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“Thrikkaṇamathilakam” As A Jain Centre

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Abstract

Mathilakam played an important role in the development of the Jain tradition in Kerala. It is considered in the Saṅgam period, Thrikkaṇamathilakam was a famous Jain centre during the Chēra dynasty rule. There is a popular opinion that Mathilakam as ancient Kuṇavayīr kōttam, Thrikkaṇamathilakam or Thirukkuṇāvai, the place where Iṅgaṅga Adigaḷ composed his epic Cilppadikāram. This paper is an attempt to shed fresh light on the unexplored corners of the history of Thrikkaṇamathilakam as a Jain centre. There are various inscriptions mentioned about Kuṇavayīr kōttam, Thrikkaṇamathilakam, or Thirukkuṇāvai. This inscriptional analysis can be termed as a landmark in the history of Jainism in Kerala. Fragmentary inscriptions from Mathilakam, which have been read with the help of an epigraphist, can be marked as an original contribution to this study. In this paper, the author included all the inscriptions chronologically related to the region. On the other side, this study is an answer to the question, i.e., “what was the contribution of Chēra to Thrikkaṇamathilakam?”, “what was the reason behind the decline of Thrikkaṇamathilakam?” etc. This research is interdisciplinary in many aspects and focuses on the closer look and scientific documentation of Mathilakam based on historical, archaeological, inscriptional and literature aspects.

Keywords: Jainism, Thrikkaṇamathilakam, Inscriptions, Chēra, Saṅgam.

Introduction

History lies deep within the villages of India, which is unfortunately, often forgotten. Mathilakam is an obvious name in that long list. There is a popular notion that the Thrikkaṇamathilakam aka present day Mathilakam, N 10° 17' 28.29" E 076° 10' 12.06") (Northern region of Kodungallur), 19km North from Paṭṭanam was an important Jain Centre. One version is that Iḷaṅgo Aḍigaḷ wrote Cilppadikāram from Thrikkaṇamathilakam. However, this is not yet scientifically proven. Still, the pieces of evidence from there, such as rectangular wells and other objects collected from the pond raise the question of Jain tradition. There are memories among the local people about objects being recovered from this pond. The Mathilakam is described as Thrikkaṇamathilakam in 14th-century works, as a walled town having a larger temple structure within it. Several laterite walls exposed in earlier archaeological explorations are yet to be chronologically identified. The occurrence in the lower half of the deposit of sturdy redware, Chinese celadon ware, and Chōḷa coins dated the site to the 10th -11th century CE (Cherian, 2014). The coins have familiar Chōḷa characteristics, i.e., standing king on the one side and seated goddess on the other. The surface survey in the Mathilakam area by teachers and students of the archaeology course at UC College, Aluva in 1996 revealed few Iron Age burials. Apart from this, there were some sites identified in the Northern region of modern Kodungallur such as Agasthyapuram, Chakkarapadam, Chentrappinni, Mathilakam, Perinjanam, etc. These sites were reported with urn burials (Cherian, 2016). The latest development of the fragmentary inscription from Mathilakam again raises the question of the Jain settlement. On this aspect, it is important to look with a multi-disciplinary approach. Thus, the work "Thrikkaṇamathilakam as a Jain centre" focuses on the closer look and scientific documentation based on historical, archaeological, inscriptional, and literature aspects.

Review of Literature and Methods

Several scholars have examined the religious beliefs of the people of Kerala. Many of them pointed out that groups of people followed the religions of Jainism, and

Buddhism in Kerala. Their remarks were often very casual and few of them had come to definite conclusions based on authoritative evidence. This study is a critical survey of earlier works intended to examine their views on Jainism, points out the strength and weakness of arguments, and reassess them for a precise understanding of the subject based on concrete evidence.

Historians argued that there was a wide gap of sources between the post-Saṅgam period. Up to the 8th century or in a conventional view, it was a dark age in the history of Kerala. The noted historian Kesavan Veluthat (1976: 183.) considered this period as an era of Brahminical influence. Scholars like Champakalakshmi, (1996: 101) by analysing the Saṅgam anthologies, and Iravatham Mahadevan (2003: 129) by examining the Brāhmī inscriptions of the period stated that during the time of Saṅgam literature there was a spread of both Jainism and Buddhism in the ancient Tamiḷakam. We can notice that Kerala was a part of Tamiḷakam at the same time. But the scholars of Kerala not worked much in this area and wrote only from the Brahmin influx or with Keraḷolpathy and Parasurāma legend.

There are several works published about Jainism in Kerala. The works of M.S, Dhiraj (2020: 52-59), (2018: 487-504) have been focussed on the Jain tradition of Kerala. Apart from this, there are works by Manoj T.R.(2008: 73-91) and Padmakumari Amma (1995: 99-158) which talk about various Jain centres across Kerala. However, these works didn't refer to Mathilakam specifically in detail.

Mathilakam was an important Jain centre in Kerala. But it doesn't get the recognition it deserves. The difficulty in obtaining evidence is the main obstacle in conducting such a study. The recent explorations, excavations, and findings from this region are adequate to prove its importance as a Jain centre. This research is interdisciplinary in many aspects and focuses on the closer look and scientific documentation of Mathilakam.

Results and Discussion

Mathilakam played an important role in the Jain history of Kerala. It is considered in the Saṅgam period, Thrikkkaṇa mathilakam was a famous Jain centre during the Chēra dynasty rule. There is a popular opinion that Mathilakam as ancient Kuṇavayir̥kōttam, Thrikkkaṇamathilakam *or* Thirukkuṇāvai, is the place where Iḷaṅgo Aḍigaḷ composed his epic Cilppadikāram (Narayanan, 1972: 17-22). It is commonly believed that most of the present-day Hindu temples were once a Jain centre. Jains came to South India, during the period of Chandragupta Maurya and migrated to Śravaṇabelagoḷa from Magadha. Jains of ancient Tamiḷakam were the successors of them. They had a significant role in trade activities.

Chēra ruled the ancient Tamiḷakam and the regions related to Kerala. History points out the presence of two Chēra dynasties, i.e., ancient and medieval Chēra. Inscriptional evidence indicates both Chēra have the same family lineage (Dhiraj, 2019: 58-69). Most of the ancient Chēra rulers were either Jains or patrons of Jainism. Several ancient Tamiḷ-Brāhmī inscriptions have been found from the ancient Tamiḷakam. These inscriptions bearing the suffix ‘ātaṅ’ indicates the patronage of Jainism in Chēra. The inscriptions bearing ‘ātaṅ’, mostly found from the Jain caves or the regions are directly or indirectly related to Jainism. It can assume that the suffix ‘ātaṅ’ related with most Chēra king’s name found in Tamiḷ-Brāhmī inscriptions as well as in the literary sources have a Jain affiliation (Dhiraj, 2018: 487-504). The book titled ‘Early Tamil Epigraphy’ by Iravatham Mahadevan (2003:12-13, 36, 40, 46, 56, 61-62, 70, 74, 82: 334-335, 369, 373, 381, 395,405-407, 419, 425, 435) deals with major inscriptions of ancient Tamiḷakam.

The Koṅkarpuḷiyaṅkuḷam Tamiḷ-Brāhmī record is the earliest evidence that indicates the Jain affiliation of Chēra. It dates back to the 2nd century BCE which about talks the Chēraātaṅ who donated a cave for Jain monks (Mahadevan 2003:12: 334). The Mēṭṭuppaṭṭi Tamiḷ-Brāhmī record dating back to the 2nd century BCE strongly suggests the existence of Jainism and Jain monasteries in ancient Tamiḷakam. The reference of the term “*āmaṇa*” (Jain monk) is the indication of this

(Mahadevan 2003:36, 369). The cave inscription of Mēttuppaṭṭi located near the Vaigai Dam is not far from the border of modern Kerala.

The Muttuppaṭṭi Tamil- Brāhmī inscriptions have been found on a Jain cave near Madurai in Tamilnāḍu. It dates 2nd century BCE, reads “*Nākaperuṛāi Muciṛikōtaṇṇamakaṇ*”. This means *kōtaṇ* or *Ko ātaṇ* i.e., King ātaṇ, the *ṇamakaṇ* aka junior prince of Muciṛi donated a cave shelter for the Jain monks. Two Chēra records dated 2nd century CE from Pugaḷūr Jain cave also refer to ‘*ko ātaṇ*’ (Mahadevan 2003,56: 395). The mention of “*ko*” means king.

The Maṇārkōyil Tamil-Brāhmī of 2nd century C.E inscription mentions “*kuṇavāviṇṇaṅko ceypita paḷḷi*”. This relates Iḷaṅkō with Kuṇa, i.e., *Kuṇavayir Kottam* (Mahadevan 2003,89:447). From this record, it can be assumed that the Chēra prince named Iḷaṅgo lived during the second century at the place Kuṇa and the Jain temple might exist earlier as well. As mentioned earlier the word Kuṇa is mentioned in Cilppadikāram as well. From both literary and inscriptional evidence, it can be concluded that the Iḷaṅgo lived in the 2nd century CE or before that in Kuna and he was a patron of Jainism.

Another Tamil-Brāhmī inscription of the 3rd century CE from Edakkal caves in Wayanad also refers to *ko ātaṇ* (Mahadevan 2003,82: 122, 435). The term ātaṇ suffixed to most of the ancient Chēra rulers like Utiyaṇ Ceralathāṇ, Neḍuñceralathāṇ, Selavakkaduṅko Valiyathāṇ, etc. illustrated in the Saṅgam work *Paṭiṛruppattu* also talks about their Jain affiliation (Herbert, 2012: 32-33). The *Akanāṇūru*(2017. 55,246) and *Puṛaṇāṇūru*(2017. 65-66) talks about the *vadakkirikkaḷ* by the Chēra king Utiyaṇ Ceralathāṇ. The *vadakkirikkaḷ* is a Jain ritual which means fast until death. This also helps us to understand the close connection of Chēras with the Jain tradition.

Tamil-Brāhmī script on potsherd has been found from the site of Paṭṭaṇam, which is 17 km away from Mathilakam. There are 5 letters in this Tamil-Brāhmī inscription

scratched on a potsherd. The word has been read as ‘āmaṇa’ and the link may be the word ‘āmanen’ ‘sāmana’ means a senior Jain monk in ancient Tamiḷakam (Cherian, 2014: 32-33). The style of the letters allows the script to be dated to the 5th century CE. Paṭṭaṇam is considered one of the ports of ancient Tamiḷakam. Thus, the inscription from this site indicates the involvement of Jains in the trade activities of the region.

A fragmentary inscription has been discovered from Mathilakam in the year 2014. This unpublished inscription is engraved on a broken piece of a slab with 68cm long, 24cm wide, and 15-16cm thickness. It is kept in the School of Social Science Museum at MG University, Kottayam. The record says:

“*Āmaṇa vadakkirukkai.....
lukkuvaychathu chēra.....
Puḡaḷaṟuvāṇi chovareyūrna.....*” (Dhiraj,2020: 132)

A Jain monk..... who fasts until their death

The fame of a female artist..... from Chovareyūrna

The second Mathilakam fragmentary inscription says:

“Thiru-kkuṇāvai..... Thēvarkku....” To Thirukkuṇāvai..... Thēvar

The translation of these inscriptions means sāmaṇa (Jain monk) *vadakkirikkaḷ* (Jain ritual, i.e., fast until death) has been already found in earlier inscriptions as well. This makes it clear about the Jain affiliation of the region. Along with this, the word ‘*pugaḷ*’ means fame and ‘*aṟuvāṇi*’ means dancing girl or prostitute. So, the term *puḡaḷaṟuvāṇi* of Choverayūr means the famous dancing girl or courtesan from the region. Choverayūr, the place of *Puḡaḷaṟuvāṇi* could be the Chovaram mentioned in medieval records and can be identified as Śūkapuram in Edappāḷ (Dhiraj, 2020: 132-133), Malappuram. From the translation of this record, it can be assumed as

either the temple has witnessed the *vadakkirikkaḷ* of a Jaina monk (*āmaṇaor āmanan*) or the record erected to commemorate the *vadakkirikkaḷ* of a monk at the temple (Dhiraj, 2020: 132). The ‘*aṟuvāṇi*’ dancing girl might donate or offer something to the temple.

The medieval inscriptions related to Jainism have been found from various regions of Kerala. After a detailed assessment of these records, it can be easily stated that Thirukkuṇāvai or Thrikkaṇamathilakam was an important Jain centre. It was a Jain core temple modeled for the other Jain temples such as Thāzhekkav, Ālathūr, Paruvassery.

The inscription related to Kuṇavāi temple was recovered from the neighbourhood of an ancient Jain Basti at Thāzhekkav near Wayanad. This record may be assigned towards the end of the 9th century CE. The inscription suggests that the rules of Thirukkuṇāvai were the model of the Thāzhekkav temple. It states, “those who obstruct the properties of Thāzhekkav shall be deemed as offenders against Thirukkuṇāvai (Narayanan, 1972: 75)

Ālathūr inscription was another record. It dates back to the 10th century. This document unequivocally proves that *Thirukkuṇāvai*, which formed the model for the *paḷḷikal* was also a Jain temple (Narayanan, 1972: 73-74) The inscription records an agreement by *Nālpāthennayiravar*, the *adhikarār* of *Thirukkuṇāvai*. It is regarding the *paḷḷikal* (non-Hindu temples) of ‘*valancciyār*’ and their property. Those who committed an offence against the agreement shall be deemed as offenders against the deity of *Thirukkuṇāvai* (Narayanan, 1972: 73-75)

The Koḷam inscription of Rāma Kulaśekhara dating back to the 12th century is the last Jain record found from Kerala about the Chēra dynasty. He is considered the last Chēra ruler. The early medieval period saw the revivalism of Hinduism in Kerala due to the teachings and philosophy of Ādi Śankarācārya. This led most of the medieval Chēra rulers into the patrons of Shaivism and Vaishnavism. However, the inscriptional evidence suggests that the last Chēra ruler, Rāma Kulaśekhara was

a patron of Jainism. His Koḷam inscription helps us to reconstruct the history of Jainism in Kerala during the 12th century.

The inscription has 4 parts and is in the format of a royal order (Dhiraj, 2018a :487-504). It not only helps us to know about the Jain affiliation of later Chēra but also illustrates the socio-political conditions of Chēra country. The first two parts dedicate to brahmins. This could be measured by him to rectify the wrongdoings of him and his predecessors. His conversion or affiliation to Jainism might have disturbed brahmins. So, the first two parts of Koḷam record could be the appeasement measure to solve the conflict with brahmins.

The last two records talk about Thirukkuṇāvai, the famous Jain centre. The record states that “from the current year onwards, a certain quantity of paddy, additionally, will go to the Thirukkuṇāvai Thēvaṛ, for the conduct of Thirukkūthu festival” (Dhiraj, 2018a :489). There is a reference in the inscription, which talks about collecting of paddy from the tenants directly by the king’s court for the worship in Thirukkuṇāvai temple. The *Thirukkuṇāvai* or *Kuṇavayir kōttam* is another name of Thrikkaṇamathilakam, the Jain centre. This brings the Jain affiliation of Rāma Kulasekhara. Thus, it made clear that the Jain affiliation of the ruler creates an internal problem within the Chēra Empire. This fuel ran with the invasion of Hoysala ruler Viṣṇuvarḍhan led to the decline of the Chēra dynasty and Jainism in Kerala (Dhiraj, 2018a :489-490).

During the 14th and 16th centuries, Saṅdeśakāvyaṅ like *Kokasaṅdeśa*, *śukasaṅdeśa*, and *Uṇiachicharitam* referred to *Kuṇavayir kōttam*. The 14th-century work *Uṇiachicharitam* describes Kuṇavāi as an important town like Mangalapuram and Kodungallur. The anonymous author of *Kokasaṅdeśa* refers to Kuṇavāias *Gunaka* or *Kuṇaka*.

He had also stated that the brahmins were not allowed to see the lord of Kuṇaka (Pillai, Elamkulam, 1999: 58). The *Kokasaṅdeśa* was completed in 1400 CE It mentions Thrikkaṇamathilakam. The work gives plenty of information about places like Kuṇaka(Thrikkaṇamathilakam)and Vañci before it reaches *Thiruvanchikkulam*.

This work shows the importance of the area has as it is in close proximity to Vañci, the old capital of Chēra rulers, and *Mahodayapuram*, which was the capital of the Chēra kingdom later.

Similarly, Mathilakam finds its place in the work of Lakṣmīdāsa called *śukasāñdeśa* which was completed around the 14th century. The work revolves around a lover who is in Rameswaram sending a message to his counterpart in Thrikkaṇamathilakam.

Conclusion

A popular notion is that the Thrikkaṇamathilakam was an important Jain centre and Iḷaṅgo Aḍigaḷ wrote *Cilppadikāram* from there. The empirical evidence received by the researcher confirms this hypothesis. A large number of earliest inscriptions mention the Chēra rulers, their Jain affiliation, and the role played by Thrikkaṇamathilakam during the Chēra period. Tamiḷ-Brāhmī inscriptions from Paṭṭaṇam and fragmentary inscriptions from Mathilakam undoubtedly indicate the Jain tradition of this region. It can't be said that Thirukkuṇāvai and Thrikkaṇamathilakam are different. Because another inscription from the Thrikkaṇamathilakam starts with the lines “Thirukkuṇāvai Thevarkk”. Hence it can be summed up that both Thrikkaṇamathilakam and Thirukkuṇāvai are in the same region. The evidence of rectangular wells found in Mathilakam is similar to wells found in Wayanad and Palakkad which were also Jain centres.

After a detailed study of literary evidence and careful observation of inscriptional evidence, it can be concluded that Thrikkaṇamathilakam was an important Jain centre of Chēra and Iḷaṅgo Aḍigaḷ wrote *Cilppadikāram* from here. It received the patronage of the Chēra kingdom till the 12th century. The Koḷam inscription of Rāma Kulaśekhara talks about the Thirukkuṇāvai, the famous Jain centre. His affiliation towards Jainism along with the internal problems led to the decline of the Chēra dynasty and thereby the decline of Jainism. Similarly, the emergence of the Bhakti movement in the medieval period played a crucial role in the further deterioration of Jainism. The revival of Hinduism and teaching of Ādi Śankarācārya

led to the deprival of Jain doctrines in Kerala. This coincided with the conversion of many Jain centres into Hindu temples. Thrikkaṇamathilakam also faced the same fate.

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Figures



புலகு
புலகு
புலகு
பு

Fig.1. Mathilakam Vatteluttu Inscription I (Part-I)-Mathilakam.

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ಶುಭಂ ಕುಶಲಂ
ಶುಭಂ ಕುಶಲಂ



Fig.2 Mathilakam Vatteḷuttu Inscription I (Part-II) -Mathilakam



Fig.3. Mathilakam Vatteḷuttu Inscription II, Mathilakam

Promoting Chinese Cultural Heritage Tourism in Sri Lanka during Post-COVID19 Revival Phase: Viewpoint

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Abstract

The Chinese outbound tourists have received the spotlight of many destinations around the world. Therefore, the main aim of this article is to discuss the Chinese cultural heritage tourism potential in Sri Lanka with the purpose of attracting Chinese tourists to Sri Lanka during the post-COVID19 tourism revival phase. The study critically evaluates the previous literature on Chinese outbound tourism, heritage tourism, and Chinese cultural heritage in Sri Lanka. The study follows an interpretivism research approach. The study identified the potential of attracting Chinese outbound tourists to Sri Lanka after developing Chinese Cultural Heritage in Sri Lanka as a niche tourism product. The study further examined the resilience of the Chinese outbound market against the COVID19 pandemic and makes recommendations to attract Chinese tourists to Sri Lanka during the post-COVID19 revival phase. This viewpoint paper provides practical implications to Sri Lanka tourism policy makers and practitioners on how to attract the Chinese outbound tourists, which has not been systematically studied before.

Keywords: *Post-COVID19 tourism, Chinese outbound tourism, cultural heritage tourism, tourism recovery and resilience and post-pandemic tourism*

Introduction

People have been travelling since the great medieval era for different purposes. As of now, tourism is being anticipated and experienced in different ways than previously. Visits to cultural and heritage spaces are considered as one of the main components of today's travels (Kerstetter *et al.*, 2001). Cultural and heritage tourism can be viewed as being a type of special interest tourism (Nuryanti, 1996). In a narrow sense, cultural and heritage tourism is, special interest holidays (vacations) essentially motivated by cultural interests, such as trips and visits to historical sites and monuments, museums and galleries, artistic performances and festivals, as well as lifestyles of communities. In a broad sense, it includes activities with a cultural content as parts of trips and visits with a combination of pursuits (Medlik, 2003; Hewison, 1987).

Heritage is a complex notion based on historical events and experiences as well as artefacts. However, meanings and understandings are shaped by contemporary circumstances and thoughts about the future alongside personal and group perspectives (Nuryanti, 1996; Ashworth *et al.*, 2000). Built heritage is very often recognized as one form of cultural heritage. As stated in the "United Nations World Heritage Convention Concerning Protection of the World Cultural and Natural Heritage" there are three main components of inbuilt heritage (Hewison, 1989; Ross, 1991; Samarathunga, 2019). First, monuments: architectural works; works of monumental sculpture and painting; elements or structures of an archaeological nature; inscriptions, caves, and dwellings; and combinations of features that are of outstanding universal value from the point of view of history, art, or science. Second, groups of buildings: groups of separate or connected buildings that, because of their architecture, their homogeneity, or their place in the landscape, are of outstanding universal value from the point of view of history, art, and science. Third, sites: works of man or combined works of nature and man, and areas including archaeological sites that are of outstanding universal value from the historical, aesthetic, ethnological, or anthropological points of view (Nuryanti, 1996).

Conserved heritage can perform useful social and cultural functions by inculcating national and civic pride and feelings of connections (Torre, 2002). In developing countries, the development of heritage tourism involves not only reconstructing the past; it is also part of restructuring the economies (Nuryanti, 1996). Heritage's development and marketing as a visitor attraction demonstrates a capacity to earn income directly and indirectly (Rypkema 2008; Timothy and Nyaupane 2009; Henderson, 2012). Further, it contributes to the development of economies (Bellini *et al.*, 2007; Henderson, 2012), improve the lives of residents (Mathieson and Wall 1982), and has the potential to be a sustainable development tool by helping to make cities more attractive destinations in which to stay, work, visit and invest (Hutton, 2003). Consequently, it is vital that cultural sites are promoted with a proper plan to earn the maximum benefits to a country.

Cultural heritages also face challenges in their existence. Much of the danger to built heritage sites arguably results from destruction for tourism development; crowding and congestion, or from the inappropriate behaviour of visitors, such as touching delicate surfaces, littering and vandalism (Moscardo, 1996). Showcasing of culture and history can create antagonisms, especially if it is left completely in the hands of marketers to decide what to represent (Teo and Yeoh, 1997). Thus, it is important to identify, document, and conserve the cultural heritage at a destination before the profit-seeking sectors get involved with it. The authentic heritage tourist sites and authentic presentation to the tourists will always create a constant visitor demand (Yi *et al.*, 2017). Since the cultural tourists spend a relatively short time at built attractions, they tend to demand “show and know” the past, rather than to be amazed or entertained (McIntosh and Prentice, 1999). This is reflected in recent trends among global travellers who seek novelty through a return to traditional social values; whose new tastes and styles refer back to the past; and whose demands have become more specialized (Nuryanthi, 1996). Therefore, it is important to plan the cultural sites in such a way that busy tourists can experience the cultural sites in the shortest period.

