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Bérénice Bellina, Aude Favereau, Laure Dussubieux, T.O. Pryce, Krisztina Hoppál

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Óc Eo and the Thai-Malay Peninsula early trading polities links between the last centuries BC-early centuries CE based on archaeological material evidence.

Bellina, B. (National Centre for Scientific Research, UMR8068 France), Favereau, A. (National Cheng Kung University, Tainan, Taiwan), Dussubieux, L. (Field Museum Chicago, USA), Pryce, T.O. (National Centre for Scientific Research, UMR7065, France), Hoppál, K. (ELTE Roman World and the Far East Research Group, Eötvös Loránd University Hungary).

In Southeast Asia, the middle of the first millennium BC saw increasing interregional exchanges. River systems and coastlines facilitated exchanges within and between regions allowing the creation of sub-regional zones of influences that some researchers analyse with the concept of spheres of interactions (Miksic in press; White and Eyre 2011; Hung et al. 2013, Carter et al. 2021). Regions connected to coastal zones experienced a dual process: the development of a sub-regional craft tradition as well as of a more maritime and cosmopolitan-oriented pan-regional culture (Manguin and Stark 2022). The latter immediately formed when South and East Asian regional networks interlocked from the 5th-4th c. BC (Bellina 2018). This pan-regional style found in the newly emerged port-settlements lasted and evolved adapting South Asian elements as soon as the protohistoric (Bellina 2014) and early historic periods (Manguin 2010). Both in the Thai-Malay peninsula (hereafter TMP) and the Mekong delta regions (Giong Phet and Giong Ca Vo), the rising elite of the early trade-involved polities were sharing material culture, ornaments in particular, that were made using high skilled foreign techniques and exotic materials, perhaps to seal alliances in their sphere of influence and between peer polities (Bellina 2001; 2007; 2014; Carter 2015; Carter et al. 2021). But some common ceramic types too were found in these early trading polities of the South China Sea (Favereau et al. 2017) and several of them, along ornaments, attest links between the TMP early polities and those in the Mekong Delta as soon as the late prehistoric and protohistoric periods (Bellina 2001; Favereau 2015 ; Reinecke 2022). From the 3rd c. CE, art history with evidence such as the mitered Vishnu (Dalsheimer et Manguin 1998) and some Chinese sources, attest to links between the two regions. The Liangshu (ch.54, f.9r in Wheatley 1973: 15) accounts for the attack of the TMP trading cities by the general Fanshiman. Whether these attacks were meant to control the South China Sea trade routes (Jacq-Hergoualc'h et Hobson 2002: 102) or led to the integration of the TMP polities (which remain to be defined) into the Fu Nan or are questions that still await answers. In fact, South China Sea early polities' structures are still largely unknown. It has been suggested that they may have been organized as confederations of city-states during the late prehistoric trading polities in the Kra Isthmus (Bellina 2018) and in the Mekong delta during the early historical period (Manguin and Stark 2022), and that those combined agriculture (Bourdonneau 2010, Castillo 2017) and maritime trade. For Óc Eo, the political and economic hypotheses were developed based on studies of architectural remains, art history and written sources, whilst in the TMP, they were largely developed based on settlements and industries' analysis.

Major settlements structures have been excavated in Óc Eo emphasizing further the sophistication and complexity of this culture and its polity. There is comparatively fewer comprehensive research in early historical TMP sites. In both regions, the political and economic level of centralization, the polities respective spheres of influence and networks, their respective relations are fields for research. This very preliminary article lists some of the available evidence of connections between the two regions from the last centuries BC to the early centuries CE by type or class of archaeological material (ceramics, glass, semi-precious stones, metals and Roman or Roman-inspired materials) and suggests possible avenues for research. It emphasizes the connections between the two regions, their simultaneous developments and unravels the prospect of promising research.

1. Sites in the peninsula and limitations

Sites in the TMP that yielded evidence for long-distance involvement include port-settlements as well as sites from their inland and maritime hinterland (Bellina, Favereau, et Dussubieux 2019; Bulbeck 2004; Wisseman Christie 1990). This paper focuses on the material from port-settlements only. Other sites further south include Khlong Thom and Thung Tuk in peninsular Thailand (Chaisuwan 2011) and sites in Kedah (Kuala Selinsing, Sungai Batu) in Malaysia. The latter is not dealt with as its industries is less well known to the authors. In the TMP, most complete data come from the Isthmus of Kra where the French Archaeological Mission in peninsular Thailand-Myanmar (FAMPTM) works since 2005 in collaboration with Silpakorn University in Thailand and the department of Archaeology and the university of Mandalay in Myanmar. The FAMPTM has a strong focus on industries that are analysed with the technological approach in order to reconstruct the “chaîne opératoire”, i.e. “a series of operations transforming a raw material into a finished product” (Cresswell 2010). This enables reconstituting the technical traditions and the associated social group (Balfet 1991; Roux 2016; Lemonnier 2004).

Three periods can be distinguished for the exchange networks and within the sites of the TMP: the late prehistoric earliest sites which emerged in the late 5th and early 4th centuries, early ports from the 3rd-2nd centuries BC, during which trade intensified, probably in connection with the involvement of the Roman world and then China and the protohistoric and early Historical sites until the mid-first first millennium CE. Most of ports excavated or surveyed by the archaeological mission in the Isthmus of Kra have yielded material from an earlier period prior to the Óc Eo period (500-400 BC to AD 100), and from an "Early Óc Eo " period (AD 100-200).

1.1. Late prehistoric - earliest sites – 5th-3rd c. BC

Khao Sam Kaeo (hereafter KSK) and Khao Sek (hereafter KK) (Chumphon Province of Thailand), Maliwan (Tanintharyi Region of Myanmar). Khao Sam Kaeo and Maliwan are currently the earliest cosmopolitan walled port-settlements in the TMP. There was found evidence for several craft productions involving the import of raw material (carnelian, nephrite, glass), the use of foreign skilled technologies and the likely presence of foreign artisans (Bellina 2017). Khao Sek appears smaller and possibly a satellite of Khao Sam Kaeo controlling one of the transpeninsular routes but also hosting similar crafts (Dussubieux et Bellina 2018; Bellina 2018). Khao Sam Kaeo and Maliwan yielded imports from India and the South China Sea.

