

When History Meets Technology: Preliminary Survey on the Historical Documents of Underwater Cultural Heritage

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ABSTRACT

Underwater cultural heritage (UCH) is a newly developed interdisciplinary field in which historical research is indispensable. According to the UNESCO 2001 Convention on the Protection of UCH, the desk-based study of historical, archaeological, geological, and environmental data is necessary for the preliminary work of inventory. Then researchers conjecture sensitive areas after analyzing and integrating the above information. The Taijiang Inner Sea and Tayouan are important historical sites for the political activities of the Dutch East India Company and the Siege of Fort Zeelandia in the 17th century. According to preliminary conclusions from the historical documents, Dutch shipwrecks may have been buried in the shoals and wetlands around the mouths of the Zengwen to Yanshui River or the land area of Anping District, Tainan City. If there are discoveries, they will be significant material evidence of Taiwan's history in the Age of Discovery. However, the Taijiang Inner Sea has undergone 400 years of geographical and environmental changes, including river channel migration, sandbars, lagoons, land expansion, and urban development. Many of the hydrological regions of the period are gone. Therefore, planning shipwreck survey strategies that compare historical documents and map data with current geographical locations is more complex than surveying the sea. This study attempts to collect domestic and foreign maps of the Taijiang Inner Sea and Tayouan area and collect documents related to Dutch East Indies shipwrecks. After inductive analysis, a geographic information system program overlays the maps and data. Authors estimate the possible location range of sunken ships as a reference for UCH survey planning and target object comparison. Finally, integrate the suspected targets discovered by the scientific instrument survey to examine the relationship between historical documents and scientific survey data.

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INTRODUCTION

Since equipment for scuba diving was invented by the French engineer Jacques-Yves Cousteau and Émile Gagnan in 1943, operations in archaeology could be extended from land to underwater, which also brought about the cooperation of different fields and made underwater archaeology an emerging interdisciplinary practice. Regardless of legal or practical perspectives, history is always an inseparable element in research.

I. Legal Perspective

Articles 14 and 15 of Annex-Rules Concerning Activities Directed at UCH in UNESCO's 2001 Convention on the Protection of the Underwater Cultural Heritage (UNESCO 2001 Convention) address that an assessment should be conducted in the preliminary work to elevate the meaning and fragility of damages upon the UCH and surrounding natural environment from the project itself as well as the potential of obtaining the data that can satisfy the project goals. Such assessment shall include obtainable background studies on the history and archaeological evidence, the archaeological and

environmental qualities of the historic sites, and any potential consequences of affecting the stability of such UCH as a result of these activities.

The Operational Guidelines for the UNESCO 2001 Convention specify that the State Parties shall declare their link to a specific UCH through the following information when consulting their interests in such heritage: (a) the results of scientific expertises; (b) historic documentation; or (c) any other adequate documentation (UNESCO 2015). In other words, the historical documentation is essential evidence for clarifying the ownership or other relevance of the UCH.

II. Practical Perspective

In terms of underwater archaeology operations procedures, they include preliminary work, historic site investigation, study organization, preservation and management, and education and promotion.

The preliminary work can be divided into advanced assessment, desk or background research, general investigation, and evaluation. Among them, the advance assessment can be further divided into:

1. Thorough or partial history investigation of UCH.
2. Thorough and partial evaluation of marine environment, social and economic development, national policies, and comprehensive resources.
3. Draft of assessment standards of general investigation in sensitive zones.
4. Assessment of the potential sensitive area of the UCH.
5. Planning of a range of thorough or partial one-time general investigations.
6. Planning of priority or road map of thorough general investigation.

Background research shall be involved with the time of the historic site's formation and the historical and archaeological backgrounds of relevant regions. Historical geography can provide crucial information on the development of a specific area and possible historic sites of that region (Maarleveld et al. 2013). The historical data can also serve as the archaeological resources for the expected site (Manders and Underwood 2012). The desk research shall integrate all previously collected archaeological evidence and take all usable historical proofs as the reference (Maarleveld et al. 2013).

Evaluation should be about the historical, cultural, archaeological, artistic, and scientific values, among which the historical importance should be about evaluating whether the historic sites or relics are relevant to the local, regional, or national history, or even the people, events, activities, locations, or themes of world history.

