOP-M 400 1,25x). The features were then compared with wild and cultivated materials to aid the identification. The total numbers of grains and seeds belonging to each species from all the sections have been noted. The measurements have also been documented with the help of stage micrometer and an ocular disc. The material has plotted quantitatively, layer wise and trench wise; the results are summarized (Table-1).
Fig. 1: Archaeological Site at Suabarei. *a*, General View of the site; *b*, Site surrounded by modern agriculture; *c*, Index Trench at the site; *d*, Profile after soil sampling.
Table-1 : Archaeobotanical remains at Suabarei

<table>
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<th>Sl. No.</th>
<th>DCB Lab No.</th>
<th>Archaeological Provenance</th>
<th>Depth in cm</th>
<th>Nature of the Material</th>
<th>Result of Botanical Identification</th>
<th>Total No. of Grains</th>
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<td>Stratum-2</td>
<td></td>
<td></td>
<td>Oryza sativa L. (Rice) Spikelet bases</td>
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<td>Rumex sp. (Knotweed), Polygonaceae</td>
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<td></td>
<td></td>
<td>Panicum sp.</td>
<td>1</td>
</tr>
<tr>
<td></td>
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<td>Eleusine indica (L.) Gaertn.</td>
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<tr>
<td></td>
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<tr>
<td></td>
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<td></td>
<td>Indet cut grains</td>
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</tr>
<tr>
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<td></td>
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<td>A1/Qdt. II Stratum-11</td>
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<td>Charcoal</td>
<td>Wood parenchyma</td>
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<tr>
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<td>-565 to -583</td>
<td>Charcoal</td>
<td>Wood parenchyma</td>
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Description of the Botanical remains

Cereals

1. Rice (*Oryza sativa* L.): The charred remains of rice recovered from different Chalcolithic levels in sufficient quantity mixed with other seeds and grains. These were in the form of whole grain, fragmented, embryos, embryo ends, immature grains, immature fragmented, immature embryo ends, spikelet bases of mature and immature rice grains. The whole rice grains are elongate to narrowly oblong, laterally flattened and prominently ribbed with few partial and much more without husk. Morphologically five different types of cultivated rice grains were recovered from the site (**Fig.2 a-g**). They measure 4.00–4.60 × 1.70–2.00 × 1.20–1.30mm (l×b×t).

2. Wild rice (*Oryza rufipogon* griffith): It is wild weedy species of rice occasionally harvested along with the cultivated crop. Few grains in the form of whole grain, fragmented, embryo ends, have been encountered from the site. The grains are comparatively more slender than the cultivated rice, elongate to narrowly oblong and without husk. They measure 4.50–5.00 × 1.55–1.70 × 1.00–1.30mm (l×b×t). The grains of weedy *O. rufipogon* are highly variable perennial form of wild rice which gives the appearance of cultivated rice (**Fig.2 h**).
Fig. 2 (h)

Pulses

1. Horse-gram (*Macrotyloma uniflorum* (Lam.) Verdc.): The cultural phases represented by ellipsoidal and somewhat kidney-shaped, laterally flattened whole and fragmented seeds with smooth surface (Fig. 2 i). They measure 3.73 × 1.53 × 1.10mm (l×b×t). The seed has small, elliptical and laterally positioned hilum scar measure about 0.75–1.00 × 0.50mm (l×b). The seeds are comparable to those of *Macrotyloma uniflorum* (Horse-gram).

Fig. 2 (i)

2. Green-gram (*Vigna radiata* (L.) Wilczek): Single complete carbonized grain has been recovered from layer (7) of Chalcolithic cultural level. The seed is elongated and somewhat cylindrical in appearance, smaller in size than black-gram, measure 3.00 × 2.00 × 2.00mm (l×b×t). It is characterized by squarish to somewhat rounded ends. Flat and elliptical hilum about 1.00mm long is situated at the level of seed-coat surface. In general morphology, the carbonized seed has therefore been referred to as *Vigna radiata* (Green-gram) (Fig. 2 j).
Wild and Weedy Taxa

1. Browntop millet (*Brachiaria ramosa* (L.) Stapf.): Three grains of browntop millet were recorded from layer (2). The seeds are broadly elliptic having smooth surfaced pericarp, measuring 2.25 × 1.87 mm × 0.80 mm (L×B×T) are comparable to *Brachiaria ramosa*. The plant is commonly occurs on wet places such as rice fields, along ditches and canals and in marshes (Fig.2 k).

2. Raishan millet (*Digitaria cf. cruciata* (Nees) A. Camus): Two complete grains of domesticated minor millet *Digitaria* have been encountered from Chalcolithic levels. They measure 1.50 × 0.90 mm (lxb). It is a rain fed crop and consumed mainly as a substitute for rice. The straws of Raishan are useful as a fodder for cattle. On morphological ground the grains are comparable to the seeds of *Digitaria cruciata* (Fig.2 l).
3. **Barnyard millet** (*Echinochloa* sp.): The grains are ovoid-orbicular having smooth surface and well-marked hylum scar. They measure 1.00-1.50 × 1.00-1.25 × 0.50-1.00 mm (l×b×t). It is a type of wild grass originating from tropical Asia formerly classified as a type of *Panicum* grass usually found in water lodged areas and as a weed in the paddy fields. On morphological ground, the seed are comparable to those of *Echinochloa* sp. (Barnyard grass) (*Fig. 2 m*).

4. **Anjan-grass** (*Cenchrus cf. ciliaris* L.): The charred single, ovate, hulled caryopsis with rugose surface and arched ventral side measuring 1.26 × 0.73 mm (l×b) and is comparable to *Cenchrus* sp. belong to family Poaceae (*Fig. 2 n*).
5. **Knotweed (Rumex sp.):** The complete nuts have been recovered from different layers of Chalcolithic levels. The nuts are stalked, triangular in shape and measure 1.20–1.50 × 0.75–1.00 mm (l×b). The characteristic one side is broader than other two almost equal sides. The plants commonly found in shallow fresh or brackish water; pools, marshy sites, along drains; lowland-irrigated and tidal rice fields often abundant and often gregarious. The nuts have been identified as belonging to *Rumex* sp. of Polygonaceae family (Fig.2 o).

6. **Spike Sedge (Elaeocharis sp.):** Few nuts of spike sedge recovered from layers (2) and (7). The nuts are ovoid, biconvex or plano-convex, smooth or faintly reticulate, triangular, compressed measure 1.5 × 1.0 mm (l×b). These plants are commonly
occurs in swamps, stream, river, pond and lake margins. On morphological features these nuts are identified as spike sedge belongs to Cyperaceae family (Fig. 2p).

(Fig.2 p)

7. Club-rush (*Scirpus triqueter* L. Cyperaceae): The nuts are trigonus with angles slightly thickened and reticulate surface, measure 0.70–0.90mm in length recovered from layers (6) and (9). These plants are commonly found in river banks, lakes and rice fields. The morphological characteristics are comparable to those nuts of club-rush belong to family Cyperaceae (Fig. 2q).