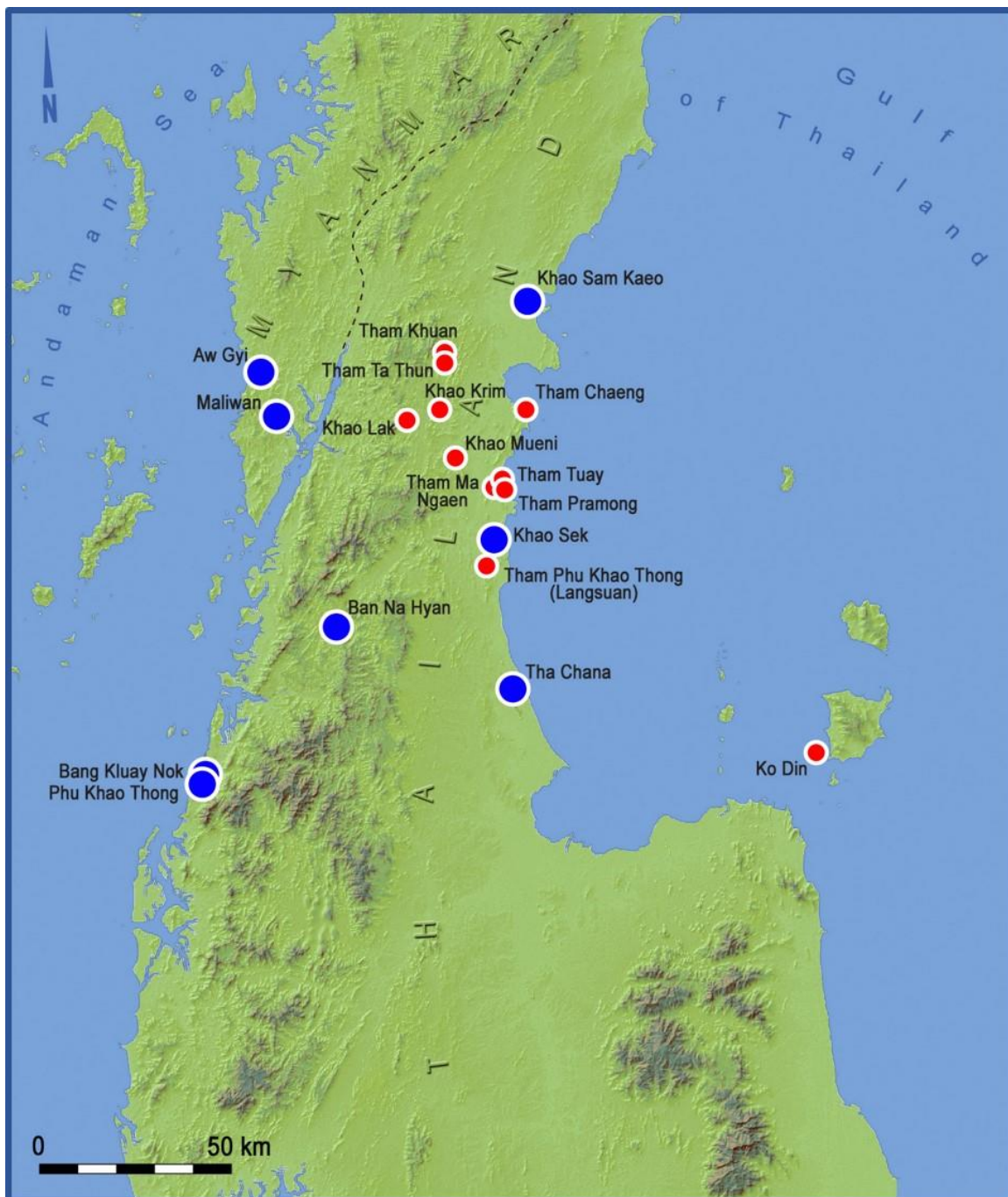
1.2. Early sites – 3rd /2nd BC-1st CE

During this period, network seem to shift with a larger involvement of southern India, in parallel to the growing interest of the Roman world in the far East and of China in the South China Sea. Sites in the TMP include KSK, KK and Maliwan and Aw Gyi (Tanintharyi Region), Tha Chana (Surat Thani Province, not excavated). Similarly, craft production involving imported materials and foreign techniques are active. Besides raw materials from southern India can also be found more finished objects (beads and ceramics).

1.3. Protohistoric and early historical sites –mid-first mill. CE

During this period, exchanges have increased with clearer involvement of the Middle-East and the emergence of sites further south in the peninsula such as Chaiya (Surat Thani Province), Thung Tuk (Chaisuwan 2011), Khlong Thom (Krabi Province) (Veraprasert 1987; 1992; Bronson 1990) in Thailand and sites in Kedah sites in Kedah in Malaysia such as Sungai Batu (Chia et Moktar 2011).

Khlong Thom in the TMP has a long occupation or perhaps two periods of occupations during the first millennium. The site yielded several imports in the form of ceramics and raw materials and evidence for local workshops. There, craft involve more mass-production techniques and simpler morphologies and local adaptations of Indian and Western artefacts.



Map 1. sites in the Upper Thai-Malay peninsula mentioned in the text (FAMPTM)

1.4. Limitations

TMP sites have been the subject of intense looting, some since the 1960s, such as Khlong Thom. Some have benefited from extensive and intensive excavations, post-excavation in-depth analysis and radiocarbon dating, such as KSK, KK and to a lesser extent Maliwan in Burma. This has made it possible

to compare excavated data with data from other contexts and to reconstruct a rather robust cultural sequence. This is not the case for other late sites, such as Khlong Thom and Bang Kluay Nok. Also comparative studies are still limited to the earliest sites, to certain regions and types. Comparative studies between semi-precious stones (carnelian, agate), nephrite and glass ornaments were carried out for the earliest sites and far less for early historical sites. Ceramic studies were conducted thoroughly in the earliest sites of the TMP and compared with some regions. Certain types, such as the Sa Huynh-and/or Kalanay-related pottery (Favereau 2015), the Fine Ware (Bouvet 2017) and later Han ceramics (Perronet et Sachipan 2017; Yamagata 2007) are best known but the range of more discrete types constituting evidence of exchange between the two regions exist as this article hints and remain to be explored. Those types often are neither fully locals, nor fully imported, which may make it difficult to identify and interpret them. The study carried out in the TMP highlighted for instance the existence of a variety of hybrid ceramics made using local raw materials and exogenous morphologies. In some cases, technologies associated with those hybrid types are predominant while in other cases, they are unusual. As for ceramics of the early historical period, they need full investigation in the TMP.

2. Regional comparisons and future avenues for research by type of archaeological material

2.1. Ceramics - A. Favereau

2.1.1. Comparisons between TMP sites and Óc Eo

Based on the ceramic data from analysis previously conducted in the Thai-Malay peninsula and on available publications on Óc Eo, various morpho-stylistic similarities have been spotted between both areas and are listed in the table below (table 1).

