Proceedings of the 3rd Asia-Pacific Regional Conference on Underwater Cultural Heritage

Brian Fahy, Sila Tripati, Veronica Walker-Vadiilo, Bill Jeffery, Jun Kimura

Editors

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Editors
Brian Fahy, Sila Tripati, Veronica Walker-Vadillo, Bill Jeffery, and Jun Kimura

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Acknowledgements

The 3rd Asia-Pacific Regional Conference on Underwater Cultural Heritage (www.apconf.org) was held in Hong Kong from the 27th to 30th November 2017, with a pre-conference excursion to the Nanhai No. 1 shipwreck museum in Yangjiang, China from 24th to 26th November and post-conference excursions in Hong Kong and Macau on 1st and 2nd December.

The conference was held at the Hong Kong Maritime Museum, Pier 8 in Central, Hong Kong, a Gold Sponsor of the conference (www.hkmartimemuseum.org).

The Taiwan Bureau of Cultural Heritage, Ministry of Culture was also a Gold Sponsor (www.boch.gov.tw).

Other sponsors (all Bronze category) included: the Australasian Institute of Maritime Archaeology; The Anthropology Department of the Chinese University of Hong Kong; the Department of Chinese and History of the City University of Hong Kong; The National Research Institute of Maritime Cultural Heritage, Korea and Tokai University in Japan.

We wish to thank all the sponsors for supporting this conference.
Forward

The theme of the 2017 conference was:

*The Maritime Cultural Landscapes and Seascapes of Asia-Pacific: Voyaging, Migration, Colonisation, Trade, and Cross-Cultural Contacts*

The aims of the conference are to address management and protection strategies of underwater cultural heritage in Asia and the countries of the Indian and Pacific Oceans in the 21st Century. To further these aims, this third regional conference in Hong Kong selected the above theme to explore in a more holistic approach, the incredible landscape and seascape that has been developed from thousands of years of human colonisation, migration, trade and cross-cultural contact in the region. This theme attracted over 100 delegates from 25 countries who formed 15 sessions and gave 125 presentations.

Dr. Le Thi Lien from the Vietnam Institute of Archaeology and the Hon. Robert Underwood, President of the University of Guam gave key-note presentations and spoke of underwater cultural heritage and its connection with the incredibly rich, varied and connected maritime cultural heritage of Asia and the Pacific.

Many conference papers were reviewed and edited by the Publications Committee and made available to all conference delegates in digital form. The study and preservation of underwater cultural heritage (UCH) benefits directly from the knowledge shared by these contributing authors, who are at the forefront of the UCH discipline across the Asia Pacific region. The Conference Organizing Committee would like to extend its gratitude to the authors and session organizers for making these papers available. While copyright in the conference proceedings as a whole is vested in the 2017 Asia-Pacific Regional
Conference Organizing Committee, the copyright of the individual papers belongs to their authors.

While the presentations in Hong Kong have ended, the conference will live on in a digital collection on the Museum of Underwater Archaeology (http://mua.apps.uri.edu). The papers are organized by session. By making this outstanding collection freely available online it is our hope that the conversations from Manila 2011, Hawaii 2014 and Hong Kong 2017 will continue into the future.

Look forward to seeing you again in 2020.

Dr. Bill Jeffery, Chair of the 2017 Conference Organizing Committee
Conference Overview

The need for comprehensive stewardship of marine and freshwater resources, specifically the cultural and historical assets commonly referred to as UCH, is the underlying reason for the Asia-Pacific Regional Conference on Underwater Cultural Heritage (APCONF) series. Recent decades have witnessed an expansion of activity directed at this heritage which has raised awareness of its potential and significance. Underwater cultural heritage is complex, combining related disciplines and issues critical to our time. Consideration of indigenous cultural values, heritage tourism, biological interactions, socio-economic benefits, and threats from increased development, industrial extraction, certain diving activities, and even sea-level rise and erosion, continues to shape our understanding of this field. Our reliance on maritime resources and need for ocean stewardship encourages government agencies, heritage groups, coastal zone managers, diving groups, and other ocean users to formulate a better approach to investigating and managing non-renewable underwater cultural heritage.

The inaugural Asia-Pacific Regional Conference on Underwater Cultural Heritage, initiated by Dr. Mark Staniforth, addressed all of those issues. Hosted by the Asian Academy for Heritage Management and the National Museum of the Philippines in Manila, From November 8 – 12, 2011, a wide range of professionals involved with underwater cultural heritage attended, including those from universities, government agencies, museum, NGOs, IGOs, the private sector and the community. The successful event featured 128 participants from 35 nations and also led to the published proceedings. Given the challenging size and diversity of the Asia-Pacific region, it was clear then that future conferences should seek a variety of locations, incorporating and benefiting from new experiences and perspectives.
The 2nd Asia-Pacific Regional Conference was held in Hawaii in 2014, whereby the University of Hawai‘i at Mānoa and the NOAA Office of National Marine Sanctuaries hosted 110 participants from over 27 nations to continue the tradition of raising awareness of and promoting collaboration in underwater cultural heritage.

The 2017 Asia-Pacific Regional Conference on Underwater Cultural Heritage in Hong Kong, provides an opportunity to further engage diverse additional contributions in the field, such as capacity building in the Pacific Islands (Session 1), studies in traditional boat technology (Session 12) and cross-regional studies into maritime communities (Session 14). In this way, the Hong Kong 2017 conference builds on the momentum generated by the two previous conferences in Manila and Hawai‘i while continuing the discussion of the nature, meaning, and potential of underwater cultural heritage, and to exchange and disseminate information about heritage and underwater/maritime archaeology projects from the countries of Asia and the countries of the Indian and Pacific Oceans.

The 2017 Asia-Pacific Regional Conference on Underwater Cultural Heritage included 15 session, 135 presentations, and nearly 60 published papers, contributed by over 100 registered participants from 30 different countries. The five-day event featured an opening reception, three days of concurrent presentation sessions, poster session, evening banquet and optional tours throughout Hong Kong and Kowloon.

**2017 conference aims:**

- address management and protection strategies of underwater cultural heritage and the countries of the Indian and Pacific Oceans in the 21st Century
- facilitate regional cooperation through the development of academic and governmental networks in the Asia-Pacific Region
• provide a forum for discussion of technical and ethical issues related to underwater cultural heritage and underwater archaeology
General Setting
The Hong Kong Maritime Museum is a vibrant, cultural institution dedicated to preserving, collecting and displaying objects that tell the story about trade and maritime in Hong Kong and the Pearl River Delta. A non-profit registered charity founded in 2003 by members of the Hong Kong Shipowners Association, the Museum opened in September 2005 at Murray House in Stanley and relocated in 2013 to Pier 8, in the heart of the Central Harbour Waterfront. Today the Museum attracts 100,000 visitors annually where across 4,400 square metres more than 1,200 objects are displayed in 13 galleries on three levels. All of which uniquely overlooks a bustling Victoria Harbour.

A special exhibition and events space, resource centre, roof-top café and gift shop augment visitors' experience and patrons and the community of Hong Kong actively engage in education and public programming offered for schools, community groups and families.

Moving to Pier 8 followed a public tender process initiated by the Hong Kong Government, which was awarded to the Museum in 2009. The Government, a principal contributor, provided funding to support the cost of relocation and new construction and has committed to an operational subsidy for the first five years of operations.

Mission
Our mission is to promote a greater knowledge of Hong Kong, China and Asia’s maritime history and the vital role that ships and the sea play in our past, present and future. We do this by providing the community and visitors with an exceptional museum experience and opportunities to learn about Hong Kong’s heritage and how it links with the rest of the world.
**Vision**

Our vision is to be the Hong Kong community-based centre of excellence for exploring local and regional maritime and shipping issues.

**Strategic Focus**

To ensure the ongoing success of the Museum we must continue to strengthen our position within Hong Kong’s cultural landscape and grow our capabilities as an organisation. Success over time will only be achieved by systematically building on achievements-to-date and ensuring new projects are linked to proven capabilities.

**Organizational Values**

- **Respect.** Show respect in the delivery of museum services at all times and with all stakeholders.

- **Stewardship.** Present the importance of Victoria Harbour and the role of maritime in Hong Kong and China through the collection, research and preservation of artefacts, and objects within our galleries for the public.

- **Learning.** Provide new and continuing opportunities for adults, students, scholars, families and the community to gain new knowledge.

- **Innovation.** Continually evolve and improve how we display objects and engage visitors and the community of Hong Kong.

- **Service.** Ensure an exceptional visitor experience with high quality displays, contextual storylines and thoughtful interactions with our staff.
List of Conference Sponsors:

Gold Sponsors

Preservation of Underwater Cultural Heritage in Taiwan

Underwater Cultural Heritage is an important part of history, and is the common heritage of all mankind. With the rapid advancement of exploration technology, underwater cultural heritage confronts increasing threats. As a result, Convention on the Protection of the Underwater Cultural Heritage was adopted by the United Nations Educational and Scientific and Cultural Organization (UNESCO) in 2001. The Convention recognizes the importance of underwater cultural heritage, but also urges the underwater cultural heritage needs to be protected through establishing a specialized protection mechanism and promoting international cooperation.

Underwater Cultural Heritage Preservation Act was formulated and implemented in Taiwan at the end of 2015 to echo the spirit of the UN Convention, ushering into a new era of preserving underwater cultural heritage in Taiwan. The Bureau of Cultural Heritage of the Ministry of Culture (BOCH/MOC), as the competent authority of underwater cultural heritage preservation and research, is endowed with the responsibility for enhancing its preservation, studies, maintenance, management, application, education, promotion, sponsoring and international cooperation.

Taiwan is surrounded by ocean. Abundant underwater cultural heritage is left by ancestors as they were engaged in various activities and navigation in these waters. Since September 2006, Taiwan’s competent authority of culture entrusted the Academia Sinica to conduct an investigation study of sinking ships in Magong port of Penghu, and cultivate talents in preservation science, initiating Taiwan’s underwater archaeology. Since then, underwater cultural heritage survey is conducted in scientific and non-intrusive ways, which include scientific exploration and diver’s visual investigation. Scientific equipments used for marine exploration includes Side-scan Sonar, Multi-beams and Sub-bottom Profiler, Remotely Operated Vehicle (ROV), underwater positioning system, magnetic detector and Differential Global Positioning System (DGPS).

Over the past 10 plus years, more than 100 concrete underwater targets near the waters of Penghu, southwestern Taiwan, Dangsha atoll and Green Island. Among which, 17 locations are recognized as historical sinking ships from Song Dynasty to World War II. Four ships, General No.1, Warship Guang Bing, Green Island No. 1 and S.S. Sabraon are enrolled as the priority for management and protection by the Ministry of Cultural as they have high value of cultural heritage and for study in accordance with the Underwater Cultural Heritage Preservation Act.

In order to strengthen the study of underwater cultural heritage preservation, the BOCH/MOC in accordance with relevant regulations of Underwater Cultural Heritage Preservation Act, will formulate mid- to long-term study and development strategy and project, set up national underwater cultural heritage preservation institute, continue to have general survey of underwater cultural heritage, establish basic data bank, enroll to manage underwater cultural heritage, set up a sanctuary to tighten supervision and management, enhance exploration technology, purchase necessary equipments, cultivate professionals, increase education and public awareness, strengthen international exchanges and cooperation to preserve the shared underwater heritage of all mankind.

Underwater Cultural Heritage Preservation Act (Full Text):

Bureau of Cultural Heritage, Ministry of Culture ©
Tel : +886-4-2229-5848 Fax : +886-4-2229-8240
Web : http://www.boch.gov.tw/
Address : No. 362, Sec. 3, FuHeing Rd, South Dist., Taichung City, Taiwan 40247
Discover Hong Kong’s Maritime Heritage at Central Pier 8

Chinese troops engaging pirates on the China coast in Chek Lap Kok Lantau Island, Hong Kong

C. 1820
Chinese school
Oil on canvas
Gift of Roger and Miranda Keyme

Hong Kong Maritime Museum
Central Pier No. 8, Hong Kong
Tel: +852 2713 2500
Email: info@hkmaritimemuseum.org
www.hkmaritimemuseum.org
The Department of Chinese and History of the City University of Hong Kong values the complementary development and interaction between teaching and research. Our programmes place special emphasis on the acquirement of historical and cultural knowledge, and training of language competence, leadership and critical thinking skills, which enables students to apply their knowledge in diverse professions, enterprises, and academia. We also actively explore the research direction of “development of China’s coastal cities in a global perspective”, and collaborate with mainland China and international academia in organizing conferences and seminars, publishing journals/books and doing research projects.
Tokai University is one of the largest private universities in Japan, composed of 21 schools and faculties. The School of Marine Science and Technology is the leading high education and research body in the field of oceanography in Japan. The School consists of eight departments including the Department of Maritime Civilizations. The Department provides a focus for maritime archaeological research and three-full time staff are experts in marine-zoo archaeology, coastal and island archaeology, and maritime archaeology.
Session 1: Underwater and maritime archaeology and capacity building in the Pacific Islands

Abstract
The Pacific Ocean contains a wealth of underwater cultural heritage (UCH) spanning human history from the Stone Age to the atomic age. Since the first Pacific UCH Workshop held in Solomon Islands in 2009, the Pacific island nations have been progressing in the implementation of the Pacific UCH Programme by awareness raising, research and capacity building activities through inter-disciplinary cooperation and promoting synergy with the Pacific World Heritage and Intangible Cultural Heritage Programmes. Notable progresses include, among others, the SIDS Accelerated Modalities of Action (SAMOA) Outcome Document of the 3rd UN International Cooperation on Small Island Developing States (SIDS) (Samoa, 2014) that contains references to the importance of UCH for sustainable development of SIDS and SIDS ratification of the UNESCO Convention for the Protection of the Underwater Cultural Heritage (2001), as well as the enhanced cooperation between universities in the Pacific islands and professional training institutions through UNESCO University Twinning and Networking Programme (UNITWIN) for Underwater Archaeology.

With this as its background, the session “Underwater and maritime archaeology and capacity building in the Pacific Islands” will be held with the aims to: i) share information on recent progress in awareness raising, research and capacity building activities in underwater and maritime archaeology in the Pacific Islands, ii) identify priority actions, iii) foster partnership for regional and international cooperation. The session especially welcomes presentations focusing on the protection and management of UCH belonging to indigenous community shared UCH in the Pacific, addressing challenges and opportunities facing Pacific SIDS in the implementation of the Pacific UCH Programme and the promotion of the UCH Convention, presenting good practice in ensuring the effective engagement of Pacific island countries and community in UCH management for their sustainable development, and proposing collaborative projects in this area.

Session Chairs: Dr. Akatsuki Takahashi
                 Mr. Andrew Viduka
                 Mr. Nicolas Bigourdan
Trade in Ceramics on Guam in the Wake of the Manila Galleon

Lon E. Bulgrin
Archaeologist/Cultural Resources Manager Navy Base Guam

Abstract

Various colonial factors led to the Mariana Islands being one of the most economically isolated areas of the Pacific from the late 17th century until the late 18th century. This isolation is reflected in the dearth of artifacts of European and Asian origin in the archaeological record. Starting in the late 18th century rules on public trade were relaxed and outside goods became more readily available in the Marianas, if still uncommon. This paper considers the ceramic collection from the Rosario House located in Hagatna, Guam. The Rosario House has the largest data set of imported Euro-American and Asian historical artifacts that has been discovered in the Mariana Islands to date. The collection is dominated by Provincial Chinese porcelains and stonewares but also includes a sample of refined European earthenwares.

Key words: Guam, Pacific Islands, Manila Galleon, Ceramics

Introduction

The Mariana Islands are some of the most geographically isolated islands in the Western Pacific. They lie on the western periphery of Oceania, located approximately 1200 miles southeast of Japan and 1500 miles east of the Philippines (Fig. 1). Spanish colonial policies of the late 17th century further isolated the Chamorro people of the Marianas from other indigenous polities in the Pacific. This solitude and segregation from the rest of Oceania would last through the late 19th century. This isolation extended to economic exchange even as they acted as a key nexus in the Manila Galleon trade. This paper will examine Guam’s place in world trade at the end of the Manila Galleon trade through archaeologically recovered ceramics.
Historic Background

Guam was the first landfall in the Pacific of an occupied island by Magellan and his exhausted scurvy-ridden crew in his quest to reach the Spice Islands. When Magellan and his crew made anchor on Guam on that first long trek across the Pacific they felt both saved and threatened in the initial lifesaving exchanges of food and water that were made with indigenous Chamorro inhabitants. The day after contact Magellan’s men launched an assault on a Chamorro village and burnt most of it down in the course of recovering a ships boat needed to sound future anchorages. Yet, at the same time that these Europeans were conducting a raid against one Chamorro village they were busy trading for fresh food and water with others. This ambiguity involving violence continued through the early Manila Galleon trade (Rogers 1995; Giraldez 2015).

For the next 150 years or so, the Mariana Islands were common stopping places on the southern leg of the Manila Galleon route to take on water, fruit, and fresh food. Trade was done at a distance with laughing Chamorros making sea-borne
trades of rice and other victuals that often turned out to mostly consist of baskets of rocks and sand or coconut oil heavily diluted with seawater (Pigafetta 1521 and Legaspi 1564 in Barratt 2003: 56 and 61-62). The Chamorros had to maintain a safe distance from the Spanish ships or they might themselves impressed as involuntary translators for future voyages or worse yet working the pumps all the way to Manila in the stinking, over heated bilges of leaking galleons (Giraldez 2015:49).

The Spanish mission and the colonization that rapidly followed in the Marianas were directly related to the glimpses of the islands from the passing galleons that inflamed the imaginations of various churchmen who saw them as fertile fields for the harvest of souls (Driver 1989). The Spanish crown showed initially little interest in acquiring a string of tiny islands without spice, textile, or mineral resources. Zealous religious first jumped ship to convert the Chamorro. After a campaign conducted by the politically connected Father San Vittores a Jesuit mission was established (McDonough 2004; Coomans 1997). The Marianas mission rapidly found itself embroiled in cultural and political conflict with local power structures and called for protection from the Crown (Lesveque 1995; Levesque 1996). However, the military companies sent for their protection were “like a rich armor worn in heat of day that scalds with safety” (Shakespeare Henry IV PtII.). The churchmen spent much of the next century or so complaining about the character and behavior of the troops and their captains. Still without the military presence the Catholic Church would have been unable to further their mission of conversion. The Spanish controlled islands became safe harbors for galleons battered by typhoons or just poorly captained or incompetently crewed in the Acapulco crossing. These islands were also a welcome stop to take on fresh fruit and vegetables during the Manila crossing.
Prior to European Contact the Chamorro people had maintained limited trading contact and social ties with the Caroline Island groups of Chuuk and Yap to the south and with the Philippines to the west (Farrell 2011:211; Quimby 2011). The punctuated natures of these trade ties are reflected in the sparse evidence of long distance trade in the archaeological record. Linguistic and historic accounts have been interpreted to represent a limited trade in iron with the Philippines (Quimby 2011) and perhaps iron fragments discovered at the Obyan latte site (Spoehr 1957) on Saipan may reflect a Pre-Contact trade in iron. Ethnohistoric evidence and historical accounts of the Carolinian contacts with the Marianas, however, are clear on the trade and interaction. The descendents of migrants from the outer islands of Yap and Chuuk make up a small but significant population of the Northern Mariana Islands and their relatives still visit Saipan using the traditional navigation chants to guide their way. At some time in the late 17th century the navigation routes disseminated and controlled by chants between the islands to the south to Guam were magically closed by the master navigators of the Carolines in response to stories of Spanish cruelty related by Guam Chamorros (Smith 2003:79; Farrell 2011:211). The Marianas were now isolated from their traditional Pacific trade partners.

By the early 19th century Spanish policies of isolation, the Catholic mission, and the relentless hammering taken by the Chamorro people from introduced European and Asian diseases had eliminated the limited ties that once had bound them with their neighbors in the Pacific (Farrell 2011). The Spanish mission in the Marianas concentrated not only on the introduction of the Catholic faith but also inculcation and enforcement of European social and gender roles (Russell 1998). A primary goal was to eliminate the animistic beliefs and ancestor worship of the Chamorro. To this end, indigenous songs, dances, and oral histories were actively discouraged by the Jesuit Fathers. Indigenous
knowledge systems that did not explicitly find favor with the Church rapidly eroded. Proprietary knowledge of all kinds was made vulnerable by the need to limit transmission to chosen heirs, the association with non-Catholic ancestors, and the unpredictable appearances of diseases that swept away the living repositories. Seafaring and navigational knowledge and expertise were heavily impacted by this social revolution. A people capable of making rapid voyages up and down the Marianas chain and of delivering passengers from Guam to Manila in 4 to 6 days as late as 1704 were barely capable of sailing beyond the northern tip of Guam by 1819 (Freycinet 2003, Originally 1827).

The Spanish were interested in maintaining this isolation for geo-political as well as religious reasons, primarily to deny access to rival European powers. The Marianas were an important stop off point for the Manila galleons making their voyages between Manila and Acapulco, carrying New World silver in exchange for the spices, silks, and gold of Asia. The Pacific route of the galleons was composed of extremely empty distances with very few points where fresh water and food could be brought on board. The galleon routes could be approached by pirates from only a few points and the Spanish wanted to limit this. Denying access to the Marianas was a way to keep English and Dutch at bay. Accordingly the Spanish crown did not allow trade with foreign nationals in the Marianas. They maintained their own garrison and mission on Guam with an annual *situado* or subsidy (Farrell 2011:192) that arrived on a very irregular basis. A series of venal governors usually managed to reacquire the majority or entirety of this subsidy before they were recalled, actively cheating their troops as well as the local subjects. The economies on the inhabited islands of Guam, Rota, and Saipan were subsistence based with limited internal trade and no outside trade to speak of. Local people saw little to no benefit from the galleon trade or the government (Rogers 1995).
After the political unrest and revolutions in South and Central America starting in 1808, the Spanish money making machine, trading silver mined by *encomienda* labor in the New World for Asian gold and goods in the Philippines totally broke down (Giraldez 2015). The structural position of the Mariana Islands changed for the Spanish crown. No longer were the islands an essential supply stop and defensive shield for the Manila galleons located within a “Spanish lake”. Now they were at the ends of the earth, just beyond the Philippines, and a fiscal drain. Accordingly, the yearly *situado*, of New World silver, that provided payment for the Mission and the garrison was radically reduced (Rodgers 1995:93). Economically, changes had already been made in the trade policy in the Marianas before the revolutions. Governor Cerain, 1776-1786, had issued a proclamation allowing both internal trade as well as trade with passing ships. This was due to a deteriorating economy and the increase of foreign whaling vessels in the Pacific.

The 19th century saw a slow opening and reintegration of the Marianas with the rest of the world. The Pacific whaling fleet composed primarily of U.S. and British vessels consistently wintered a few ships at Guam and Saipan. Sailors came ashore looking for leisure, fresh food, liquor and companionship, not necessarily in that order. The 19th century also saw a reappearance of Carolinians in the Marianas. The chief and master-navigator Aghurubw reopened the navigational ways to the Marianas and led a fleet of canoes of Carolinean families north (Driver and Brunal-Perry 1996; Smith 2003). The governor of Guam gave them permission to settle on Saipan. More canoes would come north in the continuing decades and would help to spur interisland trade. The Marianas remained underdeveloped with land ownership becoming more concentrated in the hands of the Church and elite families (Rogers
Many of the smaller landholding families slipped into debt peonage (Rogers 1995).

During the stay over on Saipan and Guam, many whalers lodged with local families and presumably paid primarily in goods for room and board. The annual supply ship from the Philippines usually also wintered in the Marianas until the trade winds were steady. Some wealthy families also contracted with visiting ships to provide provisions. Providing fresh foods and salt meats would have required large land holdings so presumably only those families with significant crown grants would have been major players in the trade (Madrid 2006:14). Regardless of the participants this trade would have decreased, as the whaling fleets declined, through the mid to late 19th century (Rogers 1995:105).

The lives of average Chamorro families were not much affected by these economic changes. They continued in their yearly rounds of religious festivals. They conducted small scale agriculture, fished and hunted, collected wild foods, and practiced limited animal husbandry. Most Chamorros retained two residences under the Spanish. During the week they lived on small farms called *lancho* and returned to their formal residence on the weekend to attend religious services (Madrid 2006:8; Rogers 1995).

In 1898 the United States seized Guam during the Spanish American War. Following its defeat Spain sold the remainder of the archipelago, the Northern Mariana Islands, to Germany. Japan seized the Northern Marianas from Germany in 1914 during World War I and Guam from the U.S, in 1941 during World War II. The United States took Saipan, Tinian, and Guam in amphibious assaults in 1944 and retained the entire archipelago after WWII (Rogers 1995).
**Historical Archaeology and Rosario House**

Historical archaeological investigations into the Spanish Period in the Marianas have been limited. Almost all investigations have focused on the island of Guam where the vast majority of the population, the Catholic Mission, and colonial government were located.

There are two principle challenges in conducting historical archaeology in the Mariana Islands. The first is the paucity of identifiable historic artifacts and the second is the direct involvement of the island chain in the ground combat of World War II.

The paucity of identifiable historic artifacts is rooted in two separate factors. The primary factor is the economic isolation of the archipelago previously discussed. The second is the hostile preservation conditions. High heat and humidity, acidic soils and high levels of salt combined with termites, mildew, and periodic typhoons, rapidly decay most materials including metal.

The effects of WWII can not be overemphasized in the historic archaeology of the Marianas. The majority of Saipan and Tinian and a significant portion of Guam were subjected to naval and aerial bombardment and combat ground operations. More importantly, post battle cleanup and the WWII logistical buildup subjected huge portions of the islands to the not so tender mercy of the Seabees, who never did anything with hand tools when it could be done mechanically. Their “Can Do” spirit was a war winning attitude but it wreaked havoc on the archaeological sites of the Marianas. This damage was particularly acute because of the aforementioned lancho residence system. The three largest towns and commercial centers on Guam; Hagatna, Sumay, and Agat were destroyed and built over, as was Garapan, the largest town on Saipan. In
the case of Hagatna significant portions were bulldozed into the sea to create additional land. Garapan also suffered extreme earthmoving. These actions eliminated most of the formal residences in the Marianas where imported materials were present for archaeologists to study. Asian and European artifacts have been discovered at former lancho sites but they are not common finds and they are present in low densities.

The Rosario House (Fig. 2) is one of the few surviving Pre-WWII buildings and intact archaeological sites remaining in Hagatna on Guam. The site was investigated by archaeologists from Micronesian Archaeological Research Services in 1988 (Moore et.al. 1993). The largest historic ceramic collection discovered in the Marianas was recovered from these excavations. In 2009 the Guam Preservation Trust funded the cataloging of this important collection (Bulgrin 2010).

![The Rosario House](image)

**Fig. 2: The Rosario House. (Guam Preservation Trust)**

Stratigraphical interpretation of the excavations at the Rosario House indicates historical processes that caused disturbance and soil mixing in the areas tested. A leaching field and potential excavation for garbage disposal appear to have
mixed PreContact and historical deposits. Laboratory analyses agreed with these interpretations. Uncertain contexts have limited chronological interpretations so the collection needs to be addressed as a totality.

The Rosario House Ceramic Collection

A large variety of European and Asian ceramics were recovered from the initial testing at the Rosario House. The vast majority of the ceramics dated from the late 18th century to the late 19th century. European ceramics made up 24% of the Rosario House collection and were dominated by wares manufactured in the United Kingdom. This is no surprise given the English domination of ceramic production at that time (Tames 1995:39). Asian ceramics present at Rosario House were manufactured in both China and Japan. The Chinese ceramics, porcelain and stoneware, composed 71% of the collection and tended to cluster in the late 18th to mid-19th century. Japanese porcelain and stoneware made up the remaining 5% of the collection and dated from the late 19th century to the 20th century.

Fig. 3: European Ceramics. (Adapted from Bulgrin 2010)
European ceramics (Fig. 3) are uncommon finds on historic sites in the Marianas and the Rosario House is unique in the quantity and richness of their discovery. European refined earthen wares present were produced for food service or hygienic purposes. The more utilitarian earthenwares of the time produced for food preparation and storage such as yellow ware, Rockingham glazed yellow wares, and annular whitewares were present but in very low numbers.