(Fig.2 q)

8. Catchfly (*Silene conoidea* L.): Two seeds of Catchfly recovered from (6) and (9). The seeds are very small and flattened with rounded margin. They have shiny and warty surface with distinct tubercles. They measure 0.75 to 0.90mm in diameter. On morphological grounds the seed resembles to *Silene conoidea* L. (Catchfly) belongs to family Caryophyllaceae. Presently it grows as a weed in winter crops (Fig. 2r).
9. Scrophulariaceae: Single carbonized seed which is rectangular, broadly pitted on all sides and measure 2.50 × 1.71mm (l×b) recovered from layer (7). On morphological ground it is identified as a seed of family Scrophulariaceae (Fig.2 s).

(Fig.2 r)

10. Spider flower (Cleome cf. gynandra L.): Two reniform seeds, compressed and conspicuously tubercled, measuring 1.25 mm in diameter documented from layers (6) and (9). They show close resemblance to Cleome sp., in family Capparaceae, a weed of wasteland and cultivated fields (Fig.2 t).

(Fig.2 s)

(Fig.2 t)

11. Indian goose-grass (Eleusine indica (L.) Gaertn.: Two caryopsis or grains of goose-grass has been documented from layer (10) of Chalcolithic period. The grain
shows topographic undulations on the surface. They measure 1.10–1.33 × 0.55–0.9mm (l×b). It is serious weed of rice crop. The external morphology grains resemble to those of Indian goose-grass belongs to family Poaceae (Fig.2 u).

(Fig.2 u)

12. *Panicum* sp.: Few grains of wild *Panicum* sp. have been recovered from layers (6) and (9) of Chalcolithic levels. The grains measure 1.30–1.50 × 1.10–1.30 × 0.80–1.00mm (l×b×t). It is good fodder for cattle. On the morphological ground the grains are comparable to those of *Panicum* sp. (Fig.2 v).

(Fig.2 v)

13. Spine of some thorny plant: It is recovered from layer (6) (Fig.2 w).

(Fig.2 w)
14. **Large Fungal Scleretia**: Few fungal scleretia have been noted from layer (2) (Fig. 2 x).

![Large Fungal Scleretia](image)

(Fig. 2 x)

15. **Rice Husk Impression (Oryza cf. sativa)**: The rice husk impressions were observed on many potsherds at the site. The impressions were elongate to narrowly oblong. They show prominent ribs with few partial and much more without husk. Some impressions represent the typical chess board pattern of rice husk on the potsherd (Fig. 2 y-z). The size of impressions ranges from 4.20–4.80 × 1.8–2.3mm (lxb).

![Rice Husk Impression](image)

(Fig. 2 y-z)

16. **Culm base of grass (Fig. 2 aa)**

![Culm base of grass](image)

(Fig. 2 aa)
17. Culm node of grass (Fig. 2 ab)

(Fig. 2 ab)

Fruits and Nuts

1. Jujube/jharberi (*Ziziphus nummularia* (Burm. f.) W. & A.): Globose or somewhat oval fragmented stone measuring 6.85 mm has been encountered. The stone pieces exhibit tubercled surface. The stone has been found comparable to jujube/jharberi. The nut shells of indeterminate plants were also noticed from Chalcolithic level (Fig. 2 ac).

(Fig. 2 ac)

2. Indeterminate (Fig. 2 ad).

(Fig. 2 ad)
Discussion and Conclusions

The archaeobotanical remains systematically recovered from stratified layers of four trenches at Suabarei comprise different plant species belongs to cereals, pulses, fruit and nut shells, and wild and weedy taxa. Qualitative analysis shows that the ancient settlers at Suabarei were subsisted on starch rich cereals like rice (*Oryza sativa* L.), protein rich pulses like horse gram (*Macrotyloma uniflorum* (Lam.) Verdc.) and green gram (*Vigna radiata* (L.) Wilczek), fruits like jujube (*Ziziphus nummularia* (Burm. f.) W. & A.) and nuts. The weedy and wild taxa associated with these crops comprise wild rice (*Oryza rufipogon* Griffith), browntop millet (*Brachiaria ramosa* (L.) Stapf.), raishan millet (*Digitaria cf. cruciata* (Nees) A. Camus), barnyard millet (*Echinochloa* sp.), anjan-grass (*Cenchrus cf. ciliaris* L.), knotweed (*Rumex* sp.), spike sedge (*Elaeocharis* sp.), club-rush (*Scirpus triqueter* L.), catchfly (*Silene conoidea* L. Caryophyllaceae), member of Scrophulariaceae, spiderflower (*Cleome cf. gynandra* L.), Indian goose-grass (*Eleusine indica* (L.) Gaertn.), *Panicum* sp. and seeds of *Solanum* sp. The other plant remains include a spine of some thorny plant, rice husk impressions, culm base and culm node of grasses, few indeterminate wild type of seeds, their fragments, seed coats and wood parenchyma. Termite frass and fungal scleretia were also noticed in the collection.

Agriculture practices vary among region to region but crops grown are primarily determined by climate and habitat. Rice, (*Oryza sativa* L.) is grown wherever irrigation is possible and the qualitative data shows that the ancient settlers at Suabarei were self-sufficient in rice production. They may have produced a surplus of grains that can be exchanged for other necessities of village society. Rice shows its abundance in archaeobotanical assemblage with its five morphotypes of whole grains, separately preserved embryo, embryo-ends and spikelet bases. These remains throws light on different activities of crop processing such as, threshing, winnowing, dehusking, etc., of rice have been conducted at the site.

The statistical analysis have also confirmed that, rice contributes 90.74%, pulses 3.43%, fruit and nut shells 1.04% and wild and weedy taxa 4.77% of total archaeobotanical assemblage at Suabarei (Fig. 3). It confirms that rice was the staple food of Chalcolithic settlers at Suabarei with pulses like horse-gram and green-gram.
Fig. 3: Showing average relative % of abundance of archaeobotanical remains.

Horse-gram (*Macrotyloma uniflorum*) is drought resistant plant hence it may have been cultivated as pulse crop during Chalcolithic period in the vicinity of site. Horse-gram is one of the richest vegetarian sources of protein and has the highest calcium content among pulses. The presence of green-gram at the site attests its distribution in the region with other grains. These both the pulses reported by Harvey *et al.* (2006) from Neolithic-Chalcolithic site of Golabai Sasan.

