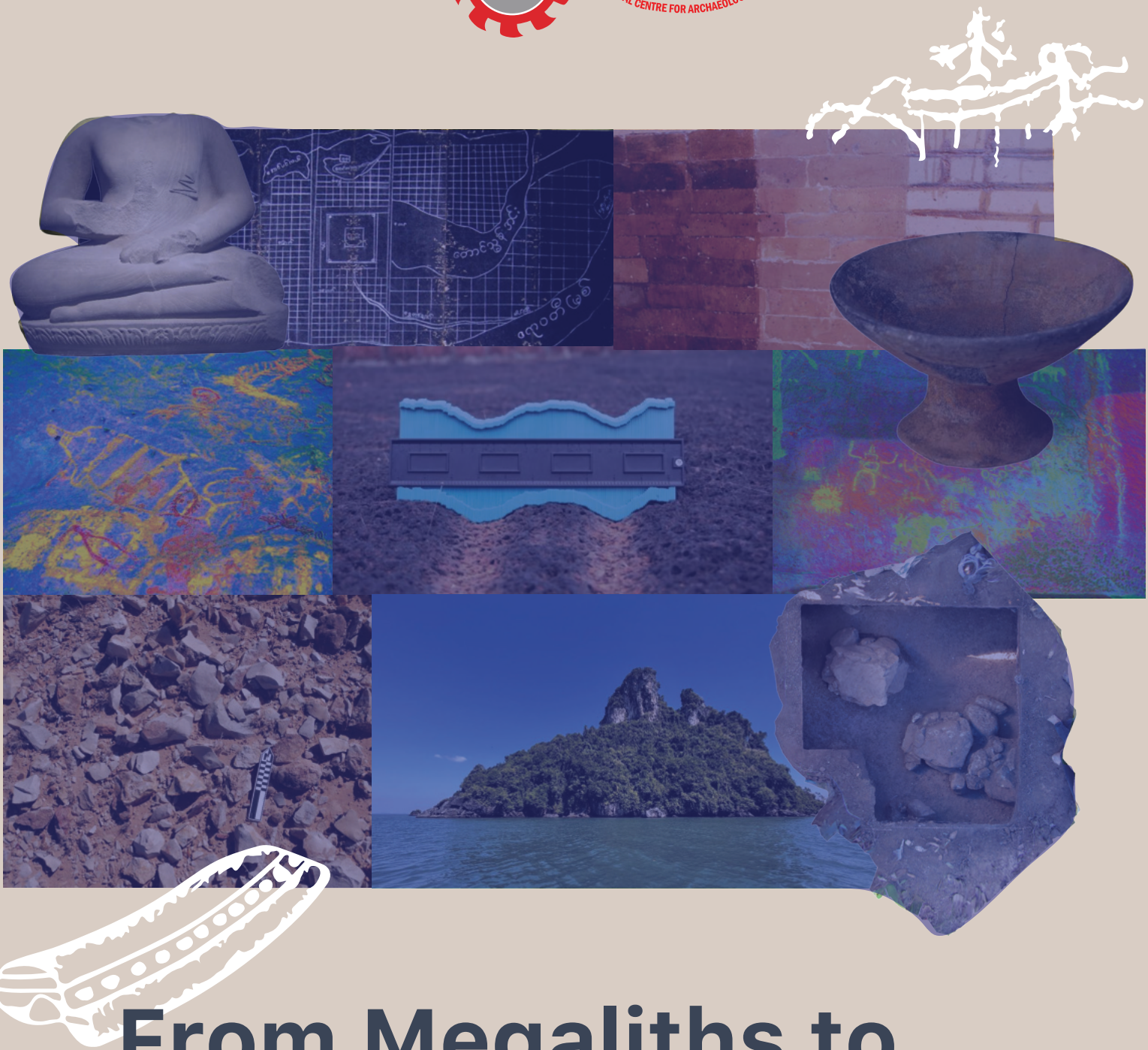
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From Megaliths to Maritime Landscapes:

Perspectives on Indo-Pacific Archaeology



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TABLE OF CONTENTS

04 **Introduction**

05 **Megalithic Culture Research in Banyuwangi, East Java Province, Indonesia** by *Putri Novita Taniardi*

15 **Cultural Landscape and Resources of Amarapura Old City, Mandalay Region, Myanmar** by *Pyiet Phyo Kyaw* and *Moe Sat Wathan*

35 **Learning more about the praxis of archaeology and advocacy in Southeast Asia** by *Andrea Natasha Kintanar*

44 **Geospatial Data Presentation of Wooden Coffin Burial Sites discovered during Guthe's Philippine Expedition (1922-1925)** by *Jacqueline Roanne Chua* and A*nna Pineda*

52 **Enquiring the two transcendent Buddha statues of Cham art belonging to the Vijaya state in the 11th to 13th centuries** by *Nguyễn Thị Tú Anh*

64 **Reassessing the conservation and restoration activities of Champa temples in Ninh Thuan province, Vietnam** by *Tuyen Quang Dai*

83 **Rock Art of Perlis, West Malaysia** by Saw Chaw Yeh and Goh Hsiao Mei

97 **Analysis of Pictographs at Phang-nga Bay, Western Coast of Peninsular Thailand** by *Thawatchai Chanpaisalsilp*

113 **Ex Machina: Machine Learning, ceramics and rock art in the Khorat Plateau, Thailand** by *Felise Goldfinch, Nigel Chang* and *Dianna Hardy*

130 **Maritime Landscape and the Rock Art Traditions at Lanta Bay, Krabi, Thailand** by *Sorathach Rotchanarat*, *Noel Hidalgo Tan*, *Bérénice Bellina*, *Olivier Evrard*, *Jutinach Bowonsachoti*

145 **The Gilparrka site complex, Mithaka Country, southwest Queensland, Australia** by *Phillip J. Habgood*, *Natalie R. Franklin*, *Nathan Wright*, *Josh Gorringe* and *Michael C. Westaway*

157 **Rock Art as an Indigenous Historical Tradition, Northern Vindhyas, India** by *Ajay Pratap*

178 **Imaging Ancient Images: Challenges in Analogous and Digital Documentation of Geoglyphs on Lateritic Plateaus of Konkan, India** by *Mrudula M. Mane*, *Tejas Madan Garge*, *Prabhin Sukumaran*, *Jigna Desai* and *Parth R. Chauhan*

INTRODUCTION

It is with great pleasure and pride to introduce a remarkable collected volume of articles. These papers were originally presented at the 22nd Congress of the Indo-Pacific Prehistory Association, held in the enchanting city of Chiang Mai, Thailand, from November 6th to 12th, 2022, of which the Southeast Asian Ministers of Education Organization Regional Centre for Archaeology and Fine Arts (SEAMEO SPAFA) was a proud co-organizer. The 22nd Congress of the Indo-Pacific Prehistory Association brought together scholars, researchers, and archaeologists from across the Indo-Pacific region, offering a platform for the exchange of knowledge, ideas, and insights.

The articles compiled in this volume represent the outstanding scholarship of two groups: Scholars who were recipients of SEAMEO SPAFA support, and Scholars who presented their research during Session 13 of the congress, "Rock Art of the Indo-Pacific Region". This scholarship delves into diverse aspects of our shared heritage, from the megalithic cultures of Banyuwangi in Indonesia to the geospatial data presentation of wooden coffin burial sites in the Philippines. Their research covers an expansive range of topics, from the ancient maritime landscape of Lanta Bay in Thailand to the rock art traditions of the Northern Vindhyas in India.

We extend our heartfelt gratitude to the conveners of Session 13, Noel Hidalgo Tan (SEAMEO SPAFA), Meenakshi Dubey-Pathak (Rock Art Society of India), Adhi Agus Oktaviana (Griffith University), and Andrea Jalandoni (Griffith University), for their dedication in curating a session that has led to this exceptional collection of articles.

Their work not only advances our understanding of the past but also underscores the importance of preserving and protecting our archaeological and cultural heritage for future generations. We hope that this volume will serve as a source of inspiration and knowledge for archaeologists, researchers, and enthusiasts alike. It is a testament to the collaborative efforts of scholars from diverse backgrounds who share a common passion for uncovering the mysteries of the Indo-Pacific region's prehistory.

On behalf of SEAMEO SPAFA, I extend my sincere appreciation to all the contributors for their invaluable work and commitment to the field of archaeology and fine arts. May their research continue to illuminate the paths of discovery as we collectively explore the depths of our shared human history. I would also like to extend my heartiest gratitude to IPPA Congress Secretariat and our partner organisations, The Fine Arts Department of Thailand, Silpakorn University, Princess Maha Chakri Sirindhorn Anthropology Centre, Geo-Informatics and Space Technology Development Agency, Social Research Institute, Chiang Mai University, ICOMOS International Committee on Archaeological Management and the Archaeo-Alumni of Thailand for a fruitful collaboration.



Khmechat Thepchai
Director
SEAMEO Regional Centre for Archaeology and Fine Arts
(SEAMEO SPAFA)

Megalithic Culture Research in Banyuwangi, East Java Province, Indonesia
Penelitian Budaya Megalitik di Banyuwangi, Jawa Timur, Indonesia

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ABSTRACT
Previous research on the megalithic cultures of East Java, Indonesia was carried out in the regions of Situbondo, Bondowoso, Jember, and Probolinggo. The results demonstrated that there is a diversity of megalithic monuments and cultures in the area, both in terms of form and chronology. The latest project undertaken by the Megalithic Culture Research Team in Banyuwangi focuses on the megalithic monuments in Banyuwangi, the easternmost region of East Java. This research was conducted using surveys and excavations. The project has demonstrated that Banyuwangi possesses dolmens, a type of megalithic monument uncovered by excavation. Pottery fragments and beads were also recovered from the megalithic sites. Dating of pottery retrieved from the same contexts as the dolmens suggest that the megalithic culture of Banyuwangi originated in the 3rd to 6th centuries CE, or in the protohistoric period. This date is the oldest when compared to othermegalithic cultures in East Java. Thus, the results of this study contribute important new archaeological data to the diversity of megalithic cultures in Indonesia.

ABSTRAK
Penelitian sebelumnya tentang budaya megalitik Jawa Timur, Indonesia dilakukan di daerah Situbondo, Bondowoso, Jember, dan Probolinggo. Hasilnya menunjukkan bahwa terdapat keragaman monumen dan budaya megalitik di daerah tersebut, baik dari segi bentuk maupun kronologis. Proyek terbaru yang dikerjakan tim penelitian budaya megalitik di Banyuwangi berfokus pada monumen megalitik di Banyuwangi, wilayah paling timur Jawa Timur. Penelitian ini dilakukan dengan metode survei dan ekskavasi. Proyek tersebut telah menunjukkan bahwa Banyuwangi memiliki dolmen, sejenis monumen megalitik yang ditemukan melalui penggalian. Pecahan tembikar dan manik-manik juga ditemukan dari situs megalitik. Penanggalan tembikar yang diambil dari konteks yang sama dengan dolmen menunjukkan bahwa budaya megalitik Banyuwangi berasal dari abad ke-3 hingga ke-6 Masehi, atau pada periode protohistoric. Pertanggalan ini merupakan yang tertua jika dibandingkan dengan kebudayaan megalitik lainnya di Jawa Timur. Dengan demikian, hasil penelitian ini memberikan kontribusi data arkeologi baru yang penting bagi keragaman budaya megalitik di Indonesia.

Keywords: megaliths, research, Banyuwangi, Indonesia | megalitik, penelitian, Banyuwangi, Indonesia

INTRODUCTION

Megaliths are usually defined as structures made of large stones, usually rough and untidy, which are characterized by certain types (Perry 1918:10). A megalithic culture is a form of human creation that is characterized by megalithic objects in the form of stone buildings. The term megalith comes from the Greek mega (big) and lithos (stone). The term megalithic has a meaning as a culture that characterizes megalith buildings or buildings made of large stones. Megalithic culture is a manifestation of establishing a relationship between the living and the dead. The spirit of someone who has died will not just disappear but has lived in its own realm. There is a belief that these spirits are always in contact with people who are still alive and are considered to have a strong influence on the welfare of society (Tanudirjo et al. 2012: 305). Fritz A. Wagner argues that a megalith which is defined as a large rock will lead to a misunderstanding because even objects made of small stones can be included in the megalith criteria if these objects are clearly made with sacred purposes such as worship of ancestors (Fritz A Wagner, 1959:23-24). Therefore, it can be concluded that megaliths are stone objects or buildings resulting from megalithic culture, while megalithic culture is defined as a culture that produces buildings or objects made of large or small stones (Tanudirjo et al. 2012: 305). According to Robert von Heine-Geldern , the megalithic culture that entered Indonesia can be divided into two waves. The first wave occurred in the Neolithic Age by speakers of Austronesian languages, roughly between 2500-1500 BCE. The first wave is called the old megalithic culture. This old megalithic culture was brought by immigrants via Tonkin to West Malaysia and entered Indonesia via Sumatra. From Sumatra, some of it continues to Java and Nusa Tenggara, while some of it spreads to Kalimantan and continues to the north. The next wave entered during the early period of bronze and iron which came together with the Dong Son culture, namely between the 4th – 3rd centuries BCE. This wave was then called the younger megalithic culture von Heine Geldern via van Heekeren, 1958:44-45). The assumption about immigrants spreading megalithic culture so far has only been based on research on material objects and comparisons within the areas where they were spread, so this is a weakness that needs to be limited. This weakness also occurs in the lack of dating data on megalithic sites in Indonesia (Tanudirdjo et al. 2012: 310).

Megalithic research in Indonesia is intensively carried out by researchers under the National Archaeological Center. Bagyo Presetyo summarizes the dates of 25 megalithic sites in Indonesia to reconstruct the history of megalithic culture in Indonesia (Prasetyo 2015:57-63). Sumatran megalithic chronology obtained through the dating of the Nias megalith excavations. Charcoal samples from the Tundrumaho megalith context are known from around the 15th and 17th centuries CE. Charcoal from the Hiligeo megalith context is from around the 15th to the 20th centuries CE. Dating data from the Limapuluh Koto site are known to date from the 10th century until the 13th century CE. In Kerinci, Jambi, it is known that the dating of the Bukit Arat site dates from the 7th and 11th centuries CE, Dusun Tinggi around the 4th and 7th centuries CE, and Bukit Batularung around the 10th and 19th centuries, ,and Renah Kemumu around the 11th, 12th, and 13th centuries CE. In Pagar Alam (Pasemah), the chronology starts from around the 15th, 17th, and 20th centuries CE. The oldest chronology is estimated to be around the 3rd century to 6th century.

Not much is known about the chronology of megaliths in Java, except for West and East Java. At Gunung Padang, it is known that the dates indicate the age of 45 BCE and 22 CE (Prasetyo 2015:57-63). Research to trace the dating of megalithic sites in East Java was carried out in several places. At the Bojonegoro Kalang Grave site it is known that the date is around the 15th to the 17th centuries CE.

At the Doplang Site, Jember the dating is around the 13th-15th centuries CE. The Krajan Bayeman site, Situbondo is dated around the 6th and 11th centuries. The Pedaringan site is dated around the 10th and 14th centuries CE. The Dawuhan site is dated around the 7th and 8th centuries CE.

In Eastern Indonesia, research to determine megalithic dating was carried out in the Poso and Minahasa regions. Tetelu 2 site, Minahasa dated 351 and 207 BCE; 228 and 222 BCE; and 210 BCE and 69 BCE. The Wineki site is dated between 39 BCE and 8 BCE; 4 BCE and 19 BCE. Other sites are known to have a younger range, such as Woloan 1 around the 4th to 7th century CE. Woloan 2 site around the 7th to 9th century (Prasetyo 2015:57-63).

Research on megalithic culture at the Mulyosari site contributes data to the megalithic culture of Banyuwangi, which has not been studied much so far. Van Heekeren in his book mentions reports of the discovery of megalithic remains in the East Java region, especially in the eastern part (1958:46). In early 1898, H.E. Steinmetz published an amazing summary of his time, namely the findings of megalithic remains around Bondowoso. The findings included sarcophagi and dolmens that resemble tombs, decorated with human and animal figures and geometric motifs. The image is at the bottom of the rock or engraved directly on the rock structure. Almost all the graves in Bondowoso have been looted.

J.B. Hubenet reports that in 1903 a dolmen resembling a tomb was found during the construction of the railway line between Kalisat and Banyuwangi. The dolmen is a small vertical rock, surrounding a human skeleton, and supported by a large capstone over two meters long and one meter on its widest sides. All stones are monoliths in rough condition and uncut. The tomb contained human bones and teeth and 72 fine beads. On the side of the Dolmen lies a hollow rock, tapering downwards, 15 cm in size. When observed from the diameter and depth; perhaps a hollow stone was used as a mortar for grinding grain. Another dolmen was excavated by B. de Haan in 1921, during the construction of a road between Garahan and Mrawan, three kilometers from Pasar Alas station (Van Heekeren, 1958:46).

The dolmen is covered by a 50 cm layer of humus, beneath which is an 18-20 cm layer of volcanic sand from the eruption of the Raung Volcano. This dolmen, placed in an East-West direction, appears to be another example of a dolmen of the simplest type. There is no floor and the covering stone is natural stone slabs and has not been quarried. In front of the grave is a circle made of river stones. A long stone is located 1.5 meters from the front of the closing stone, in the form of a flat stone on the side. All of these stones are in a form level with the bottom of the closing stone resting on the supporting stone. Supporting stones were set to form a closed chamber that contained: 43 human molars, 5 canines, 6 incisors, and about 79 beads of various sizes. The entrance to the tomb is on the west side and is closed with a piece of rock. Unfortunately, human bones shattered when touched, but from the number of teeth, it appeared that there were at least three corpses. Small gold rings were also found in these graves, the ends were somewhat thickened and held together. The beads differ greatly in size and color; the largest is 45 mm in diameter, while the smallest, pearl-colored terracotta, is only about 3 mm. The large beads are yellow and green, dark blue with a white eye, plain yellow, plain green, and red-golden yellow. They are egg-shaped, flat on top and bottom, with a cylindrical open core (ven Heekeren 1958: 46-47). Starting from these reports, van Heekeren then continued his research in the eastern part of East Java, such as in Bondowoso and Besuki. From 1929 to 1932 van Heekeren was involved in studying megalithic objects in the easternmost part of Java. Heekeren's writing has not specifically reviewed the



Fig.1 Location of Mulyosari Site. Source: Balai Arkeologi Yogyakarta, 2021.

megalithic remains in Banyuwangi. Starting from Heekeren's writings, research on megalithic culture in Banyuwangi has been conducted since 2016. Information received by the research team, there are megalithic remains in the coffee plantation area owned by a state-owned company known as PTPN 12. This location is at the Mulyosari Site, Kebun Malangsari, Kalibaru area, Banyuwangi, East Java.

MAIN SECTION

Mulyosari is located at 8°22'56.8" S 113°56'38.7" E, south of Mount Raung (3260 m asl) and in a coffee plantation complex owned by PT Perkebunan Nusantara XII in Afdeeling Muyosari, Malangsari Garden. The Mulyosari site is located at an altitude of 600-670 meters above sea level with a rough surface relief. The Mulyosari site has relatively cooler air when compared to the air in the Banyuwangi City area. This site, as mentioned in the previous section, is in the northern part of the Meru Betiri Complex. According to the characteristics of the land, Mulyosari is suitable for coffee plants. Coffee planting is carried out throughout the year without rotation with other crops. It is among these coffee plants where the megalithic remains are located.

Administratively, the study area is located in Kebonrejo Village, Kalibaru District, Banyuwangi Regency which is included in the area with wet and dry tropical climates with the largest average rainfall reaching 257 mm and the smallest average rainfall is 28.6 mm. Based on the results of the delineation of the research location on the 1992 Geological Map of the Jember Sheet with a scale of 1:100,000 made by Sapei et al. (1992) The lithology of the research location is in the Sukamade Formation which consists of claystone interspersed with siltstone and sandstone. In this formation, there are sedimentary structures with parallel, crisscross, convoluted and massive local stacked layers. The thickness of this formation is ± 300 meters. This formation was deposited in an open marine environment on underwater slopes and is interspersed with volcanic rocks of the Merubetiri Formation.

Based on this finger relationship, the Sukamade Formation is estimated to be Late Oligocene - early Middle Miocene.

Based on the topographic map observations, the research area in Afdeeling Mulyosari is divided into ten sectors, namely sectors 1, 1A, 1B, 1C, 2, 2A, 2B, 3, 4 and 5. The division of sectors is based on the physiography of the study area. This makes the river a boundary between sectors. In addition, the administrative boundaries of Afdeeling Mulyosari are also one of the factors that influence sector development in the research area.

The process of collecting data on the Mulyosari Site is carried out to answer the formulation of the problem posed. Data collection consists of excavation and survey. The excavations were carried out in three sectors, namely sector 1, sector 4, and sector 5. The excavations in sectors 1 and 5 are follow-up excavations from 2019, while the excavations in sector 4 are excavations that have just been carried out in research in 2021. Meanwhile, the survey was conducted in sector 1, 1A, 1B, 1C, 2, 2A, 2B, 3, 4, and 5. The survey was conducted to obtain geomorphological data for landscape analysis as a complement to survey data for 2018 and 2019. (Taniardi et al. 2019)

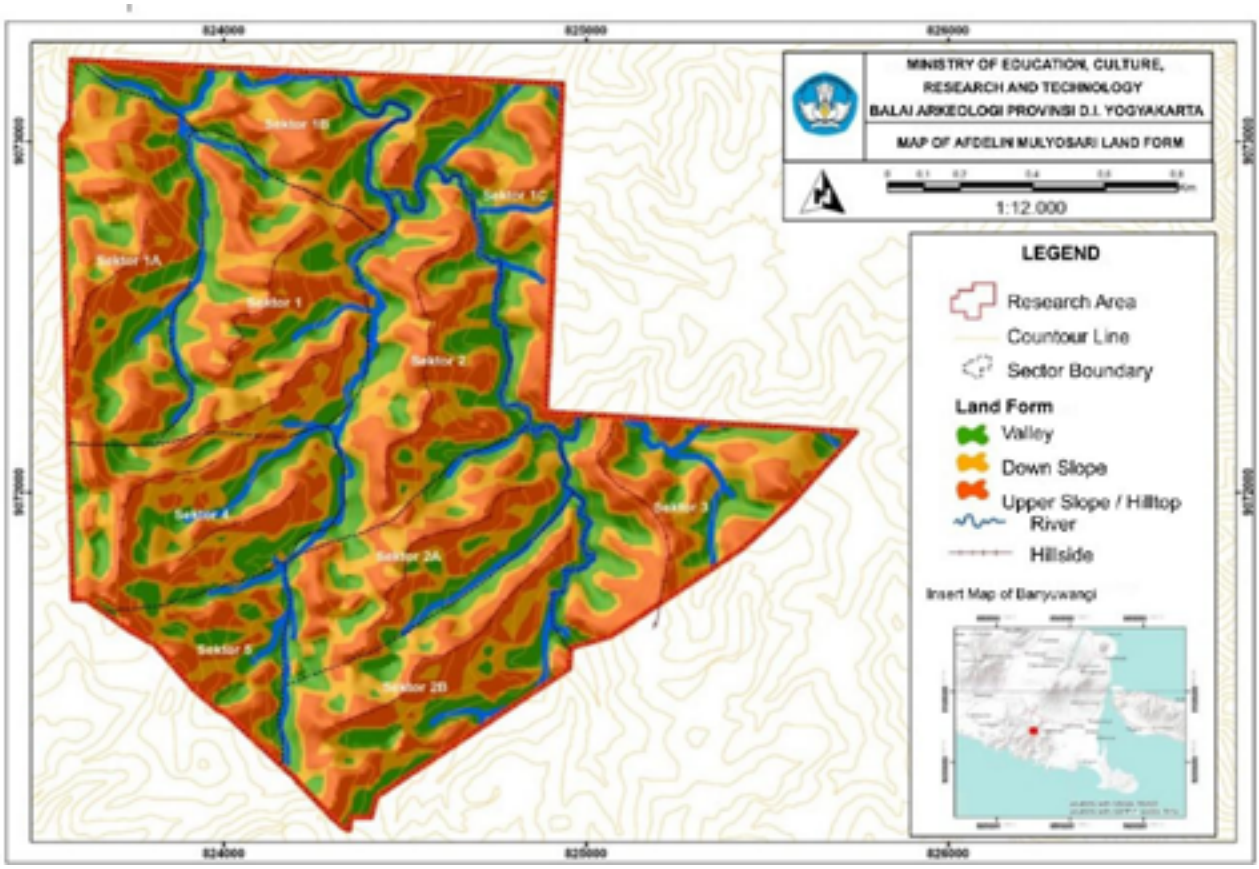


Fig. 2 The Land Form of Mulyosari Site. Source: Balai Arkeologi Yogyakarta.

The megalithic remains in sector 1, in squares U1T1, U1T2, U2T1, and U2T2 are dolmens with the dimensions of the covering stone being 132 cm long, 129 cm wide, and 70 cm high. Around the dolmen, there is a circular arrangement of stones. The dolmens use andesite rock in the cover as its constituent material. While the supporting stones are made of tuff rock. The source of andesitic rock material closest to sector 1 is located at 8° 22' 58.7" S, 113° 56' 30.9" E which is included in sector 4 area. The distance between the source of andesite rock material and the dolmens is 175 m. The sources of rock supporting the dolmens and circular stone structures in the form of white and yellow tuff are in the vicinity of sector 1. The nearest source of white tuff is located at 8° 22' 35.8" S, 113° 56' 44.1" E, included in the sector 1 with a distance of 697 m. The nearest source of yellow tuff is located at 8° 22' 38" LS, 113° 56' 47.3" E, included in sector 2 with a distance of 718 m (Taniardi et al. 2021).

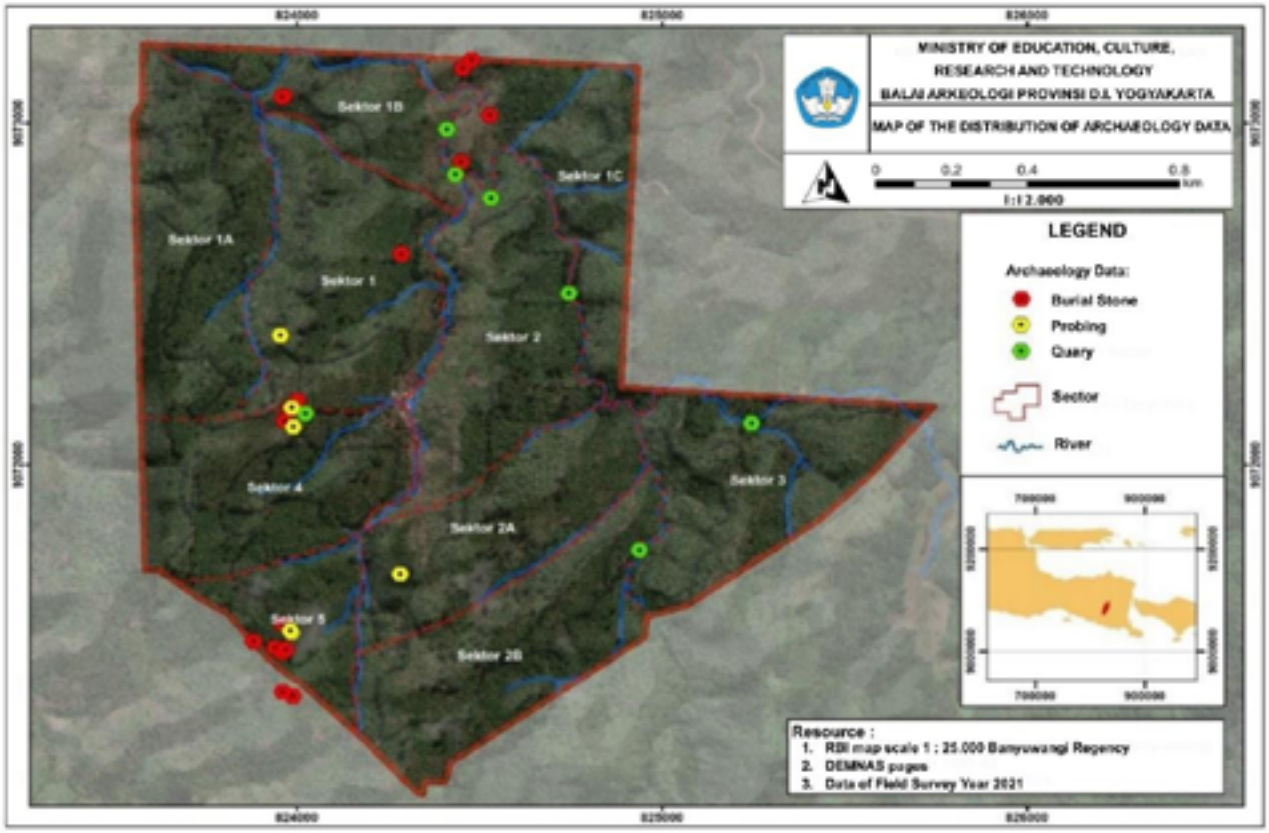


Fig. 3 The Distribution of Archaeology Data. Source: Balai Arkeologi Yogyakarta.



Fig. 4 Dolmen Type 1 from Sector 1.
Source: Balai Arkeologi Yogyakarta.

Sector 1

The results of the excavations show that the cultural materials accompanying the dolmens are pottery fragments and beads. The pottery fragments found from both the S1T2 and S1T1 boxes as well as from the U1T1 and U1T2 boxes were ancient pottery. This is known from the analysis of the shape of the pottery fragments. Some of the ancient pottery was found starting from spit 12 (110-120 cm). Pottery fragments with decorative stripes were also found from spit 12 squares of sector 1. Apart from the line patterns, there were also pottery that had chipped motifs on the edges. Meanwhile, most of the bead findings were glass beads (Taniardi et al. 2021).



Fig 5 Boulders that are thought to be megalithic remains.
Source: Balai Arkeologi Yogyakarta

Sector 4

The megalithic remains in sector 4 are hollow boulders with observable dimensions, namely length: 57 cm, width: 50 cm, thickness: 60-70 cm. The source of white tuff is located at 8° 22’ 35.8” S, 113° 56’ 44.1” E with a distance of 827 m. Material culture as an accompanying finding in the U3T1 box is in the form of pottery fragments. Pottery fragments originate from the topsoil or from the depth of the spit at the beginning of the excavation process. Nothing was found other than pottery fragments until the excavation was stopped at a depth of 90-100 cm (spit 10) (Taniardi et al. 2021).



Fig 6 Dolmen Type 2 from Sector 5.
Source: Balai Arkeologi Yogyakarta.

Sector 5

The megalithic remains in sector 5 are two dolmens with the following dimensions. Dolmen 1 in box S1B1 has length: 74.3 cm, width: 82.4 cm, height: 56.7 cm. Dolmen 2 in squares S1B1, U1B1, U1B2, and S1B2 has length: 89.3 cm, width: 80 cm, height: 101.3 cm. This dolmen is made of a type of tuff rock. The closest source of tuff rock to sector 5 is located at 8° 22' 35.8" S, 113° 56' 44.1" E which enters sector 1 B. The distance between sector 5 and the source of material is 1425m. (Taniardi et al. 2021).

DISCUSSION

Until now, the Mulyosari Site is the only megalithic site in Banyuwangi that has been studied intensively. The megalithic remains at the Mulyosari Site show a distinctive character when compared to megalithic sites around Banyuwangi. The dolmens at the Mulyosari Site have a different character when compared to the dolmens at Bondowoso, namely in the form of supporting stones that form the walls and the position of the dolmens which are underground. The uniqueness of the dolmens at the Mulyosari Site then prompted the research team to trace the chronology of the Mulyosari Site's dating. It aims to find the relationship between the Mulyosari Site and other megalithic sites in East Java.

Dating analysis was carried out in 2019 by taking soot earthenware samples and charcoal samples. This sample was taken from sector 1, from box S1T2 on Spit (10) and (11) or a depth of 100-110 cm, in the rock feature to the southeast of the dolmen (Taniardi et al. 2019). The sample is then sent to the Beta Analytic laboratory for dating, the results of which show that the megalithic age range is between the 4th and 5th centuries CE. This analysis was then reconfirmed by sending samples dated from the S1T2 box with the same depth and context to the laboratory of The University of Waikato. The results of the dating analysis show that it is the 3rd century CE, thus confirming the results of the 2019 dating analysis.

In addition to samples from box S1T2 located in sector 1, the team also sent dating samples from sector 5. Charcoal samples were taken from box S1B2 in Spit (12) or a depth of 120 cm in dolmen boxes S1B1, U1B1, U1B2, and S1B2, to be precise at Lot 1 and Lot 2. Lot 1 is the upper dolmen, while Lot 2 is the lower dolmen. Between Lot 1 and Lot 2 it is bounded by flat stones. The existence of this boundary stone indicates that there was some kind of compartmentalization in Lot 1 and Lot 2. The results of the dating analysis show that the time span is between the 3rd and 6th centuries CE.

Compared to the megalithic culture around Banyuwangi (Situbondo, Bondowoso, and Jember, the dating results from the Mulyosari site are relatively much older. The Kubur Kalang Bojonegoro site produces dates around the 15th to 17th centuries CE. Doplang site, Jember dated around the 13th to 15th centuries CE. The Krajan Bayeman site, Situbondo produced dates around the 6th and 11th centuries CE. The Pedaringan site produced a chronology around the 10th and 14th centuries CE. The Dawuhan site was produced dating around the 7th and 8th centuries CE. This is of course interesting if the correctness of the dating can be confirmed. The Banyuwangi megalithic culture can be linked to the Gilimanuk megalithic culture in Bali which dates to the 2nd century CE (Prasetyo 2000).

CONCLUSION

The megalithic culture at the Mulyosari Site lasted from the 2nd century CE to the 6th century CE. These periods were the transition from the prehistoric period to the Hindu-Buddhist period in the archipelago. If it is connected with the megalithic tombs in Gilimanuk, then the existence of the Mulyosari site shows a correlation, namely in the 2nd century CE. Likewise, if it is connected with megalithic sites around Banyuwangi. Dating analysis conducted at the Krajan site, Bayemen (Situbondo) shows that the megalithic sites in Situbondo took place in the 5th to 10th centuries CE.

The results of the dating of the megalithic sites in Gilimanuk and Situbondo lead to the allegation that megalithic culture took place continuously, starting from Bali to the east, namely Banyuwangi, to Jember, Situbondo, Bondowoso, Lumajang, and Probolinggo. This assumption is the initial basis for knowing how the megalithic culture took place at the eastern tip of Java Island and the characteristics of the megalithic remains and their landscapes.

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Cultural Landscape and Resources of Amarapura Old City, Mandalay Region, Myanmar

မြန်မာနိုင်ငံ၊ မန္တလေးတိုင်းဒေသကြီး၊ အမရပူရမြို့ဟောင်းရှိ ယဉ်ကျေးမှုအမွေအနှစ်ဆိုင်ရာ အရင်းအမြစ်များနှင့် အခင်းအကျင်းများ

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ABSTRACT

The characteristics of historic cultural landscape in Amarapura are identifiable by the functions of agriculture, residential, water management and religious buildings. The ancient boundaries of Amarapura city were gradually transformed by changing landscapes between cultural elements and development plans. Depending on the archaeological sites and historical documents, the ancient urban pattern and settlement of Amarapura city can be traceable to know the original setting of cultural landscape. This study attempts to promote the cultural landscape and the historic socio-cultural aspects of ancient Amarapura Old City. The population growth and development plans are the challenges to maintain the cultural landscape.

စာတမ်းအကျဉ်း

အမရပူရမြို့ဟောင်းဒေသရှိ စိုက်ပျိုးရေး၊ လူနေထိုင်မှု၊ ရေအသုံးချစီမံမှုနှင့် ဘာသာရေး ဆိုင်ရာ အဆောက်အဦများ၏ အခြေအနေများအရ သမိုင်းဝင်ယဉ်ကျေးမှုအမွေအနှစ် အခင်းအကျင်းလက္ခဏာ ရပ်များကို ခွဲခြားသတ်မှတ်နိုင်သည်။ အမရပူရမြို့၏ရှေးခေတ် နယ်နိမိတ်ဧရိယာများသည် ယဉ်ကျေးမှု အမွေအနှစ်အချင်းအရာများနှင့် ဖွံ့ဖြိုးတိုးတက် ရေးစီမံကိန်းများအကြား ပုံသဏ္ဌာန်အသွင်အပြင်များ တဖြေးဖြေးပြောင်းလဲခဲ့ကြသည်။ ရှေးဟောင်းသုတေသနနေရာများနှင့် သမိုင်းဝင်မှတ်တမ်းများ အပေါ် မူတည်လျက် အမရပူရခေတ်မူလရှုမျှော်ခင်းပုံသဏ္ဌာန်များကို နားလည်စေရန်အတွက် အမရပူရမြို့ပြ ပုံစံများနှင့် လူတို့၏အခြေချနေထိုင်မှုများမှ ချည်းကပ်လေ့လာသိရှိနိုင်မည်။ ရှေးခေတ် ဟောင်းအမရပူရ မြို့၏ ယဉ်ကျေးမှုအမွေအနှစ်ရှုမျှော်ခင်းများနှင့် သမိုင်းဝင်လူမှု ယဉ်ကျေးမှုမြင်ကွင်းများကို ဤလေ့လာမှုက ပိုမိုအထောက်အကူပြုမည်ဖြစ်သည်။ လူ ဦးရေတိုးတက်လာမှုများနှင့် ဒေသဖွံ့ဖြိုးရေးစီမံကိန်းများ၏ အကျိုးဆက်များသည် အမရပူရမြို့ဟောင်း၏ ယဉ်ကျေးမှုအမွေအနှစ်ရှုမျှော်ခင်းများကို ထိန်းသိမ်းစောင့် ရှောက်ရန်အတွက် အခက်အခဲစိန်ခေါ်မှုများအဖြစ် ရှိနေကြပါသည်။

Keywords: cultural landscape, natural resources, Amarapura, historical elements | ယဉ်ကျေးမှုအမွေအနှစ်အခင်းအကျင်း၊ သဘာဝသယံဇာတအရင်း အမြစ်၊ အမရပူရ၊ သမိုင်းဝင် အချက်အလက်များ

INTRODUCTION

The cultural landscape of Amarapura during the reigns of Myanmar Kings (18-19th century CE) can be regarded by the current archaeological evidence, architectural monuments, and contemporary documents. The contemporary describes how the kings choose the location to build the new capital, and changes to the boundary of the city. Comparison between historical land-use and modern land-use can estimate how much the landscape in Amarapura has changed over the past 150 years. The archaeological evidence can help in revealing the cultural landscape of Amarapura with five main sections: (1) the historical background, (2) the concept of cultural landscape, (2) the natural landscape, (3) the reconstructed cultural landscape of Amarapura (4) boundary, and (5) utilization of landscape. Amarapura was built as royal capital in 18th -19th century CE and nowadays it has been known as Amarapura Township including Mandalay Region.

Historical background of Amarapura

Archaeological evidence has indicated that the area of Amarapura Township located in the southern part of Mandalay has been a settlement for human occupation since the Neolithic period. The Taungthaman site is associated with the Neolithic settlement situated around the U Bein bridge in Amarapura Township. The Taungthaman site was excavated for two seasons in 1971and 1972 by U Seing Maung Oo (Sein Maung Oo 1972: 1). The artifacts from these excavations are stone tools, bone tools, iron objects, animal bones, beads, pottery and human skeletal remains. Taungthaman is typically regarded as the context of Neolithic to Iron Age. Thermoluminescence dates on specimens of pottery and iron give the date on earliest to be 2660 B.P. ± 200, and the latest to be 2360 BP ±235 (Aung Thwin 2002: 24).

Amarapura was the former capital city founded by King Badon of Konbaung Dynasty in 1782 CE (Moe Sat Wathan 2020: 43). King Badon moved the capital from Innwa (Ava) to Amarapura in 1783 CE (Than Tun 1986a: xxiv). King Badon built the capital city of Amarapura with these wishes: (1) for himself (2) for his generation and (3) for his people (Aung Nyein Chan 2007: 203). Amarapura was progressively developed in all cases such as social, economic, political, etc. Bagyidaw (Sagaing Min) ascended the throne when King Badon died in 1819 CE (Than Tun 1986a: xxxi). Unfortunately, the capital of Amarapura was destroyed by fire in 1821 CE (Than Tun 1986b: 364). The north city gate, Parliament buildings, the royal courtyard, Shwetawkyaung , Shwetaung monastery and pahocin (royal tower) were also destroyed by fire. Therefore, King Bagyidaw rebuilt Innwa (Ava) palace and returned to Ava in 1824 CE (Than Tun 1986c: xiii). King Tharawaddy, successor of Bagyidaw, ascended the throne and came back to Amarapura again in 1837 CE (Than Tun 1986c: xiii). Amarapura returned as the capital for the second time after 15 years. King Bagan was proclaimed as king after deposing his father Thrawaddy in 1846 CE (Than Tun 1986c: xiii) at the Amarapura palace. King Mindon ascended the throne from King Bagan in 1852 CE (Than Tun 1986c: xiii) and built up a new kingdom in Mandalay. When King Mindon moved to Mandalay palace, the Amarapura period ended and the city gradually degraded. However, it was still popular according to its historical elements. The valuable historical attributes are still existing in Amarapura Township.

Materials and Methods

The study utilized three methods such as historical records, field survey and qualitative method. Literature survey of historical records can outline the previous research of Amarapura heritage. Field survey can support the intrinsic data of archaeological sites, monuments and the vulnerability of cultural landscape. To conduct a reconnaissance survey around the city, previous records would be useful with the help of historical maps. To discern between the past and the present landscape of Amarapura city, analysis of surveyed data can take a good result for authenticity of Amarapura heritage separated from other historical periods. The analysis of the landscape can provide the examination of ancient boundary through different periods.

Concept of Cultural Landscape

Concerning the cultural landscape, it can be conceptualized as anthropology has culture and archaeology has sites; climatology has climate; ecology has system; and biology has community. (Dincauze 2000: 22). Geo-archaeological investigation of landscape context can explain the subtle reciprocal responses of settlement systems in the cultural landscape and their ecosystems through time (Butzer 1982: 156). Combining both their physical origins and the cultural overlay of human presence, often created over millennia, landscapes reflect a living synthesis of people and place that is vital to local and national identity.

Cultural Landscape can be realized that the study of the way in which humanity has changed the physical appearance of the environment in both present and past. Landscape generally refers to both natural environments and environments constructed by human beings. Archaeology should assert as a discipline that seeks to explain present-day physical and cultural landscapes and should be more actively engaged in ecosystem. (O'Connor 2001: 17) The environment including landscape, settlement and social organization will remain an important investigation for archaeology in dealing with biological and geological aspects (Albarella 2001: 11). The investigation of archaeological sites interrelates human behavior in terms of cultural systems within an environmental context (Driver 2001:47).

The World Heritage Committee identifies three categories of cultural landscape, ranging from (i) those landscapes most deliberately shaped by people, through (ii) full range of 'combined' works, to (iii) those least evidently shaped by people (yet highly valued). The three categories extracted from the Committee's Operational Guidelines, are as follows. 1. A landscape designed and created intentionally by "man"; 2. an "organically evolved landscape" which may be a "relict (or fossil) landscape" or a "continuing landscape"; and 3. an "associative cultural landscape" which may be valued because of the "religious, artistic or cultural associations of the natural element" (UNESCO World Heritage Centre 2019: 83).

The specialty and objectivity of cultural landscape and its formation are often rather difficult to interpret. Explaining by spatial and visual components of cultural landscape may usually change over time by the effects of social and cultural life, like space (Keceli and Kocaman 2014: 432). German geographer, Carl Sauer, defined in 1925s as "Culture is the agent, the natural area is the medium, the cultural landscape is the result. Under the influence of a given culture, itself changing through time, the landscape undergoes development, passing through phases" (Plumwood 2006: 121).

Geographical Setting of Amarapura or Natural Landscape

Amarapura is located 6 miles from the southern part of Mandalay and 4 miles from northeastern part of the confluence of Ayeyarwady River and Dutthawaddy River. It lies between North Latitude 25° 54' and 22° 46' and East Longitude 96° 0' and 96° 3'. It covers an area of 81.11 square miles. It is locally known as Taungmyo (Southern City). Amarapura Township lies in the central lowland area. Two miles east of the township is the Shan plateau. (Cherry Win 2012: 8). Shwekyetyet and Shweyetkya hills which are the southern continuation of the Sagaing-Minwun range is in the western part of the city (Cherry Win 2012: 8). The topography of Amarapura Township is a level plain area.

As Amarapura Township is situated in the Mandalay Region, the temperature and rainfall data are taken from those of Mandalay. The average annual rainfall of the city is below 40 inches (Cherry Win 2012: 8). The average annual temperature of January, the coldest month is 70.67°F, while the average temperature of April, the hottest month is 88.33° F and the range of temperature is 17.66°F (Cherry Win 2012: 16). The plain area, where Mandalay and Amarapura are situated, is built up of Older Alluvium (Cherry Win 2012: 18). The eastern part of the township area is formed of alluvium that was laid down in the past millions of years (Cherry Win 2012: 18). In the western part, it is built up of newer alluvium deposited annually during flood times (Cherry Win 2012: 18).

Cultural Landscape of Amarapura

Cultural landscape is a natural-anthropogenic system, whose main subsystems are men and nature (Andreychouk 2015: 5) (inanimate and natural). In the case of nature elements are constituted by environmental components (Rocks, air, water, soil, biota, etc.), whereas in the case of man by human being themselves, tools (techniques) and products of their activity (houses, cities, dams, roads, stations, power stations, etc.) (Andreychouk 2015: 5). The cultural landscapes of Amarapura period are 1. palace residential sites, 2. water management 3. agriculture and 4. religious monuments and the cemetery.

1. Palace residential area

It is important to note that the Palace was built simultaneously with the building of the seven auspicious structures[1] at seven places of the capital on 9 January 1783 CE (Than Tun 1986a: xxvi). The construction was completed on 5 May 1783 CE (Than Tun 1986a: xxvi). The ancient capital covered an area of 2000 tars (Khin Myint Swe 2016: 13). There were two merlons[2] (Thu-ye-Kho) at every tar[3] distance, therefore, it has totally about 4000 merlons. The height of it was 3 Taung (cubits) and 2 mites. The height of the city wall was 18 Taung (cubits) and 2 mites. There were three city gates on each side of the square palace city, and hence it has totally 12 city gates on all sides (Khin Myint Swe 1992: 3).

Altogether 30 million baked bricks were used in constructing the city walls. The length of the palace was 120 tars from north to south and 137 tars from east to west covering an area of 514 tars (Khin Myint Swe 1992: 4). On the palace platform were spacings -from the steps leading to the principal building called "Myay Nan" to the east where the Dagani (Red Door) was a spacing of 18 tars. It was a spacing of 24 tars from Dagani to Yway Taw Yu door and it was the spacing of 6 Tars from the city wall to the Thit that (wooden defense). Outside the Thit That, the moat was 10 tars in Taung (cubits) in depth (Khin Myint Swe 2016: 13). The brick walls, Thit Tat and the moat were built for the security

1 The Royal Palace, Capital, Moat, Cave, monastery, Library (Pitaka Taik) and Lake
2 A merlon is the solid upright section of a battlement in medieval architecture or fortifications.
3 1 tar=7 taung, 10 feet 6 inches

of the palace. An earthen wall was built in the east of the capital for the security of the capital. The Yarhu corner of city wall inclined inside because it was touched with the That Thay lake. Great stupas namely Shwe Saga, Shwe Lin Pin, Shwe Gon Aut and Shin kyo Shwe Gu were built on each side of the city corner according to astrological prescriptions. Today, it represents the most important points for the palace residential area.

The ancient capital city is now on the verge of extinction due to the arrival of new settlements, the construction of roads, railways and government offices. The moat can be seen only a little on the east side and vague on the other sides. The city walls can be seen only slightly on the south side and no longer on the other sides (Figure 1). Although it had the remains of the palace foundation, its complex is covered with the foundation of the school buildings.



Fig. 1 The ruins of the southern city wall. Photo by Moe Sat Wathan.

2. Water Management

Water management features are also expected to be definable in the peri-urban zone (Macrae and Iannone 2019: 307). In describing the water management of Amarapura, it was widely based on the map and the written record in Royal Order of Burma (ROB).

Firstly, ROB mentions the water management for the city moat:

> "On 14 September 1781, water level in the city moat should be kept high by a constant flow of water through a canal from Zaung Kalaw reservoirs (Than Tun 1986a: xiii)".

Secondly, it describes the water management for agriculture.

> "Myo Wun (Town Officer), Madaya, shall take the example in water distribution from the irrigation system in Koe Khayaing (Nine Districts) of Kyaukse (Than Tun 1986b: 75)".

The irrigation of Amarapura was described with the following five points (Than Tun 1986a: xi):

- Royal Lands have top priority to receive water distributed from reservoirs;
- Canal used for water distribution should be in good repair at all times;
- Water is to be shared among various fields strictly in accordance with the quota mentioned in old records; and
- Works at weirs in Kyaukse area are always given first preference; officers at Kyaukse have the authority to commandeer any man for any emergency (ROB 15 September 1787); and
- Enlarge the width of canals so that they can carry more water for distribution (ROB 24 September 1787).

The important natural and artificial irrigation features are Ayeyarwady river, Myitnge river, Mitsu creek, Kyichaung creek, Shwetachaung canal, Tamotso canal, Kindat canal and Taungthaman-Inn reservoir. Ayeyarwady river, running in a north-south direction, forms a natural boundary between Sagaing and Amarapura Township. The river flows along the western boundary of the Mandalay-Amarapura area. Myitnge river (Dokhtawady) known as Namtu originates from the Shan Highlands and finally joins with Ayeyarwady river near the ancient city of Innwa. It provides the southern boundary between Amarapura Township and Singaing Township, running from east to west. It is an important branch of Ayeyarwady river. Myitnge river passes through the southern boundary of Amarapura Township. The Myitsu creek is a small watercourse near the southern boundary. It flows within steep banks and enters the Ayeyarwady River.

Shwelaung canal is also known as "Yatananadi canal". It is 28 miles long and commences from Chaungmagyi canal. It enters the Ayeyarwady River passing through Taungthaman-Inn reservoir in the western part of Amarapura Township. The purpose of this canal was to supply water to Aungpinle Lake, Nanda Lake and to supply domestic water. Taungthaman-Inn is situated in the south-western part of the township. It is an oxbow lake diverted from Ayeyarwady River. During the rainy season Ayeyarwady River water rises and enters the Taungthanma-In through Taunggyi canal. During the hot season, the water level falls leaving a shallow muddy lake.

3. Agriculture

Agricultural production plays an inherent role in peri-urbanism (Macrae and Iannone 2019: 306). According to the Royal Order of Burma, there was a written record of agriculture. ROB describes about cultivation on 8 June 1801 as below.

> "Gardeners under U Dain Shwe Daung, U Yin Hmu - Chief Gardener, Nanda Wun gardens, shall extend their cultivation from Kauk Kyee Lè Daw - Big Paddy Royal Fields, in the north to Ashay Taw Lè Zu - Patch of Paddy Fields in the East Jungle, Taung Byon, but they should be careful not to transgress on other people's plot of cultivations when they made the extensions". (Than Tun 1986 b: 148)

It can be assumed that all of the cultivated land, cultivator and cultivation process are derived from Nanda Wun (The royal garden). There was the description about the agricultural practices and farming strategies on ROB as below.

> "There have various cultivation plots, viz. *Lè* - land for rice, *Ya* - land for crops other than rice, *Kaing* - land subjected to yearly inundation, *Kaing* - Vegetable Garden subjected to Yearly Inundation, *Kyun* - Vegetable Garden subjected to Yearly Inundation on Riverine Island described in part of ROB 19 May 1801" (Than Tun 1986b: 132)

ROB in 30 May 1801 was

> "On the east of Yè Mun Htaung Boatmen village, a hexagonal plot of land on the south of Thiri Nanda Wun gardens between Myitnge river on the southwest and south and an irrigation canal on the east" (Than Tun 1986b: 140).

In summing up, Processes of agriculture were systematically carried out at that time. The kings tried to increase the cultivation processes in all parts of the kingdom. It needs to explore systematically the land use of agriculture in Amarapura period with the help of technical support.

4. Monuments and Sites

Archaeological monuments and sites of Amarapura period are approximately 100 including religious edifices, royal monuments, royal tombs and cemetery, urban structure, inscription houses, etc (Figures 2-9). According to the inventory of Department of Archeology and National Museum, there are three types of temples and stupa in Amarapura and they are as follows;

- Small temples and stupas lower than 12m in height.
- Medium temples and stupas between 13-25m in height.
- Large temples and stupas are between 26-50m in height.



Fig. 2 Location of palace site and religious monuments. Source: Google Earth.



Fig. 3 **Royal Monument inside the Palace. Source: Photo by Moe Sat Wathan.**



Fig. 4 Nagayone Temple.
Source: Photo by Moe Sat Wathan.



Fig. 5 **Indigo factory. Source: Photos by Moe Sat Wathan.**



Fig. 6 **Exchequer. Source: Photo by Moe Sat Wathan.**



Fig. 7 **Library. Source: Photo by Moe Sat Wathan.**



Fig. 8 **Shwe Gu Gyi monastery. Source: Photo by Moe Sat Wathan.**



Fig. 9 *Kwang Yin Si* **Chinese Temple. Source: Photo by Moe Sat Wathan.**

Historical Boundary

Boundaries are the final characteristics of the peri-urban zone (Macrae and Iannone 2019: 307). The boundary of Amarapura was formed by the natural topographic elements such as the Zaung Kalaw lake to the east, Taungmyint village to the southeast, Taungthaman Inn lake to the south, Shwe Kyet Yat Pagoda to the southwest, Thatthay Inn (lake) to the west, Mandalay Myinwin Min Gyi monastery to the north and Aungpin Le lake to the northeast.

The boundary of Amarapura Urban landscape can be realized by historical records such as historic royal orders, stone inscription, parchment and so on. King Badon chose the area of Hti Baung Ga for the new capital on 10 October 1782 (Than Tun 1986a: xxiv). The boundary of Hti Baung Ga described in Zambudipausaung Kyan (Chronicle of Geography and Administration of Myanmar Kings) is Kyaukmi Milatnwala Tang Yo (the name of mountain range) to the east, Shwe Kyat Yat pagoda to the south, Ayeyarwady River to the west and A Yat Ma Htwet pagoda of Madaya to the north (Than Tun et al. 2005: 97). The boundary of Amarapura City (1782-1853 CE) is Aung Pin Le lake to the east, Shwe Sar Yan Pagoda to the southeast, Ngayan Chanel inside Palace city to the south, Sagaing City to the southwest, Innwa (Ava) to the west, Sagaing City to the northwest, Madaya City to the north and base of Shan Plateau of Patheingyi Township to the northeast (Aung Nyein Chan 2007: 20).

Further, an important question is how these boundaries changed over time. One particular point is that the boundary of Amarapura before 1859 CE is larger than present boundary. It can be assumed that Amarapura became part of Mandalay city when King Mindon moved the new city to Mandalay in 1855 CE.

Modern boundary

The boundary of Amarapura Township is of two kinds; the land boundary and the river boundary. River boundaries are found in the western and southern sides of the township with Ayeyarwady and Myitnge Rivers respectively. The Myitnge River flows from east to west along the southern township boundary to join Ayeyarwady River. The length of the Myitnge forming the township boundary is about 14 miles long. In the west of the township, Ayeyarwady River forms both of Singaing and Tada-U Townships as natural boundary. Ayeyarwady river, flowing from north to south along the boundary is about 6 miles long. Amarapura Township is bounded by Pyigyitagun Township on the east, Chanmyathazi on the north, Patheingyi Township on the north-east, Sagaing Townnship on the west and Singkaing Township on the south (Figure 10).