Decorated refined earthenwares predominated. Creamwares, pearlwares, whitewares, and a very few semi-porcelain sherds were recovered. The only wares that were not decorated were the creamwares and a single tin glazed earthenware sherd. These are presumably some of the earliest European ceramic type introduced into the Marianas (other than a very few majolica vessels, none of which were discovered at the Rosario House). Decoration ranges from inexpensive shell edged wares and sponge stamped wares to transfer prints. Transferprints were recovered in all colors produced, but blue was the most common. Plates and large serving or hygienic vessels predominated as vessel forms with cups and bowls making up the majority of the rest of the collection. Unusual vessel types include an open vegetable dish, a chamber pot or spittoon, a child’s chamber pot, a possible candlestick and a teapot. Importantly, none of the recovered ceramics matched any other within the collection and it appears that they were acquired individually. Two unusual finds include a copper luster sherd and a fragment of an animal figurine.

Chinese porcelains and stonewares made up by far the largest proportion of the ceramics collected from excavations at Rosario House. This study does not address the large quantity of utilitarian stoneware recovered at the site. Asian stoneware jars of various makes and national origins were ubiquitous in trade within Southeast Asia and the Manila Galleons, being the shipping containers of their day.
Almost all of the Chinese porcelain (Fig. 4) present was of the type commonly referred to as Provincial ware whose production was centered in Fujian province (Macintosh 1977; Sheaf and Kilburn 1988). These wares were produced for Asian tastes rather than European and are of a different quality and aesthetic to the porcelain exported to the West. Porcelain bodies were a uniform light grey. Glazes ranged from pale blue through pale grey for most sherds. More unusual glaze tints included pale greenish grey and pale cream colored. Most vessels were decorated with blue underglaze handpainting but there are examples of underglaze block printing and overglaze hand painting as well. Unglazed rings on both the interior and exterior are another common technique present. Unglazed footrings and sand adhesions are also common. Several sherds were clearly of inferior production runs as they appeared to be over oxidized perhaps due to an early opening of the kiln.

![Chinese Porcelain Diagram](image)

Fig. 4: Chinese Porcelain. (Adapted from Bulgrin 2010)

A small number of porcelain sherds were clearly produced for the European export trade based on quality, form, and painting style. One sherd has
characteristics of early 19th century English porcelain and another higher quality painted sherd has an Empire Shape lobed body (Berthoud 1990:105).

Many porcelain sherds from Rosario House are identical to ceramics recovered from the wreck of the Junk Tek Sing that sank in 1822 (Pickford and Hatcher 2000). These include motifs such as stylized peach sprays, stylized Sanskrit printing, floral sprays, and lingzhi fungus and flower heads within a spiral or bloom. Koh (2013) has identified the majority of the porcelain from the Tek Sing as Dehua Blue and White. Dehua blue and white porcelains were a lesser quality ware that was principally marketed to Southeast Asia. Koh (2013) has also proposed that the Tek Sing cargo serves as a reference collection for the late Qianlong/Daoguang period (late 18th century – 1850). Nevertheless, the variety of glazes present and different painting techniques and quality among the porcelain collection make it unlikely that all of the collection is the product of the Dehua kilns.

Porcelain vessel types are overwhelmingly for food service, predominantly bowls and cups. The general impression from working with the collection is that sets of bowls and cups are present at the site but this can not be stated with certainty due to the small size of most of the sherds recovered and the few cross mends that could be made. A number of sherds from small plates with a dark blue edge with lotus blossoms was found in two of the excavation units and were almost certainly a set. Similar decorated plates are dated from 1825-1850 (Mudge 1986:182). Block printed “debased Sanskrit” pattern bowls are another possible set present in the assemblage. The availability of these as sets is reinforced by block printed “Sanskrit” bowl sherds recovered from excavations at the Governor’s palace at Hagatna (Schuetz 2007:139).
Chinese stoneware (Fig. 5) makes up a small proportion of the Rosario House collection. Two distinct types are present in the collection. The first type has a buff body and cream colored glaze. Decoration consists of crimson overglaze painting. The second type has a body varying from grey to pale buff to pinkish buff, glazes ranging from pale greyish blue to cream, and underglaze blue painting.

The ceramic collection from Rosario House seems to be a direct reflection of economic opportunities for an elite family on Guam. The earliest architectural remains at Rosario House date to approximately 1750 but there are no imported artifacts from that period. Upon legalization of private trade, foreign artifacts immediately appeared but in low quantities. With the advent of the whalers quantities increase and more varied goods are available. European ceramics appear to be individually acquired and may reflect lodging and board transactions for whaling crews. Chinese ceramics are available in greater quantity and possibly in sets. However, the porcelain’s quality is low and lower
quality stoneware copies are sometimes substituted for porcelain vessels. Provincial porcelain is difficult to date, particularly as fragmented as it is in the Rosario House collection. However, the porcelain recovered from the Rosario House site is extremely similar in style to the cargo recovered from the Tek Sing wreck of 1822 (Pickford and Hatcher 2000). Logically the porcelain at both location dates to approximately the same date. Given that cargoes may have been assembled over time from wares in storage a time frame of the late 18th century – 1830s seems appropriate for the porcelain. Ceramics at Rosario House dating to the late 19th century and early 20th century are almost entirely Japanese stenciled porcelains.

Two different ceramic types, Chinese Provisional porcelain and English refined earthenwares are predominant in the Rosario House collection. Clearly these ceramics were manufactured in two different areas of the world under very different conditions and their distribution in tandem is unlikely. It is also interesting that European ceramics appear to have been acquired singly while Chinese ceramics were available in sets or small lots of similar decoration. These patterns indicate two different streams of availability.

It is likely that the European ceramics were acquired in serial transactions with Euro-American sailors as payments for lodging, meals, or commodities such as dried meat, coffee or tobacco, that were locally available. Whaling ships may have carried ceramics as part of a suite of trade goods to reprovision and refit ships over the whaling voyage. It is possible that crews were able to draw from these against future wages for their needs or they may have brought their own trade goods in their sea chests against future need.

Chinese porcelain availability in sets (Fig. 6) indicates a different kind and direction of trade. These were available for trade or purchase in bulk, if not necessarily on a regular basis. Provincial porcelain was produced for and
marketed to the Southeast Asian market. It is unlikely that whaling ships would have chosen to load these ceramics in bulk at their home ports in New England or the United Kingdom when cheaper industrially produced English earthenwares were available. It is also unlikely that these ceramics are tied to the Manila Galleon. These porcelains would have been readily available in Manila but in order to be transported to Guam via the galleon trade they would have had to be trans-shipped through Acapulco and back to Guam. This is an unlikely scenario as separate taxes and fees would have had to be paid and the ceramics could have already been sold for a substantial profit in Mexico. In addition, the bulk of the Provincial porcelain in the Rosario collection postdates the Manila Galleon. Therefore, it appears that these ceramics were being shipped directly from the Philippines to Guam, most likely by the annual supply ship or mail schooners. It is ironic that the demise of the galleon trade actually led to an increased availability of consumer goods on Guam. It is not clear whether this was speculative trade or orders put in by local consumers or retailers for delivery.

**Fig. 6: Porcelain Patterns. (Adapted from Bulgrin 2010)**
Conclusion

Several preliminary conclusions on consumer choice can be made for the family that lived at the Rosario House given the caveats of limited sample size. The first is that the end of the galleon trade and the political turmoil of the South and Central American revolutions expanded the availability of foreign commodities on Guam. This supposes that other non-preserved commodities such as fabric that presumably made up the bulk of trade followed the pattern for ceramics. The second is that options on the products available were still limited. Large serving bowls and other serving vessels, and hygienic vessels such as ewers and basins and chamber pots were probably only available when European or American ships were in port. This hypothesized punctuated availability likely extended to other commodities as well. Rarity and inherent fragility possibly indicate use of these vessels primarily for display and prestige purposes. In the case of imported ceramics there was a preference for food service vessels such as cups, bowls and plates, over utilitarian vessels such as pans, mixing bowls, bottles, and jars. Presumably food storage and preparation functions were being taken up by more durable though heavier stonewares. In the case of European ceramics, there was a preference for decorated wares and this continued over time. This is in contrast to the general trend by European manufacturers of producing plainer, whiter vessels such as molded ironstones. There was also a preference for blue decorated wares over other colors. Finally, even when broken, imported ceramics retained some value as there are multiple examples of broken sherds rechipped into circular gaming or tally pieces. Hopefully, more archaeological testing will be conducted at the Rosario House in conjunction with planned rehabilitation and these hypotheses can be tested with additional data.
(Please note that this research was conducted privately by the author under Guam Preservation Trust Grant GPTG-08-01 and does not represent the opinion or the policy of the U.S. Navy)

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**Biography**

Lon Bulgrin is the Archaeologist and Cultural Resources Manager for U.S. Navy Base Guam. He has worked in various capacities in the Western Pacific for over 20 years and is the former State Archaeologist and Deputy Historic Preservation Officer for the Commonwealth of the Northern Mariana Islands. Prior to working in the Pacific, Mr. Bulgrin worked in the Midwestern and Northeastern U.S. His research interests concentrate on the Contact Period, historic archaeology, historic ceramics and glass, battlefield and conflict archaeology, and the Latte Period in the Mariana Islands.
Reinterpretation of Stone Fish Weirs mentioned to Freycinet in 1819 on Guam

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Abstract

In 1819 the French Corvette L’Uranie anchored off Apra Harbor on Guam where its captain Louis Claude de Freycinet was told of the former presence of stone fish weirs, no longer in use. Archaeological surveys of Apra Harbor tidal flats identified several low-walled coral enclosures at the mouth of two freshwater estuaries. Controlled excavation of small sites adjacent to one of these complexes yielded late Latte Period pottery and wood charcoal radiocarbon dated with a Bayesian calibration to A.D. 1645-1725. Besides Chamorro fishermen using the weirs to feed local populations, it is plausible they were expanded to feed visiting sailors during the seasonal arrival of the Manila Galleons. More challenging to former notions of Colonial domination is archaeological evidence documenting the continuity of communal aquaculture practices well after sustained Contact. The apparent resistance of Chamorro fishermen to La Reduccion circa 1700 is provocative, especially after the introduction of Eurocentric food ways and enforced settlement patterns.

Key words: Guam, Fishing Weirs, Pacific, Radiocarbon

Introduction

In 1998, an archaeological survey for the U.S. Navy of Outer Apra Harbor tidal flats on the Micronesian island of Guam (Fig. 1) identified several low-walled coral enclosures at the mouth of a freshwater estuary (Dixon et al. 2013), first recorded in 1991 (Wylie and Madsen 1991). Piles of WWII-era bottles of Japanese manufacture and discarded bivalve shells were also found on the surface at these shoreline sites, suggesting that the walls themselves may have been constructed to foster shellfish production by forced native labor known to have been used to expand wartime rice fields nearby. However, interviews with
a local Chamorro resident who abandoned the area with his family in 1941 yielded no memory of the walls in Apra Harbor during their periodic harvesting of shellfish before the war⁴.

![Fig. 1: Location of Gigao on Guam. (Modified from Dixon, et al. 2017:196)](image_url)

Another archaeological survey of Inner Apra Harbor tidal flats in 2002 identified more low-walled coral enclosures at the mouth of two freshwater estuaries, many overgrown by mangroves or half-buried by silt, thus bringing archival documents in the Micronesian Area Research Center (MARC) at the University of Guam (UOG) under new scrutiny. A rereading of Captain Louis Claude de Freycinet’s account of his 1819 visit to Apra Harbor aboard the French Corvette L’Uranie suggested these sites might be the stone fish weirs or gigao mentioned by Chamorro residents.
On March 17, 1819, the French corvette *L’Uranie* anchored off Apra Harbor in Guam on a three year scientific mission to the Pacific which eventually circumnavigated the globe (Freycinet 2003), finishing the voyage in the vessel *Physicienne* (Arago 2013). While surveying the island and its inhabitants’ customs, Captain Louis de Freycinet was told of the former presence of stone fish weirs no longer in use. Most archaeologists and historians assumed that Freycinet was misinformed or such features had not survived the frequent typhoons that affect the region, as well as the ravages of WWII and subsequent U.S. Navy harbor construction.

WWII therefore seemed the most logical date of origin for these walls (Dixon et al. 2013), until scholars of Japanese history on Guam who were consulted found no record of non-military construction projects along the shores of Apra Harbor during the 1941-1944 occupation. A more thorough examination of archaeological and historical literature from across Micronesia housed at the Micronesian Area Research Center then revealed close parallels between construction methods and environmental settings in Apra Harbor and traditional stone fish weirs recorded in coastal Yap, Pohnpei, and Kosrae. Marine science literature housed at the Marine Science Laboratory of UOG also confirmed the former use of fenced fish weirs by Chamorro residents near Apra Harbor from before WWII until the 1970s when such methods were outlawed.

Freycinet’s informants therefore appear to be vindicated by the convergence of archaeological, historical, and circumstantial evidence. So besides Pre-Contact fishermen using the weirs to feed local populations before the arrival of Ferdinand Magellan in 1521, it is hypothesized they were expanded to exchange fish and shellfish for metal and trade goods with visiting sailors during the seasonal arrival of the Manila Galleons, perhaps until well after the arrival of Jesuit missionaries in 1668. Traditional sailing techniques, ancestor veneration, ritual cohabitation, matrilineal land tenure, herbal healing specialists, and
communal redistribution of natural resources were by then all discouraged in favor of Spanish Colonial norms of behavior and economy. In contrast, the gigao might have been maintained until after the forced relocation of northern Guam residents into traditional southern Guam villages like Sumay during La Reduccion circa 1700 and even the subsequent development of Apra Harbor to accommodate periodic Spanish shipping before Freycinet’s arrival. More challenging to former notions of Colonial domination is archaeological evidence for continued traditional aquaculture methods and pottery production radiocarbon dated generations after the Spanish entrada, generally perceived as the end of the traditional era (Dixon et al. 2017). Documenting the continuity of subsistence practices from before until well after initial Contact and the apparent resistance of Chamorro fishermen to La Reduccion is provocative, especially after the introduction of Eurocentric food ways and settlement patterns.

Archaeological Identification of Fish Weirs around Apra Harbor

During the first survey in the mangroves along the edge of Outer Apra Harbor in 1998 (Dixon et al. 2013), a complex of 14 previously unrecorded low-walled coral enclosures and nearby sites was encountered on the coral shelf and within the low tide area (Fig. 2), near fresh water seeps situated between the mouths of two small estuaries. At irregular intervals along the shoreline opposite this wall system were scatters of late Latte Period style prehistoric ceramics and marine bivalve shells (Fig. 3), mostly of Anadara sp. with fewer Gafrarium sp. Site 1 on-shore appeared to be the battered remains of a low latte set or raised Latte Period habitation with midden, Site 4 was a coconut hummock located about 50 m inland with shell midden and more pottery, and Sites 2, 3, and 5 contained the stone enclosures off shore. Site 15 was a natural limestone hill with WWII Japanese defenses dug into the hillside. A subsequent survey of a segment of the Inner Apra Harbor shoreline in 2002 (Dixon et al. 2013) revealed another
complex of seven walled constructions on the coral shelf near the mouth of another small estuary.

Fig. 2: Outer Apra Harbor Fish Weir Map. (Dixon, et al. 2013:360)

Fig. 3 (left): Outer Apra Harbor Site 3, Shell Midden and Pottery, View to the Southeast. (Dixon, et al. 2013:359)

Fig. 4 (right): Outer Apra Harbor Site 3, Coral Wall, View to the Northwest. (Dixon, et al. 2013:358)
The walled enclosures of Outer Apra Harbor were composed of irregularly shaped, medium to large coral heads (Fig. 4), removed from inside the enclosures and piled directly on the tidally inundated coral substrate without the aid of mortar or fill. While some stacking was evident, the walls were very porous and today attract mangrove growth due to their stability and entrapment of sediment from the small estuaries flowing into the features. The outer walls of the roughly rectangular shaped enclosures measured approximately 3 m wide and 90 cm tall, accounting for some collapse after years of abandonment and typhoon damage, while some of the inner walls were less substantial. Many of the walls did not reach the modern shoreline during high tide, and much of their interiors were exposed during low tide. Controlled excavation adjacent to one of these complexes at Site 2 (Fig. 5) yielded late Latte Period pottery and wood charcoal radiocarbon dated with a Bayesian calibration to A.D. 1645-1725 (Fig. 6).
Fig. 5: Outer Apra Harbor Site 2, TU. 2, East Profile. (Dixon, et al. 2013:363)

Fig. 6: Radiocarbon Dating Results, Site 2, TU.2. (Dixon, et al. 2013:365)
Regional Context of Fish Weirs on Guam within Micronesia

A regionally appropriate comparison with the Apra Harbor walled enclosures in design and construction may be made with other Micronesian islands that have undergone less impact from modern development (Moore 1987), and hence maintained traditional prehistoric fish weirs into modern times. Low islands as far away as the Gilberts and Nauru farmed juvenile milkfish in artificial interior ponds for later harvest (Alkire 1972). On Kosrae, stone holding pens for turtles and fish were built along the mangrove lined coastline near chiefly residential complexes indicating their ownership by specific high ranking families over time (Cordy 1981). On Pohnpei, basalt stone weirs were constructed near shore to trap fish driven into the mangroves by high tides of the tradewind season from December to February. Weirs of coral were longer and more irregular in shape, constructed closer to the deeper water lagoon to enable their incorporation in group fish drives to generate chiefly tribute (Ayers et al. 1979).

The Micronesian island group best known for their fish weir diversity is Yap, where several varieties of off-shore construction provide the best comparison for interpreting the function of the Apra Harbor enclosures. The arrow trap may be the oldest technique employed on Yap, where a V-shaped enclosure with a central shaft is built facing away from the shore toward the direction of the outgoing tide and the reef, although some were built facing deeper channels and holes within the lagoon (Hunter-Anderson 1981). Baskets were placed at the ends and apex of these weirs to trap fish attempting to escape. Another type of multiple V-shaped trap was built just inside the reef to catch fish running both in and out with the tide, while other Z-shapes traps were built on the crest of the reef pointing in both directions for a similar purpose. Rock and coral piles were also constructed in relatively clear areas of the lagoon to provide refuge for certain fish before they were speared or netted, although the yield of such features was lower than the V-shaped constructions. Closer to shore and along
main channels were rectangular surrounds which reportedly functioned as corrals or holding pens for fish captured in deeper waters, as well as foundations for guardhouses associated with the more productive V-shaped arrow traps owned by chiefly families.

**Conclusions**

After comparison of the walled enclosures within Apra Harbor on Guam to their regional counterparts in Micronesia, it appears that the majority of features recorded archaeologically likely functioned as holding pens or corrals for high tide fish collection in deeper waters and as traps for fish stranded as the tide receded. The partial arrow-shaped wall extending seaward from the west end of Site 5 in the Outer Apra complex suggests its function in trapping fish returning to the reef at low tide as seen in Yapese constructions. Its spatial proximity to a set of rectangular walls in Site 3 that do not reach the shore suggests a similar function. Given the holding capacity of these pens, it is reasonable to expect that deeper water features similar to those on Yap also existed in mid-harbor (i.e. rock or coral piles) or nearer the reef (i.e. V- or Z-shaped traps).

It is possible that 19th century Spanish Colonial sailors may have found some aquaculture features at shallower depths within Outer Apra Harbor to be an obstacle to safe entry and mooring, although many vessels remained in deeper anchorage or at Umatac. The organization of Chamorro labor by local alcaldes to clear such impediments as payment of labor tax in the late 17th and early 18th century would have been challenging however, given native participation in numerous revolts against Spanish demands (Lon Bulgrin, personal communication 2017). Almost yearly visits by the Manila-bound situado ship from Acapulco by the 1580s and at least 24 Dutch and English visits by 1686 also noted the increasingly poor health of many inhabitants (Levesque 1997). Instead, if these deeper aquaculture features indeed existed at mid-harbor then many may have been dismantled to build Fort Santa Cruz in 1801 (Driver and
Brunal-Perry 1994), a generation or more after their use had been discontinued by native fishermen when Freycinet arrived. The shoreline pens nevertheless, could still have been useful settings for family fishing even with declining population and Colonial entanglement, until mangrove growth reclaimed them in the 20th century.

Forms of indigenous resistance in the face of Spanish Colonial influences were varied in the 16th through 18th century Pacific, but included the maintenance and transformation of native food ways in coastal California missions: “European-introduced foods… were prepared and cooked… according to traditional native prescriptions…” (Lightfoot 2005:196). Reuse of European objects was another method of resisting their intended uses: “instead of using the objects in the European fashion as ceramic and glass tableware, the people transformed them into native objects such as pendants, beads, scrapers, and projectile points” (Lightfoot 2005:196). Traditional political structures and marriage patterns did change as native populations suffered catastrophic mortality rates from introduced disease, but religious dances continued and Catholic symbols and rituals were incorporated into native belief systems (Lightfoot 2005).

Similarly, one might expect Chamorro use of the near-coastal fish holding pens in Apra Harbor to continue for a generation or more after La Reduccion circa 1700, albeit in smaller scale family collection endeavors not inviting Colonial taxation. The continued use of specific coastal settings for aquaculture in the Mariana Islands thus emphasizes the longevity of cultural memory as encoded in marine resource exploitation practices, even in the face of sustained Colonial enculturation. Cultural revitalization movements as expressed in the maintenance of traditional fishing practices remain active in the region today in the face of new challenges, as they appear to have been after the initial shock of Spanish contact in the Mariana Islands. Further archaeological evidence
remains to be sought in Guam’s other embayments, as well as off the west coast of Saipan that represents a much larger lagoon system of equal antiquity.

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\(^1\)This manuscript in no way reflects the opinions of the U.S. Navy or its contractors. Permanent site locations are not revealed here for their protection.

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**Biography**
Dr. Boyd Dixon is a Senior Archaeologist for the Cardno GS office in the U.S. Territory of Guam. With over 40 years of archaeological experience in North America, Latin America, Western Europe, and the Pacific Basin, his interests are equally varied. They embrace prehistoric and historic patterns of settlement, subsistence, interaction, power, and conflict.
From safe haven to island abandonment - impacts of the growth of Pacific shipping on the Pitcairn Island community during the 19th century

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Abstract
The story of the Bounty mutiny is one of the great sagas of Pacific history and has inspired a rich literature for more than two centuries. By contrast, our knowledge of the community founded by Fletcher Christian at Pitcairn Island has remained enigmatic and obscured by evangelical and Euro-centric interpretations of the survival and development of the settlement. Founded by a small, culturally-divided group of settlers on one of the most remote islands in the Pacific and completely cut off from the world for the first 18 years of its existence - the establishment of the settlement may be seen as a remarkable success. Fifty years after the arrival of the Bounty settler-group, the island had become a regular port-of-call in the expanding network of Pacific shipping and the Pitcairn community, now approaching 200 people, had established important relationships with the Royal Navy, the American whaling fleet and Pacific communities in Tahiti, Valparaiso and Sydney. Just a few years later however, the resources of the island could no longer cope with the increasing demands and the entire population of Pitcairn was removed to Norfolk Island. Based on historical research and archaeological fieldwork conducted on Pitcairn, this paper examines the process of colonisation at Pitcairn to reveal the changing nature of an island environment in a period of rapid change in the Pacific.

Key words: Mutiny, Pacific, Whaling, Royal Navy

Mutiny and Pitcairn

“Know then my own dear Betsy, I have lost the Bounty. …On the 28th April at daylight in the morning Christian having the morning watch, he with several others came into my cabin while I was asleep, and seizing me,
holding naked bayonets at my breast, tied my hands behind my back, and threatened instant destruction if I uttered a word.“

With these words to his wife, William Bligh (Brunton, 1989) described the event which would galvanize public opinion and haunt him for the rest of his life. Recounted repeatedly, dissected, weighed and scrutinized from every angle, the story of the mutiny on the *Bounty* has been the subject of numerous books and films and needs no further discussion here. By contrast, the subject of my paper – the settlement of Pitcairn Island by mutineers from the *Bounty* and their Polynesian partners - is a story which is far less known, and in the context of this conference’s theme, represents one of the earliest sources of data demonstrating the impact of European activities in the Pacific.

*Fig.1: Pitcairn Island. (Photographer Jon Carpenter, © Nigel Erskine)*

Pitcairn is a volcanic island situated in the Eastern Pacific, south and east of the southern end of the Tuamotu Islands. The first European record of the island was made by Philip Carteret in 1767 when his ship HMS *Swallow* sailed around it. His description of the island was published in John Hawkesworth’s *Voyages* in 1773. Carteret wrote:
“...it appeared like a great rock rising out of the sea: it was not more than five miles in circumference, and seemed to be uninhabited; it was, however, covered in trees, and we saw a small stream of water running down one side of it. I would have landed upon it, but the surf, which at this season broke upon it with great violence, rendered it impossible”

Cook passed to the east of Pitcairn in 1769, and to the west in 1773, without sighting the island – suggesting the position of the island, calculated by Carteret and shown on Hawkesworth’s chart of the Pacific, was wrong. Indeed, while Carteret’s latitude for Pitcairn was relatively accurate, his longitude placed Pitcairn 320 kilometres too far west – a not unusual error in the period prior to the use of chronometers and one which the mutineer Fletcher Christian appears to have suspected. For, following an abortive attempt by the _Bounty_ mutineers to settle on the island of Tubuai (300 km south of Tahiti), and after leaving 16 mutineers at Tahiti, Christian took the _Bounty_ east against the prevailing wind, sailing along the latitude given by Carteret until finally sighting Pitcairn in January 1790. When the vessel finally anchored, it had 28 people aboard – 9 European mutineers, 6 Polynesian men, 12 Polynesian women and a baby girl.

Once ashore the group soon found evidence of previous Polynesian occupation of the island in the form of rock carvings and a morai, and later they would discover a stone quarry on the southern side of the island littered with the discarded flakes from tool manufacturing.¹ While this evidence of a Polynesian presence remained, the Bounty settlers soon realised they were alone on the island and totally reliant on a combination of their skills, the resources they brought with them, and what they found in their new home, to establish a viable community. Indeed Pitcairn offered Fletcher Christian and his fellow mutineers the perfect place to hide! Uninhabited, incorrectly charted and cliff-bound, the island was effectively lost to Europeans in the vastness of the Pacific Ocean - a harbourless, uncontested 2.5 square mile speck of land where the next stage of
the *Bounty* saga would be played out. Satisfied with their new home, the mutineers set about stripping the ship, and after a week, they set fire to it – destroying it completely.

With the destruction of their vessel, the *Bounty* settlers became self-imposed exiles – a tiny community in the Pacific hiding from the Royal Navy and completely cut off from the world. Indeed, the mutineers had found a place so remote that the settlement remained undisturbed for the first 18 years of its existence and it was only as a network of Pacific trade gradually developed in the 19th century that Pitcairn’s isolation diminished.

**Violence and isolation**

The first years of settlement on the island were marked by violence as the mutineers divided the island’s resources amongst themselves and attempted to impose their control over the Polynesians who had accompanied them to Pitcairn. In the case of the women, each of the 9 mutineers had a partner from amongst the 12 women, leaving 3 women to partner with the 6 Polynesian men. This situation was initially tolerated by the Polynesian men who were now treated as servants to the mutineers, but following the deaths of two of the women (one falling off a cliff while collecting birds’ eggs, and the other dying of natural causes), the affected mutineers took new partners from those living with the Polynesian men. This produced immediate hostilities between the Polynesian men and the mutineers and resulted in the murder of two of the Polynesian men in 1791. Two years later a second wave of violence spread across the island, claiming the lives of Fletcher Christian and four other mutineers, quickly followed by the murder of the last remaining Polynesian men.

With these deaths the community settled into a period of relative peace for another six years until 1799 when William McCoy committed suicide. In that
same year Matthew Quintal was killed by his shipmates in a pre-emptive strike after he threatened them. And finally in December 1800, John Adams emerged as the last mutineer standing when Edward Young died of natural causes. After a decade on the island, and with the population standing at 38 (consisting of 27 children, 10 women and 1 man), the community now entered a new era of peace and stability.

In regard to viability of the settlement, the violence characterizing this early period highlights the fact that the main threat to the community was social rather than ecological. Like Pandora’s Box, the *Bounty* contained a volatile mix of racial, sexual and class tensions thrown together by the chance circumstances of the mutiny and which Polynesians happened to be sleeping aboard when the vessel left Tahiti for the last time. With the destruction of the *Bounty*, these forces were released and, as we have seen, played out to bloody resolution. However, despite this violence, a number of positive factors contributed to the initial survival of the community.