Sri Lanka is an island destination in the Indian Ocean, which is famous as a paradise for tourism. The end of the three decades-long separatist war opened up new avenues for Sri Lanka tourism and it is on its way to emerging as a successful tourism destination despite of many post-war empirical glitches (Liyanage & Jayawardena, 2013; Dissanayake & Samarathunga, 2020). Although proper planning is deemed necessary to position Sri Lanka as a pristine destination (Lokuhetty, *et al.*, 2013) the industry questions the effectiveness of current promotional plans. Therefore, it is vital to set realistic tourism plans to harvest the maximum benefits to Sri Lanka tourism (Fernando and Jayawardena, 2013; Samarathunga, *et.al*, 2020). In this context, looking at the growing Chinese outbound market seems very effective during the post-COVID19 revival phase. Therefore, this viewpoint paper primarily focuses on how to promote Chinese culture and heritage tourism potentials in Sri Lanka during the post-COVID19 tourism revival phase. Further, motivations of potential Chinese visitors to Chinese cultural heritage sites in Sri Lanka by emphasizing the relationships between the individuals and the sites are investigated. Thus, it is important to identify the nature of the Chinese outbound market and their preferences as well.

Chinese Outbound Tourism Market

An old Chinese saying is, 'He who travels far knows much' (author anonymous). The Chinese population is growing in affluence, with outbound travel continuing to climb as more people can afford the luxury of tourism experiences (WTO, 2003). The rapid development of the Chinese economy has provided motivation for the development of sustainable outbound tourism (China Tourism Academy, 2010). China is the number one international tourism source market in the world in terms of border-crossings and spending (Arlt, 2013a; China Tourism Academy, 2010). 90% of all affluent Chinese have already visited Europe. Almost all affluent Chinese have been outside Mainland China at least once (Arlt, 2013a). Over 70% of Chinese tourists travel abroad at least once a year. Active outbound tourists who go abroad several times annually account for 36.97% of the total (World Tourism Cities

Federation, 2014). Chinese in the middle and top incomes are already starting to consider travel a ‘birthright’ (World Travel and Tourism Council, 2020) and there have been an increasing number of Chinese taking outbound trips (China National Tourism Administration, 2007). In 2020 one out of seven of all international border crossings will start from Mainland China, conducted by approximately 9% of Mainland Chinese citizens (Arlt, 2013b). The significance of the Chinese outbound market segment has been identified as a lucrative market segment by most destinations and regions. Thus, most of the destinations are now maintaining convenient visa policies for Chinese citizens and diversified promotion activities (China Tourism Academy, 2010).

Until now, tourists from China have visited well-known “must-see” destinations and attractions. However, the modern Chinese outbound tourists are leaving the “beaten track”(Arlt, 2013a). Arlt (2013a) further explains that, the “Second Wave” travellers move from “money-rich and time-poor” to “money and experience rich and time-poor”, looking for new kicks and lifestyle affirmation, new destinations, and authentic activities, clean nature, culture and stories to tell. This has created lucrative opportunities to developing countries to grab this mammoth market. China Tourism Academy (2010) also confirms that outbound tourists from North China mainly travel to surrounding countries and regions. The Second Wave Chinese travellers can be attracted to new places, new activities, new times of the year, bringing not only more, but a different kind of business. In order to get the advantage of this trend, it is important to give the right kind of reasons to come that include novelty, exclusivity, intensity, connection to China, endorsement by a celebrity, quality labels, and social media hype. If they are given the right story to tell and the feeling of being more welcomed as Second Wave Chinese travellers than any other kind of customer the arrival of Chinese tourists will be unstoppable (Arlt, 2013a).

The potential of attracting second-wave travellers to cultural and heritage sites is more promising. The desire to see well-known attractions stand out as the major motivation for Chinese travelling overseas. Chinese tourists appear to have high

regard for monuments that have a historical, cultural or contemporary significance. They are some of the key destination attributes that are likely to be attractive to outbound Chinese tourists (Zhou, King, and Turner, 1998; Kim *et al.*, 2005). This is further confirmed by the 2014 Market Research Report on Chinese Outbound Tourists (City) Consumption. According to this market report by World Tourism Cities Federation (WTCF), 87% of the Chinese outbound tourists prefer sightseeing as the primary purpose of travel followed by the availability of unique culture with 68% and long history 53%. The same report evident that Historical sites as the second most chosen sites with 73% preference closely preceded by Natural Scenery with 87% preference for Chinese tourists when they tour in outbound cities. Further to that, the vast majority of cultural visitors indicated that visits to cultural attractions on holidays were a reflection of cultural visits made in their home country or region (Tse, 2013). Walsh (1992) argues that heritage tourism is closely linked with the rise of “the new middle class” or the “service class”. However, it is not simply the consumption of heritage that is determined by the rise of the new middle class, but also the production of heritage. The potential that exists in Sri Lanka to attract this segment is explained in the succeeding section.

Sri Lanka Tourism With Chinese Cultural Heritage

From medieval times, because of its location in the Indian Ocean, Sri Lanka has attracted merchants, marine explorers, and invaders. In addition, the treasure of Buddhism, the bracing climate, and the hospitality of the natives, all paved the way to its reputation. While mercantile quests first brought the Chinese and the Sri Lankans together, the interest in Buddhism created a healthy relationship between the two countries from the third century A.D. The Bhikku Fa-Hien (3-4 A. D.) stands out among all these travellers as he had documented all his associations with Sri Lanka. According to the inscriptions, the Fa-Hien Bhikku travelled along the Silk Road to India and from there by boat to Sri Lanka in between 399 – 412 AD in search of Buddhist scripts. He spent two fruitful years in Sri Lanka and boarded a merchant ship to travel back to China. Sri Lankan evidence further suggests that he

stayed in *Abhayagiriya* (a key ancient Dhamma School in Sri Lanka) with 5000 Buddhist monks studying Buddhism, *Phahiyangala* (a rock cave in the Western province of the country) (Weerasinghe, 1995; Saunders, 1996; Kularathna, 2015). The story of Admiral *Zheng He / Cheng Ho* is both true and epic. His sea voyages explored the ancient world and brought them together. Although at certain instances he used his military powers, i.e. the ruler of Sri Lanka refused to recognize the emperor Ming and was taken to China as a prisoner, while a similar fate befell two rulers in Sumatra, and in most other instances the voyages have been diplomatic (Lunde, 2005). Zheng He's treasure ships were 450 feet long and suggest that there were 200-300 men on the ships. Zheng visited Sri Lanka 6 times out of his 7 voyages to around 30 countries, during the Chinese Ming Dynasty (Church, 2005; Sri Lanka Tourism Promotion Bureau, 2012). "Zheng He is a hero in China but sadly, his visits to Sri Lanka are not very much known in China", reported by the Xinhua News Agency in 2017. One of the strong pieces of evidence about the arrival of Zheng He to Sri Lanka is mentioned in Galle Trilingual Inscription (erected in 1411) which is being exhibited in Colombo National Museum. This evidence strongly suggests that he visited Sri Lanka 100 years, 233 years, and 397 years before the Portuguese, Dutch and British. Even the ancient diplomatic records of Rome confirm Chinese traders' visits to *Mantota*(present: Mannar) harbour in 52 BC (Sri Lanka Tourism Promotion Bureau, 2012). Further to, the Sri Lankan ancient records of *Mahawamsa* also affirms Sri Lanka and China diplomatic and trade relationships from the 1st century BC (Weerasinghe, 1995). In addition, there is plenty of evidence in Sri Lankan literature highlighting the hundred years of Sri Lanka and China relationships around the country including the trade missions, religious missions, and diplomatic missions. It can be further argued that all this evidence are found along with the sea-based *Silk* route, which once connected the Eastern and Western worlds.

One Belt One Road And Sri Lanka

Chinese One Belt One Road (OBOR) is one of the key development projects that the world has seen in recent decades. Under the visionary leadership of President Xi

Jinping, the OBPR was first proposed in 2013 to demarcate the one hundred year's celebrations of the establishment of the Chinese Communist Party (CCP). The OBOR project follows the ancient silk route, both land and maritime, that brought East and West together many centuries ago. Following the guiding starts set by their ancestors, most of the OBOR projects are now taking place along the ancient silk route, which are aimed at accelerating the development of China by promoting Chinese investments in countries that fall under the purview of OBOR project. Morgan Stanley, a renowned global investment bank estimates that by 2027 China's overall expenses over the life of the OBOR could reach \$1.2–1.3 trillion with sixty countries partnering with the project (Morgan Stanley, 2018). Although there are many benefits of OBOR projects to the host country, many scholars have pointed out the demerit of it. Ownership of economically valuable assets in other countries, spying over countries, influence over political matters and sovereignty, strict credit terms and conditions, expanding Chinese military power are a few of them (Alguacil, Cuadros and Orts, 2011; Fasslabend, 2015; Kleven, 2015; Aoyama, 2016; Ferdinand, 2016; Liu *et al.*, 2017; Var and Po, 2017; Jetin, 2018).

Sri Lanka is located in the heart of the ancient maritime silk route that has connections with the ancient silk route since the 13th century A.D. Sri Lanka started diplomatic relationships with China after Admiral Zheng-Ho (Zheng-he) visited Sri Lanka in the 13th and 14th century A.D. (Dewaraja, 2006). Reflecting the strength of the relationship between the Sri Lankan Government and the Chinese Government, there are many Chinese investments projects in Sri Lanka. Some of the key OBOR projects in Sri Lanka are presented in Table 1. According to Table 1, the direct value of OBOR loans and investments in Sri Lanka is well over US\$ 7.5 billion. Therefore, it is important to have stable socio-political and economic conditions in Sri Lanka to achieve the objectives of both Sri Lanka and China.

| # | Name of the project | Loan / Investment | Amount (US\$ millions) |
|----|---|-------------------|------------------------|
| 1 | Southern Expressway | Loan | 1,545 |
| 2 | Norochcholai Coal Power Plant | Loan | 1,346 |
| 3 | Hambantota Port Development Project | Loan | 1,335 |
| 4 | Colombo Port City | Investment | 1,300 |
| 5 | CICT Colombo Terminal | Investment | 500 |
| 6 | Rehabilitation of Northern Roads | Loan | 302 |
| 7 | Colombo-Katunayake Expressway | Loan | 248 |
| 8 | HambantotalMattala International Airport (Phase I & II) | Loan | 292 |
| 9 | Moragahakanda-Kalu Ganga Development Project | Loan | 214 |
| 10 | Extension of Southern Railway | Loan | 278 |
| 11 | Colombo Lotus Tower | Loan | 104 |
| 12 | Greater Kurunegala Water Supply and Sewerage Project | Loan | 79 |

Table 1: Chinese OBOR investments and loans in Sri Lanka

Source: Bhatia *et al.*, (2016), Wignaraja *et al.* (2020)

The completed and ongoing OBOR projects in Sri Lanka attract a large number of Chinese employees, businessmen, contractors, and diplomats at various levels. This upward trend could be seen since 2010 when Sri Lanka ended terrorism and started the development battle.

Developing Sri Lanka As A Chinese Cultural Tourism Destination

Heritage requires more than documentation and preservation. Its heritage and archaeological value should be conveyed to the visitors (Nuryanti, 1996). However, converting cultural items into tourism products does not have only detrimental effects but has both positive and negative implications for the local and tourist communities (Chang, 1997). Thus, it is important that introduction of proper tourism concepts to the Chinese culture and heritage sites in Sri Lanka.

Sri Lanka tourism enjoyed the highest number of Chinese tourists' arrivals during 2018 and 2019. Sri Lanka's tourism industry has acknowledged China as an important emerging market. The number of Chinese arrivals to Sri Lanka has increased at an increasing rate during the last decade (Sri Lanka Tourism Development Authority, 2016). Although the literature related to Chinese inbound tourists is very low, a few articles and books are published in Sri Lanka. Silva and Lasanthi (2014) suggested that Sri Lanka needs to diversify its tourism attractions to attract more Chinese tourists. The recent report entitled 'Survey of Departing Foreign Tourists from Sri Lanka' (Sri Lanka Tourism Development Authority, 2016), reports that Chinese tourists expect Chinese culture in Sri Lanka: people to speak the Chinese language, their Union Bank payments, Chinese food, to visit China Town and places of importance to Chinese people. The purposes of the Chinese tourists to visit Sri Lanka are for recreation, business, religion and culture according to the Survey Report. However, Silva and Lasanthi (2014) conclude that although Sri Lanka is known to the Chinese people, the lack of information about Chinese culture and heritage values stops people to travel to Sri Lanka. This is mainly because Sri Lanka is more focused on physical infrastructural development, not product development when it comes to tourism planning (Samaranayake *et al.*, 2013).

Covid19 And Chinese Outbound Tourism In Sri Lanka

COVID19 has imposed an irreversible impact on world tourism (Samarathunga, 2020; Samarathunga and Weerathunga, 2020; Weerathunga and Samarathunga, 2020). China has been very much successful in controlling the spread of the deadly virus. Since 2011, Chinese tourists have been visiting Sri Lanka at an increasing rate who also spend handsomely at the hotels, tourist shops, and for other tourism services. China has been the largest source market in the world since 2012. In 2018, there were around 150 million outbound trips from China, and Chinese tourists spent over US \$277 billion in their travels abroad (United Nations World Tourism Organization, 2019). On the other hand, in 2018 Sri Lanka received only 265,965

(167,863 in 2019) number of Chinese tourists (0.1% of the total outbound traffic). According to Travel China Guide Vietnam, Thailand, Japan, Indonesia, Singapore, Malaysia, Hong Kong, Philippines, Cambodia, and Macau have been the top China outbound destinations (Pacific Asia Travel Association, 2020). In comparative terms, the effectiveness of the Sri Lankan pandemic controlling mechanism is equal or better than most of the above countries (Weerathunga and Samarathunga, 2020). On the contrary, some European and American leaders have made controversial statements regarding the COVID19 to the disappointment of China. Additionally, the West has developed stereotype mentalities towards Chinese people which will affect negatively Chinese travelling in the West.

This will open up new avenues for Sri Lanka to attract more high spending Chinese tourists in the year to come provided we do our homework well. It is also important to highlight the favourable economic and political ties that both countries are sharing, which will ease any future bottleneck. The latest study report by Pacific Asia Travel Association (PATA) along with CCT and IVY Alliance highlights the post-COVID19 travel behaviour of Chinese tourists. According to the reports Japan (18%) and Thailand (14%) will remain as the most preferred travel destinations among the Chinese tourist, followed by European countries (14%), and Maldives, Singapore, New Zealand, Australia, South Korea, Sri Lanka and Malaysia (Pacific Asia Travel Association, 2020).

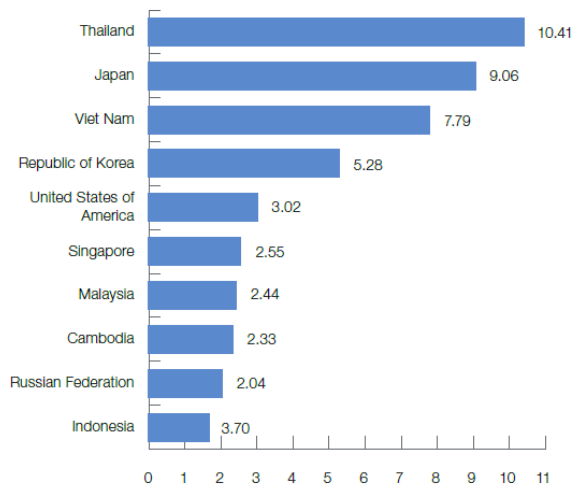


Figure 1: Chinese outbound travels to top 10 destinations in 2018

Source: UNWTO (2019)

Continuous promotions in other conventional tourism markets that include the UK, Germany, Australia, France, United States, and Canada should not be forgotten because in near future the world will discover long waiting for curative and preventive vaccines to combat COVID19. Small elite clusters from those countries will continue to make international travels immediately after lifting the travel bans and Sri Lanka will get their limelight as a “Safe” destination to travel. Therefore, it is our responsibility to handle the existing and emerging markets in efficient ways to get the maximum benefits under the new circumstances.

Conclusion

Although promoting foreign cultures as a part of tourist attractions at the destination areas has not been a popular researchable area. There is much evidence proving the fact that foreign tourists prefer to see their culture in other countries. For example, Kampung Baru in Kuala Lumpur has been a very popular destination to visit among British tourists due to its British colonial remains (Ar, 2009; Henderson, 2012). Henderson (2000) further points out that Manila's Spanish colonial architecture and buildings which date back to the 15th century are the key attractions to visit among Spanish tourists. Similar to that, in Singapore, Chinatown Historic District is the most popular destination among tourists in 1998. Another popular destination among the Chinese tourists in Singapore is Tiger Balm Gardens (Haw Par Villa) which depicts scenes from Chinese mythology, folklore, legends, history, and illustrations of various aspects of Confucianism (Teo and Yeoh, 1997). Therefore, following the best practices, the possibility of attracting Chinese outbound tourists to Sri Lanka seems relatively easy than attracting long-haul tourists.

There is no doubt that the future tourism industry of most countries will fall in the hands of the Chinese outbound tourists. This largest, fastest-growing, and elite market will also decide the success or failure of most of the destinations in the future. The present viewpoint paper of the Chinese outbound market gestures that the Chinese travellers tend to be heterogeneous rather than homogeneous. Thus, there will be an increased demand for niche tourism concepts including visiting

ancient cultural heritage sites that has a relationship to modern Chinese travellers. Cultural and heritage tourism is not only viewed as a concept that increases the awareness of the tourists about history, archaeology, or anthropology but also it has been found out as an important economic driver that converts stagnated economies into booming economies. Therefore, post COVID19 tourism plans in Sri Lanka should be more sensitive to the ever-growing Chinese outbound market.

Recommendations

The study put forward the following implications to attract more Chinese tourists to Sri Lanka:

1. To identify the Chinese culture and heritage sites in Sri Lanka through proper scientific investigations and conserve them, and convert them into tourism products;
2. Promote Mandarin language education in Sri Lanka;
3. Empowering the tourist service personnel with Chinese language competency;
4. Promote online check-in's and check-outs at the hotels to save time;
5. Introducing We-chat and Ali-pay payment methods to Chinese tourists to pay in RMB;
6. Sri Lanka to have more direct flights from Chinese tourist generating areas;
7. Promoting alternative tourism including eco-tourism, responsible tourism, community-based tourism, Ayurveda and Yoga, bird watching, agro-tourism, etc. instead of conventional mass tourism;
8. Recommending longer credit facilities to be given to stable tour operators;
9. Encouraging the Chinese tour operators to encourage their credit card companies to offer interest-free instalment payments for travellers on travel plans;

10. Identifying the shopping behaviour of Chinese tourists and developing shopping tourism;
11. Involve more activities at tourist destinations by means of value addition;
12. Conducting more research on outbound Chinese tourists, trends, and patterns;
13. Preparing the local communities to welcome and host tourists.
14. To restructure the existing tourism promotional campaigns, which can reach the Second Wave of Chinese tourists through Chinese media, internet platforms, and popular mobile Apps.

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The Current Challenges in Sri Lanka's Rattan Manufacturing Industry

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Abstract

This research examines the contemporary challenges associated with the rattan manufacturing industry in Sri Lanka. Accordingly, the main objective of this research is to identify the current challenges associated with the rattan manufacturing industry. This research was carried out using a mixed methodology under the inductive approach. Quantitative and qualitative data were used for the research and they were collected from primary and secondary sources. The secondary data were collected through DSD offices, resource profiles, district, and statistical handbooks, relevant websites, and journal articles. Questionnaires, structured and semi-structured interviews, were used to obtain primary data. Radawadunna Grama Niladhari Division of the Mirigama Divisional Secretariat Division in the Gampaha District in Sri Lanka was selected as the sample for conducting this study. The reason for selecting this area for this study was that this area is identified as a place significantly famous for rattan-related products and trade. Ten attributes were derived from the literature survey to identify the research objective. A factor analysis was performed using SPSS software and the analyzed data were presented in tables. After analyzing data, it was identified the challenges faced by the traders engaged in the rattan manufacturing industry in this area. Thus, the four factors can be named as, Resource scarcity, Market factors, Spatial factors and, Cultural factors. Under these four main factors, several other sub-factors can be identified. Accordingly, the study finally identified several challenges associated with the rattan industry in present Sri Lanka.

Keywords - Rattan, Rattan production, Rattan manufacturing industry, Sri Lanka

Introduction

This research paper associated with mainly the current challenges related to the rattan manufacturing industry in the Radawadunna Grama Niladhari Division of Sri Lanka. The rattan manufacturing industry belongs to the category of primary economic activities. The primary economic activities are located under the influence of labour, raw materials, markets, etc (Huang et al., 2019). The above factors have also influenced the establishment of this economic activity in this area in the past. There is evidence that rattan products have been produced in Sri Lanka since ancient times. The people who make rattan products are called “Kulu Pottan”. Robert Knox also wrote about them in his travelogues (Jayawardena, 2015). Accordingly, it can be concluded that the rattan industry was still strong in the seventeenth century and may have received royal patronage. Village names such as Wewelduwa, Wewel Kandura, Wewelwala, Wewelpathana, and Weweldeniya indicate that the rattan industry has existed in Sri Lanka since ancient times (Jayawardena, 2015).

It is believed that the basic knowledge of rattan production came with the arrival of Sangamitta Theraniya. This evidence is further confirmed by the fact that among the 18 artisans who came to this country during the reign of King Pathis II was a group known as Kulu Potthan. Their task was to make various items using rattans. Native people of Sri Lanka also used rattans to make ladders for wasps (Liyanagedara, 2020). Different types of rattans are used when manufacturing rattan products. Some of them are Heen rattans, white rattans, ma rattans, kambotu rattans, Nara rattans, Malaysian rattans, Kekuna rattans and Ela rattans. However, well-ripped rattans are most preferred in manufacturing rattans rather than young rattans.

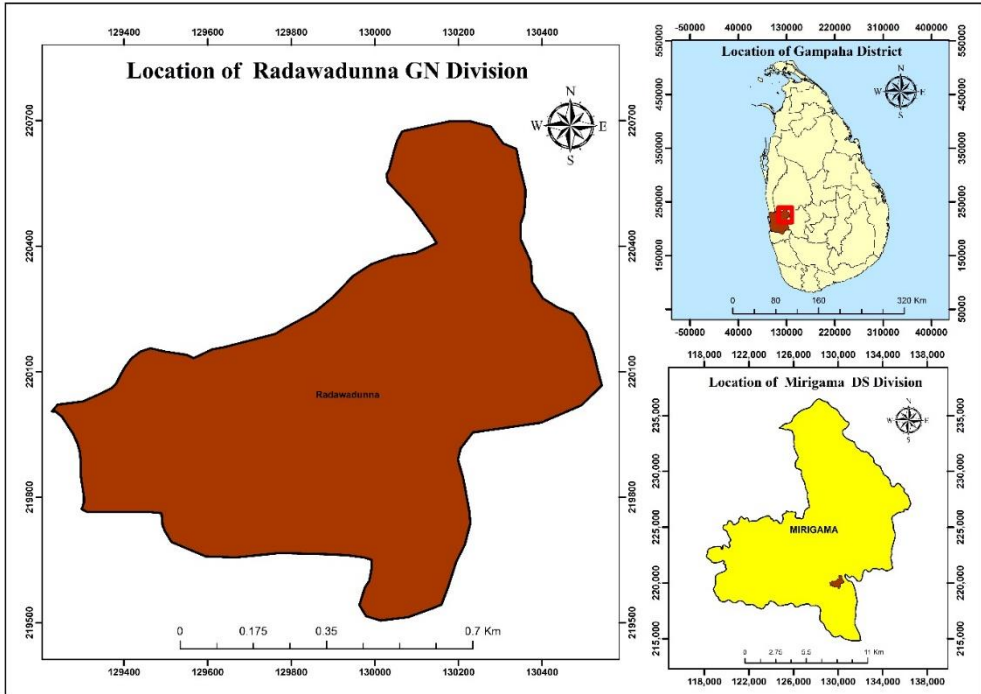
As in past in present also, rattan products are very popular among Sri Lankans as well as foreigners (Rathnayaka, 2019). Such products can sometimes be cited as one of the major reasons to attract foreigners to this country. In the past, rattan production in Sri Lanka was limited to the kitchen, but today the situation has changed. Nowadays, manufacturers are highly interested in making a variety of

decorative products that can be placed in the living room and bedroom. The creation of various animal figures, various formats, wall hangings, lamp sets, etc, is practised in the present rattan manufacturing industry (Silva, 2019). However, currently, the people who are engaging in this industry are facing various challenges. Accordingly, various problems related to this industry can be identified.