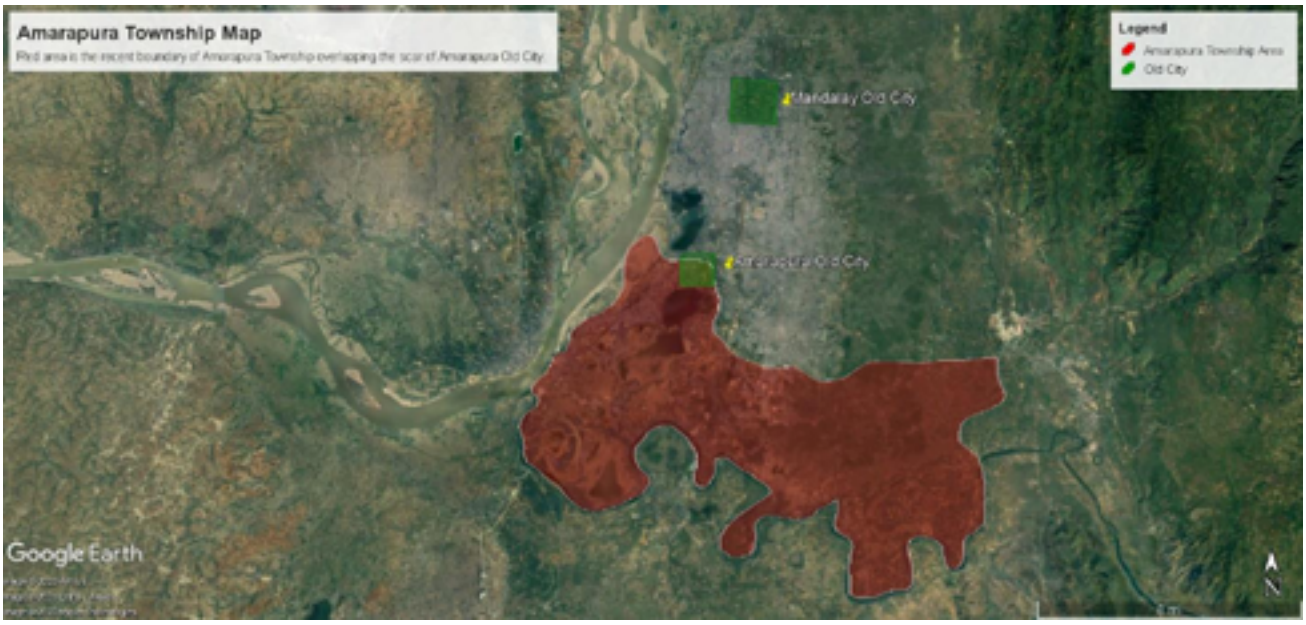


Fig. 10 Modern Boundary of Amarapura. Source: Google Earth.

Historical land-use

Land-use refers to the management and modification of natural environment or jungle into built environment such as fields, pastures, and settlements. It has also been defined as

> "the arrangement, activities and inputs people undertake in certain and cover types to produce, change or maintain it" (Maung Maung Nyunt 2012: 59)

The historical land-use can be described in two points: land-use of the ancient capital city and land use of rural city or peri-urban area. The plan of Amarapura city is a square surrounded by a wall and moat and each side has three gates (see Fig 1 and Fig 11). It also has three roads running north-south and three running east-west dividing the royal city into 12 x12 blocks (Yamada 2019: 36). The royal palace is in the center of the royal city. Yamada (2019) suggested that the land use of Amarapura palace city can be divided into three major categories such as (1) Court, (2) Resident and (3) Utility with five sub-categories (Yamada 2019: 36). It can be assumed that the royal palace is in the center according to the figure of the land-use in the royal city of Amarapura. It was surrounded by 34 court buildings, 15 utility buildings, 7 buildings for religious monuments, 27 buildings for royal family and 38 buildings for officers. The largest quantity of the buildings is for officers and the second one is for the court. And the buildings for royal family tend to be in the southwest and northwest sections. The buildings for officers are in the east, west and south of the palace. And the buildings for court are in the north, east and south of the palace. A few buildings like the court, utility, the buildings for royal family and officers in the north part of the palace can be found. The buildings located in the northern part are less than other sides.

The rural land-use of ancient Amarapura can be counted depending on the ancient map of Amarapura that recorded on the original parchment (Parabeik) entitled *Amarapura Shwe Myo Taw nint Patwonkyin Pya Nalmyay Pon* (Map Showing Amarapura Golden Royal City and Its Environs) (Figure 11, Tun Yi 2019: 170, Tin Naing Win & Haling Hlaing Swe, 2020:229, 230, 233) Three points were described on this Parakeik map: (1) ancient capital, (2) sub-plots with numbering, (3) water bodies. Land-use

of ancient capital was narrow and elongated in the northeast, southeast and southwest of the walled city (Figure 12). There are residential areas and religious land. It described 136 sub-plots in the map; 54 sub-plots for religious land and 122[4] sub-plots for residential areas (Tun Yi 2019: 174). There are more sub-plots to the west and southwest of the capital city. Amarapura is located in the junction of Ayeyarwady and Dutthawaddy Rivers. Moreover, it has Thatthay Inn (lake) and Shweta Chang cannel on the northwest Aungpinle lake on the northeast, Zaungkalaung lake on the east and Taungthaman Inn (lake) on the south of the city. There are some small islands nearby the water body.

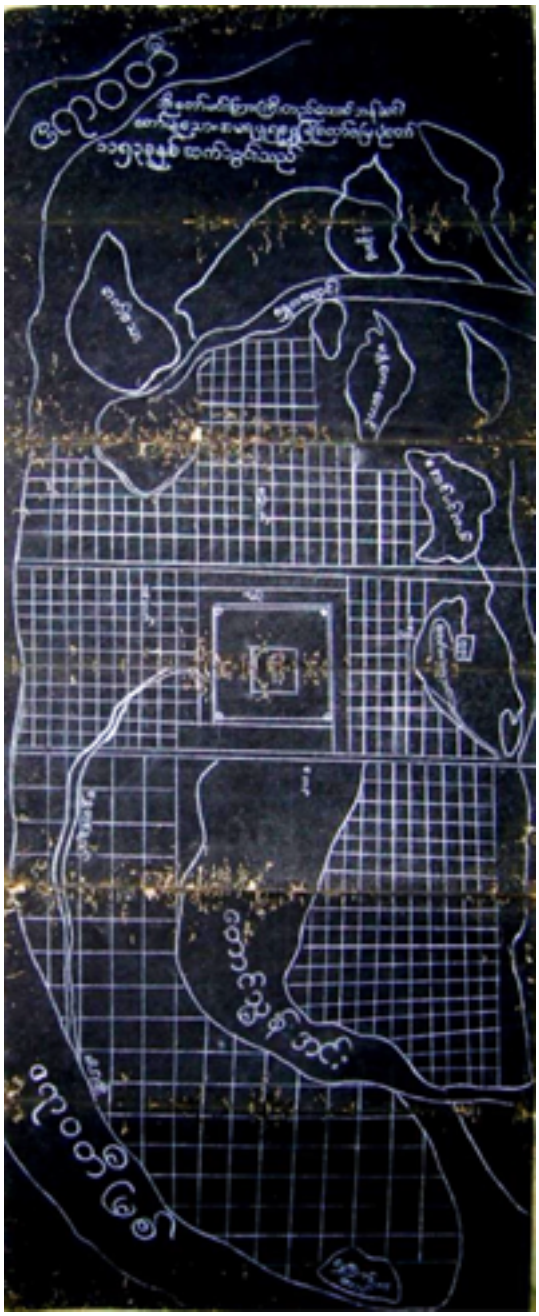


Fig. 11 The Original Black Parchment (Parabeik) entitled Bodaw Mintaragyi Thithaungphan Sin Taw Mu Thaw Amarapura Shwe Myo Taw Myay Pon Taw, 1153 Khu-nhit Set-thwinthi (Royal Map of Amarapura Golden City founded and created by King Bodaw, submitted in 1791 CE). Source: U Pyinnya Collection, Tin Naing Win & Haling Hlaing Swe, 2020:229, 231).

4 According to the 136 lists listed in the book, non-religious wards are considered as residential areas.



Fig. 12 Reproduction of original parchment (Parabeik) entitled Amarapura Shwe Myo Taw nint Patwonkyin Pya Nalmyay Pon (Map Showing Amarapura Golden Royal City and Its Environs) (Source: Tun Yi, 2019, Tin Naing Win & Haling Hlaing Swe, 2020:229, 230, 233).

The agricultural land-use can also be counted with the help of ancient parchments and chronicles like Zambudipausaung Kyan (Chronicle of Geography and Administration of Myanmar Kings). It describes the list of farmlands of Amarapura during the reigns of Myanamr Kings (Tun Yi 2019: 25). According to the table (1), it can be assumed that 3346 pe 18 lun were used for agriculture during the reign of Burmese/Myanmar Kings. The largest farmland is Thirinadar garden and smallest farmland is Athant Hintaw Set village.

No	Name of the villages	Area	Area of Farm land	Area of land in Sq-km[5]
1.	Bon-oh village	327 pe	2 lun	2.316 sq-km
2.	Latpansi village	134 pe	2 lun	0.949 sq-km
3.	Sinya village	53 pe	3 lun	0.375 sq-km
4.	Thaphayoak vilalge	403 pe	2 lun	2.854 sq-km
5.	Thirinadar U Yin Taw (garden)	567 pe		4.015 sq-km
6.	Myitlaung village	512 pe	2 lun	3.626 sq-km
7.	Danon village	104 pe	2 lun	0.736 sq-km
8.	Athant Hintawset village	42 pe	2 lun	0.297 sq-km
9.	Bayekyun village	105 pe		0.743 sq-km
10.	Chin village	136 pe		0.963 sq-km
11.	Shwekyatyat Village	185 pe	3 lun	1.310 sq-km
12.	Taungthaman village	310 pe		2.195 sq-km
13.	Thattay Inn	468 pe		3.314 sq-km
	Total	3346 pe	18 lun	23.696 sq-km[6]

Table 1 Agricultural land-use of Amarapura during the region of Burmese/ Myanmar Kings. **Source:** Based on the source of list of farmlands of Amarapura in U Tun Yi (2019).

Modern Land-use

There are two main points for modern land-use: (1) modern land-use within the royal city and (2) modern land-use for overall boundaries. Firstly, there is one railroad and two motor lines inside the royal city. A rail line is cutting diagonally across the site and dividing the city into two equal parts. This runs between Mandalay and Sagaing and was built by the British Colonial Government between 1885 and 1910 CE (Florence University Team et al., 2016: 209). The Sagaing-Mandalay main road cuts diagonally across the site, mainly in the north-west corner of royal city. Then, the Taungthaman-Mandalay junction road (locally called Sa-ya-pha road), runs north-south and divides the city into unequal parts. The section of the royal city, north-west of the rail line maintains the characteristics of the urban site, in spite of lesser forms of a peripheral suburb. The other section, southeast of the railroad has regressed to an almost rural appearance because of the dense tree vegetation. Nowadays the military headquarters had taken place inside walled city wall of Amarapura.

Present land-use is classified as residential, agricultural, industrial, commercial, public and institutional areas, services, recreational, municipal services, transportation, unused land, and water lands. A table of land-use type of Amarapura Township in 2007 can be seen below.

5 100 pe=175 acres=70.8225 hectares that described in ROB V.p.140 (Therefore it can be assumed as 1 pe=1.75 acres=0.0070820 sq-km)

6 It is not included “lun” because the term for converting lun to pe is unknown.

No.	Land-use Type	Sq.km
1.	Agricultural	144.09
2.	Water Land	26.45
3.	Residential	12.42
4.	Public and Institutional	9.28
5.	Transportation	8.65
6.	Unused Land	1.39
7.	Industrial	1.49
8.	Commercial	1.24
9.	Municipal	0.89
10.	Service	0.89
11.	Recreational	0.85

Table 2 Area of Land-use type of Amarapura Township in 2007. **Source:** Maung Maung Nyunt (2012: 71).

The area under Village tract cultivation is 144.09 sq-kms (55.63 sq. miles) or 70 per cent of total township area (Maung Maung Nyunt 2012: 73). The total area of water is 26.45 sq-kms (10.21 sq. miles) or 12.74 per cent to total township area (Maung Maung Nyunt 2012: 81). Water land area is the second largest after agricultural use. Residential land-use area is 12.42 sq-kms (4.08 sq-miles) taking up 5.98 per cent to total area of the Amarapura Township (Maung Maung Nyunt 2012: 70). Most of the residential buildings in the township are one or two-stories (Maung Maung Nyunt 2012: 71). But recently three and four storey buildings appear along the Sagaing-Mandalay and Yangon-Mandalay Roads, as well as in Amarapura Township and Myitnge indicating the improvement in the social economic conditions of the people (Maung Maung Nyunt 2012: 71).

The area under public and institutional land-use is 9.28 sq-kms (3.58 sq-miles) which accounts for 4.47 per cent of the total township area in 2007 (Maung Maung Nyunt 2012: 76). Religious land-use such as monasteries and pagodas are in all towns and village tracts. Areas under roads, railway line and stations, jetties and whereas are classified as transportation land, totaling 8.65 sq-kms (3.33 sq-miles). An area is rectangular in shape in which major roads and railway (Yangon-Mandalay and Sagaing-Mandalay) are aligning north-south direction and feeder roads running east-west direction. In Amarapura Township, basalt roads, gravel roads and paved roads are found in 2007 (Maung Maung Nyunt 2012: 79).

Unused Land includes muddy areas. The total area of unused land was 1.39 sq-kms (0.54 sq-miles). Industrial land-use covered about 1.49 sq-kms (0.58 sq-miles). Myitnge town has the largest area with 0.62 sq-kms (Maung Maung Nyunt 2012: 74) (0.24 sq-miles) because of the extension of train repair industry, rice mill and cottage industries are located in this area. The total commercial land area covered considerably to 1.24 sq-kms (0.48 sq-miles). It accounted for 0.60 (Maung Maung Nyunt 2012: 75) per cent of the total area of Amarapura Township. The most important business area of the township lies on Sagaing - Mandalay Road and Yangon-Mandalay Road. These main business areas are Theingyizay market and Nandawyar Sanpya Bazaar and Laza Bazaar on Sagaing-Mandalay (Maung Maung Nyunt 2012: 75). These Bazaars with one-storey structures. The Sagaing-Mandalay business area possesses 0.2 sq-km (0.1 sq-miles) of commercial land and Theingyzay area has the largest commercial area of the township (Maung Maung Nyunt 2012: 75).

Municipal land-use accounts for 0.89 sq-km (0.43 sq-miles) or 0.43 (Maung Maung Nyunt 2012: 78) per cent of the total township area. This land-use is found in northwest part of Amarapura Township and beside Ayeyarwady River and Dutthawaddy (Myitnge) River (Maung Maung Nyunt 2012: 78). The area of land-used for services is 0.89 sq-km (0.34 sq-miles) or 0.43 per cent of the total township area (Maung Maung Nyunt 2012: 77). Services appeared in the township recently are Yadanabon University in Taungthaman village tract, Hotels in Lezu ward in Amarapura Town in the year of 2000 (Maung Maung Nyunt 2012: 77). The Township has 0.85 sq-kms (0.33 sq-miles) or 0.41(Maung Maung Nyunt 2012: 77) per cent of recreational land in 2007 because some of the unused area has been transformed to provide the growing people with more recreational area. Parks and playgrounds come under this category. Along Ayeyarwady River in Yindaw and Shwekyetyet village tracts can also be designated as recreational areas (Maung Maung Nyunt 2012: 77).

DISCUSSION

King Badon ordered the ministers to select land for new city under the sign of "Htee Paung Kar" (Khin Myint Swe 1992: 2). Htee Paung Kar is the word that derived from "Hti Baung Ga". Htee Paung Kar means that the king who was ruling there was respectfully offered by a hundred other kings. Royal officials of King Badon pointed out that Amarapura was originally called Pat Pa and was included in the Htee Pang Kar border area (Khin Myint Swe 1992: 2). Moreover, its surface is also found to be smooth level. Therefore, Amarapura can be assumed as a prophesied land of ancient Myanmar. Khin Myint Swe (1992) stated that the establishment of the city of King Badon was due to three facts: (1) he did not want to live on the bloody land of Innwa, (2) Innwa is considered unreliable for the security of his throne and (3) he was about to receive the title of Mayor.

There is a written record of the consideration of choosing the capital Amararpura in Royal Order of Burma in 11 Nov 1837, during the reign of King Thayawaddy. "Princes, ministers, officers, etc. petitioned for considering Amarapura for Royal Residence. They gave two reasons. Firstly, it was the place where the king was born; secondly its founder King Badon (1782- 1819 CE) had had a long reign" (Than Tun 1986c: 206). Moreover, Dr Toe Hla gave a suggestion as to why King Thayawaddy left Ava and movef to Amarapura: "During the reign of King Bagyidaw (Sagaing Min), the first Anglo-Burmese War broke out and Rakhine and Taninthayi were ceded to the British. Due to the history of defeat, King Thayarwaddy seized the throne from his successor Bagyidaw and moved to Amarapura again" (Than Tun 2019: 164).

Historically, King Badon may have chosen Amarapura to establish the new city from astrological and topographical points of view. It is believed that King Tharawaddy re-elected Amarapura as the capital, despite the longevity of King Badon and the displeasure of the defeat of King Bagyidaw in Innwa. The city is surrounded by four hills, and it is in the center of Taungthaman Inn and Myitnge River in the south, Ayeyarwaddy River in the west and Thattay Inn in the north and Aungpinle lake in the east. That natural landscape can provide not only physical aspects for palace security but also sufficient water supply for the city. These facts are reasonable reasons for the kings to establish a new capital at this place.

By comparing the present map and historic map, it is known that the Amarapura boundary is wider than the present boundary. Because Amarapura became the part of Mandalay city when King Mindom

moved the new capital to Mandalay in 1859 CE (Than Tun 1986d: xv). Today, the northern and eastern parts of Amarapura are included in the southeastern part of Mandalay.

The utilization and transformation of the landscape by humans is aimed at proving them with suitable condition of living and development (Andreychouk 2015: 3). The change of land-use is directly proportional to the development of the city. Agricultural areas of Amarapura Township were 147.28 sq. km in 1987 and 144.09 sq. km in 2007 (Maung Maung Nyunt 2012: 81). The water body of Amarapura Township was 28.54 sq-km in 1987 and 26.45 sq-km in 2007 (Maung Maung Nyunt 2012: 81). The above land use comparison is in the same boundary situation. It showed that agricultural land and water land decreased over a period of 10 years (1987 to 2007). It is true that during the Amarapura Period, there was more water land than the present time. According to the map (Map-2), there was a lot of unused land during the Amarapura period. Due to the development process and infrastructure construction, unused land is expected to be smaller than Amarapura Period.

According to the 1783 census, there were 3585 traders, 11472 service men, totaling 15457 (Khin Myint Swe 2016: 15), the biggest population for the capital. During the reign of King Badon, the 1795 census showed that there were 70000 (Khin Myint Swe 2016: 15) houses within the Capital. The increase in residential area is directly proportional to the population growth, it is accurate that the population increase in 1795 from 1783 CE. The total population of Amarapura in 2009 was 185,194 (Cherry Win 2012: 22). Therefore, it can be assumed that the present residential area will be more than that of 1795 CE. It should be considered that the boundary is different when comparing the present's land-use and land-use in Amarapura Period.

CONCLUSION

The cultural landscape of Amarapura can be determined by the socio-economic changes from agriculture and water-management. Amarapura is thought to have been more beneficial than Mandalay according to both of its recent historical remains and its longevity of the kingdom. There is a rail line and two main roads within city. The section of the royal city near the northwest corner maintains urban characteristics. It can be seen that the governmental offices, rural sub-plots and military facilities can be found in other sections of the royal city. The city still has much archaeological evidence, although the royal city and palace complex, a major symbol of the Amarapura period, are obscured by the development infrastructure. Development can be seen in the time perspective, implying a change from one state to another, or on other criteria. While encouraging the development process, management should be taken to ensure that the criteria of historical landscape are not compromised. Landscape management that effectively preserves the historical landscape should be studied in the future.

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Learning more about the praxis of archaeology and advocacy in Southeast Asia

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ABSTRACT

In Southeast Asia, Public Archaeology was generally practiced within the framework of cultural heritage management. Interest and efforts to rescue and protect cultural sites of cultural significance stemmed from the popularity of cultural heritage tourism. For America, the UK, and Europe, the practice of Public Archaeology started out with the intention to garner general public and government support for archaeological research. Throughout decades, theories and practices in the discipline evolved into something more extensive as it has become a subfield in archaeology and its own academic discourse. Public archaeology also gave way to a more mindful practice and has been effective in affecting behavioural change and given a voice to marginalised groups and communities. In recent years, archaeologists working in Southeast Asia have started to actively participate in uplifting the socioeconomic status and well-being of communities nearby archaeological sites. Public Archaeology practiced as advocacy is an emerging field in Southeast Asia and it is important to gather more work related to this.

Keywords: public archaeology, community, social justice, advocacy

INTRODUCTION: How has archaeology evolved to "advocacy work"?

Public archaeology was first mentioned as a term in 1972 (Schadla-Hall 1999). It started out with the purpose to "encourage financial, political, and even volunteer support from the public" (Gould 2016: 5). Archaeologists in America, for example, wanted more national government involvement, stressing how archaeological heritage management needed state support and sponsorship (Schadla-Hall 1999). Both Schadla-Hall (1999) and Gould (2016) wrote that the beginnings of public archaeology were more directed towards preservation, receiving funding, and state legislation. Although government involvement through legislation was flourishing around the world, Schadla-Hall (1999) noted that when it came to decision-making, the general public was still not directly involved. Despite its aim to serve the public, it did not seem like the public – for whom archaeological heritage is being protected for – had a specific role in the process and until the late 1990s, it was the archaeologists' views and ideas that were deemed more important (Startin, cited in Schadla-Hall 1999).

In the late 1980s, scholars like N.J. Merriman wrote that, while majority of the general public see the value of archaeology, most people still did not see its relevance in their daily lives. In a national survey conducted by Merriman in the UK (1989, cited in Schadla-Hall 1999: 151), it was surmised that to "stimulate interest in the subject and care for the archaeological heritage," archaeologists themselves needed to educate the public. It was during this decade that some archaeologists learned the importance of effectively communicating with the non-academic/general public (Schadla-Hal, 1999).

In the late 1990s, a wariness toward enthusiasts practicing their own archaeology developed, nevertheless, other archaeologists continued to see the imperativeness of formally trained archaeologists conducting education and outreach toward the public (McManamon 2000). In the same publication, McManamon made a remarkable point on how all archaeologists are messengers. Every archaeologist has a role to play in the interpretation of data, making it tasteful for public digestion; "we must realise that the interpretation of the archaeological record for general audiences, as well as its protection, is simply too important to leave to others" (McManamon 2000: 6). Thus, we are all responsible for misinformation being spread, so it is optimal we actively data interpretation aimed toward the general public.

For Europe and North America, public archaeology seemed to be evolving every decade since the 1970s and it is possible to relate to the socio-political situation of their countries in their respective timelines (Richardson and Alamansa-Sánchez 2015). With this, public archaeology now means "something far broader than archaeology that is completed to comply with legal and regulatory requirements or paid for by public funds" (Little 2012: 2). By the 2000s, public archaeology started being more involved in community collaboration, heritage tourism and management, indigenous rights and nationalism, doing activities supporting education, social justice, peace, and civil society (Little 2012; Richardson and Alamansa-Sánchez 2015).

Public archaeology is now a subfield in archaeology; it has evolved as its own academic discourse since the 1990s. In general, 'public archaeology' is the "practice and scholarship where archaeology meets the world" (Moshenska 2017: 3). It is "any endeavor in which archaeologists interact with the public and any research (practical or theoretical) that examines or analyses the public dimensions of doing archaeology" (Bollwerk, Connolly and McDavid 2015: 179). Matsuda and Okamura (2011) mention that since the beginnings of archaeology, the discipline had always been involved with the

public or non-archaeologists, since others' lives are affected by its activities and the results of it. But some archaeologists overlooked the importance or role the public played in archaeological endeavors.

By the 2000s, public archaeology worked around affecting behavioural change and giving a voice to marginalised groups and communities (Acabado and Martin 2020; McGuire 2008). Most practitioners seek social justice and reform through the collaboration and knowledge co-production in archaeological research (Acabado and Martin 2020; Little 2012; McGuire 2008; Richardson and Alamansa-Sánchez 2015).

In Southeast Asia, public archaeology has been generally practiced within the framework of cultural heritage management. Interest and efforts to rescue and protect cultural sites of cultural significance stemmed from the popularity of cultural heritage tourism (Shooncongdej 2011). Recently however, archaeologists working in Southeast Asia have started to actively participate in uplifting the socioeconomic status and well-being of communities close to archaeological sites (Danluan and Ledesma 2020; Kintanar and Barretto-Tesoro 2020; Nguyen 2020; Stark 2020). Public Archaeology practiced as advocacy is an emerging field in Southeast Asia, thus it is important to gather practitioners and advocates of this subfield. The subfield is still evolving, and we have a small but growing literature of this kind of public archaeology work in Southeast Asia (Stark 2020). This is why my colleague, Kate Lim, and I decided to host a Session at the 2022 IPPA Congress held in Chiang Mai. We wanted to gather public archaeologists in Southeast Asia, who push for political action and advocacy with the archaeological work that they do.

An excerpt of our Session abstract reads:

> Beyond local exhibits, and hiring local staff during fieldwork, what exactly does it mean to undertake community engagement? Beyond the presentation of archaeological data, how is it interpreted for the public audience? How is the 'community' involved in the interpretation of this data or what is their role in amplifying the significance of the archaeological data? How does this contribute to the daily lives of the community that archaeologists work with? We encourage fellow archaeologists working in Southeast Asia to share their experiences, methods, and reflections behind the praxis that exhibit political action and advocacy in their archaeological work.

Our session consisted of 12 presentations. There were around three more abstract submissions, however we had to decline as we were only given two one-hour blocks. This tells us that more scholars are identifying their work as advocacy and we should continue the discourse.

DISCUSSION: Examples of archaeology practised as advocacy

Social media and/or new media has given the space and opportunity for the non-academic public to share their opinions and knowledge about history, art, archaeology, and many other fields. Two paper presenters in our session discussed the advantages and disadvantages of this new avenue.

Pipad Krajaejun shared a few examples of pages or sites in Thailand where "new narratives and interpretations are broadcasted, reshaping understanding and perceptions of the past in and to society" (Krajaejun 2022). The page Prasat Hin Nai Dindaen Thai educates Isan people about their cultural heritage. The blogger, Archaeologeek, contributes a new archaeological approach, particularly, pop

culture in archaeology. Critical Archaeology, created by the author in 2014, aims to criticize social issues regarding archaeology and history. The YouTube channel Seang Saton Chak A-deed attempts to revise mainstream art history. Through these social media platforms, the general public landscape of archaeology and art history are changing in Thailand. They are decentralizing archaeological information by revealing more diverse information and perspectives. It has since become a source of alternative narratives. Krajaejun mentioned that the Thailand Fine Arts Department has recently adapted to using social media for information dissemination, however they still remain conservative in language and format. In his presentation, Krajaejun highlights the need for centers of information to somehow work like bloggers and popular websites, to reach a wider audience.

Igal Jada P. San Andres, on the other hand, presented a paper on television utilized as an educational tool in the Philippines. Although more than half of the Philippine population is reported to be using the internet, there is still a considerable 32 percent with no access to steady internet (Kemp 2022). For that 32 percent, television and radio are still the source of information for them. For instance, during the COVID -19 global pandemic, rural communities have had to resort to using television for their children's education modules, as the Office of the Undersecretary for Administration of the Department of Education launched "DepEd TV" in October 2020 to help the dissemination of students' modules ("DepEd TV: Schedule, Episodes, Timeslot, and Where to Watch," 2021).

This 32 percent are also the audience of television segments that are "stereotypical" (San Andres 2022). In her presentation she mentioned that "it is in some television segments that 'alternative representations of archaeological themes and ideas in popular culture continue to present a challenge'" (San Andres 2022). Some programs put the commercial value of unearthed cultural properties in the spotlight, rather than their archaeological significance. Her paper analyses public reactions elicited by a specific TV segment, "Fossils for Sale" of *Kapuso Mo, Jessica Soho* (One at Heart, Jessica Soho). It is a highly rated, weekly news-magazine television program. The study of San Andres is a starting point for developing a better understanding of the Filipino public's understanding and perceptions of Philippine archaeology, and the perceptions they hold about the value of cultural heritage. In this case, the study holds relevance since fears of misrepresentation of fossils and artefacts are expressed verbally and in writing (San Andres 2022). It is possible that it would directly contribute to treasure hunting and looting of sites. How does media depiction shape or reinforce alternative ideas about the valuation and stewardship of cultural properties? To better address this, San Andres proposes to do a more extensive study on popular representations of archaeology in local media.

Three presentations, namely: Ivan Cultura and Ame Garong's "You Are Not Forgotten: The Role of Indigenous Peoples in the Recovery of WW2 American MIA in the Philippines;" Atina Winaya et al.'s, "Engaging Community in Ancient Sculpture Research and Preservation: Digitizing the Collection amidst Local Communities in Central Java;" and "Conservation of Archaeological Remains in the Middle of Hindu-Balinese Communities: The Strengths and Weaknesses" of Ni Putu Eka Juliawati, all discuss the value of connecting with members of the local community or the indigenous people of the research area. For Cultura and Garong, the merging of forensic archaeology and ethnoarchaeology became effective tools in the recovery and identification of the American WW2 Missing in Action (MIAs) in the Philippines. They emphasized that active involvement of indigenous communities heavily contributed to the success of recovery missions. Additionally, this gave insight into the indigenous people's narrative of the Second World War.

In Central Java, Atina Winaya and colleagues taught some community members about digitization and its benefits in recording and preserving heritage. The digitization outcomes include the ancient sculptures in digital three-dimensional form, a print-out, and a web-based catalog in progress. It is hoped that the community's access to the digitized collection will be used for preservation, education, and other purposes.

In Ni Putu Eka Juliawati's project, Hindu-Balinese holy shrines are a subject of debate between stakeholders of different sectors. It is one of the many cases wherein living heritage is in conflict with conventional heritage management efforts. Juliawati mentioned that while the local community members do not intentionally damage the artifacts, as it is their custom that the artifacts are a legacy from their ancestors, living heritage still has its weaknesses. In order to strike a balance, a resolution favorable to all sectors can only be met with constant and proper collaboration among themselves.

Norhidayahti Mohamad Muztaza *et al*., agree with the notion that the purpose of archaeology transcends reconstructing the past and sharing information about it. During the panel discussion, Muztaza stressed the vital role archaeology plays "in many aspects of contemporary society such as nation-building, economic development (museum and archaeo-tourism) and education (support critical thinking) to name a few." Here, Muztaza also highlighted museums as significant and powerful institutions for public construction of the past and involvement in archaeology. In her study, even though almost all museums in Malaysia have a dedicated space for archaeological exhibition, the involvement of the public in the interpretation and research of archaeology in the museum sector, is still relatively limited to date. Their team tapped schools to join some excavations, so that students could learn the basic research methods in archaeology. Feedback from that activity shows that it increased the public's general knowledge about Malaysian archaeology.

A bit similar to this method of reaching the public not trained in archaeology is a study I did with Maria Kathryn Purnell. Purnell presented our work as Tuklas Pilipinas Society (Tuklas) – a non-government organization (NGO) composed of volunteer archaeologists and students at the University of the Philippines School of Archaeology. The NGO conducts activities like ArchaeoTrails and Sandbox Archaeology to encourage awareness and appreciation of our past leading us to where we are today. Tuklas' Sandbox Archaeology allows people to experience field methods of an archaeological excavation. Although the pandemic globally forced a halt, it provided an opportunity to reimagine how activities like Sandbox Archaeology could recontinue – migrating to online workshops with customized kits. In the past two years, Tuklas produced several virtual sandbox archaeology activities for children aged 3 to 12 years old. Participants were reportedly enthralled by the cookie excavation and pottery reconstruction activities, but admittedly it has been a challenge assessing how effective the workshops are in building interest among the children to explore more about archaeology afterwards.

The challenge was that there was no steady pool of facilitators or teachers. Although we were able to surmise that creating a regular pacing of the workshops could eventually stabilize the program as we continue revising it. We would like a more in-depth analysis of feedback and evaluation forms to see if this activity is truly enticing archaeology to a young audience. Here, Purnell and I explored this as an advocacy initiative, or a way we can promote awareness and appreciation of the discipline inside and outside the classroom.

Still in the education sector, Arturo Tablan III shared his experience in "Teaching Teachers: Dissemination of Archaeological Information to K-12 Teachers in the Philippines." WhileTablan showed the literature that recognizes the discipline of archaeology recently taking a larger and more inclusive stance when it comes to accessibility of information, there is still, however, a large disparity between archaeological discoveries and what is taught in classrooms in the Philippines. In 2021, the *Kapisanan ng mga Arkeologist sa Pilipinas, Inc.* (KAPI) - the official guild of archaeologists in the Philippines - attempted to bridge this divide through an online lecture series aimed towards educating primary school teachers. The 3-day webinar series included lectures by archaeologists. It provided downloadable teaching modules that inform on the most recent archaeological findings. In his presentation, Tablan discussed the KAPI K-12 webinar program from the planning stages to daily execution, and post-event assessments. Based on the post-event surveys, Tablan found that interest in archaeology is high as a form of identity building, despite the lack of specific and updated information on Philippine archaeology. However, the participants were overwhelmed by the breadth of information shared by the archaeologists. With this, Tablan recommends consistent information dissemination to encourage archaeological appreciation in educators for more effective knowledge transfer to students. It is Tablan's hope that the K-12 lecture series is seen and replicated by other public archaeologists, as a vehicle for information dissemination and possibly to encourage greater community engagement in a classroom setting.

As mentioned earlier, museums play a vital role in educating the public. In his presentation, Rodolfo M. Dela Cruz discusses his experience in building a community museum. "A community museum is defined as a specialized museum that exhibits and gathers for specific identity groups and/or geographic areas" (Dela Cruz 2022). Most community museums in the Philippines are found inside an old house, an institution, or a *barangay* (a small territorial and administrative district forming the most local level of government). Dela Cruz revealed that the emergence of community museums in the Philippines may be directly connected to social movements noting that their heritage was largely absent from the national context. "The lack of social representation from these places urged them to open small and locally focused museums" (Dela Cruz 2022). A vital factor to consider is how local museums are now acknowledged by mainstream museums as an avenue to reach locals through partnerships and programs developed. Dela Cruz notes that presently, "these museums are developing as dynamic and inclusive spaces for preserving diverse and multi-layered cultural heritage, and exhibiting popular histories." Truly a practice of advocacy work, these museums, developed by local communities, "are freely reachable to all and play a major role in safeguarding and promoting their vanishing heritage, making them relevant in today's changing world" (Dela Cruz 2022).

Two speakers were unique from the rest of the panelists, as they presented intriguing insights and methods. Hermine Xhauflair *et al*. worked with a Filipino migrant community in Barcelona, Spain. Xhauflair explained that migrants constitute a category of society rarely exposed to new data generated by archaeology. In addition to that, "when they are exposed to archaeological and ethnographic data from their country of origin, migrants living in countries such as those in Europe and the Americas, are presented with information on their heritage by museums whose curators have sometimes never even set foot in the country they are portraying" (Xhauflair *et al*. 2022). Migrants around the world have denounced this practice and they seek platforms to speak about their mixed heritage. In Chiang Mai, Xhauflair presented results from a joint project called "Pamana: Voices of Philippine Heritage," conjointly conducted by researchers and members of the Philippine community in Barcelona.

Together, they organised guided tours and workshops at the Museum of World Cultures in Barcelona and created an exhibition linking the past to the present through the theme of migrations, "Movements and Trajectories of the Philippine Identity." Their team closely collaborated with other scholars and the Philippine community, wherein activities and content were "designed to integrate the voice of Filipino migrants in the discourse on heritage of their country of origin, as well as the voices of researchers, members of ethnic minorities, artists, officials, and Filipino researchers" (Xhauflair *et al*. 2022).

Fascinating observation done by Xhauflair's team, during discussions with members of the Filipino community in Barcelona a repeated commentary is that they felt like second-class citizens. "At the same time, despite the fact that the archipelago was once a Spanish colony, it became increasingly clear that Catalan people were largely ignorant of Filipino past and present cultures" (Xhauflair *et al*. 2022). The project's aim was to empower, to encourage a feeling of pride in members of the immigrated community and stimulate a reflection about its members' identity(ies). This reflects an advocacy towards empowerment and hopefully the integration of people of Filipino origin in Europe.

Lastly, another unique approach is Anna Karlström's exploration of the resistance to engage or collaborate and how this could be translated as protection of Cultural Heritage. In her presentation, Karlström contends that "community engagement is not only about including the local community in the interpretation of the past," and the resistance of a community itself should be taken into context. A good example of this is among living heritage sites wherein contemporary uses of sites and objects might conflict with the official heritage discourse and its aim to protect and preserve. In her years of work, Karlström observed "non-violent and more subtle forms of resistance in relation to heritage protection," i.e. "resistance by marginalised groups and local communities who intentionally choose to remain on the fringes," developing other possible strategies for "heritage protection and temporary stewardship that are not accepted within conventional and official heritage management" (Karlström 2022). This presentation urges archaeologists and heritage practitioners to see "heritage protection through resisting protection" that we passionately work toward (Karlström 2022). An example Karlström presented is how World Heritage designation implies protection of certain conventional, often material heritage values, "whereas communities resisting World Heritage designation can also lead to protection of other heritage values, embedded in, for example, living and religious heritage."

CONCLUSION: Moving forward

PPA Session 17, "The Praxis of Archaeology and Advocacy in Southeast Asia" proved to be a valuable addition to the growing discourse of archaeology as social and political action, thus transcending as advocacy work. Our call for presentations was a challenge to all scholars working on public archaeology to show what it means to undertake community engagement. It was a challenge to reflect on how we interpret for the public audience. It was also a challenge to expose how the 'community' was actually involved in the interpretation of this data.

Krajaejun and San Andres showed how popular culture and mass media are able to connect with the general public and therefore captivate the audience with their language and way of presenting. The academically trained archaeologists must then devise a strategy to communicate using this language and medium. Cultura and Garong, and Winaya *et al.*, recognize that listening to indigenous and local communities can actually lead to the success of better data collection and thus interpretation of results. Ni Putu Eka Juliawati's Hindu-Balinese monuments predicament can only be solved through amicable

balance among all stakeholders. Muztaza *et al.*, Purnell and Kintanar, and Tablan demonstrated the importance of hands-on activities and interactive methods so that archaeologists can be aligned with the education sector. More learning occurs when students and educators experience it themselves. Dela Cruz presented that alternative ways to exhibit contribute to a more valuable museum, where it is the effort of the community that bonds the structure. Xhauflair *et al.*, offered a platform to a Filipino migrant community seeking representation with their mixed heritage. Karlström ties the whole assemblage by reminding us that sometimes resistance or no response from a community might actually be their way of preserving their archaeology, heritage, or culture.

Part of being a good researcher, or in this case, archaeologist, is also being able to truly listen to the people you collaborate with. If advocacy is an activity by an individual or group that aims to influence decisions within political, economic, and social institutions, then it is our responsibility to respect and understand the perspectives of the different sectors we continue to work with. Archaeology after all is part of the humanities (or social sciences, depending on where you study). Archaeology as advocacy must then be more sensitive to the needs and wants of the community we are visiting for archaeological research.

The session may have been dominated by work in the Philippines, but it may be attributed to the session organizers being Filipinos. However the representation of Thailand, Indonesia, and Malaysia also shows how this is a discourse that should be continued and made more widespread. For the discipline of archaeology to survive, we must work to stay relevant to present times. The public archaeology that we practice must also be relevant to the context and situation of the communities we work with.

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Geospatial Data Presentation of Wooden Coffin Burial Sites discovered during Guthe's Philippine Expedition (1922-1925)

Presentasyon ng Geospatial na Datos ng mga Lugar na may Kahoy na Kabaong na Natagpuan nung Expedition sa Pilipinas ni Guthe (1922-1925)

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ABSTRACT

Guthe's Philippine expedition from 1922 to 1925 resulted in the discovery of 542 archaeological sites across the archipelago. Out of these, 26 sites have been identified to contain wooden coffin remains. Using GIS, a geospatial data presentation of these sites is generated to view site distribution, revealing all of them to be near the coast, implying association with coastal populations. This work reveals a need to integrate old and new data on wooden coffin burial finds to come up with a comprehensive understanding of populations who practiced wooden coffin burials in the Philippines. A geospatial overview of these sites may also aid in predicting the location of currently undiscovered archaeological sites.

ABSTRAK

Ginanap ang expedisyon ni Carl Guthe noong taong ika-1922 hanggang 1925, na naging resulta ng pagtuklas ng 542 arkiyolohikal na sayt sa Pilipinas. Mayroong 26 na lugar na tinukoy na naglalaman ng mga labi ng kabaong na yari sa kahoy. Gamit ang GIS, binuo namin ang distribusyong geospatial, at natagpuang lahat ng ito'y may kalapitan sa dagat. Maaaring pinapahiwatig nito ang matinding kaugnayan ng paraang paglibing na ito sa mga taong naninirahan sa baybayin. Pinapakita nitong artikulo ang pangangailangang patuloy na pagtambal ng mga luma at bagong datos ukol sa mga kahoy na kabaong, na magpapalawak ng ating pagkaunawa sa mga sinaunang komunidad sa Pilipinas na gumagamit ng kabaong na yari sa kahoy. Maaari ring makaambag ang paraang distribusyong geospatial sa pagtuklas ng iba pang mga arkiyolohikal na sayts.

Keywords: Guthe collection, Philippine expedition, GIS, wooden coffins, burials, coastal burials | koleksiyon ni Guthe, expedisyon sa Pilipinas, GIS, kahoy na kabaong, libingan, libingang baybayin

INTRODUCTION

The Philippine expedition was a 3-year exploration led by Carl Guthe under the auspices of the University of Michigan from 1922 to 1925, with the goal of exploring prehistoric burials across the archipelago as well as the collection of oriental tradeware (Guthe 1927). Guthe also hired and trained agents to acquire archaeological materials for him (Sinopoli 2013). This exploration resulted in the recovery of numerous archaeological materials from 542 sites, all of which are mortuary contexts. The collected specimens, along with Guthe's field notes and object catalog were shipped to the University of Michigan Museum of Anthropology, making up the Guthe collection.

This collection proved to be a valuable resource in Philippine archaeology owing to the vast number of artifacts collected across several sites as well as the detailed records and reports that come with it at a time when treasure hunting activities were still not as widespread as it is today in Southeast Asia (Sinopoli 2013). While well-documented, there is inherent bias in this collection brought about by the exploration's partiality towards tradeware ceramics and probably other materials of antiquarian interest (Sinopoli 2013). Nevertheless, artifacts from this collection have been the subject of various research concerning Philippine archaeology, such as artificial cranial modification (Clark 2014), ceramics (Sinopoli 2006; Yao 2013), symbology and belief systems (Barretto-Tesoro 2020), and dental inlays (Estrella 2021), among others.

The wooden coffin burial tradition has been practiced in Southeast Asia since prehistoric times (Tenazas 1973), displaying distinct variations in coffin form and associated mortuary rituals across the region (see Liem 2005; Beavan et al. 2012; Pumijumnong and Wannasri 2015; Wardaninggar 2021). Based on ethnographic records on indigenous burial practices, Barretto (2000) identified three coffin types in the Philippines: dug-out, made of bamboo splits, and made of wooden planks. Through an archaeological survey, Canilao (2012) also identified three burial coffin traditions in the Philippines highlands.

Guthe and his agents found several coffins across the Visayas and Mindanao islands. Most of these were not collected due to them being fragmented or in very poor preservation conditions. Most bones and other organic materials that may have been associated with these burials were either disturbed or poorly preserved. One of the sites, C0.064, was reported to contain a recent coffin. Some of the sites also contained contemporary materials, such as "coconuts, remains of candles, and small offerings of money and ornaments" (Guthe 1927). These imply that some of the sites were still in use at the time of Guthe's arrival.

Due to the old wood effect, wherein the tree may have been felled long before it was used as a funerary receptable, the coffins cannot be directly dated. Reported dates for wooden coffin burial contexts are usually based on the associated grave goods. However, some grave goods, such as porcelain, could be heirlooms and thus the associated burial may be younger than assumed (Neri et al. 2022).

While most of the coffins were not collected, the Philippine Expedition's object catalog details the location of the sites, as well as the various artifacts and materials that have been found. Even though specific coordinates for the sites were not provided, these can be approximated using the disclosed location information. This work aims to use Geographic Information Systems (GIS) to investigate the distribution of wooden coffin burial sites found during Guthe's expedition.

Geographic Information Systems in Old Collections

The constant accumulation of artifacts and other materials through the years has crowded museum and institutions, causing a "curation crisis" (Marquardt et al. 1982). Martinez et al. (2022: 8) describes this as "characterized by the lack of funding, unstable collections storage conditions, lack of proper collections and/or preservation of field documentation, loss of contextual information, and the lack of storage space". This has rendered some materials, especially old collections inaccessible for research (O'Gorman 2007), losing valuable information that could be potentially gleaned from these collections. Various solutions have been proposed, such as deaccessioning and selective or no-collection of artifacts (Kersel 2015; Childs and Benden 2017). However, this has been deemed problematic given that some artifacts initially considered not relevant for research may reveal important information through future technologies and methods (Bawaya 2007).

As an answer to the issue of accessibility in older collections, O'Gorman (2007) proposes the use of GIS technology in collections management as a solution. The value of archaeological data rests on how well it could be contextualized across space and time, thus emphasizing the importance of chronology and location when interpreting such data. Hence archaeologists have recognized early on the value of spatial information in the practice (Wheatley and Gillings 2002), filling up archaeological repositories with old maps and other physical documents detailing location and landmarks. Using GIS, location information from these old collections can be entered into a database and be integrated with other data concerning the site, such as digitized reports, artifact lists, and field notes. Different layers representing different variables can also be overlapped to create a thematic map, allowing the detection of overarching patterns in the data (Esteves 2011).

Using geospatial databases will "enable data-intensive methods and big data approaches in archaeology" (Gupta et al. 2020). This will allow the management and analysis of large datasets, however, the interpretive value for such an approach also lies in data quality and data availability (Gatigglia 2015). In the context of collections management, this will address issues in the continuing disintegration of old documents, inventory management, and unnecessary handling of artifacts.

Thousands of archaeological materials have been collected during the Philippine expedition (Guthe 1927). Creating a spatial database for the discovered sites and recovered archaeological materials, as well as integrating new data, using GIS could potentially reveal a narrative or pattern that was not possible to uncover with past technology, as well as ensure the long-term preservation of data from this collection.

Methodology

542 sites were documented during the Philippine Expedition. The object catalog documents 26 sites where wooden coffins or coffin remains were found (Table 1). Five of these sites were reported by agents who brought or sent the specimens to the laboratory. The catalog does not include site coordinates and were thus approximated based on the reported municipality or province where the site was found. These coordinates were entered into a GIS application to display site distribution in a Philippine map (Figure 1).

Site	Location	Site Type
B0.052	Barrio Conisad, Siquijor	Overhang
C0.005	Dinago Island, Surigao	Cave
C0.011	Sukgong Cave, Bohol	Cave
C0.016	Majaras Cave, Samar	Cave
C0.034	Cave 34, Larena, Siquijor	Cave
C0.047	Sitio Malibon, Barrio Mataba, Municipality of Aroroy, Masbate	Cave
C0.048	Sitio Catincau, Barrio Mataba, Municipality of Aroroy, Masbate	Cave
C0.05	Sitio Ilihan, Barrio Uson, Municipality of Dimasalang, Masbate	Cave
C0.053	Bantayan Island, Cebu	Cave
C0.054	Jilantangan Island, Cebu	Cave
C0.058	Sitio Paulang-agau, Barrio de Parang-Parang, Municipality of Cantilan, Surigao	Cave
C0.062	Kabulao Point, Bohol	Cave
C0.069	Puigan Cave, Bacuit Bay, Palawan	Cave
C0.072	Barrio Cambalagio, San Juan, Siquijor	Cave
C0.073	Barrio Campalanas, Lazi, Siquijor	Cave
C0.075	Malipano Island, Davao Gulf	Cave
C0.076	Barrio Mamurigao, Bacul Point, Davao	Cave
C0.08	Barrio Sagod, Badajoz, Tablas Island, Romblon	Cave
C0.081	Barrio Majabang Baybay, Badajoz, Tablas Island, Romblon	Cave
C0.082	Barrio Cabaong, Badajoz, Tablas Island, Romblon	Cave
C0.084	Brought by agent; specimen from Barrio Buyoc, Valencia, Bohol	Cave
C0.085	Brought by agent; specimen from Barrio Dao, Tagbilaran, Bohol	Cave
C0.094	Brought by agent; specimen from Barrio Payajan, Baclayon, Bohol	Cave
C0.099	Sent over to lab; Barrio Taboilan, Tuburan, Cebu	Cave
G0.084	Maria, Siquijor	Overhang
G0.167	Brought by agent; specimen from Barrio Limoco, Valencia, Bohol	N/A

Table 1 List of wooden coffin burial sites documented in the Philippine Expedition Object Catalog.

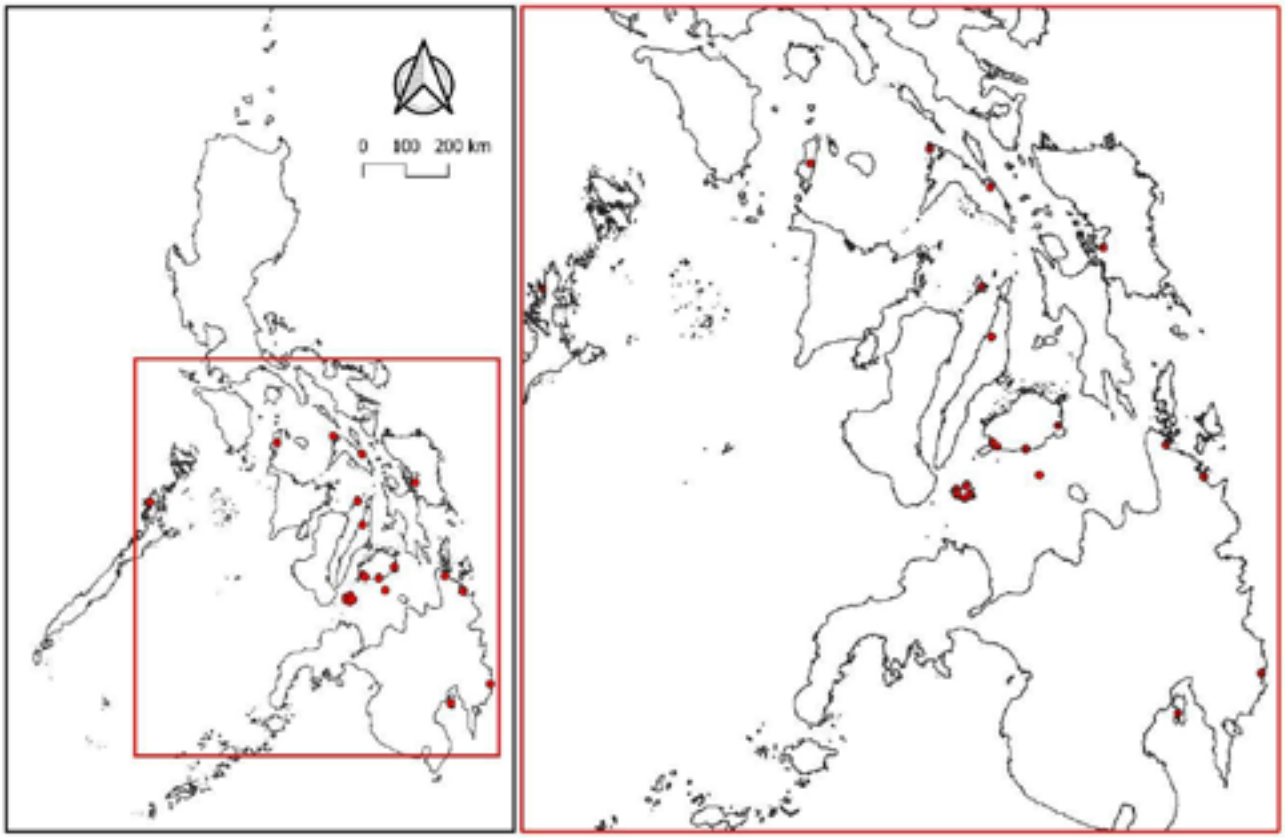


Fig. 1 Distribution of coffin burial sites documented during Guthe's Philippine Expedition.

The municipalities and provinces within the scope of this paper are based on the current administrative boundaries in central Philippines. These noted locations match the names of the municipalities and provinces in the Philippine expedition object catalog where wooden coffin remains have been reportedly found. The geographic coordinates for these were sourced using Google search and encoded into an excel spreadsheet to be saved as a CSV file. This file is uploaded into QGIS, an open-source GIS application, to plot the positions and distribution of these sites across a Philippine map. Layers for elevation and other variables can be added but for the purpose of this paper, layers are kept to a minimum to focus on clearly presenting the distribution of these sites across central Philippines.

DISCUSSION

One of the challenges encountered in plotting the site locations in this paper was going through the names of the municipalities and provinces as geographical boundaries may have changed within the last 100 years. Regardless, this attempt to generate an overview of the wooden coffin burial sites discovered by Guthe and his agents using GIS have allowed for the identification of relevant patterns in the data, guiding decisions on analysis and interpretation.

The Philippine expedition covered the Visayas and Mindanao islands, thus, there is no data for Luzon. All sites appear to be near coasts, implying that the coffin burial culture in the Philippines is associated with coastal populations. However, it was also likely that Guthe's explorations were limited to coastal areas due to logistical and chronological constraints.

Following early archaeological explorations in the Philippines, consequent explorations found more wooden coffin burial sites across the archipelago (Burton 1977; De la Torre 1996; Pineda at al. 2022). Unfortunately, most of this information is locked in gray literature. In Luzon, wooden coffins have also been found in highland areas (Solheim 1959; Peralta and Legaspi 1968; Aromin 1985; Canilao 2012).

Based on more recent literature on wooden coffin burials in the Philippines (Burton 1977; De la Torre 1996), variation in coffin form and design is apparent. As Tenazas (1972) pointed out, the geographic nature of the Philippines is "not favorable to cultural uniformity". This could not be demonstrated using data from the Guthe collection alone since most of the recovered coffins were badly weathered or were mere fragments, rendering spatial distribution by coffin type not possible. Using GIS technology would allow for the integration of new data from recent research on wooden coffin burials in the Philippines to data from old collections. This will enable a more expansive understanding of the wooden coffin burial culture in the Philippines and perhaps be used to predict the location of other archaeological sites.

CONCLUSION

Spatial information is a crucial component in archaeological research. Applying GIS technology enables the integration of different data sets from various research, potentially revealing overarching patterns and allowing for the prediction of yet unlocated sites that could have not been possible with past technology. A geospatial data presentation of identified wooden coffin burial sites from the Philippine expedition catalog reveals the sites to be in coastal areas. Seeing that the expedition was limited to the central Philippines, there is a need to integrate data from more recent research on the subject to include newly discovered wooden coffin burial sites. Coffin form and other data can be added as well for a comprehensive understanding of the populations who practiced wooden coffin burials in the Philippines.

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Enquiring the two transcendent Buddha statues of Cham art belonging to the Vijaya state in the 11th to 13th centuries
Tìm hiểu hai pho tượng Phật Chàm bằng đá thuộc Tiểu quốc Vijaya thế kỷ 11-13

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ABSTRACT

Although the stone sitting Buddha statue from the Thủ Thiện temple has been documented by French scholars since the early 20th century, the Buddha figure currently on display at the Đà Nẵng Museum of Cham Sculpture remains a mystery in Cham Buddhist art from the 11th to 13th centuries. In addition to the other stone Buddha statue in meditation position on display at the Museum of Fine Arts in Ho Chi Minh City, these masterpieces are a challenge for modern Cham Buddhist art historians. This paper will argue that the Thủ Thiện's Buddha image is Amoghasiddhi based on his hand gesture in *abhaya-mudrā* (gesture of fearlessness); while the other one is Vairocana with his hand gesture in *bodhyāgrī-mudrā* (the fist of wisdom). These two transcendent Buddhas may lead to the assumption that esoteric Buddhism was once practiced in the Campā kingdom during the Vijaya art period in the 11th to 13th centuries. It may also indicate the cultural relationships between Campā and the other Buddhist states during the time of esoteric Buddhism spreading throughout the entire Maritime Asia.

Pho tượng Phật ngồi bằng đá thuộc di tích Thủ Thiện, Bình Định, đã được các học giả Pháp tìm thấy vào đầu thế kỷ 20; sau đó, tuyệt phẩm này đã được chuyển về trưng bày tại Bảo tàng Điêu khắc Chăm Đà Nẵng, tuy nhiên pho tượng này vẫn ẩn chứa nhiều bí ẩn chưa được tìm hiểu cho đến nay. Ngoài ra, một tuyệt tác điêu khắc đá khác cũng thể hiện đức Phật ngồi trong tư thế thiền định, đang trưng bày tại Bảo tàng Mỹ thuật Thành phố Hồ Chí Minh cũng thuộc thời kỳ Vijaya vào thế kỷ 11-13. Cả hai pho tượng vẫn còn là một thử thách đối với các nhà nghiên cứu nghệ thuật Campā trong việc thẩm định nội hàm của chúng. Tiểu luận này đặt giả thiết bức tượng Thủ Thiện là hình ảnh của đức Phật Amoghasiddhi dựa trên tạo hình ấn quyết *abhaya-mudrā* (vô uý thí); đồng thời giả định rằng đức Phật của Bảo tàng Mỹ Thuật TPHCM là Vairocana dựa trên ấn quyết *bodhyāgrī-mudrā* (trí huệ ấn). Hai pho tượng Phật này đưa đến nhận định rằng Phật giáo Mật tông từng được thực hành phổ biến tại vương quốc Campā vào thời kỳ Vijaya thế kỷ 11-13. Nhận định đó đồng thời phác họa mối liên hệ Phật giáo giữa Campā và các quốc gia khác trong suốt thời kỳ Phật giáo Mật tông phát triển, dựa trên mạng lưới hải thương châu Á đương thời.