Pitcairn was a relatively fertile island with natural resources of water, trees, plants, fish and birds – a Pacific environment with which the Polynesian women were familiar, where their skills in such things as sourcing food, thatching and producing tapa cloth, were immediately beneficial. Adding to the natural resources, were resources brought ashore from the *Bounty*. These included pigs, goats, chickens, plants, seeds and gardening tools, muskets, gunpowder, axes and saws, a forge and bellows, wheelbarrows, medical supplies, books and cooking pots - as well as rope, canvas, iron and timber from the ship.

Also brought ashore were elements of maritime culture relating to the maintenance and allocation of provisions. An observer present in 1814 (the second contact with shipping) noted (Pipon, 1834) that John Adams maintained a journal system of ‘regular established allowance’, a practice paralleling the role...
of the purser on board naval vessels. On Pitcairn food was either stored communally to create a ‘food bank’ accessible throughout the seasons, or (in the case of perishables) divided equally using a system known as the ‘share out’. Aboard the Bounty this form of division was known as *Who shall have this?* Bligh (1790) described this method, which he used to divide a seabird amongst the men during his famous open boat voyage:

“One person turns his back on the object that is to be divided; another then points separately to the portions, at each of them asking aloud, “Who shall have this?” to which the first answers by naming somebody. This impartial method of division gives every man an equal chance of the best share.”

The settlers also lived communally in a single village. Very early on, the pigs and goats had gone feral and fences had been built around parts of the village to protect the vegetable gardens. Communal living also helped to harness the labour and skills of the settlers, efficiently sustaining the settlement through the years of total isolation.
First contact

In 1808 that isolation was finally interrupted by the arrival of the sealer *Topaz*. It was an edifying occasion all round, with captain Folger as surprised to be hailed in English by the young ‘natives’ who paddled out to his ship, as indeed they were to see such a large and foreign object floating off their island. Mindful of his mutineer status, John Adams sensibly remained on Pitcairn, but despite this, goodwill was established by an exchange of objects. In itself the impact of this visit was slight but it set an important precedent, as Adams later recalled (Bechervaise, 1839):

“They got from this ship a great number of articles they stood in need of, after which no vessel came near the island without being visited.”
Six years later the islanders were again amazed, this time finding two Royal Navy ships laying off the island. It should have been the moment of truth for the old mutineer but his luck remained! For after touring the village and meeting Adams and his burgeoning flock, Sir Thomas Staines, the senior captain, declared that Adams was a reformed character whose arrest and removal from the island could only have a detrimental effect on the community. In an instant John Adams was transformed from villain to hero and thereafter the community at Pitcairn enjoyed both legitimacy and celebrity, becoming a popular port of call in a rapidly expanding network of Pacific sailing routes. Some measure of the relative isolation of the community at Pitcairn in the first half of the 19th century can be seen in the following charts.

Fig.3: Principal Pacific Ocean sailing routes in 1800. (Nigel Erskine)

Fig.4 Principal Pacific Ocean sailing routes in 1825. (Nigel Erskine)
In 1788 a British settlement was established at Port Jackson on the east coast of Australia, which finding itself poorly supplied from Britain, soon initiated sailing routes to the more fertile Norfolk Island and to Tahiti for pork. Those ships which did arrive from Britain with supplies, returned there either by the southerly Cape Horn route or via one of the trading centres in Asia such as Calcutta, Canton and Batavia. At the same time a regular route was established between China and the Pacific North West by vessels trading in sea otter pelts, and routes along the west coasts of the Americas serviced Spanish supply lines.

Some measure of the relative importance of particular trade centres in the Pacific is indicated by the growth of European populations. In 1820 Honolulu had a foreign population of about 90. By 1842 the town's population had grown to 8000 people, of whom 500 were foreign. At the same time Papeete had a foreign population of around 70, and the Bay of Islands in New Zealand over
600 Europeans. Both Levuka and Apia developed later, and had foreign populations of around 50 by the 1850s (Ralston, 1979).

Of these centres, the most important for Pacific trade before the discovery of gold in California was Honolulu. The location of the Hawaiian Islands in the middle of the North Pacific Ocean made them a natural centre linking trade routes between the North-West coast of America, California and China. After 1849 San Francisco assumed much greater importance in Pacific commerce, resulting in the development of sailing routes between Australia and San Francisco, and San Francisco, New England and Europe. Both the route from Australia and New Zealand to San Francisco, and the route from San Francisco to Europe via Cape Horn, passed close to Pitcairn and represented a significant change in the relative isolation of the island.

![Fig.6: Chinese Export Ware plate c.1816 – example of trade item excavated at Pitcairn land site. (Nigel Erskine)](image)

**Development of Trade**
A total of 432 ships visited Pitcairn between 1808 and 1856, with the majority being whale ships. Some idea of the pattern of trade between the Pitcairn community and the crews of these ships is apparent in surviving logbooks.

One of the earliest accounts describing trading activities at Pitcairn is that of the American whaleship *Russell* that visited Pitcairn in 1822. Arriving off the island, the ship was met by a boat carrying seven of the islanders who “…brought us some bananas, plantains, coconuts and melons and informed us that there was a quantity more on the island”. The ship took on fresh water over a period of three days – allowing part of the crew ashore each day on liberty. When it came time to depart, the islanders:

“…stood around us with tears in their eyes and presented us with some little tokens of friendship and said that we were not to pay for them but send more ships there as they would be very lonesome when we were gone. They supplied us with such vegetables and fruit as the island produced without asking anything for them but seemed pleased to have us in their home.”

It is clear from this account that trade at this time was largely unregulated and limited to the basic resources of water, vegetables and fruit. By 1825 the impact of shipping appears to have induced experiments with new crops and Captain Beechey (1968) listed English potatoes, peas, beans and onions amongst these. In 1830 Captain Waldegrave (1833) listed the supplies available to ships:

“Ships may obtain fire-wood at Pitcairn’s Island in abundance, with a certain quantity of yams. Coconuts and plantains, but not a large supply; poultry and pigs they object to part with: it would be impossible to water a man-of-war, as the water is carried from Brown’s Well on the shoulders of the natives.”
A significant change is evident by 1834 when a regular price for articles is listed in the Pitcairn Island Register. This indicates that ‘exotic’ produce such as Irish potatoes, beans and onions had been successfully established and that chickens were available in quantity by this date. In effect, Pitcairn had joined the provisioning trade and over the next 20 years the demands on the island's resources increased dramatically.

For example in 1836 the whaleship *Triton* took three boatloads of wood, 54 chickens and a pig and in the following years there is consistent reference to the supply of potatoes, beans, pumpkins and wood in relatively large quantities. In 1843 the *Charles* took six boatloads of potatoes and four boatloads of wood. In 1847 the *Three Brothers* took 130 barrels of water, 34 barrels of yams, 34 barrels of sweet potatoes, five barrels of Irish potatoes, 22 chickens, five pigs, a duck and two boatloads of wood and so on. At the same time as these foreign demands were taxing the island’s resources, the population of Pitcairn had been growing steadily, reaching 194 in 1856.

**Environmental impact of trade**

The evidence indicates that the growth in Pacific shipping had a negative impact on Pitcairn. For in addition to demands on the island's limited water supplies, the provisioning trade significantly depleted the island’s timber resources and placed an increasing burden on the land as the Pitcairn islanders attempted to produce agricultural surpluses. Some indication of the environmental impact of such changes is suggested by an example of catastrophic erosion recorded in the Pitcairn Island Register for 1845 (Lucas, 1929):

“…the place in question was situated at the head of a ravine which debouched into the sea; the rain mixing with the falling earth (which was of a clayey nature) brought it to the consistency of thick mud but sufficiently
liquefied to glide very slowly down the inclined plane of the valley – nothing with which it came in contact could resist its force – the large trees at the head of the ravine and immense pieces of rock, were borne slowly but unresistingly along and about three hundred coconut trees were torn up by the roots and swept into the sea.”

Further evidence indicative of the community’s vulnerability and inability to sustain increasingly high levels of trade exists in the last years of the settlement. During the visit of HMS *Portland* in May 1853, Rear Admiral Fairfax Moresby found the island badly affected by drought and donated grain to sustain the community. Six months later, Captain Morshead of HMS *Dido* found the island still affected by drought and left more supplies.

The crop failures of 1853 revealed the vulnerability of the community at Pitcairn and prompted application to the British Government to relocate the community to Norfolk Island. Supported by Rear Admiral Fairfax Moresby, the request was favourably received in England and Sir William Denison was instructed to make arrangements for the removal of the Pitcairn Islanders to Norfolk Island.

The impact of human settlement on island ecologies is a major theme in Polynesian colonisation of the Pacific. In this context Fosberg (1963) noted the great variation between islands of the eastern Pacific and large continental islands of the western Pacific and emphasised the effects of isolation and limited size in creating insular and fragile ecological environments which were highly vulnerable to disturbance associated with human settlement. While Pitcairn does not fit into the extreme category with fragile environments such as atolls, the total impact of colonisation on the island was no less devastating – it simply took longer and was ultimately the result of both internal and external factors.
Conclusion

Turner (1962) conceived of the frontier as a dynamic process of expansion, characterised by continuous movement into free land at the margins of the colonial area by a succession of industries comprising fur-traders, miners, ranchers and farmers who were irresistibly attracted to the resource opportunities of the new area. European expansion into the Pacific was motivated by similar opportunities that were exploited by industries such as the pork trade, pearling, sandalwood, beche-de-mer and whaling. However, unlike the opening of vast new land areas of the American West, the expansion into the maritime frontier of the Pacific took place in a context of hundreds of small islands of which Pitcairn was but one. The history of Pitcairn Island provides a record of the ecological cost of such expansion.

Endnotes

1 In this context, Marshall Weisler’s work (1993) has shown that this Polynesian presence dates to a period starting about AD 850 and ending in about 1500. Weisler, M. 1993 Long-distance Interaction in Prehistoric Polynesia: Three case studies, unpublished thesis, University of California, Berkeley

2 Pacific Manuscript Bureau microfilm 890

3 Pacific Manuscript Bureau microfilm 671

4 Pacific Manuscript Bureau microfilm 318

5 Pacific Manuscript Bureau microfilm 386

References


Biography

Nigel Erskine is Head of Research at the Australian National Maritime Museum. As a maritime archaeologist he has worked extensively in the South Pacific and was Director of the Norfolk Island Museum 2000 – 2003. As a maritime archaeologist he has worked on the sites of HMS Sirius, HMS Pandora, HMS Bounty, HMS Porpoise, Cato and Mermaid. Since 2005 he has been actively involved with the Rhode Island Maritime Archaeology Project in the search for Cook’s ship Endeavour.

His recent work includes developing interpretive narratives for ANMM’s core galleries, building the museum’s international engagement in archaeological projects, and expanding the museum’s research profile.
Lata’s Wayfinding System and Climate Science

M. George
Vaka Taumako Project

Abstract
The cultural vision and history of Taumako extends far beyond their Duff Islands, the SE Solomons region, or the western Pacific. According to the people of Taumako, their ancestor Lata, was the first person to build and sail a voyaging canoe. Taumakans today are unique among Polynesian and Austronesian people in that they still build and navigate voyaging canoes using only the ancient designs, materials, and methods of Lata. Lata/Laka/La’a/Rata/Raka, etc, is a Culture Hero across Polynesia, and at least some islands where the ancient Austronesian migrants settled thousands of years ago. Lata’s successes and mistakes help Taumakans, and us, learn who we are, and what to do and not do as we face global climate change and cultural wars. Taumako is full of sites where episodes of the Story of Lata happened…the islet where Lata was born, the rock Lata’s father killed the father eel, the place where Lata stood with Hina to see if the tree he cut down was actually on Hina’s land, the stones where Lata moored his voyaging canoe, where he sailed out and Hina blocked the entrance so he could not come back, where Lata picked his crew from out of the ocean, etc. Taumako was a crossroads of early Papuan settlers and Lapita pottery-making, migrants, and canoe technology that combines both Polynesian and Micronesian design features. The Story of Lata is lived today in the practice of the ancient Pacific voyaging arts. How can all this help them break out from colonialist borders and policies, make a living at the bottom level of the global economy, and/or survive climate change? What can we learn from Lata?

Key words: Lata, Pacific, ethnography, Austronesian

Introduction
Climate researchers use data about the past to understand what is changing now. Today, climate scientists lack ground-truthed data for natural phenomena
of the Indian and Pacific oceans (BioScience, 2011). However Austronesian voyagers colonized Oceania millennia before Europeans arrived, and some of their descendants still practice knowledge systems that offer useful data for climate science.

Taumakan Islanders of the Duff Islands of SE Solomons practice an ancient system of knowledge in everyday life on their island and in voyaging to other islands. That system is based on ecological and environmental patterns, and relationships between patterns of natural phenomena, as well as between Taumakans and natural elements.

Today the people of Taumako are isolated from the outside world by lack of electricity, phone service, WIFI, anchorage, or airstrip. So, they still depend upon ancient cultural ways to meet everyday needs. They speak Polynesian language and practice Polynesian customs. They are the only Polynesians who still make and sail voyaging canoes using only ancient designs, materials, methods, and tools. They are heirs of an ancient system of deep sea navigation that uses knowledge of natural phenomena rather than modern instruments. This ancient system provides data of rare specificity and complexity about relationships between patterns of wind, sea, sky, and spirit that are little known to science.

**The Heirs of Lata**

After European diseases killed all but 37 Taumakans in 1919, and colonial controls arrived in 1922, the number of voyaging canoes in the region dwindled from two hundred active vessels to a few relics in the 1960s. Extensive partnerships and networks between islands were lost.

The history and cultural vision of Taumakans extends far beyond their Duff Islands, or the SE Solomons region, or the Western Pacific. Three thousand years ago Taumako was a crossroads of Lapita pottery-making migrants (Leach
and Davidson, 2014). Today Taumakan voyaging canoes and navigation methods combine both Polynesian and Micronesian design features.

According to the people of Taumako, their ancestor, Lata, was the first person to build and sail a voyaging canoe (vaka). Lata is a voyaging Culture Hero to the people of thousands of Pacific and Indian Ocean islands. Lata's name varies, as Laka, La’a, Rata, Raka, etc. Today, some of the variants are known today as male, and others as female. Today, some places like Hawai‘i, only remember short episodes in the Story of Lata. Taumakans tell the Story of Lata hour after hour, year after year, during building of vaka, and while making voyages to other islands.

Taumakans live their lives as characters in their Story of Lata. As such they are the present generation of an uninterrupted line of voyagers. Lata’s successes, mistakes, and spiritual relationships with natural phenomena, help Taumakans learn who they are, and what to do, and not do, in life.

Duff Islands are full of sites where episodes of the original Story of Lata happened. These include the seaward platform on Tohua, and islet where Lata was born, the Kahula stream lava-rock home of the father eel who Lata’s father killed and whose tail Lata suckled on after his parents died, the mountaintop where Lata stood with Hinora to look down and see if the tree he already cut down was actually on his or her ancestral land (kainga), the black stones beside Tohua where Lata moored his voyaging canoe, the entrance to TeVeni, a hole in the reef where Lata sailed out and Hinora blocked so he could not come back, the ocean outside of TeVeni where Lata picked his crew from after their canoe fell apart from being tricked by Lata telling them the wrong plant to use for their lashings, etc (George, 1999). The interactions of the characters, the natural phenomena they deal with, and the places, episodes, and themes of the Story
of Lata, are critical to Taumakan decisions about gardening, performing rituals, building voyaging canoes, and for way finding at sea.

Taumakan voyaging canoes (*vaka*) are made in the image of Lata and other characters in the Story of Lata. Each end of the *vaka* is carved into facial features of *Te Ube*, the bird who Lata befriended, and the teeth of Lata, which securely hold the carving of *Te Ube* into the back of which the mast is stepped (Fig. 1). The sail has slender extended tips, which are Lata’s arms held overhead to catch the wind (Fig. 2). The entryway to the shelter is where the current day Lata (most senior wayfinder) sits in supervision of the crew and the elements.

*Fig. 1 (left): Photo of Chief Kaveia instructing crew how to rig Te Puke voyaging canoe. (Michael Tauchert and Vaka Taumako Project)*
Since the 1970’s islanders from Hawaii, New Zealand, Cook Islands, and other more commercially developed islands have taken voyages using navigation methods that did not include modern instruments, such as compass, sextant, or electronics. Their “non-instrument” methods are traditionally inspired, and have centered on use of star paths to know the direction to islands. But the specific star path methods that most of these revival voyagers have used were created by Nainoa Thompson and Will Kyselka in Bishop Planetarium in the 1970’s. They also rely on meteorology for their weather, engage modern vessels to escort them everywhere in case rescue is needed, and they construct their vessels with nylon, Dacron, fiberglass, epoxy, chainsaws, etc. These voyagers have traveled far, correcting several centuries of denial and misrepresentation of the true history of oceanic voyaging, and reviving pride among island peoples for the brilliant achievements of their ancestors. But it is clear that they cannot, or do not intend to, make voyages using only Lata’s technology.
Taumakans today are unique among Polynesian and Austronesian peoples in that they still build their vessels and navigate using only Lata’s technology. But Lata’s vessels are only good for sailing interisland during certain seasons. If Lata’s crew sails to another island then they must stay there until the right season comes to sail back to their island, which could be nine months later. Who will feed them and what will they do while they are waiting? How will they earn money to pay school fees for their children? Who will maintain their vessel if they are lucky and a ship comes that can bring them home? If and when they have transport to return to their Vaka then how will they get money to harvest some trees to replace certain parts, and to re-lash others?

Given these challenges, why do young Taumakans want to work hard at learning the ancient ways, rather than going off-island to make money? Don’t they want their children to go to secondary and tertiary schools? Wouldn’t they like to have a permanent house with a toilet rather than a leaf house and the ocean? How can their heritage help them cross colonial nation-borders between them and nearby islands, and policies that make it impossible for them to make a living at the bottom level of the global economy? How will perpetuating ancient practices help them survive climate change?

Furthermore, what can outsiders learn from the heirs of Lata? Can people who are fully dependent on the global economy and its petrochemical and electronic technologies, learn something to help them stop their polluting and warlike ways, and possibly save what is left of the planet for all of our children?

**Perpetuation of Lata’s Voyaging Vessels**

In 1996, the Vaka Taumako Project was officially started as a research project under the Ministry of Education of Solomon Islands. It was the idea of the Paramount Chief of Taumako, Koloso Kaveia, who was a very experienced
voyager on Lata’s vessels, and then on a trading scow, for many years. He, and other elders of Taumako, wanted to teach a new generation how to build and sail a *Te Puke*, which is the design of vessel that Lata is most known for. He also wanted that knowledge documented for future generations.

In 1997 the *Te Puke* named “*Vaka* Taumako” was launched. In 1998 it sailed to Nifiloli, in the Outer Reef Islands, and in 2000 it sailed back to Taumako. The biggest challenges of those voyages included the lack of safe places to keep the vessel on other islands. People of other islands have more money-based economies, with ships coming monthly, airstrips, and phone service. Taumakans needs their own transport to relieve their isolation.

During his nineties Kaveia planned to lead a voyage from Taumako to Vanuatu. But he passed away in 2009. Several voyages were made in 2012, and again in 2013, and another one in 2017. In every case there was barely enough food for the crew, and the return transport to Taumako was delayed for weeks. Despite the hardships they continued to work on making new *vaka* and more voyages. The costs of delayed transport ate up what had been set aside to pay the school fees of their children. So, why do they persist?

The positive results of these voyages have included at least one inter-island marriage by a crew member for each voyage, and some sort of reconciliation (*Heihei Lavoï*) over events that took place generations back, when voyaging canoes were stopped by government and missionary policies, WWII, and other colonial impacts. Another result is that through voyaging each crew members gains, or proves, a good relationship with patterned phenomena of the wind, sea, stars, and with their voyaging ancestors. The leader of a voyage becomes a present day Lata.
Lata’s crew is celebrated for its accomplishments at home and throughout Solomon Islands. *Te Puke* are featured on both provincial and national icons, and Taumakans regard the leader of a voyage on a *Te Puke*, as singularly qualified to be the Paramount Chief of Duff Islands.

Knowing what Lata knew qualifies one to give advice on gardening, weather, fishing, social events, naming of newborns, spiritual activities, and so many other disciplines that are practiced by Duff Islanders. Old people reward voyaging students with appropriate knowledge and resources for voyaging, because they know that voyaging can provide the inter-island communications that are necessary to survival and the joy of renewing ties with close relatives who may not have been contacted in many decades. The voyagers themselves become responsible to share their knowledge, and inform others of changes in natural patterns that they observed.

When there are natural disasters, such as the King Tides and ferocious cyclones that are coming more frequently, there is more need for a vessel that can sail over the reef and right up onto the beach…to carry sago palm leaves to roof and wall houses, betel nut for social sharing, pigs for feasting events such as weddings and funerals, and many other goods necessary to the wellbeing and relationships between people of different islands and atolls.

Children of Taumako are told bedtime stories whose characters are navigational stars. Stories of the giants (*Pakhola*), the old woman of the forest (*Hinora*), and the fresh water eel who was killed by Lata’s father, are filled with references and meanings about voyaging. The winds that come from different directions and bring different weather and plants and animals into the center of Taumako life, are themselves main characters in the Story of Lata. Though they are not often named as such in the storytelling, the interrelationships of these winds with other phenomena are critical to finding the way to other islands. They are also the
basis for correlating and calibrating many other natural phenomena that Lata used to find the way.

**Lata’s Navigation (Wayfinding) System**

From the 1970’s onward, Pacific navigation researchers focused on the use of stars as the basic method of finding land without modern instruments (Lewis, 1972). More recently, some natural navigation researchers have centered ‘stick charts’ and ‘wave piloting’ in the Marshall Islands (Genz, 2016). They hypothesized that knowledge of swell patterns between the Ratak and Ralik island chains were the primary phenomena used for navigation there.

Although the Taumakan heirs of Lata use both stars and swell patterns extensively, they organize their navigational technology differently. They prioritize knowledge of wind, and its relationships with all other natural phenomena. Taumakans regard winds, not stars, as primary, to their navigation methodology.

Taumakans use a systematic model of way finding that does not privilege asterisms (including stars, star groups, dark places in the sky, and star paths) above other phenomena. Taumakans use Lata’s mental model to link the position of the wind around the horizon with phenomenal patterns that occur (when the wind is in that position).

So by knowing the wind position a Taumakan wayfinder knows which phenomena are useful for what voyaging routes, and which phenomena work together or provide alternatives to others. Asterisms are important because the wind positions that the asterisms rise and set in are indicative of what other phenomena are useful.
Te Nohoanga Te Matangi

The organizational image, i.e. basic data organizer, of this ancient system is a model of 32 named wind positions that are located equi-distant from each other around the horizon (Fig. 3). From the geographically widespread documentation of what English speakers have called “wind compasses” throughout the Pacific and Indonesia, it seems likely that voyagers figured out this system long ago.

![Diagram of 32 Points on Nohoanga te Matangi](image)

**Fig. 3: TNTM Diagram 8/16/32 Named Wind Positions.**

The Taumako wind-based system is called “Te Nohoanga Te Matangi” (*TNTM*). *TNTM* translates into English as “the wind positioning system” or “the life of the winds.” The eye of the wind can sit (*noho*) in, or move through, the various positions. The 32 named *TNTM* positions surround the observer around the horizon, and each *TNTM* position is located at equal distances from its neighboring position.
TNTM Opposite Partners

Each TNTM wind position is paired with the position that is located opposite to it on the horizon (Fig. 4). Taumakans do not learn the 32 positions one by one, sequentially in a circle. They learn them in opposite pairs, or “partners.”

There are 16 partners in the 32 wind positions. But most people just deal with the 4 partners that comprise the basic 8 wind positions. After a person learns the relevant partners for any voyage, then they know what is in front of them and behind them, no matter which position they are headed for. Thus, the partner of Te Alunga is Te Haka Hiu, and the partner of Te Tonga is Te Tokelau (Fig. 3).

*Fig. 4: TNTM Diagram opposite Pair. (Partners)*
TNTM works like a slide rule (mechanical analog computer) that recognizes patterns in a variety of natural phenomena, and organizes those patterned natural phenomena into spatial, temporal, and spiritual relationships.

The relationships contained in these TNTM linkages are based on knowledge about natural and spiritual phenomena, and relationships between them.

Such linkages include storm winds (natural) and beneficial or dangerous interventions of ancestors (spiritual). For example, it is not surprising that cyclonic west winds come in the strongest wind positions of the cyclone season (Te Hakahiu to Te Tokelau) (Fig. 5). But if a Te Alunga or Te Tonga winds are weak during the middle of the tradewind season, then it indicates that there has been disrespectful behavior toward ancestors. Ancestors include winds, rocks, stars, animals, and other natural elements. So disrespectful behavior to these elements can cause climate change.

There are times when certain phenomena will happen, such as strong winds. There are signs that herald new weather, such as a rainbow showing where the wind will soon position itself. The TNTM slide rule correlates and calibrates...
natural phenomena that can be both observed and engaged with. The engagement is a spiritual endeavor, with many layers and scales.

The late Te Alki Koloso Kahia Kaveia of Taumako told, and showed, me these explanations of TNTM. As a master of TNTM, Kaveia did a lot of “weather work,” e.g. prediction and modifications. Prediction included telling when the best wind for a voyage would come the next year. Modifications included stopping rain, and changing the wind position (but not the season). He also used TNTM to control dangerous seas, heal illnesses, plan ritual events, facilitate gardening, and control communications with colonial powers, (as Paramount Chief for about 35 years).

Kaveia remembered all this information, without making diagrams. But he invited and approved the diagrams I made. Furthermore he wanted them shared with his descendants who want to learn how Lata made voyages, and with anyone who wanted to learn how Lata found the way to other islands. Here are diagrams that my colleague, industrial designer Daniel Jackson, and I made to illustrate Kaveia’s teachings about TNTM.

The head position of the system is named Te Alunga, which translates in English to “the pillow.” In other words, Te Alunga is where you lay down your head. Te Alunga is also the defining wind position of the trade wind season, and its location on the horizon is where the sun rises during the winter solstice (Fig. 5). Te Tonga is a variation of what Hawaiians call Kona (Hawaiian Kumu, Roselle K. Bailey, pers. comm.), but since Te Tonga is a sunrise position it is not easy to know why it is linked with a term that is used for the dry west side of Hawaiian islands. Perhaps it is because when Te Tonga blows the west sides of island become dry. Te Tokelau contains the work lau, which translates to English as “strong.” The strongest winds occur in Te Tokelau. Taumakans I asked did not know a translation for other wind position names. Kaveia thought that this could
be because they were very old names. In any case many of these names were reported in ‘wind compasses’ reported throughout Polynesia and Indonesia.

**TNTM Annual Sunrise and Sunset Positions**

There are eight wind positions that traditional Taumakan voyagers use to keep track of at the sunrise and sunset positions during the year. *Te Alunga* is the wind position that the sun rises in at the qinter solstice. When the sun rises in *Te Alunga* it sets between *Te Tokelau* and *Te Tokelau Palapu*. Later in the Trade wind Season, when the sun rises in *Te Alunga Tonga*, it sets exactly in *Te Tokelau*. Later yet, when the sun rises in *Te Tonga*, it sets somewhere between *Te Tokelau Hakahiu* and *Te Haka Hiu*. Lastly, when the sun rises in *Te Ulu Tonga*, it sets somewhere between *Te Tokelau Hakahiu* and *Te Haka Hiu*.

The fact that when the sun rises in three out of four sunrise positions, the sun is observed to set in a range of positions, rather than just one position may not seem intuitive. However if one considers that the orbit of the sun is not circular, but elliptical, then it may be that when the sun is closest to the observer its movement along the horizon is more observable that when it is farther away. So maybe *Te Alunga Tonga* sunrise sets exactly in *Te Tokelau* because it is so far away and moving mostly away or toward the sun around the pointy end of the orbit, then we cannot observe its change of position along the horizon. Whereas when the sun rises in *Te Alunga* and sets between (and including) *Te Tokelau and Te Tokelau Palapu*, or when the sun rises in *Te Tonga*, or *Te Ulu Tonga*, and sets anywhere between (and including) *Te Tokelau Hakahiu* and *Te Hakahiu*, it is because we can actually see the change in position along the horizon when the earth is nearer to the sun in its orbit. In any case, the naked eye observations are correct.
TNTM Seasons, Solstices, and Equinoxes

According to TNTM, the tradewind season begins at the winter solstice and ends at the spring equinox. The cyclone season begins at the summer solstice and ends at the autumn equinox. The Gregorian calendar, that is commonly used by European-derived cultures today, is not useful when interpreting TNTM correlations. This is because the particular dates when the sun is overhead is different at different latitudes. So the actual month for making a particular voyage, or the length of a particular voyaging season, or gardening season, varies too, But the solstices and the equinoxes never change. Thus these comprise the calendric structure of TNTM seasons.