Jujube/ber (*Ziziphus nummularia*) and nut shells represented in the collection may also have been used as eaten raw; the traditional uses of these wild plants may be regarded meaningful, which the farmers at Suabarei could have not afforded to neglect. The wild and weedy taxa documented at the site are the small varieties of weeds of the rice crop helps to deduce picture of ground vegetation and state of agricultural field at Suabarei. Caton *et al.* (2010) documented these wild and weedy taxa as weeds of rice fields in Asia. The minor millets of wild and weed plants are of economic importance e.g. browntop millet (*Brachiaria ramosa*) appears to have been the first staple millet in South India (*Fuller et al.* 2004), and has also turned up as an early crop/resource in the Neolithic Ganges (*Harvey et al.* 2005). Although it is usually regarded as a weed, *B. ramosa* is still cultivated as a minor crop in some areas of southern India for both human and animal consumption (*Kimata et
Similarly an esculent form of *Digitaria cruciata* is grown by the Khasi Hill tribals of Meghalaya for its grains (Bor 1940). Singh and Arora (1972) stated that the Raishan crop is rainfed and cultivated by the hill tribals mixed cropping pattern with maize. The harvested grains are first dried in the sun by spreading and stored in small cloth or gunny bags. Dehusking is done as and when it is desired to cook the grains. The occurrence of these grains of Raishan at the site of Suabarei attests its domestication during Chalcolithic phase.

This archaeobotanical data are the source of limited information about food habits and ancient agriculture system at Chalcolithic Suabarei. The author tried hard to recover archaeobotanical remains from Neolithic phase but except wood parenchyma (charcoal) no food grains were encountered at the site. As agriculture developed incrementally from the stage of food-gathering, it needs more fresh excavations and direct dating of the archaeobotanical material in understanding the origin of agriculture and to mark environmental interpretations in this region.

**References**


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Faunal Remains from the excavations at Suabarei, District Puri, Odisha

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Abstract

A random sample of faunal material recovered from Suabarei (District Puri, Odisha) was examined in 2016. The material from two excavation seasons has been studied. Total 1176 fragments were examined. The study revealed presence of five domestic species (cattle, buffalo, goat, pig, dog and cat), twelve wild mammals (elephant, wild buffalo, nilgai, sambar, spotted deer, four-horned antelope, gazelle, wild pig, common squirrel, hare and rat), birds (common crane, black partridge, cattle egret and pond heron), reptiles (Indian Sawback turtle and Indian mud turtle), and five fish species.

Introduction

The Neolithic-Chalcolithic site of Suabarei (District Puri, Odisha) located near River Daya (Pls.I-II) was excavated by the Archaeological Survey of India, Excavation Branch-IV, Bhubaneswar under the leadership of Dr. Jeeban Kumar Patnaik. The site revealed presence of 11 stratigraphic cultural layers of which layer 10 was a hiatus between the Neolithic and Chalcolithic culture. This study is based on material recovered during two excavation seasons.

Faunal Material and Methodology

Since the amount of faunal material recovered was large, it was decided to examine a sample with following two objectives:

(1) To ascertain the diversity of animal species utilised at Suabarei, and
(2) To record signatures of both natural and anthropogenic taphonomic factors which have impacted the faunal material.

While selecting the sample care was seen to represent all the layers. Excavation had not progressed to the Neolithic context at the time of conducting this study. Therefore, this study is primarily based on material from the Chalcolithic contexts. The sample examined during this study represents a random sample that accounts for
approximately 60% of the recovered faunal material. The samples studied for this report came from trenches A1, A2, A3, B1, XB1, XB2, XB3, YA2, ZA2 and XB2.
A standard protocol of the laboratory analysis, data storage and quantitative analysis has been developed at the Archaeozoology Laboratory, Deccan College in the 1990s as per internationally accepted norms (Joglekar 2015). Each bone fragment was thoroughly examined to find out the impact of both pre- and post-depositional factors. Bone modification signatures that were searched include intentional fractures (Sadek-Kooros 1975) as well as accidental breakage of bones both in the past and after their recovery during the excavation process. The results of bone identification and where it was possible to measure bones, the measurements (von den Driesch 1976) were recorded in the computerized coded format used at the Deccan College. DCPARZ –computer software developed at the archaeozoology laboratory by the author in late 1980s was used to analyse the bones recoded in the standard format. Identification work was done on the site of Suabarei itself in 2016. Identification of a few fragments was confirmed by consulting reference collection at the Archaeozoology Laboratory, Deccan College. After the analysis was over select bones were photographed and all the studied material was restored back to the respective storage bags. The studied faunal material is housed in the Excavation Branch office at Bhubaneswar, Odisha.

**Results of Analysis**

In all 1176 skeletal elements were examined of which 539 could be identified (NISP). A large number of fragments (n=637) could not be identified (Table-1; Fig.1). This includes material from the layer marked as hiatus (10) and pits of the Chalcolithic Period.

![Fig.1: Summary of identification](image-url)
Table-1 : Summary of identification

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<th>Layer</th>
<th>NISP</th>
<th>UF-L</th>
<th>UF-M</th>
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<td>539</td>
<td>114</td>
<td>194</td>
<td>329</td>
<td>637</td>
<td>1176</td>
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</table>

As shown in table, a total of 637 fragments could not be identified. All these skeletal elements (Unidentified fragments- UF) were classified arbitrarily into three different groups (Table-1). Those up to 1 cm length were called as the ‘small’ unidentified fragments (UF-S), those between 1 and 5 cm were categorized as the “medium” unidentified fragments (UF-M), and those longer than 5 cm were treated as the ‘large’ unidentified fragments (UF-L). The fragments that had freshly broken edges (broken after excavation) were not included in this counting procedure. The table also reveals that the amount of small-sized unidentified fragments was large (n=329). It was observed that a majority of the medium and small-sized fragments were part of debitage of bone working. Cutting and charring activities related to food consumption and discard have also contributed to these unidentified fragments.

Material from the pits

Faunal material from three pits was available for examination. Pit in Trench XB1 (sealed by layer 9) had total seven fragments, of which only three were identifiable. The identified specimens were a fragment of mandible of cattle, a fragment of cattle humerus and a rib of sheep/goat.

Pit in Trench ZA2 (sealed by layer 3) contained only a single skeletal element. It was a maxillary second premolar of cattle (left side). A part of this tooth showed marks of abrasion.

Pit in Trench ZA2 (sealed by layer 2) contained nine fragments that all belonged to cattle. These were teeth, humerus head (with criss-cross cracks) and distal end of femur (with abraded surface).
Material from the Chalcolithic layers

Bone modifications (both anthropogenic and non-anthropogenic) were observed in case of 54.40% of the identified specimens (Table-2). This proportion of modified skeletal elements is quite high. The bone modifications include mainly due to activities related to food consumption such as charring and cutting.

The signature of effect of bones exposed to water and hence becoming porous was seen in two cases. These were a third phalanx of cattle and centrum portion of thoracic vertebra of cattle (layer 6). Effects of physical factors related to abrasion and erosion of the bone surface were seen in a number of cases. One fragment of spotted deer brow tine recovered from layer 6 showed that the surface has been abraded, perhaps movement within the deposit. There were eight antler fragments of sambar whose surface showed marks of erosion (Pl.III). One of these was a shed antler. Also, from the same layer another shed antler fragment (spotted deer) showed marks of weathering. A similar case of surface erosion was noticed in case of an ulna of cattle recovered from layer (2).