Keywords: Campā Kingdom, Vijaya State, Esoteric Buddhist sculptures, Amoghasiddhi, Vairocana | Vương quốc Campā, tiểu quốc Vijaya, điêu khắc Phật giáo Mật tông, Amoghasiddhi, Vairocana

The sandstone sitting Buddha at the Museum of Fine Arts in Ho Chi Minh City

The sandstone sitting Buddha sculpture is currently on display with the accession number BTMT.203 and was believed to be a Buddhist sculpture originated from southern Vietnam, dating to the 12th century as reflected in the artifact annotation at the Museum of Fine Arts in Ho Chi Minh City (MFA-HCMC). However, the sculpture was sourced from the History Museum in Ho Chi Minh City (HM-HCMC), and was documented with accession number BTLS.6000, and described as headless and location unknown in the HM-HCMC's archives in June 1983; it was then moved to enrich collections of the MFA-HCMC in 1986, and has been integrated into the MFA-HCMC collections since it officially opened in 1989[1]. The sitting Buddha statue is made of sandstone, dimensions are 64 cm high, 61 cm wide, and 40 cm deep.

The Buddha image wears a thin robe draped over the left shoulder, leaving the right shoulder bare, with the drooping edges created by successive thin ridges; the entire folds of his robes on his body are finely sculpted in vertical lines, as can be seen on his legs. Meanwhile, the robe is clinging to the body, revealing the body curves underneath, this style is sometimes called the 'wet look'.

He sits in the *sattvaparyaṅka* posture with the right leg on top of the left; his seat is a single-tiered lotus with delicately carved round lotus petals; he holds his hands at chest level as a *mudrā*, notably that the three middle fingers of the right are interlocked between the two middle fingers of the left, the remaining fingers interlaced as natural (Figures 1 and 2).



Fig. 1 The Buddha statue on display at MFA-HCMC. Photo: Nguyễn Thị Tú Anh.

1 I would like to thank the authority of History Museum in Ho Chi Minh City for this information.



Fig. 2 Hand gestures seen from the front, right and left side of the statue. Photo: Nguyễn Thị Tú Anh.

Stylistically, the hand gestures were first documented in the Buddha sculpture found in the Đồng Dương *vihāra* by French scholars in 1902 (Figures 3 and 4); the gesture has been called *bodhyāgrī-mudrā*, also known as the gesture of the 'peak of enlightenment'. This typical *mudrā* is a symbol of Jina Vairocana as seen in some Buddhist traditions in East Asia; for example, the colossal bronze Buddha of the United Silla period remains in the Kyôngju area in Korea, dating back to the latter half of the 8th century; the term '*bodhyāgrī-mudrā*' has thus become familiar to scholars whenever referring to the *mudrā* of Vairocana of Buddhist visual art in their works (Snellgrove 1978: 235, plates 180).

Despite the assumption of uncertain terminology mentioned in the archival photograph of a colossal body of Jina Vairocana in *bodhyāgrī-mudrā*[2] or *vajra-mudrā*, the *bodhyāgrī-mudrā*[3] with interlocking hands was probably familiar to the Cham craftsmen from the 9th century onwards (Baptiste 2019: 345–346). Since then, the Cham esoteric Buddhist traditional art has perhaps been slightly adapted in the later centuries, such as the Buddha statue of the MFA-HCMC.

This *mudrā* also suggests the title for this sculpture as Jina Vairocana with his hands held in *bodhyāgrī-mudrā*, positioned in the center of a Vajradhātu-*maṇḍala*, who is the original of the five transcendent Buddhas of esoteric Buddhism (Kiyota 1968: 31–39). Its specific art stylistic and material can be assumed to be one of the works originating from the workshops in the ancient Campā Vijaya state in the 12th to 13th centuries.

2 Vietnamese: trí huệ ấn; Chinese: 智慧印
3 Vietnamese: trí quyền ấn; Chinesse: 智拳印



Fig. 3 Archival photograph of a colossal body of Buddha Vairocana (?) in *bodhyāgrī-mudrā* among architectural fragments at Đồng Dương. **Source:** École française d'Extrême-Orient, Paris, fonds Vietnam VIE 00344_b.



Fig. 4 Detailed the Buddha Vairocana (?), in *bodhyāgrī-mudrā*, dated back to late of the 9th century (c. 875 CE); being looted from the Đồng Dương vihāra, Quảng Nam. Photo: Courtesy of P. Baptiste.

The sitting sandstone Buddha at the Đà Nẵng Museum of Cham Sculpture (DNMCS)

The headless Buddha sculpture was found by Lucien Escalère in 1935 at a site belonging to Thủ Thiện village, Bình Nghi commune, Tây Sơn district, Bình Định province; this site was located near the Thủ Thiện temple in the Cham Vijaya state; Escalère thus suspected the Thủ Thiện temple was a Buddhist monument based on this sculpture and many other works found at this site (Chronique de l'année 1935: 471). The statue's dimensions are 72 cm high, 80 cm wide, and 47 cm deep; and it is made of grey sandstone (Figure 5).



Fig. 5 The Buddha statue found at the Thủ Thiện temple on display at DNMCS. **Photo:** Nguyễn Thị Tú Anh.

That suspicion is supported by Jean Boisselier (1963: 275–277) with his assumption that this Buddha statue may belong to the Thủ Thiện temple; Boisselier (*ibid*.) strengthened the relationship between the Buddha statue and the Thủ Thiện temple by making comparisons with the sandstone carving high altarpiece adorned on the western interior brick wall of Thủ Thiện temple (Parmentier 1909: 179–184, plate 124), including:

1/ Ten images of bodhisattvas are arranged in a pointed arc; those are bust figures with their hands folded across their chests, their heads wearing four-tiered *kirīṭa-mukuṭa*, and jewellery around the neck, shoulders and wrists (Figure 6). The ten bodhisattvas appearing in the altarpiece perhaps symbolize the ten Earths of enlightenment (*daśabhūmi*) mentioned in esoteric canonical scriptures (Wayman and Tajima 1992: 303–5);

2/ Two Inner Offering Bodhisattvas (?) standing in god pose with two hands resting on knees, behind are two layers of pointed halo, wearing four-tiered *kirīṭa-mukuṭa* on the head; jewellery around the neck and arms (Figure 7);

3/ Two *makara* heads with a figure holding a sword appear in their mouth, reflecting a traditional style of the Đồng Dương Buddhist art (Baptiste 2019: 347, fig. 7)[4]. It should be noted that the high altarpiece of Thủ Thiện temple is the only work remaining in Cham art.

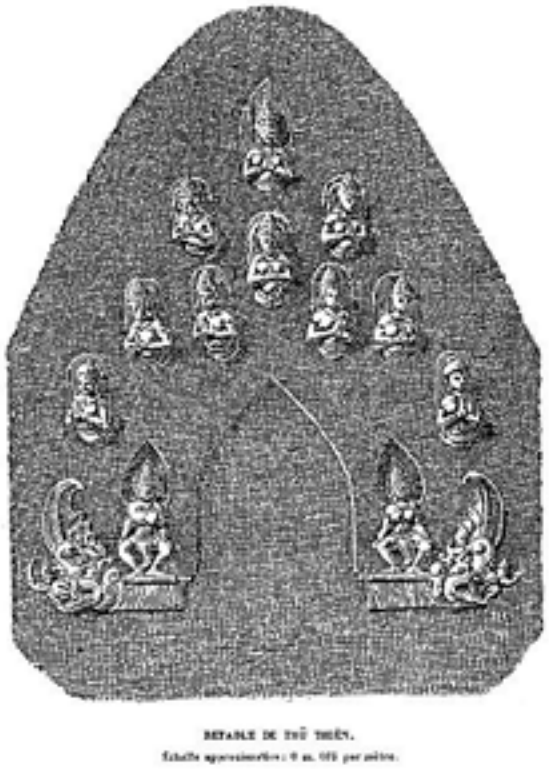


Fig. 6 Sandstone altarpiece installed on the western interior brick wall of Thủ Thiện temple. **Source:** Parmentier, 1909.



Fig. 7 An Inner Offering Bodhisattva adorned the altarpiece of Thủ Thiện temple. The 12th to 13th centuries; sandstone, 71 cm high. **Source:** website of the Asian Art Museum of San Francisco.

4 The Asian Art Museum of San Francisco, 1994: 66–67.

There is a close relationship in the art stylistic between the Buddha image and the sandstone carving altarpiece of the Thủ Thiện temple, as mentioned above (Boisselier 1963: 275–277), they may belong to the transitional period between the Chánh Lộ and Tháp Mẫm art styles, around the 11th to 12th centuries, although Boisselier (1963: *ibid*.) found dating the sculpture a challenge because the statue's head was lost as a key detail reflecting the art stylistic of each art period. According to Henri Parmentier (1909: 181, 444), there is a similarity between the high altarpiece in the interior of Thủ Thiện temple and those of the main temple (or *Tour principale* in French) as well as the pillared hall of the Đồng Dương Buddhist monastery; these are the sole altarpieces of Cham art. Those considerations indicate that the Thủ Thiện temple was probably a Buddhist monastery (Figure 8).



Fig. 8 Thủ Thiện temple is in Tây Sơn district, Bình Định province. Brick and sandstone, the 11th to 13th centuries. **Photo:** Nguyễn Thị Tú Anh.

The proto-Indian art style reflects the contemporary Southeast Asian Buddhist sculptural fashion with outstretched knees, as explained by Boisselier (1963: 275–276), along with the design of thinly *sattvaparyaṅka* curving lotus petals adorning the pedestal, reflecting a Cham ancient tradition. Although the *sattvaparyaṅka* posture and lotus pedestal are the first noticeable similarities between the Thủ Thiện Buddha and the Buddha of MFA-HCMC, this statue also details various features.

The Thủ Thiện Buddha's robe reveals the right half of the chest; the robe's edge is folded and draped over the left shoulder; the draperies are carved horizontally, showing a classic fashion technique that can be seen from the Buddha's robes of Đồng Dương. It is important to identify the title of this Buddha sculpture, thereby assuming the relationship between the two Buddha statues. The Buddhist scriptures will first be used to interpret this matter. In theory, the five sections in which each of the Jīna[5] (Tathāgata or Buddha) dwells symbolize a Vajradhātu-*maṇḍala* (Thunderbolt Realm-*maṇḍala*); each transcendent Buddha has specific iconographical features associated with him, and hand gestures (*mudrā*) are also one of the symbols assigned to them.

5 Jīna means a 'victor' in Sanskrit.

(1) The sacred circle begins with Jīna Akṣobhya, who presides over the eastern quarter, performing the earth touching gesture (*bhumisparṣa-mudrā*). This *mudrā* is associated with the victory over the Mara, one of the important events in the life of Buddha Śākyamuni; (2) The second is Jīna Ratnasambhava residing in the southern portion of *maṇḍala*, who performs the gift-bestowing gesture (*varada-mudrā*); (3) The Jīna Amitābha abodes the western section of the *maṇḍala*, his hands held in the meditation gesture (*dhyāna-mudrā*); (4) The Jīna Amoghasiddhi is the ruler of the northern portion, displaying in the fear not gesture (*abhaya-mudrā*); (5) The Jīna Vairocana is the original of the five transcendent Buddhas of esoteric Buddhism, identified by his hands in the 'gesture of the highest awakening' (*bodhyāgrī-mudrā*), he occupies the center of Vajradhātu-*maṇḍala* (Mallmann 1976: 173–187; Vessantara 2008).

Boisselier (1963: 276) noted the peculiarity of the right hand raised vertically in front of the chest and the gesture of the left hand resting on the thigh with the palm facing forward following the traces of the remains; the gesture is interpreted as "*le rejet de Mara*" (known as the gesture of fearlessness)[6] that fashioned Siamese Buddhist art only in the late times. It may be proposed that the right–hand performing *abhaya-mudrā*, the *mudrā* is associated with the Jīna Amoghasiddhi. The above comments suggest that probably this sculpture is an image of the Jīna Amoghasiddhi, with his hand gestures performing the *abhaya-mudrā*, as can be seen at the DNMCS.

In addition, Boisselier compared the Buddha of Thủ Thiện temple with another sculpture found from the Phú Ngọc site, in Bình Định province; he notes that there is a difference in the Buddha's robes; the last fold of the robe of the Phú Ngọc Buddha is larger, and with the hem of the robe forms two thin edges; the sleeve is reach to the left elbow, but not to the wrist like the Thủ Thiện Buddha statue; he thus concluded that the Thủ Thiện Buddha may reflect another traditional Buddhist art (Boisselier 1963: 275–277).

The inscription C. 92 engraved under the reign of Cham king Sūryavarmandeva, was found at the Mỹ Sơn Sanctuary, dating back to 1194 CE (Golzio 2004: 174–176); its contents are the most convincing evidence for the practice of esoteric Buddhism in Campā, in which the king ordered the construction of a temple dedicated to the esoteric Buddhist deity Heruka (*Śrī Herukaharmya*) in Mỹ Sơn Sanctuary (Trần Kỳ Phương and Nguyễn Thị Tú Anh 2023: 56–59). The temple was the first Buddhist shrine to be positioned in the Cham royal sanctuary, where Śiva-Bhadreśvara is the supreme god worshipped by the Cham elite; this Buddhist deity has also been practiced as a local cult in Java at the same time (Chutiwongs 2005: 85; Acri 2015: 261–282; Schweyer 2018: 76). The wrathful Heruka, the emanation of glorious Buddha Vajrasattva, was later adopted as an enlightened deity of the Highest Yoga Tantra in Angkor, Java, Sumatra and China in the 12th to 14th centuries (Schnitger 1937: 26, figure xxxiv; Bautze-Picron 2014: 107–128; Sharrock 2009: 49–64; Calo 2020: 1–20; Sharrock 2022: 126–164).

It should be noted that the Buddhist deity Heruka and his temple were the only ones discovered at the Mỹ Sơn Sanctuary, although the cult of Heruka and several emanational forms of his were found at various sites in Asia at the same period. The explanation is that the political crises occurring in northeastern India may have caused the spread of tantric Buddhism to Southeast Asia in the 12th century; recent

6 "[L]e geste des mains est, lui aussi, inhabituel avec la main gauche dans le giron, doigts en extension et la main droite élevée verticalement devant la poitrine, paume tournée en avant, d'après la trace de l'arrachement […] Il semble, enfin, qu'elle ne soit pas inconnue de l'iconographie siamoise tardive où elle paraît interprétée comme «le rejet de Màra»." (Boisselier, 1963: 276)

studies on the esoteric Buddhism discovered in the Vajrayāna sect, including the Hevajra cult practiced in Java, Campā and Khmer (Acri 2016: 1–25; Acri and Sharrock 2022: 1–6).

Moving to the south of Campā territories, Peter Sharrock (2022: 139–141) points out the traces Cakrasaṃvara, another form of Heruka, worshipped at the Dương Long temple[7], located near Vijaya port, during the renewed alliance with Angkor in 1203-1220. That is a 100-cm-high sandstone tympanum excavated in the 1980s at the site, showing a deity dancing with three heads, a smiling mouth without moustache, eight arms holding several attributes such as lotus buds, daggers (*kartari*) and his typical hand gesture, so-called *cakradharma-mudrā* or *vajrahūṃkāra-mudrā* (?), in which its outstanding features reflect the style of Khmer art (Figure 8). The mentioned ideas may indicate that the features of esoteric Buddhist art were very popular in the Campā Vijaya state during the artistic period from the 11th to the 13th centuries.



Fig. 9 The sandstone tympanum carving Cakrasaṃvara found at the Dương Long temple complex; 100 cm high. On display at the Bình Định Provincial Museum. **Photo:** Trần Kỳ Phương.

7 The Dương Long temple complex of three buildings is very close to the Thủ Thiện temple, just approx. three kilometres to the southeast on the southern bank of the Côn River.

Determining the relationship between the two Buddha statues

Theoretically, there are four forms of maṇḍala, including: 1/ The *Maha-maṇḍala* is a circle representing the images of the Buddhas, in which, the universe of the Buddhas is view more broadly; 2/ The *Samaya-maṇḍala* is represented the vows or precepts of the five Jīnas, to lead human to enlightenment; it is depicted by typical attributes or *mudrās* hold/performed by the Buddhas, such as a sword, a lotus, and a thunderbolt-pounder; 3/ The *Dharma-maṇḍala* depicted with a *bīja-akṣara* (the seed syllables of a mantra) is said to possess supernatural powers, and represent the Buddhas and bodhisattvas; 4/ The *Karma-maṇḍala* is regarded as fundamental to all temple architecture, or by the various arrangements of statues enshrined on altars (Takakusu 1956: 158; Takakusu 2008: 234–235; Kiyota 1978: 68–69; Tuệ Sỹ 2016: 314–334).

In addition, Shingon Mikkyo texts indicate that 'the wisdom–fist' denotes the 'dynamic' realm of wisdom, also called Vajradhātu-*maṇḍala*, with the left hand grasping the index finger of the right hand; while the '*mudrā* of meditation' considered static is represented of the Buddha of the natural realm, called Garbhadhātu-*maṇḍala* (Womb Realm-*maṇḍala*) or realm of compassion (Takakusu 1956: 156–157). Junjiro Takakusu (*ibid.*) also notes that the two Buddhas are in two realms, differing in manifestation but identical in quality, with one and the same name as Mahāvairocana Tathāgata. As mentioned above, the *bodhyāgrī-mudrā* performed by Buddha Vairocana Đồng Dương is a unique feature of Cham Buddhist art (Baptiste 2019: 345–346). This also leads to a hypothesis that the two Buddha statues with *bodhyāgrī-mudrā* of Cham sculpture are both images of the Buddha Vairocana/ Mahavairocana of the Vajradhātu-*maṇḍala* and Garbhadhātu-*maṇḍala*, which are associated with the prevailing traditional school of esoteric Buddhism in the contemporary Campā during the 9th and 13th centuries.

Importantly, a recent discussion of Tháp Mẫm art style shows that it was only formed after the Vijaya state was occupied by Khmer king Jayavarman VII in the early 13th century (Southworth and Trần Kỳ Phương 2019: 340–342). This argument leads to the perception that the sandstone carving high altarpiece on Thủ Thiện's interior walls and the statue of Amoghasiddhi were probably made in the 12th to 13th centuries. Reality shows that the remaining structure of the Thủ Thiện temple reflects a sanctum large enough for one Buddhist deity to be enshrined. This aspect also leads to the assumption that a wide-scale space of *karma-maṇḍala* can be created by incorporating images of the other Buddhas being worshipped in several different temples built within the Vijaya state territory.

The above ideas propose that both sculptures of the Jīna Vairocana and the Jīna Amoghasiddhi may have an integrality in the landscape of the *maṇḍala* created by the complex of temples that were built alongside of the Côn river, the longest river of Bình Định province. Especially, the estuary of the river connecting with the deep sea-port of Thi Nại, or Sri Boney in the ancient Cham language, which links the contemporary Maritime Asia.

CONCLUSION

Although it remains a challenge to determine the origin of which temple in Vijaya the Vairocana statue once belonged to, the comparison with the Amoghasiddhi statue has led to the assumption that both statues belong to a Vajradhātu-*maṇḍala*, once established in the landscape of the Vijaya state in the 11th to 13th centuries. The practice of establishing a '*buddhakṣetra*', a symbol of a kingdom's territory, was once very common in the structure of ancient Southeast Asian kingdoms following esoteric Buddhism such as Cambodia, Java, Thailand, and Campā as well (Sanderson 2003-04: 424–435); in which Heruka or Hevajra was worshiped as the supreme protector to the kingdoms by the Cham kings in Vijaya and the Khmer empire from 1203-c.1220 (Sharrock 2022: 126–164).

Recently, the study of Cham religion has made new strides, with the reading and translation of the latest discovered inscriptions as well as the editing of previously translated Cham inscriptions, including C. 123, C. 218 and C. 219; Amandine Lepoutre (2015: 117–157) points out that the Cham king Jaya Parameśvaravarman supported Buddhism and Shaivism around the 13th century in Vijaya (Bình Định province today). Her findings partially explain the statement about Cham Buddhism during the reign of Jaya Parameśvaravarman, similar to the cult of 'Śiva-Buddha' of the Javanese sovereigns reigning at the same time in the 13th century, notably under the reign of Raṅgah Rājasa (1222–1227) (Lepoutre 2015: 140). This opinion suggests that, hitherto, this issue needs to be examined and that the cult of 'Śiva-Buddha' may also have been practiced in Campā contemporaneously (?).

Although scholars have asserted that Cham Buddhism was unable to reach the same powerful religion as Brahmanism in Campā, this affirmation comes from the corpus of Cham inscriptions (Bronkhorst 2011: 52–53, note 56). This article adds some evidence to argue that Buddhism expanded as successfully in the final centuries of the Campā kingdom as Brahmanism had done earlier.

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Reassessing the conservation and restoration activities of Champa temples in Ninh Thuan province, Vietnam

Đánh giá lại hoạt động bảo tồn và trùng tu đền tháp Champa ở tỉnh Ninh Thuận, Việt Nam

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ABSTRACT

The preservation and restoration of Champa temples in Ninh Thuan Province, Vietnam, have been the subject of increasing attention from the government and conservation experts. This study aims to reevaluate the current conservation and restoration efforts and provide recommendations for ensuring the sustainable preservation of these important cultural relics. The research data were gathered between 2010 and 2019, using a combination of archival documents, site surveys, and ethnographic fieldwork. The study highlights that Champa temples are valuable national and special national heritage sites, receiving significant support from the State of Vietnam to safeguard and protect these historical structures. Despite the substantial conservation and management efforts, certain conservation methods have resulted in some limitations, such as testing directly on the body of the tower and modifying the architectural features of the sculptures and new constructions of the Champa temple, which could alter the core meaning of these sites. Therefore, this study suggests that conservationists and researchers must closely collaborate with the Cham community to understand and appreciate the significance of the Champa heritage, while also preserving its cultural and historical authenticity. Overall, this research proposes a reconsideration of the conservation approach, taking into account the cultural context, community values, and long-term sustainability of the Champa temples in Ninh Thuan Province, Vietnam.

Nghiên cứu này đánh giá lại việc trùng tu và bảo tồn các đền tháp Champa ở Ninh Thuận và gợi mở một số đề xuất nhằm thực hiện công tác bảo tồn một cách đảm bảo nhất trong tương lai. Dữ liệu nghiên cứu được thực hiện từ năm 2010 đến năm 2019 bằng việc áp dụng nhiều phương pháp khác nhau bao gồm dữ liệu văn bản, khảo sát thực địa và nghiên cứu điền dã dân tộc học. Nghiên cứu này cho thấy rằng các đền tháp Champa đã nhận được sự quan tâm rất lớn của Nhà nước Việt Nam nên được công nhận là di sản quốc gia và di sản quốc gia đặc biệt. Bên cạnh đó, Việt Nam cũng đã có những biện pháp để bảo tồn và bảo vệ các di tích này. Do đó, có một số kiến trúc và nghệ thuật đã và đang dần được duy trì và bảo vệ. Tuy nhiên, những nỗ lực bảo tồn và quản lý đã có một số vấn đề giới hạn từ cách tiếp cận bảo tồn của các chuyên gia trùng tu. Cụ thể, thử nghiệm trực tiếp trên thân tháp, thay đổi nhiều đặc điểm kiến trúc điêu khắc và xây mới hướng lên tháp Champa đã làm thay đổi ý nghĩa cốt lõi của đền tháp Champa. Nghiên cứu này khẳng định rằng, các nhà nghiên cứu và trung tu đền Champa cần phải nghiên cứu một cách kỹ lượng và gắn với cộng đồng Chăm để đảm bảo được tính nguyên trạng và ý nghĩa di sản Champa.

Keywords: bricks, heritage conservation, Champa temple, Cham people, Vietnam | Từ khóa: gạch, bảo tồn di sản, đền tháp Champa, người Chăm, Việt Nam

INTRODUCTION

Preservation and promotion of Vietnamese ethnic-minority cultures is a crucial objective of Vietnam's Ministry of Culture (Luong Thu Oanh 2012; Mai Thanh Son 2011). This includes the Cham people and their cultural heritage, which is concentrated in central Vietnam and encompasses many heritage sites containing the collective knowledge of the Cham people, including their history, culture, and religion. The Cham temples, in particular, exemplify the Cham architectural arts, history, culture, and religion and have attracted increasing attention from researchers interested in heritage conservation.

Foreign researchers, such as French archaeologists from 1902 to 1954 and Polish architects from 1975 to 1998, have made significant efforts to document and protect the Champa cultural heritage sites, generating greater interest from the Vietnamese government in preserving and protecting these sites. After the Mỹ Sơn site was recognized by UNESCO as a World Cultural Heritage Site in 1999, a large body of data concerning the conservation and management of the Cham temples was collected. While some architectural features are being maintained and protected (Tran Ky Phuong 2007: 2), other preservation efforts have caused irreparable damage and become a point of contention among residents. Issues affecting the management of these cultural heritage sites (Tran Ky Phuong, 2008) often concern the treatment of architectural features and spiritual spaces and reflect negative interactions between Vietnamese conservationists and cultural heritage.

The ancient Champa temples reflect the architecture, history, culture, and relationships of the Cham people with other civilizations in the region. However, some Cham temples are in danger of collapse, and authorities are making their best efforts to preserve and protect them. Despite the literature on the conservation of Cham heritage mainly focusing on Quang Nam, Da Nang, Hue, and Binh Dinh Provinces, little research has been conducted on heritage conservation in Ninh Thuan Province, where most Cham people live. As the Cham people who reside in this province still maintain traditional ceremonies and festivals at Champa temples, conservation and restoration work also impacts their spiritual world. In recent years, negative and positive issues have arisen at all temples, making it essential to assess and compare the changes before and after conservation and propose suitable solutions for the heritage conservation of Cham sites in this province. Therefore, this research uses a case study in Ninh Thuan to investigate one of the unique cases of conserving Champa temples in Vietnam.

The Champa temples and the history of conservation

In the field of Champa studies, temples attracted the most attention from researchers during the late 19th century and early 20th century. The first works that French scholars published on Cham culture focused mainly on architecture. Some notable scholars, including C. Lemire, C. Paris, L. Finot, H. Parmentier, and P. Stern, established a vast wealth of documentation on Cham temples in Vietnam, including collections, descriptions, classifications, and formal assessments of architecture and sculptures. These documents and collections have been the primary sources of reference for researchers from the earliest days into the 1970s (Ngo Van Doanh 2005: 6–11; Tran Ky Phuong 2007: 53–55). After 1975, there was renewed interest on the part of scholars in researching the Champa temples; these scholars include Cao Xuan Pho, Ngo Van Doanh, Le Dinh Phung, Hoang Dao Kinh, Tran Ba Viet, Nguyen Hong Kien, and Tran Ky Phuong. The bulk of their research focuses on architecture, culture, history, art, and construction techniques. Today's greatly increased body of data concerning the Champa temples demonstrates the importance of the temples in gaining an understanding of both the history and culture of the Cham people.

The most significant legacy of the Champa Kingdom that remains today in Central Vietnam is seen in the form of approximately 80 documented brick temples (*kalan/bimon* in the Cham language). These temples are scattered mainly throughout the region's lowlands, with only a handful found in the highlands. The construction of these Hindu and Buddhist temples dates to periods as early as the 7th and 8th centuries and as late as the 16th and 17th centuries. Cham kings constructed temples for religious purposes, but the temples also functioned as a demonstration of power. In the aftermath of the collapse of the Cham Kingdom, many temples were damaged or completely destroyed, leaving only a fraction of the temples that inhabit swaths of land in the Central Highlands of Vietnam. Today, there remain about 23 areas with temples, with approximately 40 monuments of various sizes. Most of these temples were built along the main rivers of the region (Tran Ky Phuong 2008: 10). Before the 7th and 8th centuries, most of the Champa temples were of wooden construction and thus vulnerable to incendiary attacks. As a result of the region's protracted warfare, all of these temples were destroyed, leading to subsequent innovations in temple construction and the use of brick and sandstone (Lam My Dzung 2008: 294; Tran Ky Phuong 2006: 8).

The materials and building methods used to construct Champa temples have attracted the attention of a considerable number of scholars studying Cham culture. There are many assumptions and varying opinions about the exact organic materials and building methods used to build brick towers. In 1928 Zeane Lenba (cited by Tran Ba Viet 2007) stated that Champa temples were built using unbaked bricks, with certain features later fired in place, whereas Maspero argued that the Champa temples were built with baked bricks (Maspéro 2002). Other opinions are that the Champa temples were built with bricks and mortar derived from plant-based glues and mixed with brick powder (Claves 1939 cited by Tran Ba Viet 2007). Awawrencrak and Skibinski (1987) speculated that the Champa temples were built using baked bricks and were tied together by a thin film of clay and that later the tower was baked again as a whole.

After 1975, Vietnamese scholars began proposing their own theories about the construction of Champa temples, building on hypotheses from previous researchers. Various studies have suggested that the mortar used was mixed with cactus molasses (Ngo Van Doanh 1978), Dipterocarrpusalatus (cây dầu rái) (Nguyen Xuan Ly 1991; Tran Ky Phuong 2002), or that the bricks were arranged using a grinding technique (Trinh 1985). According to Le Dinh Phung, the temples were constructed using locally produced materials and a sharpening surface to create a powder used as mortar mixed with water (Le Dinh Phung 1990). Oral history and Cham legends, as researched by Cham scholar Thanh Phan, suggest that the Champa temples in Ninh Thuan Province were built using unfired bricks immersed in vegetable oil just before assembly. The assembled bricks were allowed to cure in place, backfilled with soil, clay, and sand, and repeated in stages until the tower was erected in an encapsulating shell. The structure was then decorated and sculpted from the top down (Tran Ba Viet 2007). Luu Tran Tieu and colleagues tested permutations of this theory and speculated that the Cham people arranged unbaked bricks for the outer shell, used a thin adhesive layer, and created pilasters from bricks and stones to form an overall cohesive or "decorative theme" (Luu Tran Tieu et al. 2000: 183). One hypothesis for the composition of the mortar is that a superfine aggregate produced by rubbing bricks was mixed with an organic resin (Brambilla and Condoleo 2011: 278), which is currently being tested in conservation efforts at Cham temples.

These studies have been vital in understanding the construction and preservation of Champa temples. The conservation of these sites can be divided into three periods:

- the French Colonial period from 1902 to 1954,
- the Polish-Vietnamese conservation period from 1975 to 1998, and
- the contemporary period from 1999 to today.

Throughout these periods, archaeologists, architects, private citizens, institutions, and organizations have contributed to a body of work that is an essential resource for future research and conservation efforts. Many of these parties have also acted as advocates, protecting and securing the Champa temples through international legislative and diplomatic efforts. However, despite these efforts, adverse impacts on the temples have occurred, particularly during the Vietnamese conservation period (Tran Ky Phuong 2006: 23).

Today, the condition of Champa temples can be categorized into three types:

- Buried under the ground or leveled to the ground. The Dong Duong Buddhist Sanctuary in Quang Nam Province is an example;
- Existing as ruins, such as My Son or Chien Dan in Quang Nam Province, and Po Dam group in Binh Thuan Province;
- Partially damaged. Examples include Bang An and Khuong My groups in Quang Nam Province; Banh It, Thap Doi, and Duong Long in Binh Dinh Province; and the Po Klaong Girai groups in Ninh Thuan Province.

Temples in the latter two categories will soon be in critical condition without conservation efforts. Thus, there is a strong case for more substantive scientific and ethically grounded conservation efforts in the preservation of the Champa temples (Hoang Dao Kinh 2012: 3).

Summarizing the three major periods of conservation efforts at Champa architectural heritage sites:

Period	**Timeframe**	**Description**
French Colonial Period	1902-1954	The French Colonial period saw the initial restoration and conservation efforts at Champa architectural sites.
Polish-Vietnamese Conservation Period	1975-1998	During this period, conservation efforts were carried out through the collaboration between Polish and Vietnamese conservationists.
Contemporary Period	From 1999 to today	The contemporary period marks the current era of conservation efforts at Champa architectural heritage sites. Efforts have been made by archaeologists, architects, private citizens, institutions, and organizations to preserve and protect these sites.

Additionally, the following table summarizes the current condition of the Champa temples:

Condition	Description
Buried or Leveled	Temples that have been buried or leveled to the ground, such as the Dong Duong Buddhist Sanctuary in Quang Nam Province.
Existing as Ruins	Temples that still exist in a ruined state, such as My Son or Chien Dan in Quang Nam Province, and Po Dam group in Binh Thuan Province.
Partially Damaged	Temples that have suffered partial damage, such as Bang An and Khuong My groups in Quang Nam Province, Banh It, Thap Doi, and Duong Long in Binh Dinh Province, and the Po Klaong Girai groups in Ninh Thuan Province.

Conservation efforts are needed to preserve the Champa temples, particularly those that are currently in a state of partial damage or ruin.

Overall, the construction techniques used for Champa temples are still the subject of speculation and ongoing research. Scholars have proposed various hypotheses regarding the materials and methods used, and these theories have been tested through experiments and conservation efforts. The history of conservation work at Champa sites can be divided into three major periods of international collaboration, with the most recent period highlighting the need for more substantive and ethically grounded conservation efforts to ensure the preservation of these sites. Today, many Champa temples are in critical condition, emphasizing the urgency of ongoing conservation efforts.

Backgrounds of Champa Temples in Ninh Thuan Province

This study focuses on Ninh Thuan Province, which was an important part of the Cham Kingdom until 1834 and is rich in cultural heritage sites that provide valuable insight into the history, culture, and religion of the Cham people (Po Dharma 1999). The temples in this province serve as a centre for daily religious practices and festivals for the Cham people. The cultural heritage sites in Ninh Thuan Province are composed of relatively well-preserved temples, structural remains and ruins, and a variety of artifacts dispersed throughout the region, extending beyond the temple precincts. The three primary temples in this area are Hoa Lai, Po Klaong Garai, and Po Rome, which hold significant cultural and historical value and serve as focal points for ongoing research and conservation efforts.



Fig. 1 Map of Cham temples in Ninh Thuan province.

The Po Rome temple, situated on a desolate hill covered with cacti and wild plants about two kilometers west of the Cham village in Ninh Phuoc district, is one of the cultural heritage sites in Ninh Thuan Province. It is a group of towers constructed during the final period of Cham architecture in the 17th and 18th centuries (Ngo Van Doanh 2002). The temple complex comprises a Kalan built in honor of King Po Rame, a temple dedicated to his wife, and his relative's tomb. In the past, it also housed a repository for offerings, but it has since been severely damaged, with only traces remaining today. The temple is considered the last tower showcasing the art, history, architecture, and sculpture of the Cham people.



Fig. 2 The Po Rome temple. Source: **Photo** by Ja Khang, 2018.

Ninh Thuan Province is rich in cultural heritage sites that embody the collective knowledge, including culture, history, and religion, of the Cham people. The temples and artifacts scattered throughout the province are closely associated with the Cham's daily practices of worship and festivals. Three significant temples in the province are Hoa Lai, Po Klaong Garai, and Po Rome. The Po Rome temple, in particular, is an excellent example of the Cham's remarkable architectural and artistic accomplishments during the 17th and 18th centuries.



Figs. 3-4 Hoa Lai temple before conservation work. Source: Ninh Thuan Provincial Museum, 2000.

The Hoa Lai/Ba Thap temple, also known as Yang Bakran in the Cham language, is dedicated to the form of Shiva called Adidiveshavara (Schweyer 2011). Originally, the temple had three Kalans or towers, but the middle one was destroyed during the American War. In the early 20th century, French scholars discovered the remains of a wall that surrounded the three Kalans, as well as other structures such as a main tower (Mandapa) and a Gorupa (gateway tower) facing the central Kalan (Tran Ky Phuog 2008: 103). While the Hoa Lai complex is built in the traditional Cham style, its decorative patterns are unique, representing a style typical of the late 8th and early 9th centuries (Tran 2008: 106). Scholars consider the Hoa Lai temple the most valuable piece of art among the existing temples in Ninh Thuan Province (Ngo Van Doanh 2002; Parmentier 1909; Luu Tran Tieu et al. 2000). Parmentier described it as a masterpiece of ancient Cham architecture, featuring a multi-tower complex with unique design patterns that reflect cross-cultural influences. He also noted that the Hoa Lai style marked the end of the first phase of Cham art, featuring square shapes, symmetry, and no small decorative towers on the floor of the complex. The motifs include cylindrical flower motifs and naturalistic foliage (Parmentier 1909: 118–120).

The Po Klaong Girai temple complex is situated on Trầu hill in Phan Rang–Thap Cham city. This complex, dedicated to King Po Klaong Girai, was constructed during the late 13th and early 14th centuries and was later rededicated to the king during the reign of the Cham monarch Jaya Simhavarman III in the late 14th century. Po Klaong Girai temple is considered one of the most advanced examples of Cham architecture and construction techniques (Tran Ky Phuong 2007: 138). In the early 20th century, the temple had an abundance of unique architectural details, as noted by Parmentier (1909: 96). Unfortunately, the temple fell into ruin and today only a few towers remain among the ruins of the central tower, entrance tower, and southeast building.



Fig. 5: Po Klaong Girai temple. **Source:** Ninh Thuan Provincial Museum, photo by author, 2016.

The Po Klaong Girai temple is deeply intertwined with the traditional Cham belief system and is the site of numerous annual festivals and ceremonies.

Today, all Champa temples in Vietnam have been designated as special national historical sites by the Ministry of Culture, Sports, and Tourism. In Ninh Thuan, both Hoa Lai and Po Klaong Girai temples were recognized as special national architectural relic sites in 2017. Additionally, the Katé festival of the Cham people was recognized as a national intangible cultural heritage in the same year. Po Klaong Girai temple is therefore doubly recognized as a special national historical site and a site for national intangible cultural heritage. These designations not only acknowledge the importance of the Po Klaong Girai cultural heritage to the Cham community but also serve to preserve and promote its cultural heritage values for local development.

Methods

My study of Champa heritage conservation involved three stages of research: a literature survey, a site survey involving photography and preparation of field notes, and data analysis.

Stage 1: Archive Document Research

My research relied on available databases from previous and ongoing archaeological projects, as well as historical documents, oral histories, artifacts, and photographs. These records varied in quality and quantity, with marked gaps in information for some projects, particularly those conducted before 1975. I consulted archived photo collections stored on-site in the Ninh Thuan Provincial Museum and Center for Cham Culture Studies to compare and analyze changes in decorative and structural patterns and conditions of each site.

Stage 2: Site Survey

I documented and photographed each temple with a high-resolution digital camera in RAW format for later analysis. I wrote field notes and evaluated current issues to describe in great detail all existing discernible patterns, such as decorative patterns, ground surface, materials, and surrounding landscape. My assessment process emphasized the examination of the current condition of these temples and how the three temple towers are being managed currently.

Stage 3: Data Analysis Plans

The data analysis incorporated results of library-based research, site survey, and ethnographic research in interpreting the findings of the site survey. The library-based research involved the compilation of all conservation work by organizations, periods, principles, and conservation methods. Compiling this inventory helped me to ascertain the reasoning or thought behind each of the previous methods of conservation. I could also see what elements were conserved and compare the different stages up to the current conditions of temples. My field-based site survey involved visits to the temples to evaluate their current conditions. I coded and photographed each temple for comparison of the previous conditions and the current condition after conservation.

Results

This research found that Po Klaong Girai temple is considered to have the best conservation work in Ninh Thuan province. It is in relatively good condition when compared to other Champa temples in Vietnam, with successful consolidation methods employed by conservation specialists that have helped in its preservation and maintenance. However, the use of cement in the conservation process has resulted in the rapid erosion of the original brickwork, spreading to the surrounding bricks and ultimately creating more harm than good. This same issue is present at Po Klaong Girai temple, where new bricks are now covered in a black patina of surface lichens (Kwiatkowski and Hoang Dao Kinh 1995).

Despite these negative issues, the conservation works at Po Klaong Girai and Po Rome temples have successfully restored some damaged decorative elements and have placed original features back into place as harmoniously as possible. Kwiatkowski, a conservation expert, emphasized the importance of maintaining the condition of the temple for future generations with more professional skills and knowledge to conserve the Champa temples (Tran Ky Phuong 2007: 4). While his use of cement has been criticized, it was acknowledged that he worked in a nation destroyed and under embargo, with limited resources available for conservation (Zolese 2009).

In general, the conservation of the Champa temples has shown several negative issues. There are three main points of concern: the use of cement, which can result in damage to the original materials and structure; the lack of long-term planning, which has resulted in piecemeal and inconsistent approaches to conservation; and the lack of local community involvement in decision-making, which can result in a lack of understanding and support for conservation efforts. It is therefore crucial to involve local communities in conservation efforts and to consider more sustainable and long-term solutions, such as the use of traditional materials and techniques, to ensure the preservation of Champa heritage for future generations.

Conducting the experiment directly on the body of temples at Po Rome and Hoa Lai temples

Conservationists often used the temple as a lab for their experiments. This is particularly true in this case. For instance, 1m2 of the wall was divided into three small parts to test different methods of a chemical nano-spray technique or "phun sơn thếp vàng". This is a serious violation of the principles of restoration and this fact has been brought to the attention of the local authorities responsible for conservation projects in Ninh Thuan province. However, the experiments still continue.



Fig. 6 Direct testing on the body of the Po Rome temple with three different segments. **Source:** Photo by author, 2012.

A similar issue was the decision by the conservationists in using new bricks in conserving the Hoa Lai temple. In particular, the bricks used in conservation began showing signs of decay before the project was completed. The Institute for Building Science and Technology conducted experiments with materials of uncertain origin in the restoration (Ho Xuan Tinh 2012: 2). The debates and discordant opinions voiced about the various methodologies of restoration on the brick temples have been well broadcast (Tran Ky Phuong 2008: 29); yet the Institute for Building Science and Technology continued to experiment on the towers and its specialists have proceeded to use their new construction methods on the Hoa Lai temple.

Because the bricks in the Hoa Lai temple were already degrading, conservationists had to halt construction many times. Still, despite problems they continued with the work (Ho Xuan Tinh 2012: 2). The methods of restoration with substandard bricks and experimental adhesives became widely used for almost all the temples. As a result, conservation projects continue to damage this and other

temples. After just a few years, almost all the temples with new bricks and experimental adhesives have degraded or otherwise decayed. More critically, the mortar powder used decays in rain and erodes the surfaces of the original bricks. The new layer of powder formed is likely a caustic agent that accelerates erosion to the bricks of the towers. Furthermore, the new bricks at the base of the West and Southern towers retain moisture, a condition that further places the original bricks at risk. New bricks are fraught with a blight of surface flaws, compromised of biological organisms such as black patina and lichens. Currently, the Hoa Lai temple is heavily damaged from the impacts of the conservation.



Fig. 7 Current conditions of the Hoa Lai temple due to new conservation work. **Source:** Photo by author, 2012.

Changing architectural details, decorations, and motifs on the surfaces of the temples at Hoa Lai and Po Rome temples

The conservation efforts at Hoa Lai and Po Rome temples have resulted in unintended consequences such as changing the original architectural details, decorations, and motifs on the surfaces of the temples. These mistakes are a result of a lack of knowledge and experience in historical conservation and archaeology site management. Despite acknowledging the need for careful consideration of methodology, inappropriate restoration practices continue to be used. The negative impact of these practices is evident in the case of Hoa Lai temple where the mistakes of the past have led to new problems.



Fig. 8 Some decorative objects characterized Kinh cultural features are added to the Po Rome temple. Source: Photo by author, 2013.

Many scholars have criticized the conservation works at Hoa Lai temple, citing it as the biggest debacle among all the restorations in Cham. Examples of inappropriate restoration practices include the alteration of decorative patterns of Garuda into human faces, the resurfacing of decorative patterns resulting in a rough and rigid appearance, and the alteration of special features that now make the towers seem strange and unfamiliar to the Cham people. It is important for conservationists to learn from past mistakes and ensure that their methodologies are carefully considered to avoid unintended consequences that could negatively impact the cultural heritage they are trying to preserve (Luu Tran Tieu et al. 2019).

Constructing a new entrance on the Po Rome and Po Klaong Girai temples that go against the practices of traditional Cham culture

The decision to construct a new entrance on the Po Rome and Po Klaong Girai temples that goes against the traditional practices of Cham culture is deeply concerning. In Cham culture, the east direction is considered sacred and reserved only for gods, while the west is typically avoided for entryways in traditional homes and buildings. However, the architects involved in the restoration of these temples chose to create a direct entrance to the central temple from the east, disregarding the values and traditions of Cham culture. This decision not only shows a lack of respect for the cultural significance of these sites but also highlights how the Cham community has been excluded from the preservation and management of their own ancestral heritage. Furthermore, the new entrance alters the original design and aesthetic of the temples and undermines their historical integrity. It is essential that any restoration work takes into account the cultural beliefs and practices of the community and works to preserve the authenticity and historical value of these important sites.




Fig. 9 & 10 The new entrance from the East offends traditional Cham beliefs about temple entrances. **Source:** Photo by author, 2013.

DISCUSSION

The conservation of Champa temples has been a priority for many foreign architects, archaeologists, and conservationists. In order to preserve these structures, they have adopted empirically established principles of conservation. One such example is the collaboration between Italian and Vietnamese conservationists, who have followed a strict set of principles including repairing and consolidating the remaining parts of the buildings as much as possible, leaving the present profile of the ruins as intact as possible, maintaining the original masonry, and using new bricks only in cases of dangerous stability deficiency (Brambilla and Condoleo 2009: 301).

Similarly, Polish architect Kwiatkowsky adhered to basic principles of conservation during his time, as demonstrated by his work conducting an inventory survey and evaluating the condition of Champa heritage in Central Vietnam after the American war. The conservators conducted emergency repairs, prepared inventories, and applied technological reinforcements at several temples, including My Son in Quang Nam Province, Thap Doi and Duong Long temples in Binh Dinh Province, and Po Klaong Girai temple in Ninh Thuan Province (Hoang Dao Kinh 2012:26).

These efforts demonstrate a commitment to preserving Champa heritage while respecting the original structure and materials of the temples. By following these principles, foreign conservationists are able to minimize interventions and maintain the integrity of the original design. However, it is important to note that there have been instances where these principles have not been followed, leading to controversy and criticism among scholars and the Cham community.

In recent years, many conservationists have applied methods to explore the techniques, construction, and materials that comprise Champa structures in the hopes of preserving these ancient temples. Foreign architects, archaeologists, and conservationists have adhered more strictly to empirically established principles of conservation. In particular, they have minimized the interventions on the temples and have attempted to consolidate and maintain the original condition of the temples. Collaboration

between Italian and Vietnamese conservationists is a good example of conservationists conducting their practices using these principles (Brambilla and Condoleo 2009: 301).

Conservation workers believed in the principles and technology of archaeological restoration, using a conservative anastylosis method (Hoang Dao Kinh 2012:27), which involves using original materials to the greatest degree possible. Conservators reused fallen bricks and modern cement to restore damaged walls and temples. They also applied the methods of consolidation, anastylosis, and fragmentary restoration to preserve the authenticity of the temples (Tran Ky Phuong 2002:116-118).

The major method used, called "anchor P.O.K.," involved inserting a steel rod into one brick to reinforce it and link it to another brick. Furthermore, decorative reliefs on walls were restored at Po Klaong Girai temple in Ninh Thuan Province, and at My Son group B and Chien Dan temples in Quang Nam. The use of sanding to restore original brick walls often created indentations in the reinforced walls approximately 5 cm deeper/wider than those in the original walls. Large numbers of broken bricks were moved and rearranged in many temples in central Vietnam after the devastating bombing raids of the American war, which reduced large portions of My Son, for example, to ruins (Nguyen Thuong Hy 2012:3).

According to Hoang Dao Kinh (2009), his conservation projects were highly effective, although he was unable to research the original Cham techniques of making bricks and adhesives. He could only use temporary materials to maintain the temples, and he allowed for future advances in conservation for the next generation of conservationists, who might have better skills and knowledge to continue this important work. At this point, the majority of Cham temples have been restored and preserved.

Tran Ky Phuong, a well-known scholar, and Vietnamese conservationists are actively taking part in the restoration of the Champa temples and argue that most Vietnamese conservationists base their own ideas rather than considering historical facts (Tran Ky Phuong 2006: 22). Unfortunately, heritage conservationists have not performed empirical scientific research on architectural monuments before carrying out restorative works, due to government policies that require expediency (Tran Ky Phuong 2006: 23). Moreover, these actions are undertaken without appropriate cultural knowledge. Coupled with a maxim of expediency, the entire process has led to unfortunate distortions and misleading representations of Cham's cultural heritage. The overlaps of knowledge between construction crews and museum conservators (Nguyen Hong Son 2012) means that the experts are ultimately accountable for the negative impacts upon all temples, even those at which they did not work. The work of the restoration and conservation of Cham monuments has generated a body of discordant opinions. The conservation of the Hoa Lai temple in Ninh Thuan Province is another exemplar of negative interventions on cultural heritage (Tran Ky Phuong 2006: 23).

The preservation of ancient brick buildings, such as the Roman period brick structures, has been accomplished through the use of effective and proven conservation methods. Preservation efforts typically begin with the consideration of original brick size, quality, and colour to be replaced, and experts warn against the use of cement-based mortars in most situations. Instead, new mortar should be flush with the existing edges. (Baer and Livingstone 2015, Camuffo et al. 1999).

In the case of the Champa temples, conservation efforts must take into account the quality of both bricks and adhesives, as these are the two most important elements in determining the success or failure of the project. There have been numerous experiments with traditional Cham materials, but doubts persist as to whether these materials have the same quality as the originals. Therefore, the use of new and untested methods on the Champa temples can have disastrous consequences. Improper work could result in the loss of elements of the Cham heritage forever.

Unfortunately, previous interventions have resulted in deformed architecture due to the experimentation with new bricks, adhesives, and cement. Additionally, these new materials are often used in areas where the temples are most vulnerable. Recently, conservation specialists in Vietnam have started using the Nano spray technique to preserve the Po Rome temple in Ninh Thuan Province. However, critics question the long-term effects of this method on Champa temples. There are concerns about the catastrophic failure of materials and the responsibility for such mistakes. It is unclear whether the new materials will last for a thousand years like the traditional Cham materials.

The evidence shows that the experimental use of bricks and mortar has led to the rapid erosion and decay of the Hoa Lai temple. Therefore, conservationists must exercise caution when implementing new methods to preserve ancient brick buildings, especially those with such significant cultural and historical importance as the Champa temples. It is vital that conservation efforts focus on preserving the original architecture using traditional methods, rather than risking the loss of valuable heritage through arbitrary experiments. (Baer and Livingstone 2015, Camuffo et al. 1999).

The Champa temples not only serve as historical artifacts but also hold great significance for the Cham community. However, most of the Cham temples in Vietnam are not used for religious practices, with only four temples in Ninh Thuan and Binh Thuan Provinces being used for this purpose. The Po Klaong Girai and Po Rome temples are two such temples still used for worship and ceremonies, but the former is currently being impacted by tourism development. The conservation work on the Po Rome temple, which is still ongoing, could potentially lead to a similar fate, thereby diminishing the value of the temple for both tourists and younger generations of the Cham community.

It is essential to involve the Cham people in the conservation work of these temples to avoid any mistakes and ensure that their beliefs and values are respected. However, previous conservation efforts have shown a lack of community participation, leading to the creation of new entrances at the Po Klaong Girai and Po Rome temples that go against Cham beliefs. Heritage experts play a crucial role in the decision-making, design, and management of heritage, as highlighted by Smith and Waterton (2009: 29), but community participation is often overlooked and misrecognized.

Therefore, it is imperative to strike a balance between conservation and community involvement to preserve the historical and cultural significance of these temples. As stated by Labadi and Long (2010: 3), “Heritage conservation should be seen not only as a technical exercise but as a socially embedded and participatory process.” By involving the Cham community in the conservation process, we can ensure that the temples remain meaningful to both the community and future generations.

RECOMMENDATIONS AND CONCLUSION

Scholars have been attempting to identify the original adhesive, brick, and construction techniques of the Cham temples for some time, but there is no final result yet. While waiting for experts to solve the technical renovation of Champa temples, conservation projects can continue to preserve these temples with the aim of strengthening, repositioning, and repairing existing problems to maintain the buildings (Hoang Dao Kinh 2012: 3). However, in recent years, there have been fewer conservation efforts, and many Vietnamese conservation agencies and foreign experts interested in conducting conservation projects on Champa temples in Vietnam are still seeking opportunities. While waiting for debate and experiments to bear fruit, the Cham temples continue to deteriorate with numerous examples still awaiting conservation treatments.

To preserve the Cham temples, three main principles should be considered in the conservation work. First, the monuments need to be maintained in their existing stage to prevent further damage and preserve their historical and aesthetic value. Second, conservation work should be based on scientific knowledge to limit mistakes that can lead to significant deviations. If conservationists' knowledge is limited, they should leave further advances in conservation to future generations. Finally, the conservation methods that have been successful, such as those used by Kwiatkowski from 1975 to 1998, should be continued. These methods have been successful in maintaining the My Son, Chien Dan, and Po Klaong Girai temples for almost thirty years, and if Vietnamese conservationists continue to use them, the Champa temples can be preserved for many more years (Nguyen Thuong Hy 2012; Hoang Dao Kinh 2012; Ho Xuan Tinh 2012).

Additionally, present-day conservationists recommend that repairs of the architectural temple should rely on consolidation principles of anastylosis, and restoration and reconstruction should be limited to help restore the original composition and reinforce existing (Nguyen Thuong Hy 2012; Hoang Dao Kinh 2012; Ho Xuan Tinh 2012). By following these principles, Champa temples can be preserved for future generations to appreciate and understand the unique cultural heritage of Vietnam.

The negative issues currently affecting the Champa temples require urgent attention from those in authority. For instance, the entrances of Po Rome and Po Klaong Girai temples were recently re-aligned in accordance with Cham spirituality. However, this research argues that Cham people should have a greater say in the conservation of their ancestor's temples. Previous conservation efforts have negatively impacted Cham religious practices, and it is important to consider the spiritual values of the Cham people in any conservation strategies.

Tourism is an important aspect of Ninh Thuan Province's economic development, and local authorities have sought to promote the Champa temples as a major tourist attraction. However, the conservation process has altered the temples and caused tension between the Cham and local authorities. For example, the construction of an Eastern pathway for tourists has affected Cham spiritual values. The Cham people, who comprise the largest population in Vietnam, continue to maintain their cultural values around these temples as part of their spiritual and religious activities.

Cultural heritage management in Ninh Thuan Province takes the form of a "living cultural environment," where conservation projects promoting Cham cultural heritage have had both positive and negative impacts. While Champa temples are generally less affected by restoration during the first phase,

conservation works that lacked community involvement had significant negative impacts. Nonetheless, conservation efforts that followed the principles of conservation and had the assistance of international scholars were successful in saving the temples from total collapse.

To preserve the Champa temples and their cultural and spiritual values, it is crucial to plan and manage cultural heritage in a way that is appropriate and careful, taking into account the local community's environment. This will not only help preserve the temples but also promote a sustainable form of tourism that is sensitive to the needs and values of the Cham people (Nguyen Thuong Hy 2012; Hoang Dao Kinh 2012; Ho Xuan Tinh 2012)

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Rock Art of Perlis, West Malaysia

Lukisan Gua di Perlis, Semenanjung Malaysia

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ABSTRACT

This paper presents an overview of the rock art sites in Perlis of West Malaysia, namely Gua Bintong, Gua Semadong, Bukit Jernih, and Bukit Tengku Lembu. In general, the Perlis rock art consists of black charcoal drawings with a wide variety of motifs such as anthropomorphs, zoomorphs, watercraft, geometric shapes, ray motifs, and abstract designs. This paper provides new insights into the rock art from Perlis and further explores their relationship with other rock art sites across West Malaysia. We propose that the rock art from these sites were possibly made between middle 19th to 20th century CE by the Negrito Orang Asli.

Kertas kerja ini membentangkan tapak-tapak lukisan gua di Perlis, iaitu Gua Bintong, Gua Semadong, Bukit Jernih dan Bukit Tengku Lembu. Secara amnya, lukisan gua di Perlis terdiri daripada lukisan arang yang berbentuk seperti manusia, haiwan, kapal, geometrik, sinar, dan reka bentuk abstrak. Kertas kerja ini memberi perspektif baharu mengenai lukisan gua di Perlis dan seterusnya menerokai hubungannya dengan tapak-tapak lukisan gua lain di Semenanjung Malaysia. Kajian ini mencadangkan bahawa lukisan gua di Perlis dihasilkan antara pertengahan abad ke-19 dan ke-20 oleh Orang Asli Negrito.