Fig. 6: TNTM Diagram Seasons, Solstices and Equinoxes.

The tradewinds start when the wind sits briefly in Te Tokelau Tu, and then moves clockwise to sit firmly in Te Alunga (Fig. 6). Te Alunga is regarded as the base position for the Trade wind Season. Any wind position from Te Alunga, Te Tonga, Te Ulu, and Te Laki are trade wind positions. During the period of time from the Winter Solstice to the Spring Equinox, the eye of the wind will shift.
gradually from Te Alunga to Te Tonga, Te Ulu, or even to Te Laki, and then shift back again to Te Alunga. But as the Trade wind Season progresses, the wind will sit for prolonged periods in Te Tonga. Toward the end of the season the wind starts to sit in Te Ulu, and then moves into Te Laki before coming back to Te Tonga or Te Ulu.

During the cyclone season, from the summer solstice to the autumn equinox, the wind sits between Te Hakahiu Laki and Te Palapu. As weather fronts move through, the wind position moves clockwise from position to position, returning to Te Hakahiu Laki early in the season, and then only returning to Te Tokelau, then only to Te Palapu, and finally moves into Te Tokelau Tu when the tradewind season is beginning again.

**Taumako Model of Wind Patterns, and Human Modifications**

The ancient model of seasonal and inter-seasonal wind shifts is that there is a person who, like Lata, stands in the middle of all the wind positions (Fig. 7). This person, according to Taumakans, is like anyone who has an interactive relationship with the elements, like wind. That is, anyone can modify the positions of the wind, as Lata did, and Lata’s descendants, do today.
When the wind sits down in the primary positions of the Trade wind or the cyclone season (i.e. Te Alunga for the tradewind and Te Hakahiu for the cyclone) then the person waits for the wind to move clockwise to other positions. Each time it does this the person pushes the wind back (counterclockwise) to Te Alunga or Te Hakahiu (depending on the season).

But as the season progresses the Lata-like person in the middle (which is identified as a “man” in the diagram, but is not necessarily gendered) is not able to push the wind all the way back to the starting position of each season. So, for a long time the person can only push the eye of the wind back to Te Tonga (for the trade wind season), or back to Te Tokelau (for the cyclone season). Eventually, when it is getting close to the next equinox or solstice, the person will be unable to push the wind back to Te Tonga or Te Tokelau…or even back to Te Ulu or Te Palapu. So then the wind will eventually move past Te Hakahiu...
and out of the tradewind season positions, or past *Te Palapu*, and out of the cyclone season positions. Then the man (probably Lata) will have to turn 180 degrees around and begin to push the wind back to the base position of the next season. So the person who pushes the wind back turns his/her own body clockwise twice a year to keep modifying the wind positions and the seasons. This person is spiritually skilled in relationship to weather, and has the ability to modify, but not completely control weather patterns.

This model recognizes that some people have useful relationships with weather. This model is also very like the meteorological model of the way systems moving through a location during seasons. As the location of highs and lows shift with time during a season the wind rose positions experienced at any location in the southern hemisphere tend to shift in just the way the Taumako model describes.

*TNTM Voyaging Routes Between Islands*

Sailing vessels need to have the wind come from favorable directions and not be too stormy to sail to other islands. Taumako voyagers choose wind positions that are most reliable and that come from the side of, or from behind, the vessel (Fig. 8).
Fig. 8: TNTM Diagram Inter-Island Routes.

Routes between islands are linked with wind positions needed for those routes. TNTM way finders set off on a given route only when the wind sits (noho) in the right position for that voyage. For example, to voyage from Taumako to Tikopia or Vanikoro, the wind must come from Te Palapu, and it must come sometimes in November. No other wind position is reliable for that route. But for voyaging from Taumako (Duffs) to Reefs, any wind position from Te Alunga through Te Tonga is good, and these occur during the trade wind season.

**Rises and Sets of Asterisms Useful for Navigation**

The rises and sets of asterisms (stars, star groups, dark cloud shapes, or other celestial bodies) occur in certain wind positions (Fig. 9). When various asterisms are in these wind positions they are useful for navigation. Each of the named asterisms is the lead asterism in a star path comprised of other un-named asterisms that rise and set in the same wind positions. Each of them also has an opposite partner asterism. When one of the partners rises higher above the
horizon the other is falling closer to the horizon, or is below it. But some asterisms are used for way finding during some of the months when they are not seen above the horizon at all…such as Hetu Mdavo (the Pleiades).

The opposite partners Takelo (Orions belt on far right) is going to set, while Salo Lavoi (top 7 stars of Scorpio on far left) has just risen (Fig. 10). In this diagram
there are notes about the weather that occurs when some of these asterisms rise or set, such as the rises or sets with specific wind positions and weather.

![Fig. 10: TNTM Asterisms/TNTM Miles-High View Diagram.](image)

**Conclusion**

Interrelationships have been briefly presented here that are part of a body of knowledge of Taumaka voyagers. These relationships are between wind positions and weather, rises and sets of asterisms, (including the sun, the stars and star groups, and the solstices and equinoxes), seasons, and specific routes between islands. There is specificity, complexity, and layering of natural patterns, and there are spiritual relationships between the voyagers and the elements. These are correlated and calibrated in the mental model of Lata’s
TNTM wayfinding system (Fig. 11).

There are many more types of phenomena included in TNTM voyaging knowledge, including swell patterns, Te Lapa (George, 2012), signs by animals, plants, and atmospheric phenomena, as well as complex protocols involving respectful spiritual behaviors.

As scientists seek to further define the causes and effects of climate changes, the systematic knowledge of ancient voyaging cultures has value as baseline data about natural patterns and events, including relationships between spiritual knowledge and natural phenomena.
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Biography:

Marianne “Mimi” George, Ph.D, a remote-ocean sailor and cultural anthropologist, who supports revival of ancient voyaging practices that enable sustainable and peaceful interactions. George researched spiritual power and female imagery in the ritual cycle of an Austronesian people in New Ireland, Papua New Guinea, the experience of a small, mixed gender, group, in prolonged isolation, wintering-over a sailboat in Antarctic sea-ice to do science, the spiritual connections of sea-hunters and herders across Bering Straits, and the efforts of SE Solomon Islands Polynesian elders and their students to build and navigate using only ancient materials, designs, and methods, and re-establish voyaging networks to share and maintain resources.
The Sacred and Cultural Maritime Sites of Fiji-An Inventory in the Making

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Abstract

The Fiji Museum Archaeology Department, since 2015, has begun inventorying the different underwater and maritime sites in Fiji. Ratification of the 2001 UNESCO Convention on the Protection of the Underwater Cultural Heritage and review of the legislation on the Preservation of Objects of Archaeological and Palaeontological Interest Act (Chapter 264) has had little fruition due to limitations in manpower and resources.

The Fiji Museum has however taken first steps towards realizing the amendment of the legislation by developing and drafting an overarching policy for the institution. The Fiji Museum continues to deliberate on the draft policy encompassing all aspects of its services, which includes underwater and maritime cultural heritage sites, to ensure that Fiji’s cultural heritage is protected.

This paper will elaborate on the different types of underwater/maritime cultural heritage sites in Fiji and the inventory process of documenting and creating a database, including challenges and opportunities. It will highlight the importance of the database in assisting the Fiji Museum in its work to raise awareness and provide advice to Government and relevant authorities in the respect, preservation and protection of these submerged historical treasures.

The paper will also highlight the various agencies with common goals to protect underwater cultural sites and discuss the importance of inter-agency collaboration.

Key words: Cultural heritage, maritime, preservation, and protection
Introduction

The Fiji Islands

The island nation of Fiji encompasses over 300 volcanic islands. About 100 of these are inhabited, rich in biodiversity and cultural heritage.

Fiji is located in the tropics of the southern hemisphere and has a total land area of approximately 18,300km² that covers the region positioned between a latitude of 12°N-21°S and longitude 176°E-178°W (Nakoro, 2014).

Fig 1: Map of the Fiji Islands. (Fiji Museum)

The Republic of the Fiji Islands is a multicultural nation with a tapestry of cultural traditions of Indigenous Fijians (iTaukei), Indians, Europeans, Chinese and other minority cultures. While all the various cultures can be linked to the underwater heritage of the nation through shipwrecks, the iTaukei people are custodians to
a special, sacred and mysterious connection to the land, which includes sacred underwater or maritime sites.

In capturing the fascinating connection between the sacred maritime sites and its owners, the Archaeology Department embarked on a digitization project in 2015 to document details pertaining to the sites and protection under legislative powers\(^1\) entrusted to the Fiji Museum. Utilizing the basic Microsoft Access tool, the department developed its maritime sites database.

**The Fiji Museum**

The Fiji Museum is located in a historically significant site within an old fortified village that was called Suva. During the expansion of the city, the inhabitants of the old settlement were relocated across the harbor. Today, the area known as the Thurston Gardens complements the Fiji Museum in the background. Currently under the jurisdiction of the City Council, the Thurston Gardens have great potential for a facelift with plans in the pipelines for this to eventuate before the end of 2017. Adjacent to the Gardens is the historic and newly refurbished Albert Park where the monoplane *Southern Cross*, piloted by Sir Charles Kingsford Smith made a safe landing on its first transpacific flight from Hawaii to Fiji en route to Australia in 1928. Similarly the northwestern fringe contains the remnants of the World War II underground tunnels and the Allied forces military headquarters, which now accommodates the residence of the British High Commission and Fiji’s presidential palace and compound.
Since its establishment in 1904, the Fiji Museum has been governed by two legislations - the Fiji Museum Act and the Preservation of Objects of Archaeological and Palaeontological Interest (POAPI) Act, enacted in 1940. The latter, which is administered by the Archaeology department of the institution, is the legal instrument covering the protection of cultural heritage sites in Fiji. This legislation has a more generalized definition of cultural heritage where underwater cultural heritage sites such as shipwrecks, planes, sunken villages, islands and the likes are not specifically mentioned but in the clause which reads ‘…or any objects of archaeological, anthropological, ethnological, prehistoric and historic significance….’ covers any form of culturally significant sites and objects without distinction of their location. As such the Fiji Museum, Archaeology Department with limited manpower and resources tries to cover all aspects of Fijian cultural heritage.

In early 2017, the institution underwent a change in leadership involving the designation of a new Director and Board of Trustees members. The driving force
behind changes to the Museums’ priorities, new leadership identified gaps in legislation of the safety of cultural heritage sites in Fiji, as a target area to be addressed. The Board endorsed the review of the legislation and the Archaeology Department is currently in the process of forming the relevant committees to spearhead this process. These committees will be tasked with development of policies to strengthen the role of the department and its legislation. The Convention on Underwater Cultural Heritage has also been highlighted as an ideal approach in the near future.

**The Archaeology Department**

Cabinet endorsed the legislation that governs the work of the Archaeology Department in 1940, however the Archaeology unit of the Fiji Museum was not formally established until over 5 decades later in 1995. Since its establishment, the Archaeology Department has been involved in the identification, documentation and protection of terrestrial archaeological and cultural heritage sites of the nation. This includes the protection of ancestral old village sites, sacred grounds, cemeteries, caves, or any prehistoric or historic significant places discovered from the impacts of development.

Today, the Archaeology unit at the Fiji Museum is comprised of four staff members who look after the entire Fijian group of islands. At present the team, focuses much of its efforts on terrestrial cultural heritage sites meeting an influx of community requests to survey, record, document and protect places of cultural heritage significance against the ever-looming threats of development. Most of these issues are related to a complicated land acquisition system that was developed in the early stages of Fiji’s colonial administrative system.

The Archeology department plays a crucial role in the implementation of Archaeological Impact Assessments (AIA) in line with Environment Impact
Assessments (EIA) for national development projects such as tourism development, infrastructural development, agriculture, and other land use development.

In addition to this, the department is engaged in national projects for climate change mitigation and reducing carbon emissions through carbon trade with the Reduce Emissions from Deforestation and Forest Degradation and Foster Conservation (REDD+) and the Mangrove Ecosystem Conservation and Livelihood (MESCAL) projects. This includes the setting up of new forest reserves where a rapid survey is warranted. The Archaeology team’s role in these projects is to identify cultural heritage sites within the earmarked forest boundaries and to examine and record the ancient forest system - in particular, evidence of the impacts of human activities on natural systems.

The Archaeology Department is mandated under the same legislation to issue archaeological research permits for local and international researchers and field schools. During the course of the research, the officers of the Archaeology Department are required to be present providing advice to researchers, conducting the various traditional protocols on their behalf and ensuring that proper procedures itemized in the research permits are carried out.

This paper will explore and discuss the different types of underwater cultural heritage sites in Fiji with focus on traditional maritime sites. It will highlight the inventory process of documentation and the creation of a database to assist in the preservation and protection of these submerged historical treasures.

The paper will also feature the various institutions or agencies with mutual goals to protect underwater cultural sites and discuss the importance of stakeholder collaboration.
Maritime Cultural Sites Database

Fiji is one of the more developed nations in the Pacific region making it particularly vulnerable to the destruction and loss of significant cultural features related to the history and identity of its people. With limited resources and manpower, the Archaeology Department is at the forefront of defending the nation’s cultural heritage from such threats. At present the department manages six databases, as listed below:

1. Terrestrial Cultural Heritage Sites
2. Traditional maritime cultural heritage sites
3. Shipwrecks
4. Excavated Archaeological Research Materials
5. Lapita Sites
6. Oral History recordings

Excavated archaeological research materials that are kept in the department’s storage facility and oral history recordings are managed using the Microsoft Access platform.

Terrestrial cultural sites, maritime heritage sites, shipwrecks, and Lapita sites, on the other hand are maintained using the Geographic Information System (GIS) program ArcGIS. Since the information has spatial attributes, the ArcGIS program is an appropriate tool for such systematic recording, information analysis, mapping, and data sharing within national authorities on the preservation of cultural heritage sites.

After each survey, the Archaeology team members marked each site visited using a Global Positioning System (GPS). The GPS data is later transcribed for report compilation and corresponds to the national register or database. The
database is rather a useful tool in decision-making, advising authorities dealing with national development on the existence of cultural heritage sites in earmarked project areas.

Given that a small team looks after the various functions of the Archaeology unit for the whole country, managing four separate databases on ArcGIS was a challenging responsibility that fell solely on the Head of Department. A combination of limited human resources, a lack of capacity in team members and no centralized system contributed to a constant backlog in updating the database.

Ideally, the vast information database managed by the Archeology department needed to be maintain on a single database as all databases shared common coordinates from the various sites surveyed, the only difference being in the key thematic areas.

In June (2017), the Fiji Museum successfully installed a file server for a centralized mechanism available to all the museum departments. This was a great boost to the institution, as each department ceased to have separate databases of the same contents to manage. Soon after the installation of the server infrastructure, the Archaeology Department embarked on a weeklong staff capacity building in the areas of field mapping with the use of conventional survey methods, the use of GPS, GIS and database management including Microsoft Access. This enabled all team members to update the database in a shared folder as and when needed, freeing up time for departmental heads to carry out their supervisory functions improving productivity greatly.

Merging the 4 data sets was advantageous and crucial to improve database management efficiency while ensuring that all four themes of terrestrial sites,
Legislation Pertaining to the Protection of Underwater Cultural Heritage Sites in Fiji

Currently, the overarching legislation (POAPI Act) makes feeble reference to the safeguarding of underwater or maritime sites. However, it is encouraging that there are agencies that share similar goals to protect Fiji’s cultural heritage including underwater sites. In the past year, these agencies have taken a stance on the activities within Fiji’s Exclusive Economic Zone propelled by a nationwide implementation of marine protected areas towards the sustainable monitoring and use of marine resources as food supply and transport. The global concerns of mitigating climate change and the different treaties and conventions that Fiji is a signatory to have elevated these agencies to take action.

Below is a list of these agencies, which include Government, civil society organizations and regional institutions now in the forefront of maintaining marine protected areas.

Government Agencies

1. Maritime Safety Authority of Fiji (MSAF)

MSAF is responsible for the registering, regulations and safety of shipping services and shipping routes in Fiji. As a member state of the International Maritime Organization (IMO), the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships, Fiji is trying to secure the international recognition for the protection of two significant sea areas recognized for ecological, socio-economic, cultural and scientific reasons which may be vulnerable to damage.
by international maritime activities (www.imo.org, 16th July 2017) under the Particularly Sensitive Sea Area (PSSA) special protection action by IMO.

Fiji has several maritime ports of entries and two of these have been identified as meeting the criteria for PSSA. This further enhances the local regulations in the protection of maritime cultural significant areas. The two sites, the Beqa Passage and the Vuda Passage, may have shipwrecks and other sensitive cultural components necessary for submission to have the passages protected. The Archaeology Department is a new member of the taskforce for the PSSA. On the 14th of July, 2017, the taskforce held its second meeting since its establishment and many stakeholders attended. The PSSA taskforce is in the early stages of information gathering and report submissions.

2. The Department of Environment (DOE)

Mandated to protect the environment and regulate development procedures in the country, the DOE, under the Environment Management Act (EMA-2005) is vital in the protection of coastal cultural sites. In July 2017, the Fiji Museum was consulted to assist in the protection of three World War II lookouts constructed out at sea threatened by a development application for the construction of a jetty.

3. The Fijian Naval Unit under Republic of the Fiji Military Forces

The Fiji Navy is responsible for the maritime needs in border control such as watching over Fiji’s exclusive economic zone ad organizing task and rescue missions. Similar to any naval force, the Fiji Navy is equipped with a dive team that recently (2017) spearheaded a diving expedition to assess the discovery of seven chests in Fiji waters. The chests were believed to contain explosives and arms. Unofficial information stated that these would have been WWII materials-mine. The Fiji Museum continues to work closely with the Fiji Police to confirm the contents of the chests.
4. iTaukei Affairs Board (iTAB)

iTaukei Affairs Board is the Government arm that looks after any matters concerning indigenous Fijians or iTaukeis. With crucial mandates for safeguarding Fiji’s indigenous culture and traditions, it is vital that iTAB is aware of the significance of the maritime sites as all the sacred sites are of iTaukei origins. iTAB has access to legal expertise to be able to assist with the protection of intangible cultural heritage.

Non-Governmental Organizations

5. International Union for Conservation of Nature (IUCN)

The IUCN is heavily engaged in conservation works in the Pacific and in Fiji, with a regional office in Suva, Fiji. The organization has signed a Memorandum of Agreement with the Fiji Government to provide advice and review legal frameworks, policies, legislations and conventions in safeguarding and protecting Fiji’s environment. In 2016, IUCN included the cultural heritage sites (an area that is usually overlooked) in its list of marine protected areas and consulted the Fiji Museum for information and advice (H. Wendt and N. Yakub, personal communication, July 12, 2017).

Regional Institutions

6. The Secretariat of the Pacific Community (SPC)

Similar to the role of the IUCN, SPC has the expertise and equipment for underwater surveys. SPC also has a unit that looks after the cultural affairs of the Pacific region and is aware of the significance of underwater cultural heritage.

While these institutions and agencies have a shared vision to promote the protection of Fiji’s underwater cultural heritage sites, there is a need to inform
these stakeholders on the role and functions of the Fiji Museum in safeguarding UCH. The Archaeology Department needs to lobby and promote the significance of UCH and the need for collaboration between all stakeholders involved.

Sacred Maritime Sites

Fiji is filled with many traditional or cultural sites and practices which cannot be explained with scientific knowledge. Attempts by Mr. David Attenborough, a BBC documentary reporter in the early 60s were futile as he tried to explain some of the practices he came across such as the fire walkers of Beqa, the turtle calling in Koro, the fishes in the lake on Vanua Balavu.

Below is captured some of the fascinating and respected maritime sites that the Archaeology Department has already listed in its database:

![Map of Fiji Islands](image)

*Fig. 1: Map showing the names of places mentioned in the Sacred Maritime Sites section.*
1. The sacred fishes of Naigani Island

On the eastern coast of mainland Viti Levu, the paramount chief of Verata, Rokomoutu holds and can be identified with the traditional title of the ‘Ratu.’ It was said that when the first Fijian’s left Lake Tanganyika in Africa for Fiji, the daughter of Lutunasobasoba (the chieftain of the group) asked to take with her some pet fish. In Fiji, the fishes (Sardinella fijiense) known as Daniva or sardines, were put in the Verata waters by the princess. So catching the fish with a spear or using of fine nets or fishing lines were prohibited. Normally the Trevallies would swim after the Daniva and push them close to land and during this pursuit there would be a lot of splashing noise on the beach. People would normally go to the beach and pick the Daniva.

When the fishes were in Verata, Rokomoutu, one day tried to use his spear on them. He threw his spear, missed them and it landed on the rocks. He slipped, hitting his knee on the rock (today, the mark of his spear and his knee on the rocks are still evident). Furious, he said to the fishes, “go down to Naigani (an island about 37.5 kilometers north of Verata as shown on the map) where I will not see or hear you, and when I want to drink boiled water, I will come down for you” (oral history recording with Naigani village elder, 2004)

The people of Naigani would catch the Trevallies as they come close to land with the sardines. Similar to the Norse folklore of Thor and his goats, when consuming the Trevallies, the bones are not allowed to be broken. The bones are then carefully placed back in the water where it comes back to life. According to the people of Naigani, one can easily tell the difference between a newly formed Trevally from an old one and this is a traditional practice that is still carried out today.

2. The sacred passage between the island of Ovalau and Naigani
One of the oral accounts collected from Naigani was that there were two cousins named Laginiwasa and Rakavono. One day, the cousins ate the young germinating coconut palms which is called ‘vara’ in the iTaukei dialect. The vara had been planted by Laginiwasa’s father Ratu (chief) Matanabalavu. Hearing Ratu Matanabalavu coming, Rakavono fled but not before he was seen by Ratu Matanabalavu. Encountering Laginiwasa and enraged at his behavior, Ratu Matanabalavu banished him from the island. Laginiwasa took his double hull canoe (drua) and fled to the island of Moturiki which is south of Ovalau Island (Ramoli and Nunn, 2001).

A few days later Ratu Matanabalavu confronted Rakavono and told him that he must leave the island as Laginiwasa had done. Lacking his own drua, Rakavono swam to Rukuruku on the northwestern coast of Ovalau island (Ramoli and Nunn, 2001).

According to the oral narrative, the path when Rakavono swam, is a warm passage about 8 kilometers in distance. Several fishermen from both Naigani and Ovalau have swam the passage without any swimming aid stating that the warmth provided buoyancy and any cold water encountered during the swim meant that the path where Rakavono swam was not being followed.

3. The sacred stone of Matuku

Matuku is an island located in the Lau group (southeast of Viti Levu). It was also the only island in the Lau group that was not conquered by the Tongan army led by the Tongan prince, Enele Ma’afu’out’itonga (around the 1840s). On the eastern end of the island there is a stone which is submerged during high tides. The stone, reddish in color is almost rectangular in form and about 1 meter x 1.5 meters in dimension can be found amidst beach cobbles near Levukaidaku village. This reddish stone displays traditional relationships between
Levukaidaku and the neighbouring village, Raviravi. According to the oral accounts collected from both villages, giant tidal waves occur instantaneously when a villager from Raviravi walks past the stone.

Similarly, another reddish stone which is smaller in size is located about 20 meters west of the previous one happens to cause giant tidal waves when it is disrespected through speech or action.

The giant waves can only be calmed when a clan member from Levukaidaku performs a ritual by covering the red stones with leaves from a particular tree.

4. The sacred mosquito crevice, Matacaucau

Along the eastern coast of the main island, Viti Levu, there is a mysterious maritime site. This is a crevice at the foot of a cliff at high water mark. The crevice is called ‘Qara ni namu.’ Qara is opening and namu is mosquito. The Qara ni namu contains mythical history. It is said that this was a gift by Rokomoutu who was the leader of one of the migrating party from the hills of Nakauvadra. While sailing across towards Verata Ucunivanua, strong winds tore his sails and he decided to seek shelter close to land to mend his sails. As a gift for the people that helped him, Rokomoutu presented a parcel containing mosquitoes, which was supposed to be his present to the Turaga na Ratu from Verata to awake him every morning. This was instead gifted to the people of Matacaucau for their assistance.

The villagers of Matacaucau relayed stories that anyone who disturbed the Qara ni namu would suffer dire consequences in that mosquitoes would swarm the village resistant to repellents and sleeping nets. It was also relayed that during ceremonial festivities young men would purposefully stir the Qara ni namu to
Conclusion

Pacific Islanders are deeply connected with the ocean. The ocean as the source of life, the medium for transportation between islands and sustaining livelihoods, much of the Pacific’s history is related to the use of the ocean where some of it are now underwater.

Similarly, the Fiji Islands is littered with historical sites related to maritime heritage. This paper offers a glimpse of the diversity of distribution of maritime heritage sites, most of which are connected through myths and legends and have unexplainable occurrences. However, these mysterious heritage sites are considered in the iTaukei language as the ‘sau ni vanua’ or the power of the land and its people.

On the contrary, current climatic conditions should also be considered. Fiji is experiencing the threats of global sea level rise where a total of 64 coastal villages are earmarked for relocation. More than 3 villages have already been relocated under the National Climate Change Fund and the Archaeology Department is mapping a proactive strategic plan on the potential of documenting all community related heritage in affected villages which will add to the list of underwater heritage in the future.

Given that human and financial resources are lacking, the Fiji Museum will slowly proceed and continue to document underwater cultural heritage sites while working in collaboration with other government agencies and NGOs in creating awareness on the significance and protection of UCH.

Endnotes

1 Preservation of Objects of Paleontological Interest Act: (Laws of Fiji, Chapter 264)
2 Title, name by which a person or group is identified, the (usually honorific) name by which a kin-group is known or, less commonly, their plant, fish or other animal (Gatty, 2009).
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Exploring the Sunken Military Heritage of Midway Atoll

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Abstract
Following the attack on Pearl Harbor in December 1941, the Japanese Imperial Navy readied their forces to secure the Pacific Theatre through one final blow to the US aircraft carrier fleet. The target of that attack was the US base at Midway Atoll, which provided support as a naval air station and submarine refit center. In June 1942, the Japanese Navy launched an aerial attack on Midway in an effort to destroy its defenses and lure the remaining aircraft carriers into combat. Although outgunned and outnumbered, US aviators surprised the Japanese fleet and succeeded in destroying four of their carriers, thereby crippling Japanese aerial defenses for the remainder of the war. Today, Midway Atoll is situated within the boundaries of Papahānaumokuākea Marine National Monument and many of its World War II naval facilities are preserved as a memorial to those who lost their lives. Recent interest in the battle has led to a renewed effort to locate and document the submerged cultural heritage of the atoll and to create outreach materials addressing both the tangible and intangible heritage of the battle. This paper provides an overview of the history of the atoll and the Battle of Midway, describes significant archaeological sites so far located there, and discusses recent survey projects focused on identifying the remains of aircraft associated with the battle.

Key words: Midway, World War II, survey, aircraft

Introduction
Located at the northwest end of the Hawaiian island chain (Fig. 1), Midway atoll is geographically isolated, sitting approximately 1300 miles northwest of Honolulu (FWS, 2000). Managed by the US Fish and Wildlife Service (FWS) and
part of the larger Papahānaumokuākea Marine National Monument (PMNM), the atoll is protected as a National Wildlife Refuge, National Memorial, and a United Nations Educational, Scientific, and Cultural Organization (UNESCO) World Heritage Site (NOAA, 2017). Furthermore, the WWII-era facilities on Eastern and Sand Islands are designated as historic structures on the US National Register of Historic Places (Thompson, 1986). Visitation to the atoll is currently restricted, limiting public interaction with the atoll's historic resources to outreach materials. As such, there has been an increased interest by PMNM (in partnership with FWS and the US National Park Service, NPS) to better understand and present the historical significance of Midway atoll to the public through archival research, archaeological site detection and documentation, site visitation, and mapping.

Fig. 1: Midway Atoll, located at the eastern part of the Northwestern Hawaiian Island chain. (NOAA)

Historical Background

Concerned with the increasing Japanese presence in the Pacific, the United States (US) Navy began construction on a naval air station at Midway atoll in
1938 (FWS, 2000). The two islands within the atoll soon became host to the 6th Marine Defense Battalion and the 2nd Raider Battalion when construction of the base was completed in 1941 (Thompson, 1986). As Midway was (and remains) geographically isolated, the islands' infrastructures emphasized coastal defense, fuel storage, and air transport facilities. In May 1942, the Imperial Japanese Naval code was deciphered, revealing an imminent attack on the base (Layton et al., 2006). Reinforcements of submarines, motor torpedo (PT) boats, and aircraft were sent to Midway while the US aircraft carriers sailed north of the atoll (Office of Naval Intelligence, 1943:3). Submarines and small craft began patrolling nearby waters while aircraft stationed at the base participated in daily scouting trips (Nimitz, 1942:4).