The rattans, which have been manufactured based on local as well as foreign markets, are currently facing various challenges. The research goal of this paper is to do thorough investigations about, what are the current challenges associated with the rattan manufacturing industry in Sri Lanka?

Methodology

This research was carried out using a mixed methodology under the inductive approach. Quantitative and qualitative data were used for the research and they were collected from primary and secondary sources. The secondary data were collected through the DSD office, Resource profile, District statistical handbooks, Relevant websites, and journal articles. Moreover, the primary data was collected through questionnaires, structured and semi-structured interviews. Radawadunna Grama Niladhari Division of the Mirigama Divisional Secretariat Division in the Gampaha District was selected as the sample to conduct this study. The reason for selecting this area for this study was that this area is identified as a place significantly famous for rattan-related products and trade. Ten attributes were derived from the literature survey to identify the research objective. A factor analysis was performed using SPSS software and the analyzed data were presented in tables and charts. Map No. 01 below shows the location of the study area of this research in Radawadunna Grama Niladhari Division in Sri Lanka.



Map No. 01: Location of the Study area

Source – Using Arc GIS 10.1, 1:50,000 Digital data, Survey Department of Sri Lanka, (Rathnayaka, 2021)

Research Discussion and Analysis

| Variable | Percentage |
|---|------------|
| Shortage of raw material | 16.8% |
| Increase in production cost | 11.0% |
| Increase in prices of manufactured goods | 10.3% |
| The arrival of substitutes | 5.2% |
| Decreasing the contribution of the current generation | 7.1% |
| Increase in market tax rent | 5.2% |
| Reducing profits | 7.7% |
| Traditional industrialists are experienced due to aging Lack of staff | 7.7% |
| Transporting raw materials costs a lot of money | 16.1% |
| Culturally these producers are considered inferior to society | 12.9% |

Table 1.1 indicates the percentage distribution of each attribute.

Table 1.1. Percentage distribution of the Initial Variables.

Source – Field Data, 2019

According to table 1.1, more than 15% indicated that shortage of raw material (16.8%) and high transportation cost (16.1%) as the burning issues respectively regarding rattan production. In addition to these variables, producers are considered inferior to society, high production costs, as well as high prices of manufactured goods, represented more than 10%. Furthermore, arrivals of substitutes and increased market tax rent indicated around 5%.

Factor Analysis

The significance of Bartlett's test (Table 1.2) confirmed that the observed correlation matrix is significantly different from the identity matrix. It also indicated that the KMO statistic (0.826) is greater than 0.6 confirming that data satisfied sampling adequacy for FA. In addition to the KMO and Bartlett's test, it is recommended to compute Cronbach's Alpha Coefficient for categorical data (Peiris, 2018).

| | | |
|---|--------------------|---------|
| Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy | | .755 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 121.555 |
| | Df | 21 |
| | Sig. | 0.00 |
| Cronbach's alpha coefficient | | 0.826 |

Table 1. 2: Results of Adequacy Statistics for FA

The significance of the Bartlett Test ($p = 0.00$) showed the correlation matrix is significantly different from the identity matrix. Cronbach's alpha coefficient of 0.826 confirmed that there is good internal consistency in data. All these results confirmed that the data set is suitable for FA.

Extraction Factors

The number of factors to be retained was decided by the Kaiser's rule of which eigenvalues exceed unity. It was found that the four factors accounted for 87% of the variability of the original system. The factors were extracted using the PCF method and were rotated using Varimax.

The following table (Table 1.3) shows the factor rotation results under the Varimax rotation methods in the PCF method.

| Reasons | Component | | | |
|---|-------------|-------------|-------------|-------------|
| | 1 | 2 | 3 | 4 |
| increase in production cost | .364 | .333 | .474 | .177 |
| increase in prices of manufactured goods | .782 | .078 | - | .198 |
| the arrival of substitutes | .859 | - | - | - |
| Decreasing the contribution of the current generation | .745 | .176 | - | .136 |
| Increase in market tax rent | - | .701 | .506 | - |
| Reducing profits | .285 | - | - | .774 |
| Traditional industrialists are experienced Lack of staff | .066 | .053 | .565 | .625 |
| Transporting raw materials costs a lot of money | - | .185 | .834 | .104 |
| Culturally these producers are considered inferior to society | - | .177 | .110 | .551 |
| increase in production cost | .406 | .563 | .018 | .123 |

Table 1.3: Factor Loadings of 4 - Factor Model (PCF and Varimax)

Based on the results in table 1.3, it can be confirmed that among the initial ten variables, increase in prices of manufactured goods, the arrival of substitutes, Decreasing the contribution of the current generation load more highly on the first common factor, increase in market tax rent and increase in production cost load

more highly on the second common factor, increase in production cost, transporting raw materials costs a lot of money load more highly on the third common factor and reducing profits, traditional industrialists are experienced lack of staff, Culturally these producers are considered inferior to society load more highly on the fourth common factor.

Thus, the four factors can be named as, resource scarcity, market factors, spatial factors, and cultural factors. Under these four main factors, several other sub-factors can be identified. Accordingly, the following are the challenges facing the rattan manufacturing industry today.

Resource scarcity

The main problem that has arisen in connection with this manufacturing industry is the scarcity of resources. It was identified a shortage of physical as well as human resources. There are two main challenges under resource scarcity. That is,

1. Shortage of raw materials
2. Scarcity of employees.

In the past, it was easy to get raw materials from this area, but today the situation has changed. As a result, those engaged in this industry have had to import raw materials from other areas. Raw material is currently being transported, especially from Ampara, Mahiyanganaya, Polonnaruwa and Trincomalee. Thus, manufacturers have to spend extra money to transport raw materials to the market from the above-mentioned remote areas. Accordingly, the impact value of the raw material shortage was recorded as .474. In addition to the shortage of raw materials, a shortage of human resources was identified as another challenge in the study area. There was a shortage of quantitative as well as qualitative human resources. The main challenge here is the lack of experienced workers due to the ageing of traditional industrialists. Accordingly, the scarcity of employees was .834.

Since the rattan manufacturing industry is based on skills, it is very important to have more skilled labourers. Lack of skilled labor is also a current challenge associated with this industry.

Market Challenges

Market factors can be identified as another challenge with the rattan manufacturing industry. The primary challenges identified under market challenges were, an increase in production cost

1. Increase in prices of manufactured goods
2. The arrival of substitutes

Etc. were able to identify the challenges.

At the end of the study, it was found, several key factors contribute to increasing the cost of rattan products. Those factors are, such as the high cost of exporting rattan products, the need to pay various commissions on transportation, the high cost of labour due to the shortage of labour, and the increase in market rents. The value here was recorded as .782. Due to these factors, the cost of production of rattan products is very high and the shop owners have to increase the selling price of rattan products. Due to this situation, the number of local and foreign buyers is less than before. Another challenge is the availability of various substitutes for the rattan industry. With the introduction of substitutes made of plastic, aluminium, and fiber in the market and their prices being lower than rattan products, consumers are more motivated to buy those products.

Local challenges

Land is a more important factor in establishing primary economic activities. The following main challenges were identified locally with the rattan manufacturing industry,

1. Increase in market tax rent
2. Reducing profits
3. High cost to transport raw materials

Some traders keep their shops under rent and the challenge they face is increasing the rent of the shop. In the past, these shops were in houses, but now they are rented out. As a result, traders from other areas continue their businesses for monthly rent in this area and they face this problem. Thus, the increase in market rent, the higher cost of transporting raw materials, and the increase in production costs affect reduce the production profits. This is also a challenge faced by traders associated with this industry.

Cultural challenges

Much of Sri Lanka's trade is still based on culture. The main factor here is to determine their social status based on the trades they make. Accordingly, cultural challenges can be pointed out as a challenge facing the rattan manufacturing industry today. Under cultural challenges, the following key challenges were recognized as existing challenges in present.

- Culturally these producers are considered inferior to society
- Decreasing the contribution of the current generation

The rattan makers in the society are called “Kulu Pottan”. The importance of such individuals in the social hierarchy is still evident today. Due to this, the contribution of the modern generation to this industry has been minimal. Because of this low social concern. Accordingly, this can be identified as another challenge associated with the rattan manufacturing industry.

Conclusion

Primary economic activities are concentrated in different parts of the world and are caused by various physical and human activities. This research paper focused on identifying the current challenges faced by the rattan manufacturing industry in Sri

Lanka. Accordingly, four major challenges related to the rattan industry and 10 other sub-challenges under them were identified. Major challenges identified in the Rattan manufacturing industry were resource challenges, market challenges, spatial challenges, and cultural challenges. As the resource challenges, the shortage of raw materials, and the shortage of trained and adequate human resources were identified in the study area. Under the market challenges, the increase in production cost, increase in prices of manufactured goods, the arrival of substitutes were identified. Local challenges identified in the study were, an increase in market tax rent, reducing profits, transporting raw materials costs a lot of money, and as cultural challenges, culturally these producers are considered inferior to society, decreasing the contribution of the current generation were identified. Thus, the study finally identified the main challenges associated with the rattan industry in present Sri Lanka.

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Preliminary results of the Yodhawewa Archaeological Research in Sri Lanka - 2018: Exploration, Excavations, Findings, and Radiocarbon Datings

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Abstract

This archaeological research aimed to investigate the authentic metalworking activities of the Yodhawewa area and examine contemporary socio-economic movements based on discovered material culture. The entire research work was carried out in 2018 based on a surface survey and two excavations in an area of about 201600m² on the outskirts of Yodhawewa reservoir. The C14 chronology confirms the 1st-8th centuries activities, and in this research obtained a considerable artefacts collection related to metal extraction, copper metalwork, and crucible steel production. This research also discovered that half of a lower spherical (crucible-typed) metal furnace was used to produce crucible steel for the first time in Sri Lanka. Artefacts such as coins, BRW, RW, and some porcelain prove that the site maintained cultural relations with India and China in the c. 1st century and 8th century AD. Other artefacts of this site include ceramics, beads, faunal remains, minerals, and rocks that have been used for human needs for a considerable period. This article discusses at length the archaeological evidence that the Yodhawewa region is a metalworking site that has been active since the early historical period of Sri Lanka and a place that reflects national and international cultural relations.

Keywords: Copper, Crucibles, furnace, Metal Slags, Yodhawewa

Introduction

There is a copious amount of literature produced by the researchers who have focused on the South Indian Ocean port city of *Mannar* or '*Mantai*' as known and its archaeological value. The book "Mantai: City by the Sea" provides an extensive description of archaeological research centred on the port city of Mannar at various times since the 1880s (Carswell et al., 2013). Through such studies, it was shown that the Mantai ancient port in north-western Sri Lanka was one of the major ports in the route of East and West trade in the Indian Ocean. The archaeological record of the Mantai shows its wide range and diversified links with the local and international trade networks (Bohingamuwa, 2017; Prickett-Fernando, 2003). As the port-city of Mannar became an important economic centre in South Asia, researchers did not pay much attention to how it affected settlements in the surrounding suburbs.

Significant research has been done in ancient Sri Lanka in various fields such as regional metalwork, metal artefacts, raw materials for metal production, and technological parameters related to metalworking (Juleff, 1996, 2015; Seneviratne, 1985, 1995; Solangaraarachchi, 2011). The oldest evidence of metallurgical activities found at Anuradhapura citadel (c. 834-778 BC), Sigiriya-Aligala excavation, and the Pomparippu megalithic burial excavation (c. 998-848 BC) in Sri Lanka (Begley et al., 1981; Deraniyagala, 1992; Karunaratne & Adikari, 1994). They mainly focused on local iron smelting, iron production, and copper metallurgy. Then, two research related to two types of metal furnaces in ancient Sri Lanka stands out; (a) *Samanalawewa* research based on the seasonal monsoon wind power through the west-facing furnace technology in the 5th century BC to 12th century AD (Juleff, 1996), and (b) The magnetite iron ore extraction furnaces in the Sigiriya (Kiri Oya Basin - KOB) with the evidence of c. 3rd century BC to 10th century AD (Solangaraarachchi, 2011). Thantilage and Vithanage (2015) have also conducted significant research, including primary metal ore deposits, ancient smelting, and metal production sites, and some iron ore geochemical descriptions in Sri Lanka.

Furthermore, Seneviratne's studies (1995) on the quantitative factors, utility, and consumption of the Seruvila copper deposit near Trincomalee (East province in Sri Lanka) are particularly significant. Some researchers have explained that the utility of the Seruvila copper deposit was also crucial in coinciding with the demand for copper in South India (Juleff, 2013; Seneviratne, 1995; Srinivasan, 2016).

Ancient crucible steel production is a technological transformation of iron production in the world. The *Kodumanal* site in Tamil Nadu has uncovered a small circular furnace cluster (more than 12 furnaces) used for the production of crucible steel/wootz, and the earliest evidence (300 BC) of semi-solid crucible steel (Gullapalli 2009; Sasisekaran & Raghunatha Rao, 2001; Sasisekaran 2002; Srinivasan, 2013, 1997; Srinivasan & Ranganathan, 2004). Archaeological evidence for this type of circular (crucible-shaped) furnaces was not reported until the *Yodhawewa* was discovered. Ondaatje (1854) and Coomaraswamy (1908/1962) have provided eyewitness accounts of Sri Lankan crucible-steel production in recent history (Juleff 1996; Solangaraarachchi 2011), and most recently, a significant intervention has been carried out by Juleff (1996). Arab writers such as Al-Kindi report a tremendous demand for Sri Lankan (*Sarandibi*) steel from the Islamic world in the 6th-9th centuries AD (Juleff 1996). Analyzing the metal facts of Mannar (excavations 1980-84), Juleff (2013) pointed out that high-quality steel produced in *Sarandibi* may have been exported through the Mannar port.

Due to the central location on the South Asian silk road and the extensive port system around the country, Sri Lanka has maintained an excellent cultural network globally in ancient times (Carswell et al., 2013; Weisshaar, Roth, et al., 2001). Foreign artefacts such as pottery, coins, beads can form a broad discourse on cultural relations not recorded in the written literature. The quantities of foreign artefacts discovered in Sri Lanka help provide a quantitative and qualitative interpretation of these relationships. Here we intend to comment on some of such specific artefacts discovered by the *Yodhawewa* research.

The adverse effects of the civil war in the Northern and Eastern Provinces of Sri Lanka during 1983-2009 also significantly changed the geo-environmental conditions of the region, and archaeological sites were accidentally opened due to rapid irrigation projects initiated after 2009. The *Yodhawewa* archaeological site was discovered in October 2017 during a reconnaissance survey of ancient settlements around the *Yodhawewa* Reservoir (Giant's Tank). The Department of Archaeology and Heritage Management of the Rajarata University of Sri Lanka conducted a field investigation in 2018 with the Director-General of Archaeology's approval to further observe the material culture and settlements of the *Yodhawewa* area. This study aimed to provide a chronological description of the movements of the ancient settlement based on the material culture revealed by the archaeological observations. It will provide essential clues as to the impact of commercial activities centred on the port city of Mannar on the settlements in the periphery zone. Two specific objectives were expected to be achieved in this research: (a) Giving a chronological definition to the newly discovered *Yodhawewa* metalworking activities, and (b) Explaining the authentic technical parameters and resource utilization of the *Yodhawewa* area through the research findings of 2018.

(I) Study Area and the Geophysical environment of the region

The archaeological study was conducted near the Yodhawewa reservoir, located 12 km southeast of the Mannar ancient port city (Fig. 1) and in the 'Yodhawewa' village in the Mannar District North-Western coast and the Northern Province of Sri Lanka. The study area was bounded by the Yodhawewa Sanctuary - east, the Yodhawewa reservoir - South, and the canal and agricultural lands from the north and west. Archaeological investigations of the whole area were carried out beginning from the outer spill of the Yodhawewa reservoir to a length of 1600m area, especially on the right bank of the canal in the GPS location 08°89'14.0' N - 080°04'82.2' E (Fig. 1).

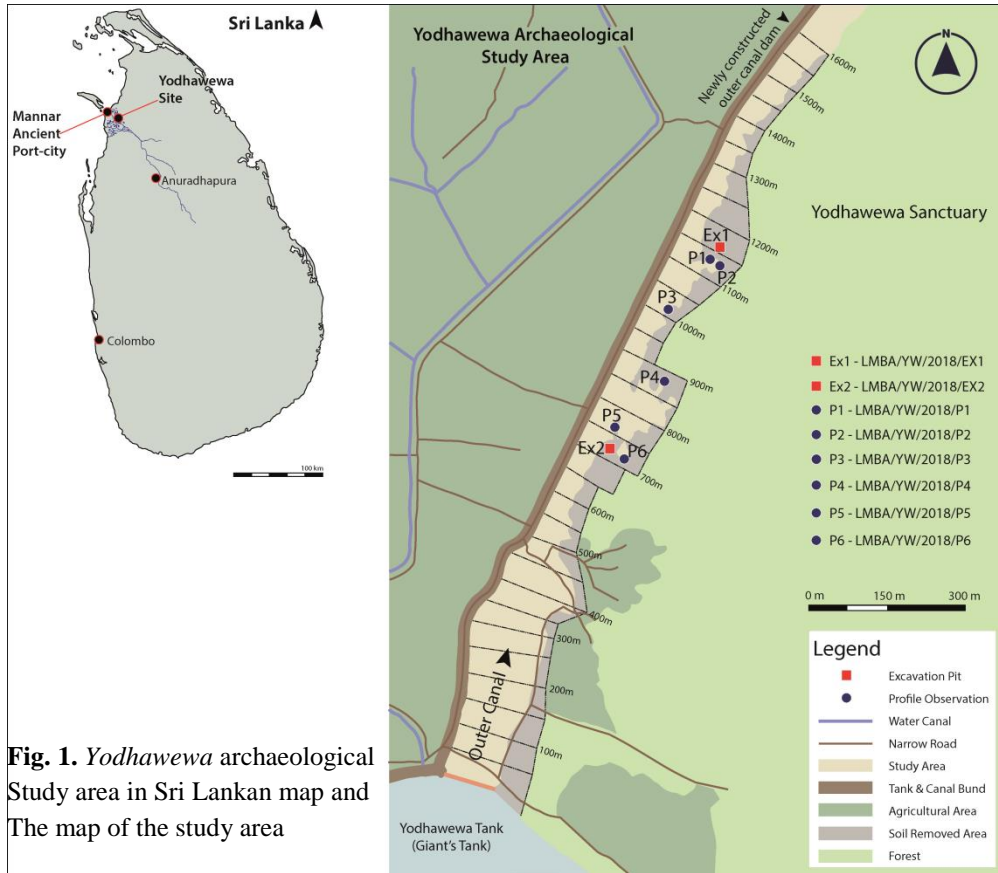


Fig. 1. Yodhawewa archaeological Study area in Sri Lankan map and The map of the study area

The study area was located in the North-Western plains of Sri Lanka, geologically on the Miocene limestone layer (Cooray & Katupotha, 1991). The region consists of three soil distributions. The undulating terrain spreads eastward from the Yodhawewa, comprising Reddish Brown Earth developed on the Red Yellow Latosol horizon. The flat coastal terrain mainly comprises alluvial soils, and eroded surfaces and grumusols noticed within the region (Alwis & Panabokke, 1972). Deposition of alluvial soil was reported from the river and flood basins. Climatically it falls into the North-Western Dry - semi-arid zone and, Grasslands, shrubs with thorny bushes are prominent as vegetation. Despite the prolonged drought, the region receives < 1,200 mm of rainfall annually, from June to August. The temperature remains high throughout the year causing higher evaporation and relatively low humidity. Droughts after August create a significant impact on the

soil and the vegetation. The dehydrating South-West monsoon winds prevail from April to August. Dry climatic conditions are frequent; however, floods are reported occasionally (Pemadasa, 1984).

Materials and methods

a) Surface Sampling

The exposed surfaces with artefacts were identified during the preliminary site visit at the end of 2017. A formal surface sampling was done through a water canal area of 201600 m² extended, and it was divided into 32 sampling units in an interval of 50m. In order to present a detailed and unbiased image of the premise's cultural and natural phenomena, artefacts scattered on the surface were collected to represent each sample unit following the Exploration Procedures (2015) declared by the Department of Archaeology Sri Lanka. Artefacts (pottery, Slags, furnace wall fragments, crucible fragments, beads, shells, coins) were collected and recorded by each sampling unit and were bagged in separate ziplock polythene bags. During the initial observation, several irregular vertical soil profile units were observed in the centre of the study area. Formal profiles (100cm / 150cm x 15cm) of such sites were observed to uncover further information in the study area. Profiles detail were also included in this research under exploration.

b) Excavations

In selecting the site for the first excavation LMBA/YW/2018/01 (Ex-01) of the *Yodhawewa* research (Fig. 1, 2a), the geophysical factors, minimal human impact, and the surface artefacts distribution density were considered. The primary purpose of that excavation was to identify the layer distribution pattern of the site and, the minimum to a maximum of 0.50m to 0.80m depth from the surface level was excavated in the 9m² area. The site for the second excavation, LMBA/YW/2018/02 (Ex-02), was selected based on the surface factors of the furnace structure discovered 700-750m sampling unit during the survey (Fig. 1, 2b). The Ex-02 was

carried out aiming at uncovering information on the technical parameters based on the furnace. The excavation was completed at the end of 0.60m to 0.75m depth from the surface level. The excavation process followed the established procedure (Standing Order No. 488) of the Department of Archaeology Sri Lanka and included detailed statements, illustrations, measurements, and photographs in contextual reporting.

c) Radiocarbon Datings

Five charcoal samples were collected from the Ex-02 excavation and dated using Accelerator Mass Spectrometry (AMS) from the Beta Analytic laboratory, USA. All radiocarbon dates were conventional Radiocarbon Ages, and sigmas are rounded to the nearest ten years as for the 1977 International Radiocarbon Conference conventions. When counting statistics when sigmas are lower than ± 30 years, a conservative ± 30 BP was cited for the result. For Beta Analytic, the reported results are accredited to ISO/IEC 17025:2005 testing accreditation PJLA #59423 standards.

Results and Discussion:

a) Stratification and Chronology

The six profiles reported in the surface survey revealed the study area's topography, confirmed that the entire region consisted of five main soil layers. All soil layers in the premises were certainly presented only in Ex-01, P1, and P2 areas and did not signify the same topography in other areas. The exposed facies' recorded depths vary between 120cm - 240cm. The Reddish Brown Earth was developed on the surface level or at 1-40 cm of depth whole study area. The lower horizons comprise reddish-brown soil (Dull Reddish Brown Layer).