Keywords: rock art; charcoal drawings; Perlis; Malaysia | lukisan gua; lukisan arang; Perlis; Malaysia

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INTRODUCTION

Our contemporary knowledge of rock art in West Malaysia has mainly derived from publications in the late 19th to early 20th century (Daly 1879; Skeat and Blagden 1906; Evans 1920; Collings 1937; Williams-Hunt 1952b; Peacock and Dunn 1968). However, early rock art record was fairly sporadic, with little descriptions and rarely accompanied by photographs or illustrations since the research were heavily focused on the excavated archaeological materials or ethnographic observation or anecdote. In the last two decades, despite a growing literature on the rock art in West Malaysia, the publications are still heavily focused in the state of Perak and Kelantan (e.g., Mokhtar and Taçon 2011; Zuliskandar 2019; Zuliskandar et al. 2020; Saw and Goh 2021, 2022). This paper aims to address the understudied rock art sites in Perlis, a small state located in the northern Peninsular Malaysia. Its archaeological potential has been noted since the 20th century after a series of archaeological surveys carried out by the Department of Museum Malaysia (previously known as Department of Museum and Antiquity) (Adi 1990). The archaeological record of Perlis can be divided into three main phases, the prehistoric period (10,000 to 3,000 years ago), the pre-Islamic period (10th to 12th century CE) and the early historical period (16th to 19th century CE) (Adi 1990).

The earliest mention of rock art in Perlis was in the 1937 during an archaeological excavation at Gua Bintong (Collings 1937). However, rock art was never systematically studied, and no new rock art sites were reported for a period of 80 years. It was until 2017 that the rock art at Gua Semadong was discovered, then the caves in Bukit Jernih and Bukit Tengku Lembu were reported with rock art in 2022. This paper focuses on the latter two because they were only newly discovered in 2022 and have not been published elsewhere. The term *gua* and *bukit* are Malay terms meaning a cave and a hill respectively. Both the caves were unnamed, hence for reference, we label the site at Bukit Jernih as BJ-SC (Bukit Jernih Shallow Cave), and the site at Bukit Tengku Lembu as BTL-NC (Bukit Tengku Lembu North Cave). All sites included in the discussion are severely threatened by human activities, such as quarrying, guano digging, graffiti, vandalism, and the landscape of the caves have been altered.

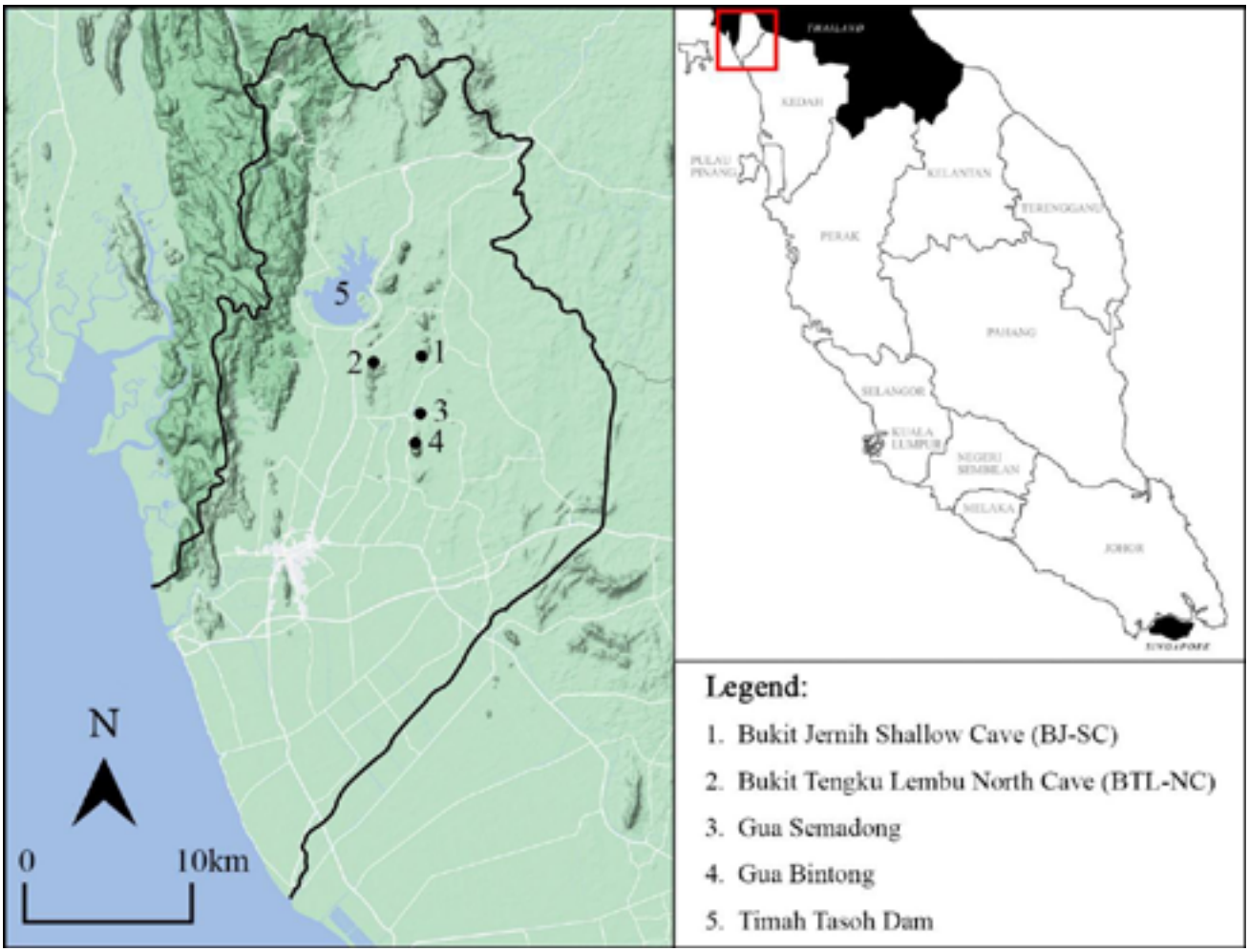


Fig. 1 Rock art sites in Perlis and the Timah Tasoh Dam. **Source:** Saw

Motif categorization

This categorization on the Perlis rock art motifs adopts the five-level categorization model which was applied in the study of rock art in Perak (Saw 2022). By adopting the same categorization model, a multivariate analysis could be applied to study the patterning of rock art across different localities in the future, this approach will allow a more coherent interpretation of rock art across West Malaysia.

According to this model, a motif is first categorized as Determinate or Indeterminate motif (Level 1). The former can be categorized as Figurative or Non-figurative motif (Level 2). Under Figurative motif, there are six categories (Level 3): Anthropomorph, Zoomorph, Anthropomorph & Zoomorph, Material Culture, Botanic, and Handprints, whereas under Non-figurative motif there are Geometric, Line Art, and Abstract. Each of these categories can be further separated into smaller groups (Level 4). For example, under Anthropomorph, there are Plain Anthropomorph, Decorative Anthropomorph, Face/Mask, or Undetermined. The classification for Non-figurative motif is more specific and can further categorized into Level 5.

Overview of the rock art of Perlis

Gua Bintong

Gua Bintong is a cave on the western side of Bukit Chuping. Archaeological excavation was conducted at the mouth of Gua Bintong in 1936 (Collings 1937). The excavation unearthed Hoabinhian stone tools, Neolithic stone tools, pottery sherds, eight human teeth, bone tools, shell tools, bone beads, large numbers of shells, broken animal bones, and a carnelian bead. Collings (1937) noted the presence of watercraft motifs, but there no further elaborations or images relating to the rock art were published. He believed that they were made by the Negrito people in the late 19th century (possibly around 1887 to 1897 based on the year of publication). Subsequent visits to the site also discovered Hoabinhian stone tools (Williams-Hunt 1952b; Adi 1987) and pottery sherds in the cave (Williams-Hunt 1952b; Sieveking 1959; Adi 1987). Unfortunately, no photos or illustrations on the rock art are available, and the site is now heavily quarried, making it inaccessible due to safety concerns (Liew et al. 2021).

Gua Semadong

The rock art of Gua Semadong was discovered in 2017 by a local NGO known as Perlis Nature & Wildlife (Ramon 2019). However, the rock art only made national headlines in 2021 along with the discovery of human skeletal fragments at Bukit Keteri which is not far from the rock art site (Aizat 2021). The human remains were estimated to be 5,000 to 10,000 years old whereas the rock art was believed to be of protohistoric period (Aizat 2021). No follow up report has been published since then.

Based on the photos retrieved online[2], all seven motifs at Gua Semadong are Determinate motifs, and all are categorized as Figurative motifs. They include depictions of three Anthropomorphs, two of which with upraising arms, and another with only one arm upraised but appears to be in a "standoff" gesture with a snake motif (Ramon 2019; Jabatan Penerangan Negeri Perlis 2021; Aizat 2021). Apart from the snake motif, other Zoomorphs include a bovine, an elephant, and another snake with coiled body. The motifs are either solid infilled with black colour or have a black outline with maroon infilled. The motifs represent the sole instance of bichromatic rock art in West Malaysia. This is very unusual because all motifs discovered from other sites thus far are monochromatic in black or reddish hue.

Bukit Jernih Shallow Cave (BJ-SC)

Bukit Jernih is one of the sites within the Aspiring Perlis Geopark, which was gazetted in 2021. The front of the hill has been converted into a camping ground, and tour packages are being offered to the public to promote tourism in Perlis. The site BJ-SC is a small cave some distance away from the main tourist trail. Like most rock art sites in West Malaysia, the cave wall is covered with graffiti, some appear to be from the 1980s based on the written dates.

The rock art was first discovered by a caver from Perak in early January 2022. He informed us about discovery which led to our survey in April in the same year. A total of 111 Determinate and two Indeterminate motifs were recorded across four panels (Figure 2). The rock art can be seen on the wall the back of the cave (Panel A), on the wall to the left of the cave and across the ceiling (Panel B-D). The motifs are mainly geometric shapes that were drawn in outline, and linear designs. Figurative motifs consist of three Anthropomorphs and seven Transport motifs. All the Transport motifs are depictions of watercraft, one of them has three masts and is approximately 1 metre long (Figure 3).

2 The authors have not visited Gua Semadong in person.

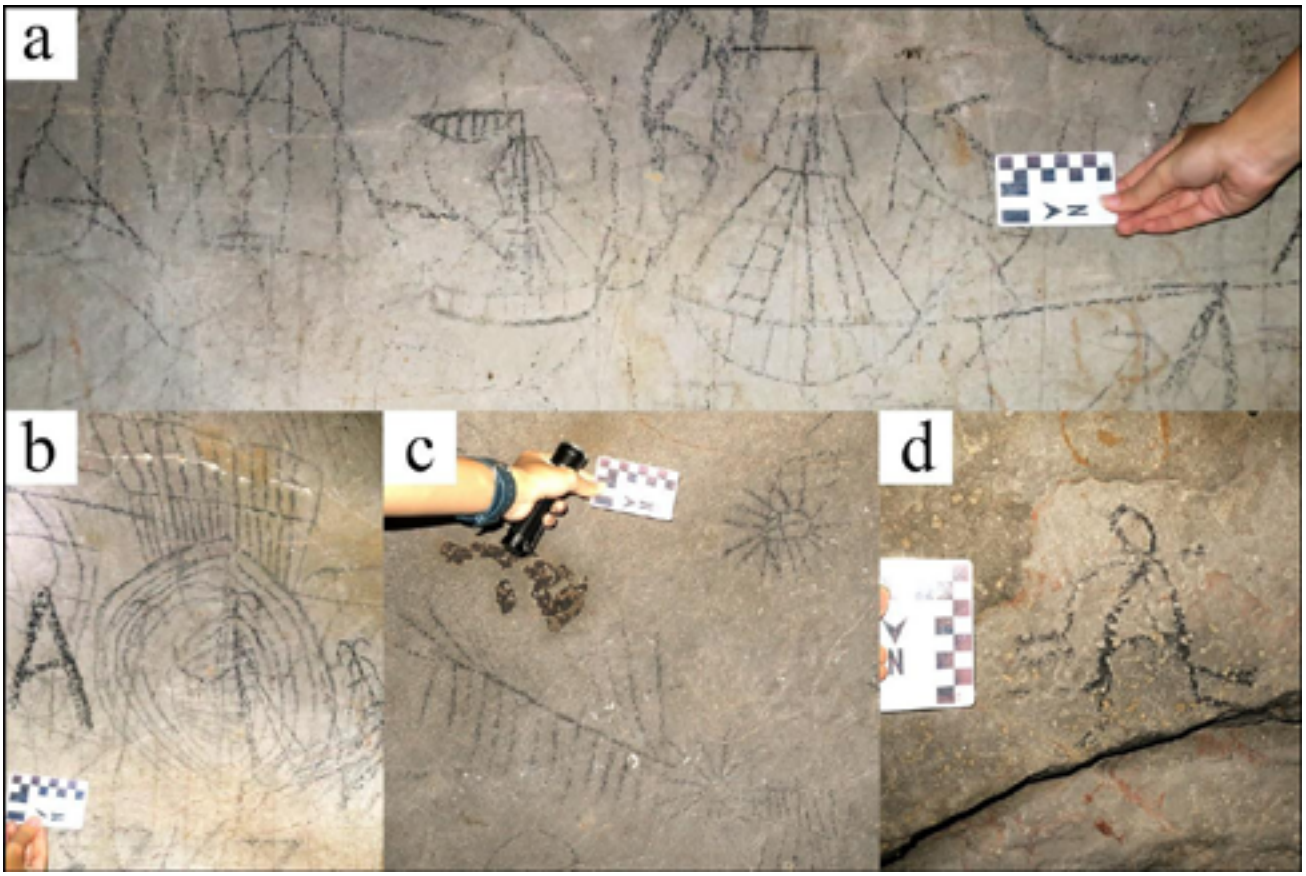


Fig. 2 Some of the rock art motifs of BJ-SC: (a) Watercraft motifs, (b) Complicated abstract motifs, (c) Branch Variant and Ray Variant motifs, (d) Anthropomorph. **Source:** Saw.



Fig. 3 A large watercraft motif at BJ-SC that is approximately 1 metre long. **Source:** Saw.

Bukit Tengku Lembu North Cave (BTL-NC)

Bukit Tengku Lembu was destroyed by guano diggers in the 1950s but the Museum Department managed to recover the artefacts unearthed by the guano diggers (Williams-Hunt 1952b). The site reveals strong evidence of Hoabinhian and Neolithic occupation due to the presence of a large collections of Hoabinhian and Neolithic stone tools. A total of 94 vessels in complete and broken state, a stone bracelet, two bone tools, and three human burials were also recovered from this archaeological locality (Williams-Hunt 1952b; Sieveking 1962; Adi 1987; Chia 1998). BTL-NC is located at the northernmost tip of Bukit Tengku Lembu. It is uncertain whether this is the same cave examined by Williams-Hunt in 1951 since we were unable to obtain the site photos taken in the 1950s. BTL-NC was also heavily disturbed, a portion of the soil at the cave entrance has been dug out.

Similar to Bukit Jernih, we were notified by the Perak caver of the presence of rock art at BTL-NC in early January 2022. Two surveys conducted between April and June 2022 successfully documented a total of 231 Determinate and five Indeterminate motifs were recorded across seven panels. The rock art can be seen on the ceiling of the cave entrance (Panel A), and on various parts in a small room to the left of the entrance (Panel B-G). There are more varieties of motif forms at BTL-NC compared to other sites. The most common form is linear form, followed by outline form, six motifs in solid-infilled form and one in stipple form. The motifs are dominated by Non-figurative motifs of different sizes, while the Figurative motifs are much lesser and smaller (Figure 4). There are also more motif categories present here, including depictions of an elephant rider that are absent from other sites. Table 1 summarises the motif categories from Gua Semadong, BJ-SC and BTL-NC.

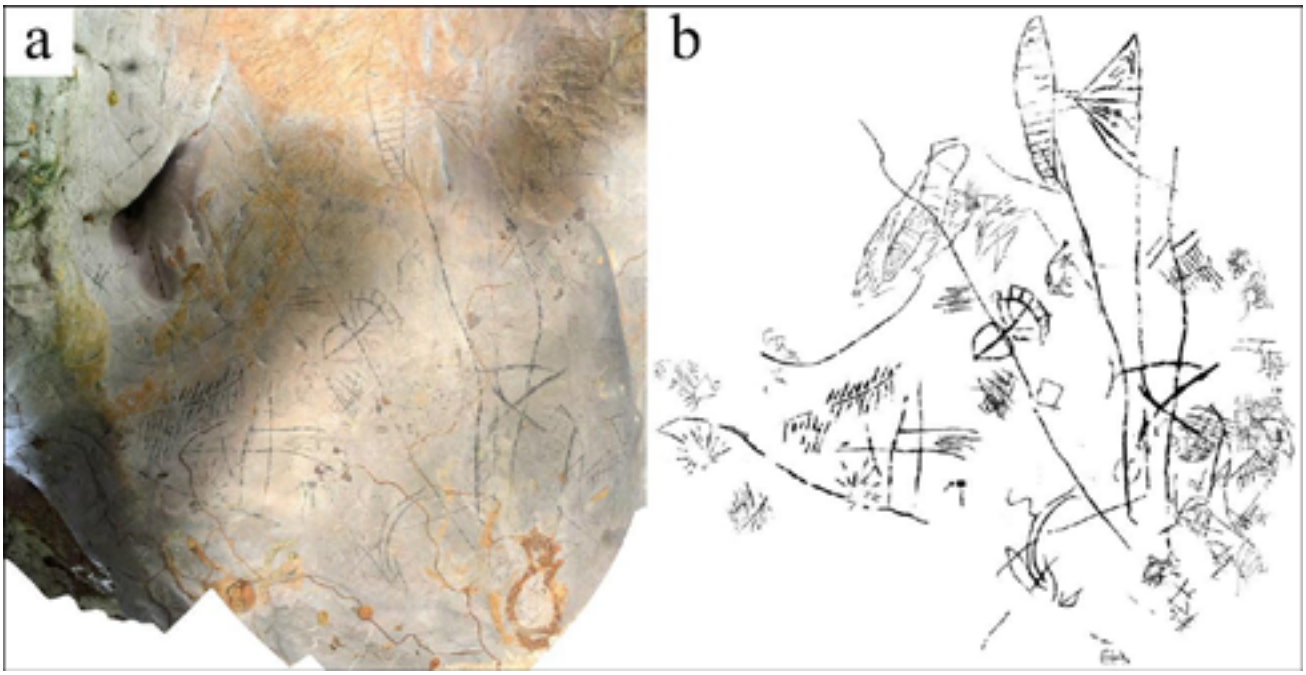


Fig. 4 Portion of BTL-NC Panel A, note the small elephant figure in the centre of the panel. (a) Stitched photos of the ceiling panel (b) Tracing of motifs. Image not to scale. **Source:** Saw.

Site	Figurative (%)				Non-figurative (%)			Total (%)
	Anthropomorph	Zoomorph	Animal rider	Material culture	Geometric	Line art	Abstract	
Gua Semadong (n=7)	42.9	57.1	-	-	-	-	-	100
BJ-SC (n=111)	2.7	-	-	6.3	19.8	60.4	10.8	100
BTL-NC (n=231)	2.2	2.2	0.9	1.3	24.2	51.5	17.7	100

Table 1 Motif distribution of Gua Semadong, BJ-SC, and BTL-NC.

DISCUSSION

Comparison with West Malaysian rock art sites

There are approximately 60 rock art sites reported in West Malaysia, but only a handful were properly documented (Saw 2022). More than half of the sites were discovered in the state of Perak, as this state have been the main focus of archaeological research in West Malaysia (Saw and Goh 2021). There are two main types of rock art in West Malaysia: coloured paintings and charcoal drawings. The former mainly made up of monochromatic red, and are believed to be prehistoric in age due to their faded conditions and similarity with the general characteristics of the early rock art of Southeast Asia (Taçon et al. 2014). At present, Perak is the only state where coloured paintings still survive. On the other hand, charcoal drawings are present in most regions of West Malaysia. They are also believed to be younger due to the occasional presence of modern depictions, such as watercraft, motorcars, firearms, horses, or human figures resembling the colonial officials (Mokhtar and Taçon 2011; Saw and Goh 2021, 2022).

Due to the major difference between coloured paintings and charcoal drawings in the context of West Malaysia, the former was not included in the analysis in this paper. Comparison was made between the rock art motifs of BJ-SC and BTL-NC and charcoal drawings from other northern West Malaysian sites[3] (Figure 5). Five types of motifs were seen to occur repeatedly across this region: Ray Variant, Geometric shape with gridlines, Watercraft, Elephant rider, and Tiger. Ray Variant is a generic category referring to the motif design with multiple lines emanating from a single origin or from a concentric circle. They are often perceived as representing the sun but for the categorisation model used in this study, Ray Variant solely describes the design instead of suggesting an interpretation for the motif.

As shown in the Figure 5, Ray Variant has the widest distribution across the region, followed by watercraft and elephant rider motifs. This comparison was based not only on the motif categories, but also on the forms and styles. For instance, Gua Kelawar in Perak also has a watercraft motif, but the hull is solid-infilled and has three human figures on the boat, displaying no similarities with the watercraft motifs in Perlis. Similarly, the drawing styles of Gua Semadong rock art are highly distinctive not only within Perlis, but within West Malaysia as well. No comparable sites are known at present.

3 Rock art is also present in the central region of West Malaysia, but we do not have access to the photos or rock art inventory (if any) during the writing of this paper.

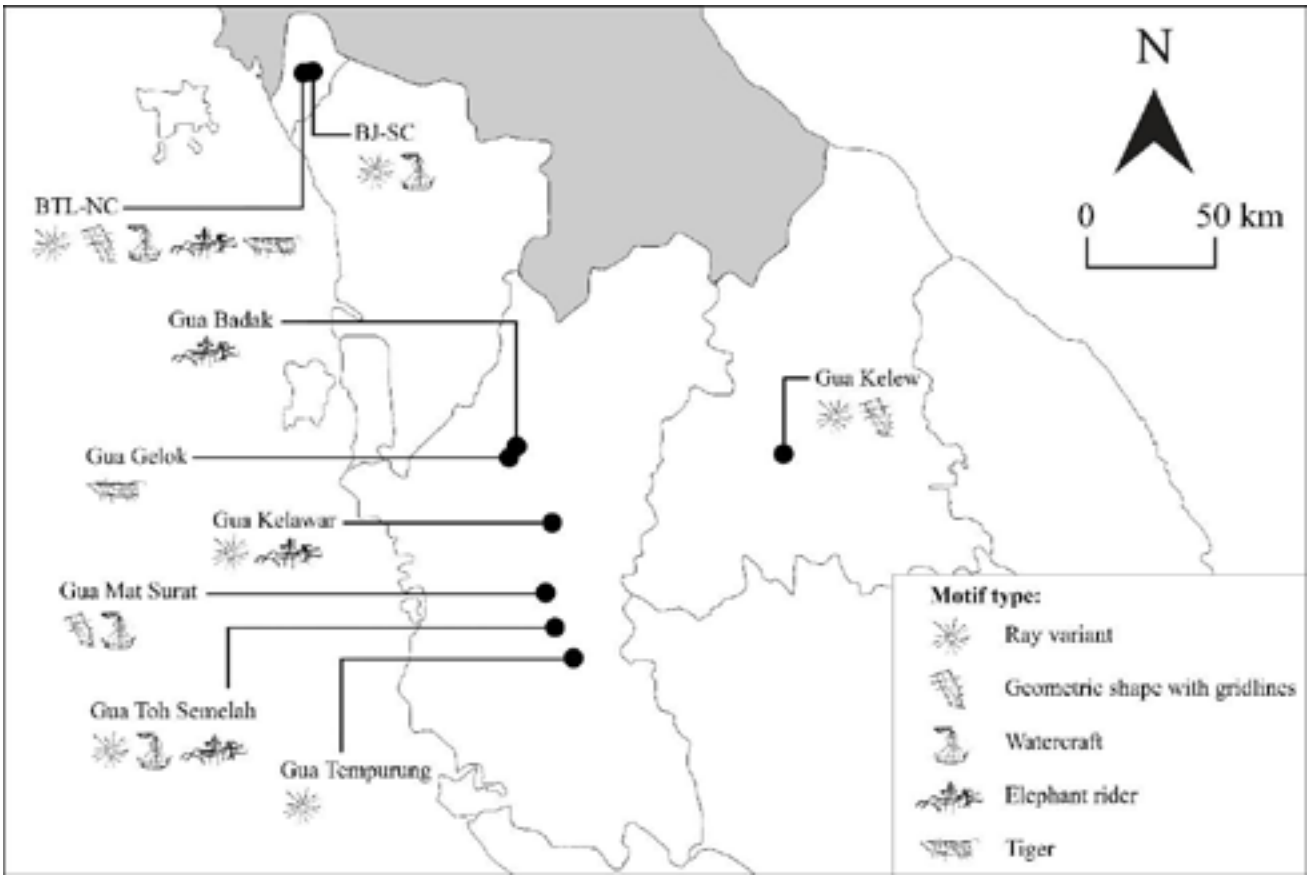


Fig. 5 Similar motifs from other West Malaysian rock art sites. **Source:** Saw.

Branch Variant, Ray Variant, and Complex Linear motifs

The frequent occurrence of three similar motif types across BJ-SC and BTL-NC indicates a strong cultural connection between these two localities. These motifs are Branch variant, Ray variant, and Complex Linear designs (Figure 6). Based on superimposition, and their condition that often appear to be much more faded than other motifs, we postulate that they are from the earliest production phase at these sites.

It remains obscure on what these three motifs represent, as their placements, orientations, and associated motifs appear to be random. One interesting panel from BTL-NC, however, suggested that the Branch Variant are perhaps tree branches. On this panel, a "tiger" is surrounded by several Branch Variant motifs, resembling a jungle scene (Figure 7). The depiction of tiger is also intriguing because it is the second known instance of the representation of this predator in Malaysia, the first one was documented at Gua Gelok, Perak (see Hamid 2014). Tigers were estimated to disappeared from Perlis after 1950s (Kawanishi et al. 2003), hence this rock art is unlikely to be made later than that year.

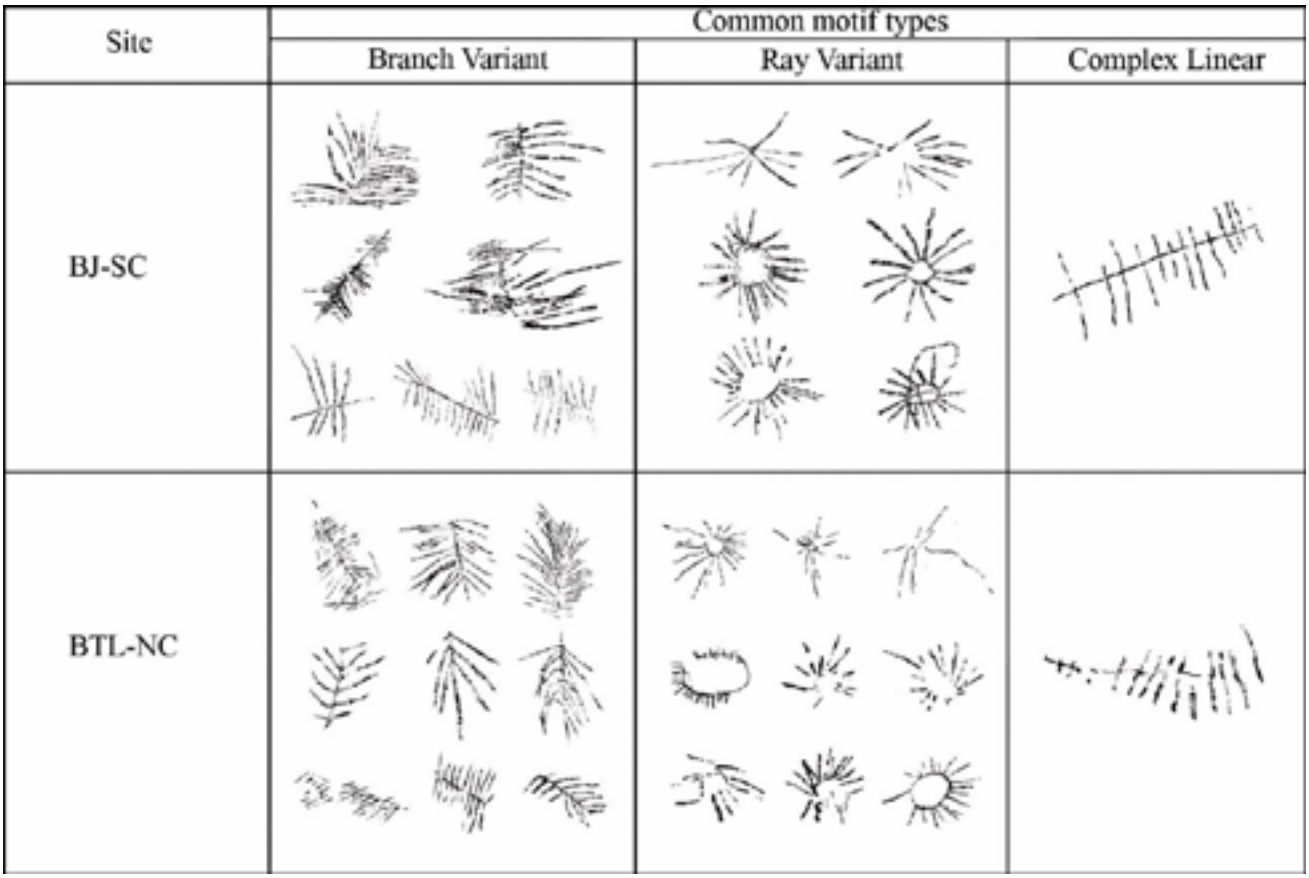


Fig. 6 Common motif types at BJ-SC and BTL-NC. Image not to scale. **Source:** Saw.

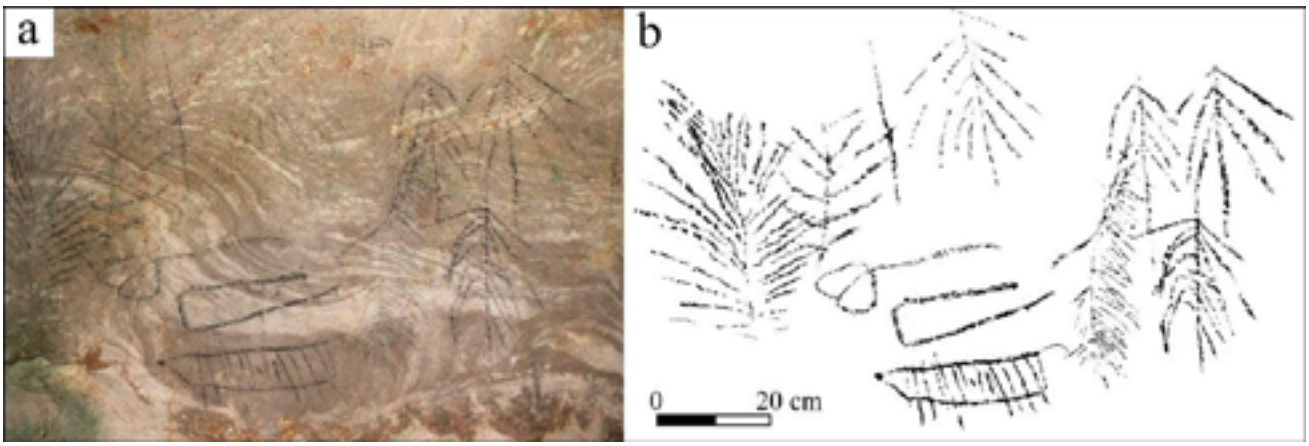


Fig 7 A jungle scene from BTL-NC. A "tiger" is seen at the lower centre of the image. (a) Original photo of the panel (b) Tracing of the motifs. **Source:** Saw.

Elephant and mahout motifs

Other motifs that can help to position the timeframe of the Perlis rock art are elephant and mahout motifs. Elephants was still sighted in the wild in Perlis in the 19th century CE but was estimated to disappear from Perlis around 1960s (Salman et al. 2011). Mahout culture that was prevalent in the West Malaysia up until the 19th century eventually became obsolete around the same time (Salman et al. 2011). Therefore, the presence of an elephant motif and a mahout motif at BTL-NC points towards a date of no later than the 1960s (Figure 8). In addition, the absence of modern subject matter in rock art such as car and weapons also suggest these were made prior to the colonial era.

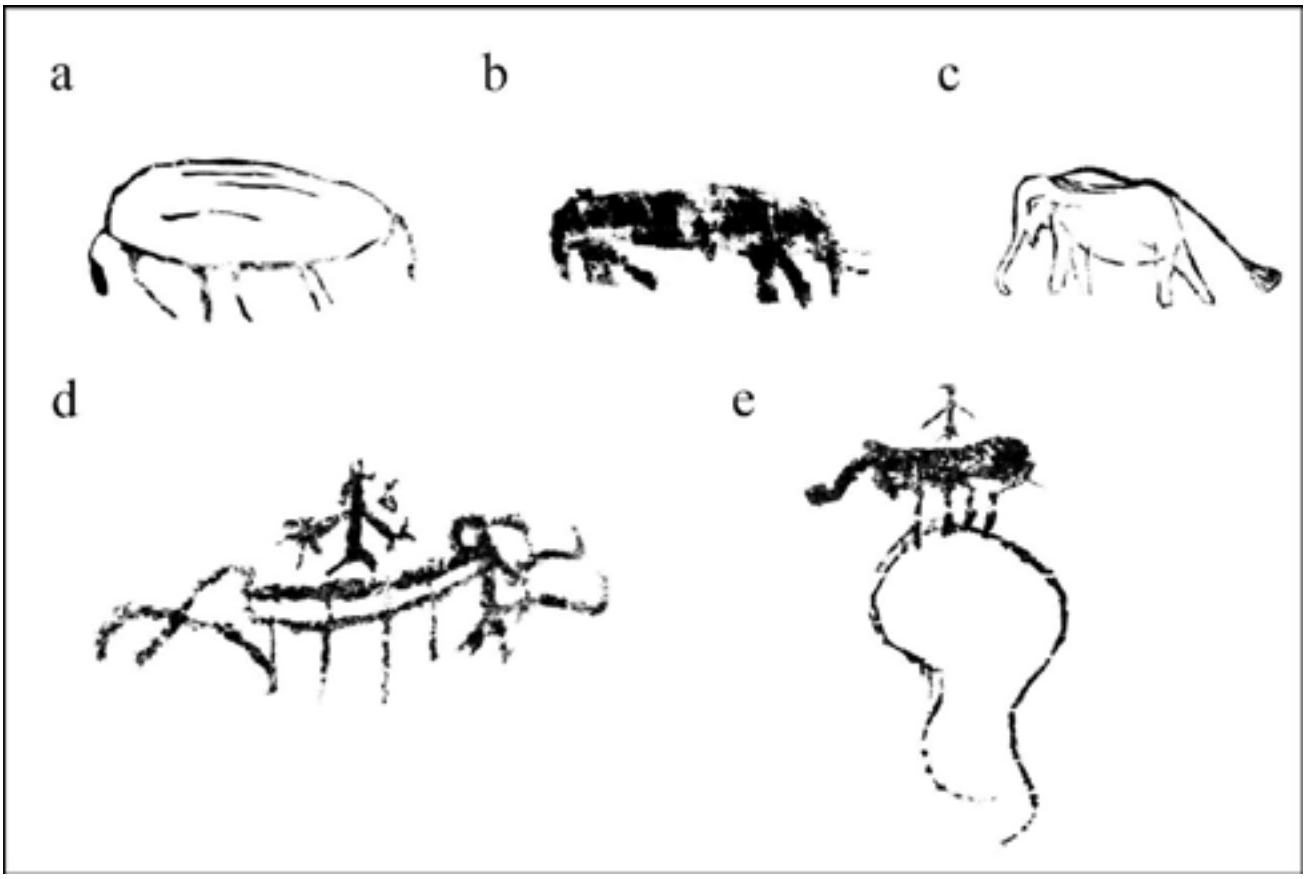


Fig 8 (a-c) Elephant motifs and (d-e) mahout motifs from BTL-NC. Image not to scale. **Source:** Saw.

Watercraft motifs

Watercraft motifs are present at Gua Bintong, BJ-SC and BTL-NC. Watercraft motifs are also reported from a few other sites in West Malaysia, but the motifs from Gua Mat Surat and Gua Toh Semelah most closely resemble the ones from Perlis in terms of styles and boat typologies (Figure 9). Collings (1937) suggested that Gua Bintong motifs may have been made in the late 19th century CE by the local Negrito people (Collings 1937). This also coincides with the time when populous settlements existed along some of the rivers prior to the Siamese attack in the 19th century CE (Adi 1987). Another possibility is that they are related to the ancient trans-peninsular river route which connects Perlis and southern Thailand (Jacq-Hergoualc'h 1997). The construction of the Timah Tasoh Dam between 1987 and 1992 had significantly changed the landscape and riverscape of the area. At present that are no rivers that can penetrate far enough into the sites that are located inland, or rivers wide enough to allow large watercraft to pass through. However, a map from the early 19th century shows that there was a route connecting Perlis to Ligor in Thailand (see Hall 1830). Perhaps in the early days, large boats or ships can be observed passing through this area, which was then being drawn onto the cave walls.

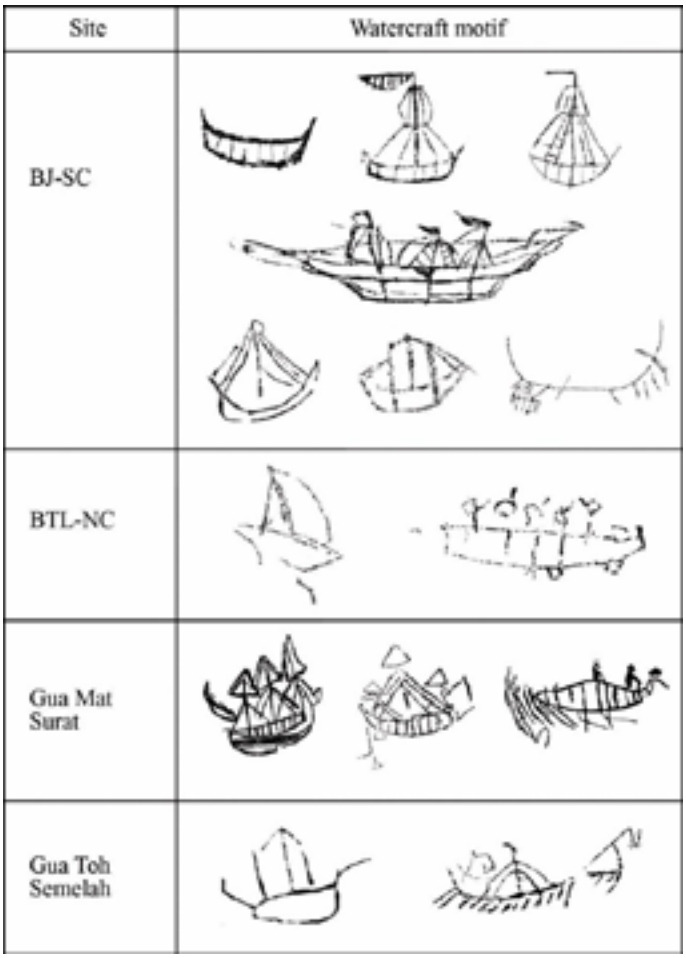


Fig. 9 Similar watercraft motifs from BJ-SC, BTL-NC, Gua Mat Surat, and Gua Toh Semelah. Image not to scale. **Source:** Saw.

Authorship

The indigenous community (Orang Asli) is generally assumed to be the traditional owners of historical rock art in West Malaysia. Researchers have noted the similarity between the rock art motifs and the designs on Orang Asli material culture (Adi 2007; Mokhtar and Taçon 2011; Hamid 2014; Wan Noor Shamimi et al. 2019), and these rock art sites are usually found in the close proximity to Orang Asli settlements areas (Abdul Latib 1985; Zuliskandar 2019). Most importantly, ethnographic studies in the early 20th century CE have recorded that the Lanoh Negrito Orang Asli produced some of the rock art in Lenggong Valley, Perak (Evans 1918, 1927; Schebesta 1928; Williams-Hunt 1952a).

For the case of Perlis, the Negrito people who was seen living in the neighbourhood in the late 19th century CE was believed to be associated with Gua Bintong rock art (Collings 1937). However, the Negrito people vacated Perlis since the early 20th century CE (Skeat and Blagden 1906; Evans 1937), and the reasons remain unknown. The closest Negrito tribe would be the Maniq people from southern Thailand. Two hypotheses stemmed from this scenario: (i) the Perlis rock art was made by the Negrito in Perlis prior to the 20th century CE, or (ii) the Perlis rock art was made by the Maniq people who moved across border from southern Thailand. If the second hypothesis is true, then future surveys should be able to find similar motifs in the traditional homeland of the Maniq people. It should also be noted that the rock art may also to be culturally affiliated to other cultural groups, given that the caves and rock shelters of West Malaysia were utilised by different communities over the years for different purposes. For instance, Buddhist pilgrims have occupied several Perlis caves since as early as 10th to 12th century CE (Lamb 1962, 1964; Khaw and Mokhtar 2013).

CONCLUSION

In conclusion, the rock art of Gua Bintong, Gua Semadong, BJ-SC and BTL-NC belongs to the later phase of rock art production in Malaysia. Although archaeological investigations indicated a long period of human occupation in Perlis, the Perlis rock art is probably only 150 to 50 years old (19th to 20th century CE). The earliest phase mainly consisted of Non-figurative motifs (Branch Variant, Ray Variant, and Complex Liner), while Figurative motifs were added at a later period. The presence of Watercraft and Mahout motifs shows that the artists were in contact with foreign culture, possibly through trades. The authorship and purpose of the rock art remain an open question due to the heavily disturbed context of the site and the complicated historical background of Perlis. Nevertheless, this paper shows that there is a high potential for rock art research in Perlis.

ACKNOWLEDGEMENT

We would like to extend our appreciation to Mr. Billy Chai who discovered and notified us of the rock art at BJ-SC and BTL-NC.

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Analysis of Pictographs at Phang-nga Bay, Western Coast of Peninsular Thailand

การวิเคราะห์ภาพเขียนสีที่อ่าวพังงา ชายฝั่งด้านตะวันตกของประเทศไทย

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ABSTRACT

There were 10 pictographs sites discovered in the Phang-nga Bay. However, the scientific analysis of the rock paintings is not available. Therefore 214 pigment samples appeared on the rock walls at 10 sites were detected by pXRF and analyzed by the experts. These results suggest that rock paintings were probably created by several artists. It reflected more than one group occupied the area of the Phang-nga Bay. There is a need for further multidisciplinary studies on archaeology, ethnology, paleoecology, and geomorphology in order that the rock art identification will give information on interaction between human and nature.

ปัจจุบันมีการค้นพบแหล่งภาพเขียนสีหรือศิลปะถ้ำบริเวณอ่าวพังงา จังหวัดพังงา จำนวน ๑๐ แหล่ง ซึ่งยังไม่มีการวิเคราะห์ทางวิทยาศาสตร์แต่อย่างใด นักวิจัยและผู้เชี่ยวชาญจึงมีการทดสอบและวิเคราะห์องค์ประกอบธาตุของสีที่ใช้เขียนภาพ จำนวน ๒๑๔ ตัวอย่าง ด้วยเทคนิครังสีเอ็กซ์ (pXRF) ผลจากการวิเคราะห์พบว่าภาพเขียนสีที่อ่าวพังงา อาจมีการเขียนขึ้นโดยกลุ่มคนหลากหลายกลุ่มที่อาศัยอยู่ในพื้นที่อ่าวพังงา ซึ่งในอนาคตมีความจำเป็นต้องอาศัยการศึกษาแบบสหวิทยาการ ได้แก่ โบราณคดี ชาติพันธุ์วิทยา นิเวศวิทยาโบราณ และธรณีสันฐาน เพื่อให้ได้ข้อมูลที่ชัดเจนถึงความสัมพันธ์ระหว่างมนุษย์และธรรมชาติ

Keywords: rock art, pictograph, rock painting, pigment analysis, Phang-nga Bay, western coast of Peninsular Thailand, southern Thailand | ภาพเขียนสี, ศิลปะถ้ำ, การวิเคราะห์ภาพเขียนสี, อ่าวพังงา, ชายฝั่งด้านตะวันตกของประเทศไทย, ภาคใต้ของประเทศไทย

Phang-nga Bay is located in Phang-nga Province, southern Thailand, by the Andaman Sea. There is a karst topography which is a characteristic of the erosion of the limestone mountains (Figure 1). Rock paintings were found on the rock wall of caves and rock shelters on a small island and some sites situated near a mangrove forest.



Fig. 1: Karst topography at Phang-nga Bay, Phang-nga Province. **Source:** Photo by Thawatchai, 2021.

There have been reports of rock art sites in southern Thailand since 1912. Later, Thai archaeologists from Fine Arts Department continuously surveyed and studied archaeological sites in southern Thailand, discovering more than 30 pictographs sites at present (Figure 2).



Fig. 2 Pictographs sites at Phang-nga Bay and Ao Luk area.

Pictographs can be seen in the form of figures and non-figures which reflect the way of life and environment in the past. However, scientific analysis is not available. The purpose of this paper is to report the result for interpretation.

There were 10 pictograph sites discovered in Phang-nga Bay (Figure 3). Among these 10 sites, 5 new sites (No.6-No.10) were discovered by officers of Phang-nga Bay National Park in 2020. The conditions and paintings at each site can be summarized as follows:



Fig. 3 Pictographs Sites at Phang-nga Bay.

1 Ko Panyi. The paintings were discovered on the rock wall of the shelter on the sea notch, northwestern side of the island. The significant features include red boat figures and human figures performing different actions such as standing, sitting, and dancing (Figure 4).

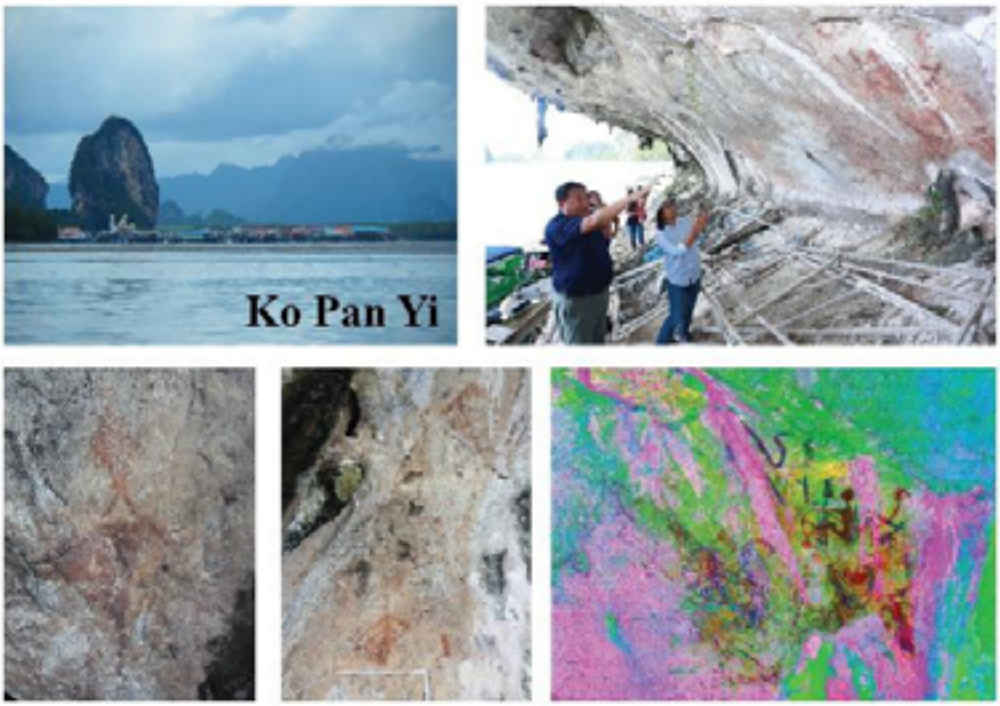


Fig. 4 Pictographs at Ko Panyi. **Source:** Photo by Thawatchai, 2021.

2 Tham Nak is a large cave, located on Song Phi Nong Island. The important pictures are groups of boats and fish in red colour (Figure 5).



Fig. 5 Pictographs at Tham Nak**. Source:** Photo by Thawatchai, 2021.

3 Khao Raya is a wall karst topography which is more than two kilometres long. Groups of geometric forms or nets with wavy lines in red colour were discovered on the rock wall of the cliff (Figure 6).



Fig. 6 Pictographs at Khao Raya. **Source:** Photo by Thawatchai, 2021.

4 Khao Khian is the most well-known site in this area. At the rock shelters along the mountain, groups of various figures, including humans, dolphin, birds, fish, monkey, reptile, and geometric symbols. These figures were painted in red and reddish-brown colour (Figure 7).

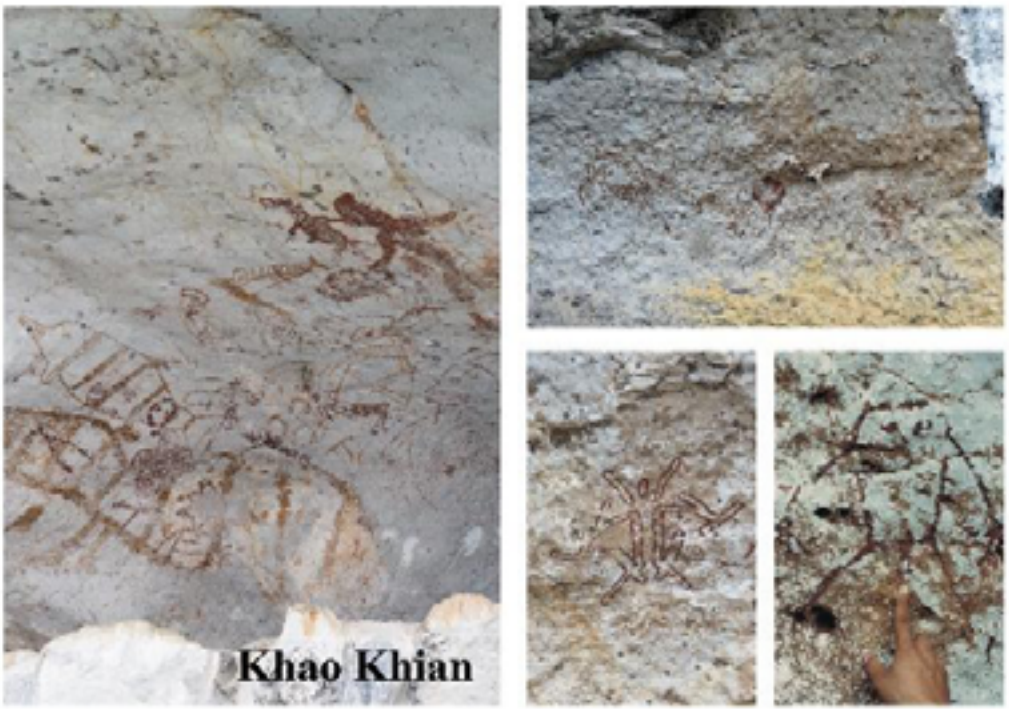


Fig. 7 Pictographs at Khao Khian. **Source:** Photo by Thawatchai, 2021.

5 Khao Phra-at Thao. There are two groups of red colour figures. The first group consisted of a large fish, shrimp and human. Another group represented figures of humans, reptiles, lines and geometric symbols (Figure 8).



Fig. 8 Pictographs at Khao Phra-at Thao. **Source:** Photo by Thawatchai, 2021.

6 Ko Thalu Nok is a recently discovered site. There is a large rock shelter that is higher than the other sites. The significant figure is a group of cows and humans and discovered geometric forms in red colour (Figure 9).



Fig. 9 Pictographs at Ko Thalu Nok. **Source:** Photo by Thawatchai, 2021.

7 Ko Khao Tao is a small island surrounded by mangrove forest. On the rock wall of the shelter, there were distinctive red figures of boats and humans. In addition, some of red figures were painted over with black human and animal figures (Figure 10).



Fig. 10 Pictographs at Ko Khao Tao. **Source:** Photo by Thawatchai, 2021.

8 Tham Nok Krarian located on Sa-wang Yai Island. Unidentified red traces of pictures were discovered on the rock wall (Figure 11).



Fig. 11 Pictographs at Tham Nok Krarian. **Source:** Photo by Thawatchai, 2021.

9 Ko Khai, there was a cave formed by erosion of sea water. Geometric forms or nets in reddish-brown colour were discovered on the rock wall (Figure 12).



Fig. 12 Pictographs at Ko Khai. **Source:** Photo by Thawatchai, 2021.

10 Ko Yang Daeng is a small island. Above, there was a narrow cave. The red paintings were discovered on the rock wall. The significant figure is a resemble flower. Other figures are geometric forms (Figure 13).

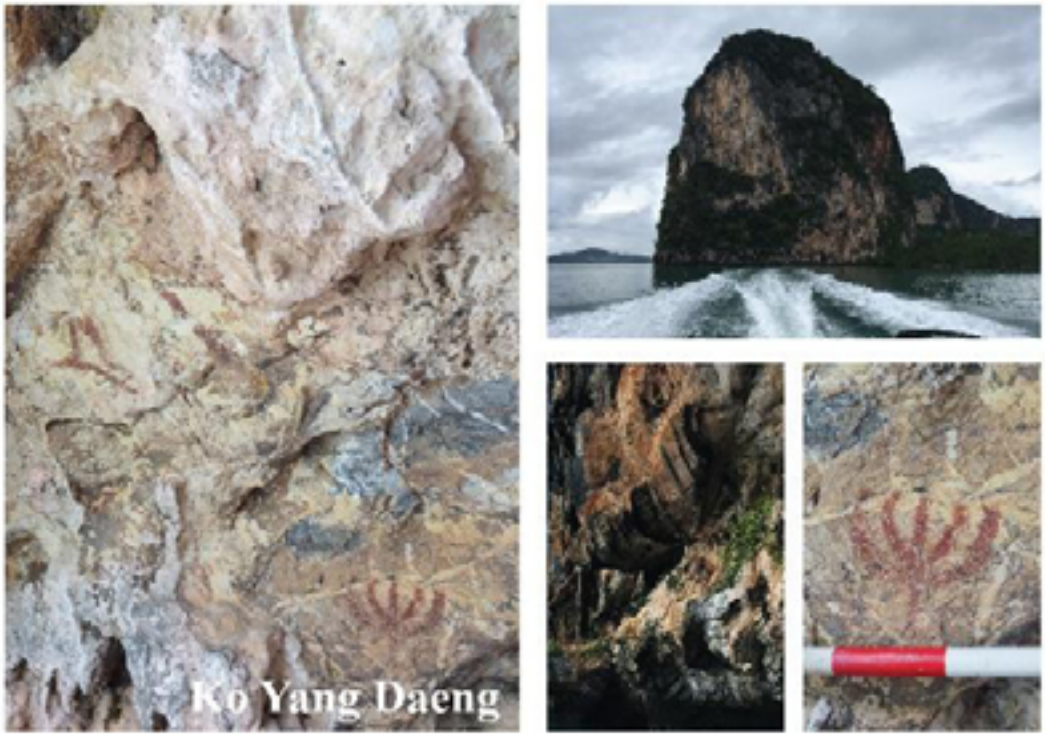


Fig. 13 Pictographs at Ko Yang Daeng. **Source:** Photo by Thawatchai, 2021.

The comparative study of rock paintings at Phang-nga bay and Ao Luk were classified and compared according to technique, form and colour by using iDStrech application to enhance the pictures of superimposition that reveal some pictures are painted over multiple periods with different colours (Figure 14).

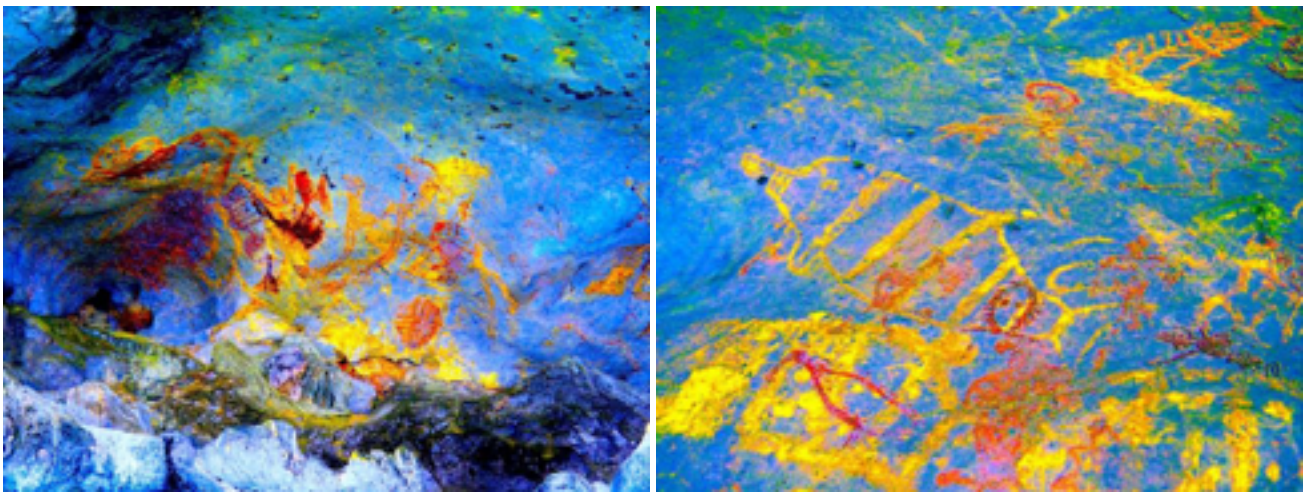


Fig. 14 Images enhanced by iDStrech application showing the superimposition of rock paintings on the rock wall of Khao Khian, the Phang-nga Bay. **Source:** Photo by Thawatchai, 2021.