All types of ceramics mentioned in table 1 are poorly dated in the TMP, often lacking archaeological context, and the chronological range therefore lacks precision. Such vessels are usually found in limited quantity. All display forms rare in the TMP, that are not found at earlier periods. To clarify the chronology and better understand the networks in which communities of the TMP and Óc Eo were or were not involved, it may be useful to also list ceramic types documented in the TMP and in areas neighboring to Óc Eo, but which interestingly seem absent at Óc Eo . Several types are noted:

- Cups with high pedestal, which are documented in the TMP but also in the Mekong Delta at Giong Ca Vo for instance (Bouvet 2017).
- "Black-and-Red Jars" (Bouvet 2017) which are identified in the TMP, in the Mekong Delta at Giong Ca Vo but also seem to be present further north at Hoa Diem (see Yamagata 2013: 125, fig. 52) and associated with dating ranging from 400 BC to AD 200.
- "Kalanay-related pottery" which are reported in the TMP (Favereau, in press) and in Hoa Diem (Yamagata 2013). Bùi Minh Trí (2022, 2023) mentions the occasional occurrence of black polished ceramics in Óc Eo culture sites and suspects an Indian origin. Since the origin is not established yet, other comparisons might also be considered. For instance, those black polished ceramics seem to share some similarities with Kalanay-related pottery documented in the TMP, not only based on the visual aspect but also considering that these ceramics were tempered with organic materials.
- "Fine Wares" from South Asia (Bouvet 2017), which are associated with dating ranging from 4th-1st c. BC. More and more "Fine Wares" have been identified in the TMP the past few years (Bouvet 2017; Lefrancq et al., in prep) and a few examples are reported in central Vietnam (Glover & Yamagata 1995).

Several scenarios are possible to explain why those ceramic types are not found in Óc Eo: (1) they may remain unidentified for the moment. As Bùi Minh Trí (2022) notes, more research is needed to identify all exogenous ceramics in the Óc Eo culture. (2) They may relate to different periods – especially those that compare with ceramics at Giong Ca Vo (3) They may have travel along different networks and different routes.

2.1.2. Future avenues of research

To make progress on this topic in the future, it could be useful to carry out a detailed comparative analysis of all ceramic types (including locals) from the TMP and Óc Eo , considering ceramic raw materials, technologies, shapes, and decorations as well as archaeological contexts, with the following objectives: (1) to potentially identify more ceramics providing evidence of contact. Hybrid ceramics (i.e., ceramics incorporating local and exogenous elements), for instance, are often underestimated. Those ceramics give the opportunity for in-depth investigations of stylistic and/or technological transfers between communities; (2) to clarify the chronology and set up a techno-typo-chronological framework; and (3) to discuss the origin of ceramic types and characterize communities involved into contacts based on the ceramic data.

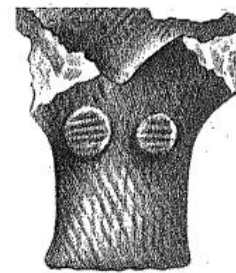
Type of ceramic showing similarities
Clay stoves with “support pads”

Thai-Malay Peninsula

Óc Eo



(Khao Sam Kaeo, Tha Chana)

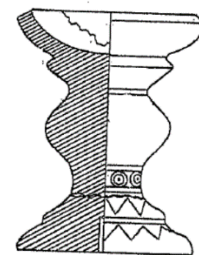


(Malleret 1960, plate XXX)

Possible decorative architectural fragments or



(Aw Gyi, Khlong Thom)

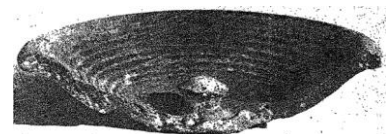


(Malleret 1960, plate XLV, T.4380)

Lids with central grip knob

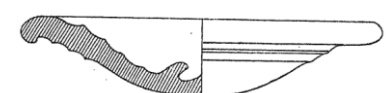


(Khao Sam Kaeo, Maliwan, Aw Gyi, Khlong Thom)



(Malleret 1960, plate LXVII, 2)

Lids with central grip hole



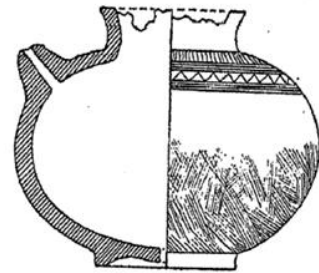
(Malleret 1960, plate XL, T.55)

(Khao Sam Kaeo, Bang Kluay
Nok, Khlong Thom)

Kendis (spouted ceramics)



(Khao Sam Kaeo, Maliwan,
Chaiya)



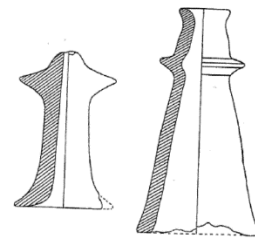
(Malleret 1960, plate XXXV, T.46)

Fragments of spouted vessels are found on some of the TMP sites and at Óc Eo , but the Kendi shape itself was produced in South Asia before being introduced to Southeast Asia. It is a vessel shape identified at different time periods. Further analysis would be useful to clarify the origin of Kendis found in the TMP and Óc Eo , and to establish a detailed techno-typo-chronology. One specific Kendi shape is documented at Khao Sam Kaeo and Óc Eo : a globular spouted vessel with ringfoot. Base and body are impressed, and incisions of horizontal lines and broken lines can be found on the upper body.

Fragments of upper parts of kendis

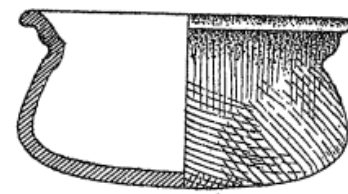


(Khao Sam Kaeo, Aw Gyi)



(Malleret 1960, plate XLV, T.4820
& 4785)

Impressed ceramics



(Malleret 1960, plate XXIV, T.17)

Impressed ceramics have been recovered from most of the sites in the Thai-Malay Peninsula. Such ceramics are also reported on various sites in the Mekong Delta including Óc Eo , but also further north in Hoa Diem for instance. The occurrence of impressed ceramics is documented in Óc Eo (Malleret 1959), but limited information is provided. Despite the ubiquity of impressed vessels in Southeast Asia and the fact that they are found at various time periods, such ceramics are often poorly documented. Analysis conducted in the TMP revealed a complexity that suggests that late Prehistoric impressed ceramics - and the people associated to them - may be classified into several groups and could have different origins.

Han-related ceramics



(see Bùi Minh Trí 2022, illustrations 25-26)

As highlighted by Bùi Minh Trí (2022), the presence of imported Han-related ceramics in the Mekong Delta and in the TMP may suggest links between both areas. In the Mekong Delta, two types of Han-related ceramics are reported: one imported from southern China and the other one from northern Vietnam (Bùi Minh Trí 2022). Interestingly, a similar situation is found in the TMP: Han-related ceramics were imported from different areas likely to be southern China on one hand and northern Vietnam on the other hand (this hypothesis is based on techno-morpho-stylistic comparisons between ceramics from the TMP, southern China and northern Vietnam (Favereau 2015).

Table 1: similarities between ceramics from the Thai-Malay Peninsula and Óc Eo (pictures for Thai-Malay Peninsula ceramics: A. Favereau).

2.2. Glass - L. Dussubieux

2.2.1. Status of research on glass

As far as glass is concerned, mainland Southeast Asia has been studied quite unevenly. While certain regions have attracted a significant amount of attention such as Thailand and Cambodia (e.g. Dussubieux and Bellina, 2017; 2018; Carter 2015), other parts of SEA remained understudied, creating large gaps in the re-construction of the glass exchange network in this part of the world. Vietnam is part of the regions where there is still little data for ancient glass. Although glass beads of Óc Eo were recently discussed in Carter et al. 2021, the material considered in that study was surface collected and lacked context limiting greatly conclusions.