For the subsequent investigation of historic sites, research organization, preservation, and educational promotion, the historical research can be essential support, such as comparison of relics or ship nationality, statements on the value of the heritages, as well as explanation, exhibitions, and publications of data of historical sites.

CASE STUDY: VOC SHIPWRECKS IN THE TAIJANG INNER SEA

Taijiang Inner Sea and Tayouan were necessary historical fields of the governance activities of the United East India Company (Verenigde Oostindische Compagnie, VOC) and the battle between them and Koxinga. From the literature, we can preliminarily conclude that Dutch shipwrecks or relics might

be underneath the shoal, wetlands, or even the inland area of nowadays Anping, Tainan. They can be the material proof of Taiwan's place in the Age of Sail if they can be found.

However, due to the river channel migration and urbanization over the past 400 years, the shoals, lagoons, and the inner sea became land, and the waters of Taijiang Inner Sea are no longer. The comparison between historical documents, maps, and current locations, as well as the investigation of shipwrecks, is significantly more complex than underwater cultural heritage in marine areas.

In this study, we intend to collect the maps of the Taijiang Inner Sea and Tayouan in Taiwan and other countries and the pieces of literature about VOC shipwrecks. By overlaying the maps and the data with the geographic information system (GIS), we can preliminarily speculate the possible locations or range of the shipwrecks, which can serve as a reference for investigating cultural heritage and target comparison. Lastly, we can organize the suspected targets found by the scientific devices for cultural heritage to check the correlation between the historical documents and the found data.

RESOURCES

First of all, regarding the source of historical documents, we have original and second-hand data. For accuracy, we took the journals, letters, and paintings to find the records and clues of ship sinking and estimate the possible locations of the shipwrecks with other data organized in previous research.

The historical data in this study include:

1. VOC Literature: *De Dagregisters van het Kasteel Zeelandia, Dagh-Register gehouden int Casteel Batavia: vant passerende daer ter plaetse als over geheel Nederlandts-India*, Report of Affairs in East India, *De missiven van de VOC-gouverneur in Taiwan aan de Gouverneur-generaal te Batavia*, and *Konxinga's March to Taiwan* by Albrecht Herport.
2. Maps: Overview Taijiang: Scanning Antique Maps of Tayouan for 400 Years, Historical Atlas of Tainan, 1626-1960, and Antique Maps Drawn by the Dutch in the 17th Century.
3. Previous Research: Report of Investigations on Port Channels of Tayouan and VOC Shipwrecks in the 17th Century by Tree Valley Foundation with the commission from the Administration Office of Taijiang National Park in 2012, as well as the Closing Report of Collection and Analysis of Historical documents and Data of VOC Shipwrecks by Tamkang University from 2015 to 2016 and the Report of Prospection Plan with Remote Sensing on Underwater Cultural Heritage in the Waters of Tayouan Port by Strong Engineering Consulting Co., Ltd. from 2017 to 2018 with the commission from Bureau of Cultural Heritage, Ministry of Culture.
4. Field Survey: On-site positioning of former sites of Fort Zeelandia, Tayouan Towns, Fort Provintia, and Zeeburgh, as well as detection with shipborne devices and investigation with an airborne magnetometer in waters of Taijiang.

FRAMEWORK

We collected the humanity and natural background data of the waters of the former Taijiang Inner Sea before planning this investigation, including:

1. Historical documents and data, such as the ports, the channels, naval warfare, and the shipwrecks.
2. Map data, such as historical maps and voyage maps.

3. Archaeological information on land, such as indigenous archaeological sites related to the VOC.

4. Terrain and environment data of the waters, such as the landform, depth, sediments, and depositions.

First, we organized the information about shipwrecks in the historical documents. As the records lacked coordinates, we could only mark the possible areas from the textual descriptions about the locations, wind direction, and relative position of the objects on land. Second, for the maps we collected, we would position and digitalize the buildings or historic sites that still stand today and overlay them with Taiwan e-Map. Third, we use GIS to establish the attribute data and carry out archives and analyses with these data. It can be helpful not only in drawing out the sensitive zone of the investigation but also in the comparison of the data. Such data can become a reference for future studies, courses, and promotions. Last, the target data from comparing the shipborne devices and airborne magnetometer in the waters of Taijiang can be input for overlay in GIS and serve as the basis for further investigations and the reference for EIA on the UCH in the future.