Human figures mostly use silhouette, outline and partial silhouette techniques (Figure 15). Some of the figures are showed details of faces and hair that are different from the figures in other regions. At Phi Hua To Cave in Krabi Province, only one pair of hands was discovered. The stylized human figures might represent a distinctive status and/or be related to the ritual beliefs of the communities in the past.

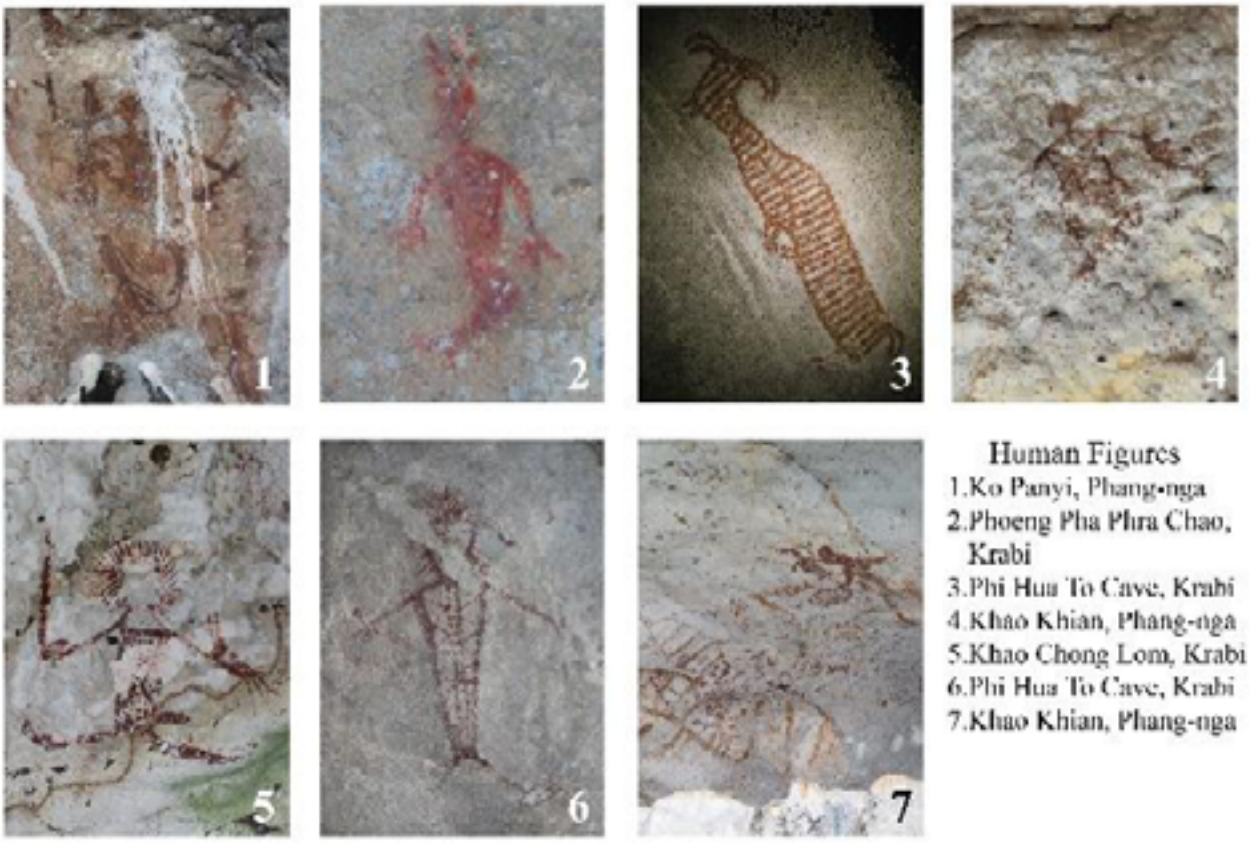


Fig. 15 Comparison of human figures in the Phang-nga Bay. **Source:** Photo by Thawatchai, 2021.

The figures of land animals include cows, elephants, rhinos, monkeys, hedgehogs, and tigers or cats (Figure 16). At Phi Hua To Cave, there were two large birds and some of the figures had small birds perched on their arms, suggesting that they may have been useful for hunting. In addition, reptile figures such as lizards, crocodiles and turtles were also discovered (Figure 17).



Fig. 16 Comparison of land animal figures in the Phang-nga Bay. Source: Photo by Thawatchai, 2021.

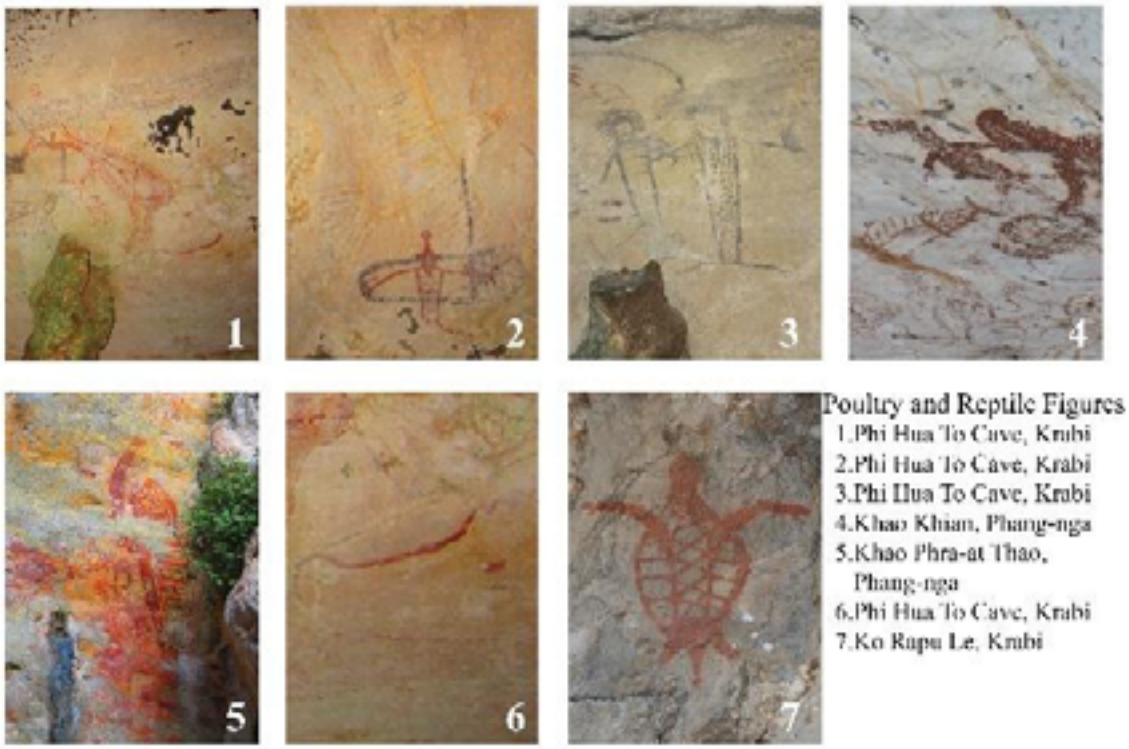


Fig. 17 Comparison of poultry and reptile figures in the Phang-nga Bay. **Source:** Photo by Thawatchai, 2021.

Aquatic animal figures were discovered in almost sites and were typically larger than the human figures in the same group and may have indicated an abundance (Figure 18). There were many different species of fish. A dolphin figure was discovered at Khao Khian, Phang-nga which is similar to the figure at Khao Ko Yo, Krabi. Other aquatic animals such as jellyfish or stingrays, shrimps and crabs were also discovered, demonstrating the environment in the past along the coast of the Andaman Sea.

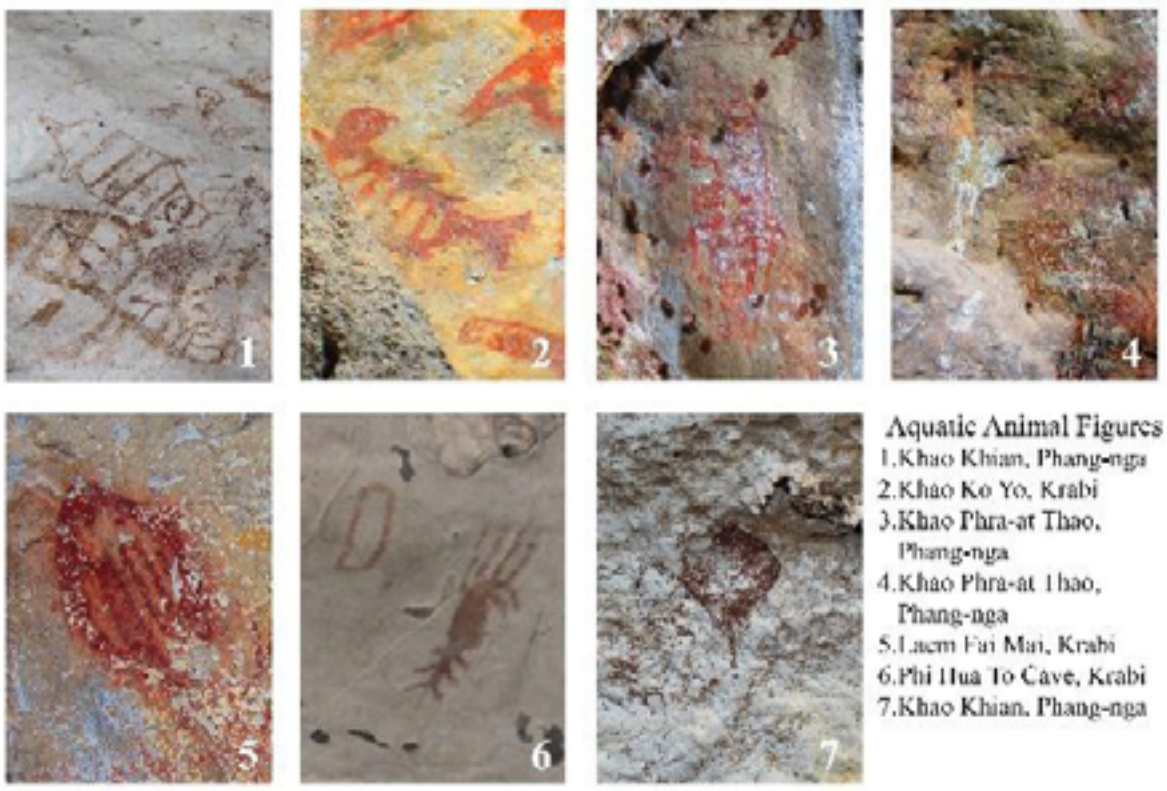
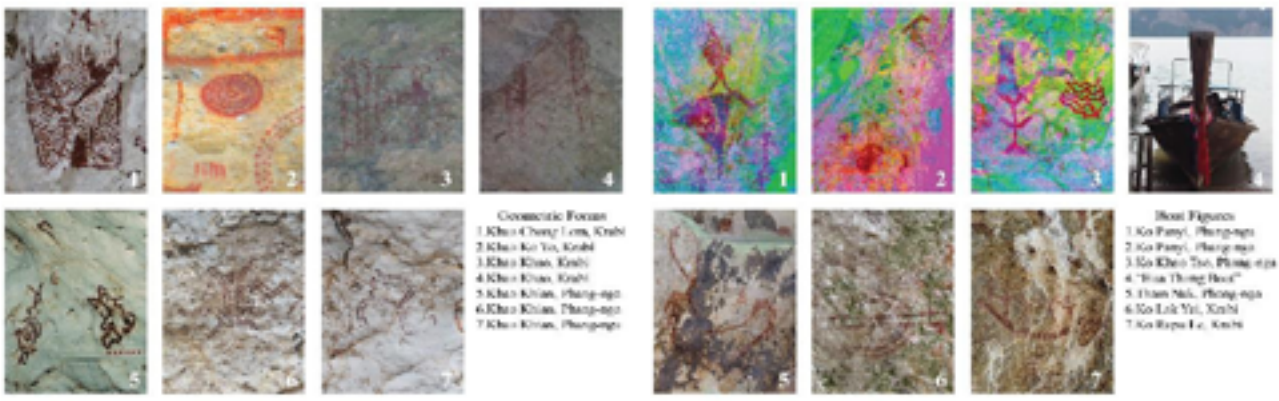


Fig. 18 Comparison of aquatic animal figures in the Phang-nga Bay. **Source:** Photo by Thawatchai, 2021.

All pictographs sites have geometric forms that could be used as composite patterns (Figure 19). Therefore, it may be interpreted as symbolic pictures for a specific group of people.

Boat figures at Ko Khao Tao can be compared with Hua Thong Boat which is a regional fishing boat in southern Thailand, created by local people who lived close to the coast of the Andaman Sea with their knowledge (Figure 20). These boats are still used in nowadays.



Figs. 19 and **20** Comparison of geometric (left) and boat (right) figures in the Phang-nga Bay. Source: Photo by Thawatchai, 2021.

Interpretation of pictographs that might represent a story and ritual beliefs. For the ritual beliefs, the masterpiece picture at Phi Hua To Cave is a human in stylized form, dressed in a long robe (Figure 21).

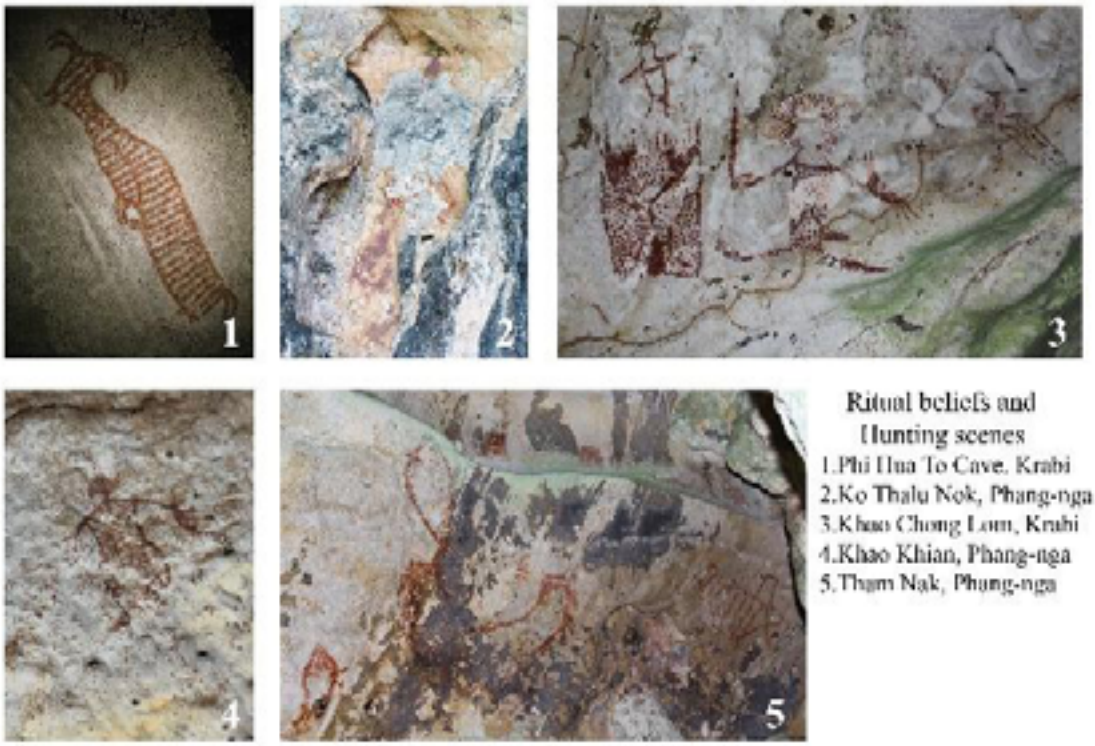


Fig. 21 Comparison of ritual depictions in the Phang-nga Bay. **Source:** Photo by Thawatchai, 2021.

Regarding the hunting scene, there was a picture at Ko Thalu Nok depicted a group of cows being chased by humans. Picture of sailing in the sea, rows of boats and groups of fish. And pictures of humans catching animals.

Pictures that represent the activity such as dancing humans and a couples sitting and blowing or smoking, as well as humans riding a four-legged animal. There is also a male figure standing with exposed genitals at Khao Khao in Krabi Province and a scene of a large group of animals and humans for example at Khao Khian in Phang-nga. Therefore, the pictographs represent the way of life of the hunting-gathering society in the prehistoric period who lived near the coast of the Andaman Sea (Figure 22).

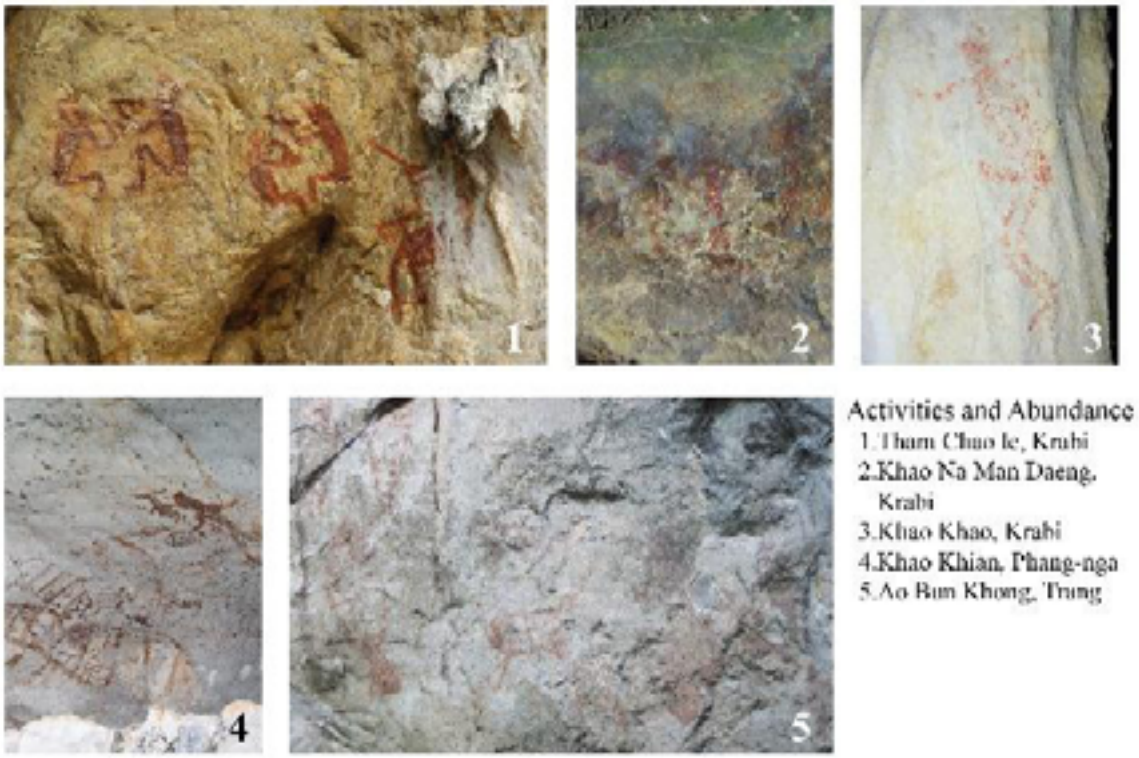


Fig. 22 Comparison of human activities in the Phang-nga Bay. **Source:** Photo by Thawatchai, 2021.

From research, interpretation, and analysis, there is a possibility that the person or group who created these rock paintings is the ancestor of "Chao Nam / Chao Le" in Thai or Sea Gypsies who live close to the coast and have through experience about the sea very well.

The location of the sites may provide as a landmark in the route of their hunting and gathering. The paintings may represent the record to communicate the stories and way of life. Furthermore, based on legends and beliefs, it may be used for ritual ancestor's worship.

The only methods used for dating pictographs sites in southern Thailand are comparative studies of archaeological evidence discovered nearby and geological studies which can be considered and compared with the duration of the incision (Notch) of the rock wall (Figure 23). These incisions were caused by the sea waves during the highest level about 5,000 years ago. In conjunction with archaeological evidence at nearby sites, these paintings should be date to prehistoric period, approximately 5,000–3,000 years ago.



Fig. 23 Red pictographs on the rock wall of the shelter on the sea notch at Ko Panyi. **Source:** Photo by Thawatchai, 2021.

In 2021, FAD 12 Nakhon Si Thammarat collaborated with Kasetsart University on the project titled "Geomorphology and Rock Art Studies in the Phang-Nga Bay for Understanding of Prehistoric-Historic Societies and Migrations in Southern Thailand" This project is partly funded by the National Council of Thailand (awarded to P. Pananont).

The methods of this project are to study history, archeology, geology, ancient climate and sea level change. Collecting sea level data, topographic survey, 3D scanner, analyzing paintings with scientific and technological methods (Figure 24):

- Optical microscopy of pigment
- Spectroscopy and Raman analysis
- Chemical analysis of pigment and materials
- UV and IR Absorption Spectroscopy
- X–ray Diffraction
- 3D laser scanner



Fig. 24 Left: Field data collection by project researchers at Pictographs sites in Phang-nga Bay. Right: Analysis by Synchrotron Light Research Institute and Kasetsart University. **Source:** Photo by Thawatchai, 2021.

In the first year, the project concentrates on pictographs sites at the Phang-nga Bay. In addition to conducting archaeological research, the project requires to analyze pigment by using pXRF for collecting data and comparing the component with other sites.

The result of the reddish-brown pigment sample at Ko Khai which consist of Iron, Manganese, Zinc and Phosphorus is the significant distinctive feature. The red pigment sample from Khao Khian and Ko Khao Tao reveals that the main component is Iron and trace of Manganese, Titanium and Phosphorus. While black pigment sample from Ko Khao Tao showed traces of Iron and other minerals (Figure 25).



Fig. 25 Left: Reddish brown pigments at Ko Khai. Right: Red pigments at Khao Khian. **Source:** Photo by Thawatchai, 2021.

Therefore 214 pigment samples that appeared on the rock walls at 10 sites were detected by pXRF and analyzed by the experts of Synchrotron Light Research Institute and the Department of Earth Sciences, Faculty of Science, Kasetsart University.

The analysis results show that most rock paintings used red pigment. Its main component is Iron (Fe 0.12-13.89 %); Manganese, Titanium and Phosphorus were traced minerals. Reddish brown pigment for geometric painting at Ko Khai obtain the result of the component: Manganese (0.10-0.17%), Zinc (0.06-0.09%), Phosphorus (0.11-0.45%) which is the significant distinctive feature. Iron was a trace mineral (0.04-0.18%) of samples from black pigments of pictographs at Ko Khao Tao therefore, it was likely made from organic material (Figure 26).

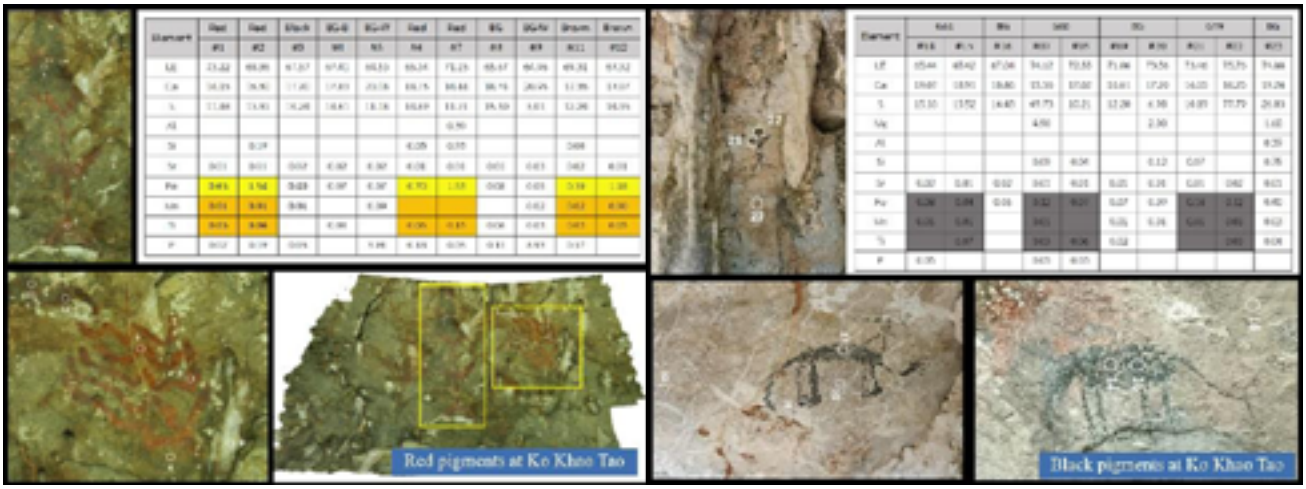


Fig. 25 Left: Red pigments at Ko Khao Tao. Right: Black pigments at Ko Khao Tao. **Source:** Photo by Thawatchai.

According to the XRF result, rock paintings were created by several artists who had also different tastes and skills. It reflected more than one group occupied the area of the Phang-nga Bay.

There is a need for further multidisciplinary studies on archaeology, ethnology, paleo-ecology and geomorphology in order that the Phang-nga Bay rock art identification will give information on the interaction between humans and nature. The next year, the project intends to perform collecting of data and expand to the nearby area at Ao Luk, Krabi Province.

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Ex Machina: Machine Learning, ceramics and rock art in the Khorat Plateau, Thailand

Ex Machina: แมชชีนเลิร์นนิง เซรามิกส์ และศิลปะหินบนที่ราบสูงโคราช ประเทศไทย

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ABSTRACT

Machine Learning for the recognition and analysis of prehistoric rock art and pottery is a promising area of research that could reveal new insights into cultural heritage and identity. Deep Learning (a form of Artificial Intelligence) can now be used to train powerful models to automatically recognise pottery and rock art images, overcoming resource constraints such as time, manpower, and lack of funding. This article provides a preliminary overview and proof of concept by providing Machine Learning approaches based on current advancements in Deep Learning to train a model to recognise images of pottery and prehistoric rock art. These methods can process large amounts of data quickly and accurately, revealing new patterns and relationships. Although ML can be a complex undertaking, new tools make it accessible to the archaeological practitioner who is not an AI expert.

แมชชีนเลิร์นนิงสำหรับการจดจำและวิเคราะห์ศิลปะหินยุคก่อนประวัติศาสตร์และเครื่องปั้นดินเผาเป็นพื้นที่ที่มีแนวโน้มของการวิจัยที่สามารถเปิดเผยข้อมูลเชิงลึกใหม่ๆ เกี่ยวกับมรดกทางวัฒนธรรมและเอกลักษณ์ ตอนนี้สามารถใช้การเรียนรู้เชิงลึก (ปัญญาประดิษฐ์รูปแบบหนึ่ง) เพื่อฝึกโมเดลที่ทรงพลังให้จดจำภาพศิลปะเครื่องปั้นดินเผาและหินโดยอัตโนมัติ เอาชนะข้อจำกัดด้านทรัพยากร เช่น เวลา กำลังคน และการขาดเงินทุน บทความนี้แสดงภาพรวมเบื้องต้นและการพิสูจน์แนวคิดโดยให้แนวทางการเรียนรู้ของเครื่องตามความก้าวหน้าในปัจจุบันของการเรียนรู้เชิงลึกเพื่อฝึกโมเดลให้จดจำภาพของเครื่องปั้นดินเผาและศิลปะบนหินยุคก่อนประวัติศาสตร์ วิธีการเหล่านี้สามารถประมวลผลข้อมูลจำนวนมากได้อย่างรวดเร็วและแม่นยำ เผยให้เห็นรูปแบบและความสัมพันธ์ใหม่ๆ แม้ว่า ML จะเป็นงานที่ซับซ้อน แต่เครื่องมือใหม่ๆ ทำให้ผู้ปฏิบัติงานทางโบราณคดีที่ไม่ใช่ผู้เชี่ยวชาญด้าน AI สามารถเข้าถึงได้

Keywords: Machine Learning, Deep Learning, Cultural Heritage, Ceramics, Rock art, Archaeology, Convolutional Neural Networks | การเรียนรู้ของเครื่อง, การเรียนรู้อย่างลึกซึ้ง, มรดกทางวัฒนธรรม, เซรามิกส์, ศิลปะหิน, โบราณคดี, เครือข่ายประสาท Convolutional

INTRODUCTION

The significance of rock art is recognised worldwide (Whitley 2016). However, a lack of resources often hampers the discovery and exploration of this unique kind of cultural heritage. Manually identifying rock art and analysing it can be a time-consuming and expensive endeavour. Automation of this process would allow larger-scale analysis, enabling this study to be extended to locations where there has been little previous research. Similar issues exist in the analysis of ceramics. In the last few years, advances in Machine Learning (ML), a subfield of Artificial Intelligence (AI), have begun to be applied to the study of ancient ceramics and rock art. Currently, much of this research is in the 'proof of concept' stage; nevertheless, it shows promise, particularly in the area of image classification (Pawlowicz et al. 2017; Prasomphan and Jung 2017; Tsigkas et al. 2020; Bickler 2021). In recent years, ML-based algorithms have been used to identify and extract unique qualities from a wide range of creative and cultural assets, including rock art. However, studies that report on such research assume familiarity with advanced data science and ML algorithms, making it difficult for archaeologists to learn and use these techniques.

Ban Non Wat (BNW) and Khao Chan Ngam (KCN), both of which are located on the Khorat Plateau in Thailand, are home to impressive collections of ceramics and rock art, although much of the data regarding these sites remain relatively unexamined. This paper discusses the application of deep learning techniques (DLs) using Convolutional Neural Networks (CNNs) to analyse ceramics and rock art image datasets from the Khorat Plateau and shows the effectiveness of these methods.
Three primary contributions are made in this paper:

- We outline the process needed to perform classification of images from two different sites containing very different types of material culture (rock art and ceramics) using DL
- We provide details regarding our use of lower code frameworks for image classification and a discussion of the benefits and difficulties associated with such solutions for archaeologists and other researchers who do not have access to data science and machine learning specialists.
- And finally, we provide a discussion of some of the implications surrounding the use of ML for image analysis and the limitations of methods using open-source and commercially hosted ML options.

This paper first presents a background on the topic of DL and how this may be used in archaeological research. Next, we describe the methods we use to perform image classification using CNNs. We propose a method of using transfer learning (TL), which makes use of a model previously trained on a very large image dataset (which is not made up of archaeological data) to analyse two image datasets. We then turn to a discussion of the implications of using DL; both from a general ML standpoint and from the perspective of archaeology. Finally, we discuss our conclusions and recommendations for future work.

BACKGROUND

Machine Learning and Deep Learning Application in archaeology

ML seeks to answer the question of how to build machines with the capacity to learn independently (Jordan and Mitchell 2015). Computer models are digital representations of the physical world. A weather model may calculate how likely it is to rain given a particular set of parameters (called features). After the model has been trained by ingesting a large number of examples of previous outcomes, it is capable of responding with a prediction of how likely a particular outcome is to occur. Over time, the model is capable of 'learning', that is, making a more accurate prediction of the outcome is likely to occur as it collects more example data. Models are essentially a collection of simple calculations (addition, multiplication, and logarithmic functions) that are executed at great speed.

Deep Learning (DL) is a sub-field of ML and is concerned with creating "neural networks" that mimic the structure of networks of individual human brain cells. The concept of neural nets has been around since 1960 (Widrow and Lehr 1990), but only recently have advances in processing and computing power made them practical. Researchers have developed complex networks with many layers of neural nets that can execute formulas with hundreds of thousands of parameters. They are run on systems with graphic processing units (GPUs) or tensor processing units (a tensor is a type of mathematical vector) to allow these calculations to be executed extremely quickly. DL models are capable of analysing text to look for patterns of words, images of elements in a photo, or sounds such as the human voice. Many businesses are using some type of DL in their customer interactions (Davenport and Mittal 2023).

Convolutional Neural Networks (CNNs) are a type of layered artificial neural network used for image and video recognition tasks and are the engine that powers image classification. They are designed to process and analyse data with grid-like structures, such as images, videos, and audio signals. The convolutional layers are responsible for learning and detecting local patterns and features in the input data, while the pooling layers reduce the spatial dimensions of the data while preserving important information. The fully connected layers are used to make the final prediction or classification. The key advantage of CNNs is their ability to automatically learn hierarchical representations of the input data, without the need for manual feature engineering. They can also be trained on large amounts of labelled data, which allows them to learn and generalise well to new, unseen data. CNNs have been successfully applied in a variety of computer vision tasks, including object recognition, image classification, and semantic segmentation, among others (El Naqa and Murphy 2015).

There is great promise in applying AI techniques to the study of rock art. However, in the archaeological domain, visual item categorisation, one of an archaeologist's primary techniques, has been mostly unassisted by technology. Although visual inspection is traditionally used to classify artefacts, ML techniques can be used to construct tools to assist in this task (Maaten et al. 2007). Literature describing the application of ML to painted rock art analysis is limited; however, there have been a few notable publications in this area, such as Purshotam's (2015) master's thesis on automatic indexing of South African rock art images, Kowlessar et. al.'s (2021) model that identifies a stylistic chronology from learned features, and Jalandoni et al.'s (2022) article on the use of ML methods in rock art research and their application to automatic painted rock art identification.

Stages of the ML workflow

The stages involved in using ML for artefact classification are summarised in Table 1 below. These activities as they relate to CV and image analysis will be discussed in more detail in the methods section.

	Stage	Activities
0	Data collection	Collect a representative and diverse dataset of artefact images or other relevant information for training and testing the ML model.
1	Data pre-processing	Clean and pre-process the data to remove errors, missing values, or inconsistencies and ensure that the data are in a suitable format for ML.
2	Feature extraction	Extract meaningful features from the data that are relevant to artefact classification. This can include information such as the shape, size, colour, texture, and other characteristics of the artefacts.
3	Model selection	Choose a suitable ML algorithm for artefact classification. This may involve testing different algorithms and comparing their performance on the data.
4	Training and validation	Train the ML model on the data using a suitable training set and validate its performance on a separate validation set.
5	Model evaluation	Evaluate the performance of the trained model using appropriate metrics, such as accuracy, precision, and recall and identify any areas for improvement.
6	Model deployment*	Deploy the trained model for real-world artefact classification tasks, and use it to make predictions about new, unseen artefact data.
7	Model refinement*	Continuously evaluate and refine the model as new data become available, and retrain the model as needed to improve its performance.

Table 1 Stages in the ML workflow. *These stages are beyond the scope of the report of this paper.

The details and implementation of these stages may vary depending on the nature of the artefact data, the complexity of the classification task, and the availability of relevant resources and tools. Of these stages, data pre-processing requires the bulk of time needed to make data usable by an automated model, and so we turn our attention next to a discussion of the steps involved in this process.

Data pre-processing

Pre-processing as applied to ML is the action of ensuring that the data are in a suitable format and condition to be used by a model. Regardless of the domain where ML is used, pre-processing consumes most of the time required to use ML. A standard rule of thumb is that 80% of the time for a ML project will be consumed by data pre-processing (Frye et al. 2021). The next two sections are concerned with the steps in the pre-processing stage and their importance to the archaeological process and then a discussion of the similarities and differences between data pre-processing and Principal Component Analysis.

Pre-processing image data for use in ML

Data pre-processing consists of preparing and transforming raw data into a format that can be used as input to ML algorithms. This stage is particularly important when the data is obtained from different sources such as different sites or different orientation of the camera angle to the artefact in the image. It

involves tasks such as cleaning and transforming data, handling missing values, and normalising data. Processing archaeological data is a time-consuming task that often falls to graduate students or entry-level employees. Data pre-processing is not the most glamorous work, but it is essential to ensure that the data are accurate and usable by the ML algorithm. The risk is that if processing data is seen as a low-priority task, it may be rushed or done incorrectly.

The steps in data pre-processing include:

- Data cleaning: Identify and remove any errors or inconsistencies in the data. Actions: detect and remove images that are too dissimilar, handle missing values such as no labels, and deal with duplicate data.
- Data Transformation: Convert data to a suitable format for ML algorithms. This process can include converting text data into numerical data or transforming images into arrays of pixel values suitable for the ML model.
- Data normalization: Adjusting the data to ensure that it is on the same scale and has the same distribution. Datasets with unequal distribution are skewed and may produce inaccurate predictions. Add or remove data as needed (i.e., choose more images of a certain type). ML models assume that data are suitably scaled and are proportional.
- Data augmentation: Add copies of the data that are modified such as tilted in angle, flipped, mirrored, zoomed, cropped, etc. For the best accuracy, DL requires large datasets with many examples. Many DL frameworks provide methods to automate this process. Overfitting occurs when a model learns the detail and noise in the training data to such an extent that it has a negative impact on the model's performance when applied to new data.
-

Image Classification Methods

This section describes the image categorisation approach we propose for ceramics and rock art. The study area where the data was collected will be first presented, followed by the DL models utilised. For various DL models, images are often scaled to a lower resolution to reduce the number of parameters to be learnt. We apply a DL approach using transfer learning (TL) with a model that had been previously trained on a large set of non-archaeological images. The following are details about the setup for the two experiments and what methods were followed to execute the machine learning code. We include a description of a free development environment, Google Colab, which we used to conduct the experiments, as well as input data dimensions. Lastly, we discuss performance evaluation measures and the generalisability of the models.

Study areas

The Khorat Plateau (ที่ราบสูงโคราช) takes its name from the local dialect of Nakhon Ratchasima Province and is located in northeastern Thailand incorporating a number of provinces, including parts of Nakhon Ratchasima, Buriram, and Maha Sarakham (Figure 1). The plateau is surrounded by uplands and is characterized by fertile soil, abundant water resources, and a dry- tropical climate. Two basins are separated from the plateau by the Phu Phan Mountains: the northern Sakhon Nakhon Basin and the southern Khorat Basin. The region is drained by several rivers, including the Mun and Chi rivers, which flow into the Mekong River forming the region's northeastern boundary. The geography of the Khorat Plateau has played a significant role in shaping its cultural and economic development, historically making it a barrier that controlled access to the region. This made it an important center for agriculture, trade, and transportation in the region. Historically, this made the plateau difficult to access. After the Post-Angkor period (Keyes 1976) and a protracted series of droughts between

the 13th and 15th centuries, the plateau appears to have been mostly depopulated. The Khorat Plateau in Northeast Thailand has significant archaeological importance due to its rich cultural heritage and abundant ancient remains. The plateau has been occupied by various civilizations and cultures over the centuries and has played an important role in the development of the region. Archaeological sites on the plateau, such as Ban Chiang and BNW, reveal early examples of rice cultivation, metalworking, and advanced social organisation. The Khorat Plateau is therefore considered a crucial area for the study of Southeast Asian prehistory and the development of early civilizations in the region. Keyes (1974: 504) explains:

> "… to acquire a fuller and more accurate picture of the society and culture of the early urban life on the Khorat Plateau, much more archaeological investigation must be conducted. And, I would add, we can gain a deeper knowledge of these civilisations by undertaking rigorous research on a number of the Thai-Lao people of north-east Thailand's indigenous myths."

Forty years later Higham (2014) adds, "...we remain essentially ignorant of the linkages between sites and the presence or absence of states on the Khorat plateau". The plateau is considered a crucial area for the study of Southeast Asian prehistory and the development of early civilizations in the region, with artefacts found there providing important insights into the lifestyles, beliefs, and technological advancements of the civilizations that inhabited the area. Elaborating on this Higham and Kim (2022: 592) suggest that "sociocultural complexity during the local Iron Age was multidimensional and multilinear… [however] complex polities- early state analogues are still out of focus in the archaeological record". Despite a wealth of archaeological evidence, much remains unknown about the society and culture of early urban life on the Khorat Plateau, and more research is needed to gain a deeper understanding of these civilizations. The datasets used for the DL analysis reported in this paper come from two sites in the Khorat Plateau: BNW and KCN. Background information regarding these two sites is provided next.

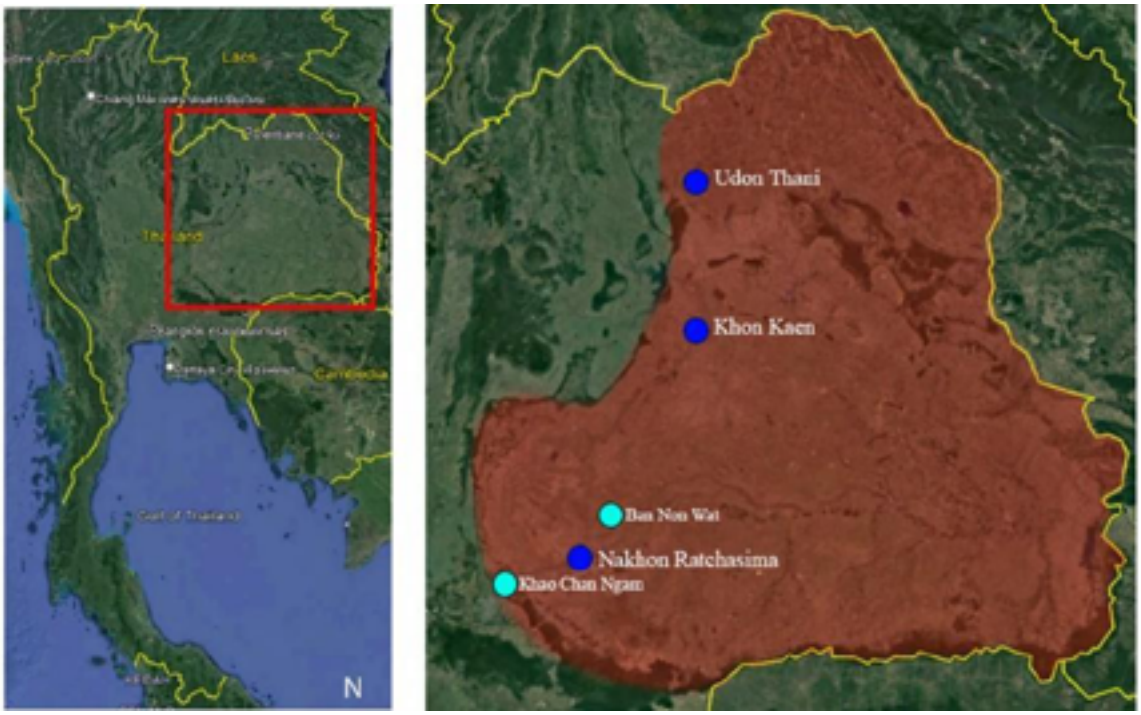


Fig. 1 Map of Thailand showcasing the Khorat Plateau and the locations of the study sites (after Google Earth Pro 2023).

Ban Non Wat

BNW is an archaeological site located in northeastern Thailand on the Khorat Plateau. It is a Thai town in the Non-Sung district of Nakhon Ratchasima province, close to the small city of Phimai. The region was occupied during the Neolithic, Bronze, and Iron Ages, according to archaeological evidence, and provides insights into the development of early civilisations in Southeast Asia (Harris and Tayles 2012). It has been the subject of excavations since 2002, revealing a cultural sequence that spans 11 prehistoric periods and 640 burials (Higham 2011). BNW is particularly significant, as it is believed to have been a key centre of early bronze production and trade. The first Neolithic settlement in BNW occurred in the 17th century BCE, whereas the Bronze Age began in the late 11th century BCE. The transition to the Iron Age occurred around 420 BC (Higham 2011). Seventy-six radiocarbon readings and Bayesian computations have refined the exclusiveness of this sequence (Higham 2011; Higham and Higham 2009). Bayesian analysis is the application of Bayesian statistical interpretation of probability to radiocarbon dating to obtain a more exact date (Otárola-Castillo and Torquato 2018).

Khao Chan Ngam

KCN is located 45 kilometres from the provincial capital of the Nakhon Ratchasima Sikhio district and is connected to Ban Loet Sawat. KCN is situated within a large collection of sandstone ridges that provide a natural rock shelter at the base of the Petchabun mountain range. According to Khanthakan (1979) and Tan (2014), the sandstone shelter is the largest in the region. The monks who constructed Wat KCN in 1968 allow access to KCN through the forest temple. KCN is notable for its prehistoric paintings of humans and animals. There are two parallel, north-south oriented sandstone massifs at this location. On the side walls of the caves are pictures of people (men, women, and children) indulging in various activities, such as sitting, dancing, standing with a dog, and firing arrows with bows, which portray daily life between approximately 4,000 and 2,500 BP (Tan 2014).

Development environment and frameworks used

We selected Google Colab and Jupyter notebooks to conduct our machine learning experiments. Jupyter notebooks are self-contained files capable of executing complex scripts written in programming languages such as Python, R, and Scala. Google Colab is a free cloud service that enables the execution of Jupyter notebook code and provides Google Drive storage access. The combination of these two free tools allows researchers to conduct ML and DL experiments without installing costly software. Colab also offers access to advanced computer resources, such as graphics processing units (GPUs) and tensor processing units (TPUs), which are required to execute the complex calculations required by ML/DL quickly. For our experiments, we used PyTorch, an open-source ML library. It offers a comprehensive platform for building and training machine learning models, as for well as executing existing models. To reduce development time, we also used Fast.AI, a wrapper library that sits on top of PyTorch and simplifies the creation of ML and DL models.

Experimental workflow

To replicate the most common scenario for dataset acquisition, we chose to use two disparate archaeological image collections for our experiments. The ceramics dataset consisted of 450 photographs with easily identified ceramics (in other words, one pot per image) from the site of BNW. The dataset of rock art images consisted of 165 photographs with easily identified rock art from the site of KCN with one motif present in each image. Our goal was to use ML/DL to do binary classification on each image.

Data pre-processing

Because our datasets contained relatively few images, we expanded the datasets by performing data augmentation on the images. All images were resized to 224 x 224 pixels x 3 colour channels. Additionally, Fast.AI was used to automate image duplication to expand our datasets using image flips, image rotations, image squish, random resized crops, and padding the image images with zeros. For accuracy DL algorithms require many images to train on to "teach" the model how to generalise from training images which are labelled, to test images which are not.

Feature extraction

Feature extraction is the transformation of raw data into numerical features that may be handled while maintaining the integrity of the original data set. It yields better results than applying ML directly to raw data. ML on images is effective because features may be used to compare photographs and correlate with another (owing to similarity) or with a specific label. People can easily recognise a vehicle or a tree in an image. Even if you have never seen a particular tree or automobile before, you can accurately associate it with the relevant thing or compare it to other objects in your memory that are comparable. In the case of an automobile, the presence of wheels, doors, a steering wheel, etc., distinguishes a fresh instance from others. It occurs because you sense forms and elements outside the image itself; hence, you can distinguish a unique tree or car if it exhibits particular traits. Google's "I am not a robot" CAPTCHA method is an example of feature extraction in practice. Benefits of ML include improved accuracy, efficiency, scalability, and the ability to automatically learn and improve from experience without being explicitly programmed; and the ability to deal with increased complexity as more data are used.

Model selection:

This case study employs two types of machine learning: Supervised, using Fast.ai and TL, using PyTorch. Both models used the RESNET18 Architecture and were compared for accuracy, speed, and ease of use. When using DL with a small number of examples models can overfit. A solution is to use a model that has been pre-trained on thousands of images.

Training and validation

Train-test split is a technique used in ML to evaluate the performance of a model. It involves dividing the original dataset into two parts: a training set and a testing set. The training set is used to train the model, and the model is fit to the data in this set. The testing set is then used to evaluate the performance of the model, by providing it with input data and comparing its predictions with the actual target values. The objective is to estimate the model's performance on new, unseen data. This study used an 80:20 ratio for each dataset (with 132 rock art images for training: 33 rock art images for testing and with 350 ceramics images for training: 150 ceramic images for testing). The split was done randomly to ensure that no bias was introduced into the results. The train-test split is an important technique for evaluating the performance of machine learning models, as it allows us to estimate how well the model will perform on new data.

For these experiments binary manual labelling was used. Manual labelling is the most accurate method, but it can be time-consuming and expensive. For the binary classification in this study, the goal is to predict one of two possible outcomes for a given input, 'figurative/non-figurative', or 'restricted/unrestricted'. Binary classification problems can be solved relatively quickly and this can be useful for

gaining a preliminary understanding of the problem and testing different approaches to the problem. Binary classification problems often require smaller datasets, making it easier to train models and perform experiments with limited computational resources. As this study includes two separate image classification notebooks, each data set was divided into 'figurative' and 'non-figurative' for rock art and 'restricted' and 'unrestricted' for ceramics.

Results

In ML, the number of epochs used during training can impact the results of the model. Epochs define the number of times the model will see and learn from the training data. Generally, increasing the number of epochs will result in a more accurate model as the model has had more opportunities to learn from the data. However, increasing the number of epochs will also result in a longer training time.

Ban Non Wat Ceramics

Ceramics images from the BNW archaeological site were utilised to construct both a Supervised, or labelled, code and Transfer Learning code to train a model. This model was based on Cameron (2013) in which she devised a typology for a sample of reconstructed Bronze Age and Iron Age burial containers. In conjunction with seriation, Cameron's (2013) typology revealed significant variations in ceramic traditions from the beginning of the Bronze Age 2 (about 1250 BC) and the beginning of the Bronze Age 5 (approximately 1000 BC) (c. 690 BC). The initial typology consists of two broad categories: restricted (Figure 3a) and unrestricted (Figure 3b), with an additional 16 unique subclassifications that represented whether the degree to which a vessel was restricted or unrestricted. This is most evident in the ceramic' necks were open. However, for the initial image detection, the coding for this model was condensed into binary categories: restricted and unrestricted.



Fig. 3a: example of restricted ceramic (Chang, 2019)



Fig. 3b: example of unrestricted ceramic (Chang, 2019)

Fast.ai

Table 2 shows the results for the ceramic Fast.ai training process. Each row represents the results for a single epoch, or iteration, of the training process. This model used 4 epoch iterations and total time it took for this process can be estimated based on the time column in the table. For each epoch, the time taken to run the model is specified in the format "hh:mm:ss". Based on the time column, each epoch took approximately 1 minute and 43 seconds to run, so the total time for the four epochs was approximately 6 minutes and 52 seconds. Additionally, the results indicate that the train_loss and valid_loss decrease as the number of epochs increases, indicating that the model is becoming more accurate and better able to fit the data. Additionally, the error_rate decreases as the number of epochs increases, which is a further indication of the model's improved accuracy.

epoch	train_loss	valid_loss	error_rate	time
0	1.312665	1.415879	0.466667	01:43
epoch	**train_loss**	**valid_loss**	**error_rate**	**time**
0	0.929468	0.747595	0.355556	01:46
1	0.847627	0.362395	0.177778	01:43
2	0.652359	0.318893	0.155556	01:46
3	0.543068	0.311377	0.155556	01:43

Table 2 Fast.ai metrics error rate showing a decrease in inaccurate predictions.

Based on the findings (Table 2; Figure 4), it is evident that this code was successful. The systems were using the most basic classification of restricted vs unrestricted without the subsections in Cameron's typology with an approximate accuracy of 75%. When evaluating any of these systems, it is essential to keep in mind the expectations regarding the algorithm's level of accuracy. The definition of 'sufficient precision' in ML is highly subjective, with industry standards recommending a range of 70 to 90%. A confusion matrix is a mechanism for summarising the effectiveness of a classification system. If the dataset is balanced and you are using two classes, then classification accuracy should be reliable. By calculating a confusion matrix, you could gain a better understanding of what your classification model does right and what kinds of errors it makes. The confusion matrix (Figure 6) has rows for each 'restricted' and 'unrestricted' ceramic in the dataset. In general, the classifier does not produce many errors, and the data is only slightly overfitted.



Fig. 4 ML results for the Fast.ai categorisation of BNW ceramics with 'X' indicating an inaccurate prediction.

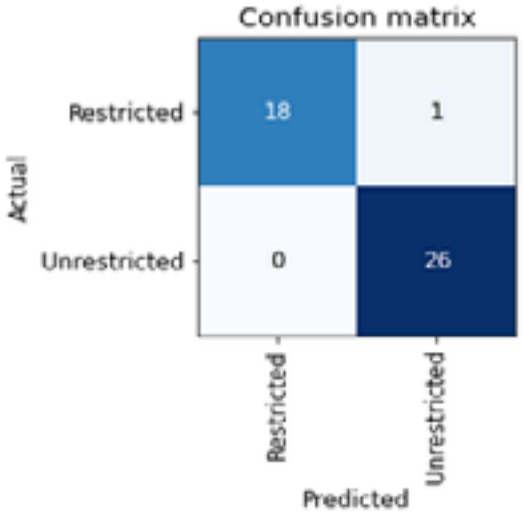


Fig. 5 Results for the Fast.ai BNW confusion matrix.

Transfer Learning

This approach trains a convolutional neural network for image classification using transfer learning. The model underwent two training and validation iterations, in which the model is being trained for 25 epochs (iterations) in each. For each epoch, the performance is evaluated on two sets of data: a training set and a test set. The "Loss" and "Acc" values represent the model's loss (error) and accuracy respectively.

Epoch 22/24

TRAIN Loss: 0.2960 Acc: 0.8811
TEST Loss: 0.8324 Acc: 0.6906

Epoch 23/24

TRAIN Loss: 0.2246 Acc: 0.9251
TEST Loss: 0.8086 Acc: 0.7130

Epoch 24/24

TRAIN Loss: 0.2285 Acc: 0.8811
TEST Loss: 0.9239 Acc: 0.6726

Table 3 Sample of Transfer Learning metrics error rate for Training and Validation 1.

Epoch 22/24

TRAIN Loss: 0.3796 Acc: 0.8370
TEST Loss: 0.7086 Acc: 0.6816

Epoch 23/24

TRAIN Loss: 0.4154 Acc: 0.7885
TEST Loss: 0.7551 Acc: 0.6592

Epoch 24/24

TRAIN Loss: 0.3450 Acc: 0.8590
TEST Loss: 0.7541 Acc: 0.6547

Table 4 Sample of Transfer Learning metrics error rate for Training and Validation 2.

The loss values in Table 3 show that the model's training accuracy improves over the course of training, but its test accuracy fluctuates. In this case, the model seems to be improving during the first few epochs, with a decrease in loss and an increase in accuracy on both the training and test datasets. However, the performance plateaus after a few epochs and starts to fluctuate. The model appears to reach a maximum test accuracy of around 71% in the final epoch. This first training and validation took approximately 1 hour 12 minutes 18 seconds. The results in Table 4 for Training and Validation 2 indicate that the model's training loss decreases and accuracy increases over time, reaching a maximum accuracy of 86.78% on the 15th epoch. Training loss and accuracy are improving with each epoch; however, test loss and accuracy oscillate at times. This is a common occurrence known as overfitting, where the model is performing well on the training data, but not generalising well to new data. The aim is to find a model that has a good balance between training performance and test performance. Additionally, the accuracy varies between different epochs, suggesting that the model may not be fully converging. The average runtime for Training and Validation two was 1 hour, 9 minutes and 56 seconds.

Khao Chan Ngam rock art

Analysis of rock art often involves attempting to identify the subject matter and interpreting the meaning behind the images. Photographs from Khao Chan were utilised to construct a Supervised code and a Transfer Learning code to train a model. This dataset of rock art images were based on an iconographic classification and were divided into two categories: Figurative (Figure 4a) and Non-Figurative (Figure 4b). Figurative rock art refers to images that depict recognisable objects, people, animals, or symbols.

Non-figurative rock art, on the other hand, consists of abstract designs or patterns that do not represent anything specific. One characteristic of this dataset is its skewness, as the rock art motifs at KCN are primarily figurative.



Fig. 4a Example of Figurative rock art (Tan, 2014).



Fig. 4b Example of Non Figurative rock art (Tan, 2014).

Fast.ai

Table 5 shows the results of the rock art Fast.ai training process. Like the Ceramics data, each row represents the results for a single epoch, or iteration, of the training process. Again, this model used 4 epoch iterations and total time it took for this process can be estimated based on the time column in the table. The total time for this process is approximately total of 00:29 seconds to train over the given epochs. Based on Table 5, the model improved in terms of both "train_loss" and "valid_loss" over the course of training and had a low error rate of 0.045455 in the validation dataset after each epoch.

epoch	train_loss	valid_loss	error_rate	time
0	1.247491	0.261175	0.045455	00:09
epoch	**train_loss**	**valid_loss**	**error_rate**	**time**
0	1.297137	0.199935	0.045455	00:06
1	1.248356	0.163435	0.045455	00:04
2	1.262464	0.180043	0.045455	00:04
3	1.131350	0.233866	0.090909	00:06

Table 5 Fast.ai metrics error rate.