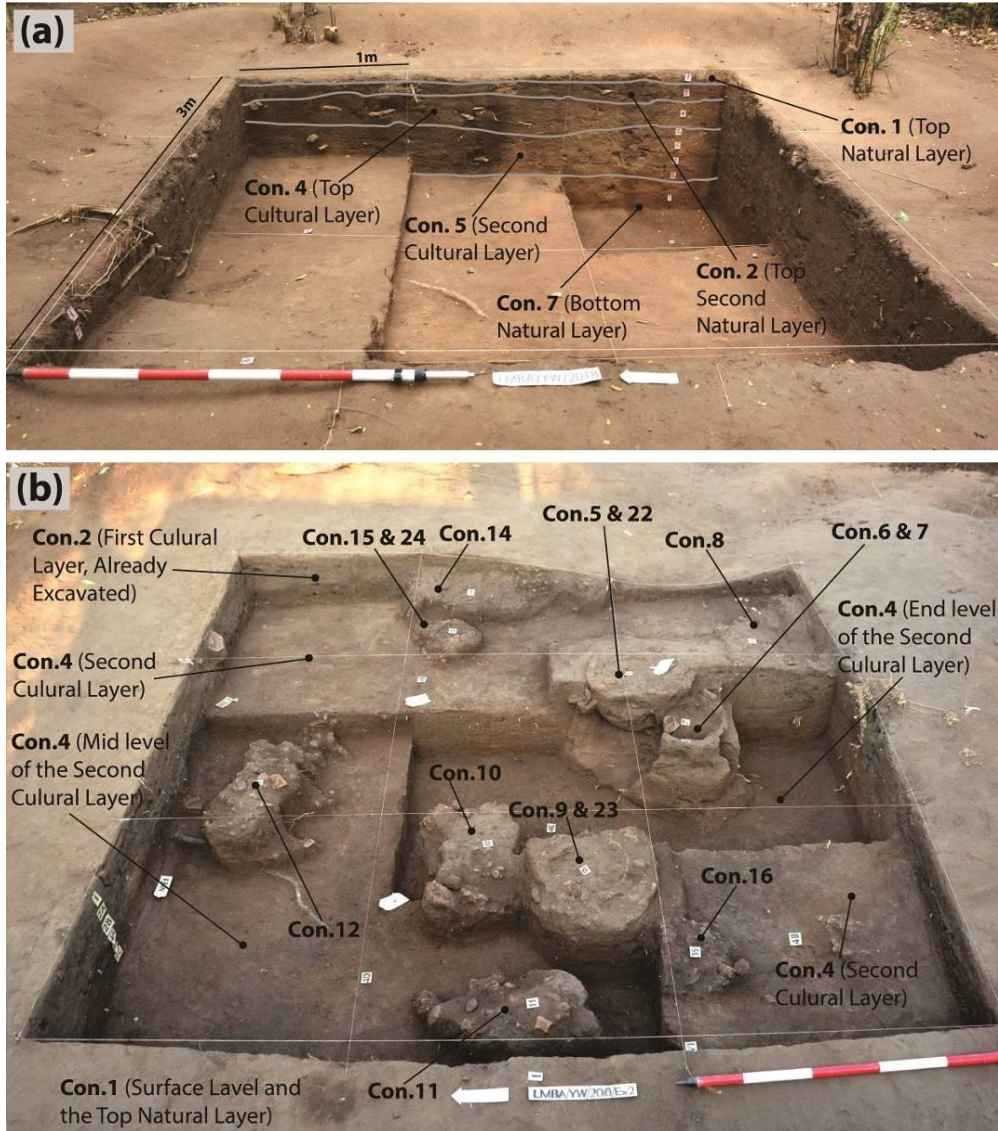


Fig. 2. Two Archaeological excavations in the *Yodhawewa* site (2018) including specific contexts (a) First excavation pit (LMBA/YW/2018/01) and (b) Second excavation pit (LMBA/YW/2018/02) (Both Photo direction is west to east)

The anthropogenic provenances were noticed from two layers deposited between the upper (one or two) natural layer and characterized only in the Reddish Brown Earth. The Dull Reddish Brown soils in the lower horizon are devoid of any trace of anthropogenic evidence. The lowest horizon of all recorded profiles is a natural

deposit extending further beneath the exposed area. Based on that data, no attempt has been made to excavate the two main excavations beyond that level.

| Area | Slags | Crucible Frag. | Furnace wall parts | Metal Frag. | Ceramics | Beads | Glass Frag. | Rocks/ Minerals | Flora/ Fauna | Total |
|--------------|-------------|----------------|--------------------|-------------|-------------|------------|-------------|-----------------|--------------|--------------|
| Ex-01 | 32 | 26 | 1 | 27 | 2110 | 66 | - | - | 1 | 2263 |
| Ex-02 | 6226 | 326 | 193 | 32 | 1217 | 18 | 5 | - | 1 | 8018 |
| Survey | 368 | 63 | 10 | 12 | 1634 | 70 | 30 | 73 | 18 | 2278 |
| P.01 | 77 | 6 | - | - | 5 | - | - | - | - | 88 |
| P.02 | 51 | 59 | 31 | - | 630 | - | - | - | - | 771 |
| P.03 | 2 | - | 2 | - | 34 | - | - | - | - | 38 |
| P.04 | - | - | - | - | 2 | - | - | - | - | 2 |
| P.05 | 17 | - | - | - | 0 | - | - | - | - | 17 |
| P.06 | 41 | - | 14 | - | 481 | 6 | - | - | - | 542 |
| Total | 6814 | 480 | 251 | 71 | 6113 | 160 | 35 | 73 | 20 | 14017 |

Table 1. Artefacts density of the entire *Yodhawewa* research in 2018

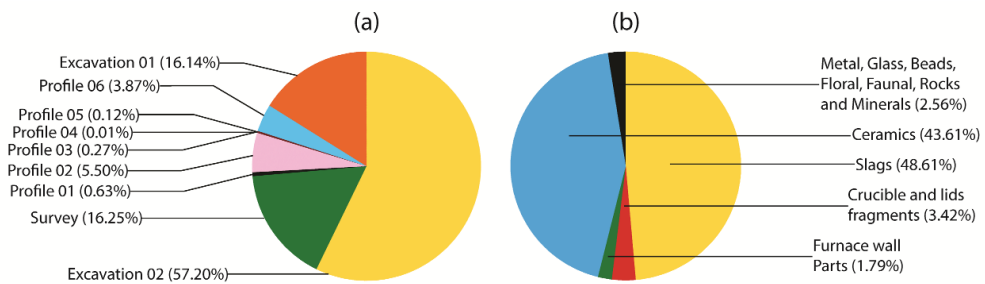


Fig. 3 Artefacts density of the *Yodhawewa* research in 2018 (a) Location-based percentage and (b) Artefacts type based percentage

The first excavation (Ex-01) reported five main layers and seven contexts. The stratigraphic composition is similar to the profiles registered during the exploration, where two anthropogenic layers (3rd and 4th layers) were sandwiched between the top and bottom natural layers. Several artefacts were reported from the top two layers of this premises and possibly mixed from the lower cultural deposit. Contexts

1, 2, 4, 5, 7 were the main soil layers in this area, and contexts 3 and 6 could be identified as two sub-soil layers. Accordingly, two natural layers (Contexts 1 and 2) of the surface could be identified, followed by two cultural layers (Contexts 4 and 5). The second culture layer was slightly wider (22–28 cm in height), followed by the natural layer (context 7). As mentioned above, after observing profiles 1 and 2, it was decided to stop probing beyond context 7 (Fig. 2a).

The second excavation (Ex-02) reported 24 contexts in four main layers, and the layers were assigned the numbers, which are the contexts numbers of 1, 2, 4, and 21. The top layer (context 1) is heavily disturbed through the recent canal expansion constructions and secondly by the monsoonal runoff. The second context was the first cultural layer of the premises, and the 4th context was the second cultural layer. Two circular furnace structures (fragmented) were exposed during the excavation and numbered as context 5 and 9. Layers 2 and 4 were the main cultural layers, including the furnace preparation remains, operational debris accumulation, post-production abandonment, and human-induced debris from later settlement phases. However, contexts 3 and 13 were the sub-soil layers that were not spread over the excavated area. It was decided to stop Ex-02 with the beginning of the bottom natural layer (context 21) based on prior understanding of the Ex-01 and the profiles. Contexts 8, 10, 11, 12, 14, 16, 17, 19, and 20 consisted of ceramics, slags, crucible fragments, and furnace wall fragments. Context 15 was an overturned pottery, and context 18 was an assemblage of potsherds. The contexts 7, 22, 23, 24 were fillings of the contexts 6, 5, 9, and 15, respectively (Fig. 2b). All the reported profiles and excavations revealed that the region's stratigraphic distribution is almost evenly deposited and has similar attributes, except that the thickness of the layers varies to some extent. Table 1 and Figure 3 show the density of the artefacts discovered from the entire *Yodhawewa* site.

In preparing a contextual note chronologically, it is essential to inquire about the context in which the samples were acquired. Five charcoal samples were dated from three different contexts; the S-159 sample from an accumulation dated back to the c.

1st century AD. Sample S-27 was collected near the main furnace, and results have been confirmed to belong to the c. 5th century AD. The samples of S-48, S-64, and S-78 were collected from the bottom of the fourth context belonging to the c. 8th century AD. Overall, the *Yodhawewa* site was confirmed by 60% of C14 datings as a c. 8th-century AD site. However, it cannot be ignored that the premises were still activated in the c. 1st and 5th centuries AD (Table 2).

| Sample Reference No. | Sample Ref. (Beta analytic laboratory) | Locality | | | Radiocarbon age | | Accuracy |
|----------------------|--|----------|---------|---------------|-----------------|-----------|----------|
| | | Context | MSL (m) | Location type | cal AD | cal BP | |
| S-159 | Beta - 517842 | 12 | 11.45 | Accumulation | 70 ± 30 | 1880 ± 30 | 95.40% |
| S-27 | Beta - 517342 | 4 | 11.61 | Layer | 430 ± 30 | 1520 ± 30 | 95.40% |
| S-48 | Beta - 517843 | 4 | 11.41 | Layer | 760 ± 30 | 1190 ± 30 | 95.40% |
| S-64 | Beta - 517844 | 4 | 11.36 | Layer | 730 ± 30 | 1220 ± 30 | 95.40% |
| S-78 | Beta - 517343 | 4 | 11.32 | Layer | 730 ± 30 | 1220 ± 30 | 95.40% |

Table 2. Conventional radiocarbon dating of selected contexts of the Excavation no. 2, *Yodhawewa* Archaeological Research in 2018

b) Metal Extraction evidence of the *Yodhawewa* site

Archaeological studies have uncovered much important information about metalworking in the *Yodhawewa* area. Slags, crucible fragments, metal fragments, and furnace wall fragments are the main material factors in the focus on metalworking in this site. It is noteworthy that the slag was found in both the high weight (metal type) and low weight (glass type). The exploration collected three hundred sixty-eight slags from the surface, and the Ex-01 produced fewer ($n=32$) slags (Table 1). A large number of slags ($n=6226$) were recovered from the Ex-02 premises (Table 1); in particular, the context of 8, 10, 11, 12, 14, and 16 shows the highest density. Slags were collected 48.61% of the total artefact density of the *Yodhawewa* research (Fig. 3b).

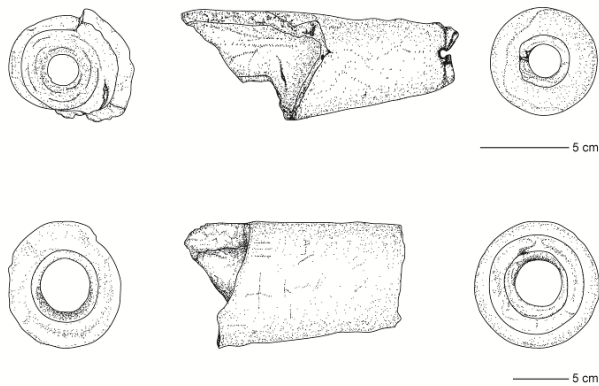


Fig. 4. Different types of two 'Tuyere' fragments were collected from the *Yodhawewa* survey 2018 (Drawn by N.R. Lankapriya)

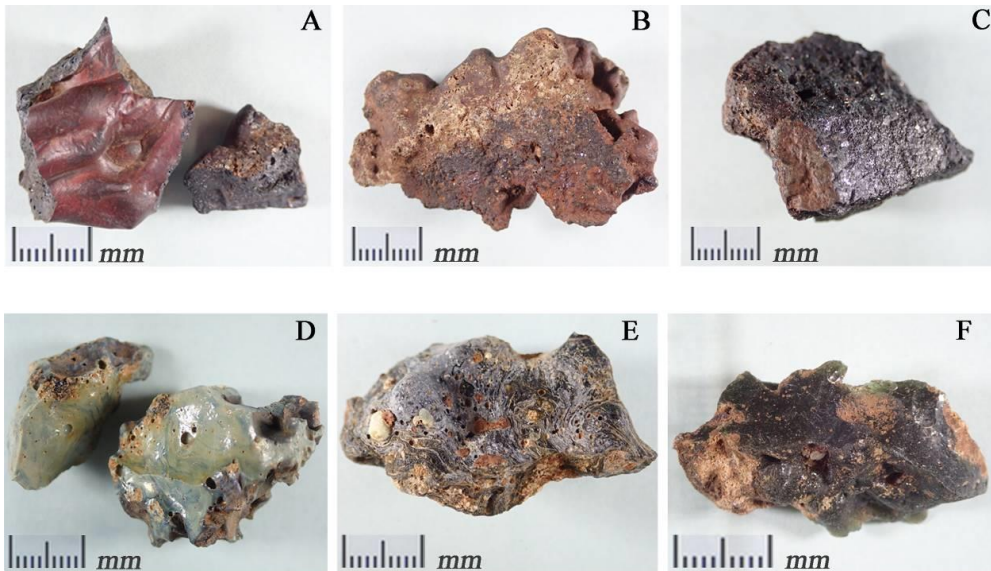


Fig. 5. Slags collected from *Yodhawewa* site (A) Tap slag (B, C) Metal typed oxidized slags (D, E) Low weight Glass or Glassy typed slags with blue, green, and white-coloured bands, (F) Transparent or translucent green glass slags

Excavations in the Samanalawewa, Matale, and Sigiriya areas of Sri Lanka have uncovered essential facts about iron smelting furnaces (Juleff, 1996, 2013, 2015; Solangaraarachchi, 2011). Two fragments of unvitriified air supplying tuyeres (into metal extraction furnaces) were discovered from the *Yodhawewa* exploration (Fig. 4). Tap-slag fragments, usually black, red, or reddish-brown, have also been

acquired from this research (Fig. 5A). The Colour of the slag functions in the 'metallurgical chain,' and the chemical composition usually hinders using slags to identify the initial metallurgical processes (Killick, 2014). Typical tap slags with their unique visual appearance are the best indicators for identifying the iron smelting locations (Eliyahu-Behar et al., 2013). The tap slags are recognized from the rosey texture on their upper surfaces, indicating they cooled from molten, flowing slag, most probably out of the furnace (Georgakopoulou, 2014). The oxidization process can be noticed on some slag surfaces (Fig. 5B-C). The metallic slag collection could be identified as having both high and low weight. Slags were largely discarded with the smelting process (Ettler et al., 2015), and they also usually act as an indicator of the amount of metal extracted. In total, 251 furnace wall fragments (1.79% of total artefacts) were discovered during the *Yodhawewa* research, and they are also more likely to have wall fragments of metal extraction furnaces. The 'Tuyere' fragments, furnace wall fragments, and the large-scale slags collection (including tap slag) were confirmed that the metal extraction took place at this site; however, the complete or fragmented smelting (metal ore) furnace structure could not be identified from the research area in 2018.

c) Crucible Steel Production and the copper metalworking

Two factors presented clues concerning crucible steel production at the *Yodhawewa* metalworking site; (a) A lower half of a crucible-shaped furnace and (b) a collection of crucibles and lid fragments. Thus, the most significant discovery of the research was a lower half-spherical (crucible) typed furnace half from the Ex-02 premises. The furnace (context 5) remains the lower spherical part, and the upper part is not visible (Fig. 2B). The remaining half of the inner furnace chamber could show a soil fill (context 22) with the depth of 29 cm, and in the region between 16–22 cm in-depth (11.59m to 11.53m MSL), 18 pieces of crucible fragments (>2cm) were detected. Observing how these crucible fragments existed as a cluster can be referred to as disposal to the furnace chamber by human intervention after the manufacturing process. Because debris of the furnace chamber (context 22) were

existed with crucible fragments ($n=32$), slags ($n=8$), ceramic fragments ($n=3$), furnace wall part ($n=1$), a metal fragment ($n=1$), and a fragment of a clay pipe ($n=1$) without interconnections. When considering the furnace structure, the wall shows the burned clay pieces, which nicely fit with the clay mortar into the wall to get the circular shape (Fig. 6 *top*). The wall thickness was 8-12 cm, and there was a bonded inner white colour plaster 1-1.5cm thick. It was also noticed that plaster (daub), which was weakened during prolonged use of the same furnace, was maintained by re-coating (Fig. 6 *bottom*). Such layers often act as thermal insulation coats (Parr & Boyd, 2002; Weisshaar, Schenk, et al., 2001). There was no 'tuyere' evidence related to the furnace, and In-out connected small "Tube hole" ($\varnothing = 2.5$ cm) through the furnace wall (west side) could be identified 16cm top to the furnace chamber base. Based on the lack of evidence of "tuyere" and the discovery of a small fragment of a clay pipe from the furnace filling (context 22), it can be assumed that the furnace was activated through the "bellow" method.

In this research, the *Yodhawewa* premises discovered a spherical metal furnace's lower half for the first time in Sri Lanka. Such crucible-shaped steel furnaces were discovered in the *Kodumanal* megalithic burial excavations (1986-1996) of South India, and they are believed to have been made to make crucible steel (Gullapalli, 2009; Sasisekaran & Raghunatha Rao, 2001).

These crucible fragments (crucibles and lids) were represented 3.42% ($n=480$) of the entire artefacts of the research, and the majority ($n=326$) were collected from Ex-02 (Table 1). However, a non-damaged (complete) crucible could not be found, and they have been uncovered as fragments of the rim, body, base, and lids (Fig. 7). The crucibles of Ex-2 represented an elongated tube-shaped and rounded base with an inner diameter of approximately 4cm - 6.5cm. Morphologically, the outer surface was completely dark green or blue (or mixed) with glazy vitrification or a waxy solution. The inner middle or lower part shows glass fins as a smelting line, and the bottom of that line shows a honeycomb pattern. The crucible lids in the Ex-02 area have a unique shape with a small hole connecting the inside and outside of them

(Fig. 7). Such small holes help balance the heat inside the crucible and expel the gas (Juleff, 1996). Traces of small metal particles were visible inside the crucible's upper parts and the lids. However, there were not found both types of crucibles in the same locations. Compared to Juleff's Samanalawewa (1996) and Hattota Amune (2015) records, the crucibles found in the *Yodhawewa* Ex-02 were also used to make crucible steel.

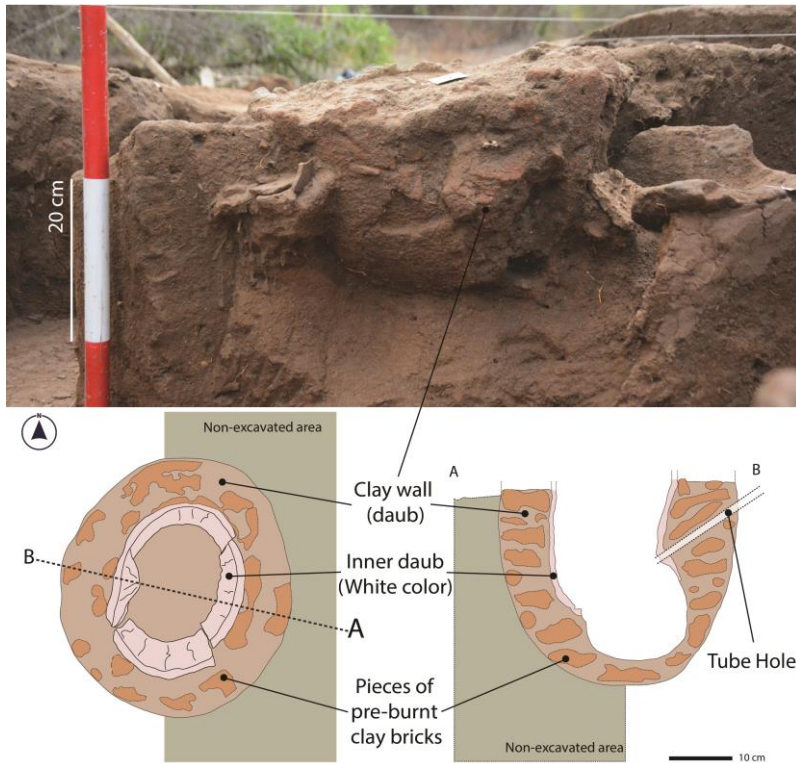


Fig. 6. The crucible-typed furnace (context 5) was discovered from the *Yodhawewa* site. Outer west face of the furnace (*top*), detailed plan of the remained furnace top (*bottom left*), and Cross-sectional details A-B (*bottom*)

The crucibles' shape, size, and thickness in the first excavation area (Ex-01, P-1, and P2) displayed variations compared to the crucibles found in Ex-2. In the first excavation area, crucibles were shaped into round bowls with a flat base, and copper fragments were also deposited inside some crucibles fragments. However, crucible lids (or lid fragments) were not found in this area. However, the

metalworking process using copper and the crucibles are more likely to be an alloying process or a re-production than an extraction process. Juleff (2013) has presented a similar idea regarding the copper products discovered during excavations (1980-84) in the old port city of Mannar. Besides, researchers have pointed out that copper is sourced from the *Seruvila* copper deposit (in the eastern part of Sri Lanka) as a raw material for the Mannar port city and South Indian copper needs. (Juleff, 2013; Seneviratne, 1995; Srinivasan, 2016). There is no need to challenge that view as no copper deposits have been discovered so far near Mannar or *Yodhawewa*.

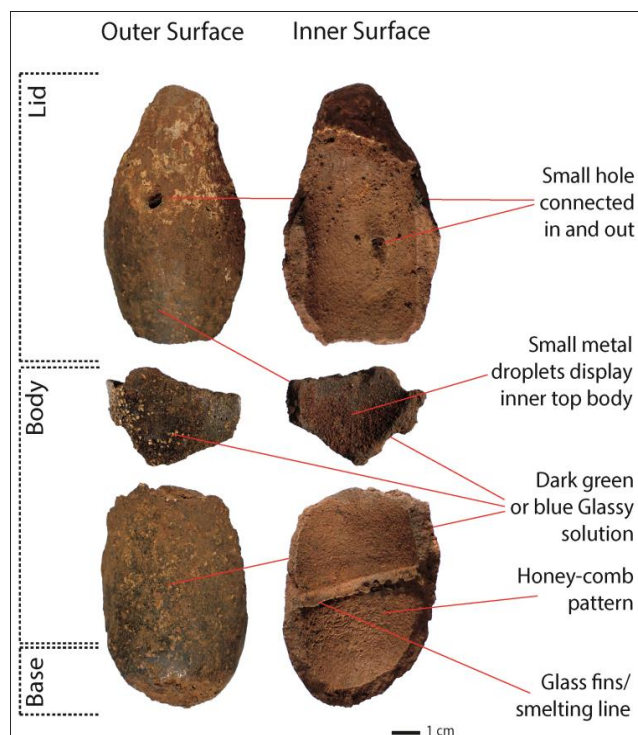


Fig. 7. Fragmented crucibles were collected from the Ex-02 area. The lid, body, and base were presented from inner and outer surfaces.

d) Glass produced at the *Yodhawewa* area?