RESULTS

By organizing the historical documents, we can conclude that 11 ships sunk in the waters of Taijiang or Tayouan at the time. The vessel and brief information are shown in Table 1.

Table 1. Information of VOC Shipwrecks in the Waters near Tayouan

No.	Ship	Date of Shipwreck	Type	Tonnage	Location	Remarks
1	Valk (Valck)	1623-07-19	Jacht (Yacht)	60	South to the entrance	
2	Taiwan	1654-08-09	Jacht (Yacht)	150	Reef at the entrance	Port and Starboard (dismounted) Er'ren River Rear side of Fort Zeelandia
3	Verde	1654-10-28	Retour schip	400	Noorderrif Sicao, Tainan	
4	Lam, Witte	1654-10-28	Fluyt		Noorderrif Sicao, Tainan	Shipwreck Caya, Wengang (Northern Gate)
5	Formosa	1654-10-28	Galjoot		Western end of Baxemboy to Luermen	
6	Maarssen	1656-09-11	Jacht (Yacht)		Baxemboy	
7	Hector	1661-05-01	Jacht (Yacht)	300	Fort Zeelandia channel	
8	Immenhorn	1661-05-29	Galjoot		South to the entrance	
9	Urk	1661-08-18	Galjoot		Soulang River (Zengwen River) Mashagou, Jiangjun District, Tainan	
10	Koudekerke	1661-09-16	Jacht (Yacht)	100	Baxemboy	
11	Kortenhoef (Kurtenhofen)	1661-09-16			Baxemboy	

When choosing the base map, as Dutch Formosa lasted from 1624 to 1662, we could only obtain information about the shipwrecks after 1654. Therefore, we took Formosa 1652 / Een perfect caertjen vant Taijouanse canael as the base map because the era is closer and the terrain marking is the clearest.

For the modern map, we chose Taiwan e-Map and Google Maps as the base maps for overlay. After analyzing the relative locations of the shipwrecks in the texts, we marked on Formosa 1652 / Een perfect caertjen vant Taijouanse canael first and then overlaid with Taiwan e-Map after digital positioning. The combination produced Figure 4, and can be the referenced for detecting the target objects with the submersible devices.

Below I discuss our process of approximating two shipwrecks during the battle between Konxinga and the Dutch.