The "error rate" column in the table represents the percentage of incorrect predictions made by the model. In Table 5, the error rate ranges from 4.55% to 9.09%. Therefore, the model had an accuracy of around 95.45%, which means that it correctly predicted the outcomes for approximately 95.45% of the data it was evaluated on. However, as shown, there are photographs that have been misinterpreted (Figure 5). Ordinarily, it is difficult to determine why an algorithm identifies photos as belonging to a particular category; interestingly, the two of the figurative images used were sitting, indicating that the system lacked sufficient training on those specific image types. Due to the few samples (images) in the dataset, the confusion matrix indicates that the model was unable to generalise knowledge to accurately predict rock art motifs (Figure 6).

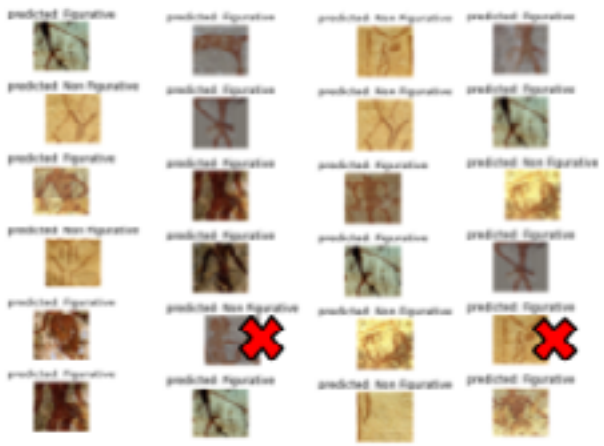


Fig. 5 ML results for Fast.ai categorization of KCN rock art.

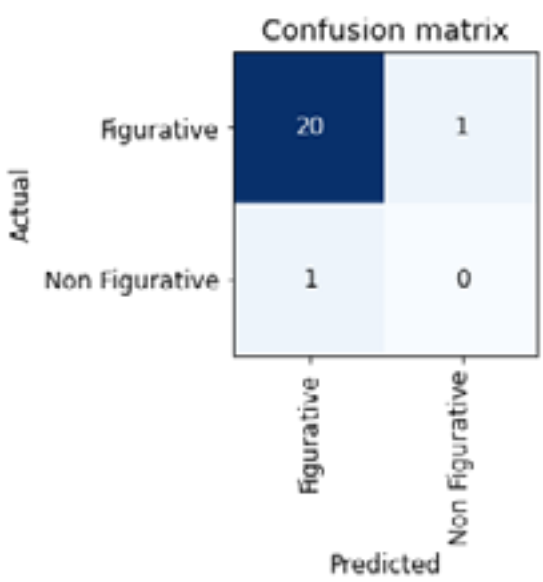


Fig. 6 Results for the Fast.ai KCN confusion matrix.

Transfer Learning

This model underwent two training and validation iterations in which the model was trained for 25 epochs on each. For each epoch, the performance is evaluated on two sets of data: a training set and a test set. The Training and Validation 1 results models train loss decreases over time and the train accuracy increases over time, indicating that the model is learning and improving on the training data. The test accuracy fluctuates but generally remains above 90%, with the best accuracy being 96.22% indicating that the model has a high level of accuracy. This first training and validation took approximately 2 minutes and 37 seconds.

Epoch 22/24

TRAIN Loss: 0.3885 Acc: 0.8326
TEST Loss: 0.6044 Acc: 0.7399

Epoch 23/24

TRAIN Loss: 0.3623 Acc: 0.8458
TEST Loss: 0.6621 Acc: 0.7220

Epoch 24/24

TRAIN Loss: 0.3893 Acc: 0.8018
TEST Loss: 0.6541 Acc: 0.7085

Table 6 Sample of Transfer Learning metrics error rate for Training and Validation 1.

Epoch 22/24

Train Loss: 0.0635 Acc: 0.9821
Test Loss: 0.1178 Acc: 0.9434

Epoch 23/24

Train Loss: 0.1592 Acc: 0.9732
Test Loss: 0.1284 Acc: 0.9434

Epoch 24/24

Train Loss: 0.0469 Acc: 0.9911
Test Loss: 0.1168 Acc: 0.9434

Table 7 Sample of Transfer Learning metrics error rate for Training and Validation 2.

Table 7 results indicate that the train loss decreases, and the train accuracy increases over the 24 epochs. Training loss and accuracy metrics are improving throughout the epochs, reaching a minimum of 0.0469 for the training loss and 1.0 for the training accuracy in epoch 16. In contrast, the test loss and accuracy metrics are fluctuating, reaching a maximum test accuracy of 0.9811 in epoch 5 and a minimum of 0.8491 in epoch 3. The test loss also decreases and the test accuracy increases, but the model may have overfitted to the training data as the gap between train and test performance increases as the number of epochs increases. It is important to note that a model with high accuracy on the training dataset does not always translate to high accuracy on the test dataset, as it might be overfitting to the training data. The overall accuracy of this model can be estimated to be 94.34% with an approximate run time of 2 minutes and 49 seconds.

DISCUSSION

ML and archaeology

This paper has provided results of two experiments using small collections of images of ceramics and rock art from the Khorat Plateau. Each dataset was trained and tested using the same algorithm (ResNet18) and following a supervised learning and transfer learning process. These experiments have demonstrated the following.

- That the small number of example images in a dataset can be problematic when using DL, however this limitation can be overcome by either using automated data augmentation to increase the number of example images or by using a model trained on thousands of images that are unrelated to archaeology.
- Demonstrated options for using lower code tools such as Jupyter notebooks, Google Colab and ML frameworks such as Fast.ai and PyTorch
- Demonstrated that existing code for doing CNN and TL is easily generalisable to disparate datasets of archaeological images without extensive revisions.
- Shown that some of the tedious work of classifying images into broad categories can be automated, leaving time for other explorations.

ML has the potential to revolutionise the field of archaeology by providing new tools and methods for analysing and processing large and complex data sets. This can improve both intersite and intrasite analysis by finding patterns and relationships in data that traditional methods cannot. Clustering algorithms can group sites and artefacts based on similarities, and decision tree models can predict cultural affiliations and the function of features. Ways ML has the potential to improve the speed and accuracy of archaeological research and help preserve cultural heritage include:

Data analysis: ML algorithms can be used to analyse large datasets of archaeological information, such as artefact and site data, and identify patterns and relationships that would be difficult to detect using traditional methods. For example, clustering algorithms can be used to group sites based on similarities in their artefact assemblages, while decision tree models can be used to predict the function of a feature within a site based on its location and other characteristics.

- Predictive modelling: ML algorithms can be used to make predictions about archaeological sites and artefacts, such as their cultural affiliation, age, or function. For example, decision tree models can be used to predict the cultural affiliation of a site based on its location and other characteristics, while neural networks can be used to predict the age of an artefact based on its physical characteristics.

- Cultural Heritage Management: ML can be used to support heritage management and preservation by identifying threats, predicting the impact of climate change, and monitoring the condition of cultural heritage sites.
- Artefact classification: ML can be used to classify and categorise artefacts, allowing more efficient and accurate cataloguing and management of archaeological collections.
- Image and signal processing: ML algorithms can be used to process and analyse images and signals from remote sensing and other imaging technologies, such as LiDAR and GPR. For example, convolutional neural networks can be used to detect and classify archaeological features in drone or satellite images, while signal processing algorithms can be used to analyse GPR data to identify subsurface features.
- Data visualisation: ML algorithms can be used to create visualisations of archaeological data, making it easier to understand and communicate complex relationships and patterns. For example, dimensionality reduction algorithms can be used to create 2D or 3D visualisations of artefact and site data, while clustering algorithms can be used to visualise patterns and relationships in the data.

General implications

Limitations of Google Colab

Google Colab offers the opportunity to create Jupyter Notebooks to run ML code on the fly; however, it is not without issues. Access to Google storage for the data is a benefit, although since the storage and notebook capabilities are not hosted in the same area, connecting to said data can be an issue. Colab provides access to common ML libraries which can be loaded into the environment, but uploading of user-generated libraries is limited. On the free version of Colab, GPU and TPU processing may be limited due to traffic on the site, and disconnections to the compute services can be frequent, especially if the user has stepped away for a short time. Data uploads to the Colab environment are not permanent, and connections disappear after the session ends, which can lead to confusion as to where the data are stored. Uploading large datasets to Google Drive can be slow and prone to dropout. The Colab platform stores files on Google Drive with 15GB of free capacity; however, dealing with larger datasets requires more space, which makes execution challenging. Google Colab sessions allow customers to connect to the service for up to 12 hours a day. To work for a longer period, customers can use the commercial version, Colab Pro, which allows programmers to remain online for 24 hours. Upgrading to the paid version of the service can ameliorate many of these concerns.

Commercial Options

Due to the complexity of the calculations needed, computer scientists and mathematicians have primarily led the advancement of ML and DL. The three major cloud-provision tech companies (Microsoft, Google, and AWS) have made the move to develop cloud-based ML tools that aid businesses to leverage AI. AWS is the most developed of the three, having been in the market for the longest time, however it is also the most expensive. Their pricing structure is complex, but extremely fine-grained, allowing the customer to purchase only the minimal amount of computing power needed to complete the task. Many of these commercial services offer resources as well as access to pre-trained models and Jupyter notebooks with prewritten code that can be easily modified to suit the required processing task. A free tier of services is available for one year, although users may create new accounts as needed to extend this access.

CONCLUSION

Currently, ML is heavily dependent on large amounts of data to be effective. For DL models to generalise and thus provide correct predictions for image classification, thousands of examples are needed. This can be a problem for researchers that do not have access to large data sets or data that are well labelled. In addition, ML algorithms can be complex to implement in code and often require a high level of programming knowledge. This can be a barrier for researchers who do not have the resources to invest in training. Furthermore, ML is often not able to provide accurate results in cases where the data is very noisy or unbalanced. This can be a problem in many real-world applications, such as medical diagnosis or fraud detection.

However, modern development tools are starting to flatten the learning curve necessary to do basic ML such as image classification. Although computer vision has existed since the 1960s, hardware requirements and computational knowledge have always made it highly complex and difficult to implement. This project suggests that archaeologists with limited resources have access to lower-code image analysis choices. Some platforms, such as Google and AWS, have begun to develop software for this purpose. The development of automated solutions for the identification of rock art and ceramics that extends beyond the simple binary classifications are now available. The experiments in this study have used labelled data and CNN to predict categories as well a pre-trained model with no labelling and using feature extraction, by using representations learnt by a prior network to extract relevant features from incoming data. In the instance of KCN, stylistic variance may indicate intersite and intrasite identification, as well as regional cultural links.

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Maritime Landscape and the Rock Art Traditions at Lanta Bay, Krabi, Thailand

ภูมิทัศน์ทางทะเลและวัฒนธรรมศิลปะบนหินในอ่าวลันตา จังหวัดกระบี่ ประเทศไทย

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ABSTRACT

Several Rock Art sites were discovered and partially studied in southern Thailand, especially in Phang Nga Bay. Fewer are known further south, in the coastal area along the Lanta Bay and in the Trang and Satun provinces. This article provides preliminary results of surveys conducted in 2021 on caves located in the coastal zone and offshore in Lanta Bay as part of the Thai French Archaeological Mission that focuses on the maritime landscape and exchange networks. The project is done in collaboration with communities in Ko Lanta, amongst which are the indigenous maritime people called "Urak Lawoi." This participatory approach shed new light on the potential rock art traditions this region possesses, and on the relationship between landscape and rock Art. The rock art may correspond to landmarks for navigation, especially along exchange routes linking the bay to Phang Nga, Phuket, Krabi,Trang, Satun, and Malaysia, and/or form part of rituals undertaken during successive sequences of use by various local and foreign groups. This project also focuses on the special relationship between local groups, and especially the Urak Lawoi, developed with hills and caves, in particular on islands.

บทคัดย่อ

ภาคใต้ของประเทศไทยมีการค้นพบและศึกษาแหล่งศิลปะบนหินหลายแห่ง พบว่าส่วนใหญ่อยู่ในบริเวณอ่าวพังงา จังหวัดพังงา ส่วนทางใต้ตามแนวชายฝั่งอ่าวลันตา จังหวัดกระบี่ ลงไปจนถึงจังหวัดตรังและสตูล ยังมีรายงานค้นพบแหล่งค่อนข้างน้อย ในบทความนี้ จึงได้นำเสนอผลลัพธ์เบื้องต้น จากการสำรวจบริเวณอ่าวลันตา ใน พ.ศ. ๒๕๖๔ เป็นส่วนหนึ่งของโครงการโบราณคดีไทย-ฝรั่งเศส ซึ่งมุ่งเน้นเพื่อศึกษาภูมิทัศน์ทางทะเลและเครือข่ายการแลกเปลี่ยนทางทะเลในแถบทะเลอันดามัน ด้วยวิธีการมีส่วนร่วมกับชุมชนกลุ่มต่าง ๆ ในพื้นที่เกาะลันตา โดยเฉพาะชาวอูรักลาโวยจ

ทำให้ทราบถึงความสัมพันธ์ระหว่างภูมิทัศน์กับวัฒนธรรมศิลปะบนหินในพื้นที่ โดยพบว่าแหล่งศิลปะบนหินมักปรากฏอยู่บนเกาะที่มีตำแหน่งที่ตั้ง ที่มีความสอดคล้องกับการเป็นจุดสังเกตในการเดินเรือทางทะเล และอยู่ในเส้นทางแลกเปลี่ยนทางทะเลที่สามารถเชื่อมต่อไปยังอ่าวพังงา ภูเก็ต กระบี่ ตรัง สตูล และประเทศมาเลเซีย และมักปรากฏอยู่ตามเกาะที่มีการใช้พื้นที่ในการประกอบพิธีกรรมของกลุ่มต่าง ๆ ทั้งภายในและภายนอก อีกทั้งพบว่าภูมิทัศน์รูปแบบต่าง ๆ เช่น ถ้ำ หรือเนินเขาบนเกาะ มีความสัมพันธ์กับชาวอูรักลาโวยจ ในด้านวิถีชีวิตและความเชื่อที่มีต่อสถานที่ต่าง ๆ ในอ่าวลันตาด้วยเช่นกัน

Keywords: Rock Art, Urak Lawoi, Sea People, Lanta Bay, Community Archaeology | ศิลปะบนหิน, อูรักลาโวยจ, ชาวเล, อ่าวลันตา, โบราณคดีชุมชน

INTRODUCTION

Rock art is widespread throughout Thailand. More than 200 sites are documented mostly in Northern Thailand (Tan 2019). Among these, about 30 sites are multi-periods in Southern Thailand. In the Thai-Malay peninsula, until now, except for the Phang Nga Bay rock art, most rock arts were found inland. The rock art sites in Phang Nga Bay can be indirectly dated to 5,000 to 3,000 years ago according to the shell specimen's dating of the limestone outcrops by geologists. The representative sites of this area are exemplified by Leam Fai Mai, Leam Chao Le, Tam Chao Le, and Phi Hua To Cave. Fewer are known further south, especially in the coastal area along Lanta Bay.

This article provides preliminary results of surveys and interviews conducted in 2021-2022 in the coastal zone and islands in Lanta Bay as part of the Thai French Archaeological Mission, which focuses on the maritime landscape and on exchange networks (see also Bellina et al. 2021). The project aims to document local networks and the different maritime groups that formed part of the port-polities hinterland. It focuses on coastal areas and islands that have been little considered when reconstructing local networks and exchanges. These areas have been visited and used by various maritime groups for centuries and represent archives on past and current groups as well as on exchange networks. The project is a participatory project and is done in collaboration with communities in Ko Lanta, among which are the sea people called "Urak Lawoi" (UL).

The Urak Lawoi are sea people who may have been involved with trading polities of the Kedah region in the past and who moved to southern Thailand about 500 years ago. They have a great knowledge of the region and its past events. The question we initially raised was: What are the relationships that these sea people have with hills, caves, and rock art? Some researchers (Rotchanarat 2019) raised the possibility that some of the depictions showed parallels with some of Urak Lawoi rituals.

This article will focus on the newly found rock art in this region of Krabi and provide an overview of the results of the participatory work. This preliminary work combining archaeological and ethnographic methods emphasizes the potential for documenting and promoting past and current cultural traditions.

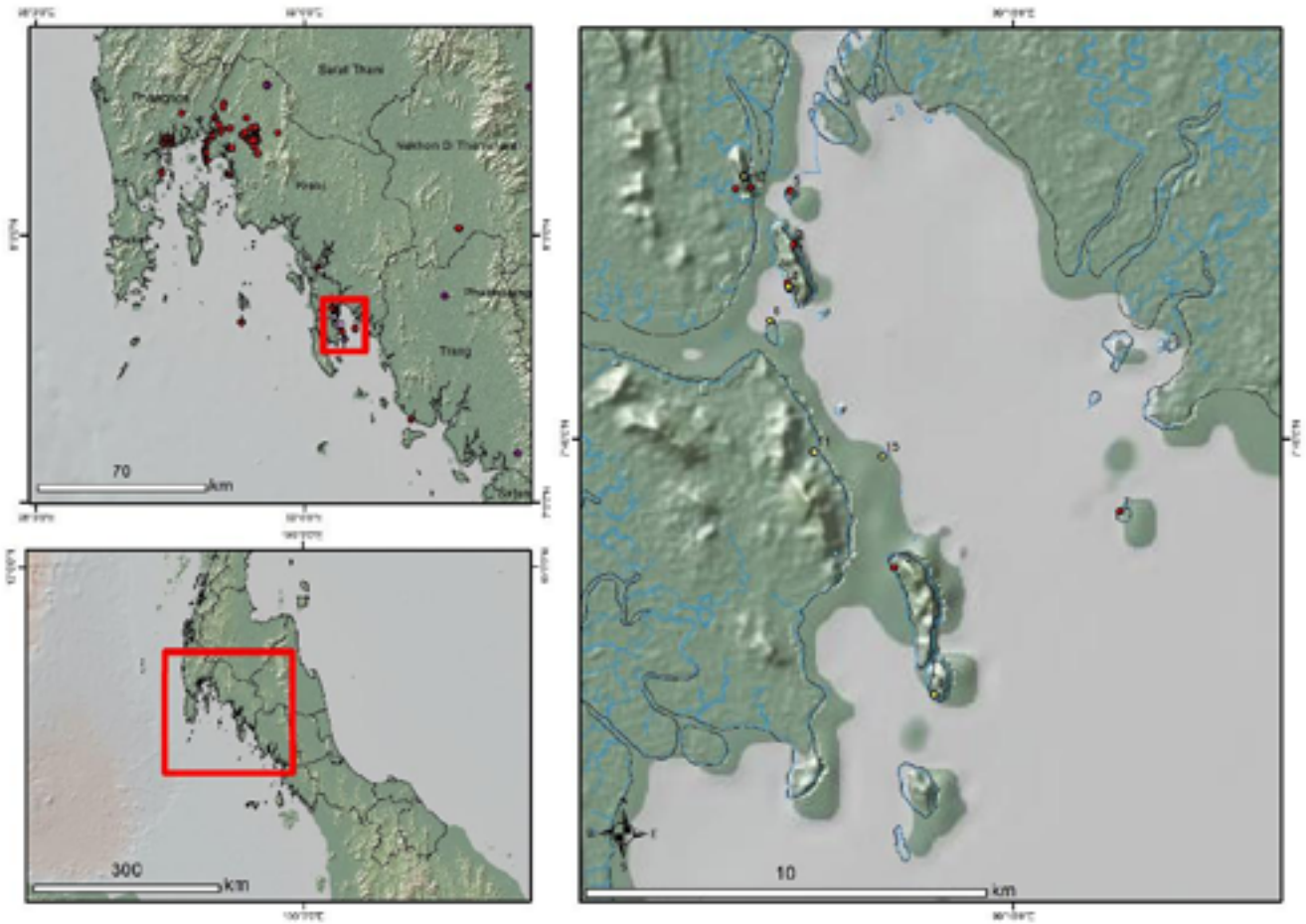


Fig. 1 Map showing the location of southern Thailand, Phang Nga Bay, and Lanta Bay. ***Source:*** map prepared by Sorathach Rotchanarat, 2023

Methodology

Archaeological Survey is conducted with a focus on caves offshore and their rock art. The images acquired through DSLR cameras have been processed with Metashape and enhanced with DStretch to facilitate their interpretation and classification. Interviews are conducted either with individuals or with several members of the three communities of Ko Lanta using the Participatory Mapping Method. This is a means to have maps produced by local populations in conjunction with academics (Cormier-Salem and Sané 2017). It is a bottom-up approach to science and a means to collect local histories to help interpret heritage remains. It is also meant to help local communities to be incorporated as active subjects in the registration and interpretation of their cultural heritage, as well as in the defense and management of it. Interviews are conducted either with individuals or with several members of one of the three communities of Ko Lanta using this method in the fieldwork from 6 to 8 June 2022.

Maritime landscape in Ko Lanta

Surveys in Lanta Bay led to the discovery of eight rock art sites located on small islands or in coastal hills in the mangrove. They can be found in different locations such as caves, cliffs, and rock shelters. The new rock art sites can be considered newly discovered sites in the Ko Lanta area, Krabi, Thailand.

The rock shelter and cliff at Ko Ra Pu Le can be seen from far away. There is an area that can be a location for boats to moor. There is a short walk along the cliff to the hall where the pictographs are painted on the rock walls. There is also a rock shelter at Ko Ra Pu Phang where we found the tripod

pots lying on the ground with the painting on the cliff where the boat can be ported and walked up to the rock shelter.



Fig. 2 The cliff view from afar of the east side of Ra Pu Le Island. ***Source:*** photo by Sorathach Rotchanarat, 2021

Several caves are scattered around Ko Ra Pu Le, Ko Talabeng, and Ko Ra Pu Don. They are formed by the erosion of waves hitting the limestone to make it into a slight hollow concave or cave hole. This cave was most likely formed during a time when the sea level rises above the present sea level. The open cave at about 5-7 meters above sea level and the cave is positioned on the northeast-southwest line. You must port the boat into the rocky area in front of the cave and climb up. In high tide, it is easier to enter than during low tide.



Fig. 3 The landscape of Ra Pu Phang Island where we found the painting on the cliff. ***Source:*** photo by Sorathach Rotchanarat, 2022

The coastal dune at Klong Jak is located on the east side to the north of Ko Lanta Noi. A creek flows down from the mountain called Klong Jak in the south of the plain area, flowing past a small beach down to the sea. Traces of digging for beads are found throughout the area. From the survey, it was found that a little piece of pottery was on the surface. At the mouth of the creek, a piece of red glass bead was found on the beach. When looking out from the beach in the east direction, you will see Ko Phi in front as an important landmark.



Fig. 4 Ra Pu Don Island which found two colored paintings located on the east and west sides of the island. ***Source:*** photo by Sorathach Rotchanarat, 2022



Fig. 5 Kurong Island which found red colored paintings located on the north-west side of the island. ***Source:*** photo by Sorathach Rotchanarat, 2022

Rock Art Sites in Ko Lanta

Ko Ra Pu Le

The pictographs are on a large cliff on the east side of Ko Ra Pu Le. It can protect from the sun, rain, and strong wind during the southwest monsoon. Approximately ten paintings are found 2-3 meters above the ground, but the best-preserved image is the Turtle. The unique figure is a solid human, possibly similar to the shaman image found at the Phi Hua To Cave in Phang Nga Bay (Sarikabutara 1987). This shaman is a unique motif in Krabi and southern Thailand. They appear to be human figures with two protrusions emanating from the head, possibly some headdress. The human form and the ship can be easily distinguished by digital optimization. The abstract image looks like a fish. Other pictures are overshadowed by mineral deposits or deterioration of the rock surface. There are caves on the west side of Ko Ra Pu Le. We found traces of a looted pit dug into the ground covered by pottery, human bone, and skull fragments. In another cave next to the south, above the entrance was found a red painting of a fish inside the cave found a fragment of a possible dug-out canoe.



Fig. 6 The figures on the cliff on the east side of Ra Pu Le Island. ***Source:*** photos by Sorathach Rotchanarat, 2021



Fig. 7 The unique figure such as a turtle, a human with a head-dresser, and a boat with the human on board. ***Source:*** photos by Sorathach Rotchanarat, 2021



Fig. 8 The figures of human at Ra Pu Le (left) and Pi Hua To cave (right). ***Source:*** photo by Sorathach Rotchanarat, 2021



Fig. 9 The figure of fish at the southwest side of Ko Ra Pu Le (left) and the enhanced version (right). ***Source:*** photos by Sorathach Rotchanarat, 2021

Ko Ra Pu Phang

The rock shelter is suitable for long-term living. They can provide good protection from the wind and rain during monsoon season and have a reasonably sized flat floor for 4-5 family members to use as a shelter and for various purposes. We found ordinary potsherds, earthenware with red slips, corded-mark, tripod legs with corded-mark, shells, and animal bones. The color painting is a sizeable animal-like on the cliff facing the sea which can walk up to a rock shelter. The painter might want to signal that it is the entrance up to a rock shelter uphill.

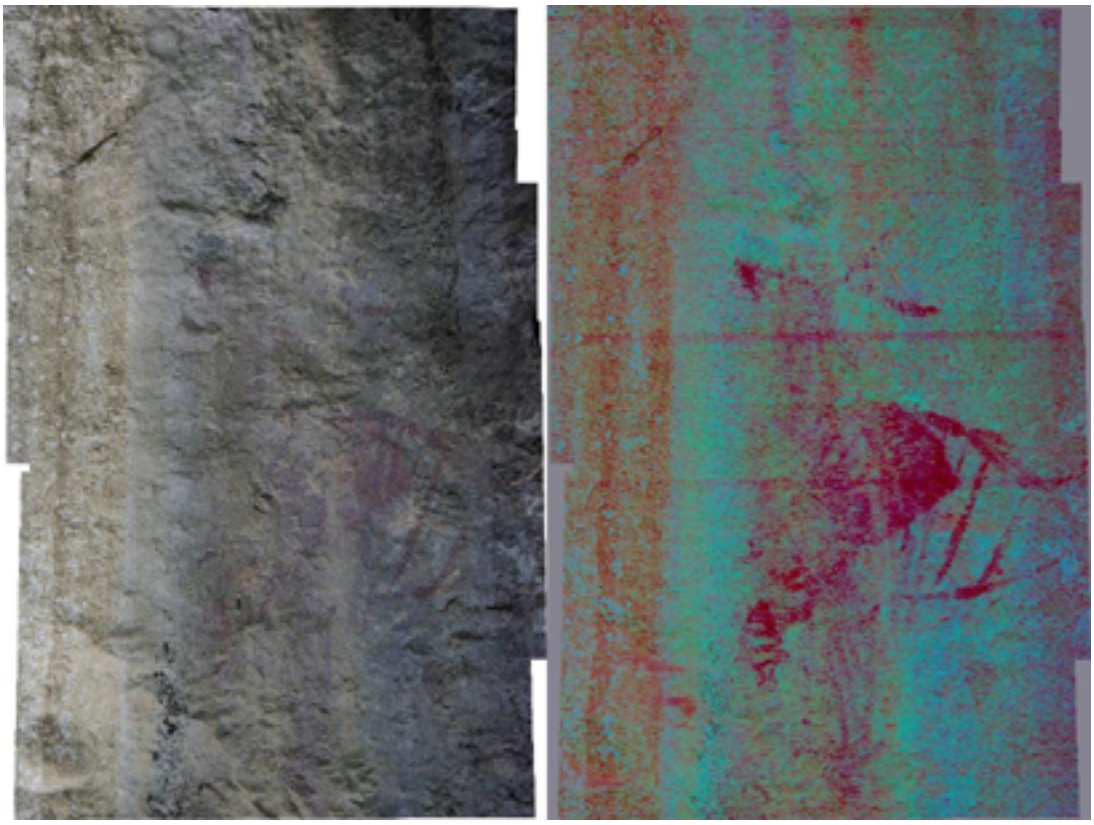


Fig. 10 Possible animal figure at Ra Pu Phang Island. ***Source:*** photos by Sorathach Rotchanarat, 2021

Ko Ra Pu Don

While visiting the numerous caves and cliffs on Ko Ra Pu Don we found two colored paintings located on the east and west sides of the island. The color technique is divided into two-tone colors: red-brown and black. On the east side, it is a solid red line and a black boat with a line technique. On the west cliff, we found a red-brown color painting above the entrance in front of the narrow cave. It was a line drawing in red-brown that looks like a fish. Inside the cave, on the wall above the cave entrance, several color paintings were found at various points around them, which were red-brown and black. Most of the images are in a faded condition that cannot be identified. There is one image that is outlined in black and drains the reddish-brown color inside. It is assumed that the image is a bird. The other cannot be identified because it is in a rather degraded condition.



Fig. 11 The small cave with the figure of fish on the top of the entrance and other figures in the cave at Ra Pu Don Island. ***Source:*** photos by Sorathach Rotchanarat, 2022

Ko Kurong

There is one figure on the west side cliff of this small island that can be seen from a far distance. It is a red image line technique. It is possibly a fish to reflect the relationship of people with the marine animal or it could be a sign of a fishing area near this island.

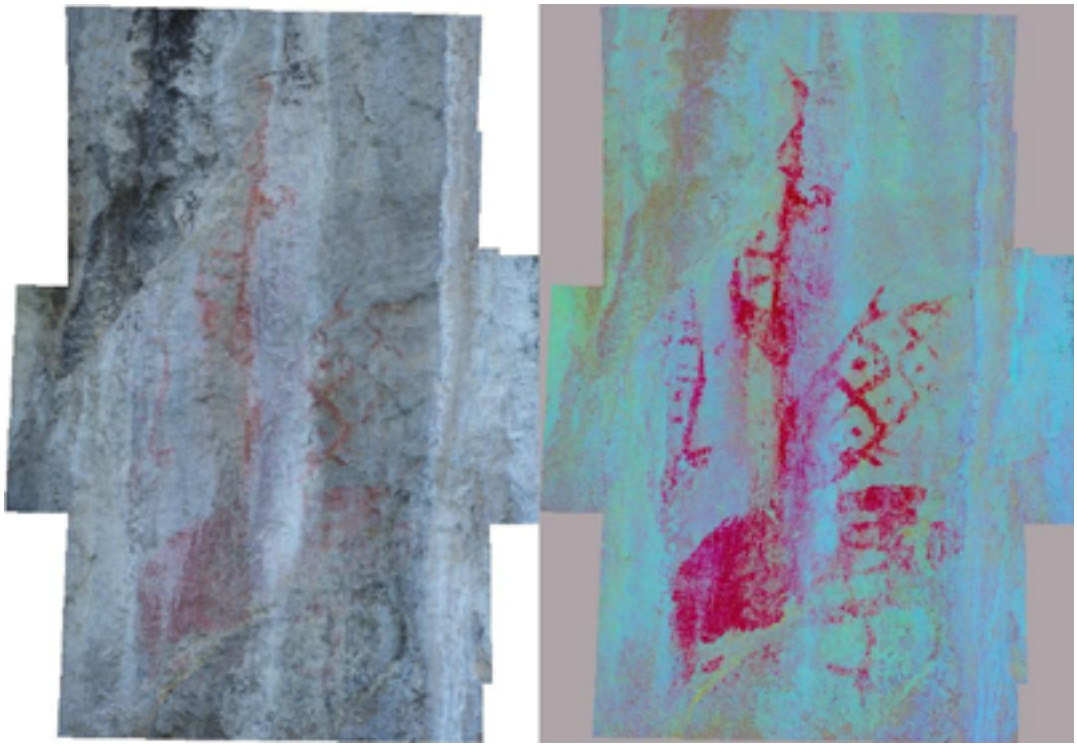


Fig. 12 The figures of fish with unique decorative patterns at Kurong Island. ***Source:*** photos by Sorathach Rotchanarat, 2022

Ko Talabeng

We found a red painting on the west side cliff. It is in such a light color condition that cannot be identified. It is assumed that the boat figure with a line pattern technique.



Fig. 13 The figures at Talabeng Island are in faded condition. ***Source:*** photos by Sorathach Rotchanarat, 2021

Participatory Mapping

Although still in their preliminary stage, interviews, and participatory mapping with the three main social groups, the Chinese community, the Thai-Malay, and the Urak Lawoi, provided insights into their different knowledge of the territory, oral stories, their interactions, and respective role. The locations of the different groups reflect ethnic differentiation going along a distinct ethnic division of labor. Each group also has a different sense of history, of temporality, and of marking events that can be materialized in the landscape. These differences are clearly reflected in the maps and in the oral histories.

The focus groups interviewed representatives of the Chinese, Thai-Malay, and Urak Lawoi communities. For the Chinese representatives two ladies (Wannaphon Engchuan and Jintana Engchuan) in Si Raya. The Thai Malay is represented by three men at Ko Por (Aeat Yamae, Kasem Hantalay and Don Lam-nga). The Urak Lawoi communities are represented by men (Somjit Talayluek, Deaw Talayluek, Supin Talayluek, Perawit Talayluek) and a woman (Phannapha Talayluek) at Sangka-Ou school, Ko Lanta. The interviews mainly provided information on history, toponyms, ritual practices, and economic activities.

Chinese community interviews

Early Chinese communities settled in Ko Lanta during the reign of King Rama V (1868-1910), with a community in Ban Tae Laeng, Lo Yai Sub-district, Lanta Noi Island. They gradually moved to Ban Si Raya, Ko Lanta Yai, about 111 years ago (Si Raya, from Malay, originates from the arrival of King Rama IX in 1957). Originally, the area of Ban Si Raya was called Lan Tat, some called Lan Ta or Lan Tak, and then distorted to Lanta. The word "Lan Tak" originated from the fish-drying area in the backyard. "Lan" means yard, courtyard, or patio. "Tak" means dry or drying. "Lan Tak" means the place for drying fish in every backyard of this village. In the Si Raya community, there is an important Chinese shrine named the Sam Tong Ong Shrine. The story is about this shrine where one day, a floating piece of wood appeared near the village. This wood looked like a figure of three gods so they established the shrine where they found this figure. The figure represents three brothers which themselves represent the Chinese communities in Penang, Lanta, and Tha Rue, Phuket.

Most of the Chinese economic activities in making coals and trading rice from Thap Thieng and Kantang. Products from Ko Lanta include salted fish, dried shrimp, dried coconut, and dried sea cucumber. Charcoal production is located at several points in the mangrove forest in the central island (Ko Klang) area. Ko Lanta Noi and Ko Lanta Yai, such as Ban Khlong Yang, Ban Bo Nae, Ban Ramat, and Ban Ra Pu, are primarily located in mangrove forests as an essential raw material and far from the community.

The Thai-Malay interview

The early village settled on Ko Por in Nai Ban around 200 years ago. Then the population increased until around 1987. The original name of Ko Por is "Pulo Du Por" which means the island is shaped like a human figure. The port area between Ko Lanta Yai and Ko Por, now called Tha Kang, covers the area from the northern cape to the western bay. From Laem Liga to Tha Kang used to be the dwelling place of the villagers. Next to the east of Cape Liga, it is called Laem Ung (Leam means cape, Ung, a type of bee-like insect). The descents of Ko Por community originated from a Phatthalung to a man named Khun Samut, who married to a Urak Lawoi woman and came to live on the island from around 100 - 200 years ago. Most of the names of places on Ko Por are in the Urak Lawoi language, such as Laem Lika, Laem Ung, etc. On Ko Por, next to Laem Ung, it is called Ao Nai Ban (Ao Nai Ban means village in the bay). East of Ko Por is a bay called Lo Biba. On the shore is another village. As for the west coast, next to Tha Kang Port, is called Loh Wo or Wo bay, and further south is called Loh Ra Mat. Next to the southern end of Ko Por is a cape. There is a channel to walk to the cape, called Laem Mea-rah.

The main product of Ko Por in the past was coconut, which was made into dried coconut to sell or exchanged with rice and sugar at Bo Muang, Trang, and Kantang. In the past, there was also farming on Ko Po in the lowland near the houses in Loh Biba, Tha Kung, Loh Lamat, and Ban Toh Tam Pia. At present, farming on the island has been suspended about 10 - 20 years ago. The people of Ko Por have learned rice farming from people in Ko Lanta Yai, such as Ban Jae Lee, Thung Yee Peng, etc. They also exchanged dried fish for rice. They mentioned Urak Lawoi, who lives on Ko Por for a temporary short stay in the monsoon season. The water source on the island is an essential factor in setting up a village. There are 11 wells in Ko Por. During the dry season, water was insufficient. Therefore, they had to draw water equally to solve the problem.

The maritime routes from Ko Por to various locations depend on the wind direction and season. There are several main routes. It depends on the destination and the reason for traveling. Most of them are fishing and exchanging goods. They also have boat routes to access the island or the canal way. There will be a main channel that will be used during low tide. There is a marked stick embroidered in line and the experiences of the older generation to navigate.

The interview with the Urak Lawoi communities

The interview is about the places where they have been settled, landmarks, sacred places, and the cemetery on Ko Lanta. There is history, settlement, folklore, maritime activities, and social economics. The Urak Lawoi communities settled in Ko Lanta about 400 years ago. Then, during the Second World War, some of them were moved to Ko Lipe from Ko Lanta. The maritime routes in the past sailed to Myanmar and Malaysia. For example, the people of Ko Adang would sail between Langkawi islands. There will be relatives to come and find each other. Ko Adang people will bring fish to sell to Langkawi and repurchase fish sauce and rice. On the Burmese side, they have been to Ko Song for work. Navigation relies mainly on observing the wind direction with knowledge and experience in sailing. During the fourth lunar month, they will be able to travel easily. because the wind is not strong. So, they can travel anywhere. There will be outings on various islands such as Ko Rok, and Ko Ngai. They will take the children to the island, camping on the beach, and teach them how to make a living on the island.

The cemetery and village are separated but not very far from each other. Most will choose the area by the sea. For the deceased to hear the sea, most burials have coconuts for rituals. They will pour coconut over the coffin. The descendant will eat the coconut. When burial, a coconut tree is planted to signify the descendant's return to the ceremony in April.

They traded through merchants at the Si Raya. The main products are fresh seafood such as fish, shellfish, and shrimp. Then, they dried and sold them to the three-mast boats to Penang Island. Sometimes there will be a particular order, such as a special type of shell, mother-of-pearl. Sea turtles are considered food offerings in the rituals of the Urak Lawoi people. In the past, turtles were sometimes eaten as offerings to ancestors for ceremonies. There are forbidden animals such as whales and sharks. There are also forbidden places, landmarks, and holy places. Most are not prohibited from entering but will be a place to worship, such as entering these places to pay respect to the place.

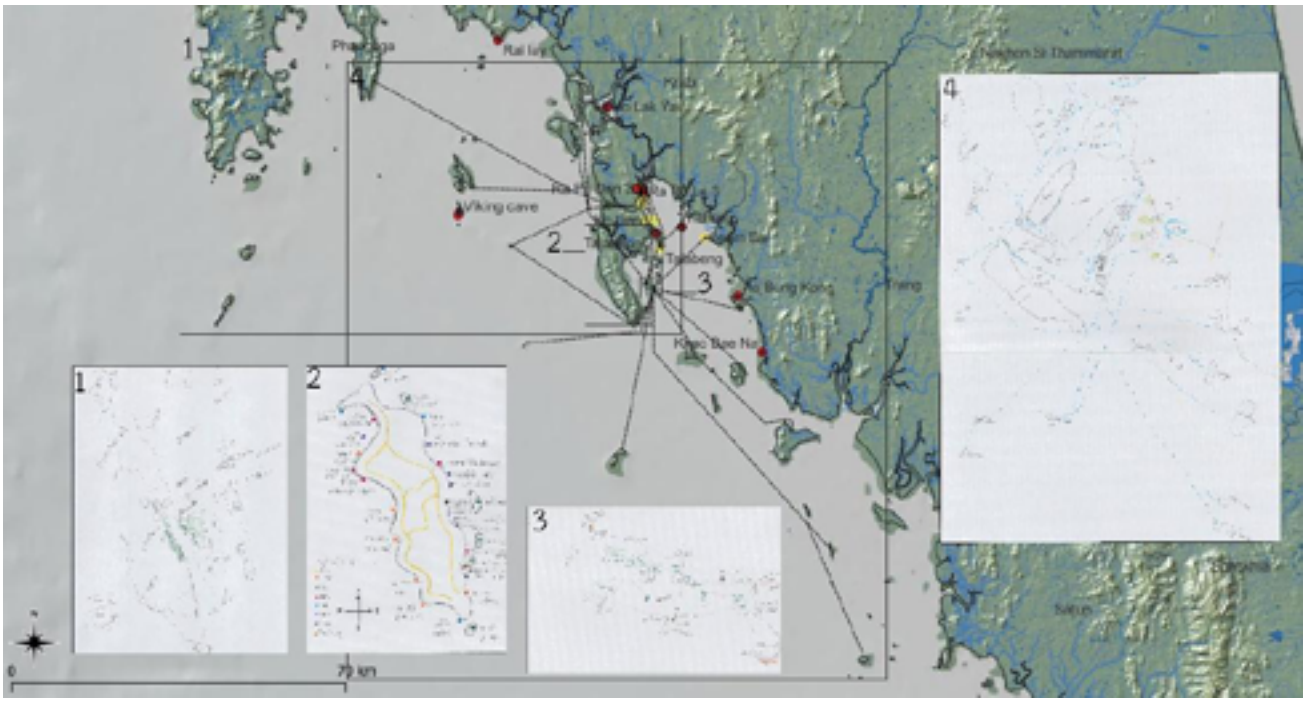


Fig. 14 The map of Lanta Island and nearby drawn by the local communities: Thai Chinese (1), Urak Lawoi (2), and Thai Malay (3 and 4) with a digitized map in GIS in the background. ***Source:*** map prepared by Sorathach Rotchanarat, 2023

DISCUSSION

Three main types of information emerged from these interviews. Some may be useful to integrate with the context of an archaeological and heritage community program there.

The first type of information concerns the territory, the places suitable for settlement, and where these groups conduct their economic activities. Each group provided stories about their origin, and how they chose to settle in Ko Lanta. Each described the territory concerning their labor/specialization and how they interact with other groups for these activities. The UL also mentions places that are forbidden and places for rituals. Some information may be used to elaborate some sort of 'predictive model' (Shoocongdej 2020) to locate ancient economically or ritually important locations.

The second type of information concerns navigation (sea routes, winds, places to settlers) and exchange networks of interest for archeologists and historians. Lanta Bay and its islands provided shelters for boats and were midway along what used to be a vivid-trading route until the 19th and early 20th c. Different routes can be used according to the winds and islands as places to settlers. The local knowledge of navigations, winds, and resource locations may also clarify some of the rock art motives and their distribution in the islands.

The last set of information concerns the local groups' absence of links with archaeological remains and the UL avoidance of caves. None of the groups spontaneously mentioned them during interviews. However, we know that they are visited as remains left on the floor of these caves indicate.

Beyond a possible form of reluctance, the negative answers given by our hosts could also be understood as reflecting a tendency to avoid the caves, for various reasons, religious or more pragmatic - forbidden access as part of the National park's regulations or due to the birds' nest economy under the control of armed groups.

It also certainly emphasizes the absence of a direct cultural and historical link between the occupants of the caves where rock art has been found (with estimates varying between 5000 - 2200 years BP) and the current Urak Lawoi population.

However, certain prohibitions and speeches about the presence of a dangerous character in certain caves and in those where shells accumulate could represent indirect evidence of the avoidance of ancient remains. The head of the UL community said that "Exploring caves was not part of the UL culture. They are afraid of Lok Suwei, a spirit looking like a small size human, with long hairs and a strong smell, living near caves and piles of shells. They said this kind of spirit has a tool to chop the shells. It is a black shining stone." This local mythology may correspond to the lost memory of past encounters, of previously occupied places.

CONCLUSION

We are currently integrating data from interviews, but we will need more time to verify the information obtained. It is possible that some of the rock art may correspond to landmarks for sacred places, and navigation, especially along exchange routes linking the bay to Trang, Satun, and Malaysia, and/or form part of rituals undertaken during successive sequences of use by various local and foreign groups.

Although the project is still at an initial stage, our two fieldworks indicate that archaeologists, social anthropologists, and local indigenous communities can learn and benefit from this integrated work. From the point of view of the academic disciplines, the groups' knowledge provides new frameworks to locate and interpret ancient remains and historical events, enriching historical reconstructions. Methodological developments are other expected outputs of this collaboration, in the field's indigenous archaeology and here of sea nomadism too. Subsequently, a better knowledge of these groups may allow for replacing them in a broader historical narrative. From the local groups' perspective, the valorization of their knowledge, traditions, and enriched history, may contribute to their empowerment (Sustainable Development Goal 10).

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ABSTRACT

This paper describes three archaeological sites in Mithaka Country in southwest Queensland, the Gilparrka site complex. Gilparrka Almira is dominated by engraved crescent motifs, and is surrounded by an extensive artefact scatter resulting from the exploitation of silcrete outcrops. The quality of the silcrete and the intensity of exploitation suggest that the material was redistributed through an extensive trade/exchange system. An engraved wavy line at Gilparrka Almira may represent a snake, recording an association with the travels of the Rainbow Serpent and reflecting the importance of the silcrete resource. Two culturally modified trees may be markers, also signifying the importance of the location.

Keywords: Mithaka Country, Gilparrka Almira, rock engravings, culturally scarred tree, artefact scatter, stone resource, trade route, Rainbow Serpent

INTRODUCTION

The Mithaka People are the Traditional Custodians of lands ("Country") located within the Channel Country in southwest Queensland, Australia (Figure 1). The Mithaka People have established a Research Framework- *Ngali Wanthi* – that details their research goals and objectives (see https://mithaka.org.au/research). They view research as a practice of collaboration with Mithaka Traditional Owners to manage Traditional Knowledge so that it benefits their Country, Culture and People. Their "Culture" and knowledge is inherently connected to the landscapes and skyscapes around them, and for generations they have studied and recorded Traditional Knowledge through their own research systems. The research detailed in this paper is part of an ongoing multi-disciplinary archaeological project undertaken in collaboration with the Mithaka People (see Westaway *et al*. 2021).

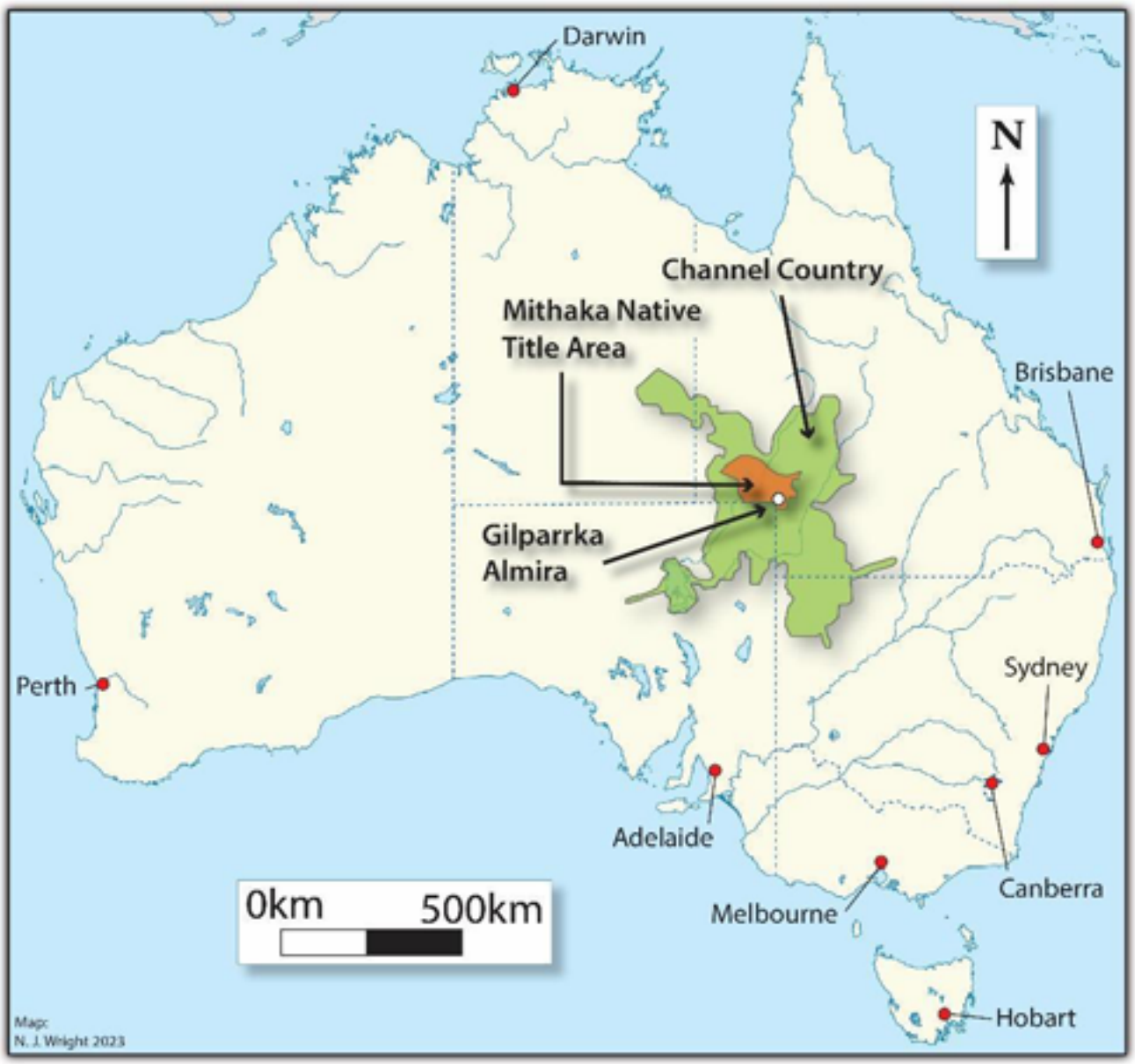


Fig. 1 Location of Gilparrka Almira. Map compiled by Wright.

Mithaka "Country" is situated towards the centre of the Channel Country biogeographic zone, which incorporates an extensive river system formed by the Georgina and Diamantina Rivers, and Cooper and Farrars Creeks. Collectively these channels supply water to Kati Thanda (Lake Eyre), the largest lake in Australia. The environment is a "boom and bust" ecological system, with monsoonal rainfall in the north creating massive semi-annual floods that fill thousands of braided channels across the desert environment. The Channel Country contains a mixture of Mitchell grass downs, open shrublands, woodlands, stony downs-gibber plains (a desert pavement) and sand dunes.

The earliest ethnohistoric accounts from the Channel Country indicate that Aboriginal groups in this region occupied village sites in high densities with an economy based heavily on seed processing and exploitation of riverine resources (Smith 2013; Westaway *et al*. 2021). The unique ethnohistoric record for the region has provided the foundation for a larger multidisciplinary investigation into the nature of this unique arid zone socio-economic system.

Mithaka Country is part of an extensive transcontinental production, exchange/trade and ceremonial network that focused on the narcotic pituri plant (*Duboisia hopwoodi*) as a core commodity. The exchange/trade network, which has been referred to as the "Pituri Road" (Kerwin 2010), has a major north-south trunk traversing South Australia and Queensland with numerous side branches. The river systems were the conduit for travel along the trade route (Kerwin 2010). Along with pituri, the network included other goods such as stone hatchets, tula adzes, sandstone grindstones and ochre (see Franklin et al. 2021; Westaway *et al*. 2021). The trade in these goods was often accompanied by the exchange of "symbolic" behavioural traits, such as songs and dances and ceremonial paraphernalia such as down, fibre and resin (Duncan-Kemp 1933).

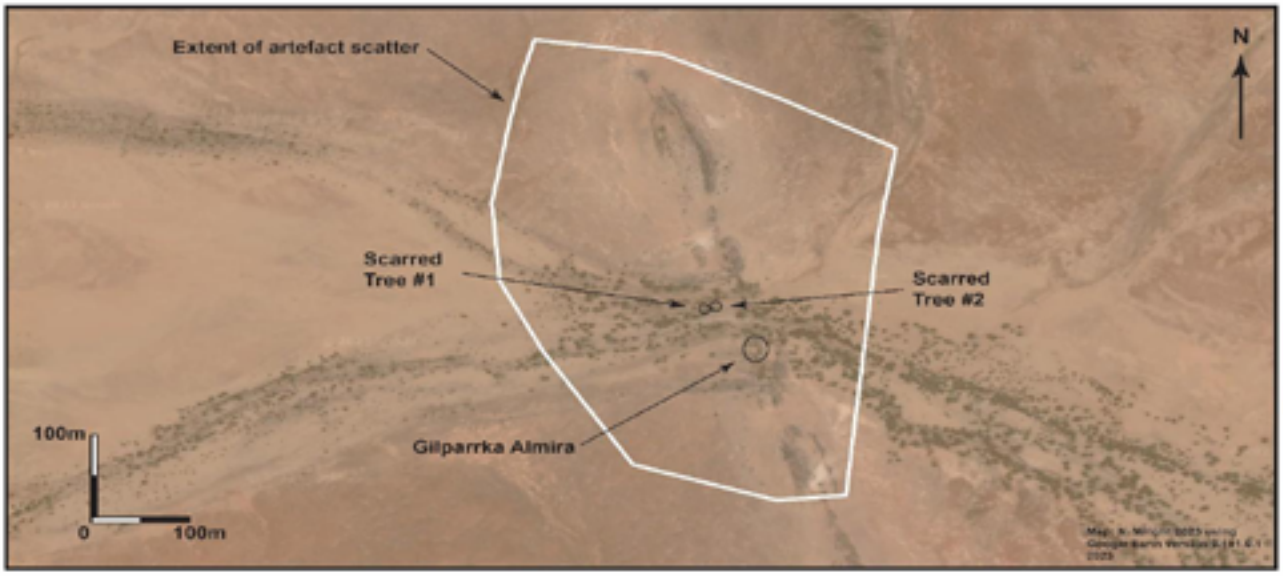


Fig. 2 Gilparrka site complex. Map compiled by Wright.

The Gilparrka site complex is located in the southern part of Mithaka Country (Figure 1) and consists of an engraving site, scarred trees and an extensive stone resource and artefact scatter (Figure 2). Each of these components of the complex will be discussed individually below, followed by a discussion of the broader cultural landscape.

Note that the name Gilparrka Almira is derived from "Gilparrka", the name of the creek at the location, and "Almira", meaning "paintings or etchings" in the Mithaka language.

Gilparrka Almira Rock Art Site

The Gilparrka Almira rock art site consists of engravings on the western face of a steeply sloping sandstone rock outcrop (see Franklin et al. 2021 for a detailed discussion of the site and its potential cultural and symbolic connections along trade routes). There is a single panel of engravings at the site, although the engravings are clustered in different areas, demarcated by natural cracks and fissures in the rock (Figures 3-4). Most of the engravings at the site have been pounded (direct percussion), bruising the rock surface, and the resulting lighter colour stands out against the dark red patina of the rock. There is no apparent re-patination of the engravings. The majority of the engravings are crescents or variations on crescent motifs, in the form of upside-down U-shapes. Other motifs include straight lines, single rows of dots, a trident-bird track with spur and a meandering line (a possible snake, Figure 5). Of the motifs at Gilparrka Almira, 82% are crescent motifs and crescent designs, compared to other recorded rock art sites in Australia, which vary from 1% to 39% at most (Franklin et al. 2021). Ethnographically, crescent motifs can carry a range of possible meanings, including boomerangs, crescent moons, rainbows, caves, huts, people sitting on the ground or tally marks. The engravings at Gilparrka Almira are similar to rock art common to Australia's deserts, which have a limited range of tracks and mostly non-figurative (geometric) images, including crescents/arcs.



Fig. 3 Gilparrka Almira panel Source: Drone photo by Wright - heading [bearing] 71.5 degrees (WNW); elevation of drone 3.81m; ground height (AMSL) immediately below the drone 108.23 metres).



Fig. 4 Gilparrka Almira - Northern end of panel ***Source:*** Photo by Franklin.