Although various researchers have hinted that there may be an indigenous glass industry based on glass artefacts unearthed in various archaeological locations of Sri Lanka, no extensive archaeological study of such products has been conducted. However, in the Ex-02 area of the *Yodhawewa* site, there were many scattered

fragments of slags glass (semi-glass fragments or glass-ceramics). These were lighter than metal slag and were mainly blue, green, white, or subtle colour stripes (Fig. 5D-E). Some glass slags are either transparent or translucent (Fig. 5F). Their sizes are in the range of 1.1 – 1.5 cm³, and a higher quantity of samples ($n=163$) was recorded from the Ex-02 and the surrounding (These glass slags/semi-glass fragments/glass-ceramics included in the slags category in Table 1). The addition of silica during the extraction process separates the slag and iron well during the extraction process, creating a glass-ceramic volume in the slag bulk (Tong et al., 2021). The different colours of such glass-ceramic slags can be shown with the chemical reaction with the metal particles during the extraction process. Because some researchers suggest that the metal was used to make coloured glass; hence metal slags can be in the presence of glass manufacturing sites (Ettler et al., 2015; Henderson, 1985). According to Francis (1982), Indian beadmakers made glass beads of specific colours using different amounts of iron, copper, manganese, and antimony mixing with the batch. All three of the above examples show that mixing different metal compositions is inevitably a factor in the colour change of glass. Accordingly, the glass typed slag fragments found in the *Yodhawewa* site are more likely to be a by-product of the metal extraction, refining (iron or copper), or crucible steel production process.

e) **International Relations with *Yodhawewa***

The *Yodhawewa* production site near Mannar, the hub of South Asia on the Silk Road of the sea, cannot be defined as a place where only local needs were met. It was also confirmed that information on international relations was presented by investigating and comparing the morphological dynamics expressed by artefacts. Forty-one artefacts were used to substantiate this fact; 12 Rouletted Ware (RW) fragments, 23 Black and Red ware (BRW) fragments, six Porcelainware fragments, and one coin collected from exploration. Researchers confirm that imported BRW and RW pottery types were widely used in the Asian region, including historic settlements in Sri Lanka, from the 2nd century BC to the 2nd century AD (Magee,

2010; Schenk, 2001, 2006). One of the identified Changsha porcelain bowl fragments belongs to China's Tang Dynasty period (c. 610-907 AD). Various types of Chinese porcelain have been collected from excavations at the Ancient Mannar port-city, and the excavations 1980-84 have been given special attention to Changsha porcelainware (Carswell, 2013; Linrothe, 2013).

The coin's obverse depicts a lion standing in the middle of a beads circle, and a large flower pot on the reverse, this type of coin belongs to the Pallava dynasty of South India. The Pallava kingdom was established based on the South Indian Kanchipuram in the seventh and eighth centuries AD. In their short-lived kingdom period, the Pallava kings maintained significant political stability in the South Indian region and maintained a good relationship with Sri Lanka (Avari, 2016; Bohingamuwa, 2017; Dirks, 1976). Accordingly, it is not a coincidence that Pallava coins were found in the *Yodhawewa* research, and these types of coins have been found in Mannar and Anuradhapura in Sri Lanka before (Codrington, 1994).

f) Other Artefacts found from the *Yodhawewa* research

In this research paper, metal fragments, glass vessel fragments, beads, minerals, rocks, floral, and faunal factors were pointed out under the same category, and those are 2.56% of the total artefacts of *Yodhawewa* research (Fig. 3). Ceramics representing 43.61% of the total artefacts of this research also have been included in the same category (Fig. 3). Accordingly, this chapter provides a brief overview of those acquisitions and stimulates the need for future research.

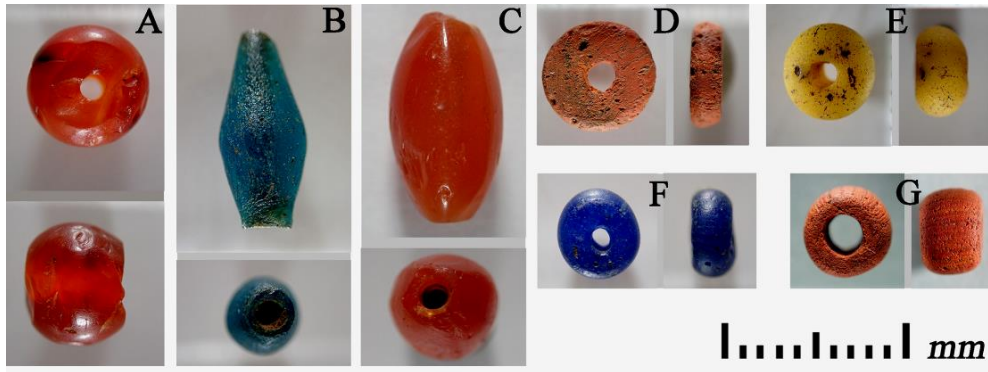


Fig. 8. *Yodhawewa* Beads, (A) Carnelian/Agate short barrel circular bead (B) Glass long truncated bicone circular bead (C) Carnelian /Agate long truncated convex bicone circular bead (D) Semi-gloss/Terracotta barrel disc circular bead (E) Glass short barrel circular bead (F) Glass short barrel circular bead (G) Semi-gloss/ Terracotta short barrel circular bead (nomenclature sources; Beck, 2006) (Scale: 10mm)

| Pottery and Porcelain Ware types | The development of pottery and porcelain in Sri Lanka | | | <i>Yodhawewa</i> Current Research |
|----------------------------------|---|----------------|--------|-----------------------------------|
| | Anuradhapura | Thissamaharama | Mannar | |
| Black and Redware | ✓ | ✓ | ✓ | ✓ |
| Fine Redware | ✓ | ✓ | ✓ | ✓ |
| Coarse Redware | ✓ | ✓ | ✓ | ✓ |
| Graphited ware | ✓ | ✓ | ✓ | ✓ |
| Mica-slipped ware | ✓ | ✓ | ✓ | NI |
| Blackware | ✓ | ✓ | ✓ | ✓ |
| Fine Grey ware | ✓ | ✓ | ✓ | ✓ |
| Red Polished ware | ✓ | ✓ | ✓ | ✓ |
| Red-on-White Painted ware | ✓ | ✓ | ✓ | ✓ |
| Glazed ware | ✓ | ✓ | ✓ | ✓ |
| Rouletted ware | ✓ | ✓ | ✓ | ✓ |
| White Stoneware | ✓ | ✓ | ✓ | ✓ |
| Islamic ware | ✓ | ✓ | ✓ | ✓ |
| Turquoise glazed ware | NR | ✓ | ✓ | ✓ |
| Unglazed ware | ✓ | NR | ✓ | ✓ |
| Yue ware | ✓ | NR | ✓ | ✓ |

Table 3. Comparison of the ware types of foreign and local earthenware (pottery and porcelain) collected from Mannar (Graham, 2013), Anuradhapura (Coningham, 2006; Kuna, 1987), Thissamaharama (Schenk, 2001), and *Yodhawewa* current research in 2018 (NR: Not Reported, NI: Not Identified)

Pottery is of great value in the study of archaeology, and it belongs to the common artefacts category in most historic settlements (Shepard, 1985). Six thousand one hundred thirteen (43.61%) of pottery pieces and porcelain were collected from the entire research. The first excavation has uncovered the most significant number of pottery fragments ($n=2110$) here (Table 1). Some imported foreign ceramics were described above, and the ceramic diversity detected by the *Yodhawewa* site is summarized in Table 3. The dominant type of Plain/Coarse ware, clay disks, and a few types of unidentified earthenware (not related to furnaces) were identified from the site. The ceramics are typologically similar to the other significant sites in Sri Lanka as *Mannar* (Graham, 2013), *Anuradhapura* (Coningham, 2006; Kuna, 1987), and *Tissamaharama* (Schenk, 2001).

One hundred sixty beads of the types as glass beads and coloured glass beads (Fig. 8B, E, F), semi-gloss beads (Fig. 8D, G), and glass-stone beads like Carnelian/Agate (Fig. 8A, C) were collected during the study. The majority were disk beads, 52.2 percentage of all beads, and short beads, standard beads, and long beads were reported 29.9%, 8.9%, and 8.9%, respectively. The types of the beads were identical to the beads reported from the other archaeological sites of the *Anuradhapura* period of Sri Lanka (Beck, 2006; Francis, 2013; Hannibal-Deraniyagala, 2001). Among the coloured glass beads, a range of blue, yellow, red, green, black, white, and transparent beads have been identified. The beads' material, colour, shape, weight, and technology are identical to each type. Although the *Yodhawewa* research has collected a considerable number of beads signifying the economic and cultural activities and the relations of the ancient settlements, it is expected to present a detailed review in the future.

Through the exploration, gneiss rock artefacts and quartz pebbles were recorded with a smooth surface with one side or several sides. Some rocks and minerals might have been used as raw materials in metalworking activities or as grinding stones. Since the addition of silica in metal extraction helps to separate slag and iron better (Tong et al., 2021), these grinding stones may have been used to grind sand

for a better quality result. Other minerals and rocks such as green chert, which is not common in this region, and limestone of different varieties were reported.

A shell and a columella of *Turbinella pyrum* (Indian chank) were collected from the surface, and they should be transported to the region from the coastal area. *T. pyrum* played a significant role in the coastal economy of Sri Lanka as food as well as a raw material for ornament production (Ratnayake, 2003; Seneviratne, 1985; Siriwardana, 2014). However, the usefulness of the shells revealed by the *Yodhawewa* research is uncertain.

Conclusions and Future Directions

Most of the previous archaeological studies focused on the port-city of Mantai; this study ignored that approach and focused directly on understanding the habitats and industrial settlements of the hinterland of Mantai. However, the results of this research cannot be interpreted outside the socio-economic context of the Mannar port city. The radiocarbon (C14) datings of the present study show the use and functions of the region from 1st to the 8th century AD. Archaeological evidence suggests three significant types of metalwork in the study area: iron extraction, copper metalwork, and crucible steel production. The *Yodhawewa* iron ore extraction was mainly confirmed by factors in furnaces (including 'tuyere' parts) fragments and slags (including tap lags). However, this research did not provide an opportunity to find a complete iron extraction furnace. Archaeological evidence suggests that copper metalwork was carried out in the *Yodhawewa* area in the blue, green, and white range of glass slags, slags with small copper particles, and copper fragments found in crucibles.

The unique discovery from the *Yodhawewa* research was a crucible furnace with a lower half-spherical shape (crucible-shaped) for the first time in Sri Lanka. Several such crucible-shaped furnaces have been reported at the *Kodumanal* Archaeological research (1986-1996) in Tamil Nadu, and it has been confirmed that they were also used to make crucible steel. It has been pointed out that the 'glass typed slags' found

in the research area are more likely to be a by-product of the metal extraction, refining (iron or copper), or crucible steel manufacturing process, and not the result of glass production. In addition to Juleff's (2013) statement that Sri Lankan (*Sarandibi*) high-quality steel, which received tremendous demand in the Arab world, may have been exported from the Mannar port, it can be speculated that *Yodhawewa* crucible steel may have been among them.

The Indian BRW and RW ceramics and Chinese Changsha porcelain discovered in this research reveal direct or indirect relationships with those countries with the research area. Coins belonging to the Pallava kings of southern India have been found at this place, indicating that cultural ties may have existed with that kingdom as well. In addition, imported RW and BRW (c. 1st - 2nd century AD), Chinese porcelain and South Indian Pallava coins (c. 7th - 8th century AD), and carbon-14 dating from *Yodhawewa* research (c. 1st, 5th, and 8th century AD) confirms that the site was active at the time. Further research is needed on pottery, beads, minerals, rocks, and faunal remains found in the site. It is expected to provide a comprehensive explanation of the cultural and natural functioning of the premises in future research through extensive geochemical and geo-archaeological studies.

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Challenges in Sri Lankan Heritage Management with the Covid 19 Pandemic

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Abstract

Heritage Management is a field which has been developed to conserve, preserve and manage the cultural heritage of any country for promoting it to the visitors. Heritage management also incurred with marketing, visitor management and community empowerment. Due to the Covid 19 Pandemic, this respected field has been very much impacted and forced to face an economic downfall. This research has attempted to identify the major problems faced by heritage managers in the safety of the staff, visitor management, and maintaining heritage. The recommendations are made in three challenging fields and, also sustainable best practices are suggested at the end for the long run in a pandemic Covid 19. The study is primarily based on mix method while using both primary and secondary data such as library material, journals and reports, media publications and various internet search engines. Convenient sampling has been used to select the sample for the questionnaire survey. As per the empirical studies, it was revealed that proper usage of guidelines and good practices for the management of the heritages incorporating the high technology in a sustainable manner may support to be endured during the pandemic.

Keywords: *Heritage management, covid 19, pandemic, challenges and visitor management*

Introduction

Heritage management plays a very important role in the protection and conservation of the cultural heritage of any country. There are numerous studies that identified in heritage management field. Heritage Management faces different challenges affected by both micro and macro-environmental changes. A pandemic situation is counted as a macro environment modification that has affected almost every industry and field. Consequently, this study has been focused on the impacts of Covid 19 on heritage management in Sri Lanka.

Research Aim

Heritage Management in Sri Lanka has been experiencing numerous difficulties post-Covid 19 pandemic. The focus of this study is to evaluate the problems faced in heritage management by the Sri Lankan government's authorities due to Covid 19 pandemic.

Objectives

To evaluate the major challenges and recommend good practices for heritage management in Sri Lanka after Covid 19.

To define functions of heritage management

To identify the challenges faced by heritage managers in Sri Lanka after Covid 19

To suggest solutions for the challenges

To recommend good practices for the function of heritage sites in the pandemic situation

Significance of the Study

Cultural heritage of Sri Lanka plays a vital role in the development of the tourism industry. With the arise of Covid 19 pandemic, the Sri Lankan tourism industry falls to zero number of tourists' arrival from overseas. Every business that has been relied on tourism faced a drastic economic downfall. The heritage sites that were managed by the tourist donations and entrance fees are also experiencing a massive

depression due to a lack of funds for maintenance. This study is attempted to in-depth identification of problems faced by heritage managers and suggests sustainable practices for the survival of tourism associated with the cultural heritage of the country post-Covid 19 pandemic.

Materials and Methods

Research Tools and the Sample

The study utilized both primary and secondary data. A desktop survey was carried out for the collection of secondary data. The questionnaire was used as a tool for the collection of primary data. The questionnaire has been distributed among hundred and twenty (120) heritage management staff (The employees in middle management and supervisory category) in different heritage sites as a google form. The response rate of the questionnaire is 56% which is above the least percentage of research acceptances.

Limitations of the Study

There are two major types when it comes to heritage, natural heritage and cultural heritage. This study solely focused on cultural heritage sites due to a lack of research resources. There are eight World Heritage Sites in Sri Lanka. Out of them, six were recorded as cultural heritage sites. Besides, there are many cultural heritage sites that are recorded under the Archaeology Department and Central Cultural Fund. This study is carried out based on seven (07) cultural heritage sites. Those sites are; Anuradhapura Abhayagiriya site and Museum, Sigiriya Heritage Site, Galle Maritime Museum, Jaffna Fort, Fredrick Fort Trincomalee, Colombo National Museum and Kandy Archaeology Museum.

Results and Discussion

Covid 19

Covid 19 or Corona is a pandemic that arise during the end of the year 2019 and continues throughout 2020 and is predicted to be positive for another two or three years as of the World Health Organization. This pandemic is an influenza virus that is spread by the touch and air. Almost all the countries in the world are suffering from Covid 19 pandemic, up to date the number of cases is 219 million and counting. This pandemic severely damaged almost all industries including agriculture, manufacturing, travel and tourism, and airlines. Each person and every business is directly or indirectly influenced by the pandemic causing terminations and shifting to new businesses. When it comes to welfare and wellbeing, there were huge amounts of money from the governments have to be pumped to the health and safety of the public. This results in less focus on conservation and preservation work in cultural and natural heritage. At a glance, it seems fair enough to cut the funds for such projects since most of the citizens even lost their jobs and some companies had to entertain the salary reductions. With such a huge economic downfall it is acceptable to face some difficulties in any field.

Heritage

Heritage is something associated with illustrious cultural or nature's aspects and that has to be preserved and pass to the next generations. Heritage is defined in numerous means. The Quebec Association for the Interpretation of National Heritage in 1980 has defined heritage as "the combined creations and products of nature and man, in their entirety that make up the environment in which we live in space and time. Heritage is a reality, a possession of the community, and a rich inheritance that may be passed on, which invites our recognition and our participation" (Richards 2018). According to UNESCO, heritage could be categorized in two as cultural heritage and natural heritage. Cultural heritage is incurred with tangible and intangible aspects of heritage. Tangible heritage means the movable, immovable, or underwater heritage such as paintings, sculptures,

monuments, shipwrecks, and archaeological sites. Under intangible heritage, the traditions, performing arts, rituals, and folklore could be categorized. However, the cultural heritage is founded, developed, and shaped by humans and society (Petronela 2016). Natural Heritage is the heritage that is formed by nature, likewise landscapes, biological and geological formations (Hua 2010).

Heritage Management

Heritage Management is a recently popularized subject area that has been generated with the heritage protection practices since ancient times. Though the terminology is quite new, the concept and the scope were bounded with the heritage. The field of Heritage Management is constructed with the identification, protection, and care of cultural heritage. It is a purely developed subject for the care of heritage and maintenance of heritage sites. Excavations, documentation of findings, conservation, research, education and marketing of heritage are key areas of heritage management (Heritage et al. 2018; Marmion, Calver, and Wilkes 2010). Heritage Management is more often connected to heritage economics and revenue management. There is no use of heritage management if it does not consider revenue generation. The revenue generated at the heritage sites are directly going to site maintenance and employee salaries. Heritage Management is now being integrated with the tourism industry. Heritage management balances the development of the tourism industry and the integrity of the site. As a result, many tourism concepts have been formed related to heritage. Cultural Tourism, Archaeological Tourism, Heritage Tourism, Maritime Archaeological Tourism, Intangible Tourism are some of such respective concepts designed with heritage management (Buckley 2014; Richards 2013). In the development of heritage management, there are a few areas to be considered by the Heritage Management Professionals such as working with Local Communities, Educating and Empowering Visitors, Visitor Management, and Cultural Heritage Marketing. Heritage Managers must consider the local communities when planning visitor activities at the site. There should be an approach to create opportunities for local businesses around the heritage site. It should be a long-term sustainable

development plan (Li 2000). Restaurants, shops, taxi services, hotels, rest houses are some of the key areas that the local communities gain economic benefits.

Visitor Education and Empowerment play a vital role in the management of heritage. The visitors also have a huge responsibility towards heritage protection and preservation. To encourage and guide them to do so, heritage managers must empower them with information, guidelines, and necessary tools (Gunasekara 2019). Nowadays, self-guiding mobile applications, awareness programs, site interpretations are used to educate visitors. Mostly visitor centred learning activities are promoted at the heritage sites (Walker 2008). As a result of visitor inflow in the sites, it is needed to manage those visitors properly to establish the sustainable operation of a heritage site. The heritage managers should have a proper understanding of the carrying capacity of the heritage site when planning visitor management (Singer 2012). Visitor management is a subject that manages to attract visitors without risking physical damage to the site. Management of visitor flow, limiting access, visitation time allocation, visitor welfare, visitor activities, visitor information management are some of the key functionalities of visitor management. Another principal role of a heritage manager is heritage marketing. The tourism industry displays enormous competition to attract visitors. Therefore, heritage managers involve in site marketing in attracting visitors to the site and to raise awareness about the site. These managers involve in destination branding, place branding and individual attraction branding in order to keep the clientele attracted (Thorell 2018).

Analysis of Findings

The major finding of the questionnaire survey is mentioned in this section.

Heritage Management Practices

The sources of income of the heritage sites are recorded to be the entrance fees of the visitors. As of figure 1, it is indicated that 82% of the respondents selected Entrance fees as the source of income. Also, 18% mentioned that it is the government funds, which means the reduction of the number of visitation to the

sites decreases the income generation. Since the travel limitations are delayed and the tourist arrivals are limited the major sources of income of these heritage sites are impacted as a drawback effect.

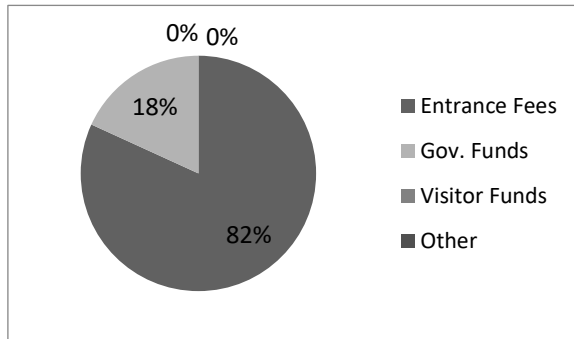


Figure 1: Major Sources of Income

After the lockdown, the heritage sites were reopened with the usual functions for domestic tourists. All the respondents stated that the health precautions were introduced to the heritage managers when reopening the sites. The visitor management staff was also empowered by the health practices. The international visitations remain zero due to the flight limitations and the health guidelines for foreigners. The site promotes domestic visitors with the following safety precautions.