Status of research on glass in the Mekong Delta:

- ancient sites: Giong Ca Vo yielded glass ornaments with a combination of potash and mineral soda-high alumina (m-Na-Al) 3 glass (Dussubieux, 2001) very similar to the glass pattern identified at other earlier sites such as KSK, KK but also Ban Don Ta Phet (Dussubieux and Bellina, 2017; 2018). This pattern was associated with a connection with the South China Sea network. As observed by Carter (2015) this network vanished at some point (maybe at the end of the 1st millennium BC) and was replaced by a different network with ramifications that extended westward toward Southeastern India that is visible at Óc Eo .

- early first mill. CE

Several thousand beads were discovered at Óc Eo, spread over the entire site. The colors of the glass include ultramarine blue, turquoise or dark, pink or purple, red, yellow, green. Polychrome beads are black with white decorations (including Bird Star beads), others are black striped with red and white, or have an ocellated decoration. Gold (or silver) foil beads have been identified as well. The shapes of the beads are of a very wide variety: bi-conical beads, octahedral, ribbed spheroids, collared with sections of various shapes, hexagonal prism, cube without corner or tubular (Malleret 1962).

Local glass and bead manufacturing cannot be ruled out, but no kiln structure was found. However, many pieces of glass and slag were interpreted as evidence of bead making (Malleret 1962). Additionally, P. Francis Jr identified wasters and other artifacts among the material found at Óc Eo that suggest local production of monochrome drawn beads (Francis 2002:224). Regarding the availability of raw material sources, Óc Eo is in a sandy area, the site being located on the seashore. In Vietnam, there are, in certain coastal regions, sodic lands under the name of cat-loi that is similar to Indian reh that is used there for glassmaking (Dussubieux, 2001).

The presence of Bird Star beads at Óc Eo (figure 1) seems to indicate a local origin for some of the beads. Elemental compositions of Bird Star beads (from unknown sites and contexts) published in Lankton et al. (2008) suggest that recycled glass was used for their production, likely located in Southeast Asia. The same authors note the presence of these beads not only at Oc-Eo but possibly at Khlong Thom. They were also found in East Java (Adhyatman and Arifin, 1993).

The site of Angkor Borei and more especially the Vat Komnou cemetery dating to 200 BC to 200 AD yielded 1320 glass beads that were mostly small monochrome drawn beads. Colors includes opaque red, yellow, orange, green, white, and black and translucent blues, purple, and turquoise blue. Most of the glass beads that were analyzed for elemental composition belong to the mineral soda – high alumina 1 (m-Na-Al 1) glass likely manufactured in South India. Smaller proportions of beads had a m-Na-Ca-Al composition. The origin of this glass type remains uncertain. A few beads with a soda plant ash composition typical of the Middle East while high lead glass beads with a Chinese origin indicate ties of Angkor Borei with long distance networks (Carter et al. 2021).

- Glass and regional connections with special reference to the TMP and beyond

The typology of the beads as well as the chemistry of the few specimens that were analyzed for compositional analysis testify of different types of connection of Óc Eo within Southeast Asia and beyond. The presence of gold or silver foil beads (figure 1) is generally associated with import from the

Mediterranean world. The elemental analysis of a greenish glass chunk revealed a soda plant ash composition characteristic of middle eastern production. For further details on Mediterranean glass in SEA and between the TMP and Óc Eo , see dedicated section further below.

Most of the analyzed samples (that were small drawn monochrome beads) have a mineral soda – high alumina 1 (or m-Na-Al 1) composition that is a type of glass likely produced in Southeastern India and that is quite common starting around the first millennium BC in different part of Southeast Asia (Carter 2015; Carter et al. 2021) including at the close by site of Angkor Borei in Cambodia. Although Óc Eo is a coastal site, Carter (2015) notes that this glass type is more particularly abundant at sites located further inland based on her observation in Thailand and Cambodia. It is important to notice that glass data (including compositional analysis) is quite scarce for coastal sites contemporaneous of Óc Eo . A notable exception is Khlong Thom in peninsular Thailand; however, the data from these sites are unpublished.

The only site contemporaneous with Óc Eo on the TMP is Khlong Thom; however, the glass from this site that was studied for compositional analysis has no secure context. Besides, comparison between the two sites is difficult as more samples from KT were analyzed and they seem to be more diverse in typology (more polychrome beads, a gold foil bead...etc) at KT compared to Óc Eo. As a consequence, the composition at KT seems more diverse than in Óc Eo but this might be at least due to the (lack of) sample strategy at both sites. A few comments about the glass found at KT: m-Na-Al 1 glass are present at this site, but it is not as prevalent as it seems to be at Óc Eo. KT yielded m-Na-Ca-Al glass that is also found at Arikamedu, PKT and AG which show a strong Bay of Bengal component present at that site (Dussubieux et al. 2012; Dussubieux et al. 2020) which is quite logical based on its location.

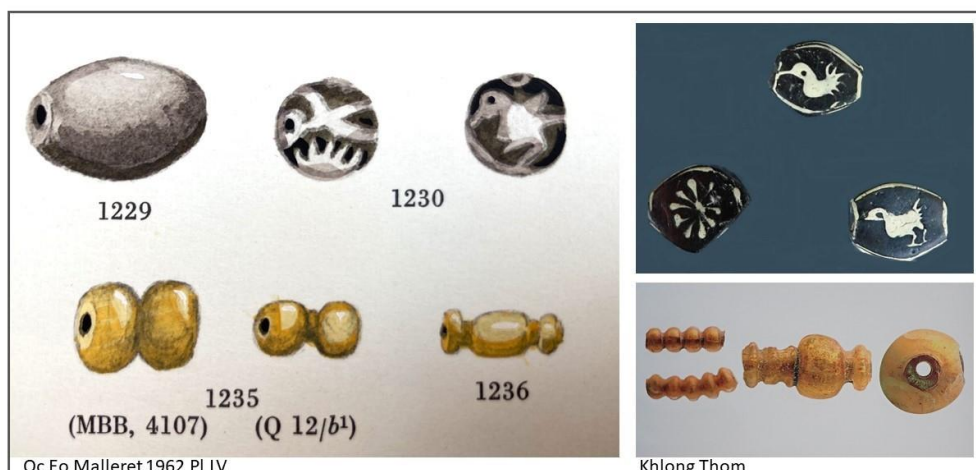


Figure 1. Left, gold foil beads and glass beads with birds from Óc Eo (Malleret 1962) ; Right: beads from Khlong Thom (photos B. Bellina)

2.2.2. Future avenues of research

Compositional data for glass material from Vietnam with a secure context are extremely scarce making it difficult to understand the role of this region in Southeast Asian ancient glass exchange networks. It would be necessary to develop ancient glass analysis in Vietnam for sites dating from the second half of the 1st millennium BC and onward. In parallel, we need more data for the rest of Southeast Asia for later periods (1st millennium AD) as so far, more efforts were directed toward the Early Iron Age.