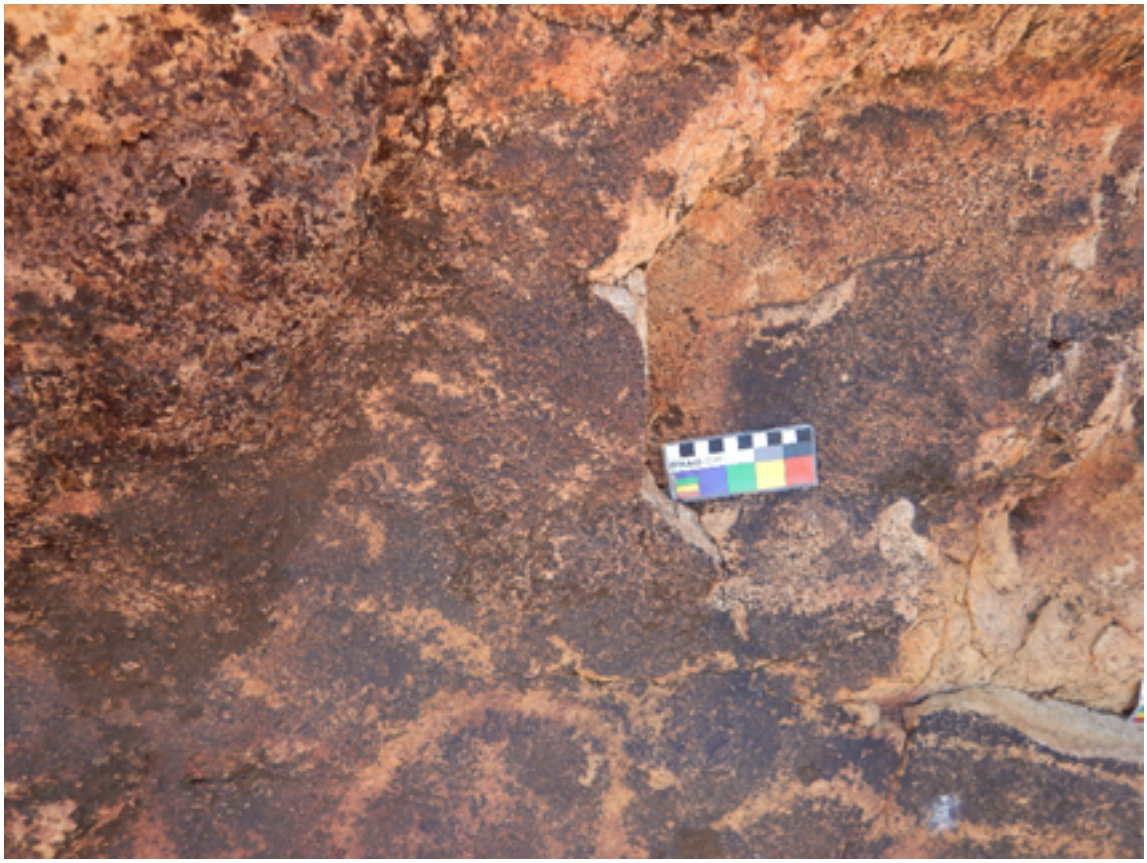


Fig. 5 Gilparrka Almira – a possible snake motif to the left of scale. ***Source:*** Photo by Franklin.

Culturally Scarred Trees

Gilparrka Almira is located adjacent to the confluence of two (2) ephemeral water channels. On one area of the bank between these two channels near the confluence, two Aboriginal culturally modified (scarred) trees are located (Figures 2, 6-7).

Culturally scarred trees result from the deliberate removal of bark to make artefacts. Culturally scarred trees usually have symmetrical scarring with squared off or rounded ends that do not extend down to the ground surface. The scar may eventually be covered by overgrowth from the sides of the scar. Dieback caused by the original scarring, or natural events such as insect activity, may cause secondary damage to the tree above or below a scar. Cultural scarring of trees can also result from traditional hunting and foraging activities such as cut holes for collecting food (for example honey or possums); and toe holds for climbing trees to access fruits, nuts, birds' eggs etc. Trees were also marked/scarred to indicate pathways or culturally significant places such as ceremonial grounds or burial locations. Culturally scarred trees are no longer commonly found across the Australian landscape due to fires and land clearance. The shapes of scars may vary. Small ovate scars (100-120 cm long and 40-60 cm wide) were formed in the manufacture of items such as containers (coolamons) and shields, or they may be markers. Larger scars may be the result of bark removal for canoes or shelters.

Culturally scarred tree #1 in the Gilparrka site complex is a dead tree stump 180cm high with a diameter of 38cm (Figure 6). The form of the scar would have been a regular oval shape, but the bottom has been damaged by insect activity. Due to over bank sedimentation, the scar extends to the current ground surface, but it would have been higher up the tree when originally made (Figure 6). The scar, which is on the SW face of the tree, is 65cm long (but the bottom is indistinct) and 25cm wide (Figure 6).

Culturally scarred tree #2 is a desert bloodwood (*Corymbia terminalis*) and is 15m to the southeast of the other culturally scarred tree (Figure 7). The tree is approximately 10m high and has a 60cm diameter. The form of the scar would have been a broadly oval shape, but there appears to have been damage to the top left corner causing dieback (Figure 7). The scar, which is on the SW face of the tree, is 50cm long and 28cm wide and is 45cm above the current ground surface (Figure 7).



Fig. 6 Culturally scarred tree #1. ***Source:*** Photo by Habgood.



Fig. 7: Culturally scarred tree #2. ***Source:*** Photo by Habgood.

Gilparrka Quarry

The Gilparrka Almira engraving site is surrounded by an extensive stone artefact scatter (Figure 2). Extending for kilometres to the north and south of the Gilparrka Almira engraving site are rocky ridgelines incorporating extensive silcrete outcrops (Figure 2). The silcrete boulders of the outcrop have been used as a stone resource/quarry. The full extent of the quarry has not yet been mapped, but the artefacts continue past the ridge to the south of Gilparrka Almira. The focus of the survey undertaken for the project was the ridge directly to the north of the Gilparrka Almira art site. As you move away from the main ridges, the density of artefacts decreases and as you move out onto the adjacent gibber plains the artefacts are no longer evident. The approximate size of the stone resource/quarry and the associated artefact scatter is a minimum of 700m x 500m (Figure 2).

The majority of the stone artefacts observed (over 95%) were made from a very fine-grained high quality grey silcrete, although there were also red, white and yellow silcrete artefacts, some of which were mottled or banded, and a few were made of chert and chalcedony. Artefacts included assayed boulders and cobbles, large cores, flaked pieces, large and small flakes and large amounts of debitage. Very few formal tools were observed during the survey of the area (Figures 8-9).



Fig. 8 High density silcrete artefact scatter. ***Source:*** Photo by Habgood.



Fig. 9 High density silcrete artefact scatter. ***Source:*** Photo by Habgood.

To systematically assess the density of the artefacts within the quarry area surveyed, two (2) intersecting perpendicular transects were laid out on the western side of the ridge to the north of the art site: the east-west transect was 60m long and the north-south transect 40m long. Every 5m along each transect a 50cm x 50cm frame was placed on the ground and all surface artefacts within the frame were counted. Densities ranged from 4 per 50cm2 (16 per 1m2) to 66 per 50cm2 (264 per 1m2) on the east-west transect, and from 17 per 50cm2 (68 per 1m2) to 48 per 50cm2 (192 per 1m2) on the north-south transect. To establish the highest observable artefact density, four (4) specific locations on the western side of the northern ridge were assessed using the 50cm x 50cm frame. Densities ranged from 80 per 50cm2 (320 per 1m2) to 122 per 50cm2 (488 per 1m2).

If these densities were extrapolated across the recorded artefact scatter it would result in artefact counts in the millions. For example:

- 16 per 1m2 (the lowest recorded density) across the entire surveyed area (700m x 500m) would equate to 5.6 million artefacts;
- A mid-range density of 150 per 1m2 across a sample area of 150m x 150m would equate to 3,375,000 artefacts;
- 488 per 1m2 (the highest recorded density) across a restricted area of only 20m x 20m would equate to 195,200 artefacts.

With such large numbers of artefacts, the silcrete resource/quarry must have been used over a very long time period or was intensively utilised over a shorter period. Either scenario is indicative of a process that would have generated a significant excess of raw material. Further analysis of the Gilparrka stone material is planned.

The quality of the fine-grained silcrete and the intensity of exploitation would suggest that the raw material was redistributed through the extensive "Pituri Road" trade/exchange system.

An Interconnected Cultural Landscape

The quality and volume of stone material at the Gilparrka quarry alludes to it being an important place in Traditional times. The Gilparrka Almira art site may be reflecting this importance by marking the culturally significant location. The small ovate scars on the two (2) trees at the confluence of the creeks could potentially have been markers signifying the importance of the area, although it is more likely that they represent regular exploitation of bark for everyday use in more recent times.

The occurrence of a possible engraved snake at Gilparrka Almira (Figure 5) also suggests that the site may have been a stopping point for the Rainbow Serpent on one of its various journeys across the continent. The Rainbow Serpent is one of the most powerful and widespread "Ancestral Beings" of Aboriginal Australia. The movement of its body as it travelled along a "Dreaming track/song line" formed physical features like hills, gorges, creeks and rivers in the once-featureless terrain. The Simpson Desert to the west of Mithaka Country was said to be the home of the Rainbow Serpent (Duncan-Kemp 1961:179). Furthermore, Duncan-Kemp (1968) noted that Maratjoora, the name for the Rainbow Serpent in the Channel Country, exerted a strong influence on the Aboriginal people of the region.

A parallel for Gilparrka Almira can be found at the site of Jukuita Cave in the Tanami Desert, northwest of Mithaka Country in the Northern Territory, where there is an association between an image of the

Rainbow Serpent and crescent motifs. An illustration of the paintings in this cave shows inverted "U" shapes/crescents in each curve of the Rainbow Serpent's body (Cowan 1992: figure 4). The Rainbow Serpent, in this region referred to as Jarapiri, is said to have surfaced on its journey north from central Australia (Cowan 1992). It is possible that the engraved snake and inverted "U" shapes/crescents at Gilparrka Almira indicate the site was also a stopping point for the Rainbow Serpent on one of its journeys. As you head east along Gilparrka Creek towards Gilparrka Almira, some of the hills and ridges take on the form of a snake adding character to this scenario (Figure 10).

Overlaps between Dreaming tracks and trade routes have been documented. Kerwin (2010:Figures 12–13) mapped the various paths of the Two Dog Dreaming across the continent, and demonstrated a correlation with the "Pituri Road". Kerwin (2010) also detailed the associations of the Two Dog Dreaming with other Dreaming stories, including the Rainbow Serpent chasing the Nightjar story and the Two Boys story of the Wangkangurru People of the Simpson Desert, adjacent to Mithaka Country. These dreaming stories highlight the movement of pituri across Australia, starting at the place of harvest in the Channel Country and radiating outwards along the Dreaming tracks. Presumably, the Dreaming stories also map in parallel the movement of the other goods associated with the "Pituri Road", such as the ochre, grindstones and stone hatchets. This would be consistent with our proposal that the Gilparrka Almira engraving site may be associated with the journeys of the Rainbow Serpent, and the high quality silcrete from the Gilparrka stone resource/quarry having been exchanged/traded along the "Pituri Road".

The three (3) individual archaeological sites - engraving location, stone resource/quarry, scarred marker trees - are therefore part of an interconnected Cultural landscape.



Fig. 10 Snake-like hills enroute to the Gilparrka site complex. ***Source:*** Photo by Habgood.

CONCLUSION

This paper has detailed three (3) co-located archaeological sites in Mithaka Country in the Channel Country of southwest Queensland, which we refer to as the Gilparrka site complex. The Gilparrka Almira engraving site is dominated by crescents or variations on crescent motifs, with a much smaller number of other motifs, including a possible snake design potentially representing the Rainbow Serpent. The Gilparrka Almira engraving site is surrounded by an extensive artefact scatter resulting from the exploitation of silcrete outcrops forming an extensive stone resource/quarry. The quality of the fine-grained silcrete and the intensity of exploitation, providing a significant excess of raw material, would suggest that the stone material was redistributed through an extensive trade/exchange system. Mithaka Country is located in the approximate centre of the great north-south "Pituri Road" trade network, which had several side branches. The route of the "Pituri Road" overlaps with stories related to the Rainbow Serpent.

Gilparrka Almira, with its possible engraved snake, may be recording the association of the surrounding landscape with the travels of the Rainbow Serpent along a Dreaming track/song line and reflecting the importance of the silcrete stone resource within the "Pituri Road". The two (2) culturally modified (scarred) trees could also have been markers signifying the importance of the location.

The three (3) individual archaeological sites are an interconnected Cultural landscape that retains important cultural values for the Mithaka People as it deepens their ongoing connection to Country and further highlights their connectivity to neighbouring Aboriginal groups.

ACKNOWLEDGEMENTS

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Rock Art as an Indigenous Historical Tradition, Northern Vindhyas, India

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ABSTRACT

While the study of rock art has been conventionally the concern of prehistory, much of its content in the Northern Vindhyas, India, is in the historical period and requires a historical interrogation. While the early Holocene rock art here is contextually associated with non or semi-geometric microliths and can be regarded as Upper Palaeolithic, the more emphatic, extensive, and skilled rock art exposition is during the Mesolithic. Mesolithic North Vindhyan rock art also has more geometric microliths, large numbers of shelter-dwellings, prepared stone-floors, human and faunal remains, corded incised hand-made mesolithic pottery, grinding stones and occasional and Iron Age tools. On the scarps, paintings of large antelopes, cattle, buffalo, elephants, rhinos, turtles, varanus, and smaller deer species dominate the Mesolithic, while neolithic-chalcolithic and Iron Age depictions contain more human figures, domesticated cattle, buffalo, sheep, goat, and greater dress, hair-style, self-images, palm-prints, iron-tools, three-dimensional perspectives, landscape simulations, superimpositions and narrative structure. Paintings show cognitively advanced choices in surface selection, the use of templates like three-dimensionality, perspective, and movement, in the selection and narrative rendering of historically oriented themes. Inter-group, identity-based differences between the several groups inhabiting the uplands and their conflicts are also represented. Historically structured materials like pastoral corrals, stelae, memorial stones, historical sculpture, and Brahmi inscriptions contextual to rock art, are found in the valleys and the foothills. Early historic trans-Indian trade routes occur in the Vindhyas and these routes are dotted with early historic inscriptions in the Brahmi script and its variants like Mauryan, Siddhamatrika, Shankha, proto-Nagari and Nagari. Their symbolic unity and continuity with upland symbolic traditions are many. Distinctly medieval rock art includes themes like soldiers, flag marches, hunting, and elephant capture by feudal lords. The final period of north Vindhyan rock art is colonial when paintings made by indigenes of the area depict the looting of colonial horse-carts and buggies after which rock art declines and disappears.

Keywords: North Vindhyan rock art, cognition, history, material culture, human and faunal drawings, designs and patterns, gender, age, childhood, early historic, medieval, modern

> The value of a research technique which does not link the local area to the larger society in terms of historical and contemporary social processes is highly questionable. (Fox 1971)

INTRODUCTION

Following the generally accepted idea in India of archaeology being a subdiscipline of history and archaeological sources as being (pre-literate) source materials of a long-term history (Hodder 1987), the methodology followed in this paper is to analyze particularly the historical period Northern Vindhyan rock art, with reference to its combined archaeological, ethnographic, and historical contexts. In our estimate, the rock art of the Northern Vindhyan region, bordering upon the Ganges Valley (see Figure 1), although separated by several hundred miles from the central Indian rock painting reserves in Madhya Pradesh and the Narmada Valley, which is considerably older (Bednarik 2019), are archaeologically and historically unitary and connected (Clarkson 2020, Misra 2001, Sharma and Clark 1983). Several archaeologists have commented on the symbolic and archaeological material cultures in the Vindhyan ranges spanning the valleys of the Narmada and the Sone Rivers (Misra 2001). From Bhimbetka (Hoshangabad) to Morhana Pahar (in Mirzapur) rock shelters occur in sandstone hills, are chronologically usually mesolithic and onwards, and other than prehistoric art includes distinct multi-layered historical period iconic overlays made by forest-dwelling hunters and agro-pastoralists. Agro-pastoralism but not hunting survives even today in the Northern part of the Vindhyas (Banerjee et al., 2021, Pratap and Kumar 2009, Pratap 2011, 2016, 2018a, 2018b, 2018c, 2019, 2020, 2022, 2023). The archaeological evidence from excavations at some localities suggests a large population of pastoralist cum hunters inhabiting the North Vindhyan scarps, valleys, and foothills since at least the epi-palaeolithic (Sharma 1964, Sharma and Clark 1983). Later Iron Age intensification of production through settled farming and population pressure resulted in conflicts between incipient farmers and pastoral hunters over territory and resources. Subsistence pressure was probably caused by the drying up of palaeolakes too, next to which large prehistoric populations resided and painted on the escarps, leading to wholesale migrations to the plains, is perhaps insinuated by ring-stone burials and in paintings of such conflicts (Pratap and Kumar 2009).

The archaeological background

Although rock art was found in Mirzapur during the mid-19th century (Mathpal 1984, Neumayer 2004, Tewari 1988, 1990), steadily from the 1980s, related excavated evidence of cowdung, corrals, hoof-prints of domesticated animals, wild and domesticated millets, rice, wheat and barley, terracotta objects, pottery, bone and antler tools, copper and iron implements, memorial stones and ring-burials has been found at mesolithic, neolithic, chalcolithic and iron age sites associated with early Vindhyan communities practising rock art (Pal 1986, 2017, Pratap, 2016, 2018a, 2018b, 2018c, 2020, 2022, 2023, Sharma 1964, Sharma and Clark 1983). The archaeological data from the highlands, however, have been usually ascribed to the upper palaeolithic to mesolithic hunter-gatherers (Jayaswal 1983: 126-33), and then during the middle Holocene, to agro-pastoralists settled on the scarp lands and in the Vindhyan foothills existing coevally with rock art communities from prehistoric to early historic period and up to much later in medieval and contemporary times (Misra 2001, Pal 1986, Sharma and Clarke 1983).

The rise of Ganges Valley urban systems in and around the 6th century BCE, it has been argued, was fuelled by communities of the highlands acting as suppliers of plant and animal domesticates as also raw materials for trade and urbanization like resins, fibre, lac, silk cocoons, tobacco, medicinal plants, stone, wood, copper and iron ores and ingots, and other mineral resources to the Ganges Valley (Jha 2014, Tewari 2003, Tripathi 2008). This tripartite horizontal socio-economic variation from the forested to rural and the urban is found in Narmada Valley too where all three settlement types form

interrelated components of a regional settlement system since early history. Thus hill-based rock art data is juxtaposed with rural memorial stones and early historic inscriptions, forts and fortresses and form a necessary part of the discussion. These varied symbolic and iconic manifestations of the early history of the region, aided by digital enhancements, also add interpretive depth by offering the full texts of that which have been represented. The existence of a sense of the past is now no longer in the contest, even for early societies, whether prehistoric or historic (Bradley 2002, Thapar 2013).

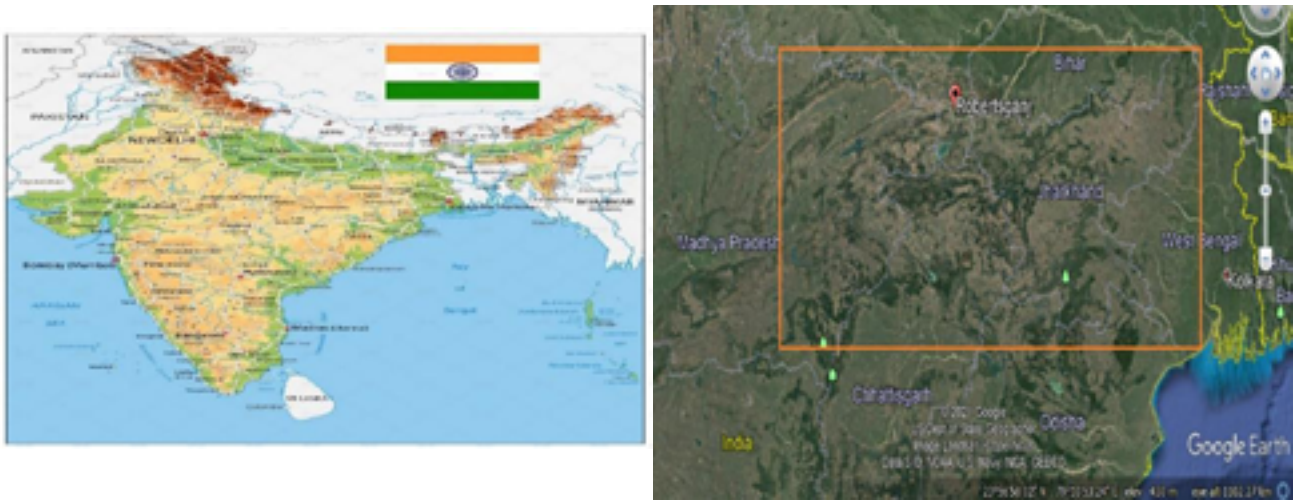


Fig. 1 Field area, location, rock art landscapes and Vindhya-Ganges Valley (highland-lowland) juxtaposition Low-altitude rolling Meso-Proterozoic sandstone formations with underlying shale and limestones on the periphery of the Ganges Valley.



Fig. 2 a-f: Morhana Pahar near Adwa and Belan Valleys, in Mirzapur, Wyndham Falls (Barkachcha Forest Reserve along Khajuri River, in Mirzapur), Likhaniya Dari and Chuna Dari (Sukrit Forest Range along Garai River, in Mirzapur), Mukkha Dari (Kaimur Wildlife Sanctuary along Belan River, in Sonbhadra). Photos by the author taken in 2011. Photos: Author.

Variations in site location, landscapes and rock art types are caused by geographically separated populations with possibly shared kinship and territorial networks (Laue 2021), but also age, gender and ethnicity are notable between scarplands, river valleys and foothill (watershed) area sites. Socialization of the landscape through kinship, marriage, trade and exchange between indigenous groups through prehistory is likely (Ingold 2000, Thomas 2001). Scarp sites are primary dwelling sites supporting larger populations, river valleys perhaps served as seasonal watering holes for cattle as well as fish and

turtle foraging and camping sites, and watershed areas were ranging locations accessed for hunting of fauna dispersed through the hills due to human presence and hunting (Mandal 2001). The core sites of our study Wyndham Falls, Likhaniya Dari and Chuna Dari, Panchmukhi, Kandakot, Mukkha Dari, Lekhahia and Morhana Pahar, and their satellite painting locations, among several other significant clusters, are characterized by mesolithic to iron age paintings dominant in wild animals, human figures, designs, and material culture.

In the same shelters, human bodies, domesticated animals, designs and material culture depictions increase towards the neolithic-chalcolithic and beyond, while wild fauna drawings decrease proportionately. Rock art at early Holocene sites like Mukkha Dari and Wyndham Falls are dominant in wild fauna representations like tortoises, wild cattle and buffalos, tragocamelus, swamp deer, spotted deer, the occasional rhino, wild pig, elephants, and many types of smaller deer all of which were locally extant (Banerjee et al. 2021, Joglekar 2015, Pratap 2016, 2022, 2023). The panels containing them seem ordered in vague but narratively charged compositions and sequences (Figures 3, 5 g, h and i and 7 a, b and c). Mukkha Dari on the Belan River is exceptional in having several extensive activity depictions of hunting and fishing, with horizontally extended panels made during repeated visits by young adults climbing to heights like 12-16 feet above the ground to paint. This panel's fresher right-hand side with women and men in association with bulls, elephants, and large deer seems more recent conveying as it does ideas of domestication.

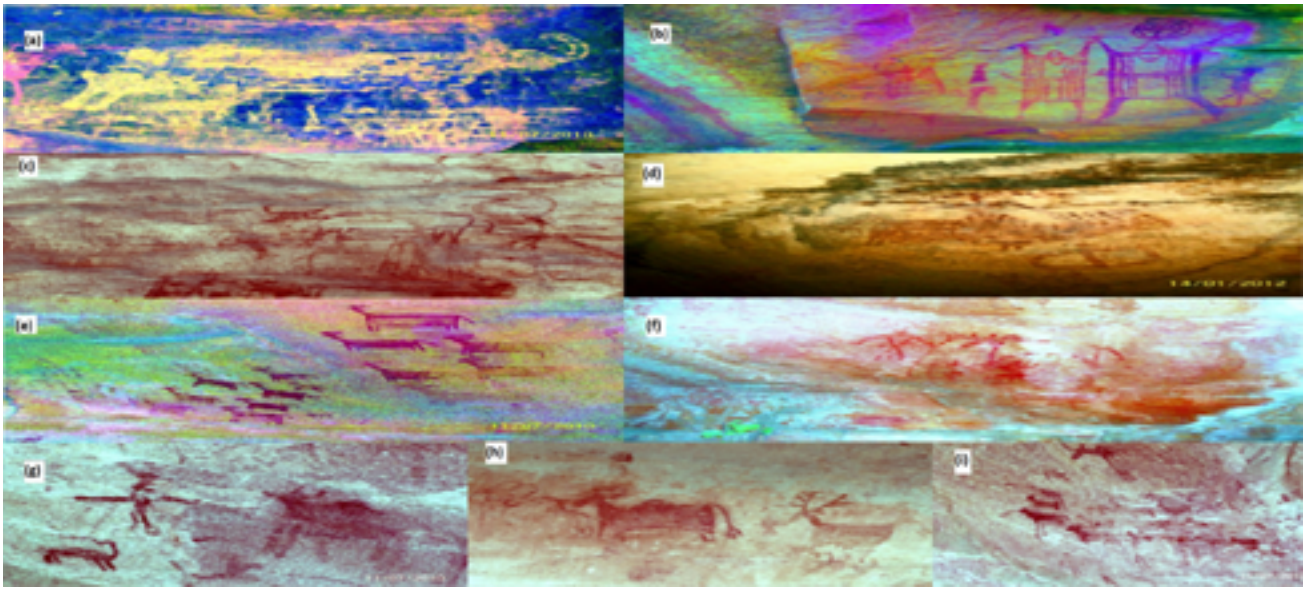


Fig. 3 a – i: Clockwise An elephant with a calf being hunted by several hunters with thrusting spears, decorated tortoise figures at Chhaan Pathari site, Ghorawal, Sonbhadra, Wild cattle drawings at Gopal Das Kandra (GDK), Morhana Pahar, a pastoral scene with a man riding a buffalo, CAR-10 Morhana Pahar, A herd of goats at CAR 10, Morhana Pahar, a man with a stick tending an Ox with diminutive figures of children in CAR 8, Morhana Pahar, a man with outstretched arms with a dog stopping a buffalo at CAR 1, Morhana Pahar, humped cattle and a stag at CAR 5, Morhana Pahar, and a row of different types of deer at CAR 1 shelter, Morhana Pahar. Photos and DStretch: Author.

The Ethnographic background

Ethnographic accounts of the Northwestern provinces of the late 19th century suggest a diversity of cultivating, pastoral and professional castes and tribes inhabiting the Vindhyan uplands, valleys, and plains, with central and eastern Indian linguistic and cultural affinities (Crooke 1896: cxlvii - clix). Some groups specialising in small craft activities ranging from stone-working to basketry, weaving and woodwork had evident use of designs for weaves and stone sculpture much in demand in rural and urban contexts. Notes Archer (1947: 17) "Within this region, each village has a form of stone or wooden sculpture. In places, stone and wooden images stand side by side. In others, wood alone is found, while in some the sole medium is stone. The latter marks the Sasaram, Dehri and Rohtas… while the wooden figures flourish in Palamau district and in southern Sasaram. Each figure is normally made for Kishnaut Ahirs, whose primary occupation is the tending of cows and buffalos and its subject is their cattle-god, Bir Kuar. The stone sculpture is made by Gonrs (*colloquial for Gonds, emphasis mine*), a sub-caste of stone-cutters, while the images in wood are carved by Barhis, the caste of carpenters." In a first-ever comprehensive study of folk memorial stones of this pastorally rich region comprising Kaimur, Rohtas, and Bhabua in the Vindhyan foothills Archer (1947: 20) notes the use of geometric shapes in the carving of pastoral stelaes of their pastoral hero Bir Kuar, referred to above, reputed to slay and keep away tigers from getting at their buffalos if propitiated in a yearly cycle, "Firstly, the idioms or ways of representing the various human parts are given a geometric distortion. This is sometimes completely geometric and results in pure forms of the circle or the rectangle. The head for example is treated as a circle, the mouth, the eyebrows, the shoulders and the waist are straight horizontals. The club is a straight line, the eyes and ears are semi-circles, the nose, the torso, and the legs are rectangles." Evidence of domesticated goat and sheep, and cattle and buffalo, are found from all excavations on Vindhyan promontories (Joglekar 2010-12, 2015, 2016, 2017), which confirms pastoral presence from the NeolithicChalcolithic. Not a surprise then that wild buffalo and wild cattle paintings often showing their hunt or coralling abound in the Mesolithic rock art, in which the use of geometric shapes seems to have been very popular on the Vindhyan escarpments. The use of such shapes in drawing human, faunal and material culture subjects, but also for nested and non-nested/ repetitive/linear designs and decorative patterns in North Vindhyan rock paintings, is discussed below, and makes it likely original pastoralists painting cattle figures on the escarpments took these design heuristics with them to the Neolithic and the Chalcolithic, using them to carve stelae, in the foothills or in areas with no stones, as described above by Archer. In other contexts, such geometric shapes dating to the Mesolithic have been found in use in 'nested' renderings (Taçon et al. 2013) of which our field area provides many examples and variations (Pratap 2016, 2023).

Rock art in our field area is itself evidence that prehistoric pastoral groups occupied rock shelters on the escarpment fringes, next to drainage lines, and in continuity, contemporary pastoralists also use such niches provided particularly with water-supply. Thus such semi-arid terrain has long been in use for cattle, goat and sheep pastoralism where acacia jungles and bush forests that serve as pasture and rearing zones (see also Brandt et al. 1983: 205-239). These are usually next to water-sources like ponds, rivers, streams, and waterfalls. Subsistence types of the day consist of dry and wet agriculture involving millets, barley, linseed, mustard, sesame, peas and chickpea, wheat, rice, and wild rice. Pastoral corrals dot the Vindhyan promontory whereas traditional agro-pastoral corrals for breeding and rearing cattle are still much in evidence (Allchin 1963: 110). The contemporary Vindhyan agro-pastoral cattle camp is occupied for nine months a year, while the remainder is used for agriculture. Traditional corrals and cattle-pens near water sources usually have rock art sites next to them. We

have recorded several major traditional but contemporary corrals, probably existing here since early medieval times, near significant upland water sources. In ethnographic fieldwork since 2010, we have noted goat and sheep herders are ubiquitous in all upland settlement zones, in which with dry deciduous trees, acacia bush and shrub forests, provide excellent grazing, and most farmers consider sheep and goat a good source of sustenance (Pratap 2018b, 2019, 2020).

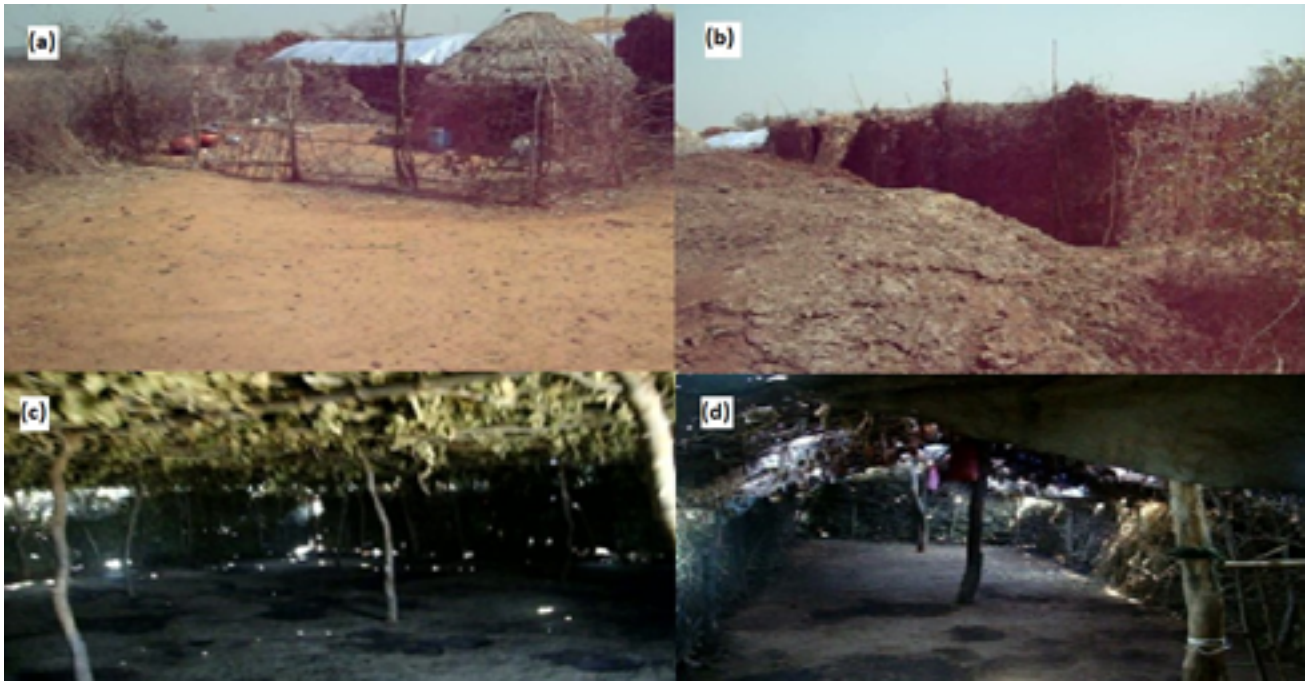


Fig. 4 a-d: Clockwise: The exterior of a pastoral camp at Chhato, Mirzapur, with a cowdung mound and interiors of cattle corralling areas fenced by acacia thorns. Photos: Author.

Rock art types at watering holes near pastoral stations (Chhato, Panchmukhi, Kanda Kot), but also inside deeper caves (Wyndham Falls, Chuna Dari, Lekhahia Pahar and Morhana Pahar), include practice drawings made to explain the drawing process to the young, and palm-imprints in multitudes which suggests the young and the old pastoralists drawing and painting conjointly.

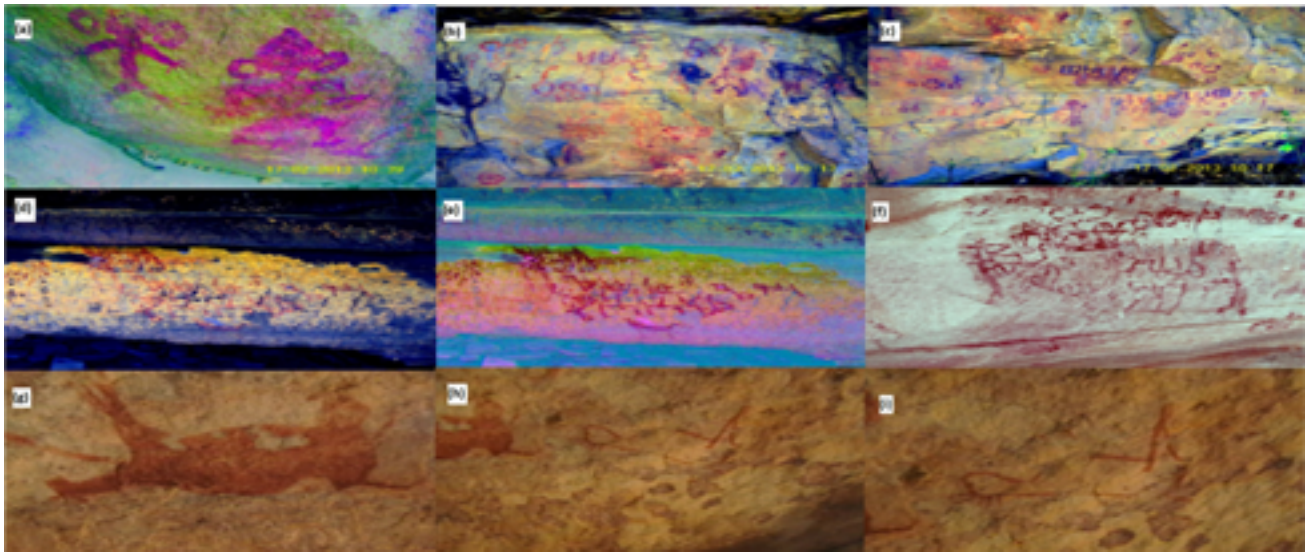


Fig. 5 a-i: Clockwise: Children's portraits (a) and child drawings and doodles (b and c) at Panchmukhi Hills, Children's drawings at Wyndham Falls (d to f), a speared tragocamelus painting with a practice sketch of the drawing by its side at Lekhahia Pahar (g, h and i) Photos and DStretch: Author.

The best of practice-figures shows a tragocamelus figure lying supine after being impaled by a spear with a practice sketch unusually drawn right next to it (Figure 5g, h and i). Panels at the early Holocene site Wyndham Falls (Pratap 2016, Banerjee et al. 2022: 612) have hand imprints of adults, minuscule paintings of humans, animals, and material culture by children. Presumed doodles attempting imagery, and figurative imagery by young children (Figure 5b, c, d, e and f), exist plentifully at Wyndham (WYN 3.1, 3.2, 3.3 and 4.1), Panchmukhi Hill Shelters (PCH - 1, 2, 3, 4, and 5), and Lekhahia (Localities KSW 3, BRL, and LKHPH), and Morhana (Shelters CAR 1, 3, 5, 6, 7, 8, 14, KHP 1, BHP-1). The inference that they are products of child's play rests on the fact they all occur less than a meter, often less, from the floor (at Panchmukhi and Wyndham 4.1), and that their content consisting of knots and crosses or simple geometric and non-geometric shapes, likely indicates play with colours. This is also a case of "children without toys" (Dozier 2016), since lateritic soils do not have the clays necessary for terracotta figurines (Pratap 2016) which have been used for manufacturing terracotta toys at most alluvial South Asian neolithic and later sites. At Wyndham Falls (WYN 3), and Morhana Pahar (CAR 8), there are many such figures including designs and patterns from zero to less than two meters high. In contrast, at heights above two meters, Morhana (CAR 6 and 10), young adolescents may have painted them; and for heights three meters and above, including those on higher cliffs (WYN 1, Likhaniya Dari, Chuna Dari CHD -1, Mukkha Dari MKD – 1 and 2), we may assume young adults to have ascended sheer gorge and valley walls for honey-collection. Preliminary estimates of finger and palm widths, and sizes at sites like Morhana CAR -14 which has hundreds of palm-prints in black colour at a single site, give clear visual evidence that children and young adults, and the more mature congregated to make these.

At the same site, the figure of an elephant hunt has numerous minuscule figures drawn in white calcareous paint above it, suggesting drawings by children, inspired by and next to a perfect figure drawn by an adult. Finally, since they were all long-term camps, from five to twenty or more painted shelters in a cluster, a significantly large population may be assumed to have occupied them, therefore the presence of numerous children may also be assumed. These represent prehistoric sociality, apprenticeships and cognitive play (Davidson and Nowell 2021, Nowell 2015a and b, Nowell and van Gelder 2020) wherein entire communities of practice were involved. The involvement of children in rock art is also proved by the representation of children and women's bodies from Panchmukhi rock shelters near Sone Valley (Figure 5a), but also from Morhana Pahar and Lekhahia Pahar. It is not unlikely older women mainly provided symbolic pedagogy but there is evidence, such as at CAR -14, that older men did that too.

Basic shapes preferred by children learning drawing are points, lines, circles, squares, rectangles and others existing plentifully at Panchmukhi (Figures 5b and c). Both at Panchmukhi and Wyndham Falls these primary forms occur in tandem barely a meter from the floor at the rock shelters (Pratap 2023). Adolescents in their company preferred ceilings at low heights. The association of more mature and perfect forms with children's drawings suggest learning was probably imparted by relatives and kin while on visits to points distant by several kilometres from their home bases. Graphic depictions of women near children's drawings may be regarded as evidence of supervision during learning. This kinship is also brought out in similarities in body shapes, apparel, jewellery, hair-styles and activities engaged in the drawings. There is a clear link between paintings that are gendered and those that represent children (Laue 2021).

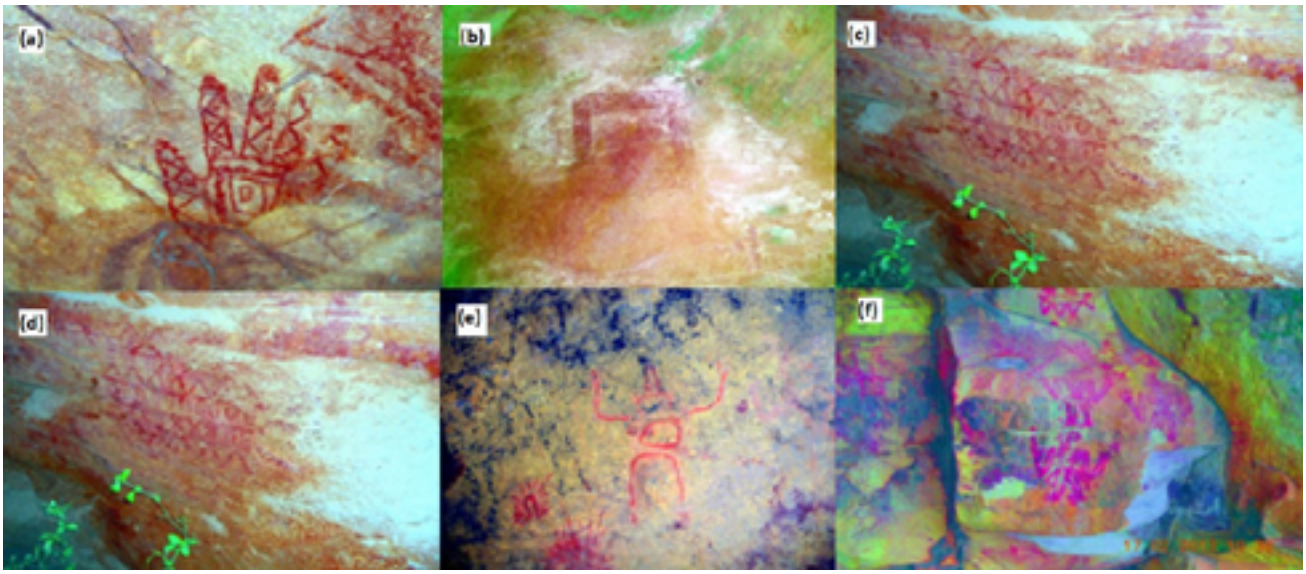


Fig. 6 a-f: Clockwise: Female hand-sketch with mehendi (henna) designs at Amila Nala stream site on the Morhana escarpment, a complicated cross-hatched gate-like design at CAR 9, Morhana Pahar, design drawings by children at CAR 8, Morhana Pahar, a male and a female figure at CAR 8, Morhana Pahar, a female figure petroglyph with inlaid red ochre paint at Likhaniya Dari, three female figures to the right-hand side of children's doodles and drawings at Panchmukhi Hill shelter PCM – 2. Photos and DStretch: Author.

Depictions of female figures are found at Wyndham Falls, Likhaniya Dari, Panchmukhi Hill shelters, and Morhana Pahar (KPH – 1, and CAR - 8). There are variations in body shapes, and often gender is expressed in proxy through designs and decorative patterns, but almost all relationships in rock art between feminine gender and children are often explicit (Baxter 2008, 2022). Some associations suggest elderly males too, perhaps kin, in teaching roles are present in community caves and drawings such as at CAR 14 at Morhana Pahar. Random drawings and sketches by juveniles are present at CAR Group I shelters facing the Deccan Road at Morhana Pahar, and at Lekhahia Pahar, on the opposite side. However, precise gender roles need to be investigated to arrive at an understanding of "the development of inequality and social complexity" (Shoocongdej 2001: 187), which is apparent from the less frequent depictions of women as compared to men. Women's depictions are also often lacking in significant material culture associations as as in figures with males in them. Fully narrative paintings, and panels purporting to symbolise political relations with extraneous groups (as at WYN 4.2, Morhana CAR 10 and Likhaniya and Chuna Dari), are also likely to have been a male preserve.

Rock art and the historical transition in the Vindhyas

Numerous narrative panels, which probably aided orality through formal representation, happened as a way of recording salient subjects for later reference (See Fig. 7, Pratap 2018). In Bradley's (2002) and Thapar's view (2013), such representations were predicated upon the idea of some occurrences having tangible but also social value. This is also in terms of historiography, a selection and classification of some memories as being of active importance. For this reason, perhaps, there is a noticeable increase in the depiction of material culture in rock art, which while adding a chronological sense to themes depicted; by their predominant male associations, may have served the purpose of creating a sense of 'property' and its male control.

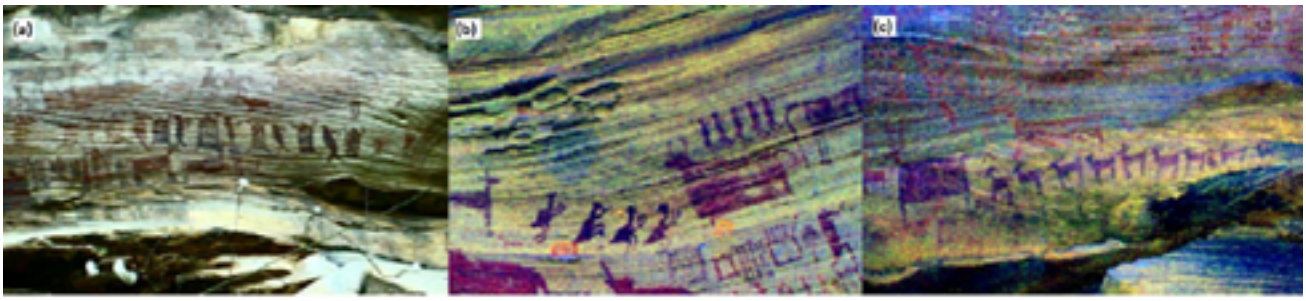


Fig. 7 a – e: Several multi-period panels at Mukkha Dari Waterfall hunting/fishing camp, 12-16 feet above the base, were made probably by young adults climbing up. Fig 7a shows a school of fish and below that two women kneeling in front of a bullock, both figures submerged under calcites, and below that a row of swimmers with bows and arrows hunting tortoises. Fig 7b shows the rescued and re-painted calcite-covered panel in 7a with notable embellishments of colour and subject, Fig. 7c shows a deer followed by many fawns. Photos and DStretch: Author.

There are at least three historically verifiable rock art panels. The corroboration of a narrative panel depicting women hunting deer at the Likhaniya Dari rock art site is from a historical ethnographic source, the account of a colonial officer Mr. William Crooke (1896: 230) entrusted with drawing up statistical accounts of the predominant ethnic groups of Northwestern of the late 19th century, when such practices (Figures 8a and b) appear to have been common. Although made of organic substances and using decoys and firelight to stampede and catch the small deer, these traps used the same hunting technique as familiar from Central and West Asian contexts. The species hunted (Gazella bennettii and Antilope cervicapra) are also similar (Chahoud et al. 2015).

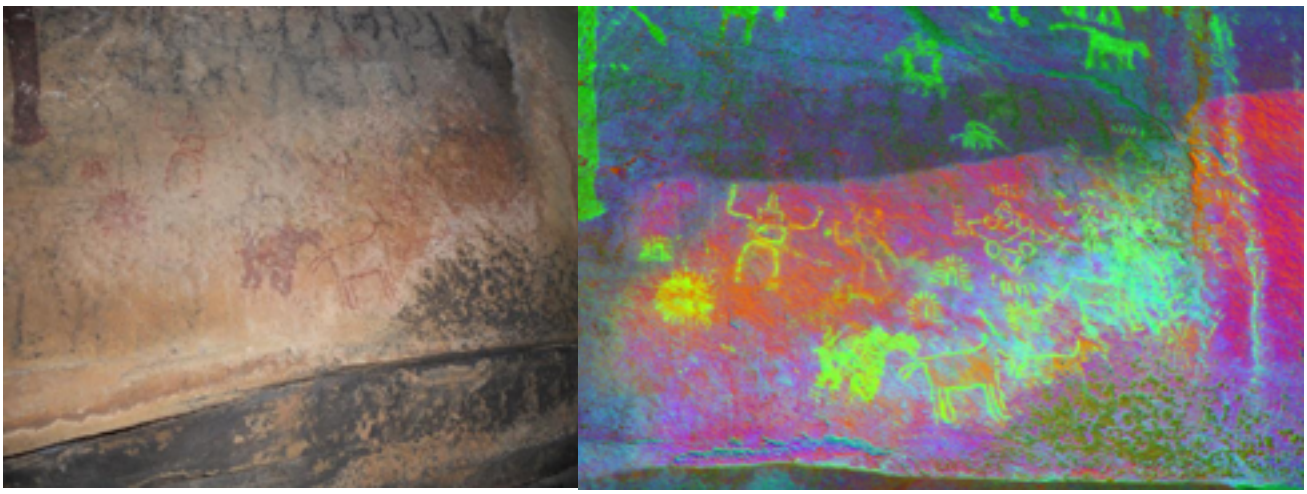


Fig. 8 a and b: Women stampeding blackbuck into an acacia thorn trap made at the exit of a V-shaped valley closed from the other side. Photos and aDStretch: Author.

The Likhaniya Dari panel (Figure 8) suggest spikey kites in an enclosed valley of the river Garai at the Likhaniya Dari rock art site. The kites were set during the night in the dry river bed, and the trap design and the "bogeys" described in Crooke's account seem to fit these drawings. The traps were made near the mouth of the valley leading to a culvert with still more rocky crevasses holding water where other paintings exist. We also note blotches of paint at the bottom left where the intended figures did not come up to expectations, probably owing to the level of cognitive development of (young) painters attempting imagery on raised surfaces of the shelter (Karim et al. 2016). Finally, this panel simulates the landscape around the narrow exit of the valley.

> "Again, a body of them, men, women, and children, go out into the prairie in search of game. When they have sighted a herd of antelope in the distance, they choose a favourable piece of ground and arrange their banwars, which are a series of many running nooses of raw hide tied together and fastened loosely to the ground by pegs; from the banwars, they rapidly make two lines of bogies by sticking bits of straw with black rags tied to them into the ground at distances of a foot or two apart. These lines widen away from the snares to enclose a V-shaped piece of ground with sides perhaps a mile in length, the unsuspecting herd of antelope being enclosed within the V at the pointed end of which are the snares. All this is arranged in a wonderfully short space of time, and when it is all ready, the main body of hunters, who have meanwhile gone round the herd of antelope and formed a line across the open mouth of the V, suddenly start up, and by unearthly yells drive the herd inwards towards the point. The first impulse of the antelopes is to rush directly away from their tormentors, but they soon come to the long lines of fluttering bits of rag, which forms one line of the V. They are thus directed into the place occupied by the snares. It is interesting as one of the methods by which an ignorant tribe with the simplest means can by their superior cunning circumvent the swift antelope on his native prairies." (Crooke 1896: 230).

A second and chronologically more recent case (Pratap 2016, Banerjee et al. 2021) at Wyndham Falls (WYN 4.2 site), represents a transition to the historical period, but apparently important to the rock art community's memory, is a unique panel of an inter-group fracas apparently between agriculturists and hunter-pastoralists (Figure 9). The attackers in this panel, of probably the historical period, outnumbering the defenders, are shown chastising a solitary hut-dwelling, with women and children inside, and some corn or millet suspended from the roof-pots while adult males and young adults of the family defend them by shooting arrows. The attacking party is supplied with spears, swords and shields while their leader wears a plumed head-dress denoting his status (Pratap and Kumar 2009).

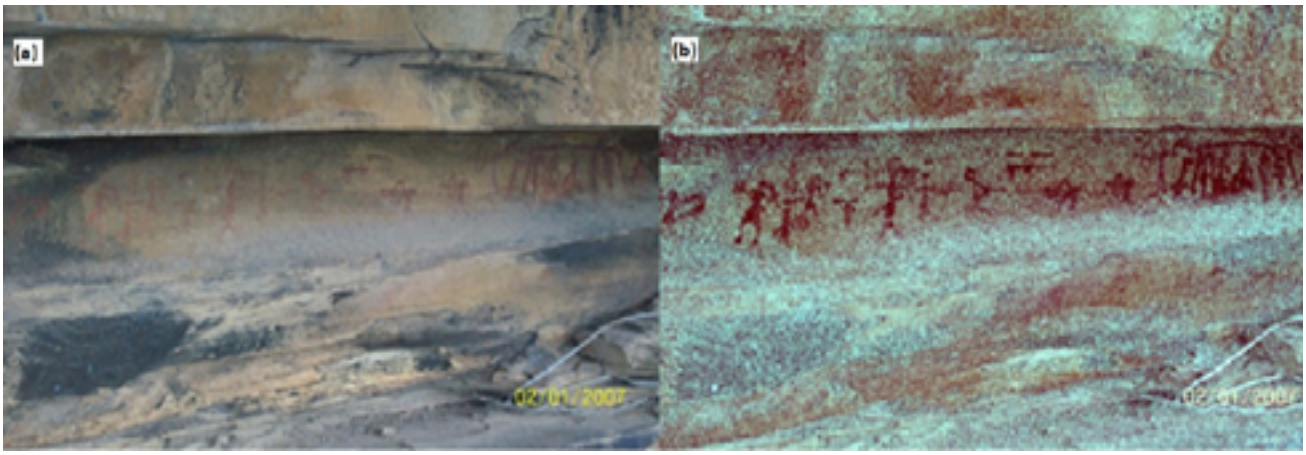


Fig. 9 a and b: Late Holocene anger and affront were recorded in a symbolic recreation of an armed raid on an indigenous camp at Wyndham Falls. The more numerous intruding groups on the left wields swords, shields, and spears. The hunter-pastoralists defend their women, children, and the elderly (inside the hut at the extreme right), some corn or millet suspended from its posts. The conflagration, and the arrow crossfire, is probably over this resource spot rich in fish, deer, goat and smaller land fauna, and possibly the harvest. Wyndham Falls have pastoral populations still residing inside the Barkachcha Forest Reserve as the Khajuri River that flows through it makes cattle-keeping easier. Cowherds, similarly, are found on a regular basis tending cattle at other rock art sites like Panchmukhi, Bhaldaria Dari, Sukhdar Dari, Kanda Kot, Likhaniya Dari, Chuna Dari, Lekhahia and Morhana Pahar, and notably at Mukkha Dari site with scenes of domestication. Photos and DStretch: Author.

Early to late historic and early medieval stelae and boulder inscriptions stand testimony to the transition from prehistoric low-intensity hunting and herding to more intensive resource exploitation by larger-scale farms, forts, and finances. It would seem from the plethora of stone-based iconic, sculptural and inscriptional occurrences, such as at Maukalan village in Southern Chandauli (Pratap and Singh 2020), that entire villages of sculptors, masons, stone-workers, adept at constructing public architectures such as temples, tanks and forts, but also adept at carving inscriptions and memorial stones with a host of designs and texts in Brahmi that prehistoric skill-sets in iconicity found new expressions in a new order of patron-client relationships with large farms and early state establishments. Literacy and public architecture were used to assert imperial authority and for defining the state's territory in wildernesses, and these appear to be the context within which literacy percolates downwards (Ramaswamy 1991, 2004). Nothing underlines the presence of the state and urbanism, and its impact on the original inhabitants of the area, than temples and sculptural traditions of Mauryan (Mahavira, Buddha, and Hindu Gods and Goddesses) and later periods. Villages like Maukalan in the proximity of the Vijaigarh fort were no doubt the early sculpting and stone-crafting villages of these times. However, the links of prehistoric symbolism and iconic crafts, and abilities, widespread in the region, with early historical arts and crafts, must be examined. Is an evolutionary link between them it likely?

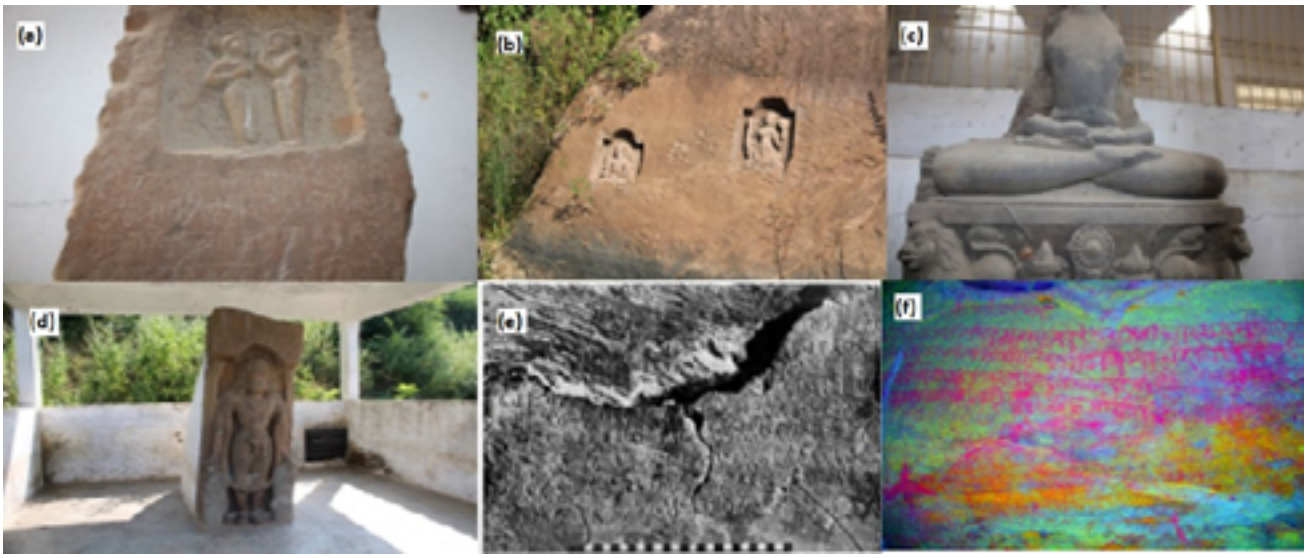


Fig. 10 a-f: Fig a and b Late historic (10-14th century CE) folk stelae and boulder inscriptions (with Hindu gods and goddesses) in the Brahmi script. Figs. c and d are statues of Mahavira and Vishnu at Maukalan village, South Chandauli, Fig e is Asoka's famous Minor Rock Edict-I, carved on the Bhandari Devi Hill at Ahraura (Image from URL: https://commons.wikimedia.org/wiki/File:Ahraura_inscription_of_Ashoka.jpg downloaded on 6-7-23), North Vindhyas, which is located along the *Uttarapatha* (the road of the north), an ancient trading route between Pataliputra, Varanasi and Sarnath. In the inscription, with sixteen copies around India, the king enjoins upon the people to follow the path of *dhamma*, and informs that he himself was on tour for 256 nights, to promote *dhamma*, after raising a memorial to the Buddha on a platform (at Sarnath). It appears Asoka himself, like the Buddha 300 years before him, walked this route to Varanasi, Sarnath and Kaushambi from Pataliputra. Fig. f is a lone 10th to 11th-century Malwa pilgrim's inscription written in rock art style with red ochre in Nagari script and corrupt Sanskrit on a surface with pre-existing rock paintings, inside the Lekhahia Pahar shelter (Pratap, 2016). The text, giving the approximate date of the inscription, invokes the gods for an auspicious visit to a nearby religious centre. Photos and DStretch: Author

There is further evidence for early urbanization at the fringes of the North Vindhyas by way of Mauryan establishments along the Ahraura-Varanasi highway, which is represented by fortifications at Magan Deewana, and the rock Inscriptions of Asoka at the Bhandari Devi Hill. Ahraura was an ancient clearing centre for goods brought from Malwa or acquired from Vindhyan forests to the Gangetic axis along this route from Pataliputra. That rock art symbolism from tens of thousands of years before the rise of urbanism could have inspired scripts for communication is likely, since both use symbols for linguistic expression (Sahoo 2014). Is it likely that the monks and hermits of all calling residing in stupas and other monastic establishments inside forests since early history were the ones who brought back some of this early symbology from rock art in the forests for designing scripts (Parshad and Kumar 2014, Tan and Taçon 2014)? In medieval times, the vast swathes of Vindhyan scarps, valleys and foothills appear settled predominantly by cattle keepers and there are records of big zamindars extracting rent from them (Drake-Brockman 1911: 261-262 or see below).