Table-2 : Chalcolithic Period: bone modifications

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<td>15</td>
<td>8</td>
<td>281</td>
<td>54.40</td>
</tr>
</tbody>
</table>

Two cases of modification of the bones when these were fresh by dogs were noticed. The distal end of a first phalanx of cattle (layer 6) and distal end of a second phalanx of cattle (layer 3) showed marks of chewing.

A total of 40.23% of the identified species were charred. It was observed that 27.70% were completely charred and a good number of skeletal elements (4.64%) were vitrified (perhaps due to prolonged exposure to high temperature in fire). Some interesting cases of charring were noticed. It was noticed that only the ventral surface of a plastron of Kachuga tecta (turtle) was charred. Almost complete thoracic vertebra of cattle was recovered from layer (6) whose only the neural arch portion was charred.
The cut surface of the antler fragment of spotted deer recovered from layer (4) was charred, perhaps as a part of activity of making some object/tool.  

Several tools and objects were found besides those already isolated as tools during the excavation (Pl.IV). These include three points (SBR091, SBR093, SBR094) and an arrowhead (SBR092), both made using antler (recovered from layer 4). Also similar antler tools were identified from layer (6) (Antiquity No. 86) and layer (2) (Antiquity No. 84). One case of an unfinished antler object was noticed from layer (5). The main beam of sambar deer antler was cut in an attempt to make some object. An interesting case of an object made using a marine shark tooth (Carcharhinton sp.) was found from layer (5) (Pl.V). This object (a pendant) was either brought from elsewhere or the tooth was obtained from the sea coast and was perforated to make a pendent (Antiquity No. 23). The only other example of a shark tooth being found in the Indian Sub-continent is from the medieval site of Vizhinjam in Kerala (Abhayan et al. 2014).
The species

The faunal sample examined showed a wide range of animal species belonging to domestic mammals, wild mammals and non-mammals. The non-mammals include birds, reptiles, and fish (Table-3).

There were six domestic species at Suabarei. These were cattle (Pls. VI-XII), buffalo, goat, pig, dog and cat. Of these except dog and cat other were used as food
species. The contribution of cattle and buffalo together was 44.00% whereas that of goats (11.60%) and pigs (1.54%), respectively. Among the large bovids it was possible to securely identify both cattle in many cases, but buffalo was securely identified only from layer 3. Only two skeletal elements of the buffalo were recovered. These were a fragment of meta-podium and an astragalus (completely charred). From this evidence it is not possible to conclude that the buffaloes were reared at Suabarei.

Although a number of fragments of goat have been identified as of sheep/goat in reality not a single skeletal element of the sheep was identified at Suabarei. Because of lack of distinguishable portions, the elements such as vertebrae, ribs, sternum fragments and splinters of meta-podia had to be classified as sheep/goat.

The contribution of the pigs to the food economy was marginal. Remains of domestic pig were found only from layers (5) to (3), and in small number. Of these except one all other skeletal elements showed marks of consumption related activities.

The two non-food domestic species found at Suabarei were the dog and the cat. Only two skeletal elements of the dogs were recovered (from layers 5 and 4), and both were devoid of any marks. Similarly, only two cat bones were identified from layer (2). These were a mandible and a calcaneum, both of a single adult animal. Like the dog bones, cat bones have no marks. Hence, it is clear that both the dog and the cat were not consumed at Suabarei.
Table-3 : Chalcolithic Period: Number of identified specimens from Suabarei

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<td>78</td>
<td>20</td>
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<td>46</td>
<td>34</td>
<td>13</td>
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The proportion of wild mammals was 18.55% of the identified specimens. The wild mammals identified at Suabarei were elephant, wild buffalo, nilgai (Pl.XIII), sambar, spotted deer, four-horned antelope (Pl.XIV), gazelle, wild pig, common squirrel, hare and rat. Of these except for elephant and rat evidence for consumption
of the other species was found. A majority of the skeletal elements of the deer, antelopes and other wild mammals showed marks of butchering, cutting and charring activities related to consumption. Except sambar and spotted deer, evidence of other animals was of sporadic nature in different habitation layers. This indicates that these wild mammals were hunted/ trapped occasionally as a part of opportunistic hunting. Presence of both meat-bearing and non-meat-bearing portions of the body suggests that these animals were hunted near the Chalcolithic settlement, and were butchered, processed and consumed. However, the sambar and spotted deer (except layer 8 and 7) were regularly hunted and their meat was consumed at Suabarei.
Six skeletal elements of the house rat were recovered from layer 8 (1) and layer 6 (5). Though, at many sites rats are known to intrude the habitation sites during the later periods, at Suabarei the rats were not later intrusions into the archaeological sediments.

An interesting feature of the faunal material from Suabarei was presence of elephant bones (Pls.XV-XVI). The material excavated from 2014-2015 season revealed four elephant bones. These were recovered from layer (6) and layer (4). A complete carpal was found from Trench A1, Quadrant III (layer 4). Layer (6) had three distal ends of bones – a right side radius (Trench A3, Quadrant III) that was charred, and two other radii (Trench A1, Quadrant II). These three radii were of right side and of adults. Besides these bones counted and shown in Table-3, during 2015-2016 field season, from Trench A1, Quadrant II (-275 cm depth) three more bones were recorded in the field (yet to be taken out from the sediment when this study was done. These bones were distal end of humerus (left side), a scapula (left side) and proximal end a femur (right side). The MNI (Minimum Number Individuals) calculation indicates that the bones represent five elephants from layer (6) and one elephant in layer (4). From the observations made on the elephant bones it is clear that the elephants were not consumed, but their bones were collected and brought into the settlement as raw material.
A substantial proportion (23.75%) of the identified specimens belonged to the non-mammals (birds, reptiles and fish). There were four bird species - common crane (*Grus grus*), black partridge (*Francolinus francolinus*), cattle egret (*Bubulcus ibis*) and pond heron (*Ardea cinerea*). Almost all the skeletal elements of these birds showed marks related to their consumption, though as part of the opportunistic hunting/trapping. Skeletal elements of only two turtle species (*Lissemys punctata* and *Kachuga tecta*) were recovered (Pls. XVI). These were mainly plastron, carapace and fragments of pectoral girdle. Several fish skeletal elements of four fresh water fish were (*Wallago atta*, *Catla catla*, *Labeo rohita*, and *Sperata seenghala*) recovered (Pls. XIX to XXI). Fish were represented mainly by opercle, preopercle, dentary, articular, angular, vertebrae and spines. The presence of fish as supplementary component of the food economy is not surprising since the Chalcolithic people could have done fishing on the nearby Daya river.