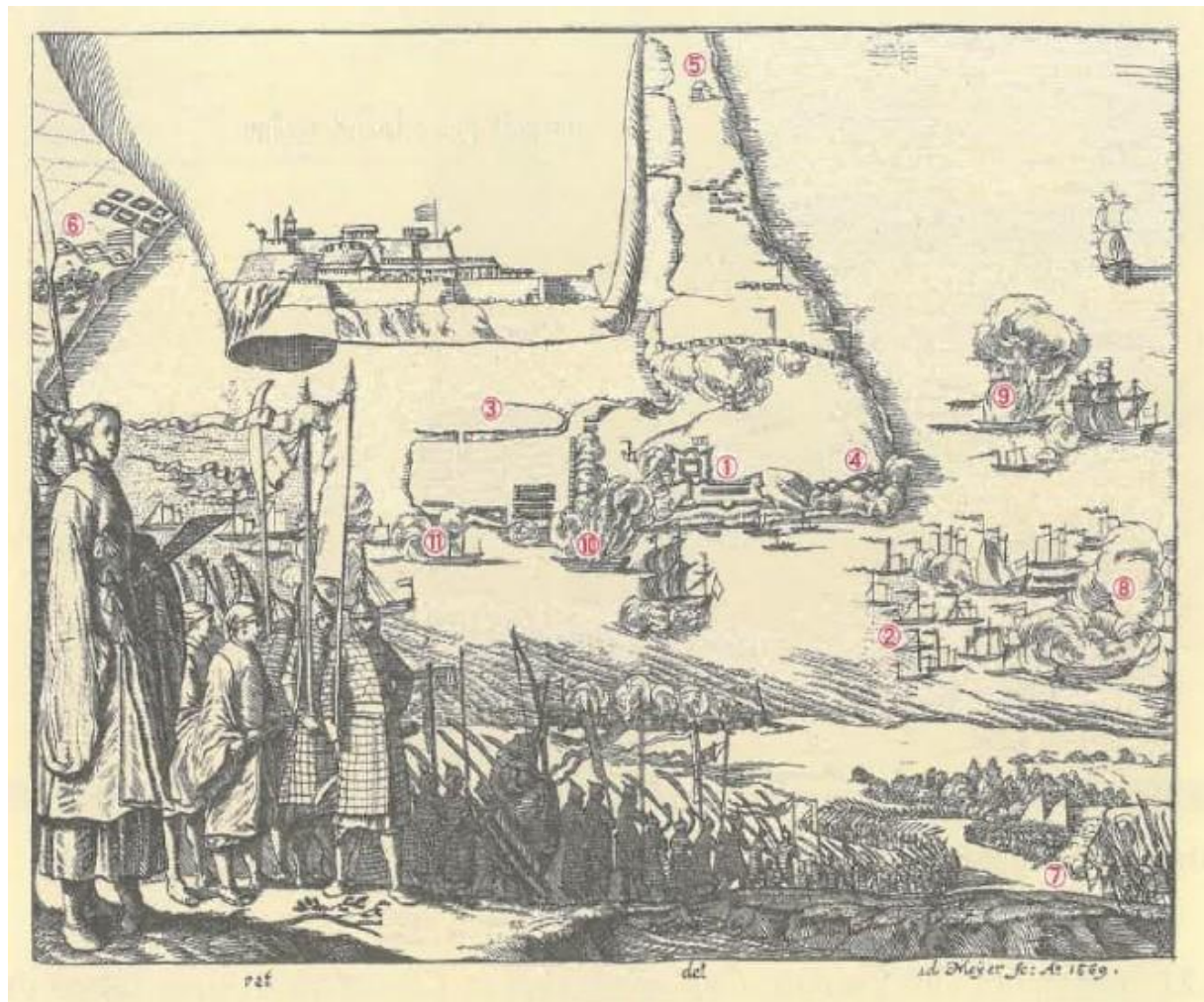


Figure 1: Fort Selandia on Teowan (Lai and Wei 2018)

I. *Hector*

According to De Dagregisters van het Kasteel Zeelandia, the *Hector* sank during the battle between Konxinga's fleet with the Dutch. On 30 April 1661, the *Hector*, the *Gravelande*, and the *Maria* were porting in the southern shipyard, preparing for battle (Chiang 2007). On 1 May the Dutch commander ordered the three ships to attack Konxinga's junk fleet. Based on the journal, we could only know the *Hector* was sinking in an explosion (caused by gunpowder) on the way to fight the fleet when sailing downwind. At the same time, the *Gravelande* and *Maria* successfully retreated to the southern porting site (Chiang 2007). The journal does not specify the route of the *Hector* nor the location where the explosion occurred. By comparing other documents, we found that two aerial views illustrated the blast of *Hector*. Although the views are not precise maps, they can serve as a reference to the relative location. According to the drawing of Die Vestung Seeland auff der Insul Tijawan gelegen published in Continuatio Diarri Europaei in 1663, the explosion was marked at the character C, which is by the

shore of towns in Tayouan; it's the northeastern direction from the towns. However, according to *Die vesting Selandia auff Teowan* drawn by the Swiss-Dutch soldier Albrecht Herport, the explosion was at the number 8 in Figure 1, between Baxemboy and Fort Zeelandia; it's the northwestern direction from the fort on the sea. The marked locations are different and contradictory. Regarding reliability, Albrecht Herport was witnessing the scene, so his drawing should be more accurate (Lai and Wei 2018). Thus, we adopted the location marked in *Die vesting Selandia auff Teowan* and believed the explosion of the *Hector* occurred between Baxemboy and Fort Zeelandia, which was the northwestern direction from the fort on the sea.

II. *Koudekerke*

According to *De Dagregisters van het Kasteel Zeelandia*, the *Koudekerke* arrived at Fort Zeelandia on 15 September 1661. The Dutch planned to detour to the rear side of the town of Tayouan, assaulting Konxinga's forces. The *Koudekerke* was ordered to port between the Noorstraat and the Custom House and attack from there on the 16th. On the day, the *Koudekerke* headed to the location but got away from the coast due to the winds. In the battle, cannons on the *Koudekerke* exploded and became the enemy's target, and it ended up sinking by the sand coast near the enemy's fort. For the relative location, please see the number 10 in Figure 1. Based on Figure 2, the Custom House was on the outskirts of the town. Although the ship was away from the coast, the location should be roughly near the Custom House. The sinking place should be by the sand coast near the eight cannons. Therefore, we deemed the shipwreck near the Custom House and by the shore of Fort Zeelandia.