2.3. Semi-precious stones – B. Bellina

Semi-precious ornaments such as cornelian, agate, garnet, amethyst, are amongst the earliest evidence for exchanges with South Asia. In Southeast Asia, they appear simultaneously with glass. Excavations of glass and stone workshops at KSK and Maliwan and studies of these ornaments there

and in other sites such as KK seem to indicate that in SEA, their production network are linked together (Bellina and Bernard 2017; Bellina et al. 2018). Similar observation was made in the case of Angkor Borei and inland communities forming part of its sphere of interaction (Carter et al. 2021). Does this close association between the two production networks have anything to do with the organisation of production in South Asia, or rather with that of the trading cities of Southeast Asia, is a question for which we cannot provide an answer at present.

Bellina analysed stone ornaments:

-from the late prehistoric period, here Giong Phet, Giong Ca Vo, Phu Hoa, Sa Huynh in Vietnam in 2000 (Bellina 2001, 2007) and from KSK, KK in the TMP (2001; 2014; 2018). Their comparison showed that they share a similar style, skilled techniques used to produce high quality beads (figure 2).

- from protohistorical and early historical sites in the Mekong delta, sites in the Long An province (Nb: 45 from Go Hang, Go De and Go Dung) and Óc Eo (Nb: 76) with Nen Chua (Nb: 4) and Vong The (Nb: 10) in the vicinity and Khlong Thom in the TMP (Nb: 60) (Bellina 2001; 2007).

On the basis of morphological and morphometric comparisons, perforation and polishing techniques secured by statistical tests, it was possible to characterise the Óc Eo technical system of which Vong The and Nen Chua belong. There is a style (techniques and morphologies) specific to the Óc Eo region that differs slightly from that of Long An and of course from other regional assemblages (Bellina 2001: 309). Although the evidence of production in the corpus examined is still patchy, based on the style and techniques, it seems clear that there were production workshops in the region that was distributed in neighboring areas.

Comparing the Óc Eo technical system with those of the TMP (figure 2): Some of the morphologies of the early prehistoric period can still be found during the later period but morphologies are generally simpler and mass production techniques predominate (Bellina 2001). Similar observation was made by Carter for beads at Angkor Borei and inland sites (Carter et al. 2021). This is also the case for Óc Eo and Khlong Thom. They have in common that their morphologies are simpler than those of the ancient periods and that they are heterogeneous, with a few beads with more refined morphologies and finishes. This difference between the quality and techniques of beads from the ancient sites and sites of the protohistoric-early historical periods no doubt has to do with the wider use to which these beads were put over time. If contemporaneous, was the heterogeneity indicative of different social destinations? Unfortunately, the corpus studied in 2001 is too small and mostly devoid of context to allow to hypothesise about these social groups and their spatial distribution. In any case, the two regions show a similar trend in terms of production which probably reflects a comparable political and economic use of these industries in both regions (Bellina 2001).



figure 2: semi-precious stone ornaments from Giong Ca Vo, Khao Sam Kaeo, Óc Eo and Khlong Thom. Photos B. Bellina

2.3.2. Future avenues of research

Bùi Minh Trí 2022 accounts for the discovery of several thousand beads unearthed during the recent excavations. These well-contextualised and dated beads may thus constitute a solid base for comparative studies. They may even help refining the chronology for beads found in the TMP, especially for the critical period of the early historical period during which little research has been carried out on these industries. In this perspective, completing the technical system definition could be achieved with further technological analysis combining provenance analysis of the raw material and analysis of production technique. If associated with the provenance of glass such study would very likely provide major insights on regional connections. As mentioned before, in Southeast Asia, stone and glass production networks may be linked. Previous combined analysis of glass and stone technical systems and their evolution at Khao Sam Kaeo and at Khao Sek showed similar trends in the production, imports and shifts in network with connections with southern India during a later period. Similar combined and comparative studies across the South China Sea would surely provide further insights on the links between the two regions, perhaps even between some port-cities and their evolution through time. Such studies both at Óc Eo, at neighboring sites and with future excavations in the TMP at sites such as Bang Kluay Nok may provide further hints on differentiated products and their social destination, thus highlighting the structure in these early trading polities that were Óc Eo and those in the TMP.

2.4. Metals – T.O. Pryce and B. Bellina

The Mekong delta is devoid of the copper and tin minerals needed to produce bronze. Although speculative, it is conceivable that the conquest of the Upper TMP by Funan mentioned in Chinese texts (Pellicot 1903: 265), may have been in part stimulated by a desire to control the area's mineral resources.

2.4.1. Copper-based material

Unfortunately, the archaeometallurgical evidence for exchange between the TMP and Óc Eo is extremely limited; pertaining to vague stylistic and typological comparison (Pryce, Bellina and Bennett 2006, and below). This is due mainly to the absence, to the best of our knowledge, of any archaeometric analysis of copper-base artefacts from central and southern Vietnam, only a single study of gold and silver (Schlosser et al. 2012), and certainly not any lead isotope characterisations, which are the basis for effective provenance and network reconstruction research in Southeast Asia, as well as globally (Pryce et al. 2011; 2014; Killick, Stephens, et Fenn 2020). While this is remedied, we can at least evaluate the evidence for exchange between the Iron Age TMP and other contemporary assemblages from the coastal regions of Mainland Southeast Asia: namely Cambodia, southern Myanmar and northern Vietnam. Due to a super-abundance of data, and space limitations here, we will necessarily exclude inland Mainland Southeast Asia, except for known copper production loci, and Island Southeast Asia. Not including the latter is particularly artificial, as we are dealing with a largely maritime exchange space, but the reader should be aware that, to date, no archaeometric copper-base provenance data are available from Malaysia (nor Brunei, East Timor and Singapore) but we have preliminary, unpublished, data for Metal Age Palawan, Java and Sumatra, and published data for Bali (Pryce et al. 2018).

For the Southeast Asian maritime interaction sphere that concerns this paper, there are three principal typologies of interest: 'Indian' high-tin bronze bowls, 'Chinese' leaded high-tin bronze mirrors and 'Vietnamese' leaded bronze drums (not discussed here). The very thin hot-worked and quenched engraved high-tin bronzes were named 'Indian' due to their presence at Ban Don Tha Phet, an early Iron Age cemetery in central Thailand with 'Indian' hardstone ornaments (Glover 1990) and similar bowls on the Indian sub-continent (Srinivasan et Glover 1995). Subsequently, typo-stylistically, technologically and elementally highly comparable examples have been excavated from KSK and Khao Sek in peninsular Thailand (Pryce et Bellina 2018), Prohear in eastern Cambodia (Pryce et al. 2014; Reinecke et al. 2009) and even Bali (Pryce et al. 2018), as well as potential ingot from peninsular Thailand and West Bengal (Pryce et al. 2014). These artefacts, however, do not for the most part have compatible lead isotope signatures (Pryce et al. 2014). If none has been reported in the Mekong delta yet, it is not unlikely that future studies will identify these bowls that form part of the materials shared amongst early trade involved polities. The other 'maritime metal' class is that of leaded high-tin bronze mirrors, of Han stylistic origin. So far, the only Southeast Asian examples studied are from KSK, Sông Khoai in northern Vietnam and Pankung Paruk on Bali. The KSK mirror can be interpreted as a Western Han import, while those at Sông Khoai are Eastern Han and the Pankung Paruk example cannot, unfortunately, be attributed yet (Pryce et al. 2014; 2018; Pryce et al. 2017). Many examples of these mirrors are known from central Vietnam (Yamagata, Manh, et Hoang 2001) but have not been archaeometrically studied, to the best of our knowledge. There is little doubt that southern Vietnam, and Óc Eo in particular, will have examples of all three copper-base metal classes, and potentially new ones, with which we can better characterise littoral interactions of the mid/late 1st millennium BC and early/mid-1st millennium AD.