The evening of 3 June 1942, US scout bombers located Japanese ships to the west of the atoll, approximately 470 miles from the air station (Office of Naval Intelligence, 1943:9). By 6:00 a.m., on 4 June, radar stationed at the atoll had picked up numerous aircraft flying at 12,000 feet approximately 93 miles from the base (Simard, 1942:2). Targeting communications buildings, the power plant, and fuel storage areas, Japanese aviators succeeded in disrupting communications and caused substantial damage to the seaplane base (Fig. 2). Furthermore, many of the base's defenses proved useless against Japanese planes. Anti-aircraft guns were too slow to match Japanese bombers, as were American fighter planes; of the 27 Brewster F2A-3 Buffalos and Grumman F4F Wildcats which had departed Midway to meet the coming onslaught, only a handful of planes returned unharmed (Office of Naval Intelligence, 1943).
As personnel on Midway prepared for a second attack, Japanese aircraft on carriers faced an escalating emergency; bomber aircraft from US carriers had located the Japanese fleet. A carrier war emerged out of the chaos—by 7 June, US forces had destroyed the Japanese carriers *Akagi, Kaga, Sōryū* and *Hiryū* while a Japanese submarine succeeded in sinking the carrier USS Yorktown. A total of 332 Japanese and 147 American aircraft were lost during the battle (Office of Naval Intelligence, 1943:54; Thompson, 1986).

With the Japanese carrier fleet destroyed, the Imperial Japanese Navy was forced to retreat. Those stationed at Midway began rebuilding and strengthening the islands’ defenses (Thompson, 1986:3). Publicized as the ‘turning point’ for war in the Pacific, the battle of Midway has become synonymous with American valor (Thompson, 1986). However, heroes emerged on both sides of the during the attack and the battle was not without sacrifice—over 300 Americans and
2,400 Japanese gave their lives in service to their countries (Office of Naval Intelligence, 1943: 54; Thompson, 1986).

Following the battle, the Japanese Navy remained a formidable opponent. While US forces had succeeded in keeping control of the atoll, American aircraft were repeatedly out-maneuvered by their Japanese counterparts such as the Mitsubishi A6M Zero Fighter. Major Jo Warner who was stationed at Midway during the attack would later state, "...the saddest story was our fighters. The PBYs and dive bombers are slow, but the Grumman and Brewsters used by the marine fighter outfits didn't have a chance against the Zeros" (Warner, 1942:7). Following the battle, engineers strove to redesign American fighter aircraft. The resulting F6F Hellcat and F4U Corsair proved far superior to the Buffalos and remained in use through the end of the war.

Following the battle of Midway, the atoll remained important in the US Navy’s Pacific strategy through the construction of a submarine base (Ellis, 2002). After WWII, it was used as a US Naval base for the Korean and Vietnam Wars. Downgraded to a Naval Air Facility in 1978, the atoll was designated a National Wildlife Refuge in 1988. In 1993, the atoll was transferred to FWS following base closure. Expansion of Papahānaumokuākea Marine National Monument (formerly the Northwestern Hawaiian Islands Marine National Monument) in 2006 placed atoll management under the jurisdiction of FWS and NOAA. Currently, the atoll is closed to visitors; as such, emphasis is currently placed on digital outreach by cultural resource managers.

**Archaeological Investigations of Midway’s Submerged Heritage**

Archaeological investigations of Midway atoll’s sunken heritage began in 1998 (Van Tilburg, 2002a). Since that time, surveys have focused on the documentation of previously known wrecked or dumped watercraft and
airplanes, as well as searching particular areas in the vicinity of historically reported wrecks. Along with the many craft lost at the Battle of Midway, historical accounts indicate that a number of 19th and early 20th century vessels are known to have come to grief upon the atoll’s reefs. These include the two-masted schooner *Julia E. Whalen* (1903), the schooner *General Seigel* (1886), the bark *Wandering Minstrel* (1888), the three-masted bark *Carrolton* (1906), the sloop *Helene* (1915), and an unidentified Japanese sampan lost in 1925 (Van Tilburg, 2002b; PMNM, 2011). Of those sites, only the bark *Carrolton* has been identified and thoroughly documented (Maynard et al., 1998; Van Tilburg, 2002b; Van Tilburg, 2003; Van Tilburg, 2005). Towboarding and drift diving have been the most fruitful methods for identifying underwater cultural heritage that represents many of the various events and activities that have occurred at Midway over time. Such surveys have resulted in the discovery of a range of materials and sites such as 19th and 20th century anchors and chain, WWII-era aircraft wreckage and unexploded ordinance, and sites of 20th century scientific data collection (Raupp, 2015).

**USS Macaw**

The wreck of the submarine rescue vessel USS *Macaw* is among the most prominent and well-known underwater archaeological sites at Midway Atoll. Situated on the eastern side of the main shipping channel, the site lies in 8-12 meters (m) (25-45 feet (ft)) of water. The wreck was first investigated in 1998 with a detailed site plan and photomosaic produced by an archaeological team from NOAA, East Carolina University, and University of Hawaii in 2003 (Van Tilburg, 2003; PMNM, 2011). In 2005, the wreck was extensively documented using high definition video equipment and digital still photography (Van Tilburg, 2005) and monitoring surveys are conducted regularly with a focus on photographic and video documentation. Although US Navy divers attempted to
reduce the ship’s superstructure and clear the channel post-wrecking, substantial hull remains – including the relatively intact bow section – are scattered over an approximately 75 m (240 ft) area. Associated material culture including three large anchors, the detached rudder anchor chains, and heavy bronze artifacts remain scattered throughout the site (Van Tilburg, 2003). A Midway-based dive shop took advantage of the easy access to the site and for several years ran tours during slack tide and optimum weather conditions; however, no changes are known to have occurred to the site since salvage operations ended in 1944 (Van Tilburg, 2003a; Van Tilburg, 2003b).

The location and remains of USS Macaw have been further researched since the time of its wrecking. Archival data indicates that the Chanticleer class USS Macaw (ASR-11) was launched in 1942 in Oakland, California and received a commission by the US Navy in July 1943. The vessel first sailed to the south Pacific to participate in a hydrographic survey of uncharted coral reefs. Soon after it was sent on its first salvage mission to Midway Atoll, where in January 1944 it ran aground while attempting to assist the submarine USS Flier (Van Tilburg, 2003a; Van Tilburg, 2003b; PMNM, 2008). Foul weather and sea conditions thwarted the numerous efforts to extract USS Macaw from the reef and it was ultimately abandoned and sunk. The ship was later salvaged of useful equipment before explosives flattened the superstructure and cleared the channel (Van Tilburg, 2003a).

**Vought F4U Corsair**

The remains of a Vought F4U Corsair aircraft were first identified by members of the "Coral King Dive Club" in 1976 (NOAA, 2017). Resting in approximately 35 m (115 ft) of water on a sand seabed, the site is situated off the south shore runway on Sand Island. Archaeological surveys conducted between 2002 and 2008 focused on site documentation and a special photographic survey of the
site was conducted in 2008 to capture data for use in the creation of a computer generated three-dimensional rendering of the site (Fig. 3) (Gleason, 2008; PMNM, 2011). The wreck site is comprised of two distinct areas situated approximately 200 m apart; one incorporates the largely inverted fuselage and wing portion of the plane with its retractable landing gear down and the other is a large and well-preserved radial engine. The fuselage and wing section is largely intact and the artifacts identified on the seabed are pieces of the plexiglass from the cockpit canopy and rolls of .50-caliber ammunition (Van Tilburg, 2002). Due to the mostly flat and featureless bottom, the site provides a wide variety of fish species with a wealth of habitats in which to shelter” (Van Tilburg, 2007:4).

![Fig. 3: Photogrammetric model of the Vought F4U Corsair at Midway Atoll (Image courtesy of Bert Ho, Exploring the Sunken Heritage of Midway Atoll expedition 2017).](image)

The distinctive bent-wing design of the wrecked aircraft make it easily identifiable as a F4U Corsair. In production between 1942 and 1952, the Corsair was
powered by a Pratt and Whitney R-2800 Double Wasp air-cooled radial engine with a large Hamilton Standard propeller which produced a top speed of over 400 miles per hour (Tillman, 2001). Although the exact date for the loss of this F4U Corsair is unknown, it occurred sometime after Battle of Midway since the type was only introduced to the Pacific theater in 1943. Based on the position of the retractable landing gear, it is likely that the plane crashed either on approach or shortly after take off from the runway at Sand Island (Van Tilburg, 2002a).

**F2A Brewster Buffalo**

In 2012, divers from NOAA’s Pacific Islands Fisheries Science Center Coral Reef Ecosystem Division located the remains of a wrecked Brewster F2A Buffalo while conducting marine debris surveys at Midway Atoll. Located in approximately 3 m (10 ft) of water on the eastern side of the lagoon, the site consists of disarticulated military aircraft components concentrated in a discreet area of the seabed. An archaeological survey of the site by a team of researchers from PMNM produced detailed sketches of artifacts, a site plan, photographic and video records, and a photogrammetric model of the main concentration of wreckage. Reconnaissance surveys of the surrounding area found a large scatter of associated wreckage, which suggests that the plane likely broke up on impact with the water. Artifacts recorded at the site include a Wright R-1820-40 Cyclone radial engine and mangled propeller, four .50-caliber Browning machine guns, .50-caliber ammunition, cockpit canopy glass, a control column, a tail cone, and multiple components of a Buffalo’s distinctive landing gear (Raupp and Green, 2012). No previous knowledge of the site or evidence of anthropogenic impacts have been located in archives or historic documents. The shallow nature of the site and the fact that no fuselage remains were identified, however, suggest that the majority of the wreckage may have been recovered sometime after impact for disposal.
Archival research did provide information on the aircraft and the wrecking event; in February 1942, a squall caused United States Marine Corps (USMC) Lt. Col. Charles W. Somers, Jr. to crash into the lagoon at Midway Atoll while trying to land at Eastern Island (TIGHAR, 2012:27). Somers survived the crash and went on to fight in the Battle of Midway. He was later appointed as the first commanding officer of VMF-214, also known as the Black Sheep Squadron (Allison, 2003:68).

**P40 Warhawk**

While conducting routine towboarding operations in 2014, PMNM archaeologists discovered the remains of a P-40K Warhawk fighter aircraft off the southeastern portion of Midway Atoll’s barrier reef. Resting at a depth of approximately 8m (25 ft) and situated in two distinct areas within a relatively small area of the spur and groove reef system, the site is located just offshore of one Eastern Island’s historic runways. Site surveys produced detailed sketches of individual artifacts and a site plan, as well as photographic and video records of the site. Identified among the scattered wreckage were a large inline engine, components of landing gear, two propeller blades, three .50-caliber machine guns, a machine gun muzzle, and .50-caliber ammunition (Gleason, 2014).

Determination of the aircraft type proved simple due to the distinct design of the motor; identified as an Allison V-1710 12 cylinder liquid-cooled engine, it was used to power the Curtiss P-40 Warhawk aircraft. Markings on some of the artifacts further supported this identification. The .50-caliber shells marked “1941” offered at date of production, and manufacturing on the muzzle indicated that was intended for use with a .50-caliber Browning machine gun (Gleason, 2014). No previous knowledge of this site or any impacts that have occurred to the wreck over time have been located. The fact that no fuselage remains were
identified is unsurprising, given the large swells created by winter storms which have likely broken up and displaced the lightweight aluminum hull and deposited only heavier iron objects.

Archival research indicates that only one P-40K Warhawk is known to have wrecked off the eastern shore of Eastern Island. In February 1943, US Army Air Force (USAAF) Lt. Ray Obenshain, Jr. was forced to ditch his P-40 and parachute to safety when the controls froze shortly after takeoff (NOAA, 2017). This plane was one of twenty-four aircraft detailed to the USAAF 78th Fighter Squadron, which set an aviation milestone when they arrived at Midway in January 1943. After equipping the planes with special belly tanks to provide extra fuel, the squadron departed Barking Sands Air Force Base on Kauai and flew 1100 miles, the longest over-water flight of a single engine, land-based airplane ever attempted (Bennett, 2009).

**Aircraft Wreck SW**

Components of an unidentified aircraft wreck were identified in the southwestern portion of the barrier reef in 2015. Phenomenal sea conditions allowed a team PMNM of researchers to conduct towboard surveys close to the reef in the generally difficult to operate portion of the atoll. Lying in approximately 3 m (10 ft) of water in a channel of the spur and groove reef topography, an intact three-bladed propeller, hub, shaft, gears, and other engine components were identified. Time constraints allowed for only preliminary archaeological recording of the site but produced sketches of artifacts, photographic and video records, and a photogrammetric model of the propeller and nearby artifacts. Artifacts identified in the surrounding area included a tailhook painted with alternating red and white stripes, two .50-caliber machine guns, a cylinder cover from a radial engine, rubber fittings, wiring, a loaded ammunition canister, and deteriorated portions of the plane’s hull (Raupp et al., 2015).
The area was considered a priority for survey as archival research suggested a P-40 Warhawk had been lost in the vicinity (Linville, 2010:12). While the aircraft has not been identified as a Warhawk—and is in need of further archaeological and archival research—limited survey of the site suggests the aircraft hit the water and/or reef very hard, breaking apart on impact. As with the P-40K site identified off the southeast of Midway’s barrier reef, the lack of substantial fuselage remains identified in this location is unsurprising. Heavy swells appear to have displaced hull structure by forcing lightweight artifacts into crevices under the reef and depositing heavier objects on the seabed.

### 2017 Survey

A total of 31 WWII-era aircraft wrecks occurring within 5 miles of Midway have been identified through archival research (Linville, 2010:10-14). As only four of these sites were documented archaeologically, NOAA and NPS archaeologists (in partnership with FWS personnel) returned to Midway in 2017 (coinciding with the 75th anniversary of the battle) to continue surveying for material culture. Funded through the NOAA Office of Ocean Exploration and Research, the project was aimed at identification of submerged aircraft remains associated with the atoll’s World War II heritage. Over the course of one week, 200 linear nautical miles were surveyed with a magnetometer. 102 anomalies were identified, 86 of which yielded material culture. While many of these findings date to the 19th and early 20th century, two WWII era sites were located during the survey.

The first site has been (tentatively) identified as a Pratt and Whitney Twin Wasp Engine (Ho and Keogh, 2017). While this model was prevalent during the war, an F4U Corsair was the only plane with this engine flown at Midway. As the Corsair only arrived at the atoll in October 1942, this site post-dates the battle. The second site, found during the last day of diving operations, consists of a partial radial engine. Due to the fragmented nature of the site, further research
must be conducted before a positive identification can be made (Ho and Keogh, 2017).

**Ongoing Research**

Additional research addressing the WWII cultural heritage at Midway were conducted as part of the 2017 fieldwork. Prior to physical fieldwork at the atoll, researchers revisited archival material to assess the battle’s military terrain through KOCOA analysis (Roth and McKinnon, 2017). Widely used to interpret historic naval and terrestrial engagements, little has been done to adapt KOCOA to historic aerial combat (Babits et al., 2011, Spennemann, 2011:360, Frye and Resnick, 2013). Thus, re-evaluating KOCOA parameters to include aerial combat aided researchers in better understanding decisions made by pilots during the battle. Furthermore, the KOCOA data could be presented in cartographic form (Fig. 4).

*Fig. 4: WWII Era Facilities at Midway Atoll. (Authors 2017)*
The resulting geo-spatial data was used in conjunction with biographies of WWII-era crash casualties at Midway (see Linville, 2017) to create an ArcGIS Story Map. Archaeologists have found the Story Maps program is opening new avenues of interactive digital outreach (Alemy et al., 2017). Given the current constraints of visiting Midway and accessing the atoll’s tangible heritage, the Story Map presents interactive content and a platform for public outreach on a global scale.

Conclusions

Aircraft wrecked within the shallow waters of Midway have undergone extensive mechanical deterioration associated with the dynamic marine environment found at the atoll. Comparative preservation of the F4U Corsair, located in a much deeper and more stable environment, suggests that offshore survey may yield sites with better preservation. Nevertheless, the 2017 survey results suggest WWII heritage remains submerged in shallower atoll waters and can contribute to the ongoing study of war in the Pacific.

Further research into the activities at the atoll post-battle may shed light on the newest WWII-era submerged sites. While none of the remains located thus far are associated with the battle, they are significant cultural resources which contribute to understanding the role Midway played in the War. Digital outreach materials addressing this history offers new ways for the public to engage with both tangible and intangible remains of a shared aviation heritage.
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Biography

Jason Raupp is the Staff Archaeologist for the Program in Maritime Studies at East Carolina University. He holds a B.A. in Anthropology from Northwestern State University, M.A. in History and Historical Archaeology from University of West Florida, and Ph.D. in Archaeology from Flinders University. Over the past twenty years he has been involved with maritime and terrestrial archaeological research in the US, West Africa, Australia, Asia, the Caribbean, and the Pacific region. He has extensive experience in public and private sector cultural heritage management, as well as diving and boating safety. Jason’s research interests include historical and maritime archaeology of the Pacific Ocean, culture contact, historic fisheries, military technologies, battlefield studies, and contact-period rock art.

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Underwater Cultural Heritage Management and Capacity Building in the Pacific Islands

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Abstract

This paper begins with introducing UNESCO’s Conventions focusing on different forms of heritage, namely land-based, underwater, movable, immovable, tangible and intangible, including the UNESCO Convention on the Protection of the Underwater Cultural Heritage (UCH Convention) adopted in 2001. The paper then presents progress in activities under the three key Conventions, namely, the UCH Convention, the Convention for the Protection of the World Cultural and Natural Heritage (World Heritage Convention) and the Convention for the Safeguarding of the Intangible Cultural Heritage Convention (ICH Convention), in the Pacific Small Island Developing States (SIDS). Notable progress in UCH-related activities includes the enhanced awareness of the importance of UCH to SIDS sustainable development through the explicit reference to UCH in the SIDS Accelerated Modalities of Action (SAMOA) Pathway outcome document of the 3rd UN SIDS Conference (Samoa, 2014) and a call for the development of comprehensive strategies to raise awareness of the natural and cultural significance of the ocean at the UN Conference to Support the Implementation of Sustainable Development Goals (SDG) 14: Conserve and Sustainably use the oceans, seas and marine resources for sustainable development (NY, September 2017). Taking into account of these developments and based on good practices identified through the promotion and implementation of the World Heritage Convention and the ICH Convention in Pacific SIDS, the paper aims to present an implementation strategy for the effective support to UCH-related activities and the promotion of the UCH Convention among Pacific SIDS as a way forward.
Key words: UNESCO, UCH Convention, World Heritage Convention, Intangible Cultural Heritage Convention, The 2030 Agenda for Sustainable Development, SDGs

Introduction

The United Nations Educational, Scientific and Cultural Organization (UNESCO) is one of the Specialized Agencies of the United Nations (UN). Among its broad mandate, UNESCO is recognized as a leader in the international cooperation in culture. The Culture Programme of UNESCO consists of two pillars of Heritage and Creativity. By safeguarding heritage in all forms, namely, land-based, underwater, movable, immovable, tangible and intangible, and promoting arts and cultural/creative industries, the Culture Programme of UNESCO aims to protect and promote the diversity of cultural expressions for sustainable development and peace in the world.

Over the years, UNESCO adopted seven conventions in culture. All together, they provide a comprehensive coverage of the culture sector. Among them, the following five Conventions directly concern cultural heritage;

i) Convention for the Safeguarding of the Intangible Cultural Heritage (2003),

ii) Convention for the Protection of the Underwater Cultural Heritage (2001),

iii) Convention for the Protection of the World Cultural and Natural Heritage (1972),


It must be noted that these Conventions provide important guidelines and principles for the heritage safeguarding that could help member states build and develop the national systems – policy, strategy, management tools such as heritage registers and inventories, infrastructure, capacities, etc. – necessary for heritage safeguarding. Some of the Conventions establish international lists through intergovernmental process. The World Heritage List established by the World Heritage Convention is one of the examples. The objective of this listing system is to enhance the protection and visibility of heritage that meet specific criteria set out in the operational guidelines of the respective Convention through international cooperation.

The Convention for the Protection of Cultural Property in the Event of Armed Conflicts adopted in The Hague in 1954 is the first Convention that UNESCO adopted after World War II. It is the first international treaty addressing the cultural property protection both at peace time and during conflicts. The definition of cultural property under the Hague Convention is broad, covering both movable and immovable, including not only cultural heritage sites, but also cultural institutions such as libraries, museums, and archives. After the end of the Cold War in 1990s, cultural heritage became a target of intentional attack and some iconic heritage such as Mostar Bridge in Bosnia and Herzegovina was destroyed during the civil war. At the request of member states calling for more effective heritage protection, UNESCO launched a process to elaborate the 2nd Protocol to the Hague Convention, which was adopted in 1999. The 2nd Protocol establishes the Enhanced Protection system. The Hague Convention played a pioneering role in promoting the concept of “Cultural heritage of all mankind” and in entrusting the international community with the responsibility for its protection.

With the increasing number of thefts and pillage of archaeological sites and museums as background, the Convention on the Means of Prohibiting and
Preventing the Illicit Traffic of Cultural Property was adopted in 1970. The 1970 Convention regards cultural property as an embodiment of cultural identity and aims to facilitate their return to the countries of origin. This Convention, however, does not apply to the cases of illicit traffic that occurred before 1970. Therefore, the Intergovernmental Committee for Promoting the Return of Cultural Property to its Countries of Origin or its Restitution in case of Illicit Appropriation (ICPRCP) was established in 1978 with the aims to provide an international forum to promote the return and restitution of cultural property for the cases before 1970 and in the process of colonization.

Increasing needs of the protection of movable cultural property were identified not only for land-based heritage but also underwater heritage. For a long time, historical and cultural objects that were found in submerged shipwrecks have been dispersed due to the application of the law of finds to sunken and abandoned vessels under which the finder is granted ownership of the objects. The advancing technology has increasingly made the access to submerged shipwrecks easier, making them more vulnerable to commercially driven “treasure hunting” activities. The United Nations Convention on the Law of the Sea (UNCLOS) adopted in 1982 includes two provisions concerning UCH. However, these provisions were felt by cultural experts to be incomplete without providing details of the protection measures. With this as background, the UNESCO Convention for the Protection of the Underwater Cultural Heritage was adopted in 2001. Article 4 of the UCH Convention states that “Any activities relating to UCH to which this Convention applies shall not be subject to the law of salvage or law of finds, unless it; (a) is authorized by the competent authorities, and (b) UCH Convention protects UCH from being commercially exploited for trade or speculation, and (c) ensures that any recovery of the UCH achieves its maximum protection”. In this way, the UCH underlined the
importance of *in situ* preservation of UCH, prohibiting UCH from being commercially exploited for trade or speculation.

The Convention for the Protection of the World Cultural and Natural Heritage, known as the World Heritage Convention, was adopted in 1972. Behind its adoption was the global interest in and movement for the protection of environment. The World Heritage Convention combined the protection of cultural heritage and natural heritage, establishing a more comprehensive system for international cooperation for the heritage safeguarding. The World Heritage Convention presents the concept of “Common heritage of humanity”, and the responsibility for future generations.

The World Heritage Convention primarily addresses issues related to tangible cultural heritage and natural heritage. The Intangible Cultural Heritage (ICH) Convention was adopted some 30 years after the adoption of the World Heritage Convention. The ICH Convention addresses the need of the urgent safeguarding of ICH or “the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artifacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their heritage.” (Article 2 of the ICH Convention). The ICH Convention underlined the importance of the participation of community and ICH holders/practitioners in establishing community-based ICH inventories with “Free, Prior, and Informed Consent”. The ICH Convention is characterized by the respect for the communities’ decision, and equality among diverse cultures. Despite the initial issues over its coherence with the existing heritage concept, the ICH Convention has received growing support of member states in particular in Africa and Asia.

UNESCO Office for the Pacific States based in Samoa is one of some 50 field offices of UNESCO. The Office in Apia is in charge of 16 member states and 1
associate member. The priority group is the Small Island Developing States (SIDS) in the Pacific, most of them are young nations and facing development challenges that are specific to SIDS. The key objective of the culture programme of the Office in Apia is to assist Pacific SIDS to develop and upgrade their national systems based on the guidelines provided by the Conventions to strengthen the culture sector through technical assistance and capacity building.

**Progress related to UCH Convention**

At present, most of Pacific SIDS are parties to the World Heritage Convention and the ICH Convention, while none of them are parties to the UCH Convention. Despite slow progress in terms of ratification, however, there have been progress in the awareness raising on the importance of UCH for SIDS sustainable development. UNESCO organized a series of activities on UCH during the 3<sup>rd</sup> UN International Conference on Small Island Developing States (SIDS) (Samoa, 1 – 4 September 2014). These activities resulted in a partnership with the Pacific Island Forum (PIF) and its Pacific Ocean Alliance (POA). The goals of POA are to reinvigorate the commitment to and implementation of the Pacific Island Regional Ocean Policy composed of six areas of cooperation including “Culture and Identity”.

A new network called Pacific UCH Partnerships (PUCHP) was also agreed upon at the expert meeting held during the SIDS Conference as an open-ended network with universities, regional intergovernmental agencies, specialized institutions and centres, NGOs and other civil society organizations in the areas related to UCH protection and management. As its first assignment, and in response to the request by Pacific member states and in cooperation with UNESCO, PUCHP carried out a research project in 2015 with the following objectives; i) to have a better understanding of issues surrounding WWII remains in the Pacific, ii) to identify good practices in the protection and management of
these remains to reduce the impact on the environment and human safety, and iii) to identify areas of international cooperation. A final report is expected to be available before the end of 2017.

Importantly, the outcome of the SIDS Conference titled Samoa Accelerated Modality of Action (SAMOA) Pathway reaffirms that SIDS remain a special case for sustainable development, recognizing SIDS’s ownership and leadership in overcoming challenges specific to SIDS. The SAMOA Pathway paragraph 54 supports SIDS’s efforts to conserve their UCH and paragraph 58 (j) supports States to consider becoming parties to the UCH Convention. This was the first time that UCH was mentioned in the outcome documents of the SIDS Conference. The summary of UCH-related activities at the SIDS Conference was published by UNESCO as an e-document (UNESCO 2014). The document was officially launched at the inaugural POA Meeting held in Suva in May 2015.

![Flyer on Pacific Ocean Alliance](image)

*Fig.1: Flyer on Pacific Ocean Alliance. (© PIF)*
Another important document was adopted at the UN Conference to support the implementation of Sustainable Development Goal (SDG) 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development (the UN Ocean Conference) at the UN in NY (New York) in June 2017. The Conference’s outcome document is titled “Our Ocean, our future: call for action” and paragraph 13 (d) in the document states “develop comprehensive strategies to raise awareness of the natural and cultural significance of the ocean, as well as of its state and role…”.

As background, SDGs are the goals that the international community agreed to achieve towards 2030 in the 2030 Agenda for Sustainable Development adopted in November 2014. The 2030 Agenda has 17 SDGs and 169 targets. Culture plays a transversal role in achieving all the SDGs, and directly concerns some of the SDGs, notably, SDG 11 on Sustainable Cities and Communities to protect worlds’ cultural/natural heritage (Note that Government budget per year for heritage safeguarding is mentioned as a basis to provide SDG Indicator 11.4.1), SDG 4 on Quality Education through the education and appreciation of cultural diversity, SDG 8 on Decent Work and Economic Growth through employment in the sector of cultural and creative industries and tourism.

**Progress related to other Conventions in Culture**

With regard to the World Heritage Convention, the Pacific member states managed to meet at a Pacific World Heritage Workshop on a regular basis with funding from development partners and UNESCO (UNESCO 2012 and 2014). This allowed the region to develop a medium-term Pacific World Heritage Action Plan since 2000. The Action Plan identifies priority actions, both at national and regional levels and currently Pacific SIDS are implementing the Pacific World Heritage Action Plan 2016-2020. Thanks to this successful regional cooperation, all Pacific SIDS except two countries are now parties to the World Heritage
Convention and over ten sites in Pacific SIDS are inscribed on the World Heritage List.