Temperature check

Handwashing facilities

Tourists are not allowed to enter the site without masks

Limit the number of tourists entering the site

Discourage group travellers

| | |
|--|---|
| Challenges faced by heritage managers after Covid 19 | The challenges faced by heritage managers and staff in managing visitors, following self-safety measures and site protection are mentioned in this section. |
| Challenges face by | Employees are not provided with the proper instructions |

| | |
|---------------------------------|--|
| staff | <p>Employees are not empowered with the personal safety equipment</p> <p>Negligence of the visitors on precaution measures</p> <p>Education officers and guides are having direct contact with the visitors for more than 30 mins causing too much exposure to outsiders</p> <p>Fewer hygiene facilities at the sites</p> <p>The temporary and contract staff members lose their jobs due to less income</p> |
| Challenges of Managing Visitors | <p>Some visitors do not follow the instructions causing other visitors and staff in danger</p> <p>Domestic visitors travel in groups, resulting in difficulties to manage the space and social distance at the site</p> <p>Inability to focus on visitor education and welfare with the safety practices</p> |
| Challenges of Site safety | <p>There is an enormous trend in domestic group travel after the lockdown. It causes to the damage site due to exceeding carrying capacity.</p> <p>Lack of consciousness of the tourists about the importance of artefacts (sitting on stone artefacts, walking on stone columns and writing names on trees and stones)</p> |

Table 1: Challenges faced in Heritage Management

Best Practices for the Function of Heritage Sites in Pandemic Situation

Best practices are a set of guidelines, ethics, or ideas that represent the most efficient or prudent course of action, in a given business situation. Best practices may be established by authorities, such as regulators or governing bodies, or they may be internally decreed by a company's management team. A best practice is a method or a technique that has been generally accepted as superior to any alternatives because it produces results that are superior to those achieved by other means or because it has become a standard way of doing things, e.g., a standard way

of complying with legal or ethical requirements. Best practices are used to maintain quality as an alternative to mandatory legislated standards and can be based on self-assessment or benchmarking. Accordingly, the countries in which the best practices to be taken into consideration are selected as per the dependency of the particular countries on the Heritage within the Tourism industry as mentioned below:

| Country/ Region/ Organiza tion | Best Practices Followed |
|---|--|
| East Asia | The digital reproduction of cultural heritage via “mass photogrammetry”, by providing approaches to digitize objects from cultural heritage collections housed in museums or private spaces using devices and photogrammetry techniques accessible to the public. |
| Europa Nostra | Launching a platform called Digital Agora, which aims at sharing and promoting best practices related to culture and cultural heritage from across the world, but in a digital form. The idea by Europa Nostra is that through Digital Agora, citizens, heritage organizations, and stakeholders are encouraged to connect, interact and learn from each other, in this difficult time of the COVID-19 pandemic. |
| Italy | Incorporation of the 4P model, public-private-people-partnership for heritage management. Eg: the Distretti Culturali (Cultural Districts) project and the Attiv Aree (“Areactivation”) program. Museum experiences are being supported by digital technologies in Campania region. |
| Angkor, Cambodia | On-site ticket sales are replaced by online sales, and physical tickets must be replaced by electronic tickets. Visitors must sign a declaration of responsibility stating that they meet the hygiene and health requirements. They must have their temperature taken and watch for other symptoms related to the virus. In case of symptoms, they must call the helpline number provided for such purposes and follow the |

| | |
|---------|---|
| | advice given. Furthermore, information must be provided in an electronic form. |
| USA | Increasing social media engagement during this time. Continuing digital content campaigns such as videos, blogs, partnerships, and paid educational content. |
| Japan | The National Theatre has begun an attempt to release the video of the Kabuki performance held in March 2020 for free on YouTube. |
| Spain | The widespread use of virtual spaces and social networks that the online activity enables communities to share content through virtual networks and museums, and the ability of users to develop, control, and continuously update the content of websites. Ex: Prometheus fire festival virtual museum |
| China | Limiting the number of tourists that can visit on a day and the arrivals been planned as per the prior online bookings. Ex: Great wall |
| Georgia | Signing MOUs among the ministry of Education, science, culture, and sports and the local authorities in the means of promoting cultural routes. |

Table 2: Best Practices followed

Conclusions and Recommendations

Conclusion

Heritage management has faced numerous difficulties time by time. Though, there are no 100% accurate solutions or techniques to face pandemics like Covid 19, safety measures and good hygiene practices may support face it and prevent the spreading. The heritage managers have to have a proper understanding and knowledge about the pandemic, heritage sites and also the visitors. Proper usage of guidelines and good practices of the heritage manager; supports the survival of the

site and establishes sustainable practices for the long run with the Covid 19. The recommendations are made focusing on recovering and solving the main issues that can be identified in the heritage sites. These solutions are appropriate to meet the good results in a short period of time. Sustainable solutions for the long run will be discussed under the best practices.

1. The social distance should be followed with the health department guidelines
2. Empower staff with powers to abolish visitors who do not support the safety measures
3. Self-guiding and online guiding has to be promoted to avoid unwanted gathering inside the site
4. Online marketing and online ticketing services have to be introduced
5. Preparation of a timetable for visitation management
6. Promote destination visitation than site visitation – Design the plan for the long run

The recommended actions are as follows.

1. Increase ventilation chances inside the site
2. Avoid Air Conditioners and get natural air as much as possible
3. Locate sanitisers and handwashing facilities at the entrance, inside the site, and exits
4. Locate disinfection cubicles for staff and visitors
5. Reserve a room for emergency use
6. Online ticket reservation
7. Replace physical ticket checking with online check-in
8. Avoid contamination of virus through objects by prohibiting touching
9. Introduce virtual reality to manage visitors
10. Promote main heritage sites bundling with the lesser-known heritage sites in the vicinity
11. Enhance the online presence
12. Establishing a proper plan to limit the number of arrivals per day in order to minimize the congestion

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Quantitative Geomorphic analysis in Geoarchaeological Investigations: A Case Study of Man-land relationship of Hanga River basin, Ahmednagar district of Maharashtra

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Abstract

Geomorphology is the study of landforms, their processes, form, and sediments at the surface of the earth which includes the earth's surface processes, such as air, water, and ice, which can mould the landscape. Since, from the beginnings human being attracted towards such suitable landscape for the establishment of their settlements. The present geoarchaeological work involves the study of the characteristics and evolution of landscapes, geological settings based on quantitative morphometric analysis, and availability of the natural resources of these areas with the man-land relationship of the Hanga river basin. The previous history of the region indicates that it is rich in prehistoric and chalcolithic settlements. The present basin is not explored systematically so far. Hence, this work is an attempt to fill these lacunae by the way of a systematic, intensive, village to village survey to understand the man-land relationship in the region. Field surveys and laboratory works were carried out to fulfil the aim and objectives of this work.

Keywords: *Geomorphology, Landscape, Landforms, Man-land relationship, Settlements, Geoarchaeology.*

Introduction

A geomorphological study leaves their imprints in the form of typical assemblages of landform on the earth surface through the different geomorphic processes which are available in the forms of mountains, River basins, bedrocks, slopes, sand dunes, surface deposition, etc. The branch of science which deals with the study of landforms is called Geomorphology (Thornbury 1968). This study is based on the certain principles that landforms can be related to the geological process and the landforms accordingly develop may evolve with time through a sequence of the deposition of forms. all the geomorphological activities are dynamic processes and played a crucial role in the development of the landscape.

The morphometric analysis provides refinement to the subject with more precise and accurate methods of studying the different landforms. According to Clarke (1967), morphometry may be defined for the measurement and mathematical analysis of the configuration of the earth's surface and the shape and dimensions of its landforms.

The information and skills provided by two essential archaeological cognate scientific disciplines, geology and geomorphology, both of which are branches of earth sciences, play a critical part in the archaeological investigation. To answer archaeological difficulties, it combines geological knowledge. It investigates archaeological records that can be applied to a wide variety of scales in the reconstruction of paleoenvironments at various locations, as well as human involvement with the landscape and the associated features preserved in the sediments, utilising earth science approaches (Goldberg and McPhail 2006). Geoarchaeology research in the field and the lab elucidates a site's micro, meso, and macro environments as well as human activity patterns over time and space.

The present work deals with the quantitative geomorphic analysis carried out to understand the man-land relationship of Hanga, a left side tributary of Ghod River, from the Ahmednagar district of Maharashtra.

Objective

The objective of this study is to determine the archaeological significance of the Hanga River basin, other goals are (i) Classify the landform with reference to the potentiality of the finding of the archaeological sites, (ii) Identify the areas that have high potentiality for the preservation or distribution of archaeological sites by geomorphic procedure, (iii) Identify the archaeological site and the associated of landform, (iv) Identification of sites of different cultural periods. This approach defines the relation between the known archaeological settlement and the associated geomorphic features which are involved in identifying the known archaeological sites. Such characteristics are evaluated to predict the location of the unexplored site according to this geomorphic context.

The main attributes of this aspect examined are the area, altitude, volume, slope, profile and texture of the land and the varied characteristics of small and big drainage basins". Such methods have been often used to describe certain relief features, like erosion surfaces and slopes. This type of investigation has been carried out by various researchers such as Horton (1932), who have developed laws of drainage composition. His empirical methods have been later modified by Strahler (1950), Morisawa (1957), Miller (1953), Melton (1959) and Schumm (1956). Dury (1952), presented firstly this analysis in a systematic form, while Wentworth (1930), employed some important techniques in the analysis of erosion surfaces, which are average slope, relative relief. Smith (1935), dissection index Nir (1957), generalized contours (Miller 1964), hypsometric and altimetry curves (Clarke 1967).

In India, morphometric evolution of landforms has been attempted for Rajmahal highlands, the neighbourhood of Almora and Mirzapur upland firstly introduced by Singh (1967), Kharakwal (1970), Pal (1972), and others. The work carried out by Sabale (2006), in the upper reaches of Bhima and Krishna River threw light on the morphotectonic setting of southern Deccan Volcanic Provinces of India.

Most of the geomorphologists have delineated the regional landform units into the physiographic and natural region while a few have demarcated based on morphometry. The work of Powell (1896) who has delineated the natural region of North America, based on physiography was followed by Fenneman (1914), is important in this connection.

This technique is successfully used for the geoarchaeological exploration in different basins of Maharashtra by various researchers. Sabale and Kshirsagar (2011) were carried out it detailed geoarchaeological exploration in Sina River and documented several cultural sites of various periods. Sabale (2015) carried out detailed geoarchaeological exploration in the upper and middle reaches of the Bhima River. Similarly, Sabale *et.al* (2015), carried out geoarchaeological exploration in the Khadakpurna basin. Kshirsagar (2017) carried out geoarchaeological exploration in the lower-middle reaches of Bhima including the Bori River from parts of Osmanabad and Solapur districts of Maharashtra.

Study area

The Hanga River is originated in Parner and further flowed towards Srigonda tehsils in Ahmednagar district (Maharashtra) confluence to the main – Ghod, at Hangewadi, Chimbhle. This is having 72km length and 12km width, so it is a narrow stream having comparatively more extension and less width, with an asymmetric drainage pattern. The Balaghat hill range – a ridgeline between Mula, a tributary of the Godavari on the northern side, and Bhima (Krishna basin) on the southern side, is the source region of the River.



Fig. 1 Location map of Hanga River basin

Methodology

The approach has been divided into pre-field, field, laboratory investigation. To learn about prior work in the topic area, a thorough literature review was carried out. Fieldwork and lab analysis was done with the use of toposheet maps.

To calculate the quantitative geomorphic analysis Survey of India, a toposheet map of 1:50000 scale was used to study the whole basin and geomorphic features present in the same. This means the area is equally divided into equal rows and columns, i.e., grids of an area km^2 each. To give the number to each grid, it is divided into a sequence, such as 1, 2, 3...to 24 vertical columns and horizontal rows, viz, A, B, C.....to T. In addition to the basin boundary, some additional surrounding areas of other basin were taken for the study. The basin covers a total 260 number of grids hence, it covers $260 \times 2 = 520 \text{km}^2$.

The Quantitative geomorphic aspects required for the geo-archaeological investigation of the basin were studied and the details of these observations with reference to field geomorphic features are described below.

Relief aspects

The meaning term ‘relief’ may be defined as the earth’s surface or relative vertical inequality of land surface. These morphometric elements are absolute relief, relative relief, slope, dissection index, etc. helps to classify morpho units of terrain.

1. **Absolute relief:** The maximum elevation of an area above the mean sea level contrast relative relief and it is denoted by ‘H’.
2. **Basin Relief or Relative relief:** The term ‘Relative Relief’ means the actual variation of height i.e., the difference between the maximum and minimum height per grid. It can be expressed by the formula for basin relief is $H = H_1 - H_2$. Where, H= basin relief, H1= highest point, and H2= lowest point of the basin.

Linear aspect: A linear aspect of the drainage basin includes the channels and their network in terms of open links, wherein the topological properties of the stream segments are analyzed. For this purpose, the numbers of all the stream segments (N_μ) are counted and their hierarchical orders are determined.

Drainage order: It is the number used in geomorphological studies to indicate the level of branching in a system.

Drainage density: A ratio of the total length of all stream segments in a given drainage basin to the total area of the basin and thus it can be derived as follows. $D_d = L_u/A$. Where, D_d = Drainage density; L_u = length of all stream segments of the basin in km, and A = total area of the basin in km (Horton 1945).

Drainage Frequency: It is also known as stream frequency, which is given by the formula, $F_\mu = \sum N_\mu/A$. Where, F_μ = Drainage frequency, $\sum N_\mu$ = Sum of all streams in a basin and, A = Total area.

Bifurcation ratio: The bifurcation ratio is denoted by symbol ‘Rb’. It can be expressed by the formula, $R_b = N_\mu/N_{\mu+1}$. Where, R_b = Bifurcation ratio; N_μ = Number of streams of order and, $N_{\mu+1}$ = Number of streams of next higher order.

Areal Aspect: Anderson (1957) termed the basin as a 'devil's variable because almost every watershed characteristic is correlated with area'. The first order basins have the smallest mean basin areas, and the successive higher orders show an increase in the areas culminating in the largest area of the highest order of the trunk stream.

Slope: A slope is an area of land that makes a definite angle to a horizontal landscape. In geomorphology, the landscape is made-up of slope units and can be defined as the vertical inclination between the hilltop and valley bottom, stands with the horizontal line and is expressed generally in the degrees. i.e., $S_z = H \times 2D_d$, Where S_c = ground surface slope, H = Basin Relief, D_d = Drainage density.

Dissection index: It is expressing the ratio of the maximum relative relief to maximum absolute relief. It is an important morphometric indicator of the nature and magnitude of the dissection of terrain.

Observations

Dissection index: While observing the quantitative morphometric data of the dissection index, the highest ratio of absolute and relative relief is 0.2 in the source region of the basin and the lowest value of 0.001 is observed in the confluence region. In the middle reaches, the value ranges 0.109-0.133 and 0.068-0.1. According to the observation, the details of the category and its value is as given below.

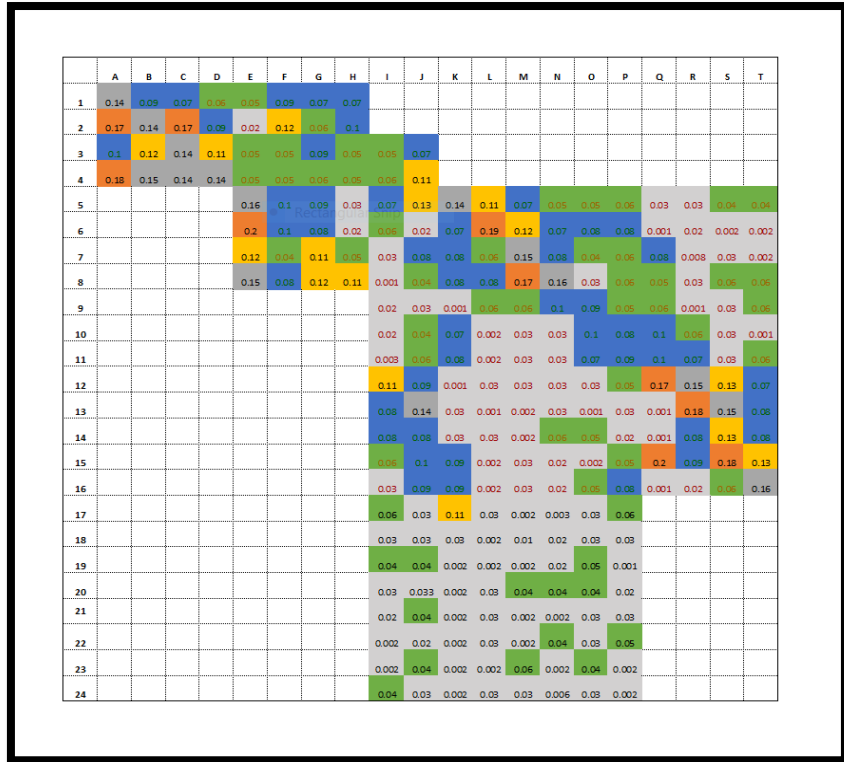


Fig. 2 Dissection index of Hanga River basin.

| Index | Category | Range | Grids | Area | Area % |
|-------|--------------|-------------|-------|------|--------|
| | Very high | 0.2-0.17 | 10 | 20 | 4 |
| | High | 0.166-0.134 | 15 | 30 | 6 |
| | Medium-High | 0.109-0.133 | 15 | 30 | 6 |
| | Low – Medium | 0.068-0.1 | 51 | 102 | 20 |
| | Low | 0.035-0.067 | 57 | 114 | 22 |
| | Very low | 0.001-0.034 | 108 | 216 | 42 |

Table 1. Dissection index of the basin.

Slope: In the present basin the gradient/slope of the landform is found varying reaches to reaches. In the case of the upper reaches the hilly area - the slope is very

high to high category while in the case of the middle reaches which consist of foothill region where the steepness is decreased and resulting it becomes slightly moderate to the gentle category while in lower reaches of the plain grounds start and River flow on nearly gentle to plain area.

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|----|---|---|-----|-----|------|------|-----|------|------|------|------|------|------|------|------|------|------|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | |
| 2 | 0 | 0 | 0 | 8.3 | 27 | 6.3 | 0 | 0 | | | | | | | | | | | | |
| 3 | 0 | 0 | 4.4 | 7.5 | 17 | 15.5 | 9.5 | 6.4 | 5.4 | 4.8 | | | | | | | | | | |
| 4 | 0 | 0 | 0 | 5.6 | 16.5 | 19.7 | 16 | 17.5 | 15.6 | 7.6 | | | | | | | | | | |
| 5 | | | | | 2.8 | 7.5 | 9.3 | 42 | 9.3 | 3.3 | 4.83 | 3.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | | | | | 1.1 | 8.5 | 9.1 | 34 | 12 | 26.5 | 10.1 | 2.93 | 2.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | | | | | 3.1 | 14 | 4.6 | 15 | 28 | 7.6 | 7.8 | 13 | 4.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | | | | | 1.7 | 5.3 | 6.8 | 5.3 | 530 | 24.3 | 10.5 | 8.8 | 4.7 | 2.7 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | | | | | | | | | 27 | 37.5 | 620 | 16.4 | 15.8 | 5.9 | 4.7 | 3.5 | 0 | 0 | 0 | 0 |
| 10 | | | | | | | | | 18 | 19 | 6.61 | 590 | 22.5 | 29.5 | 7 | 4 | 1.5 | 0 | 0 | 0 |
| 11 | | | | | | | | | 260 | 12.8 | 6.16 | 650 | 17.4 | 30 | 11.3 | 10.7 | 4.5 | 0 | 0 | 0 |
| 12 | | | | | | | | | 1.6 | 7.42 | 520 | 21 | 30.5 | 33.5 | 20 | 12.3 | 2.08 | 0 | 0 | 0 |
| 13 | | | | | | | | | 3.3 | 4.8 | 21 | 580 | 570 | 27 | 350 | 15.5 | 0 | 0 | 0 | 0 |
| 14 | | | | | | | | | 0 | 2.5 | 30.5 | 37 | 600 | 11.5 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | | | | | | | | | 0 | 1.4 | 10.1 | 520 | 29 | 29.1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 | | | | | | | | | 0 | 0 | 5.5 | 640 | 29.5 | 510 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17 | | | | | | | | | 0 | 31 | 5.8 | 32.5 | 580 | 280 | 17 | 10.5 | | | | |
| 18 | | | | | | | | | 0 | 25.5 | 43 | 530 | 60 | 54 | 29 | 17 | | | | |
| 19 | | | | | | | | | 26.5 | 27 | 460 | 220 | 370 | 0 | 0 | 0 | | | | |
| 20 | | | | | | | | | 19.5 | 32 | 340 | 0 | 0 | 0 | 0 | 0 | | | | |
| 21 | | | | | | | | | 28.3 | 3.5 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 22 | | | | | | | | | 790 | 21 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 23 | | | | | | | | | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | |
| 24 | | | | | | | | | | | | | | | | | | | | |

Fig.3 Slope of the Hanga basin.

Absolute relief: The highest value observed here is 978m in the source region of the basin while the lowest value observed is 520m in the confluence of the basin.

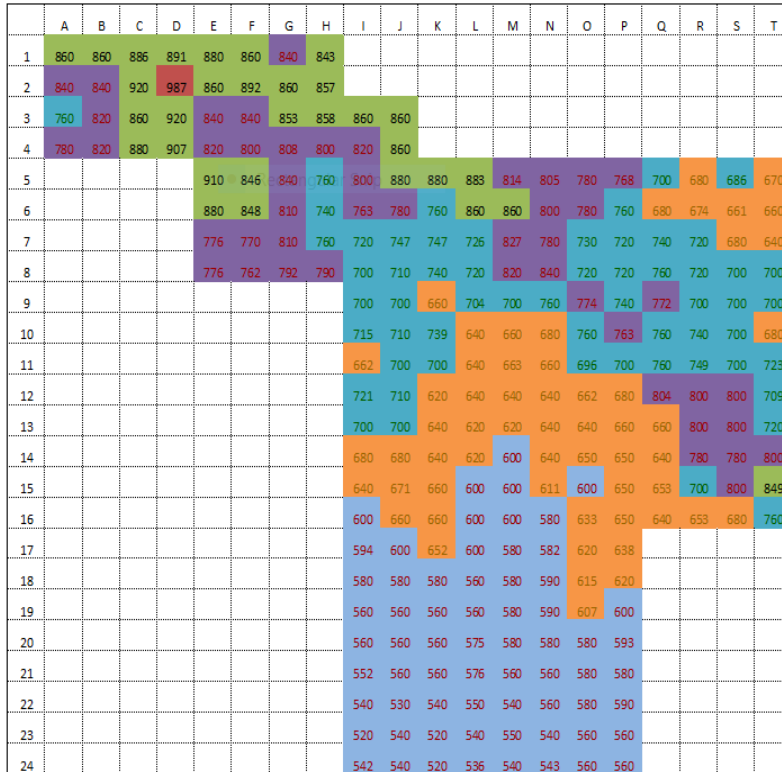


Fig.4 Absolute relief of Hanga basin.

| Index | Category | Range | Grids | Area km ² | Area % |
|-------|--------------|----------|-------|----------------------|--------|
| | Very high | 1000-921 | 1 | 2 | 0.39 |
| | High | 920-841 | 28 | 54 | 10.9 |
| | Medium -High | 840-761 | 46 | 92 | 17.9 |
| | Low - Medium | 760-681 | 58 | 116 | 22.7 |
| | Low | 680-601 | 57 | 114 | 22.4 |
| | Very low | 600-520 | 66 | 132 | 25.7 |

Table 2 Absolute relief of the basin.

Relative relief: The highest Relative relief observed here is 180m in the upper reaches while the lowest is 1m in lower reaches and observed in the middle reaches.