**Bone measurements**

Recording bone measurements is an essential part of standard archaeozoological methodology. Accurately recorded bone measurements provide a tool to look at the sizes of past animals, particularly the domestic ones. With the estimates of the size and height of the animals at the withers, it is possible to compare
the domestic stocks at various archaeological sites and in different cultural periods (Joglekar 2011). All the measurements were recorded in mm using a digital calliper with a least count of 0.01 mm. These are given in Tables 3 to 7.

Table-3 : Measurements of isolated teeth

<table>
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<tr>
<th>Reg. No.</th>
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<th>Layer</th>
<th>Tooth</th>
<th>Length</th>
<th>Width</th>
<th>Species</th>
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Table-4 : Measurements of mandibles

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<td>--</td>
<td>13.52</td>
</tr>
<tr>
<td>M2</td>
<td>Length</td>
<td>--</td>
<td>25.67</td>
</tr>
<tr>
<td>Width</td>
<td>--</td>
<td>17.00</td>
<td>--</td>
</tr>
<tr>
<td>M3</td>
<td>Length</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Width</td>
<td>--</td>
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<td>--</td>
</tr>
</tbody>
</table>
Table -5 : Measurements of tibiae

<table>
<thead>
<tr>
<th>Reg. No.</th>
<th>Trench/Qdt.</th>
<th>Layer</th>
<th>Bp</th>
<th>Tp</th>
<th>Bd</th>
<th>Dd</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBR018</td>
<td>A3/III</td>
<td>6</td>
<td>--</td>
<td>--</td>
<td>45.77</td>
<td>35.87</td>
<td><em>Bos indicus</em></td>
</tr>
<tr>
<td>SBR182</td>
<td>XB3/III</td>
<td>7</td>
<td>--</td>
<td>--</td>
<td>26.67</td>
<td>22.10</td>
<td><em>A. cervicapra</em></td>
</tr>
<tr>
<td>SBR081</td>
<td>A1/II</td>
<td>4</td>
<td>--</td>
<td>--</td>
<td>28.83</td>
<td>25.90</td>
<td><em>Sus scrofa</em></td>
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Table-6 : Measurements of astragali and calcaneum bones

<table>
<thead>
<tr>
<th>Reg. No.</th>
<th>Trench/Qdt.</th>
<th>Layer</th>
<th>Bone</th>
<th>GLl</th>
<th>GLm</th>
<th>Bd</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>--</td>
<td>A1/II</td>
<td>6</td>
<td>Astragalus</td>
<td>53.00</td>
<td>38.16</td>
<td></td>
<td><em>Bos indicus</em></td>
</tr>
<tr>
<td>SBR051</td>
<td>A3/III</td>
<td>6</td>
<td>Astragalus</td>
<td>62.52</td>
<td>58.07</td>
<td>37.69</td>
<td><em>Bos indicus</em></td>
</tr>
<tr>
<td>SBR021</td>
<td>A1/II</td>
<td>6</td>
<td>Astragalus</td>
<td>35.65</td>
<td>32.44</td>
<td>22.42</td>
<td><em>Axis axis</em></td>
</tr>
<tr>
<td>SBR095</td>
<td>A1/II</td>
<td>4</td>
<td>Centrotarsal</td>
<td>--</td>
<td>--</td>
<td>45.58</td>
<td><em>Bos indicus</em></td>
</tr>
<tr>
<td>SBR100</td>
<td>A1/II</td>
<td>6</td>
<td>Centrotarsal</td>
<td>--</td>
<td>--</td>
<td>55.00</td>
<td><em>Bos indicus</em></td>
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</tbody>
</table>

Table-7 : Measurements of first phalanges

<table>
<thead>
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<th>Reg. No.</th>
<th>Trench/Qdt/</th>
<th>Layer</th>
<th>Phalanx</th>
<th>GL</th>
<th>Bp</th>
<th>Tp</th>
<th>Bd</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBR037</td>
<td>A3/III</td>
<td>6</td>
<td>First</td>
<td>52.16</td>
<td>20.88</td>
<td>24.30</td>
<td>21.64</td>
<td><em>Bos indicus</em></td>
</tr>
<tr>
<td>SBR110</td>
<td>A1/III</td>
<td>3</td>
<td>First</td>
<td>47.00</td>
<td>--</td>
<td>--</td>
<td>24.12</td>
<td><em>Bos indicus</em></td>
</tr>
<tr>
<td>SBR111</td>
<td>A1/III</td>
<td>3</td>
<td>First</td>
<td>53.93</td>
<td>26.92</td>
<td>27.51</td>
<td>26.71</td>
<td><em>Bos indicus</em></td>
</tr>
<tr>
<td>SBR155</td>
<td>ZA2/IV</td>
<td>8</td>
<td>First</td>
<td>63.00</td>
<td>28.56</td>
<td>29.00</td>
<td>26.28</td>
<td><em>Bos indicus</em></td>
</tr>
<tr>
<td>SBR097</td>
<td>A1/II</td>
<td>4</td>
<td>First</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>16.35</td>
<td><em>Cervus unicolor</em></td>
</tr>
<tr>
<td>SBR025</td>
<td>A1/II</td>
<td>6</td>
<td>First</td>
<td>38.45</td>
<td>12.00</td>
<td>15.64</td>
<td>10.95</td>
<td><em>T. quadricornis</em></td>
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<tr>
<td>SBR052</td>
<td>A3/III</td>
<td>6</td>
<td>Second</td>
<td>31.42</td>
<td>23.21</td>
<td>23.88</td>
<td>19.34</td>
<td><em>Bos indicus</em></td>
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<tr>
<td>SBR075</td>
<td>B1/I</td>
<td>4</td>
<td>Second</td>
<td>70.72</td>
<td>23.88</td>
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<td><em>Bos indicus</em></td>
</tr>
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<td>SBR088</td>
<td>A1/III</td>
<td>4</td>
<td>Second</td>
<td>34.62</td>
<td>24.67</td>
<td>28.85</td>
<td>21.00</td>
<td><em>Bos indicus</em></td>
</tr>
<tr>
<td>SBR112</td>
<td>A1/III</td>
<td>3</td>
<td>Second</td>
<td>38.50</td>
<td>26.53</td>
<td>28.69</td>
<td>21.85</td>
<td><em>Bos indicus</em></td>
</tr>
</tbody>
</table>

Only two estimates of cattle height at the withers could be obtained based on an astragalus medial length using formula given by Zalkin (1970). These estimates for two cattle astragali recovered from layer (6) were 97.00cm and 106.27cm.