As for the ICH Convention, UNESCO launched a global capacity building programme in 2011. Under this programme, UNESCO trained a corps of trainers, developed learning materials and standard programmes of workshops focusing on ratification, implementation, community-based ICH inventorying, safeguarding plan development, and nomination development. This programme was benefitting from a significant amount of voluntary contributions from member states and development partners.

Mention should be made about so called “ratification workshop” and its impact. This category of workshop is a multi-stakeholder workshop bringing together government officials, ICH practitioners and holders, community leaders, NGOs, researchers and academics involved in ICH safeguarding. The government officials participating in this workshop typically come not only from the cultural authorities but also from other Ministries such as the Ministry of Foreign Affairs which is usually a focal point for international conventions and the UN-related matters, Attorney General’s Office that provides legal advice when countries make a decision on ratification, the Ministry of Commerce which is in charge of the Intellectual Property Rights (IRP) protection of cultural production. Participants in this workshop have the opportunity to learn the history and background of the adoption of the ICH Convention to learn why this Convention was needed, examine the key provisions of the Convention to learn what the benefits and obligations are as well as the national process towards ratification. The workshop creates a group of ICH champions who would continue to engage in the safeguarding activity in each country. The government officials trained in this workshop have obtained an ability to prepare an information paper to a Minister for his/her submission to the cabinet for a decision, or, depending on
governance system, to a relevant committee attached to the parliament for its presentation at the parliament. The ratification workshops were held both at national level and also regional level. The regional ratification workshops were attended by delegates both from states parties and state-non-parties so that delegates could have an opportunity for information sharing and mutual learning among themselves.

Conclusion

As underlined at the beginning, the UNESCO Culture Conventions provide internationally recognized guidelines for developing national systems for heritage safeguarding and for the culture sector. Ratification of these Conventions itself should not be considered as the end in itself. Pacific SIDS are relatively young nations and most of them are still in the process of developing their own national systems for heritage safeguarding. The guidelines and principles enshrined in these Conventions are useful in their efforts in developing national systems.

The progress and experience in the promotion and implementation of the key Conventions illustrated above provide good practices in UNESCO’s normative actions for Pacific SIDS which might be applied to the promotion of the UCH Convention among Pacific SIDS. The good practices identified so far are the following;

i) The advocacy for cultural heritage, its historical, cultural and scientific significance and its contribution to sustainable development through the participation in multi-sectoral platform and regional policy development,
ii) The preparation of a medium-term strategy and action plan both at national and regional levels for prioritization and coordination,

iii) The organization of a regional forum on regular basis for information sharing and mutual learning,

iv) The development of a capacity building programme addressing the specific needs under different phases of the life cycle of the Conventions.

Obviously, the heritage safeguarding is a long-term process, and the success stories in the past have owed their success to the commitment of member states and stakeholders as well as the support of funding from development partners. Therefore, it is also critically important to strengthen resource mobilizing efforts for the promotion of the UCH Convention by all parties involved.

As a way forward, UNESCO in Apia is organizing the next regional workshop that will take place in Koror from 30 August to 1 September 2017 as “Pacific Heritage Workshop”. The focus of this Workshop remains the information sharing on the implementation of the Pacific World Heritage Action Plan 2016-2020, but the Workshop will include a session dedicated to the UCH Convention and the Hague Convention as well. It will bring together not only government officials in charge of heritage but also, UCH experts as resource person and partners in Asia and the Pacific region. It is hoped that this first “Pacific Heritage Workshop” will be an effective forum, leading to the concrete result of ratifications of the UCH Convention by Pacific SIDS.
Endnote

For the Hague Convention and the 1970 Convention, UNESCO in Apia organized the Melanesia Workshop on the Illicit Trafficking in Cultural Property (Vanuatu, 2015) and the first ever Pacific Workshop on the Hague Convention and its Protocols (Fiji, 2016). Final reports of these workshops were published as an e-document and available online.

References


Biography

Akatsuki Takahashi (高橋 暁), BA in international relations (Tsuda College, Tokyo), Diploma in education (International Christian University, Tokyo), PhD in cultural heritage risk management (Institute of Disaster Mitigation for Urban Cultural Heritage at Ritsumeikan University, Kyoto) has been the Programme Specialist for Culture at the UNESCO Office for the Pacific States.
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Building Capacity in the South West Pacific – The Norfolk Island Maritime Archaeological Association

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Abstract:
The Australian Government Department of the Environment and Energy administers the Commonwealth Historic Shipwrecks Act 1976 and the National Historic Shipwrecks Program. This Program enables the Department to work with the States, the Northern Territory and Norfolk Island to protect historic shipwrecks.

With the wealth of maritime history on Norfolk Island and the strong associations with Pitcairn Island, the potential for involving the broader community in documenting and protecting Norfolk Island's wonderful maritime heritage is significant. In 2010, at the request of the Norfolk Island Delegate, the first in a series of community focussed capacity building activities in maritime archaeology was conducted on the island. These activities resulted in the creation of the Norfolk Island Maritime Archaeological Association (NIMAA), Australia's newest maritime archaeology association.

This paper briefly outlines the history of maritime archaeological associations in Australia and their engagement with management agencies. As a case study for other small island communities, the paper highlights some of the activities of NIMAA since its creation, issues faced for participants and the management agency and the potential for NIMAA into the future.

Key words: NIMAA, Norfolk Island, maritime archaeology associations, public archaeology, community engagement, historic shipwrecks

Introduction

The management of shipwrecks in Australia balances protecting historic shipwrecks with maintaining public access for recreational, scientific and
educational purposes. Objectives of the 1983 Historic Shipwrecks Program (HSP), the vehicle to coordinate the national collaborative administration of the *Historic Shipwrecks Act 1976* (the Act), include: the support of an informed public for historic shipwrecks as a cultural resource; undertaking fieldwork including shipwreck survey, excavation and monitoring; and community engagement (Viduka, 2012). This provision has been echoed in Article 20 of the UNESCO 2001 *Convention on the Protection of the Underwater Cultural Heritage*.

Of Australia’s approximately 7500 - 8000 protected Historic Shipwrecks, 23 lie within protected or no-entry zones without permit (Historic Shipwrecks Protected Zones 2017). The remaining sites can be dived without permit if that activity does not cause damage, disturbance or removal of material from the site. Divers are encouraged and can use wreck sites for recreational purposes but the physical fabric of the wreck must not be disturbed and relics must not be removed from the site without a permit (Viduka, 2015).

Due to the small number of professional maritime archaeologists and the vast amount of coastal waters around Australia, it has always been obvious that little can be done by the professional maritime archaeological community alone to: locate; document; assess the significance of; monitor; protect; stabilise and research this large distributed assemblage. A core reality of underwater cultural heritage management in Australia is that community support and community participation in the monitoring or discovery of vessels is critical to achieving the objectives of discovering and protecting underwater cultural heritage. To support such an outcome, strong community based programmes that improve the public’s access to, knowledge and enjoyment of their underwater heritage is vital (Hosty, 1987; McCarthy and Garrett, 1998; Nutley, 1998; Smith, 2006; Styne, 2010; Viduka and Raupp, 2008).
Management agencies around Australia have developed a range of different communication and engagement strategies to facilitate public access and inform the public of their heritage. These strategies include: online databases (with detail on the history, location and diving conditions of each site) (NSW Maritime Heritage Database, 2017; WA Shipwrecks Database, 2017; Vic Heritage Database, 2017; SA Shipwrecks Database, 2017; Australian Government Shipwrecks Database, 2017); websites, brochures, posters and books (Nash, 2007; Henderson, 1986 and 2016); accurate historical and site data provided to commercial dive charter industries; community based interactive programs (NSW Wreckspotters, 2015; Queensland Survey, 2015; Viduka and Raupp, 2008); and the development of dive trails (Philippou and Staniforth, 2003). A fundamental element in the strategy of promoting community participation is the development and support for vocational maritime archaeology groups.

Maritime Archaeological Associations in Australia

Australian management agencies initially put significant time and resources into fostering the establishment of local maritime archaeological associations. The 1994 Australian Government Guidelines for the Management of Australia’s Historic Shipwrecks includes details on how to foster and support the development of archaeological associations. The 1996 Australian Government Public Access Guidelines, specifically state that community groups can undertake disturbance activities subject to meeting specific criteria in training in maritime archaeology. This extended to private and public groups and institutions including local historical and archaeological societies, regional community museums and affiliated groups under the direction of a person qualified in maritime archaeology (Australian Government, 1996).

Given the strong contemporary policy framework in Australia limiting the granting of permits for the recovery of relics by private individuals or groups without
conservation and collection management resources, many community groups, often known as Maritime Archaeological Associations, focused their activities into locating shipwrecks and or survey of known resources. Many of these groups were instrumental in a jurisdiction being able to undertake more extensive fieldwork activities, such as excavation, but under the direction of a qualified maritime archaeologist.

Over time, many of these associations not only planned and undertook their own research, but also became the backbone of their jurisdiction’s fieldwork program, supplying divers with: practical, historical and nautical knowledge; a vast depth of diving experience; boat handling skills; medical and safety skills; and training in archaeological methodology. Notable amongst these groups is the Maritime Archaeological Association of Victoria (MAAV, 2017) and the Maritime Archaeological Association of Western Australia (MAAWA, 2017). The relationship between management agency and community group was so symbiotic, that at times, the strength of a jurisdiction’s management was indicated by the activity of the local community group.

Other maritime archaeological associations existed in: South Australia (Society for Underwater Historical Research) (SUHR) which was renamed the South Australian Archaeology Society in 2012; Tasmania (Maritime Archaeological Association of Tasmania) (MAAT) (Lester, 1983a, 1983b); and Queensland (Maritime Archaeological Association of Queensland) (MAAQ, 2015) however these are no longer active. A common thread amongst all these groups was some level of active involvement or support by the relevant State Historic Shipwrecks Practitioner.

A feature of the last decade or so is that new groups have appeared on their own volition, with a specific area of research interest. Southern Ocean Exploration (SOE, 2017) and the Sydney Project (Sydney Project, 2017) are
notable examples of groups who like both technical diving and discovering shipwrecks. Other groups such as Wreck Check Incorporated are interested in searching for, locating and documenting underwater cultural heritage related to or shared with Australia (Wreck Check, 2017; Fortuyn Project, 2017).

Unlike other Australian jurisdictions Norfolk Island has never had the permanent support of a local professional maritime archaeologist. The Delegate for the Historic Shipwrecks Act, who is located within the Norfolk Island Museum, has relied on external organisations or individuals to assist them in undertaking their delegated responsibilities to sites and associated recovered artefacts. Recognising a need for a local capacity to assist in the delivery of day to day delegated responsibilities, the Norfolk Island Delegate supported the idea of building maritime archaeological capacity within the local community. The value of such an approach was immediately recognised as delivering positive outcomes on three principle levels: community engagement, management and museological. Harking back to the earliest model of fostering a community maritime archaeological association to support a jurisdiction’s management goals, in 2012 Australia’s most recent Maritime Archaeological Association was formed, called the Norfolk Island Maritime Archaeological Association (NIMAA).

**Norfolk Island – a maritime landscape**

Norfolk Island is located in the Southwest Pacific approximately 1700 kilometres northeast of Sydney, at 167°57'E, 29°02'S. The island has an approximate area of 37 km² and a population estimated between 2000 to 3000 individuals. To the south of Norfolk Island are two smaller islands, Nepean and Phillip (Fig. 1). All the islands are formed from horizontal sheets of basalt with Mount Bates on Norfolk Island as the highest point, rising to 319 metres above sea level (Geosciences Australia, 2017).
Norfolk Island has several phases of occupation. Excavations around Emily Bay, on the south-central coast, identified occupation of the island by people of Polynesian ancestry circa the 13th/14th through to the 15th century AD (Anderson and White, 2001). The island was located by Captain James Cook in 1774 and was identified for its strategic value and economic potential in timber and flax. In the 19th century a British penal settlement was established near Emily Bay now known as the UNESCO World Heritage listed Kingston and Arthur's Vale Historic Area. After the closure of the penal settlement in 1855 the island was subsequently occupied in 1856 by people relocated from the Pitcairn Islands. With the arrival of the Pitcairners, many with Tahitian ancestry, Norfolk Island again became a community thread in the tapestry of Pacific Island cultures. Today, many Norfolk Islanders are intrinsically a part of the Pacific with strong cultural and familial links.

The mid to late 19th and early 20th century Norfolk Island population comprised of subsistence farmers, whose only hope of deriving an income was through exporting agricultural products predominantly to either mainland Australia or New Zealand. Intermittent services by shipping companies, further exacerbated...
by the First World War, often resulted in total spoilage and loss of products. Other than agriculture the only major industry on the island was shore based whaling which occurred between 1858 and the early 1950’s. In 1942 at the height of World War II in the south west Pacific, the island became a strategic airbase and was occupied by New Zealand troops. A radar station was located on Mount Bates. Prior to the airbase’s construction shipping was the only transport to and from the island. Fishing from rocks and boats remains a very popular activity both for food and recreation.

**The underwater cultural heritage resource and community engagement**

In 2009, recognising the operational limitations on the Historic Shipwrecks Delegate, the Department engaged Cosmos Archaeology to undertake a desktop review of shipwrecks around Norfolk Island for updating records in the Australian National Shipwrecks Database (ANSDB) (Luckman and Viduka, 2013). Prior to this desktop survey, most maritime archaeological activity had focussed on the National Heritage listed site of HMS *Sirius* (1790), unofficial flagship to Australia’s First Fleet, and its associated artefacts on display at the Norfolk Island Museum (Henderson and Stanbury, 1986; Stanbury, 2002 and 2007). Through the desktop project new information, media and archival material was collated for several sites. The ANSDB now includes approximately twenty-six sites around Norfolk Island which are recorded as sinking from 1790 – 1960’s (Fig. 2).
Fig. 2: Map indicating the distribution of the known shipwreck resource around Norfolk Island and their approximate locations. (Australian Government)

To help build an informed and supportive community group who could assist the Delegate, an Australasian Institute of Maritime Archaeology modified Nautical Archaeology Society (AIMA/NAS) training course part 1 (Nautical Archaeology Society, 2013; Philippou and Staniforth 2003) was delivered to 25 participants. The AIMA/NAS course was presented in 2010 by Cassandra Philippou, Sarah Ward and myself (Fig. 3) (Norfolk Island Museum, 2017; AIMA, 2017; AIMA NAS, 2017). This course was very successful in bringing many individuals of the community together on a subject of shared interest. The enthusiasm of the individuals involved led directly to their creation of NIMAA. This paper looks at NIMAA and the challenges for that group as a case study for other small island communities.
A shaky start

Following the creation of NIMAA, economic downturn on the island drove many diving members to the Australian mainland or elsewhere for work opportunities. At the request of the Delegate, who recognised that the group’s existence was immediately imperiled, from 22 February to 1 March 2013, a small team of maritime archaeologists were engaged to work with NIMAA members and undertake a maritime archaeological survey of Ball Bay and other coastal sites around Norfolk Island. The maritime archaeology team comprised Dr Brad Duncan (State Maritime Archaeologist, New South Wales), Mr Amer Khan (Maritime Heritage Officer South Australia) and myself (Australian Government).

2013 NIMAA Ball Bay Survey

Due to the limited anchorage or landing options at Norfolk Island, Ball Bay is constantly being considered for future development by Norfolk Islanders. To assist development consideration and for science based heritage management decision making an understanding of the potential for underwater cultural material in Ball Bay was required to be made. To that end a physical and remote...
sensing survey of the bay was planned. The intent of this collaboration with NIMAA was fourfold:

- to help inform discussion and decision making on Norfolk Island regarding this site so the Delegate could be well placed to protect the maritime heritage of the island if present;
- provide further practical archaeological training for NIMAA in underwater and terrestrial archaeological field techniques;
- empower NIMAA to continue archaeological surveys around the island and lead in the recording of previously undocumented heritage sites; and
- to galvanize activity in NIMAA.

Historically known activities in Ball Bay include a shore-based whaling station from 1935-39. Remains of the processing plant are still in situ. However, the bay has a longer history of use, starting circa 1788/9 when Captain Philip Gidley King, then lieutenant-governor of Norfolk Island, attempted to build a pier. Anecdotal accounts suggest even an earlier use of the bay by Polynesians. The Director of the Norfolk Island Museum reported anecdotal accounts of the recovery of some Polynesian cultural material, possibly dating to the pre-history settlement period (Pers com Lisa Richards 17 May 2012).

Due to bad weather, only two days of underwater surveys could be completed in Ball Bay though some in water survey training was conducted in the calm of Emily Bay and an inspection snorkel over the site of HMS *Sirius* was achieved with NIMAA members (Fig. 4). Activity switched to teaching and doing oral history recordings with locals. Selected individuals who were described by Dr Duncan as having ‘deep familial and direct knowledge of sites’ and other island maritime industries on boat building, defence, whaling and transport were interviewed (Duncan 2012) (Fig. 5). Further, several sites were surveyed and
recorded including: the Mt Bates Military Radar Defence Station; an incised marking on stone associated with HMS Calliope’s visit in 1888; and a World War II bunker in Anson Bay overlooking the landing point of the 1902 telegraph cable that connected Canada and Australia.

Fig. 4: HMS Sirius (1790) last anchor on site relocated and inspected by NIMAA members. (Andrew Viduka)

Fig. 5: Oral history interview on Norfolk Island whaling heritage in Ball Bay. (Andrew Viduka)
2013 NIMAA Cascade Bay

In the perennial search for improved lightering or anchorage conditions on Norfolk Island, in May 2013, at the request of the administration of Norfolk Island who were considering possible improvements to Cascade Pier, NIMAA undertook an underwater survey for cultural material in the proposed development and associated works footprint. Cascade Pier is located on the northern coast of Norfolk Island in an unsheltered bay. Due to the rugged coastal conditions, all produce and supplies must be lightered to and from vessels anchored off shore. Cascade Bay is one of two contemporary locations used on Norfolk Island, the other being Sydney Bay/Slaughter Bay. Both are subject to weather.

NIMAA planned, coordinated and carried out the survey with available diving members. The survey was conducted on Sunday 19 May 2013. Based on a brief supplied by Alan McNeil, Manager, Land Use & Environment, Administration of Norfolk Island, the area to be surveyed was identified using Global Positioning equipment and marked with ropes and buoys which were used as reference points. While no artefacts were found in the area surveyed, NIMAA divers on SCUBA methodically searched the designated sea floor (Fig 6) (Norfolk Island Maritime Archaeology Association 2013). NIMAA’s work contributed directly to a positive community outcome and the Pier upgrade commenced in 2016 (Norfolk Island News, 2017).
Since 2013 NIMAA members have been involved in other terrestrial projects than those mentioned in this paper including a remote sensing archaeological survey project led by Dr Duncan and Dr Martin Gibbs (University of New England). However, outside of externally generated projects or terrestrial and museological activity, little has been reported that suggests NIMAA remains an active underwater group driven by internal initiative.

**Potential for NIMAA into the future**

As with many other small island communities, the remoteness of the island has been the primary cause of much joy and difficulty for Norfolk Islanders and it is this thread that may be best exploited to deliver an exciting project for NIMAA that will engage the broader community.

Certainly, the success or not of NIMAA resides with its members, their individual enthusiasm and the support they receive from the Historic Shipwrecks Delegate.
and, in general, the Australian Government’s Historic Shipwrecks Program. As outlined above, volunteer associations are vulnerable to change and will cease to operate. In the case of the MAAQ, which ceased to operate in 2016, changing demographics of the group, few new members, the ability of existing members to volunteer time and insurance issues restricting fieldwork all combined to make the group inoperable (Pers Com Paddy Waterson 6 June 2017). It is worth highlighting that Queensland is Australia’s 3\textsuperscript{rd} most populous state and most popular dive tourism location for domestic and inbound tourism. Yet, even in this setting, a maritime archaeology volunteer association withered and collapsed.

On Norfolk Island, NIMAA has many keen and capable members. The entire island is a maritime landscape and everyone is intrinsically a part of that story. However, it is not yet certain if their individual enthusiasm will result in a coordinated community approach to projects of shared interest. The greatest hope for the longevity of NIMAA is with the strong and ongoing support of the Norfolk Island Museum, which has undergone recent organisational change and restructuring, and the Norfolk Island Historic Shipwrecks Delegate.

Separate to the activities that NIMAA members themselves may pursue in regards to whaling and military heritage, other opportunities do exist to engage participants in their underwater heritage.

**Collaboration with other researchers**

Collaboration with other maritime archaeological groups or seeking opportunities to join projects in other jurisdictions is open to NIMAA members. One example of this is a project proposed by Wreck Check Inc, chaired by Graeme Henderson. Wreck Check will collaborate with NIMAA in 2017/2018. This project proposes to reassess why was the *Sirius* wrecked? Arguably the infant Australian colony’s most threatening single incident. NIMAA members will
be doing photogrammetry of the *Sirius* ballast mound for calculation of the residual weight (Fulton et al 2016) and approximate determination of stowage area in the vessel. This data will be used to consider the potential impact of insufficient ballasting as a contributing factor to the vessel's loss.

**Other future project – Resolution?**

As briefly described earlier, to break their isolation from external markets and remedy the lack of reliable shipping services to Norfolk Island, circa 1917 the Norfolk Island Shipping Company purchased the ketch *Warrigal* (ANSDB Shipwreck ID 7958). After one successful voyage, the vessel was lost with all hands in a cyclone. This vessel has not been relocated.

Still faced with the same isolation and lack of reliable shipping issues, in 1923 the Norfolk Island Farmers and Growers Association resolved to build their own ship which they named *Resolution*. The Norfolk Island Museum describes the construction of the vessels:

> “It was difficult to source the resources needed to build a boat. Men searched the valleys for timbers with natural bends to make the stern and ribs. A Norfolk Island Pine was selected for the keel, providing a 20-metre log that was dragged to the building site at Emily Bay. There it was pit-sawn, adzed to shape and squared up. Norfolk Pine was also used for the keel and planking, while the framing was of island grown olive and ironwood. She was built as a stout auxiliary schooner of about 60 tons and more than 18 metres in length.” (Norfolk Island Museum, 2017)

Sadly, for the Norfolk Islanders the *Resolution*, which was launched in December 1925 and subsequently fitted with a diesel motor, was sold in 1927 to Burns Philp (South Seas) due to their financial inability to operate the vessel. For the next 20 years, the *Resolution* worked on the Tonga, Fiji and New Hebrides (now Vanuatu) trades. In March 1948, the vessel was disabled by a cyclone and in 1949 *Resolution* sank at moorings in the harbour at Port Villa in
36 meters. While the site has been actively and continuously pillaged by recreational divers, this site is one of many shared heritage sites between Norfolk Island/Australia more broadly and Vanuatu that could form the basis of a collaborative maritime archaeological project between NIMAA members and the people of Vanuatu to the benefits for both island communities.

**Conclusion and observations**

It is an established truism that community engagement in heritage is vital for better heritage management outcomes. Certainly the creation of NIMAA by interested individuals on Norfolk Island has stimulated activity and greater knowledge in the community. While it is dangerous to extrapolate too much from this singular example, certain observations warrant consideration for their potential value to others who are considering developing a community based underwater cultural heritage capacity in a small island community.

**Threats**

All volunteer groups face a common threat, competing activities for the attention of members. While this is not unique to small island communities, a complication for individuals on small islands, in particular, is that they are often involved in multiple concurrent positions to derive an income/subsistence.

**Financial support**

Financial support will assist any group to continue to operate. Without some form of financial support being available, any group’s personal resources may not be able to sustain activity over the long term. In a small island community where individuals may have less income, external funding is vital.

For NIMAA members, they are fortunate in that they have two options for funding assistance, via the Delegate or through competitive grants offered to small
community museums through the Australian National Maritime Museum. Without the opportunity to obtain external funding, the long term viability of NIMAA would be in serious doubt.

**A local champion/s**

Two types of champions were required to create and sustain NIMAA. In the first instance it was the support of the Delegate who championed the creation of NIMAA. The Delegate recognised the need to have an engaged and empowered community on Norfolk Island to participate in underwater cultural heritage. Once NIMAA was created it was important that individuals within NIMAA took a leadership role and championed activities within the group.

Based on observations with NIMAA, it is important to recognise that the role of the Delegate who initially championed the creation of NIMAA does not cease. Their active and ongoing support is required to sustain an individual’s enthusiasm and or the group’s effectiveness. Further, the leadership role within a group should be shared otherwise this becomes a constraining factor to the groups effectiveness.

**Links to a cultural institution/management agency**

At least initially, the group would benefit from being linked to an appropriate institution so that their activities have some oversight and official support. This not only helps build trust between individuals responsible for the protection of underwater cultural heritage but ensures the group’s ethical development. It advantageously also assists the group to seek funding support for their activities.

**Research potential – an active program**

A critical element to maintaining activity is to have projects that are initiated by the group, achievable and interesting to the individuals in the group. While
Norfolk Island has enormous research potential, it is yet to be ascertained if NIMAA members will develop their own research program.

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Biography

Andrew Viduka is a maritime archaeologist and conservator employed by the Australian Government as the Assistant Director Maritime Heritage. In this role he leads Australia’s consideration of ratification of the UNESCO 2001 Convention on the Protection of the Underwater Cultural Heritage. Andrew is actively involved in maritime archaeological projects and or capacity building training in Australia, the Pacific and the Mediterranean Regions. Andrew’s research currently focuses on linking community outcomes with the discovery and protection of Australia’s underwater cultural heritage, shared heritage management and international capacity building projects. He is a foundation member of the research group Wreck Check Inc.
Session 2: Maritime and Underwater Archaeology along the South American Pacific

Abstract

The Pacific has been a central feature in coastal – as well as continental – South Americans’ social lives since their arrival to the continent. Indeed, from early oceanic migrations to the present, the Pacific has served as the facilitator for human expansion, contact, and long distance trade; the rise of complex societies; a space for myth, ritual and contention; also as an important place for the exploitation of natural resources and fisheries; and the development of the modern world-system.

Despite this centrality, the study of human-ocean interactions and coastal ecological histories in Andean South America remains in a nascent phase. New research technologies, theoretical approaches and innovative research projects provide new opportunities to evaluate human-ocean interactions from a long-term perspective.

This session addresses the ways in which the ocean has been central to the manifold ways in which migration, social complexity, native sailing, economic activities, culture contact, colonialism, capitalism and modernity have insinuated themselves through the Pacific Maritime Cultural Landscapes of South America. With the presentation of recent researches conducted in the region, the purpose of this session is to have a better understanding of how the different societies and human maritime communities along South America incorporate the marine and maritime spaces of the Pacific Ocean as part of their Cultural Landscape and Seascape.

Session Chair: Mr. Carlos Ausejo Castillo, M.A.
Centering the margins: Capitalism and the Pacific World in mid-nineteenth century Arequipa

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Abstract

Trade policy and regulation were central to the emergent Peruvian state (ca. 1821-1879). The intersection of trade and geopolitical reconfigurations warranted the transition from “Spanish lake” to Pacific World in the nineteenth century. In this paper I examine the rise of the Pacific World from its margin of the Arequipa coast, emphasizing the effects of capitalism through the lens of maritime cultural landscapes. After independence (1821-1824), new ports were established; operation of certain coves sanctioned; and extractive activities shaped the region. The ports on the Arequipa coast supplied markets across the Andean south and Bolivia, and were a necessary and desired stop for North Atlantic ships sailing the Pacific. The Peruvian and Arequipa governments actively incorporated the coast into the inland urban markets of Cuzco, Moquegua, Puno, and the largest market, the city of Arequipa. Their efforts included the construction of roads and, way stations, and piers, thus providing infrastructural support to the regional trade and efforts against contraband. The economic networks that operated throughout here encompassed a vast portion of the population in different degrees of legitimacy. This region was strategic for the mercantile classes across the Andean south, the national government and foreign dignitaries in charge of the Peruvian trade. Contention among them arose from the regulation of trade, weighing on the power balance between the new Peruvian state, its citizens, and foreign powers. Data collected from archaeological and historical sources are combined to understand how these engagements and the pulses of capitalism impacted the Arequipa maritime cultural landscape from a multiscalar perspective. Close examination of globalizing processes reveals that the expansion of capitalism depended heavily on the transformations and continuities that the former had in small places and marginal areas, and that the imposition of a globalized market was accompanied by its involvement in local economies.