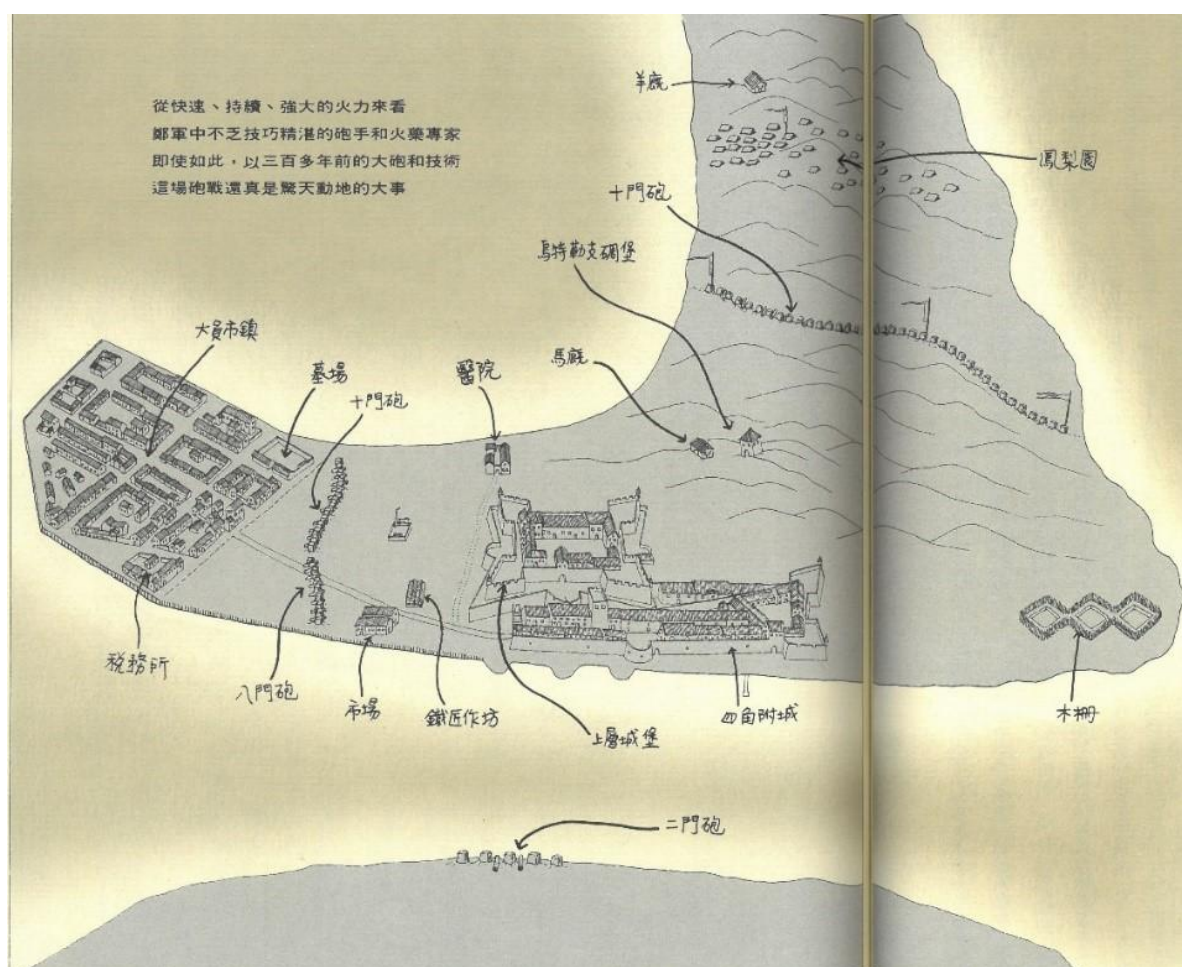


Figure 2: Locations of Sites in Tayouan (Chiang 1992)

Combined with Table 1 of the historical documents about the shipwrecks, the locations are presumed, as shown in the coloured polygons in Figure 3.