2.4.2. Gold

Gold is widely, though irregularly, distributed throughout Southeast Asia in hard-rock (igneous and metamorphic) and placer (sedimentary) deposits (Gardner 1972: 333-343). The words 'gold' and 'golden' are often associated with place names throughout the region such as 'Golden Khersonese' of Ptolemy's Geography (Wheatley 1961: 144-147). Indian sources mention the Suvarnabhumi (Land of Gold) (Wheatley 1961: 177-184), possibly referring to lower Burma and the TMP, and the Suvarnadvipa (Islands of Gold) which may correspond to Borneo and/or Sumatra. Whether these terms refer to the metal or to those lands endowed with enriching resources is unclear. In the Upper TMP, gold lodes are

known around Phuket and Prachuap Khiri Khan (Sittithaworn 1990), 200-300km from KSK, but small local sources may have been exploited in the past. Comparisons are limited because gold artefacts are often melted when collected by villagers. However, a few artefacts show prehistoric and early historical links between the TMP and Mekong delta polities.

- Late prehistoric network related sites in Vietnam: KSK together with Giong Ca Vo, and the Tabon caves in the Palawan Island (Philippines) provide the earliest sites for the recovery of gold in maritime Southeast Asia (Fox 1970: 143). Provenance analysis of gold from Giong Ca Co showed that some were comparable to those from the TMP (Reinecke 2022). Central knobbed gold beads (Figure 6a), surface finds from KSK, share stylistic elements with several gold beads from Sa-Huynh related sites and especially at Giong Ca Vo in Southern Vietnam (Thang and Hien 1997: 41, Plate 17).

- Early Historical Óc Eo related sites in the Mekong delta: A gold pendent from KSK with filigree decoration from a private collection (Figure 6b) can be compared to a specimen from Óc Eo described by L. Malleret (1962: Plate V, n°757). The polyhedral/granulated gold bead from KSK (Figure 6c) is stylistically identical to other ornaments from Óc Eo (Malleret 1962: Plate XII), and to numerous similar beads from sites in Burma some said to come from Pyu sites (Richter 2000) others observed in private collections (U Win Muang). Óc Eo yielded gold granulated beads (Malleret 1962, volume 3, pl. XII, bottom right). KSK and Aw Gyi in the Isthmus yielded similar beads such as. Further east, more than 30 polyhedral beads were found in Hepu. Others were found in Han-period tombs in southern China in Ganquan of Jiangshu, Wulipai of Changsha and Guangzhou of Guangdong (Xiong Zhaoming and Lin Ying 2019).

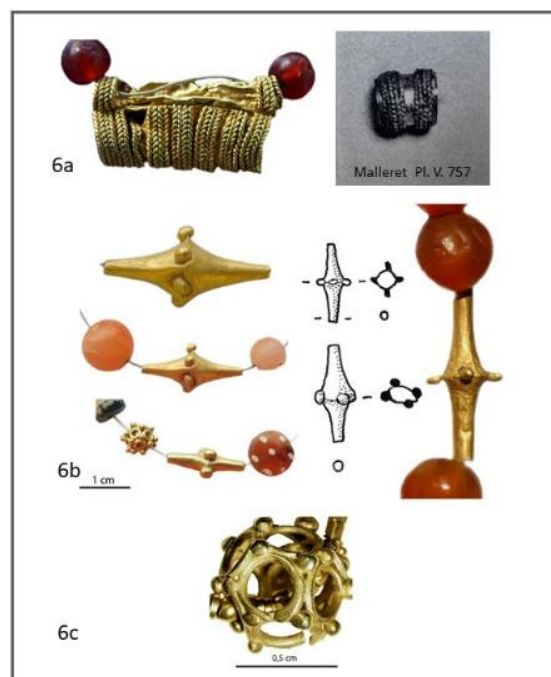


Figure 3. Gold ornaments from Khao Sam Kaeo (except top right one from Malleret 1962). Photos B. Bellina.

2.5. Roman material – K. Hoppál, B. Bellina and L. Dussubieux

Links between the TMP and Óc Eo culture sites can also be examined through comparing the types, dates and distribution of Mediterranean and related finds discovered in these regions. The comprehensive database of Mediterranean imports produced between the last centuries BC and AD first centuries, and of Asia-produced inspired objects that are integrating Mediterranean elements

(referred to as Mediterranean-inspired) consists of 73 entries referring to more than 150 individual objects from sites of mainland and island Southeast Asia (Hoppál et al. 2023).

The earliest sites dating from the fourth century BC – first century AD (KSK, Maliwan) and early sites dating from the last centuries BC (AG, BKN, PKT and TC) are all located on the Isthmus of Kra.

Later sites dating from the early centuries AD or later can be found further south in Peninsular Thailand (KT and Thung Tuk). This is when Mediterranean related material is reported in the Mekong Delta at Óc Eo and Lung Lớn, Đá Nổi and Nền Chùa. Most of the materials, whether imported or inspired, come from the Kra Isthmus (32 out of 73) and Peninsular Thailand (24), then the Mekong region (12). Most of the Mediterranean imports came from the Kra Isthmus (28), and most of the Mediterranean-inspired objects came from later sites are in Peninsular Thailand (namely KT:14 entries out of 26), then from the Mekong Delta (7).