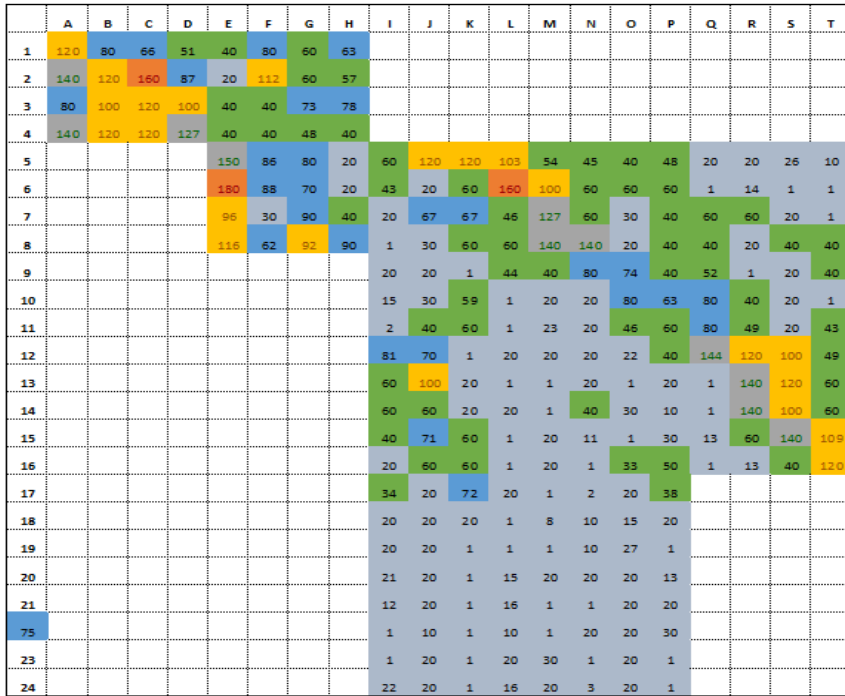


Fig. 5 Relative relief of Hanga basin.

| Index | Category | Range | Grids | Area(km ²) | Area (%) |
|-------|--------------|---------|-------|------------------------|----------|
| | Very high | 180-151 | 3 | 6 | 1.2 |
| | High | 150-121 | 11 | 22 | 4.3 |
| | Medium -High | 120-91 | 22 | 44 | 8.6 |
| | Low – Medium | 90-61 | 27 | 54 | 10.6 |
| | Low | 60-31 | 64 | 128 | 25 |
| | Very low | 30 - 0 | 129 | 258 | 50.4 |

Table 3 Relative relief of the basin.

Drainage Frequency: The drainage frequency of the basin is observed here is highest in the middle reaches of it, i.e., 50, and lowest in lower reaches at the confluence i.e., 1.

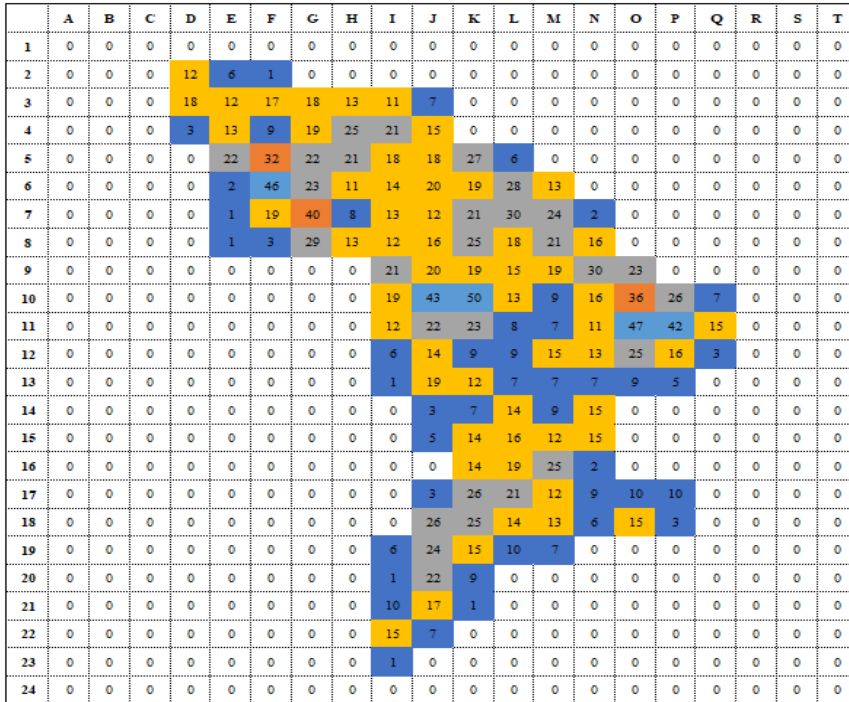


Fig. 6 Drainage frequency of the basin.

| Serial No. | Index | Category | Classification | Drainage frequency | Percentages |
|------------|-------|-----------|----------------|--------------------|-------------|
| 1 | | Very high | 50-41 | 5 | 4 |
| 2 | | High | 40-31 | 3 | 2 |
| 3 | | Medium | 30-21 | 29 | 21 |
| 4 | | Low | 20-11 | 55 | 41 |
| 5 | | Very low | 10-1 | 44 | 32 |

Table 4 Drainage frequency of the basin.

Drainage order

The highest drainage order of the stream is 7th, and the drainage number is effectively decreasing with the higher order of the stream.

| Serial No. | Index | Drainage order | Drainage number |
|------------|-------|----------------|-----------------|
| 1 | | 1st | 1086 |
| 2 | | 2nd | 256 |
| 3 | | 3rd | 58 |
| 4 | | 4th | 15 |
| 5 | | 5th | 4 |
| 6 | | 6th | 2 |
| 7 | | 7th | 1 |

Table 5 Drainage order of the basin.

Bifurcation ratio: The bifurcation ratios of the basin clearly indicate that according to the higher-order the ratio is decreasing and vice-versa. This is the characteristic of any normal River basin in which according to the higher-order the number is decreased. The bifurcation ratio ranges from 1 to 4.24 for the basin.

| Serial no. | Category | Order number | Number of streams | Bifurcation ratio |
|------------|----------|-----------------|-------------------|-------------------|
| 1 | | 1 st | 1086 | 4.24 |
| 2 | | 2 nd | 256 | 4.41 |
| 3 | | 3 rd | 58 | 3.86 |
| 4 | | 4 th | 15 | 3.75 |
| 5 | | 5 th | 4 | 2 |
| 6 | | 6 th | 2 | 2 |
| 7 | | 7 th | 1 | 1 |

Table 6. Bifurcation ratio of the basin.

Result and Discussion

The present research paper is focused on the quantitative analysis of landscape characters with the ground truth realities and its suitability for the establishment of archaeological sites in the Hanga River basin. The basin study reveals that in its upper reaches (source area) it is made up of rocky hilly- rocky terrain, which is a part of the Balaghat hill range, which divides Bhima in the south and Godavari in the north. Therefore, a sound foundation is available here for the construction of large-scale monuments like forts, *Gadhis*, heritage structures like temple complexes, *Mathas*, Churches, mosques etc. Likewise, Hattal Khindi village in the source region big monuments like Bhairavnath Temple in Punewadi, well-fortified Parashar and Pimpleswar temple of *Yadava* period and a small fort (*Gadhi*) are present in Partner. The big temple complex is like Siddheswar and Biloba temple also present in this area.

In middle reaches undulating to plain topography shows partly hilly and partially depressing basinal areas, of eroded, low relief, dissected hills formed by circumdenudation action, surrounded by plain to the gentle sloppy area. The depressed portion is unsuitable for the settlements. Therefore, some big structures on rocky foundations and some small structures rest on uneven surfaces. While some are settled very close to the fertile land, which is suitable for irrigation practices. Examples of such sites as Hangeswar temple in Hanga, Bhairavnath temple in Walvane village, a temple in Rui-Chhatrapati is observed on the steep sloppy area.

Lower reaches, where the ground is covered in fertile soil and various depressions, some of which are entirely or partially filled with water bodies. As a result of the available natural resources, this area has the ability to support large-scale agricultural activity and is well suited for the creation of large-scale towns. Since the British era, the Visapur water tank and the Visapur dam have been built to provide water to the surrounding area via railway.

Conclusion

Based on quantitative geomorphic analysis of dissection index, absolute relief, and relative relief factor, it is observed that in the study area, the rate of these factors is increasing with elevation and vice-versa. Therefore, the value of these factors is observed very high in the source area of the basin while the medium rate at the middle reaches and the lower value found at the lower reaches, where the confluence of Hanga with Ghod River, which means the land is undulating and while heading to its confluence its plains land.

The above geomorphic studies give the actual present picture of the basin in quantitative form, which is considered as a very basic analysis and important analysis to understand the ground truth condition of any basin, as per the suitability of the land for site selection for human settlement and its interrelationship with basin is a concern.

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Possibilities of using the Morphological Characteristics of the Slags in Archaeo-metallurgical Studies

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Abstract

With regards to the technical stages of the metal-working; primary smelting, secondary melting, and smithing can be identified as the main stages between reducing ore and manufacturing metal productions. In this extensive procedure, different outcomes can be recognized and among them, slags can be defined as the most abundant and well-preserved by-product that is left from the metallurgical activities. According to the archaeological perspective, slag fragments are known as extremely valuable artefacts that help to reconstruct the ancient industrial society. It is possible to identify the reduced ore type, smelted metal, and the type of furnace through analyzing the technical parameters of these residues from a scientific perspective. The main objective of this article is to carry out a scientific discussion on the applicability of slags as an archaeo-metallurgical fact in interpreting ancient culture. Slags are essentially considered on their morphological characteristics.

Keywords: Slags, Archaeo-metallurgy, Smithing, Smelting, and Ore

Introduction

The earliest evidence of metal's use in Sri Lanka was reported from the Proto-historic contexts. Which represented an advanced stage of iron-based metal technology during the Protohistoric phase (Mendis,2019,13). According to literary and archaeological evidence, the use of metals like gold, silver and the production of artificial materials such as glass increased during the early and middle historical periods. The words such as *Kabara*, *Thambara*, *Thopasha*, *Kahapana*, *Massaare* found in Brahmi Inscriptions which symbolize the metal-based social and economic background in contemporary Sri Lanka. (*ibid*,19-20). Moreover, the material evidence of metal productions, furnaces, slag fragments, and crucibles are also holding a considerable significance in archaeology and it is possible to find out more information about land use, resource manipulation as well as the trading systems of the ancient man by analyzing them.

Among the metallurgical artefacts, slag fragments are extremely valuable in archaeology as they help to reconstruct ancient industrial practices. According to Miller, slags are the durable waste by-products of a variety of metallurgical operations, predominantly primary smelting (to reduce ores to metal), secondary melting (to purify, consolidate or mix metals such as gold or copper and tin), and smithing (to work metal into finished products by hot forging) (Miller and Killick,2004, 24). Furthermore, it is known as the most common waste product of smithing which is the mixed remains of oxidized flakes of metallic iron with the fuel ash, other contamination debris such as flux, and the lining of the hearth (Dunster and Dungworth,2012,01). Furthermore, other slag-like materials with different types also can be found in metal-working areas such as cinder and clinkers. According to Morton and Wingrove slags can be defined as drossy solid materials that collect on the top of molten slag, a mass of material infusible at the working temperature of the furnace, embedded in partially fused materials (*ibid*).

These fragments are important in interpreting the chain operation of the manufacturing process. The present article is attempting to examine the value of slags as archaeological evidence and the possibilities of using it to answer certain questions of the past. There are many analytical approaches that can apply to analyze the slags, and the present research especially focuses on the morphological characteristics of the slags.

Materials and Methods

The research will be based on 350 slag remains collected as a surface collection from an area of 1.6 kilometres, lies in the right bank of the spill of Giants' tank (Yodhawewa), Mannar, under the project of Lower Malwathi-Oya Basin Archaeology (LMBA), conducted by the Department of Archaeology and Heritage Management, the Rajarata University of Sri Lanka on March 2018. Fragments were primarily categorized from the morphological perspective and each fragment was considered by its length, width, height, weight, density, colour, and surface. Density (length x width x height) calculated according to the formula; $d = m / v$ and the colour identified by the Geological Rock Colour Chart. Surface considered as regular or irregular, rough or smooth, flat or wavy, the density of lacunas, and profile features (colour, diameter of lacunas).

Results and Discussion

Generally, the high density of a slag symbolizes an ore type that is enriched with high mass elements such as Iron, Copper, Nickel, Chromium, Cobalt, Manganese, and Zinc. But it is not appropriate to decide without a proper chemical analysis since the density of slag is also associated with its placement in the furnace. In a tapped furnace, smelted metal assembled in the bottom part due to the high density and the wastage including slags remains in the upper part and gradually drains out from the taps due to the low density. Therefore, even the same ore and the same furnace were used, slags occurred with various ranges of density according to their placement level in the furnace. Morphologically, analyzing the density together

with colours and surface features may reveal certain factors related to slag residues (Miller and Killick,2004,24).

The surface features of slag can be more informative and may represent the stage of the metal-working, type of the furnace, related metal, and many more. Slags enriched with lacunas and have a rough, wavy surface can be identified as smelting slags in the furnace that went through the process of slow cooling and high oxidizing. It may contain macroscopic crystals of Iron Silicate or Iron Oxide minerals. And if it attracts to the magnet, it may contain the Iron Oxide Magnetite (*ibid*,26). Dense slags with a smooth surface that resembles solidified lava can be recognized mostly in tapped furnaces. Due to the high viscosity, the molten slag assembles in the lower part of the furnace and drains out from the taps as a liquid. After the solidification, it resembles a flow-type wavy surface, and smoothness occurred due to the fast cooling process (*ibid*,24) (Figure 01).



Fig.01 Smooth flow-type wavy slag. Scale in cm, Images and data

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The slags that symbolize rough freaky surface with light blue-green spots can be recognized as weathered copper slags that contain Copper Carbonate Malachite. Most of them are easily broken as they try to release the small copper placements

from their matrix (*ibid*,26). Glass and Glazed type residues are mostly defined as smithing slags since they are found clustered in areas of smithing forges. Glass-like droplets only contain Iron Oxide and glass due to fast freezing and silicate crystallizing (*ibid*). But according to Justine Bayley, glazed type residues occurred in the process of blast furnaces (Bayley,*et.al*,2008,14) (Figure 02).



Fig.02.Glass-likeslag. Scale in cm, Images and data Copyrights:
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Some residues are morphologically similar to Fayalite; which occurs in ultramafic igneous rocks with high containment of Iron and Magnesium. Also known as Fe_2SiO_4 – Iron crystallite; iron-rich end-member of the Olivine Solid Solution series. As Sri Lanka is not a volcanic context, it is possible to assume it is an occurrence of Iron smelting. It may contain Iron and Magnesium as well (assignmentpoint.com,2019).

The raw ores contain a vast collection of elements that represent various colours. After the reduction of ore, smelted metal and the wastage including slags received different colours due to the interactions between elements, fluxes, fuel, and gases.

The oxidization is the main cause of the occurrence of many colours and the elements that did not fuse in the smelting stage also can identify as an impact that should be mentioned. According to the colour and magnetically attracted percentage of slags, it is possible to develop a hypothesis on the containment of Iron, Nickel, Cobalt, and their alloys since they are the main metallic elements that reacted to the magnet (Britannica,2019). Therefore, even it is not highly accurate, it is necessary to use this method as a logistic statement. Typically, Iron includes in slag fragments represents the oxide state as FeO and Fe₂O₃. Generally, FeO provides the black colour and Fe₂O₃ provides the red colour (JCEFA,2008). According to the containing percentage, slag colour deviates between red and black while the brown assembles in the centre (Figure 03).



Fig.03.Red Smooth flaw-type wavy slag. Scale in cm,
Images and data Copyrights: WMTB Wijepala

In the process of Iron smelting, CaCO₃ is used as a flux that supports abstracting the metal from the dross and clustered the wastage to form slags (Mcdonnall,1986). Ca(AlO₂)₂ that derives from CaCO₃ also can be a cause of the colour formation of slags (Figure 04).



Fig.04 Slag including CaCO_3 . Scale in cm, Images and data
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Nickel is known as an extremely associated metal with Copper and the combination creates green, grey, and blue colour (Britannica,2019). A slag may contain Nickel or Cobalt if it indicates above 80% attraction on the magnet even though it is less indicating a colour related to black or red. If there are light blue-green spots on its surface represents the copper containment. And as copper is a non-magnetic metal, it may be nickel that alloying with copper. Also, slag can be contained cobalt as some of them symbolized cobalt blue.

In the process of smelting, not only metallurgical slags but also organic fusions known as non-metallurgical slags can be found. When the fused state of the furnace, some organic materials are partially fused and saved as slags. Vitrified thatch, vitrified dung, and vitrified hearth lining are typically recognized as biomass or non-metallurgical slags (Miller and Killick,2004,27). They are most

similar to metal slags and for highly accurate data it is appropriate to follow a chemical analysis. According to the morphological factors, if it contains 15% magnetic attraction, might be a non-metallurgical fragment (Figure 05).



Fig.05.Non-metallurgical slags Scale in cm, Images and data

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Conclusion

As above mentioned, we can recognize high applicability in using the terms of characteristics and technical parameters of slag fragments, to identify the development of ancient metallurgy in a particular area. Even without chemical analyses; information related to the type of ore, smelted or smithed metal, and the technology of the furnace can be vastly analyzed through the extreme support of morphological factors. For more accurate data it is appropriate to follow a chemical analysis based on microstructure and chemical composition. Other than SEM (Scanning Electron Microscope) and ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometer), EDXRF (Energy Dispersive X-ray Fluorescence spectroscopy) also can be used for data with more accuracy.

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Preservation of information in Sri Lanka: A historical perspective

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Abstract

The article attempts to explore the shape of preservation of information in Sri Lanka, from the Early Iron Age (1000-800 BC) to the beginning of Colonial Rule. Under the qualitative approach, the historical research method is employed in the study, while content analysis was used as a research tool to determine the presence of certain words, themes, or concepts within given qualitative data. Based on my focus, primary sources and secondary data were used to elicit data. Buckland's concept about information-as-thing was used to streamline the demarcations made by different collections handled. The perspective of the study is limited to the published translations and transcriptions of inscriptions, literary sources, and copper plate charters. Themes and concepts such as selection of media, extending the life span of information, changing the format, or keeping the same information in different formats, and reformatting for information preservation emerged from the literature review and content analysis. Substantiations prove that effective preservation of information has ever been in flow in Sri Lankan history. Well before the cultural institutions were established under colonial rule, ancient Sri Lankans were familiar with the concepts of libraries, archives, and museums. Information was converted, reformatted, and duplicated through different media consciously, while foreign invasions, internal conflicts, natural and man-made disasters as well as the introduction of printing challenged the existence of the indigenous system of information preservation. The study will provide a rich foundation for Archaeology, history, and Information Science students and scholars to understand what happened in the past to determine and expand their research horizons. The research highlights gaps and avenues for future research in this genre.

Keywords: Preservation, Information, Palm Leaf Manuscripts, Inscriptions Sri Lanka,

Introduction

The significance of preservation of information has ignited the interest and passion of most scholars and academics, especially in developed countries resulting in the development and implementation of actions and plans forming national policies and strategies in the recent past. Preserved Information contributes to validating memories and protecting the originality and authenticity of the document. As opposed to reproduction or surrogate, it draws people in and gives them a literal way of touching the past. Cloonan (2007), points out that preservation is more than a technical treatment but should be placed in a broader social and interdisciplinary context. While preservation has been a subject of interest during the 20th century, a probe into literature reveals that the concept of preservation is an age-old phenomenon. Many references to the idea of preservation are available in ancient literature. Spelman (2002, p.1) pointing out the preservation tendency of human beings describes “the Human Being is a repairing animal. Repair is ubiquitous, something we engage in every day and in almost every dimension of our lives. Homo sapiens also Homo reparans.” This tendency in the preservation and providing access to information is also illustrated from Prehistoric times. Preserving of information by prehistoric man in the form of art, mostly in caves, have been interpreted as transmitting an educational or allegorical message for the benefit of future generations. Drawings that depict behaviour, killing or warning of animals in the milieu, method of collecting of food, etc. certainly, have aided other groups, clans, and posterity in making decisions in hunting and gathering. Three colour charcoal drawings (Figure 01) available at the walls of the Chauvet-Pont d’Arc Cave, in southeastern France, that illustrate more than 420 animals, graphic motifs, and symbols, are belonged to the early Aurignacian period dating to 30,000-32,000 BP (Clottes, 2001; Azéma, & Rivère, 2012). Figure 02 illustrates a cave art of smoking of a bees’ nest to collect honey, in a site near the Toghwana dam in Matapo Hills, Zimbabwe (Pager, 1976; Crittenden, 2011). Information depicting elephant domestication in ancient Sri Lanka (Figure 03), is preserved in the Hulannuge rock cave in Ampara District (Nandadeva,1992). A point of access to

prehistoric man's symbolic vision of the world is provided through the preservation of information on hunting sequences, daily events, and an element of their myths in these Paleolithic graphic narrations, (Fritz, & Tosello, 2015).

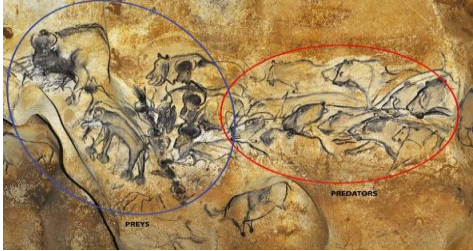


Figure 01
Hunting scene: big cats track a herd of bison fleeing toward the left. (Source: (Fritz, & Tosello, 2015)

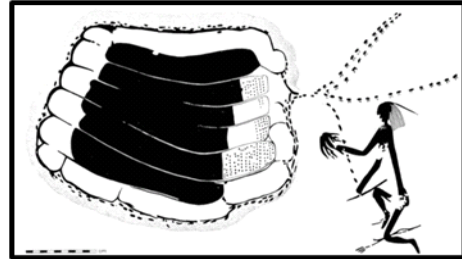


Figure 02
Smoking of a Bee's nest
Source: Pager, 1976; Crittenden, 2011



Figure 03
Source: <https://amazinglanka.com>
<https://www.spurlock.illinois.edu>, & https://www.worldhistory.org/Egyptian_Literature/



Figure 04-A Figure04- B Figure04-C
Sources: Parpola, (1917),

Nature of the study

“Before the mid-twentieth century, preservation referred to collecting. The very act of acquiring materials and placing them in an institution constituted preservation” (Cloonan, 2007, 132p.). Later on, the Preservation of collections has become one of the core responsibilities of Memory Institutions (MIs) (Dempsey, 1999; Poll, 2010). It is commonly accepted that preservation and conservation were introduced to Sri Lanka with the establishment of MIs under colonial rule. However, a probe into literature provides ample evidence that well before the inception of MIs under colonial rule, ancient Sri Lankans were familiar with the concepts of preservation. Rulers, State Officials, Buddhist Monks as well as learned lay scholars played a

major role in the preservation and conservation of ancient documents. These practices and regulations were mostly taken religious face. Even though Sri Lanka inherits a wealth of information depository since ancient times, thorough scrutiny into the previous research revealed that there is an apparent paucity of studies on preservation education and particularly on how information was preserved in ancient Sri Lanka. A probe into Sri Lankan preservation literature shows that there is an overarching trend of embracing digital technologies among MIs in Sri Lanka. Number of studies also emphasize that contemporary MIs of Sri Lanka drive toward reformatting of documents with special reference to digitization (for example Gangabadaarachchi and Amarasiri, 2009; Pushpakumara, 2007; Navirathan & Jeyakanthan, 2018). Although, digitization is considered an inseparable part of preservation as it becomes the major method to safeguard the original (Manzuch, 2008), no research is available on the specific area of preservation of information particularly in ancient perspectives, which can provide a threshold to preservation studies in Sri Lanka. Hence the study is oriented to answer the question “ what is the shape of preservation of information in ancient Sri Lanka?” The objective of the study is to explore ways and means of preservation of information from ancient times to introduce printing to Sri Lanka during the Colonial Period.

Under the qualitative approach, the historical research method is employed in the study, Historical research method is selected because the context under study is critical and provides the material for “ immediate/direct and distant/indirect causes for chains of events they are documenting any length of time from a brief moment to events covering centuries or even millennia” (Porra, Hirschheim & Parks, 2014). Content analysis was used as a research tool to determine the presence of certain words, themes, or concepts within given qualitative data which is expected to provide valuable historical and cultural insights over time analytically. Consequently, themes and concepts such as selection of media, extending the life span of information, changing the format, or keeping the same information in different formats that are more resistant to prevailing environmental conditions and reformatting emerged from the literature review and content analysis.