Acknowledgements

I take this opportunity to thank Dr. Jeeban Kumar Patnaik (Archaeological Survey of India) for inviting me to study this material, and provide all hospitality. I thank other members of his excavation team-Dr. D.B. Garnayak, Sanjay Panda, Dr. Ashis Ranjan. Sahoo, Umakanta Bhoi for their assistance during the work. I thank my student G.S. Abhayan for helping me in fish identification.
References


Ijzereef, G.F. 1981. *Bronze Age Animal Bones from Bovenkarspel, the Excavation at Hot Valkje*, R.O.B., Amersfoort


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Appendix-V

Geomorphic background of the site of Suabarei, District Puri, Odisha: A Preliminary Report

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The site of Suabarei is located in tropical sub-humid climate with average rainfall of 1337mm per annum. The site is located on the flood plain of the river Daya to the east and its tributary Gangua river to the west (Fig.1). In the normal monsoon season river Gangua gets flooded and its flood water reaches the site quite often. The river Daya starts as a branch of the Kuakhai river at Saradeipur (near Badahati) in Odisha. It is joined by the river Malaguni below Golabai Sasan and flows through Khordha and Puri districts before joining the north eastern corner of Chilika Lake. Its total length is 37 km.

Fig.1 : Location of Suabarei site in flood plain of the river Daya and its tributary Gangua
The site of Suabarei is occupied continuously since the Neolithic times up to Early Historic occupation. The Early Historical occupation is separated by 80cm yellowish-reddish silty clay from the preceding Chalcolithic phase at a depth of 2m from the surface. The Chalcolithic phase continues up to 5m depth. There is a hiatus of approximately 50cm between the Chalcolithic and the Neolithic phases that begins at 6m depth from the surface.

The top surface of the mound is at an elevation of 11.55m ASL. The site is located on a near channel flood plain of the river Gangua that flows 500m west of the site at an elevation of 8m ASL (Fig.2). The flood plain of the river is spread for a kilometer on the left bank i.e., up to the river Daya.

![Image](image.jpg)

Fig.2 : Flood plain around site

**Geomorphic observations around site**

**Locality-1** : It is located 100m east of the mound. The exposed deposit is of 2m thick. The top part is silty clay of grey colour that is capping the sandy-pebbly gravel unit. The exposed lower part is silty clayey.
Locality-2: (GPS 20°9’26” N; 85°48’52”E) this locality is in a pond dug by local people 100m west of the mound. It has preserved similar sediment as observed at Locality-1. Since large area is exposed, the gravel unit is well-exposed. The gravel is loose condition and comprised of pebbles of chalcedony and sandstone.

Few meters west of this locality new digging was carried out. This has exposed thick layer of reddish sand (Fig.3) and it is capped by 50cm thick yellowish silty clay.

Fig.3 : Reddish sand exposed in fresh digging near site

Locality-3 (Fig.4): This section is located on the right bank of the river Daya, approximately 1km east of the site. The channel of the river Daya is filled with loose sand deposit rich in quartz (Fig.5). On both banks of river Daya 3m thick deposit is seen. This overbank flood deposit is of yellow silty unit of 1.5m thickness and it is capping the grey sandy silt deposit (exposed thickness is more than 1.5m). This grayish sandy-silty clayey deposit is under cultivation on both the banks. It is extensively spread towards river Gangua.
Fig. 4: River Daya

Fig. 5: Quartz rich sand on the banks of river Daya
Remarks

The river Daya is a distributory stream flowing in a deltaic region. The base level for these rivers is the Chilika Lake. Geomorphic history of the Chilika Lake, a largest lagoon in Asia is studied by applying multidisciplinary methods by various scholars. One of such studies by Khandelwal et al. (2008) based on detailed studies of the pollen collected from the Chilika Lake. This pollen analytical has shown significant changes in the landform in the area.

The Early Holocene witnessed transgression of the sea. Due this estuarine environment was dominant and prolific development of mangrove began. Around 5000 years BP the sea level reached its highest point. Post 5000BP witnessed major regression of the sea i.e., around 2700 BP The formation of Chilika Lake is the result of this regression coupled with tectonic uplift (Venketarathnam 1970). During 5000 to 2000 years BP two major landforms developed; the first is formation of barrier spit and other sand ridges started and secondly estuary became lagoon. The Mahanadi river system developed during this phase. Post 2000 years BP (Late Holocene) the area experienced increase of fresh water input thus resulting in decreasing of mangrove vegetation.

From above observations it is clear that there are two types of sediments were deposited by two geomorphic processes. The Neolithic occupation began on deltaic sediment at an elevation of 4m ASL. The available C-14 date of this cultural phase is 3600-3900BP (1600-1900BCE). During the Late Holocene, the fluvial system dominated the area and it is evident from the fluvial gravel observed at locality-1 and 2. The reddening the sediment (Fig.6) is indicating long exposure perhaps due the regression of the sea during Late Holocene. On the other hand yellowish/greish sediment indicates flood deposit (Fig.6).

The human occupation in the area is most probably seasonal, perhaps during dry season and during wet season due to high flooding these groups might be shifting from this locality.

To summarize, that cultural ecology of the region has witnessed two major geomorphic processes, prior to Neolithic occupation it was under deltaic influence and later it shifted to the fluvial dominance. It is suggested that detailed sedimentary analysis of different units is required in future to understand geomorphic history of the site.
Fig. 6: Greyish sediment exposed in excavated trench

Acknowledgements

Author is grateful to Dr. Jeeban Kumar Patnaik for inviting to study geomorphic background of the site. Thanks are due to Dr. Patnaik and his team for providing necessary infrastructure and warm hospitality during the field visit.

Reference

Khandelwal, A.M., M. Mohanti, Garcia-Rodriguez, Felipe Scharf, Burkhard W. 2008. Vegetation history and sea level variations during the last 13,500 years inferred from a pollen record at Chilika Lake, Orissa, India, Vegetation History & Archaeobotany 17 (4), DOI 10.1007/s00334-007-0127-5.

Appendix-VI

XRD and FT-IR analysis of pottery samples from Suabarei excavated site

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Assistant Archaeological Chemist
Archaeological Survey of India
Science Branch, Bhubaneswar

Introduction

The Suabarei village in Poporanga panchayat of Pipili tehsil in Puri district of Odisha witnessed a large scale exploration by Excavation Branch-IV of Archaeological Survey of India. The site unearthed varieties of remains of birds and wild animals, teeth, horn and pottery items (Fig.1) which prove the possible existence of culture over 3000 years back to the Chalcolithic or copper Age.