2.5.1. Isthmus of Kra vs. Óc Eo sites

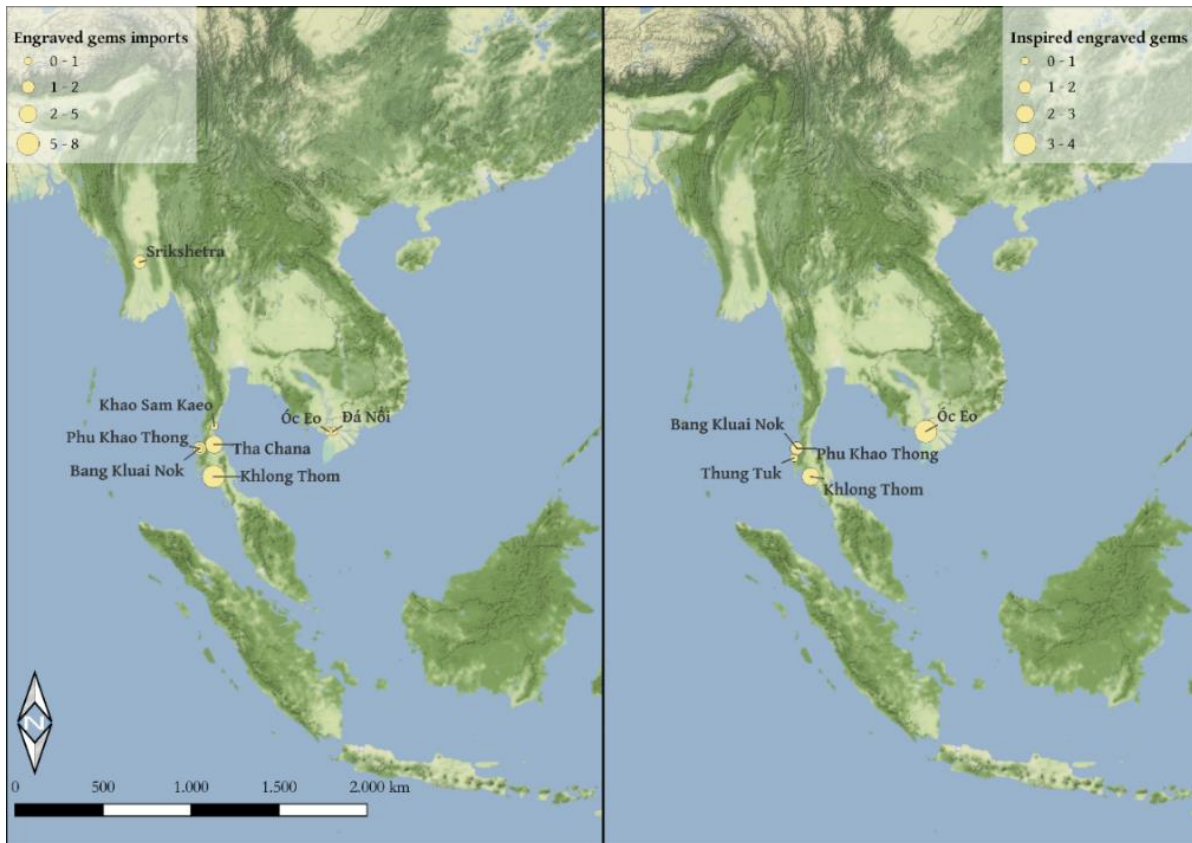
Comparing the distribution of different Mediterranean and inspired materials from the Kra Isthmus and from OE sites, several differences and a few links can be inferred.

- Glass materials

Most glass vessels of Mediterranean origin were found in the Kra Isthmus mostly from AG (4) and PKT (4). Those include multi-coloured and/or mosaic glass vessels dated to the first century BC – AD first century and undecorated fragments with a broader dating, from the first century CE to the fourth century CE. Mediterranean glass as a raw material has only been identified at AG, Maliwan and PKT (Hoppál et al. 2023). So far, one single entry of glass vessels is reported from Nền Chùa in the Mekong Delta. This entry is referring to transparent bluish and green fragments (Bùi Minh Trí et al. 2022: 317, fig. 196) of possibly Mediterranean origin, however further analyses would be required to define its origin. Glass beads of Mediterranean composition, particularly gold glass beads were discovered at PKT, TC and OE. Multi-coloured glass beads came from both regions, face beads of AD first century dating from Maliwan and KSK, and mosaic beads with a wider range of dating both from AG and OE-LL canal (Dussubieux et al. 2020; Bùi Minh Trí et al. 2022: 163, 165).

- Engraved gems

Mediterranean imported engraved gems were discovered in both regions; however, those greatly differ in number, dates, and workmanship. Seven imported engraved gems mostly of high-quality with first century BC – AD first century dates came from early sites of the Kra Isthmus, from BKN, PKT and TC. The Mekong Delta yielded two Mediterranean engraved gems to date. Those include a red jasper intaglio depicting a chariot drawn by two mice, and with a cock as a charioteer possibly of AD second century date from Óc Eo. The other is a translucent green glass intaglio with the motif of a wreath discovered in Đá Nổi. Aquileia has also yielded an identical glass intaglio, which may even be from the same mould (Malleret 1962: Nos 1293 and 1314, 299, 304, Plates LXVIII, LXXII; Middleton 2005: 17).



Map 2. Distribution of engraved gems in Southeast Asia (map B. Pradier)

- Inspired engraved gems

The Kra Isthmus and OE yielded similar number of inspired engraved gems four from each region. In the case of the Isthmus, two came from BKN and two from PKT, and are typically AD first century dates, such as a carnelian intaglio depicting Herakles from PKT (Borell 2017b; Hoppál 2022: 206, fig. 3,1a-b). This might have been made in Gandhara, just like two of the four inspired engraved gems from Óc Eo (Malleret 1962: 295-296, 298,). However, in contrast to the PKT Herakles, the Óc Eo pieces have AD post-third century tentative dates. In the case of the other two inspired engraved gems from OE, tentative dates and production places are more complicated to define (Malleret 1962: 296; Hoppál 2022: 207).

2.5.2. Peninsular Thailand vs. Óc Eo sites

Sites from P. Thailand and the Mekong Delta are all later in date and share more similarities regarding Mediterranean imports and inspired objects.

Besides gold glass beads mentioned above, some degree of links between imported engraved gems can also be seen, although KT yielded a greater number (8 vs. 2) with more diverse dating (from the CE first century to the CE second-third century). Both KT and Óc Eo yielded engraved gems moulded in glass.

- Inspired engraved gems

Number of inspired engraved gems is also the same in the case of P. Thailand and Óc Eo (4 vs 4). There are three yet-unexamined engraved gems were reported from KT and one from TT, all made of carnelian. Carnelian was used in case of the Óc Eo -discovered specimens as well. However, inspired engraved gems from P. Thailand seems to feature somewhat inferior quality and less-skilled workmanship compared to the Gandhara-connected OE pieces. This might suggest that the KT and TT inspired engraved gems might have been made locally or regionally.



Figure 3. Mediterranean engraved gems from TPM and from OE (1-4: Khlong Thom; 5: Óc Eo; 6: Đá Nổi). After Bouzek & Ondřejová 2009: figs 1-3; Borell et al. 2014: 104, fig.8a-b; Borell 2016b: 110, fig.8, 111, fig. 13; Figure 4 Inspired engraved gems from TPM and OE (1-2: Phu Khao Thong; 3: Bang Kluai Nok; 4-7: Óc Eo). After Borell 2017b: 62, fig.3; Kangked 2009: 88; Borell et al. 2014: 103, fig.7; Borell 2016b: 110, figs. 9-12.