Key words: Spain, Peru, globalisation, capitalism
In this paper, I employ a maritime cultural landscape perspective to model the conditions that paved the way for the expansion of the Pacific World and its impact on post-Colonial Peru. Trade was key to states that emerged from former Spanish colonies on the eastern Pacific (1821-1879). Trade also became an articulation of neocolonial relations North Atlantic powers enforced over the emergent states. Britain was most prominent, but France, Italy, Belgium, the German states, and the United States also developed economic interests in the region (Blaufarb 2007; Condori 2014). Struggles that ensued along the western South American coast shaped the Pacific World, spurred by a new model of empire, one reliant on commercial dependence, free trade, and wage labor, and enforced with a mighty Pacific fleet (Blaufarb 2007, 761; Miller 1993). In Peru, the southern trade created a multiscalar margin on the coast of Arequipa: local, regional, national and global processes intersected to shape early Republican geopolitics. The dynamics of the Pacific world should be examined through a multi-scalar analysis of its margins to understand the ‘local contextualities’ (Giddens 1991, 22) that constituted it.

Natural conditions and the vast distance from the coast to the city of Arequipa hampered state efforts to penetrate the region, tilting the power balance away from the national government. Economically, Arequipa channeled most of the merchandise in and out of the Andean south, including commodities of great importance to North Atlantic powers: wool, quinine tree bark, and metals (Condori 2014). Furthermore, this region experienced the fastest economic recovery in the country following independence, and a thriving export economy since the mid 1820s, a phenomenon possible due to the efforts of the southern Andean elites. The ports of the south became loci of contention between different interest groups, particularly foreign dignitaries and local authorities. By reconstructing the maritime cultural landscape of Arequipa, a multi-scalar
perspective of global politics, the expansion of capitalism, and the growing pains of the Peruvian post-Colonial state is gained.

**Historical background**

The first decades after independence were riddled with internal strife caused by military strongmen known as *caudillos*. Caudillos engaged in open warfare from their regional bastions, relying on local support that was elusive to the central Peruvian government, and spread chaos across the country (Aljovín de Losada 2003; Gootenberg 1989; Jacobsen 1993; Larson 2004; Lynch 1992). Between the declaration of independence in 1821 and the early 1850s, the presence of a unified Peruvian state is debatable at best. Ramón Castilla, another military leader, consolidated the rule of Lima, pacified regional caudillos, engaged civil elites and institutions, and inaugurated a period of state building that lasted until the 1860s (Gootenberg 1989a; Lynch 1992). Slowly, liberal economic ideas gained broad acceptance among the ruling classes and guided aspects of the national economy to look outward and reject protectionist measures (Contreras Carranza 2011; Gootenberg 2013, 1989a; Larson 2004). The first export boom cycle of the national era, guano, began to unravel, and with it the rise of a plutocratic liberal state (Contreras Carranza 2011; Gootenberg 2013, 1989a; Cushman 2014).

The transition towards a national economy after independence emphasized regional ties. In Arequipa, this meant an expansion of the wool trade, which connected the city of Arequipa to its mountainous hinterland, Puno, and Cusco (Fig. 1); silver, copper, wine, and pisco were also produced and exported (Condori 2010, 2014; Gootenberg 1989; Brown 1986; Rice 2012). Arequipa elites, traditionally a landed and mercantile aristocracy, supported liberal policies that put them at odds with the politically powerful protectionist merchant guild of Lima (Armas Asín 2011; Mazzeo de Vivó 2006; Gootenberg 1989). The guild
repeatedly succeeded in imposing their agenda, creating one of the most protectionist economies in the region.

The early Republican period in Arequipa was marked by liberal ideologies championing individual liberties and free trade, and distancing Lima as the center of Peruvian power (Bonilla 1974; Condori 2010, 2014; Contreras and Glave Testino 2002; Gootenberg 1989). The south opposed protectionist measures closing all ports but Callao to international trade (Gootenberg 1999, 30). An increase in regional exports especially to British merchants encouraged a cautious support for liberal causes. Some supported a complete ban of imported (French) wines, (North American) coarse textiles, and other goods that competed with local products. British imports became common in other southern markets, like Cusco, where liberal causes slowly began to gain favor, and contributed to the expansion of the Arequipa sphere (Chambers 1999; Condori 2014; Gootenberg 1989). Generally, the south was more interested in seceding rather than taking over or moving the capital to Arequipa (Gootenberg 1989). Armed revolts sprouted across the region through this period.

**Arequipa’s maritime cultural landscape, 1821-1879**

The mercantile basis of the southern economy during the colonial period continued in the first decades after independence, promoting an early intersectional support for free trade reforms across the Andean south (Gootenberg 1999, 30) (Fig. 2). After independence, efforts for the revitalization of the southern economy arose from the Arequipa social and political elites. Improvements that “neared it [the city of Arequipa] to the coast”1 figured prominently. Natural conditions along the Arequipa coast make overland travel extremely difficult: deep ravines and narrow valleys crisscross large expanses of deserts (Figs. 1-2). Sea navigation also presented difficulties given the rough tides and unfavorable conditions along the coast, but was cheaper and faster
than land traffic. Routes from the city to the sea took at least two or three days, and longer for caravans, making necessary the establishment of way stations. The inauguration of the Arequipa railroad in 1871 fulfilled the dreams of ocean proximity (Fig. 2). Roads and way stations were built by local governments or assigned Peruvians; New York-born capitalist Henry Meiggs built the railroad.

Small colonial ports remained in use after independence, and new ones were habilitated by the national government for local trade in coves along the coast (Monsalve 2011). All sites faced the hurdles of a desert location, mainly difficulties procuring water and foodstuffs, which were hauled from afar or imported. Earthquakes, tsunamis and tides caused damages to the ports regularly. Port captainships faced severe constraints for the exercise of their functions, as did offices across the country. Captains often decried the inability of their offices to conduct their functions due to the lack of boats, personnel, money and food for the personnel (numerous examples can be found across AHM Serie Capitanías). Further issues arose from the actions of foreign vice-consuls, particularly the British, who exercised their influence routinely, sanctioning blockades and military action against the local community and its authorities, and otherwise were involved in unstable national politics2. Ships calling on Islay, Arica and Mollendo connected the Andean south to Liverpool, Bordeaux, Le Havre, Río de Janeiro, Valparaíso, Cobija, Guayaquil and most Peruvian seaports. Arica and Islay were the first Peruvian ports visited by the British Pacific steamer line.

The rest of this section provides a brief overview of the coast from 1821-1879. This includes ports, coves habilitated for trade, and the formation of a series of networks for the exploitation of guano. The amount of commodities trafficked increased, the number of foreign officers at these ports grew, and foreign military presence became more common. Contemporaneously, habilitated coves served
the southern economy for the fast transit of goods from valleys to ports and other coves, and were central to the southern guano economies.

Quilca

Quilca serviced the city of Arequipa as its main port at the time of independence (Fig. 2). Its location and conditions required ships calling to moor a mile south of the cove (Hidrográfica 1879). All loading and off-loading had to be done with boats across rough waters before entering the cove. The cove itself is guarded and with calm waters (Stiglich 1918), but the unpredictable exterior conditions of the sea made the anchorage unsafe, and ships were lost suddenly and quickly. Quilca also serviced the city of Camaná. During this period, the customs house was located in the city of Arequipa, further complicating regional and local maritime trade in foreign goods. This arrangement delayed the arrival of merchandise to their destination markets, and provided ample opportunity for smuggling. The difficult conditions persuaded the government to move the location of the region’s primary port to the cove of Islay (1826), and the cove of Quilca was mostly abandoned after that.

Islay

The trade through Quilca was re-channeled to cove of Islay in 1826 (Fig. 2). A pier, customs house and system to provide the settlement with water were promptly constructed. A priest was deployed here in 1827 to service the port’s growing population. While Islay has better sea conditions than Quilca, transportation to the city demanded traversing the ample desert east of the port, and many deep and dry ravines that separate city and sea. New roads and way stations between the port and Arequipa were built several times in the mid-nineteenth century.
Islay’s population reached the thousands by the 1830s. The port channeled most of the Arequipa trade, as well as imports and exports to and from Cuzco and Puno. Foreign trading houses and dignitaries established in Arequipa also established branches in Islay starting the 1820s. The port town, located three hundred feet above the sea on a rocky promenade, was protected against seaquakes that regularly hit the region. Furthermore, the cove was already economically important for the region, as it has served as the locus of guano extraction and distribution for communities in the Arequipa and Cuzco hinterlands (Figs. 1-2). Guano extraction took place in the Alvizuri and La Fuente islands, and dealings were moved to nearby Matarani after the establishment of the port.

Completion of the Arequipa railroad signaled the end for Islay. Mollendo was given the role of main port in 1871. The customs house, naval offices, and consulates moved soon thereafter, and it was ordered that those who remained there moved to Mollendo that same year.

**Mollendo**

Mollendo became the main port of Arequipa in 1871, with the railroad connecting the port with Arequipa, Puno and Cuzco. Its natural capacity for receiving small boats only required early infrastructural efforts at the port (García y García, 45) (Fig. 1). A breakwater connected the shore with Ponce Island. A new system of running water was inaugurated in 1873, which required transporting water from the vicinity of the city of Arequipa, on what was lauded as a “the greatest work of its kind in the world”.⁶ A light was raised on the promontory by the beach in the evenings to facilitate nocturnal operations and navigation.

The move from Islay was facilitated by its proximity (12 km). Buildings had been erected in wood on the bedrock of Islay, and were disassembled and later
reassembled in Mollendo. Some of these buildings, including the customs house that was transported from Islay to Mollendo, remain in place, and Mollendo is still the seat of a Navy office.

**Arica**

Arica was the most important southern port at the end of the colonial period (Fig. 1). A pier and customs house were built in 1827. Upon the establishment of the department of Moquegua in 1857, Arica was separated from Arequipa. Its importance for the southern trade continued. Water was easily accessible from wells and the nearby Azapa valley, where foodstuffs were procured. Arica was connected to the nearby city of Tacna by railroad, inaugurated in 1856. Navigation was comparatively easy, although tides often brought labors to a halt between June and August (García y García 1863).
Arica channeled a significant amount of the imports destined to markets across Cuzco, Puno and Bolivia. A Bolivian port was established at Cobija in 1825, but it failed to challenge the importance of Arica to the Bolivian trade. The difficulty, time and cost of overland transportation from Arica to upland Bolivian cities were significantly lower than from Cobija\(^7\) (Fig. 1).

**Iquique**

A port was established in Iquique in 1827 to support mineral extraction from the nearby mines\(^8\) (Figs. 1-2). Establishing the port proved to be difficult. No fresh water, underground or otherwise, can be found in Iquique. Fresh water was eventually made available through processing seawater in condensation machines. Supply of the port depended exclusively on imported foodstuffs. Extractive activities in the vicinity of the port provided the basis for its growth, and population had reached 5000 by the 1860s (García y García). Iquique also channeled the guano trade from the Guaneras del Sur, a series of islands and cliffs in the far south where guano was extracted. The discovery and exploitation

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*Fig. 1: Peru, according to Mariano Paz Soldan’s 1867 map. Satellite imagery acquired through OpenLayers plugin for QGIS.*
of saltpeter accelerated the growth of the port and the establishment of more settlements and infrastructure (particularly railroads). Saltpeter, as important for its fertilizing properties as guano, was the main export of the port by the 1860s. Iquique became the capital of the Department of Tarapaca when the latter was separated from Moquegua in 1878.

**Chala**

A port captainship was established in Chala in 1850 (Figs. 1-2). Its purpose was to channel products from nearby provinces of Arequipa, and those from neighboring Cuzco and Ayacucho. Conditions at sea prevented this objective from being fully realized. Constant roughness of the sea and unrelenting damages and losses of infrastructure hindered operations. Much of the regional trade continued to be channeled through Islay and Mollendo.

**Habilitated coves**

The rough shores of Arequipa are littered with small coves. These coastal nooks represented important nodes in economic networks that spread throughout the south, and were strategic for military operations during the tumultuous first years of the Republic. Some of the coves were habilitated for trade in local and national commodities, and as a way to speed transportation of agricultural products from different points along the littoral (Fig. 2). Given the difficult natural conditions for overland travel along coastal Arequipa, the use of these coves ameliorated transportation times and costs.
Local populations at many of these coves were likely descendants of the ethnic group known in colonial documents as *camanchacas*. These coastal fishermen are poorly recorded in the ethnohistorical record and unknown archaeologically. What is known is that they were the only group indigenous to the coves and beaches from Arequipa throughout the Atacama Desert; their numbers in colonial grants were the lowest in the region; and that they went out to sea in boats made of sea lion skins. Documentary records show that this kind of boat continued in use along the coast from Chala to Iquique until the beginning of the twentieth century (Stiglich 1918). Interestingly, records from Camaná show that fishermen from Sechura serviced the valley. These northerners used wooden rafts (*balsas de palo*), which continue to be used by fishermen in the Tambo valley today (Valdivia Ochoa 2017, personal communication). The spread and
continuity of this northern tradition along the Arequipa coast remains to be elucidated.

Highland groups from across Arequipa, Cuzco and Puno were also present at the coast; their engagements with camanchaca groups remain unclear. These highland groups descended onto the coast to put their herds to pasture in *lomas* (seasonal forests), collect seaweed, and extract guano from the islands for use in cultivation elsewhere. These practices predate the imposition of the Spanish colonial system, and guano remained an important commodity throughout the Andean south during the period under study\(^\text{11}\). These dynamics created complexes of extraction, collection and distribution of guano. Fertilizer extracted from coastal Arequipa was moved inland across the south, and regional extraction was complemented with imports from Chincha that were brought to Islay and Quilca\(^\text{12}\). Guano complexes were located in Islay, Cocotea, Lomas and Arantas (Fig. 2).

**Cocotea**

The Cocotea complex is located 30 km southeast of the Tambo valley. The cove was first habilitated for the traffic of guano inland in 1828\(^\text{13}\); it appears in mid-nineteenth century trade laws as a third-tier port or “habilitated cove”. Although closer to Islay, it depended on certain functions from Arica offices (Paz Soldan 1877). The beach at Pacay is very narrow and littered with rocks, conditions that favored Cocotea for use in port operations. Cocotea also presents a better anchorage. Sea traffic scared away the birds in the area, and in 1851 extraction was restricted to the months of November and April in order to allow birds to nest undisturbed (Ortiz 1852).

Archaeological remains and documentary evidence provide insight into the establishment and use of a guano-centered complex at Cocotea (Fig. 3). The
population of the complex was small, only a few hundred semi-permanently there\textsuperscript{14}, who depended on the nearby Tambo valley for provisioning. Limited water could be found in Cocotea. Extraction was done at the islands of Jesús, La Mansa and Margarita. Once extracted, guano was stored in platforms near the beach at Pacay; platforms near the shore of Cocotea likely served a similar function. The extant architectural features across the complex consist of buildings of roughly cut fieldstones laid without mortar, sometimes constructed on artificial terraces. At present, function for these buildings has been attributed to housing operatives and herds in the Cocotea ravine, as well as the storage of guano and other goods in both Cocotea and Pacay. Surface artifacts in Cocotea include imported manufacture, local low-fired earthenwares, and animal and shell remains. All dateable artifacts are consistent with a mid-19th century occupation. Surface materials were scarce in Pacay.

\textbf{Fig. 3: Cocotea complex. Satellite imagery acquired through OpenLayers plugin for QGIS.}
Discussion and conclusion

Given the central role of trade commodity in the nineteenth century global economy and the traditional reliance of the Andean southern economy on trade, the coast takes a preeminent role. No regional or international trade could take place without maritime ports. The geopolitical reconfigurations of the nineteenth century across the Pacific basin arose in good measure as a result of the capitalist orientation of North Atlantic powers. Islay and Arica were required stops along the way for steamers and sailboats regularly crossing the Atlantic to the Pacific to Asia, and back. Entanglements between involved interest groups impacted local conditions, national policies and international relations.

As the Pacific world spread and established itself across the Peruvian Pacific, private foreign investors provided certain maritime services, particularly the transport of passengers, mail and cargo. In contrast, local governments and Peruvian citizens provided the construction and maintenance of roads and way stations, respectively. During their visits, foreign ships would also deliver luxury and staple imports, and take with them products indispensable for the reification of the mid-nineteenth century world order, including: wool destined to British looms, quinine tree bark for pharmaceutical products that aided in the expansion of European powers into malaria-ridden areas, and silver and copper to stimulate the world economy. Operations were secured by force, with British and French warships closely navigating the South American shores. Southern ports were not unique for being blockaded; these took place in Callao, the Chincha islands, and other northern ports. In many cases, the reason for these blockades directly involved trade and traders. These military actions disregarded international law and intervened in local conflicts, particularly during revolutions, uprisings and other political conflicts that arose in Peru between 1821 and 1879. A glaring exception to visitors on the Arequipa coast were North American
whaling boats: while their presence is noted in port records from Callao and the northern port of Paita, they are conspicuously absent from Islay, Mollendo, Arica and Iquique records.

The operation of southern ports raised other international questions as well. The case of Arica highlights both the mutual integration of Bolivia and the Peruvian south, and the issues that arose from the regulation of trade with the neighboring country. The inauguration of the Bolivian port at Cobija in 1825 does not seem to have affected the flow of goods destined for Bolivia through Arica. International conflicts and several treatises emerged from this situation. The Bolivian trade through Arica, and Tacna en route to Bolivia, encouraged the construction of the Arica-Tacna railroad in addition to the establishment of small customhouses and checkpoints between the port and the border.

Small-scale conditions in the southern coast heavily affected the processes of state formation undergone by the emergent Republic of Peru. Struggles between the Lima and Arequipa mercantile elites cannot be explained without considering their entanglements with foreign traders based in Peru. Lima’s merchant guild was directly responsible for overthrowing regimes during the first years of the Republic with the stated purpose of blocking liberal economic policies. Early liberal trends across the south, particularly at the city of Arequipa, encouraged social unrest in the region and promoted improvement projects in the southern ports. Indeed, a force just as mighty as Lima’s merchant guild were the citizens of the city of Arequipa whom, in allegiance with groups in Moquegua and Tacna, defended democratic values and its economic sequitur, liberalism, through newspaper editorials, public demonstrations, and armed action. Peace, the deciding factor for the definitive establishment of the state in the Peruvian Republic, was only possible after the defeat and death of most caudillos. Preliminary analysis of port records suggests a sustained growth of international
trade through these ports at times of peace. Inherently tied to the peace process was the trend towards a liberal, globally oriented national trade economy that ultimately consolidated the Peruvian state, an endeavor that escaped nationalist military leaders before the 1850s (Gootenberg 1989).

The spread of influence of Arequipa City, particularly in regards to economic dogma, grew consistently during the mid-nineteenth century, and gave rise to the Andean south (Flores Galindo 1977). The political separation of Moquegua did not affect the formation of this regional bastion. The geographical and economic distance of the Guaneras del Sur from Arequipa, the interest of the national government in the exploitation of guano and saltpeter in the region, and the later loss of the southernmost strip of Peru (including Arica and Iquique) to Chile in the Ancon Treaty of 1883, definitively shaped the south in Arequipa-centric terms.

Two interconnected trends can be recognized from the changes in the Arequipa maritime cultural landscape. First, the establishment of ports and habitation of coves for trade in increasing numbers throughout the period of 1821-1879. These “new” ports built on long-standing economic traditions connected the Pacific to places as far as eastern Cuzco and the Titicaca basin. Second, the construction of roads, way stations and railroads that facilitated trade and sought to bring the city of Arequipa closer to the coast. These efforts fall in line with the early outward look of the southern economy and its entanglements, particularly with British traders. Unsurprisingly, investments in infrastructure across Arequipa and the south at large originated from regional governments more often than from Lima. These improvements were the logical answer to the needs of the emerging southern trade at the beginning of the Republic. The founding of Islay, given the inadequacy of the port at Quilca and its later move to Mollendo, the final point of the railroad, highlights this. While Arequipa began to
rise early in the Republic as the center of the Andean south, it only did so by facilitating trade across the region through its ports. The traditional and intersectional reliance on trade across the south created the conditions for the economic recovery of the region after the wars of independence, and for part of the political instability in the country at the beginning of the Republic.

Importantly, trends in the Arequipa region differed from others in the country during the guano boom years. The use of guano was widespread across southern agricultural areas from coast to uplands, and consumption of the dung extracted from coastal Arequipa remained in Arequipa. Some guano from Chincha was also being taken to Islay and Quilca. Whether this was due to reduced guano availability because of damage to the birds’ nesting grounds, excessive sea traffic and human presence or because extraction was constrained otherwise remains to be elucidated. At the same time, guano extracted from the islands of Chincha, Guañape and the Guaneras del Sur was being exported in formidable amounts (Figs. 1-2).

The lens of maritime cultural landscapes provides a unique perspective of the multiple forces that impacted the Arequipa coast in the mid-nineteenth century. These were affected by broad scale processes, such as the expansion of free trade capitalism across the Pacific basin, the rise of post-Colonial Latin American states, and the formation of a regional bastion in the Andean south.

Endnotes

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3 El Republicano Num 45 p. 196, 30 Set 1826. Biblioteca Nacional del Perú, Hemeroteca (Microfilms)

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**Biography**

Maria Fernanda Boza Cuadros is a PhD candidate in the Department of Anthropology at Syracuse University, where she specializes in historical archaeology. Her dissertation research focuses on the impact that processes of formation of the Peruvian state and the expansion of capitalism had on the Arequipa coast. She has conducted archaeological and bioarchaeological research across Peru and the United States. Maria Fernanda is also an affiliate researcher at the Peruvian Center for Maritime and Underwater Archaeology (CPAMS).
Session 3: Ceramic trade and cross-cultural exchange from Asian-Pacific region to the world

Abstract

Ceramics are the crucial cultural materials for understanding the cross-cultural exchange from Asian-Pacific region to the world. This session will discuss how interdisciplinary approaches such as archaeology, art, history, geophysics, and material science can broaden our horizons on the study of ceramic trade and cross-cultural exchange. Second, we will discuss the connection of ceramic trade and exchange between the early age of commerce (c.900-1300 C.E.) and the age of commerce (1450-1680 C.E.) in Southeast Asia and other regions. This established some challenges in ceramic trade including the influence for new creativity and production development, such as in Europe where some trademarks were developed under the Chinese influence. Our goal is to deepen our knowledge on the application of interdisciplinary approaches on the study of ceramic trade and cross-cultural exchange across the two historical periods.

Session Chairs: Ms. Sharon Wong Yai-yee
The Blues of the Santa Cruz: A study of porcelain color and composition

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Abstract

For the study of ceramics found in a shipwreck, stylistic and provenance analysis are two approaches that can provide critical information about period and trade route of the vessel. In this paper, we investigate the characteristics of trade ceramics from the well-preserved Santa Cruz shipwreck, which sunk along the west coast of Luzon Island in the Philippines. Underwater excavation has brought to light more than 15,000 ceramics, mainly Chinese Jingdezhen blue-and-white porcelain and Longquan celadon of the Hongzhi period (1488-1505 CE) as well as other wares from Thailand, Vietnam, and Burma. Here, we have focused on the Jingdezhen blue-and-white porcelain and selected twelve dishes with similar decorative patterns, but showing different tones and shades of the blue color. The dishes were most likely produced in the same workshop or within a small region and the primary goal was to investigate production variability. The chemical composition of the ceramics and the characteristics of the blue pigment were studied non-invasively with portable X-ray fluorescence (pXRF) and fiber optics reflectance spectroscopy (FORS). Results have shown that pXRF data are relatively homogeneous which reflects some constancy in term of raw materials procurement usage. On the other hand, although the blue pigment was as expected a cobalt-based material, FORS spectral profiles present significant differences which might be due to variations in the pigment composition and/or firing conditions, while for others, they could also be related to weathering. From an archaeometry perspective, this research provides some insight on production
standardization in Jingdezhen as well as on subsequent modifications that can affect ceramics found in an underwater archaeological context.

**Key words:** Ceramics, shipwreck, Philippines, blue-and-white, pXRF

**Introduction**
Chinese blue-and-white porcelain was one of the most popular commodities during the pre-modern and early modern periods, and it was frequently found along the maritime trade routes. Because the decorative patterns of blue-and-white porcelain changed over time, the artistic style of this type of material is usually the primary research focus for clarifying dating issues. However, the chronology of Chinese blue-and-white porcelain was established based on fine wares made mostly for the court, and the variability of the production was relatively ignored. Regarding the color of the decoration observed with naked eyes, there is a broad range of “blues” on blue-and-white porcelain, ranging from blue, green, purple, gray, and sometimes even black.\(^1\) In this research, we have used scientific analysis to investigate the causes of the color difference among a selected set of blue-and-white porcelain from a shipwreck. This archaeological context provides a particular opportunity for this research: loaded in the same boat as merchandise, a same kind of mass-produced cargo was most likely made around the same time and was even from the same or nearby workshops.

The artifacts were selected from the cargo of the Santa Cruz shipwreck that sunk about ten nautical miles off the northern Zambales coast on Luzon Island. This shipwreck is one of the representative fifteenth-century vessels in maritime Asia (Fig. 1). The underwater excavation was conducted in 2001 by the National Museum of the Philippines in collaboration with the Far Eastern Foundation for Nautical Archaeology. The vessel was about twenty-five meters long and six meters wide and was built following the so-called South China Sea Tradition of
shipbuilding. The structure itself is well preserved as 80 percent of the lower hull was discovered and the cargo was still loaded in the 16 transverse bulkheads. A variety of materials were found in the Santa Cruz including ceramics, metal products, glassware, wooden and stone materials. Among these artifacts, more than 15,000 ceramics were recovered during the campaign, including Chinese and Vietnamese blue-and-white porcelain, Chinese celadon, as well as Thai and Burmese stoneware (Orillaneda, 2008, 2016). Mainly based on the style analysis of the ceramics, the Santa Cruz shipwreck could be dated to the Hongzhi period in Ming China (1488~1505 CE). The discovery of the Santa Cruz shipwreck and its cargo is an important piece of evidence for the so-called Dongyang (Eastern Sea, from the Chinese perspective) trade route during the “Age of Commerce” in Southeast Asia (Reid, 1988, 1993). Additionally, the vast amount of late fifteen-century CE Jingdezhen blue-and-white porcelain on board marked the end of the “Ming Gap” (Brown, 2009) and the revival of the trade of Chinese ceramics in Southeast Asia. This research therefore, not only contributes to the general issue of color variation among blue-and-white porcelain but also sheds light on the production process and trade of Chinese porcelain during this particular period.
Fig. 1: Map of East and Southeast Asia with the location of the Santa Cruz Wreck (left) and images taken during the excavation (right).

Materials and methods

Blue-and-white porcelain

Twelve blue-and-white dishes were analyzed with a particular focus on the different tones and shades of the blue color (Tab.1; Fig. 2). The porcelain ware was loaded in piles mostly at the port side of the boat, and the dishes were distributed in bulkhead 1, 3, 5, 7, and 9 (Orillaneda, 2008). The locations of these samples show that those from the same bulkhead did not necessarily share similar appearance or quality (e.g. III-2001-Z-2963 and III-2001-Z-3245). The selected dishes are all saucer-shaped and of similar size: diameter of the mouth rims is about 26cm, height is about 4cm, and the diameter of the foot rim is about
13 cm. Most of them are entirely decorated with the same kind of casual-style patterns (e.g., flora and rock, deer and pine tree). The blue decoration was applied on both the interior and exterior of the dishes. To leave the foot rim unglazed, the transparent glaze was applied separately at the bottom of the dishes. In many cases, the glaze applied on the bottom looks different from the glaze in the other parts. While all dishes have been cleaned and desalinated after the excavation, some still show shell encrustations.