Fig.1 : The in situ treatment of painted pottery ware during excavation by the technical experts

Pottery being the most abundant tracer in all archaeological excavations, the classification at any level of such manufacturing has a key role in historical studies. Archaeologists, historians explore the past through the pottery and establish the cultural age and provide a sequence of human history from pre-history to historical
Clay materials like pottery, brick, and tiles are major innovative designs since Neolithic period with the development of human race. Its use, ranging from functional to decorative purposes in everyday life makes it answerable to cultural linkage, technological advance and methodology of artisans during which these were produced. Knowledge of chemical and mineralogical compositions is mandatory in characterization of studies of pottery [1]. The chemical composition shows the raw materials used by the artisans to produce the ware whereas the mineralogical composition signifies the initial composition and depositional changes, the processing technology, as the minerals are the “fingerprints” of the stable and also the metastable solid phases formed during firing [2]. Characterizations of archaeological artefacts are always remaining a complex and challenging phenomenon [3]. Commonly various methodologies are adopted by researchers and scientists to characterize the ancient potteries [3-8]. Chemical, mineralogical, morphological, porosimetry studies of ancient pottery can unlock the evidence of raw materials used for production, firing temperature and determine the technological development related to its manufacture [4, 9-11]. A comparative study with various groups of locally produced fine wares [12-14], replica study [15-18]; using different instruments [19] and colour measurement [20] were well explored for ancient potteries. Several authors studied firing conditions [21-22] and influence of organic matter in the methodology [22-23].

The aim of present study is to investigate the mineralogical and chemical composition of ancient pottery samples using FT-IR and XRD techniques. Finally estimation of firing temperature for the ancient potteries is established with combination of these techniques. FTIR spectroscopy is having several advantages over the XRD in mineral identification as FT-IR technique absolutely requires no sample preparation, less analysis time moreover disordered structures can easily pointed out [5-9]. The study can also provide an insight into the technology of the pottery made, and the constituents that were used for the manufacturing of potteries.

Material and analytical techniques

Materials

Ten numbers of selected pottery samples were provided by Excavation Branch-IV, Archaeological Survey of India, Bhubaneswar with an objective to investigate the mineralogical and chemical composition along with estimation of their
firing condition, temperature. The samples were analysed with XRD and FT-IR in order to find the mineralogical and firing temperature. Before the analysis the samples were thoroughly cleaned and dried so that interventions of dust and dirt on these analytical techniques are minimized (Fig.2).

Fig.2: The pottery fragments provided for powder XRD and FT-IR study

Instrumentation

X-ray diffraction (XRD)

X-ray diffraction (XRD) of these pottery samples were carried out at Physics Department, Utkal University. This technique was utilized to study the mineralogical phases as well as the firing temperature estimation in the potteries fragments. Powder XRD used, provides more diagnostic information on sample mineralogy than infra-red spectroscopy, but has a few disadvantages. It is not sensitive to any amorphous material present within samples, and has difficulty in detecting extremely fine grained materials. For this study, powder XRD data of the earthen wares were collected on a Brucker X-Ray diffractometer (model D8 advanced) using 40kV/40mA with Cu-Kα radiation (λ 1.542Å) for angle (2θ) 20-70°).

The results obtained from XRD are shown in (Figs.3-4). Major mineral assemblage in the studied samples was quartz.
Fig. 3: XRD spectrum of pottery samples with their respective identifications.

Fig. 4: XRD spectrum of pottery samples with their respective identifications.
Fourier transforms infrared spectroscopy (FT-IR)

This is the technique which is largely employed to obtain an infrared spectrum of absorption or emission of a solid, liquid or gas. The infrared spectra were recorded in the mid region 400-4000cm\(^{-1}\) using PERKIN ELMER FTIR interferometer. The KBr pressed pellet technique was used to record the spectrum. A sample is mixed with KBr in the ratio on 1:20 using a mortar and pestle and pressed to 5 tons for one minute in preparing the disc. The spectra were obtained at 4cm\(^{-1}\) instrument scans the resolution and the number of scan is 32 within the standard wave number. The best spectrum for each sample was considered as a representative spectrum and provided in Figs. 5-7. To get more detailed view of the mineral assemblage and analyses of the spectrum another region 2000-400cm\(^{-1}\) was selected shown in Fig. 8.

![FT-IR spectrum of pottery samples along with their wave numbers.](image)

Fig. 5: FT-IR spectrum of pottery samples along with their wave numbers.
Fig. 6: FT-IR spectrum of pottery samples along with their wave numbers.

Fig. 7: FT-IR spectrum of pottery samples along with their wave numbers.
Discussion

Table 1: The FT-IR region and their significance

<table>
<thead>
<tr>
<th>FT-IR ranges (cm⁻¹)</th>
<th>Significance</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3400-3750 cm⁻¹</td>
<td>OH-stretching</td>
<td>10</td>
</tr>
<tr>
<td>600-950 cm⁻¹</td>
<td>Metal-O-H bending</td>
<td>4</td>
</tr>
<tr>
<td>700-1200 cm⁻¹</td>
<td>Si-O and Al-O stretching</td>
<td>5</td>
</tr>
<tr>
<td>400-500</td>
<td>Si-O and Al-O bending</td>
<td>6</td>
</tr>
</tbody>
</table>

In general, the constituent units of clay minerals include hydroxyl groups, tetrahedral silicate/aluminate anions, octahedral metal cations, and interlayer cations. Application of thermal methods for study of clay minerals and rocks has a history as long as that of thermal analysis itself. Table 1 represents the ranges for FT-IR and their significance whereas Table 2 shows temperature range and their significance in relation with potteries analysis. Thermal analysis is widely used in an investigation of minerals, mainly identification, quantitative analysis and water existence. The
principal thermal reactions of clay minerals and the approximate temperature ranges in which they occur are generally considered in following categories:

**Table-2 : Temperature range and their significance during pottery firing process**

<table>
<thead>
<tr>
<th>Temperature range</th>
<th>Significance</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 400 °C</td>
<td>Due to loss of water and molecular water between layers</td>
<td>10</td>
</tr>
<tr>
<td>400-850°C</td>
<td>Dehydroxylation and the formation of quasi-stable dehydroxylated phases</td>
<td>1,2,4</td>
</tr>
<tr>
<td>Above 1000°C</td>
<td>Recrystallization and formation of new phase</td>
<td>6,8</td>
</tr>
</tbody>
</table>

**The main Si–O stretching band**

In the IR spectra of these pot wares, the main Si–O stretching band is located at 1035–1040 cm\(^{-1}\) (Table 1, Figs. 5-7). This interval of the band is similar to that observed in firing the local raw material at 700–800°C, indicating that the ancient potteries were fired at this temperature range. There is shifting of peak is mentioned by several authors when the ancient pottery samples were fired above at 900 °C, the main Si–O stretching band shifts to 1066 cm\(^{-1}\) which is not found in any of our samples. This indicates the firing temperature for all the samples are within the maximum range of 850°C.

The main constituents are kaolinite (Clay mineral) with the bands detected at 1038 and 466 cm\(^{-1}\)[10]. The chemical composition of kaolinite \(\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4\). It is a layered silicate mineral, with one tetrahedral sheet of silica \((\text{SiO}_4)\) linked through oxygen atoms to one octahedral sheet of alumina \((\text{AlO}_6)\) octahedral. Very strong medium absorbed band in the region 3412 cm\(^{-1}\) and strong bands in the region 1626 cm\(^{-1}\) in the Suabarei sample are due to absorbed water. The bands near 797, 778 and 695 are assigning to Quartz \((\text{Si-O}_2)\). Similarly feldspar group of mineral orthoclase and mica group of mineral muscovite can also be concluded from FT-IR spectrum.