- Coin adaptations

KT yielded several coin adaptations (9 entries: 18 pendants and a stone mould), while three came from Óc Eo. Some of the KT types might have been manufactured locally even by Indian craftsmen (the tin pendant evoking coin designs of Tiberius PONTIX MAXIM type coins). The pendants made of gold sheet and discs with relatively faithful representations partly or entirely derived from coins of the Antonine Dynasty came both from KT (4) and Óc Eo (2). These pendants of CE post-second century dates generally differ from the Indian coin copies and might be the results of local developments (Borell 2014: 27-29). Based on technical details, at least one of the gold pendants from Óc Eo can be closely connected to the KT found ones, suggesting yet another evidence of exchange between the two sites (Borell 2017d: 170). A single gold sheet pendant crudely evoking Roman coin design came from Óc Eo. This, as well as a similarly crude piece from UT, might be result of later simplification or mass production. KT also yielded four fifth-sixth century AD gold coins recalling Roman coins on the obverse that were intended for trade transactions (Revire 2021). Although such coin adaptations are missing from Óc Eo sites, but other denominations assigned to the KT series were found at OE (Borell 2017d: 170, 174) providing more evidence of links between the two sites.

To sum up, the Kra Isthmus sites are ports with early dates and provide Mediterranean imports mostly, glass being the most frequent. While the Mekong Delta sites are mostly later and yielded imports of later dates. The two regions only share a limited number of similarities regarding material types. Those include imported gold glass and mosaic beads and inspired engraved gems with Gandharan connection. However, those latter have different dates in the Kra Isthmus and in the Mekong Delta. More connection can be seen between P. Thailand and the Mekong Delta. Those include gold glass beads, engraved gems of post-second century dates, and particularly coin adaptations of certain types.

2.5.2. Future avenues of research

Comparative studies combining raw materials (provenance), style and techniques, of more materials with secure context would contribute to this objective. This would also help to differentiate the various inspired imports, to identify local variations and a greater number of similar objects from Óc Eo and the TMP, thus providing a more comprehensive understanding of the connections between the two regions.

3. Discussion

The various comparative studies presented in this article are heterogeneous. Some studies combine physico-chemical studies while others are based solely on morpho-stylistic studies. The majority are limited by the absence of context and therefore of dating. Nevertheless, the comparisons reveal similarities and differences between the TMP and the Mekong Delta over the periods and allow us to make several observations about the links or developments between the two regions.

As far as ceramics are concerned, there are rare types in TMP that are found in the Mekong Delta during the Óc Eo period. Several imported ceramics and others that we call hybrids in TMP, often produced locally with exogenous techniques and/or styles, may not yet have been spotted in the Mekong Delta. Certain types of ceramics have been found at other sites around Óc Eo. Comparative studies of local and imported ceramics therefore have great potential.

The paucity of analyses carried out on glass in the context of Óc Eo and early historical TMP sites is one of the main limiting factors for comparisons between the two regions. Especially as the two major sites, Óc Eo and Khlong Thom have a long occupation sequence. Local glass and semi-precious stone ornament industries seem to have developed in parallel. The networks that supplied Angkor Borei during the last centuries BC and the first centuries AD are to be found in south-east India (Carter et al. 2021). What about the Óc Eo networks? Are they the same? In the TMP, sites dating of the late centuries BC and early centuries AD such as Bang Kluay Nok and Phu Khao Thong show links with Arikamedu in particular, whose glass type is different (Dussubieux et al. 2020). In the TMP, developments in the glass and semi-precious stone industries are linked at least during the late prehistoric period. We have no data on this subject for the early historical period (Khlong Thom). In both regions, there was a shift in the types of production, with simpler morphologies, some specific to the region, and the implementation of mass production techniques. Either the production is larger and reaches a wider audience, or the material has lost its value in favour of other types of production (Bellina 2001). For both industries, physico-chemical studies to determine the origin of the materials and a technological study would be beneficial in three respects. They would make it possible to refine:

- the dating of historical production in TMP based on material in the Óc Eo context.
- regional connections between the two regions.
- our understanding of the differentiated productions that may have been aimed at distinct social groups. These studies would bring insights into the socio-political organization of these polities.

Regarding metals, there are comparable gold ornaments in the Mekong delta and the TMP from the prehistoric period. It is likely that further comparative studies will enable identify other comparable materials made with copper alloys. Those have great potential for shedding light on Óc Eo's regional networks, particularly between the TMP during the late prehistoric and early historic periods.

Studies of Mediterranean material show that the two regions share certain trends. Most objects of Mediterranean inspiration have been found in Khlong Thom and Óc Eo. Imports were more numerous in the Isthmus of Kra during the early period. All types of imports and material adapted from glass and semi-precious stones, gold foil beads, mosaic beads and Gandhara-inspired seals are found in both regions. As far as Mediterranean material is concerned, the connections between the two regions are mainly visible for sites from the historic period.

There is evidence of contact in both the late prehistoric and early historic periods, although the former is more numerous due to the state of research. The main limitations of this study are the lack of material in context and of dating, since most of the comparisons were made based on old collections, often collected by villagers. However, the many large-scale excavations carried out by Vietnamese

excavation programs in recent years have produced a large amount of data in context allowing for efficient comparisons (Bùi Minh Trí 2022).

Conclusion

Each industry sheds a different light on production and distribution networks, allowing inferences to be drawn about social and economic organisation. The imports and hybrid productions identified for ceramics, semi-precious stones and glass reveal interactions between the two regions. Glass, semi-precious stone, and metals were highly sought after in ancient times. Merchants and craftsmen also moved around and settled in the ports. It is therefore highly likely that the combined study of these materials and the techniques used to produce the different types of products in the Mekong Delta and TMP could shed light not only on regional networks, but also on their social and economic organisation and evolution during the late prehistoric and early historic periods. The political organisation composed of multiple centre could also be better understood, their relations with Oc Eo and Angkor Borei for instance and the relationship between those two.

Future research using harmonised analytical methods would also make it possible to assess the nature of the relationships and the extent to which developments in the two regions are linked over time. More generally, comparative studies would contribute to a better understanding of the developments that took place at the beginning of the historical period in the South China Sea, of which the Mekong delta and the TMP visibly linked regions are essential cornerstones.

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Maps&Illustrations

Map 1: Sites from the Upper Thai-Malay peninsula mentioned in the text.

Map 2: Mediterranean import and inspired engraved gems from TPM and OE

Table 1: similarities between ceramics from the Thai-Malay Peninsula and Oc Eo (pictures for Thai-Malay Peninsula ceramics: A. Favereau).

Table 2 Mediterranean engraved gems from TPM and from OE (1-4: Khlong Thom; 5: Óc Eo; 6: Đá Nổi). After Bouzek & Ondřejová 2009: figs 1-3; Borell et al. 2014: 104, fig.8a-b; Borell 2016b: 110, fig.8, 111, fig. 13;

Table 3 Inspired engraved gems from TPM and OE (1-2: Phu Khao Thong; 3: Bang Kluai Nok; 4-7: Óc Eo). After Borell 2017b: 62, fig.3; Kangked 2009: 88; Borell et al. 2014: 103, fig.7; Borell 2016b: 110, figs. 9-12.