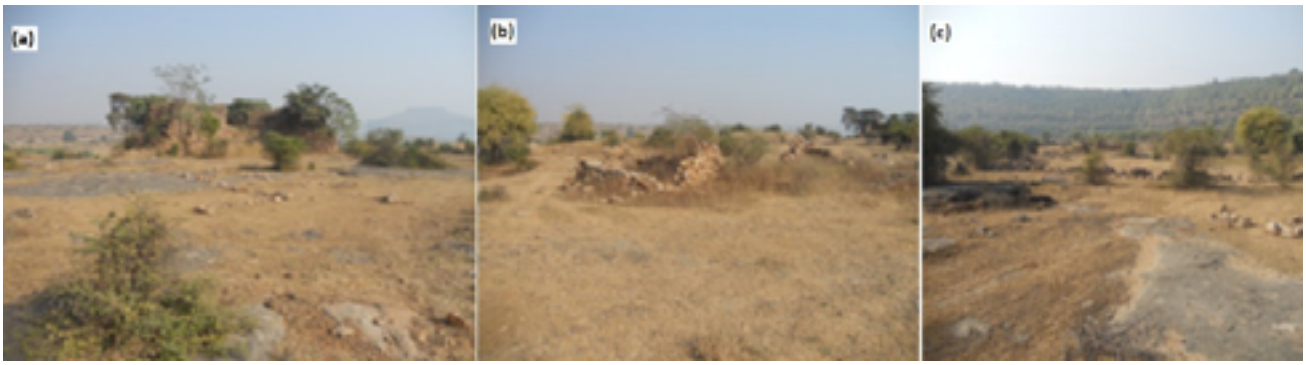


Fig. 11 a, b and c: Fig a The Latifpur Fort of Malik Farrukh, an 18th-century zamindar of the area. Fig. b A watchtower for guards of the fort. Fig. c A view of the hills and ruined fortification perimeter facing the Ahraura-Robertsganj route two kilometres from the Likhaniya and Chuna Dari rock art sites in Garai River Valley. Photos: Author.

Medieval soldiers, caparisoned elephants, arabian steed, hunting parties, flag marches, and heavy-duty armour of swords, spears and shields are depicted at Kandakot, Likhaniya Dari, Chuna Dari, and Lekhahia Pahar, in Mirzapur. These were soldiers of landowners with big farms living in various forts in the Vindhyan region, and are shown and remembered through such drawings. Elephant capture and bird trapping seemed very popular.

In this connection, the third historical thematic panel comes from two sites Likhaniya and Chuna Dari both separated by a kilometre in the same valley. Chuna Dari is upstream on the opposite side of Likhaniya Dari. While the panel at Likhaniya Dari (Figures 12a and b) depicts the coming of a hunting party of soldiers of Malik Farrukh, a local zamindar, the other related panel at Chuna Dari (Figure 12c) depicts their return with more elephants, elephant riders, foot-soldiers and a variety of other subalterns in attendance, elucidating medieval period *shikaars* and economic interactions. The existence of Malik Farrukh, the landlord of the area, and his establishment at the Latifpur Fort until the mid-18th while it is recorded in formal history (Drake-Brockman 1911) is also symbolized in rock art.

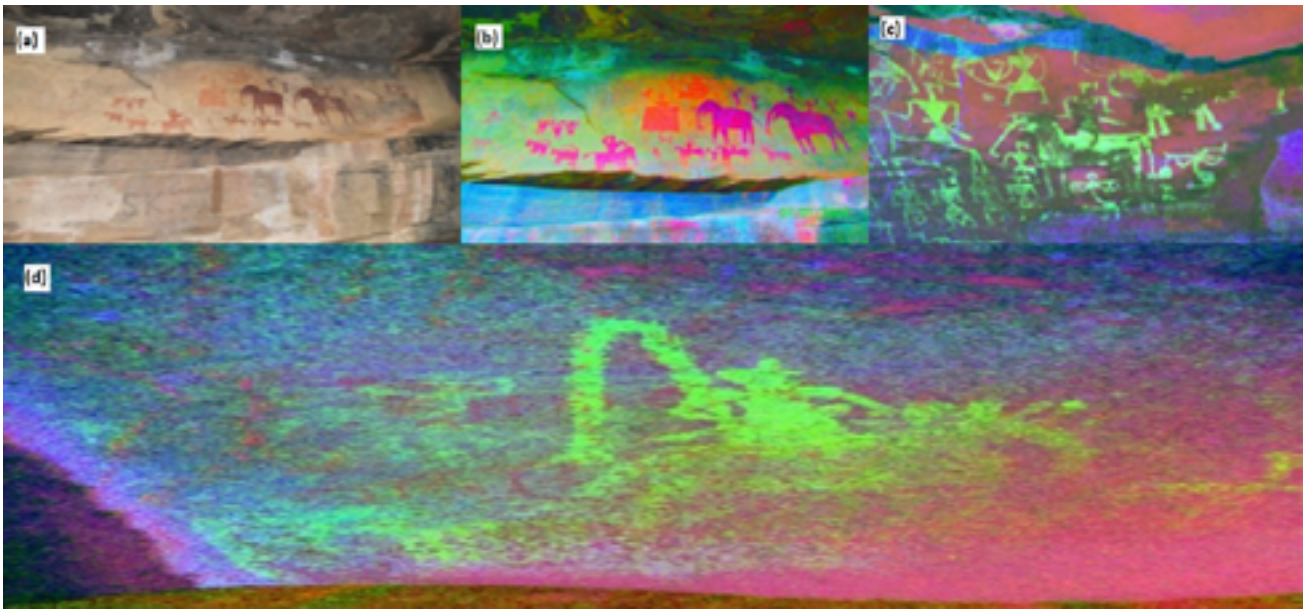


Fig. 12 a-d: Medieval Narratives Fig. a and b are depictions of a royal hunt at the Likhaniya Dari Shelter. Fig. c is the depiction of the return of the same entourage painted upstream a kilometre away in the Chuna Dari Cave on the opposite bank of the Garai River. Fig. d is a drawing probably of the local Zamindar Malik Farrukh found at an aquifer near Latifpur Fort in the watershed area of river Garai downstream from Likhaniya Dari. Fig. e is a depiction of another royal hunt on Mirzapur-Rewa or the Deccan Highway at Morhana Pahar – CAR 10 Shelter, Lalganj. Photos and DStretch: Author.

Medieval soldiers, caparisoned elephants, Arabian steed, hunting parties, flag-marches, heavy-duty armoury of swords, spears and shields are depicted at Kandakot, Likhaniya Dari, Chuna Dari, and Lekhahia Pahar, Mirzapur. These were soldiers of landowners with big farms living in various forts in the Vindhyan regions and are shown and remembered through drawings. Elephant capture and bird trapping seems very popular for supplying them to urban clientele.

> "Ahraura is said to have been originally inhabited by Kols, who dwelt in the jungles and subsisted on the proceeds of the chase. But in the Ain-i-Akbari the pargana is called Ahirwara and is said to have been so called after the Ahirs who were the original zamindars. Ahirs are still numerous in the neighbourhoods of Sukrit and it appears probable that they were the people who were overcome by Malik Farrukh, though Kols no doubt abounded in the hilly portions of the pargana to the south. How or when Malik Farrukh came to the pargana is not known; but he is said to have advanced money to the zamindars and, when they became involved, to have usurped their proprietary rights. Malik Farrukh built the forts at Ahraura and Latifpur for the protection of his treasure, and died in 1752, after a life spent in continual hostility with the resident population. He was famed for his riches; but as the pargana is said to have at this time largely consisted of jungle these riches could not have been derived from the produce of the soil and must have been accumulated from the proceeds of the traffic who passed through his domain from the Deccan to the Ganges." (Drake-Brockman 1911: 261-262).

This historical anecdote from a colonial District Gazetteer corroborates a hunt by soldiers painted at the rock art sites near the Latifpur fort. It also seems to corroborate that the local Zamindar Malik Farrukh's fort existed in 1744 at Chhato, two kilometres from the Garai Valley and the elephants captured were probably obtained on his behalf. Drake-Brockman provides illumination on Malik Farrukh and the contemporary political economy in which hunters and pastoralists were confronted with fort-dwelling landlords but also presented with opportunities to trade deer and elephants with various parties on many trading routes (Pratap 2019, 2020).

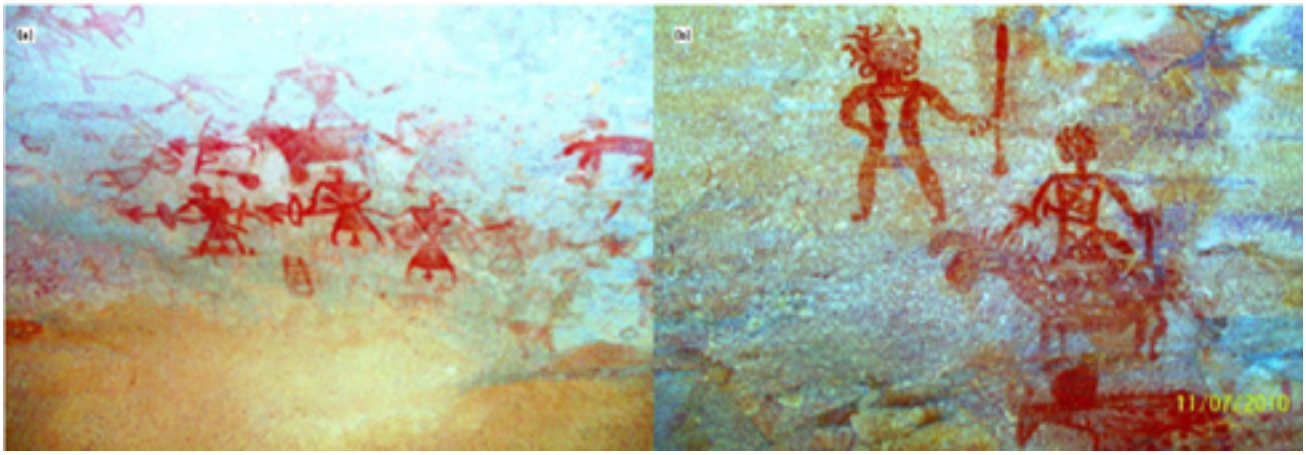


Fig. 13 a-b: Medieval Narratives: Royal hunts on Rewa or Deccan Highway (Morhana Pahar – CAR 10 Shelter). Photos and aDStretch: Author.

The material embellishments given (in Figure 12d) to the Zamindar's figure with a period head-dress of the elite, elephant riding, and a large sword tucked into a cummerbund suggests considerable authority. Several kilometres away, at the Morhana cluster, Medieval Narratives of soldiers marching past and on royal hunts on Rewa or Deccan Highway (Morhana Pahar – CAR 10 Shelter) are also available (Figure 13a). Thus, the rock art communities of the region were never probably so excluded as one might believe, nor was their symbolic expression immune to external stimuli. Finally, its efficacy and role in recording actual events seems to have been known and used.

Colonialism and rock art

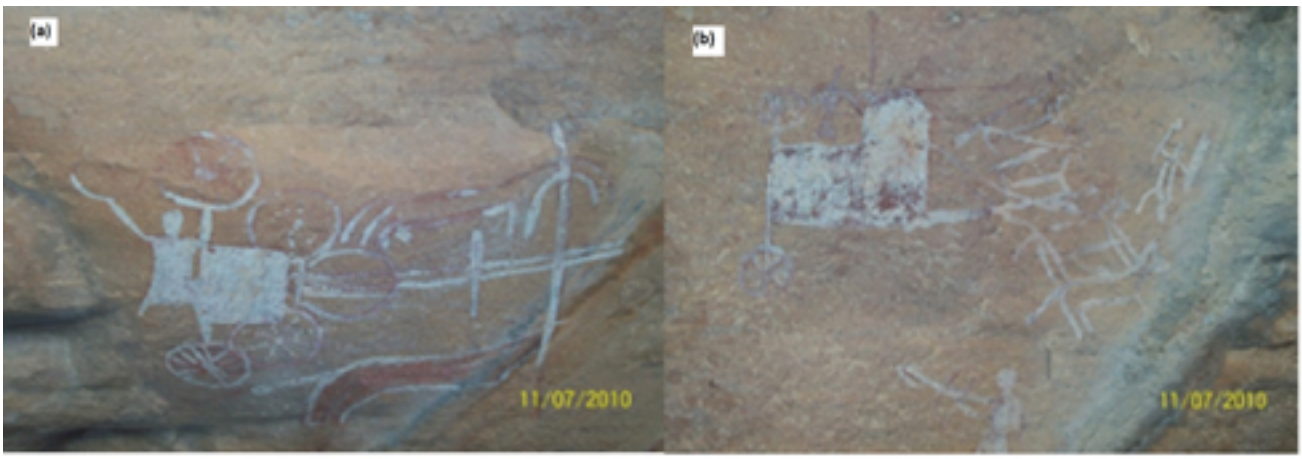


Fig. 14 a and b: Representations of 'protest' in colonial period rock art mainly from Morhana Pahar CAR-10 Shelter. Figs a, b are contiguous panels in which hold-up and looting of colonial horse carts and buggies by indigenes, have been shown. Several spoke-wheeled horse-cart drawings also occur in shelters here as if carts were seized and brought to the rock shelters at Morhana Pahar and were then drawn. Photos and aDstretch: Author.

Rock art as a medium of folk memory, history and narrative probably declined with the indigenous populations of Mirzapur and Sonbhadra dispossessed of their land or being absorbed in lowland economies as landless peasants, or being sent as indentured labourers to various "sugar colonies" of the British Empire (Ghosh 1999, Kumar 2017). Thus, rock art representations of native hold-ups and looting of horse carts, and buggys, presumably of British revenue and other district officers, also suggest rock paintings evolved further from medieval to modern times (Figures 11-13, and 14), in recording events significant for cultural memory. However, there are not many such paintings of the colonial period suggesting there was a swift relocation of the population resident in the rock shelters and a re-assigning of their tasks in the structures of the colonial economy. This goes to show how such narratives were construed both as memory and history and that symbolic continuity may provide material for tracing histories where literary records may not (Duner and Ahlberger 2019, Bray 2002, Coimbra 2019, Renfrew and Scarre 1998, Ruuska 2016). Painted narratives in rock art also coalesced and matured through historical, medieval, and modern times as intermedial forms of cultural expression (Ceciu 2021) at the frontiers of Mundari, Bhili, Gondi, Kolarian and the sanskritised worlds. A possibility exists that designs, narrative and iconic forms and structures may have been exchanged, with craftspersons, across the forest-rural-urban continuum.

CONCLUSION

"Things, then, become what the human mind and language makes of them e.g. images, percepts, concepts or mental tokens." (Malfouris and Renfrew 2010: 3). It would also be apposite to quote the historian Sahid Amin who suggests, "History writing requires evidence for its articulation. This evidence is largely expressed in language, either written or oral. The bits of evidence that we historians normally deploy in our narratives are a part of larger linguistic statements which constitute a discourse. A discourse provides a framework for inclusion or exclusion of representation, enumeration, and enunciation" (Amin 1994: 7). Amin's view on what constitutes historical evidence seems to favour the seeing of rock art repertoires of the country as linguistic statements in a pictorial form which are both evidence and a discourse constitutive of historical sensibilities preceding the development of writing.

In this paper, based on a study of Vindhyan rock art, we argued that since narratives are germane to historicizing, symbolic representation of historical events, through rock paintings, was already an established pre-literate practice, a folk tradition of historicising starting well before the origin of the Brahmi script and subsequent historical writing resulting from it.. It remains therefore to ask if rock art is basically an overlooked, even excluded, folk narrative tradition in which generally all historical periods traversed by rock art communities have been remembered in some fashion. Was this a method perhaps better than orally transmitting collective memory through mythology and folklore alone? This deduction, in our view, is probably correct, since figures executed in ferric paints, more generally preferred, were not erasable and hence became the preferred medium for storing narratives considered re-tellable, worthwhile, and exemplary. Can truly prehistoric paintings also be considered narratively charged in this 'historical' sense of captured memory? Can rock art be judged prehistoric, historical, medieval or modern through the contemporaneity of the artefacts depicted, which can be externally corroborated?

In Vindhyan rock art, human figures, animals (wild and domestic), and 'typical' material culture representations certainly increase from the Mesolithic to the modern period. From wooden spears to horse buggies, from bows and arrows to Arabian horses, and bullock carts, the complexity of material culture representations shows a progressively self-aware and cognitively accomplished representational activity geared towards facticity that we do not usually grant. In the Vindhyan context can we interpret such nuances in rock art as constituting the rise of indigenous sensibilities answering to the rise of urbanism in and around the Vindhyas with whom they maintained trade and exchange? Did upland paintings become factish as a response to literary and scripted memory practices current elsewhere? But clearly, from the archaeological to historical, and medieval to colonial contexts, rock was primarily a teaching-learning method for the young. It emphasized memory and memory-based design skills and techniques, that the elderly trained them in for future craft production.

The literature on children as craft producers and apprentices is extensive. The ability to conceive, plan and execute painted designs on ceramics is an indicator of levels of psychological development. Certain types of errors can be directly related to stages of cognitive development. Children of two age sets in craft communities usually 4 to 6 years and 9 to 12 years old were responsible for painting designs on ceramics (Crown 2001, Bagwell 2002, Finlay 1997, Kamp 2001, Greenfield 2000). Using this as a parallel to explain design and pattern drawings made by children at our sites is therefore tempting. Gender and age can be both approximately detected based on the widths of finger-flutings of children who make rock art (Nowell 2015a and b, Nowell and Gelder 2020). However, the central

point remains that communities construct the childhoods of their offspring culturally in which rock art played an important role.

Secondly, rock painting and rock art generally do precede pottery, terracotta and other graphic arts and must therefore in some sense remain the products of original hominid visual and narrative capabilities connected with the storage of ideas on external media which could be used for a variety of craft practices in the same milieu (Audouze 2002, Malfouris and Renfrew 2010). More advanced constructs use features of the rock surface to simulate landscapes as a means of building time in the paintings. This is also the aim of implanting directionality in event depictions, while undulations and striations of the rock surface were used for simulating landforms and their use, at precise loci of action. The use of movement in paintings is an excellent narrative device conveying the painting community's sensibilities involved in particular types of events. This is also a technique used, together with identity-defining material culture depictions, for better narrativizing, a technique followed in sculpture and other three-dimensional arts of the area of the early historic period. There is therefore a continuity in the evolution skills, techniques and aesthetic sensibilities which are chronologically consistent with various historical.

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Imaging Ancient Images: Challenges in Analogous and Digital Documentation of Geoglyphs on Lateritic Plateaus of Konkan, India

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ABSTRACT

In a part of western India, rock art (of unknown age) was executed on horizontal lateritic surfaces depicting abstract, human and animal figures. This paper discusses methodological and interpretative challenges confronted during manual and digital documentation attempts at the select sites of Devache Gothane, Ukshi, Devohasol and Barsu. The need for a multidisciplinary approach is highlighted to address the questions - What type of documentation is required for a truthful or accurate representation of geoglyphs for further scientific investigation? And how to integrate ethical practices for knowledge exchange between local communities and academia during documentation processes?

Keywords: Geoglyphs, Konkan, Digital Documentation, Photogrammetry, Ethical Practices

INTRODUCTION

Geoglyphs of the Konkan are relatively recent discoveries. A staggering number of engravings have survived in erosional climatic conditions in the Western Ghat Plateau. Although a few carvings have been known since the 1990s, most of the known carvings were discovered in the last ten years or so by a local group of history and nature enthusiasts[1]. The Directorate of Archaeology and Museums of the Government of Maharashtra later supported and expanded the regional surveys. The first response to these discoveries was to create a manual record of their locations, forms and sizes, and in some cases, the record included photo documentation as well. However, as the subject gained wider attention, the need for accurate records arose for investigation, discussions and dissemination of the available information.

This paper reflects upon the preliminary attempts of digital documentation through photogrammetry for the archetypal carvings at Devache Gothane, Ukshi, Devi Hasol and Barsu (Figure 1). These preliminary attempts aim to derive a documentation methodology for obtaining a digital twin of consistent quality that can provide a foundation for archaeological investigation, condition mapping and heritage management strategies. The paper also attempts to address the standard documentation approach necessary for assessing cultural heritage as outlined by international organisations (De la Torre 2002). Along with that, the paper discusses the challenges in achieving this aim and deliberates upon the need for ethical knowledge exchange practices.

Geoglyphs of Konkan

Petroglyphs are impressions created by removing part of a rock surface by incising, picking, carving, or abrading (also called bruising and etching). As an important form of rock art, it forms a base for later art traditions. Globally speaking, petroglyphs are spread across all continents and have a large time-span from the Palaeolithic to the Medieval periods. In terms of size, many of them are the largest expressions of human creative art, usually called geoglyphs. The Indian Subcontinent has diverse evidence of rock art in the form of paintings and engravings in rock shelters, caves, open boulders and other rocks. On the lines of its global counterpart, rock art in India is spread from the Palaeolithic to the Colonial period in time and is found from Ladakh in the north to the southern Indian peninsula in the south.

Thus far, evidence of rock art from the coastal areas of India was scanty, as only a few sites from Goa were reported.

Konkan, also known as ‘Aparanta’ in the Historical period (Jogalekar 1996), is the western coastline of India extending in a north-south orientation over 720 km. It is a narrow coastal strip of land between the Arabian Sea to the west and the mountain ranges of the Western Ghats to the east. Geographically this region is traversed by seasonal rivers that drain the heavy monsoonal runoff from the crest of the Western Ghats.

Topographically the terrain is a result of extensive physical and chemical weathering of Deccan Trap continental flood basalt, which erupted about 65 million years ago (Duncan and Pyle 1988). The timings of lateralisation of basalt in the area date back to the Early-Tertiary (high-level laterite) and mid-Tertiary ages (low-level Konkan laterite) (Fox 1923; Widdowson and Cox 1996). Geoglyphs reported from the Konkan region are primarily associated with the low-level Konkan laterite.

1 Nisargyatri Sanstha is a Ratnagiri based organisation involved in discovery of geoglyphs in initial stage.



Fig. 1 Location of the Konkan region along the western coast of India (inset) and location of select sites in the Ratnagiri region of the Konkan. The total number of sites discovered till today are at least 1642 engravings at 140 sites in 91 villages. ***Source:*** P Sukumaran, November 2022

The region has a long history of human habitation reflected in the archaeological and historical record in the form of port towns participating in international trade, rock-cut caves, forts, and colonies of foreign powers - factories, castles, and towns. The evidence of prehistoric[2] human habitation in the Konkan is relatively limited (Todd 1932; Marathe 2005; Sankalia 1974). However, there is continuous evidence of human settlement/s throughout the Historical, Mediaeval and modern periods. The recent discovery of rock art sites from Ratnagiri and Sindhudurg Districts of Maharashtra has created curiosity among the scholarly community and public in general across the globe, as these discoveries were highlighted by international electronic and print media. However, methodical documentation remains a major challenge due to issues related to accessibility, the nature of engravings, and the lack of a scientific approach to documentation.

2 While Palaeolithic evidence in the Konkan zone is not as abundant as in other parts of India, the regional microlithic evidence is comparatively more widespread. Currently, we have no precise knowledge how far back in time these laterite engravings extend and whether they temporally encroach any prehistoric phase(s) at all (e.g. Upper Palaeolithic, Mesolithic, Neolithic). Nonetheless, there is an increasing discourse regarding aversion to the use of the term 'prehistory' due to its origin and association with colonisation in the mid-nineteenth century. The history of prehistory is related to the colonialist process where archaeology was used to promote a certain picture of the past in colonised places (Moro-Abadía 2006). In this paper, the terms prehistory or prehistoric are used to indicate the global period from 3.3 million years ago (beginning of Lower Palaeolithic) to 5000 BCE (end of the Neolithic), during which there was no presence or knowledge of writing. Therefore, this period is generally studied through other evidences including tools made from stone and other materials such as wood, bone and antler, art work, handmade pottery, fossils of various fauna including hominin species and other physical aspects found at such palaeoanthropological sites.

Most of the findings in the region are in the belt that is approximately 220 km in length along the coast and 25 km in width from the coastline. All the engravings are on the horizontal ground surfaces of lateritic plateaus. No such engravings have yet been found on vertical surfaces, in caves or valleys around the plateaus. The total number of sites discovered and reported till today is at least 1642 engravings at 140 sites in 91 villages[3]. A comprehensive survey is yet to be initiated to verify the informally discovered sites.

The dating of these sites remained problematic due to the absence of associated and diagnostic archaeological material as well as the lack of stratified contexts. Therefore, various scholars have casually assigned different dates and periods to these carvings. Gogate and Pradhan (2008) did not mention any date in the absence of culturally associated material. Rane-Kothare (2013) situated these carvings in the Early Historic period, while Dalvi (1990), Ghanekar (1995), and Lalit (2021) respectively assigned them to the Neolithic/prehistoric period. Lad (2018) compared these motifs to those of the Indus Valley Civilisation and thus interpreted them to belong to the protohistoric period.

Categorisation of Geoglyphs

The presently known engravings are of varied sizes and styles. They can be broadly and provisionally categorised by considering three attributes – engraving style, depiction style and the subject. Although the details of the engraving techniques are not yet known, clear variation can be observed in the depths of the engravings. The range of shallow engravings is between 1.5 to 7 centimetres, and of the deeper engravings is 8 to 25 centimetres or more. However, this understanding of the depth is based on observations as per the present site conditions and currently available data. The presently available research does not inform about the loss of the laterite surface due to erosion over the millennia or centuries. The sub-categories of the engraving style are – direct etching and relief etching. At sites such as Ukshi, the elephant is depicted by directly engraving a continuous line on the surface (Figures 8 and 9D). At sites such as Rundhye, the area around the subject is carved, and the pattern emerges through uncarved surface or through varied relief (Figure 2).



Fig. 2 Abstract engraving at Rundhye. The pattern emerges through the uncarved surface of the laterite. ***Source:*** M Mane, December 2021.

3 As per personal communication with Sudhir Risbud from Nisargayatri Sanstha, Ratnagiri, 2021.

The style of depiction can be sub-categorised into three types: realistic, stylised and abstract. Most faunal depictions are realistic, and in many cases, even the species are identifiable e. g., engravings at Kasheli. The human figures and a few selected animal species are also depicted as highly stylised, e.g. Barsu (Figure 3) and Devache Gothane (Figure 9D). Examples of abstract or geometric forms are also found at many plateaus, e.g. Nivali, Devihasol, and Rundhye.



Fig. 3 Stylised human figure at Barsu with negative engraving. ***Source:*** M Mane, December 2022.

The third attribute - the subject of the engravings - can be subcategorised into animal figures, marine creatures, human figures and abstract/geometric patterns. Thus far, any depictions of cultural markers, such as huts, buildings, utensils, weapons, ornaments etc., are either undiscovered or not interpreted as such. Various combinations of the aforementioned categories can also be observed at various sites. Some sites consist of all these categories in proximity to each other, and in rare cases different categories overlap each other through superimposition, e.g., the abstract square pattern at Rundhye partially overlaps with the single-line direct engravings of marine creatures. In such cases, the preliminary assessment is that the more shallow engraving is older, and the deeper engravings would be younger. Distinguishing older and younger engravings when they overlap is relatively straightforward based on depth variation and how one dissects the other, unless the engraved depths of both are relatively equal. In the future, with advanced recording techniques and interpretation methods, the overlapping engravings can provide insights into the relative chronology of engraving techniques, various subjects, styles and general temporal sequences of land use.

Threats to the Sites

The engravings are situated on the lateritic plateaus approximately between the altitude of 75 m to 200 m. In the regional Marathi language, these plateaus are called '*sada*', broadly translated as open rocky land at the mountaintop. Traditionally, *sadas* are not used as habitational space and the settlements and hamlets are primarily situated in the valleys and on the slopes of *sadas*. The ecology of lateritic plateaus is an independent subject of research. However, it is to be noted that vegetation type on these plateaus mainly consists of various shrubs, grasses and creepers[4]. Due to the natural setting in which the engravings are located, they face the impact of wind, water and seasonal temperature fluctuations. With this background, the primary threats due to natural elements are as follows.

4 As per personal conversation with Dr Aparna Watve (Botanist and Ecologist) during exploration of the sada where Barsu, Devache Gothane engravings are situated.

- **Physical damage to the carvings due to the natural cycle of vegetation growth and decay**: The roots and rootlets of grasses and creepers grow through the porous lateritic stone and damage the laterite surfaces in the process.
- **Weathering and erosion due to the impact of wind and water**: Carvings are situated at an altitude where they are directly exposed to the monsoon rains which are generally heavy along the entire western coast of India.
- **Ageing of the laterite**: The ageing process of the laterite and associated geomorphological weathering patterns are yet to be fully understood. The rock consists of high iron content, which oxidises with exposure to the elements (Fox 1923; Widdowson and Cox 1996). This oxidation appears to make the laterite stronger over time. For example, freshly extracted stone blocks in nearby commercial quarries are comparatively softer than the older oxidised blocks (Figures 12 and 13). Hence, how the ageing of laterite affects the carvings requires further investigation through periodic documentation and scientific analysis. During monsoon rains, eroded soil and gravel get deposited in the carved grooves of the geoglyphs. Hence, exposure of the carved surfaces is lesser than the uncarved surface. Due to the difference in exposure period, the ageing and oxidation rate must be different for the carved and uncarved surfaces. However, the natural elements are relatively lesser threats than the modern anthropogenic factors.

The threats due to human actions are inclusive of, but not limited to the extensive plantations for agriculture and horticulture, laterite mining, industrial development, building construction, road construction and expansion, rituals conducted during religious festivals, excessive footfall in the absence of any visitors' management policies, etc. Especially laterite mining is a thriving enterprise in the Konkan region as the plateaus are the prime location for extracting stone blocks. For example, the engravings at Deood and Chave are within only 100 meters of the ongoing mining activities (Figure 4).

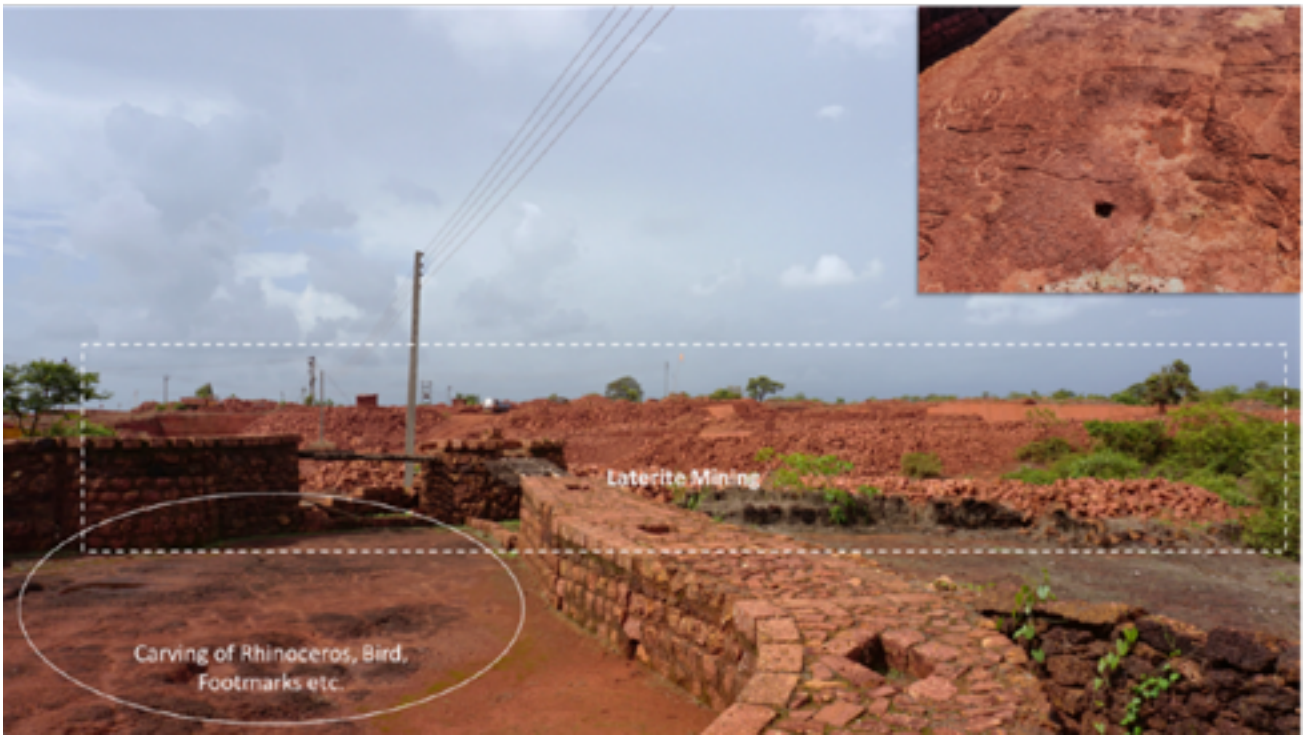


Fig. 4 Engraving of rhinoceros, bird, deer, human footprint and other miscellaneous engravings at Deood. The site is situated within 100 meters of mining activity. ***Source:*** M Mane, 16 June 2022.



Fig. 5 The abstract pattern at Nivali is one of the sites known since the 20th century and it was discovered during road construction. The engraving already appears to be heavily eroded and partially lost to road expansion project. ***Source:*** M Mane, 16 June 2022

The depiction of single-horned rhinoceros is a scientifically significant engraving. The depiction is of realistic style which indicates that the engraving is probably from the period when rhinoceroses existed in the region. Even though the general evidence of the presence of rhinoceros in South Asia extends to Historical periods, there are many unknown facts about their population dynamics and environmental stresses which led to their subsequent extinction (Shebbeare 1953; Jukar et al. 2021). In absence of preserved fossils of such fauna in a basalt and laterite terrain, archaeological depictions of realistic animal figures are one of the primary sources of information for us to decipher the past faunal community from this region. Unfortunately, carvings at Nivali (Figure 5) and Devihasol are already partially lost due to road expansion activities.

Need for Urgent Documentation

In the Konkan, anthropogenic impact is the primary factor of destruction of archaeological heritage and the geomorphological impact is the secondary factor of destruction. A comprehensive database is needed before carvings are permanently lost due to these factors. Even in case of losses, the record and, wherever possible, a digital rendering can serve as a long-term reference and research archive. The database will allow meaningful comparisons and interpretations from scientific and anthropological perspectives. It can be further used for community archaeology and anthropology, educational and training programs for various age groups, stakeholders and professionals. The database can play a crucial role in creating awareness among stakeholders, landowners, and other relevant authorities and, most notably, in community involvement in site management and conservation strategies.

In reference to the above discussion, urgent documentation is needed for the geoglyphs of Konkan. Documentation tools and methodologies need to be thoughtfully considered as they provide additional insight into assessing values. They inform understanding of the evolution of and use of objects and places, identify original elements and materials, help interpret artists'/creators' "original intent," and relate changes to intrinsic factors (design, material composition, and so on) and to extrinsic factors

(environment, human intervention or lack thereof, and so on) (De la Torre 2002). Article 4 of the ICOMOS Charter for Protection and Management of Archaeological Heritage also delineates database creation as an essential working tool for scientific study, research, and developing protection and management strategies (ICOMOS 2011).

Principles of Documentation

The documentation of the geoglyphs should be based on the principles of archaeological investigation and heritage conservation. Systematic and comprehensive documentation enables better analysis and interpretation of the historical and archaeological resources and sheds light on the processes of development and decay. A poorly understood resource cannot be conserved, protected, or managed effectively (Adams 2016).

Geo-Archaeological Investigation

The priority level should be defined for archaeological and geological investigation at the planning stage. The documentation should capture the physical quality of the engraving, natural visual clarity, type and texture of rock, spatial parameters, elevation, slope and climatic parameters. Most importantly, the methods should be non-intrusive. Minimal cleaning of the site should be undertaken for the purpose of documentation. It is advisable to collect relevant data on the natural state of the engraving at the time of its discovery.

In order to capture the accurate colours and texture of the surface, trial documentation should be conducted in different light conditions, and then an appropriate time of day for documentation should be chosen based on level of the likeness of the outcome. A similar principle should be followed for selecting the angle and height from which data is collected; the depth, width and spread of the engravings should dictate these parameters. Also, it is necessary to document the engravings during different seasons to understand the annual cycle of the changes in vegetation growth, temperature, exposure values and seasonal colour changes, if any.

Documentation for geo-archaeological investigation should be inclusive of but not limited to the attributes such as size, subject matter, orientation in reference to the north, level of richness, site versus site cluster, amount of sediment, vegetation, presence of artefacts, proximity to human activities, natural impacts such as trampling and natural resources such as streams, etc. It will also be instructive and fruitful in the long run to also document and analyse ‘ambiguous’ carvings on the landscape to distinguish between natural weathering patterns and eroded or faded engravings which may be significantly older than the ones currently known.

Documentation for Conservation

From the conservation perspective, the foremost principle of documentation is to record as per the existing conditions with precision (Letellier et al. 2015). The cultural sites are documented along with the context in which they are situated. The principle of ‘whole to parts’ is followed as a rule of thumb in order to avoid gaps and inconsistencies in the data collection. The emphasis being on precision and accuracy. It is highly recommended to notify the margin of error in the data collected and the processed outcome. All the signs of the original creation and evolution over the period of existence should be documented. Equal weightage should be given to all the archaeological periods without any biases. It is advised in the published charters and guidelines on the subject of documentation to identify the main

areas in which understanding or information is lacking (*ICOMOS* 1996; *ICOMOS* 2011; Drury 2008; Letellier et al. 2015). Periodic updating of the records is also recommended for general evaluation and enhancement of preservation strategies. The documentation should highlight the potential threats in the current situation, in the near future and in the long term.

Techniques of Documentation

Numerous analogous and digital methods and tools are available for the documentation of geoglyphs. Written descriptions, proportionate sketches based on visual observations and hand-drawn measured drawings are being created by the discoverers, researchers and students of geography, environmental studies and history. The analogous documentation of select sites is available with local organisations and not yet widely published for consumption by the research fraternity. Digital methods such as photography and videography are increasingly used for many accessible and most visited sites, for example, Devihasol, Deood, Ukshi etc. GIS mapping and drone mapping were initiated in 2018 for 17 selected sites by the Tourism Department of Maharashtra in with Directorate of Archaeology and Museums of the State government[5]. The authors of this paper and the associated institutions have been exploring the possibility of using advanced digital techniques - photogrammetry and 3D LiDAR Scanning since 2021. The aim is to integrate the 3D models derived from the digital tools with GIS for further geospatial analysis. Such technical documentation will enable us to create a virtual platform with realistic and natural 'feel' of the geoglyphs.



Fig. 6 Manual documentation of shallow human figure of approximately 1.5 cm depth at Devache Gothane by the students of M Sc Ecology, Society and Sustainable development MIT WPU, Kothrud in Pune under the guidance of Dr Aparna Watve and Mrudula Mane. Care was taken to wear appropriate footwear that will not have any abrasive effect on the engraved surface. ***Source:*** Photo by M Mane, 26 December 2021

5 The survey was undertaken by Tejaswini Aphale Associates, Pune on behalf of the Tourism Department and the Directorate. The drone mapping outcome of this survey helped understand the potential and limitation of the technique for documentation of the engravings.



Fig. 7 Measuring the depth of engraving at Ukshi with a contour gauge replicator made of plastic. Metal instruments are not used to avoid abrasion to the engravings ***Source:*** Photo by M Mane, May 2022.



Fig. 8 Location of the point where the contour gauge replicator was positioned in Fig 7. The depth should be measured at periodic intervals, and the point at which the depth is measured should be mapped to understand the variations. ***Source:*** Photo by M Mane, May 2022.

Examples of Photogrammetric Documentation

Photogrammetric documentation has been conducted for the engravings at Devache Gothane, Ukshi, Devihasol and Barsu (Figure 9). As mentioned in previous sections, these documentation trials are conducted to derive a methodology for obtaining a digital replica of consistent quality. The engravings at all four sites are of different categories regarding the depth of engraving, style and subject. It is also to be noted that they are situated on different lateritic plateaus and hence, have different densities/ porosities of the lateritic surface. The plateau of Devachhe Gothane is also known for the phenomenon of magnetic deflection[6] and some carvings may have been made in specific locations in relation to that knowledge in the past; this possibility is still being investigated by us.

6 The magnetic compass does not show the north direction at this site. Nisargyatri team had experimented with keeping multiple compasses simultaneously at the same spot. All the compasses indicated different directions. The phenomenon needs further scientific documentation and investigation.



Fig. 9 Orthoimages (of different scales) extracted from the 3D photogrammetric model processed in Agisoft Metashape. (A) Human figure at Devache Gothane. (B) Abstract Square at Devihasol (C) Stylised human figure at Barsu (D) Elephant at Ukshi. ***Source:*** Data captured and processed by M Mane.

	Site	Engraving Size LxB	Average Depth	No of photos processed	No of points generated	Quality of dens cloud
A	Devache Gothane	2.7m x 1.3m	2 cm	94	49,482,696	Medium
B	Devihasol	7 m x 8 m	6 to 10 cm	749	61,736,777	High
C	Barsu	4 m x 3.6 m	3 cm	178	99,403,099	Ultra High
D	Ukshi	5.2 m x 6.7 m	5 cm	349	37,937,865	Medium

Table 1 Information about the site and the photogrammetric data

The stone surface of Devache Gothane is visibly different from the other three sites. It is also one of the shallowest engravings, with depths varying between only 1.5 to 2.0 cm. The carving at Ukshi is 5 to 6 cm deep. It was observed that the depth and profile of the engraving remained consistent. The average width is 6 to 7 cm, varying at corners and turns. Devihasol is one of the deepest engravings known thus far: at the edges of the abstract square pattern, it is more than 10 cm deep. The stylised human figure at Barsu is similar to Devache Gothane in terms of depth. However, the one at Devache Gothane is a relief engraving, and Barsu is a combination of direct and relief engraving. The spatial spread of all the sites also differs. Hence, the number of photos taken for each site is also different.

Table 1 provides comparative information about data collection and processing at the concerned sites. Photos were taken in direct sunlight at all sites between 11:00 am and 2:00 pm. The afternoon time offers minimum shadows and contrast. Photographs were taken from close range in five sets looking downwards (perpendicular to the laterite surface), at approximately 45° from four directions, to capture the depth of the engraving.

Devache Gothane and Barsu were documented during the winter season, while Devihasol and Ukshi were documented in the summer. Any special cleaning activity was not undertaken for the purpose of documentation. However, the local organisation conducts annual cleaning after monsoon season to improve visibility for tourists. The Devihasol engraving is associated with the temple of Arya Durga and is regularly visited by devotees. Due to this, it is maintained by the temple trust, and therefore heavy vegetation growth is never observed at this site.

Limitations and Challenges in Documentation

Data Collection

The primary challenge in initiating the documentation process of geoglyphs is locating and accessing the site. The plateau undergoes physical changes through three seasonal phases annually – wet surfaces with moss, creepers and grass in monsoon; dry but overgrown grass in winter and dead or burnt vegetation on arid surfaces in summer. The sites portray different visual appearances in all three seasons and hence, locating them without the support of accurate GPS data is a challenge.

The first two weeks of the monsoon season (usually June) are ideal for locating and basic photographic documentation of the sites. The vegetation growth is not too heavy; the accumulated soil is naturally washed away with surface runoff; hence manual cleaning is not required, and reflectance due to slight water accumulation improves the visibility of the engravings (Figures 10 and 11). However, data can not be collected for the purpose of digital documentation during the monsoon season. Digital techniques are not effective for reflective surfaces and also, such data can give a false impression of the actual depths.

The engravings are often found in clusters situated across the plateaus. Hence, it is challenging to define the geographic and spatial extent of individual engravings and identify site boundaries for comprehensive documentation. This may indirectly affect the interpretation if the sites are not spatially compared in reference to each other.

Seasonal variations, vegetation growth, and soil accumulation are some of the other hindrances to collecting data and generating models of consistent quality. On the one hand, soil accumulation can

give a misleading impression of the depth of the engraving, and on the other hand, manual cleaning of the site can contribute to edge damage on the engravings.



Fig. 10 Engraving from the neighbouring cluster at Pochari. This particular engraving was not spotted during summer. It was spotted due to accumulated water. **Source:** Photo by M Mane, 24 June 2022



Fig. 11 Increased visibility of the engraving at Ukshi due to water accumulation. ***Source:*** Photo by M Mane, 24 June 2022



Fig. 12 Texture, density and colour of the laterite surface at Ukshi for 2.5 sq. cm. ***Source:*** Photo by M Mane, 24 May 2022

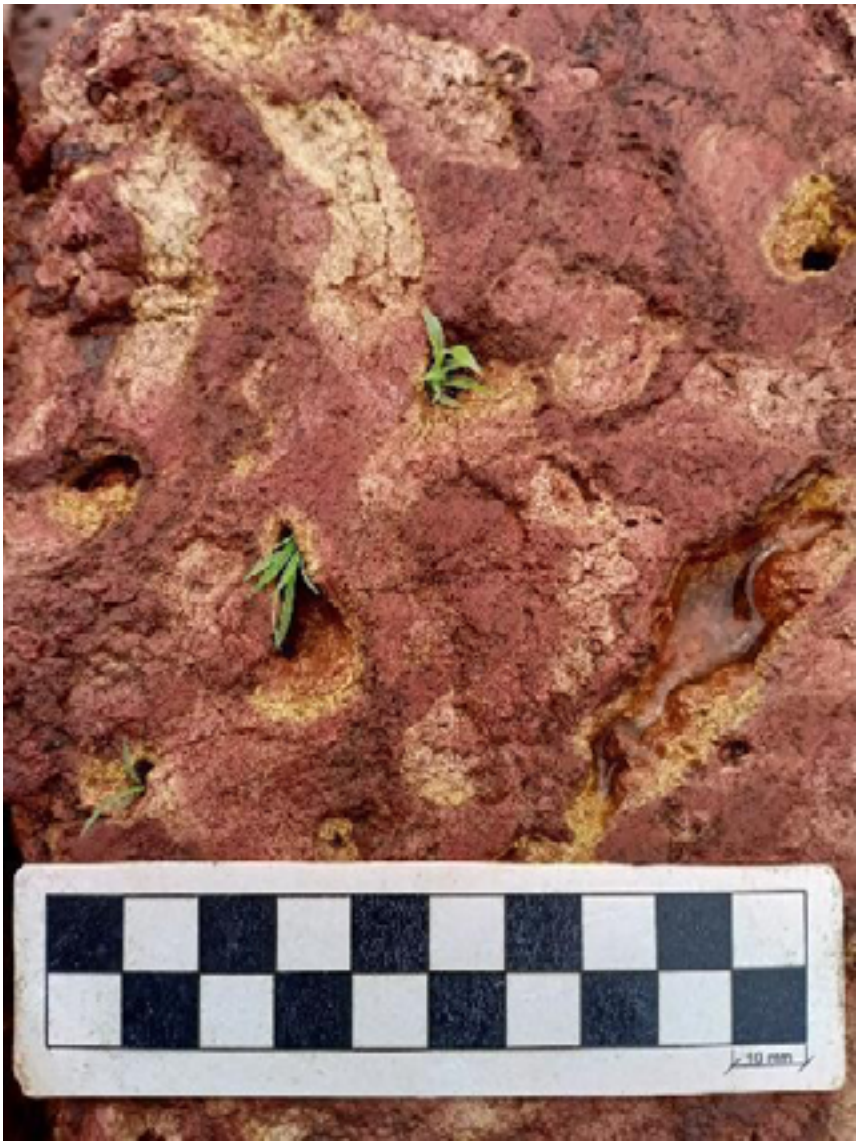


Fig. 13 Surface of newly excavated laterite block from the Ukshi region.

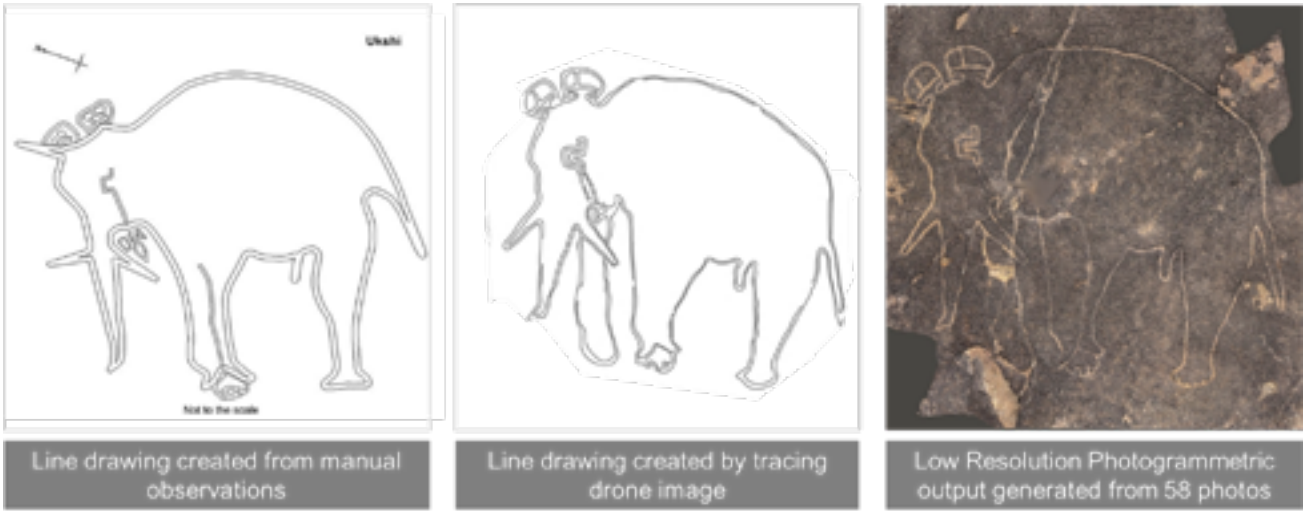


Fig. 14 Comparison of three documentation methods. ***Source:*** Manual drawing by Nisargyatri Sanstha (2017), Drawing traced from drone image by the Directorate of Archaeology and Museums (2019); Photogrammetric output by M Mane (2022)

Data Processing

The foremost challenge faced in processing the photogrammetric model was due to the texture of the lateritic surface. Laterite is a highly porous rock (Figure 12); hence the surface area is substantially more than any other rock, such as sandstone or granite. During the photogrammetric process, the porosity leads to the generation of dense point cloud data with gaps or missing information. This also causes issues in navigating through the 3D model. The model size becomes unmanageable despite the small size of the engraving and high-configuration computer system. This issue may partially affect capturing the true colour of the surface. It is to be noted that in the case of laterite, colour indicates the level of oxidation and strength. Hence, the accuracy in interpretation may get hampered due to this processing limitation.

Another challenge is that if an ultra-high-quality model is not generated, it is difficult to distinguish between the lines formed due to natural erosion and human creations. This is a peculiar problem for heavily weathered sites such as Niwali. The drawing traced from a drone image for Ukshi exemplifies the confusion between natural and human lines (Figure 14).

Knowledge Exchange and Ethical Practices

Acknowledging local knowledge

With the transition from analogous to digital documentation methods, it is essential to redefine knowledge exchange practices. ICCROM's guidance note on people-centred approaches to the conservation of cultural heritage highlights the importance of strengthening the ability of communities connected to the heritage to participate meaningfully in the decision-making processes of its conservation and management (Court and Wijesuriya 2015). In the case of the Konkan geoglyphs, community involvement is generally visible from the stage of site identification and documentation. The majority of the sites are discovered by the locals through their inherent understanding of the terrain, oral history and observation skills. The locals initiated safeguarding and manual documentation of selected sites with support from *grampanchayat* (village administration), state department of archaeology and various subject experts associated with the region. The local communities that are already involved

may be able to address the question of documenting numerous sites, quickly, with least damage to sites, if better tools are available to them. The aim is to develop future training programs for the communities to equip them with digital documentation methods. The objective of the training programs will be to design and develop ways for knowledge exchange between local communities and researchers while reducing the digital divide.

Respecting Cultural Continuity

Sites such as Devihasol continue to hold significance in present-day cultural practices. The geoglyph here is used as a site of ritualistic performances during annual religious gatherings (Figure 15). The rituals are performed at midnight on the eighth day of the ninth month (*Margshirsh*) as per the Hindu calendar, and communities from three villages come together to reiterate the traditional practices. The diaspora gathers for this annual event to reconnect with their kith and kins. The deity's procession traces the age-old route from the three neighbouring villages and rests at the geoglyph before returning to the temple. Documenting these connections and respecting cultural continuity is also a necessity during research. Due to the religious association, a certain code of conduct was expected from us during documentation activities. For instance, it is not allowed to walk on the carved pattern with any footwear, which poses a challenge to work on a highly textured rocky surface during summer afternoons. In short, methodologies need to be developed by taking cognisance of the cultural associations and religious values and sentiments.

4.3 Documenting the Connections

The outcomes of the digital documentation create a digital twin for experts to observe the site beyond the life of the place itself, and they create curiosity amongst communities due to the closeness to their reality. It, however, also creates a digital divide due to issues of accessibility of technology and skills. Digital documentation essentially records the heritage site as per its existing condition. Its layered relationship to traditional knowledge systems and aspirations of people for heritage futures are not necessarily recorded. A general reflection on digital documentation processes indicates the need to introduce participatory approaches in the processes of digital documentation. This may enable the new technologies to become opportunities for engagement rather than tools that create multi-faceted divides.[7]



Fig. 15 Annual gathering near the Arya Durga temple at the Devihasol site. The designated representatives from different communities are waiting to receive the deity's procession at the geoglyph. The temple is surrounded by numerous engravings, and it is believed to be built on the geoglyph which depicted human footmarks. The square abstract pattern shown here is spatially used for ritualistic performances during an annual festival that takes place on the eighth day of the ninth month (*Margshirsh*) as per the Hindu calendar. ***Source:*** Photo by M Mane with Dr Aparna Watve, 26 December 2021

7 IISER Mohali, CHC-CRDF and Charotar University have received a research grant under scheme of Science and Heritage Research Initiative (SHRI) by Department of Technology of Government of India for Digital preservation, risk assessment, spatial simulation & chronological interpretation of rock art heritage using multiple technologies.



Fig. 16 A community representative in traditional attire is awaiting to perform the annual rituals at the geoglyph at Devihasol. ***Source:*** Photo by M Mane with Dr Aparna Watve, 26 December 2021

Way forward

- Developing a combination of methods that can fulfil the requirements of archaeological investigation and provide essential data for informed preservation and scientific interpretation.
- Digital data can be effectively used for heritage management. The dynamic nature of the data allows periodic updating by various stakeholders simultaneously.
- Devising methods to use the digital documentation process as a tool to connect diverse knowledge systems (traditional and non-traditional) for effective preservation and dissemination
- Developing training programs for community capacity building through institutional collaborations.

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