For detection with shipborne devices, we used side scan sonar, multibeam echo sounder, sub-bottom profiler, and magnetometer in the waters near Yanshui River and river mouth Luermen. Also, we chose to hang a magnetometer on the drone for investigation due to the different terrains at the tidal river, shoals, river mouth, wetlands, and the coast, as well as the dense woods of mangroves on both sides of the river, the sandbanks, and the oyster farms, which made underwater investigation very difficult. The muddy water is also a downside for divers or optical detection. After comparing and filtering the results from airborne and shipborne devices, we found seven suspected UCH sites.

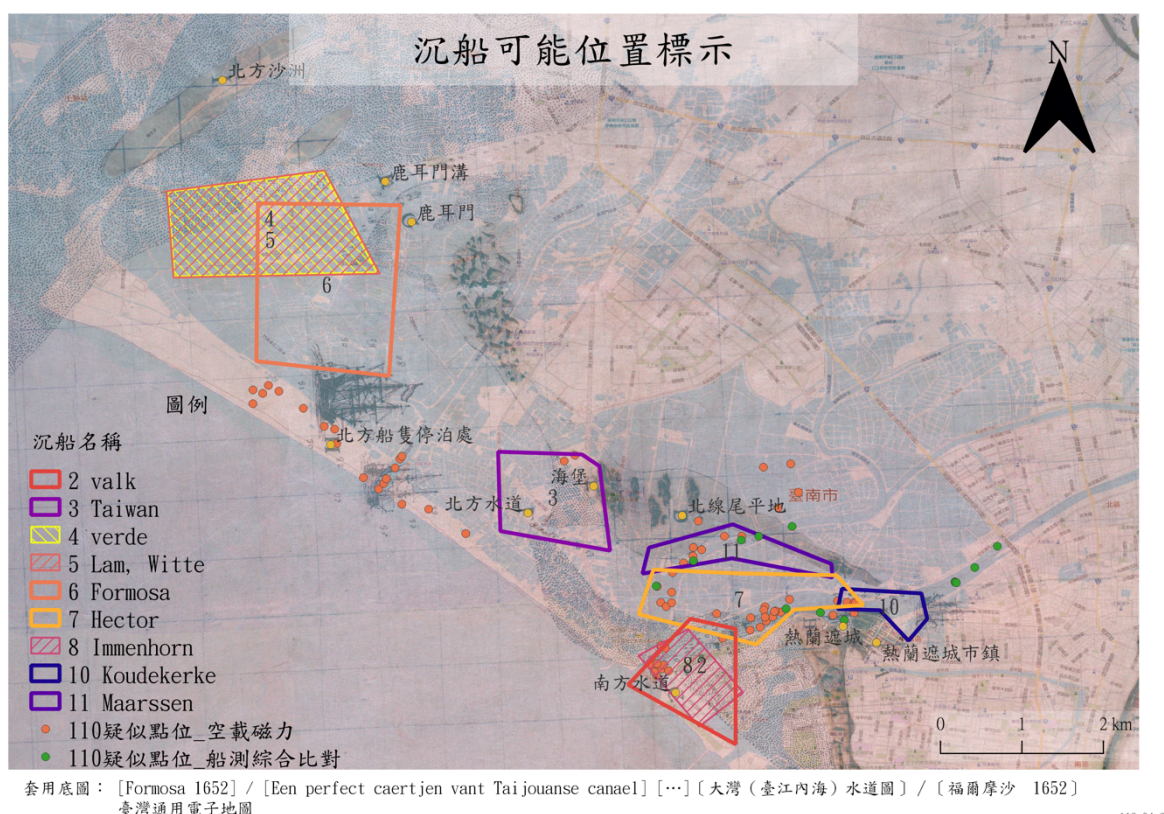


Figure 3: Overlay of Data from Historical Documents as well as the Investigations with Scientific Devices, Possible Locations of the VOC Shipwrecks (Map of Tainan Inner Sea)

We overlaid the results and the historical documents, as shown in the circular/coloured dots Figure 3, and saw they roughly match. As the investigations do not yet involve diving, optical detection with remotely operated vehicles (ROV), or archaeological sampling, the results concluded in Figure 3 can be taken as a reference in decision-making in future archaeological investigations or construction projects.

We also selected five of the seven suspected UCH sites in this study. We conducted sampling by core drilling to analyze the sedimentation and migration of the river. Combining the results of 210Pb dating and carbon-14 dating, we assumed that the locations of VOC shipwrecks are 0.7-2.7 meters beneath the riverbeds. It can also be the basis for river construction projects involving UCH investigation or surveillance.

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