Based on the focus of this study, primary and secondary sources such as ancient chronicles, inscriptions, literary sources, and charters were employed to elicit data. Since this study deals with varied informative materials, the term document is used based on Buckland's concept about information-as-thing. Considering the thingness-of information the term document is defined as "any source of information, in material form, capable of being used for reference or study or as an authority" (Buckland,1997) Accordingly, things are informative irrespective of the nature of materials such as messages, data, documents, objects, events, specimen record group or file. (Buckland, 1991; Ooghe & Moreels, 2009). Use of this definition will streamline the distinctiveness made by different documents handled in this study.

By tracing the roots of information preservation and transmitting the information from past to future generations, the study will contribute to outline and define the history of the discipline, delineate its boundaries and understand core identity. The study will provide a rich foundation for Archaeology, History, and Information Science students and academics to understand what happened in the past to determine and expand their research horizons.

Modes and Means of Preservation of Information

Bones and Clay

Preservation has become a serious problem for the custodians of information throughout history since it is a complex and challenging process. Accordingly, more durable and movable materials were discovered for the preservation of information. Seals found at Indus Civilization (2500–1700 BC) (Figure 04-A), cuneiform clay tablets of Mesopotamia (3200 BC) (Figure 04-B) as well as Egyptian hieroglyphs (4000 BC) (Figure 04-C) explains the preservation concerns that go back to ancient times. In the Sri Lankan context, clay and stone were the two vastly used materials to preserve information in the forms of pots, bricks, seals, intaglios, caves, rocks,

pillars, slabs, etc. Before the adoption of writing, identity marks of one clan or certain groups of communities were inscribed on pottery and drip-ledged caves, as well as on capstones of megalithic burials (figure 05) (Seneviratne, 1984). The Discovery of Early historic Bone stylus in the Anuradhapura Gedige excavation (Figure 06) heralds the history of the writing of Sri Lanka beyond the 1st century BC (Deraniyagala, 1972). A much-debated post-firing potsherd which read as “Anuradi” was discovered from Anuradhapura by Dr Siran Deraniyagala through an excavation of Anuradhapura informs that written materials akin to Brahmi writing can be assigned to the third century BC (Deraniyagala, 1986). These writings are not only an indication of concerns paid over information preservation but also herald the challenging news that writing was in existence even before the advent of Buddhism to Sri Lanka. Brahmi and non-Brahmi letters, graffiti, and symbols incised on pottery throw light upon the fact that ancestors were concerned about the longevity of information. A Graffito of a vessel with a mast found in Akurugoda, Tissamaharama, (figure 07) has preserved centuries-old information to inform future generations about the knowledge of seafaring during the early periods (Weishaar, et. al. 2001).



Figure 05

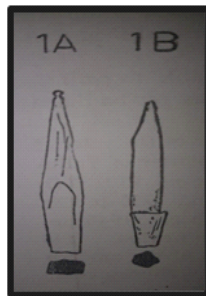


Figure 06

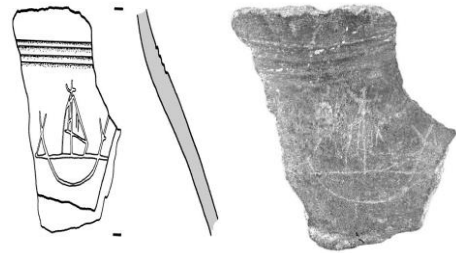


Figure 07

Figure 05 -Some of the symbols found in Megalithic burials, Source: Seneviratne, 1984

Figure 06 - Bone style from Anuradhapura Gedige Excavation, Source: Deraniyagala, 1972

Figure 07 - A Graffito of a vessel with a mast in Akurugoda, Tissamaharama, Source: Weishaar, et. al. 2001

Stones: caves, slabs, and pillars

In ancient Sri Lanka, the donation of drip ledge caves to the sangha was considered

a significant event. Thus, information about the donor, the purpose of the donation, and attributes of the cave were also incised. Ancient Sri Lankans, by describing the distinctiveness of the particular cave, such as Manapadasane (of Pleasing View), Mahasudasane (of Great Good View), Manorame (that Delighting the Mind), painted caves (Iapana), demonstrated their interest in preserving particular information inherent to the cave (Paranavitana, 1970).

Godawaya two-line stone inscription of King Gajabahu (113-135 A.D), which furnishes the details about the donation of customs duties of the port of Godapavata to the temple nearby is plausibly the oldest evidence on Customs duties in the entire world. However, there was no noticeable evidence of a seaport visible at the time of the discovery of the inscription. Hence, a series of archaeological explorations and excavations were carried out to verify the information. As a result evidence on an ancient port that had functioned from 2nd Century AD to 12th Century AD in Southern Sri Lanka at the old estuary of Walawe River was discovered. Thoughtful preservation of information in the form of an inscription facilitated filling a vital gap in Sri Lankan history, related to maritime links, international as well as internal trade (Weisshaar. et.al., 2001).

Ancient Kings were well aware of the significance of preservation Conservation activities as well as record keeping. Once a particular conservation work is completed, an inscription has been engraved to proclaim the news to the information of future generations. Polonnaruva Lankatilake Guard-Stone inscription of king Vijayabahu IV (1270-1272 A.D declares the conservation activities carried out in the temple (Wickremasinghe & Codrington, 1933). Jetavanarama Sanskrit Inscriptions state when a person is assigned to supervise the temple renovation activities, the name of the person and his duties shall be recorded in the register known as pas-pot (Wickremasinghe, et. al.,1912). Slab-Inscription of the king Sahassamalla at Polonnaruva (1200-1202 AD) states that a declaration has been inscribed on a stone to let future kings not harm but to continue the grants as they are maintained during the time of the establishment of the inscription. (Müller,

1915).

Information preserved in the Badulla Pillar Inscription of king Udaya IV (946-954 AD), enlighten us on the preservation of administrative, trade, and socio-economic information in the 10th Century AD. It also informs us of the Officials those who are responsible for the information preservation of the state and concerns of lay countrymen on the recording and sustainability of information during the period. The inscription deals with a petition made to the king by merchants and residents of the market town of Hopitigamu against subordinate officials of the magistrate in charge of the market. Accordingly, officials had transgressed the orders enacted during the reign of the previous king, which were not been incised or not preserved in written form. After examining the grievances of the countrymen, the ruling king has passed a decree reinstating the regulations enacted by the previous ruler by inscribing an edict. The establishment of an Inscription in a public place providing public access to it leads to think that ordinary citizens of the country were well attentive to the preservation of information related to rules and regulations institutionalized in the written form. Also, the incident mentioned in the inscription highlights the rate of literacy among laymen was high as it was also depicted in the Sigiri Graffiti during the 6th century AD.

Palm Leaves

Although preservation of information on the stone was immensely used in the period, there was a requirement of using lengthy documents to store and preserve more extended information, especially during disasters. In early periods Buddha's teachings were preserved in oral form and transmitted from generation to generation. However, due to several natural and man-made challenges, the requirement of long-term preservation of Dhamma stood out prominently. Difficulties involved in the incision of lengthy documents, portability, mobility, and exertion in finding suitable stones might have led ancient Sri Lankans to seek alternative media. Under the patronage of kings and the guidance of Buddhist monks information that was in the form of Buddhist scriptures passed orally were documented in Palm Leaf

Manuscripts (PLMs), in the 1st century BC (Geiger, 1908) The selection of Palm leaves as an appropriate medium for preserving information marked a turning point in Sri Lankan history. This decisive step would have been taken not only due to the difficulty of writing long Buddhist texts on stone but also perceiving the difficulty in protecting the authenticity of the orally transmitted knowledge. Kings enacted laws and regulations to safeguard the Palm trees while encouraging Palm gardens in the country.

Accounts on history including two main chronicles written in Palm leaves originally, such as Dipavamsa and the Mahavamsa, other literary sources, and artefactual information provide an account of the perceptions and practices followed in ancient Sri Lankan society. While some contend that the contents of these records are mostly Buddhist, the information preserved by these sources also delineates the socio-economic, political, cultural, and administrative history of the island.

In the meantime, the preservation of non-religious documents also has been augmented. Recording of non-religious texts on leaves is mentioned in inscriptions. Heart Hammillava rock inscription accordingly furnishes details about preserving monastery accounts by writing down on a leaf (kolahi liya tabava)(Wickremasinghe, 1976). The word “kola” mentioned in the inscription according to Dias (2001) refers to a leaf, which was a common writing material in ancient Sri Lanka, that was Palm leaves

Two tablet inscriptions of King Mahinda IV (975-991AD) at Mihintale, provide further information about the thoughtful preservation of information in a Buddhist monastery of 11th century AD (Wickramasinghe, et. al., 1912). In addition to the information dealing with the administration and inner life of a Buddhist Monastery, these two tablets, preserve information on the emolument paid to the officials including a clerk of the monastery (Veher-leya), a registrar of the caskets (karand-leya) and keeper of caskets(Karandu at-samu) who rendered services of preservation of information of the monastery. Accordingly, Officers were

responsible for maintaining a register known as pas-pot to enter expenses on the renovation activities, expenditure on meals, costs related to revenue collectors. Documents where the accounts of the monastery were entered, was recommended to place in a casket under lock and key (ibid) These caskets were instructed to deposit in the relic house, where reliquaries were deposited. The deposition of the registers [made of Palm leaves] that contained the accounts on the monastery in the relic house suggests the significance given by the ancestors to the preservation of information. They were well aware of the fragility and delicateness of the Palm leaves, as well as the significance of the information preserved in these documents. Thus, it was instructed to protect the balance sheets that were written on palm leaves in a more secure place. Inscriptions further state that the sheets of accounts that are secured in a casket shall be compiled at the end of each year; these balance sheets shall be made public by reading out amid the community of the monks. Authorities were very much concerned about the preservation of these documents, therefore, the inscription emphasized that the fines shall be imposed, and dismissal of service is recommended for the employees who infringe the above rules.

Gold and Copper Plate Charters

To achieve successful preservation practical measures must be established to ensure its survival against potential decay. Enduring the life of documents is significant because, in addition to their economical value, the fragility of documents prevents users from accessing original materials. This modern-day concept could be seen in ancient Sri Lankan practice, as recording information in Palm Leaves was replaced by the Copper plates in a later period of history.

King Nissankamalla (1187 to 1196 AD). in his Polonnaruwa slab inscription (Wickremasinghe, 1928) mentions that the decisive step of writing on Copper plates instead of Palm Leaves was initialized by him. There are previous instances that unveiled the availability of copper as well as gold plate inscriptions, however. Jetvanarama gold plate inscription, Abhayagiriya, Panakaduwa copper plate inscription, and a recent discovery of Dighavapi Gold Sheet inscription of king

Kanittha Tissa (165-193 AD) appear before king Nissanka Malla period. However, King Nissankamalla was the foremost to particularly mention the reasons for the preservation of information on more endured materials instead of on Palm leaves. Accordingly, the Copper Plates were selected as a suitable medium to inscribe the grants due to their fragility of nature, and vulnerability to insects and rodent attacks over.

The life span of PLMs is rather shorter and vulnerable to natural and manmade disasters when compared to the other media chosen for the preservation of information. However, the inherent advantages of PLMs such as ease of mobility, portability, manageability as well as effortless of finding, led them selected as writing media. As a solution for its vulnerability to disasters and shorter lifetime alternative avenues were sought after. It proves that ancient Sri Lankans were well acquainted with the inherent strengths and weaknesses of each media. It is evident that registers that were known as pas-pot and lekam miti (land tenure registers) and other documents were maintained under the patronage of rulers throughout history. These documents later led to the development of a much organized Sri Lankan archival system under colonial rule in Sri Lanka.

Conclusion

The study investigated the shape of preservation of information in Ancient Sri Lanka through the evidence available from inscriptions, artefacts, PLM etc. it revealed that ancient Sri Lankans were concerned about every single incident and had taken measures to preserve information regarding the event. Despite the view that “until recent past preservation simply meant collecting and the coordinated and conscious management aspects of the preservation is more recent” (Conway, 1996), corroborations prove that effective preservation of information has ever been in flow in Sri Lankan history. Well before cultural institutions were established under colonial rule, ancient Sri Lankans were familiar with the concepts of libraries, archives, and museums and made attempts to preserve information embedded in

different forms. Mahavamsa mentions that King Devanampiyatissa established a building in ancient Anuradhapura to safeguard the parts of the ship, which brought the sacred Bodhi tree from India in the 3rd century BC (Geiger, 1908) indicating about the world's oldest museum that preserved significant historic information. In the meantime, copies of important documents, have been deposited in the ancient chapter house Lovamahapaya, a nine-storied massive structure located between Ruvanveliseya and Sri Mahabodhi that played the role of the archive. Each Buddhist monastery has consisted of a library enabling, teaching, learning, and preaching. Concerns of the preservation of information were taken into account throughout history when even designing the buildings such as Tampita viharas (temples on pillars) during the Kandyan period.

While foreign invasions, internal conflicts, natural and man-made disasters as well as the introduction of printing challenged the existence of the indigenous system of information preservation, information was converted, reformatted, and duplicated through different media. Pottery, stones in the form of caves, pillars, slabs, etc., Palm leaves, Copper, Silver, and Gold plates were used to ensure the prolonged existence of documents over history very thoughtfully. As a result, a wealth of information ranging from the Early Iron Age (c. 1000-800 B.C) to until the beginning of printing during the Colonial rule was preserved in different materials. Although the word preservation is not directly used in the ancient literary sources, the notion was practised in the ancient Sri Lankan Society in line with the present-day definitions of preservation. Hence the study concludes that recording and preservation of information in ancient Sri Lanka as a concept is positioned in tandem with the present-day preservation purposes, i.e. "the objective of preservation is to ensure that information survives in a usable form for as long as it is wanted" (Feather, 1996).

While exploring the shape of preservation of information in ancient Sri Lanka, names and duties of professionals involved in information preservation activities came across. historical sources bring together another silhouette of professionals

engaged in preserving information till the end of the Kandyan kingdom. These officials are mentioned as scribes, chief secretaries and registrars and record keepers such as Mahale, Muk-hi, Mukaveti, Sanhals Sivatta Nayinarun, Sanhas Sivatteva Kala Perumal and Sannissiwatte Kulaperumal. It appears that this information provides access to a new arena for research on the history of Sri Lankan information preservation. However, there is no effort has been taken up to study, the role of ancient Sri Lankan professionals involved in the preservation of information. Avenues to new research rise through this information.

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Appendix 01

TRIVALENT
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Journal of Archaeology, Tourism & Anthropology
Department of Archaeology
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About

The Journal of Archaeology, Tourism & Anthropology is to provide a platform for researchers and professionals to publish their research findings, theoretical overviews, models, concepts related to Archaeology, Anthropology & Tourism & Cultural Resource Management with a multidisciplinary research approach. This is an interdisciplinary, open-access journal that is exclusively devoted to the publication of high-quality research in the fields of Archaeology, Anthropology & Tourism & Cultural Resource Management. The Journal focus on new trends in each field.

Intentions & Scopes

The academic journal of Archaeology, Tourism & Anthropology is the official journal of the Department of Archaeology, University of Kelaniya, Sri Lanka. The journal provides a platform for researchers and professionals to publish their research findings, theoretical overviews, models, concepts related to relevant fields of Archaeology, Anthropology & Tourism & Cultural Resource Management. Further, the journal encourages collaboration by teams of researchers to create special issues on the latest developments in related topics of national and international importance.

The peer-reviewed journal publishes one issue annually & invite original research articles from diverse disciplines. In addition to original research articles, the journal invites review articles, book reviews and short communications.

Overview of the Department of Archaeology

Archaeology has become a subject field of studying human culture through human activities beyond a mere appraisal of past cultures & societies. The application of new knowledge & secrets of human history uncovered through that scientific study is the main aim of archaeology. Based on the multidisciplinary & multivocal concept of archaeology, it is an internationally connected subject via likes Tourism & Cultural Resource Management. The department offers a student-centred learning system by instilling in lectures a series of practical skills in fieldwork & research.

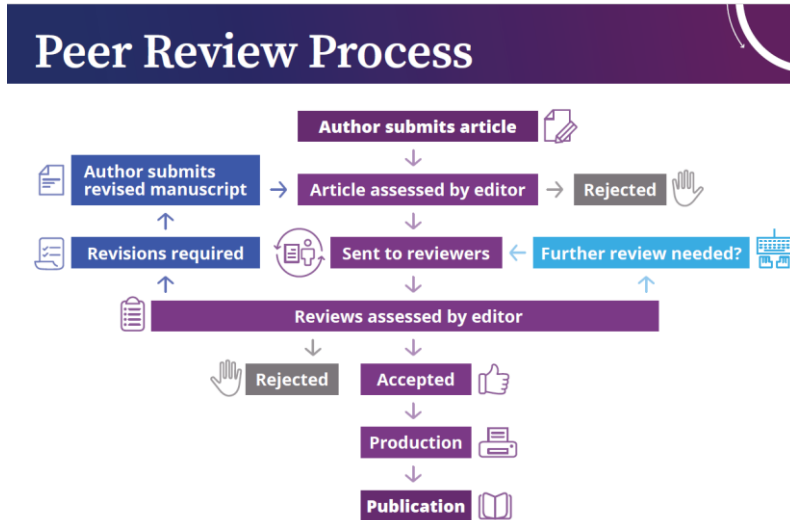
Themes

1. Pre & Protohistoric Archaeology
2. Mortuary Archaeology & Social Archaeology
3. Environmental Archaeology, Geoarchaeology, Zooarchaeology.
4. Ancient Art & Architecture, Ancient Technology, Epigraphy & Numismatics.
5. Recent trends in computer applications in Archaeology
6. Field Archaeology & Settlement Archaeology.
7. Archaeological Research, Education, Training & Public Archaeology
8. Underwater and Maritime Archaeology
9. Physical & Cultural Anthropology, Ethnology & Ethno Archaeology & Indigenous Studies.
10. Recent trends, Research & Education in Anthropology
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12. Eco, Nature, Adventure, Agro Tourism & CBT.
13. Sustainable Tourism Development, Tourism Entrepreneurship, Innovation & Creativity
14. Tourism Research, Education and Training and Tourism Crisis Management
15. Destination Marketing, Hospitality Management and Recent trends in Tourism
16. Role of Technology and Multidisciplinary Approach in Tourism Industry.

17. Archaeological Conservations, Museums & Heritage Management

Policies

Peer Review Process



1. Submission of Paper

The corresponding or submitting author submits the paper to the journal. This is usually via an online system such as Scholar-One Manuscripts. Occasionally, journals may accept submissions by email.

2. Editorial Office Assessment

The journal checks the paper's composition and arrangement against the journal's Author Guidelines to make sure it includes the required sections and stylizations.

3. Appraisal by the Editor-in-Chief (EIC)

The EIC checks that the paper is appropriate for the journal and is sufficiently original and interesting. If not, the paper may be rejected without being reviewed any further.

4. Invitation to Reviewers

The handling editor sends invitations to individuals he or she believes would be an appropriate board of review.

5. Response to Invitations

Potential reviewers consider the invitation against their expertise, conflicts of interest and availability. They then accept or decline. If possible, when declining, they might also suggest alternative reviewers.

6. Review is Conducted

The reviewer sets time aside to read the paper several times. The first read is used to form an initial impression of the work. If major problems are found at this stage, the reviewer may feel comfortable rejecting the paper without further work. The reviewers will evaluate the paper based on the following criteria;

- I. Statement of Problem or Purpose
- II. Relevance of the Topic
- III. Importance of the Topic
- IV. Contribution to the Literature
- V. The proper research methodology adopted
- VI. Organization of the contents
- VII. Discussion
- VIII. Conclusion
- IX. Quality of writing & Mechanics
- X. Any other comments from the reviewers

Otherwise, they will read the paper several more times, taking notes to build a detailed point-by-point review. The review is then submitted to the journal, with a recommendation to accept or reject it – or else with a request for revision (usually flagged as either major or minor) before it is reconsidered.

7. Journal Evaluates the Reviews

The handling editor considers all the returned reviews before making an overall decision. If the reviews differ widely, the editor may invite an additional reviewer to get an extra opinion before making a decision.

8. The Decision is Communicated

The editor sends a decision email to the author including any relevant reviewer comments. Whether the comments are anonymous or not will depend on the type of peer review that the journal operates.

9. Next Steps

If *accepted*, the paper is sent to production.

If the article is *rejected* or sent back for either major or minor *revision*, the handling editor should include constructive comments from the reviewers to help the author improve the article. At this point, reviewers should also be sent an email or letter letting them know the outcome of their review.

If the paper was sent back for *revision*, the reviewers should expect to receive a new version, unless they have opted out of further participation.

However, where only minor changes were requested this follow-up review might be done by the handling editor.

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Authors should note that proofs are not supplied before publication. The manuscript will be considered to be the definitive version of the article. The author must ensure that it is complete, grammatically correct and without spelling or typographical errors. Before submitting, authors should check their submission completeness using the given Article Submission Checklist. The manuscript will be considered to be the definitive version of the article.

Manuscript requirements

Authors are advised to prepare their manuscripts before submission, using the following guidelines

| | |
|---------------|---|
| <i>Format</i> | <ul style="list-style-type: none"> • All files should be submitted as MS Word compatible documents. • Times New Roman font, 12 sized and 1.5 line-spaced. Single columned layout and in B5 sized paper. |
|---------------|---|

| | |
|-----------------------|--|
| <i>Article Length</i> | <ul style="list-style-type: none"> Articles can contain a maximum of 10 pages including references. |
| <i>Article Title</i> | <ul style="list-style-type: none"> A title of not more than 20 words should be provided. Times New Roman font, 14 sized and 1.5 line-spaced |
| <i>Author Details</i> | <ul style="list-style-type: none"> Name of each author with initials ex: Bandara, A.W.M. Affiliation of each author, at time research, was completed. If more than one author has contributed to the article, details of who should be contacted for correspondence. E-mail address of the corresponding author |
| <i>Abstract</i> | <ul style="list-style-type: none"> A single paragraphed abstract containing maximum of 300 words. The abstract should include the purpose of the study, research problem, objectives, design/methodology/approach, findings, and also could mention the originality/value of the work with the conclusion. Times New Roman font, 12 sized and 1.5 line-spaced. Single columned layout justified Italic. |
| <i>Keywords</i> | <ul style="list-style-type: none"> Provide up to 05 keywords encapsulating the principal topics of the paper. |
| <i>Article Format</i> | <ul style="list-style-type: none"> The article submission should be compiled in the following order: <ol style="list-style-type: none"> (I) abstract, keywords main text including <ol style="list-style-type: none"> (II) introduction (including relevant literature and research objectives) (III) materials and methods (IV) results and discussion (V) conclusion and recommendations, acknowledgements (VI) references |
| <i>The text</i> | <ul style="list-style-type: none"> Line spacing should be 1.5; with 12-point font Times New Roman Should employ italics For scientific names, use the SI system/ metric system for units of measurements. |

| | |
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| | <ul style="list-style-type: none">• All illustrations, figures, and tables should be placed within the text at the appropriate points, rather than at the end. |
| <i>References</i> | <ul style="list-style-type: none">• Please use the APA (American Psychological Association) reference style.• For detailed information, please see the Publication Manual of the American Psychological Association, Sixth Edition (2010); http://www.apastyle.org/ and http://blog.apastyle.org/• References should be 1.5 spaced, 1.5 cm 2nd line right indent, and listed alphabetically at the end of the paper |

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