**The Si–O and Al–O deformation bands**

A combined Al–O and Si–O deformation mode [22] is observed at about 460 cm\(^{-1}\) in the IR spectra of ancient potteries. The location of this band is similar to that observed in firing the local raw material at 700–800°C (Figs.5-7), and consequently confirms the observation that the ancient potteries were fired at about this temperature.
Firing temperature estimation

On firing clay mineral, the octahedral layer of clay mineral which has a set of hydroxyl groups (O-H group) of has been reflected by marked alternation and disappearance of the above bands. Broad Si-O stretching bands at about 1040 cm\textsuperscript{-1} in all FTIR spectra are due to contributions from various silicate minerals. The thermal effect can be fairly judged form shifting or broadening of silicate band in the infra-red spectrum. Structural changes that occur during the firing process will (including destruction of some minerals and formation of others) effects the position of Si-O stretching and deformation bands in FTIR spectra.

According to the studies by L Damjanović et al the maximum of the Si-O band shifted systematically with thermal exposure of clay mineral [1]. At 600\textdegree C the maximum peak will detected at 1036cm\textsuperscript{-1} at 700\textdegree C, at 800\textdegree C, the band split and two maxima were observed at 1050 and 1078cm\textsuperscript{-1}, a single peak with maximum at1042cm\textsuperscript{-1} was detected.

The strong band at 1100-1000 cm\textsuperscript{-1} region indicates the presence silicates (Si-O) in clay minerals. In our present potteries the strong band around 1038-1040 cm\textsuperscript{-1} has been assigned to Si-O stretching of a silicate band. Quartz (tetrahedron) is the most common abundant mineral in the constituent of clay mineral. The presence of the IR absorption band at 797 and 778 cm\textsuperscript{-1} are also assigned to the Si-O\textsubscript{2} quartz band. Quartz and feldspar are often present in clays or added as temper in order to improve the bonding characteristic and strength of the firing materials.

The mineralogical composition for final product of this clay material depends upon the local geology, firing atmosphere and how the pottery was used. Semi quantitative mineralogical results obtained from XRD are provided in Table-3 showed that the main identified minerals of the same samples are quartz, feldspars, mica group.

The absence of clay mineral like Kaolin indicates the firing temperature more than 500\textdegree C. The presence of non-clay mineral components like quartz, muscovite and other mineral additive play an important role in the firing characteristics. These two minerals quartz and muscovite undergoes decomposition between 950\textdegree C and formation of magnetite formed at a temperature more than 850\textdegree C. The amorphous arrangement of silica and alumina is retained until a temperature of about 980\textdegree C. In the present studies decrease of crystalinity of muscovite and formation of magnetite (Fe\textsubscript{2}O\textsubscript{3}) that is the replacement of Fe with Al with -OH in case of Suabarei, indicates
the firing temperature is more than the 850°C but presence of feldspar group indicates that the firing temperature did not exceed 900°C similarly the presence muscovite mineral indicates a temperature of less than 700°C. The production methodology of the artifacts containing magnetite shows that fired in a reducing atmosphere [4, 9].

Generally, the sheet structure of clay mineral gets collapsed when potteries fired, depending on the level of firing and firing conditions. This can be monitored by FT-IR and XRD studies. According to Palaivel & Velraj [11] the absorption band around 3630 cm\(^{-1}\) is due to crystalline hydroxyl groups which persist only up to 800°C. From the FT-IR spectra of the received state samples taken in the present study do not show any absorption band at 3630 cm\(^{-1}\) indicating these samples would have been fired to a temperature of 800°C or above. The presence of a quartz band around 1040 cm\(^{-1}\) in the sample further indicates that the potteries have been fired above 600°C but not above 1000 °C. Table-3 shows the data base (mineralogical composition) for all the ancient pottery samples along with their firing temperature estimation.

Further black colour of the pottery indicates a reducing or closed atmosphere was prevailed for firing this earthenware while the red colour of the pottery indicates an aerated atmosphere has been maintained which enabled the reduction of iron components formed during oxidizing atmosphere.

**Conclusion**

Following conclusion could be drawn from overall instrumental analysis of the represented pottery fragments collected from excavated sites, Suabarei, India. The combined analytical technique of XRD, FTIR provides useful information about the mineral, chemical composition and colour of the clay materials. From this analysis firing temperature of the potteries were also established. The mineralogical and chemical results indicated that the main mineral assemblage in these pottery ware are Quartz (SiO\(_2\)) which may be added knowingly to reduces the propagation of shrinkage crack during initial firing and prevent the pottery from cracking during firing. The artisans of that period have sufficient knowledge how to use tempering minerals according to the demand and use of the pottery. Lastly, the use of combination modern instruments rather than a particular one, provide more authentic and reliable information about the ancient artefacts.
Table-3 : Mineral composition for the potteries along with firing temperature estimation.

<table>
<thead>
<tr>
<th>SI No.</th>
<th>Pottery fragment</th>
<th>Si-O stretching</th>
<th>SiO₂ (cm⁻¹)</th>
<th>Si–O and Al–O deformation bands</th>
<th>The OH stretching band</th>
<th>Firing Temperature</th>
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<tbody>
<tr>
<td>1</td>
<td>Black ware</td>
<td>1035 cm⁻¹</td>
<td>693,778,796</td>
<td>474 cm⁻¹</td>
<td>3413 cm⁻¹</td>
<td>850-900°C</td>
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<tr>
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<td>Black slipped ware</td>
<td>1040 cm⁻¹</td>
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<td>467 cm⁻¹</td>
<td>3413,3787 cm⁻¹</td>
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<tr>
<td>3</td>
<td>Black-and-red ware</td>
<td>1051 cm⁻¹</td>
<td>693,778,796</td>
<td>470 cm⁻¹</td>
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</tr>
<tr>
<td>4</td>
<td>Red ware</td>
<td>1038 cm⁻¹</td>
<td>693,778</td>
<td>466 cm⁻¹</td>
<td>3434 cm⁻¹</td>
<td>700-800°C</td>
</tr>
<tr>
<td>5</td>
<td>Red slipped ware</td>
<td>1039 cm⁻¹</td>
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<td>6</td>
<td>Grey ware</td>
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<tr>
<td>7</td>
<td>Gritty ware</td>
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</tr>
<tr>
<td>8</td>
<td>Chocolate ware</td>
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<td>9</td>
<td>Miniature Pot crucible</td>
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<td>10</td>
<td>Dull red ware</td>
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<td>3413 cm⁻¹</td>
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</tbody>
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Acknowledgement

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References