**Methods**

Two non-invasive technologies were used in this study: portable X-ray fluorescence (pXRF) and fiber optics reflectance spectroscopy (FORS). Previous research has shown that these two techniques are suitable for the compositional analysis of blue-and-white porcelain and details of the settings used here for the two instruments can be found in the corresponding paper (Fischer and Hsieh, 2017). For pXRF, soil mode was used to acquire data on minor and trace elements from both the blue and white areas while mining mode was used for major elements from the transparent glaze. Measurements on the blue areas (glaze + blue pigment) were all taken on the main decoration at the center of the plate. As to the white area, due to the difference of the glaze application mentioned above, measurements were taken on two locations: one on the area next to the blue decoration and another one at the bottom. Depending on the size of the ‘white’ areas, the location of the first measurement was sometimes on the external side of the dishes. Compositional data of the body was collected on the only dish with a bare bottom (i.e. III-2001-Z-7026). Regarding FORS, measurements were taken on the blue decorated areas and on the ‘white’ at the bottom because there was not enough space for the measuring probe in between the blue decor.
Fig. 2: The dishes selected and analyzed in this study, with the color references of the decorations.
Table 1. Characteristics of the selected blue-and-white porcelain dishes

<table>
<thead>
<tr>
<th>Reference</th>
<th>Grid location</th>
<th>Motif</th>
<th>Aspect of the glaze</th>
<th>Color</th>
<th>Colorimetric data*</th>
</tr>
</thead>
<tbody>
<tr>
<td>III-2001-Z-256</td>
<td>N22W5</td>
<td>deer and pine tree</td>
<td>transparent; a bit shrinkage at the bottom</td>
<td>brownish gray</td>
<td>X: 13.5 Y: 12.4 Z: 3.9</td>
</tr>
<tr>
<td>III-2001-Z-789</td>
<td>N19W7</td>
<td>fruit and vine</td>
<td>transparent; a bit shrinkage at the bottom</td>
<td>blue</td>
<td>X: 14.5 Y: 14.0 Z: 6.6</td>
</tr>
<tr>
<td>III-2001-Z-1269</td>
<td>N19W8</td>
<td>flora and rock</td>
<td>some opacity, crack concentrate on one side</td>
<td>greenish brown</td>
<td>X: 20.3 Y: 17.9 Z: 5.1</td>
</tr>
<tr>
<td>III-2001-Z-2797</td>
<td>N27W5</td>
<td>flora</td>
<td>semi-transparent; shrinkage at the bottom</td>
<td>gray</td>
<td>X: 10.6 Y: 10.0 Z: 3.7</td>
</tr>
<tr>
<td>III-2001-Z-2963</td>
<td>N29W5</td>
<td>flora and rock</td>
<td>transparent and crazed on the decorated area; shrinkage and milky at the bottom</td>
<td>blue</td>
<td>X: 14.6 Y: 14.3 Z: 7.4</td>
</tr>
<tr>
<td>III-2001-Z-3245</td>
<td>N29W5</td>
<td>flora and rock</td>
<td>opaque; milky; shrinkage</td>
<td>light gray</td>
<td>X: 56.2 Y: 51.0 Z: 17.9</td>
</tr>
<tr>
<td>III-2001-Z-3851</td>
<td>N30W7</td>
<td>flora</td>
<td>transparent at the decorative area; milky and shrinkage at the bottom</td>
<td>gray</td>
<td>X: 14.0 Y: 13.5 Z: 6.5</td>
</tr>
<tr>
<td>III-2001-Z-14679</td>
<td>N34W10</td>
<td>flora</td>
<td>semi-transparent; cracks</td>
<td>blue</td>
<td>X: 19.5 Y: 18.8 Z: 8.7</td>
</tr>
<tr>
<td>III-2001-Z-14878</td>
<td>N34W5</td>
<td>flora</td>
<td>some opacity</td>
<td>gray</td>
<td>X: 20.5 Y: 19.7 Z: 7.6</td>
</tr>
</tbody>
</table>

*Data type: 1964 CIE 10° XYZ standard colorimetric data

Results and discussion

Visual observations

The selected blue-and-white dishes share general characteristics regarding size, form and decoration styles. The shape of the foot rims and the way of applying the glaze show that the manufacturing process might be similar. In general, the glaze is quite transparent though a bit grayish, but for a few dishes, it shows a milky and opaque appearance that influence the visibility of the blue pigment beneath. Cracks and dewetting features related to shrinkage are also commonly observed. In some cases, these characteristics are only visible on one side of the dish, suggesting that the variations of glaze might be mainly due to firing conditions, such as the temperature of the kilns and where the plates were loaded in kilns. The surfaces of the glaze are weathered to various degrees after staying hundreds of years under the sea. In some cases, it is however hard
to tell whether the opaque aspect of the plates is due to their inferior quality or weathering at first glance. The blue areas are generally dull and look greenish or grayish with the naked eye. The primary motifs are outlined and filled with light colors, whereas the small leave patterns were drawn directly with thicker pigments favoring the formation of darker spots after firing. Sometimes, a brownish material can be observed on the top of those dark blue areas, which is most likely due to weathering.

**Chemical composition and production kilns**

Chemical composition data obtained with pXRF on the transparent glaze indicate that the blue-and-white plates were produced in Jingdezhen based on the concentrations of some discriminative elements such as zirconium, thorium and titanium (Tab. 2), a result consistent with the stylistic analysis and historical context. Values for these elements are close to the ones measured in previous studies despite the different time periods (Fischer and Hsieh, 2017; Ma, et al. 2012) and such compositional similarities could correspond to a relative constancy in the procurement of raw materials and processing technologies from the middle to late-Ming period. However, variations in rubidium levels, i.e. the higher values reported in the present study, also found for the Guanyinge and other unspecified late-Ming kiln sites (Rb: 428±78 ppm, Zhu et al. 2016; Rb: 436±84 ppm, Ma et al. 2012) compared to the lower averages measured on Jingdezhen blue-and-white ware from the Nan’ao One shipwreck in China (Rb: ~270 ppm, Zhu et al. 2016) and sherds from the Philippines and Indonesia (315±40 ppm, Fischer and Hsieh 2017) dated to the late-Ming and early-Qing periods, might reflect some intra-site variability among the numerous kilns in Jingdezhen.

Based on the analyzed elements², the chemistry of the glaze measured in the ‘white’ area, corresponds to an alumino-silicate glassy network containing
calcium and potassium added as fluxing agents and network modifiers. The composition of the glaze is relatively homogeneous, independently of its degree of transparency, making it difficult to identify the origin of the opacity which could be linked to the firing process, underwater weathering, or both. For some dishes, calcium levels are low and such levels, associated with lower firing temperatures in some areas of the kiln, could indeed contribute to opacify the glaze. On the other hand, almost invisible defects in the glaze induced by composition and firing conditions could favor the weathering in an underwater environment as well, and explain the lack of transparency for the glaze of some dishes. Also noticeable are some differences in the composition of the glaze applied to the base which shows lower calcium and higher iron and titanium in comparison to the ‘white’ and decorated areas. Although this trend is not systematic (see e.g. III-2001-Z-3245), it could suggest usage of a slightly different recipe for the glaze applied to the bottom. Finally, it can be mentioned that the desalination process was rather effective as the levels of chlorine and sulfur, not reported here, are generally low, apart may be for the dish with reference III-2001-Z-14679.
Table 2. Compositional data from pXRF and FORS analysis.

<table>
<thead>
<tr>
<th>Accession N°</th>
<th>Spot</th>
<th>Major (% oxides)</th>
<th>Minor and Trace (ppm)</th>
<th>Spectral absorptions (nm)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CaO K₂O Fe Ti Mn</td>
<td>Co Cu Th Ni Mn(II) Mn(III) Co(III) H₂O</td>
<td></td>
</tr>
<tr>
<td>III-2001-Z-256</td>
<td>blue</td>
<td>2546</td>
<td>4.4 5.2 2104 116 340</td>
<td>421w 491vw 519w 583s 678s</td>
</tr>
<tr>
<td>white</td>
<td>4.7 5.1 84 495</td>
<td>401 128 3035 385</td>
<td>239 411 97 50</td>
<td>244 422m 491w 517m 582s 673m</td>
</tr>
<tr>
<td>III-2001-Z-2797</td>
<td>blue</td>
<td>2996</td>
<td>5.4 5.0 2553 251</td>
<td>326 392 87 53</td>
</tr>
<tr>
<td>white</td>
<td>3.6 5.0 187 254</td>
<td>3375 115 1796 448</td>
<td>109 45 275</td>
<td>51 9 115 424w 493w 520m 585s 676s</td>
</tr>
<tr>
<td>III-2001-Z-2963</td>
<td>blue</td>
<td>4467</td>
<td>6.6 3.9 4591</td>
<td>400 318 95 53</td>
</tr>
<tr>
<td>white</td>
<td>4.6 4.0 95</td>
<td>4678 3840 307</td>
<td>100 45</td>
<td>611 45 9 415 422w 491w 517m 583s 677m</td>
</tr>
<tr>
<td>III-2001-Z-3245</td>
<td>blue</td>
<td>3484</td>
<td>5.4 4.2 2997 156</td>
<td>262 335 97</td>
</tr>
<tr>
<td>white</td>
<td>3.9 4.3 133</td>
<td>3408 8910 333</td>
<td>94 50</td>
<td>1047 112 12 237 423w 491w 520m 583s 677s</td>
</tr>
<tr>
<td>III-2001-Z-3851</td>
<td>blue</td>
<td>3061</td>
<td>8.1 4.1 3194</td>
<td>148 602</td>
</tr>
<tr>
<td>white</td>
<td>6.6 4.1 229</td>
<td>3018 2011 417</td>
<td>106 49</td>
<td>186 113 9 164 426w 491vw 522m 585s 675s</td>
</tr>
<tr>
<td>III-2001-Z-5135</td>
<td>blue</td>
<td>3376</td>
<td>5.6 4.2 3113</td>
<td>81</td>
</tr>
<tr>
<td>white</td>
<td>5.0 4.7 151</td>
<td>2925 105 1305</td>
<td>573 88</td>
<td>39 133 48 8 218 421m 491w 519m 583s 670s</td>
</tr>
<tr>
<td>III-2001-Z-7026</td>
<td>blue</td>
<td>2835</td>
<td>5.9 4.2 2835 202</td>
<td>240</td>
</tr>
<tr>
<td>white</td>
<td>4.1 3.5 266</td>
<td>3884 133 3543</td>
<td>392 92</td>
<td>50</td>
</tr>
<tr>
<td>III-2001-Z-13671</td>
<td>blue</td>
<td>3061</td>
<td>5.9 4.8 3061</td>
<td>191 428</td>
</tr>
<tr>
<td>white</td>
<td>4.4 4.6 117</td>
<td>3416 103 2516</td>
<td>400 54</td>
<td>52</td>
</tr>
<tr>
<td>III-2001-Z-14679</td>
<td>blue</td>
<td>4335</td>
<td>5.9 4.3 2561</td>
<td>214 438</td>
</tr>
<tr>
<td>white</td>
<td>4.9 4.5 172</td>
<td>4345 129 3169</td>
<td>539 84</td>
<td>45</td>
</tr>
<tr>
<td>III-2001-Z-14878</td>
<td>blue</td>
<td>3752</td>
<td>5.9 4.6 255</td>
<td>607</td>
</tr>
</tbody>
</table>

* Absorptions: vw: very weak, w: weak, m:medium, s: strong, br: broad
** body

Composition and color variations of the blue decorations

The pXRF analysis of the blue decorated areas has shown that the cobalt-based pigment contains high levels of manganese, low iron and significant amounts of nickel as well as traces of copper. After subtraction of the manganese and iron contribution from the transparent glaze (white area), normalized percentages of Mn, Co and Fe are similar to the blue pigment analyzed on other export blue-and-white porcelain produced in Jingdezhen (Fig. 3). This compositional profile is consistent with the results of previous studies (Chen et al., 1978; Cheng et al.,
2005; Fischer and Hsieh, 2017; Wen et al., 2007) and also supports the use of Mn-rich asbolite ores in folk kilns during the Hongzhi period of the Ming dynasty.

![Ternary plot showing the blue pigment composition based on the relative proportions of Co, Mn, and Fe.](image)

FORS analysis provided colorimetric data using the 1964 CIE 10° XYZ standard which were converted to visible references, confirming the variability of the blues based on visual observations (Fig. 2). Spectral profiles obtained with FORS on the blue decorated areas (Fig. 4, left) show the characteristic absorptions of Co\textsuperscript{2+} in tetrahedral coordination with the triplet located around 520, 580 and 670 nm (Ceglia et al., 2012; Fischer and Hsieh, 2017). For some plates, darker colors translate in an overall lower spectral reflectance in the visible, but the cobalt absorptions are always present though with variable intensities (Tab. 2). However, in these darker areas obvious signs of weathering are often visible (Fig. 4, right) and the associated brownish color is most likely due to an oxidation
of Mn and Fe phases. Moreover, the grayish or blackish hue of the decoration might be correlated with high levels of manganese in the composition of the pigment, combined with redox firing conditions favoring the crystallization of Mn-rich oxide phases (Wen et al., 2007). Some analogy can be made with ‘black’ glasses containing several percent of MnO making the glass appear black to the human eyes (Möncke et al., 2014). Similar dark colors were also found on blue-and-white from the Chenghua period (1465 ~1487 CE) though the amount of manganese in the blue pigment was not analyzed (Qu et al., 2014). In the FORS spectra, the presence of Mn-rich phases might be associated with the absorption of Mn(II) at 420 nm and a broad but weak Mn(III) absorption around 490 nm (Tab. 2), although the latter attribution would need to be confirmed by further research on reference materials. Finally, in the near infrared spectral range, some plates show a strong and asymmetrical combination band around 1910 nm which seems to be correlated to the degree of opacity and can be attributed to the presence of water adsorbed in the glaze and/or in the body that might result from the weathering and/or indirectly reflect a more porous body and lower firing temperatures.
In this preliminary study, the variability of the blue colors of blue-and-white porcelain from Santa Cruz shipwreck was explored by using pXRF and FORS. Factors associated with composition, recipe and production process as well as underwater conditions can all affect the appearance of the excavated ware, the most critical ones being the recipe of the glaze, the firing conditions and the weathering induced by water. The results of the pXRF data have shown that regardless of the appearance variability, the chemical composition of the selected dishes share the characteristics of middle and late Ming blue-and-white porcelain produced in Jingdezhen. The pXRF data also shed light on some aspects of production processes of the dishes. FORS provided colorimetric data which are well correlated with the visual perception and variability of the ‘blue’ colors. Also, the spectral profiles and related absorptions have given some insight on the potential causes for the darker colors. To further examine the variability of the blue-and-white porcelain loaded in the Santa Cruz, it would be
necessary to investigate a larger set of dishes and if possible, compare dishes from the same pile.

Endnotes

1It is worth noting that the Chinese name of blue-and-white porcelain is “Qinghua,” meaning “patterns with qing color.” And qing can refer to colors ranging from green, blue and black.

2For major elements, values for Si and Al are considered qualitative and not reported in Table 2.

References


**Bios**

Dr. Ellen Hsieh is a research affiliate at National Chengchi University in Taiwan. She started her archaeological career from Neolithic Asia and then switched to concentrate on historical archaeology. She received her PhD degree in archaeology at the Cotsen Institute of Archaeology at the University of California,
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Dr. Christian Fischer received a PhD in Geochemistry and Physical Chemistry from the Louis Pasteur University in Strasbourg. After years of scientific research in the private sector in France and China, he returned to academia in 2001. At UCLA since 2005, he has been teaching on various topics including archaeometry, conservation science and stone conservation as well as spectroscopy for the analysis of archaeological materials. He conducts research on raw materials sourcing and conservation of cultural artifacts, particularly of stone in Cambodia and neighboring countries in collaboration with the École Française d’Extrême-Orient (EFEO), Chinese export blue and white ceramics in Southeast Asia, and is involved in other projects in Cyprus, Chile and Mexico. Dr. Fischer is also the co-director of the Archaeomaterials group and the Molecular and Nano Archaeology Laboratory at UCLA as well as a scientific consultant for UNESCO on the preservation of cultural heritage.

Bobby Orillaneda is a Museum Researcher at the Maritime and Underwater Cultural Heritage Division, National Museum of the Philippines. He is also finishing his doctoral studies at the Oxford Centre for Maritime Archaeology, University of Oxford in England. He has been involved in maritime archaeology since 1999 and has worked in a number of projects in the Philippines, Egypt, Thailand, Indonesia and Sri Lanka. He was also part of a training team that carries out underwater training programs in Thailand and Indonesia. His areas of interest include Southeast Asian maritime history, Asian ceramics and World War II shipwrecks.
Ceramics and Other Archaeological Finds as Evidence of Ancient Ports Existence and Its Role in Eastern Coast of South Sumatra in Early Centuries

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Abstract

The East Coast of Sumatra has been often associated with great maritime empire in Southeast Asia, namely Srivijaya. However in this paper does not focus on the presence of that empire, but the traces of settlements and port related maritime activities early centuries AD. Foreign ceramics is one solid indication of their relationship and trade exchange activities between the origin places of ceramics was produced with which it was found on the very site of east coast South Sumatra, the same thing happened to other findings as well. By revealing these sites we might have picture what Southern Sumatra role was in maritime activities of early centuries AD.

Key words: Ceramics and Archeological Findings, Southern Sumatra, Ancient Ports

Preface

The east coast region of Sumatra Island is commonly known for seafaring since ancient times. As a “gate route” to enter the Indonesian Archipelago, its connected or passed by ships with destinations to and from the Yellow Sea in the North. The peak of trade activity in east coast region of Sumatra Island happened during the period of the Maritime Kingdom of Srivijaya. Its vast territory covered almost all of the western part of Indonesian Archipelago and Malay Peninsula (Kedah) up to southern part of Thailand (Ligor).

Based on ancient inscriptions and foreign written sources, the period of this enormous kingdom was emerging presumably in 6th until 13th Centuries. Yet it
cannot deny, some of archaeological evidencethat found in east coast of Sumatra Island, indicated the contacts activity with foreigner already conducted far before 6th Century. The peak of trading activity in eastern Sumatra through the Malacca Strait at that time appropriated with the period of “silk road” trade routes between East and West from the 8th -11th Centuries (Wolters, 1967). In land route of “silk road”, the traders were assessing the desert land through Central Asia, Eastern Asia to Europe, like wise from Europe to Central Asia. However, the sea routes in “silk routes” were sailing the routes which connected Mesopotamian and Persian Gulf in the West to South of China, through the Melaka strait and the East Coast of Sumatra.

Meanwhile the trade network from trade centers in the West also expanded to the South East. The 8th -11th Centuries were expanding period of Muslim trade along coastline of Indian Sea to China. The Ships sailed from Mesopotamia and Persian Gulf or from Egypt and Middle Sea (Mediterranean) to India and Malabar, continued to Srilangka, Indonesia, Indochina, and Southern China territory. They were loaded with commercial goods such as rocks, turtle skin, comb, and metal bars. All of those things were exchanged for elephant trunks, rhinoceros horn, and camphor along the Indian seashore. Whereas in China, the trade goods were exchanged for precious things such as silk and ceramic, all of those were going to sale in Mediterranean markets and the Indian sea became center for the distribution of spices, perfume, aromatic ingredients, and medicines. (Lombard, 1996)

The sea trade routes between East and West had went on far before the arrival of the Islamic religion into Indonesian Archipelagos. Traders and seafarers from China, Arabia and Persia had travelled using the advantage of monsoon winds. By assessing the historical records, we have descriptions of their navigation network and the kind of commodities which was traded. The journey from China
to Indonesian Archipelagos and South East Asia, at least had 3 stages period of journeys:

The first period was the 5th – 7th Centuries; the journeys were motivated by religious pilgrimages. It’s marked by Fa-shien journeying to religious centers in India and Ceylon in 414 AD. In his returned journey to China, he passed and stopped in Yeh Po Tie which located in the East Coast of Sumatra. At this time, the trade commodity was limited only to luxurious or royal goods such as: pearls, turtle skin, and religious effects such as benzoin, perfume and other exceptional things (Wolters, 1967).

The second period was in the 7th – 13th Centuries; the sea journeys not only were intended for luxurious and royal goods, but also for spices and medicines. This period was marked by the emerging of maritime kingdoms in Sumatra such as Sriwijaya and Melayu. As we found in It-Tsing’s records (677 AD), in his journey to India he stopped in Palembang, he noticed that Palembang had already become an important port. Another record made by another Chinese traveler, Hsu- T’ang –Shu, mentioned that Sriwijaya had at least 14 harbors or ports and Barus were one of its biggest one in the west coast of Sumatra, which produced camphor and had its own administrative rules (Wolters, 1967).

The third Period was in the 14th -17th Centuries; it was the summit of Chinese commercial activity in the Ming Dynasty. At that time the Chinese Empire was as its acme in prosperity and leading culture. At the beginning of the 15th century, it was a period where there was an enormous interest from the Chinese Empire to expand its influence to overseas lands, its trade’s become more developed and more diverse, as well as China’s knowledge in geography had became wider and more detailed (Mills, 1969). The famous and legendary trader and envoy at this time was Admiral Cheng Ho or Ma Huan (1403-1430 AD). Ma Huan or Cheng Ho noted and recorded on his journey in his journal and he wrote
a book “Ying Yai Sheng Lan” (The Overall Survey of The Ocean’s Shores) (Mills, 1969).

Base on its chronology, ports and trade settlements along east coast Sumatra could divide into several periods,

1. Ports which emerged in pre or early Sriwijaya period 4th – 7th C
2. Ports during Sriwijaya Period 7th – 13th C
3. Ports which existed after Sriwijaya period and at the time of emerging of many maritime kingdoms in Sumatra such as Panai, Malayu, and Samudra Pasai, as same period with Majapahit supremacy in East Java in 13th C.
4. Port that was emerged and developed in 18th-19th C

From all of the five stages of Chronology, the existing of the ports was the most varied. Some of ports could survive through several periods but there also ports which only existed only in one period and abandoned afterward.

Archaeological researches in eastern Sumatra, supported by written sources, is also conducted by field research through either surveys or excavations. The results of this research revealed that most of the sites in this area were dated back to pre- and during the Sriwijaya period in 4th - 13th C. The primary indications for the existence of those ports in east coast of Sumatra were an enormous number of ceramics found, mostly along the line of its seashore. As well as the ceramic sherds there’s also traces of ancient settlements remains such as bricks, poles of wooden house pillars, fragments of ancient ships/vessels, beads, metal, and wood relics.

Other data that we could use to explain the existence of the ports are the shipwreck cargos, which found in Indonesian Sea, such as shipwreck from Pulau
Buaya, Bangka Belitung, and the recent finding from Cirebon Sea. The data from these projects are very important and relevant evidence reveal the ancient trade activity and its commodities for export and import from other places outside of the Indonesia Archipelago. More over with sunken ship sites, which might have same chronological assemblage, contains a high value of large number ceramic data related to other kinds of commodities which were also important. The ceramics we could identified the origin of its dated and place, and from ceramics dating we could confirm the variation of other commodities which came from the same period of the ceramics.

This paper tries to decipher which sites have indicated that these activities and how their role in shipping, trade and cultural exchanges of the past by using both written source and artifacts that found in very sites.

**The Archaeological Findings And Past Ten Years New Reveals In South Sumatra**

Most of sites that indicated maritime and long distance trade activity in early centuries are located in two provinces in southern part Sumatera, which are South Sumatra province and Jambi province.

**A. Jambi Province**

The existence of ancient port in south Sumatra began with toponim of a place called “Muara Sabak”. It’s located in Batanghari estuary. The word Sabak could be refer to Arabian noted in 7th C called Zabag , a place that might be located in Sumatera (L. Damais, 1964). Nowadays Muara Sabak is in Tanjung Jabung distrik, along with others sites that had reveals later in late 90’s such as Lambur. Nipah Panjang, Siti Hawa, and Koto Kandis.
Fig. 1: Tanjung Jabung District in Jambi Province.

Tanjung Jabung district lies in a delta at the mouth of the Batang Hari River, the second largest river in southern Sumatra. The lowland region mostly consists of peat swamps. Several rivers flow into this delta, which partly empties into the Berhala Strait, among other rivers; Pemusiran, Lambur Luar, and Simbur Rise. Those sites located in this region are on the banks of the river flow, both of which still exist as well as the flow of an ancient river that has dried up. The most prominent finding on sites in this region is the distribution of foreign ceramics which is quite dense and evenly distributed on every surface of the site.

Ceramic findings, especially Chinese ceramics are quite dominant to the sites in the estuary area up to Muara Jambi site in the mid-stream of the River Batanghari. In addition to ceramics, the findings in the estuary of the river, also a variety of other ship findings such as wooden pegs, fiber ropes, ship fragments, metal, pottery, gold, and other findings that show traces of settlement activities and maritime activity of past trade. Mostly ceramic finds in this area came from the Sung Dynasty era; 11th to 13th Century, and consists of various kinds of white ceramics, caldrons, jars, ewers, which came in quite fine quality.
B. South Sumatra Province

Other than Batanghari River, the largest river in South Sumatra is Musi River. The maritime site in this province mostly scattered in the bank of this river. South Sumatra province are well-known on its role in trade route either in historical or archeological data.

![Map of South Sumatra Province](image)

*Fig. 2: Air Sugihan Site, South Sumatra Province.*

The oldest data in this region date came from the early of the 7th century AD, known as the Srivijaya period. The sites located in the estuary of the Musi River facing directly into the Strait of Malacca, among others are the wetlands sites on along the edge of the east coast of South Sumatra, such as the sites in Bayunglincir, Karang Agung to Air Sugihan, and the site of Kota Kapur in Bangka Island. These sites clearly indicate the trace of ancient settlements existence and maritime activities from the beginning of AD (century 3-4 AD). In addition to the findings of ancient settlements, there are household appliances (grinding), pottery, beads, and metal fragment fragments, as well as Chinese ceramic findings from Tang dynasty by the end of 9th century AD. For the oldest ceramic
find in the eastern seaboard South Sumatra is a jug from the 6th Century Sui dynasty found on the site of Air Sugihan.

The district of Air Sugihan lies on the south side of the delta of Musi River on an ebb and tide, swamp area. Since 1980 was made for transmigration settlements, canals and bridges were built to reach the villages. Since inhabited, many archaeological findings were reported yet illegal digging occurred around the 1990s. Preliminary surveys were conducted in 1998 and again in 2003 through to 2011, and 2013 by Indonesian National Research Center of Archaeology. The research had identified several sites with surface finds such in Kertamurti, Nusakarta, Banyubiru, and canal 7. Excavations were carried on at 2007 and 2008, 2011 and 2013.

Beside the traces of ancient settlement, sites in east coast of South Sumatra also show remains of ancient maritime activities such as; part of the remaining ancient boats, wooden fragments of ships; oars, peg wood, rope fibers, shoe stoves, as well as remnants of an ancient dock. Some others finds in Air Sugihan area which indicated similarity with other sites in South India. China Mainland and South East Asia have various beads made of glass and stone; stamps made of glass/stone; decorated pottery; Chinese ceramics; and metal objects.

Fig. 3 (left): The end of the wooden boat fragment (National Research Center of Archaeology).

C. Bangka Island
Bangka Island was used to part of South Sumatra Province, now the island namely Bangka and Belitung have became a Province of Bangka Belitung. The Bangka Island itself with its Menumbing hill has been known by sealer in early centuries. The oldest written story written before Sriwijaya about Bangka obtained in India. A Buddhist literature written in century 3 AD (Mahaniddesa) mentions a number of place names in Asia, among others about Swarnabhūmi, Wangka, and Java. Swarnabhūmi name can be identified with Sumatra as mentioned also in the book Milindapanca while Wangka may be identified by Bangka. More detailed information about the picture there Bangka Island the Chinese news from the year 1436 AD is Hsing-Ch’a Sheng-lan (General Reports Journey at Sea) written by Fei Hsin of a place called Ma-yi-tung lying west of Kau-lan (Belitung) in the southern sea (L. . Damais, 1995; Groeneveldt, 1960)

Kota kapur, a prominent archaeological site in Bangka island, well known as its inscription about the invasion to Bumijawa. The inscription was originally thought to have come from the 7th century AD, but with the discovery of a statue Vishnu style 4–5 centuries AD as it is also found in the port of Oc Eo sites in northern Vietnam. With the discovery of these findings, it can be said Kota Kapur site has been going on around the 4th century AD or the period before the Realm of Srivijaya. The findings from this site not only inscription but also remains of brick temples, with one of it center consist about 20 ceramic bowls dated from North Song Dynasty 10th C arranged in circle row.
The island of Bangka has a strait of Bangka that connects with Malacca Strait. In the 7th century AD, the Malacca Strait has become an important shipping lane and crowded with the Indian region. In 2013, National Research Center of Archaeology has revealed remnants of an ancient dock/port on southwest shore of Kota Kapur, facing to the mouth of Musi River. This remnant presumably as an entrance dock to Kota Kapur in early century. In addition to the rest of the pier, around the location are also found the remains of a large wooden boat, pottery shard, and the remains of house poles.

![Excavation on ancient dock in Kota Kapur Site of Bangka. (National Research Center of Archaeology)](image)

**Fig. 4 (right): Excavation on ancient dock in Kota Kapur Site of Bangka. (National Research Center of Archaeology)**

**Conclusion**

Indonesia was presumably greatly involved in the Indian Ocean network trade at very early period. Indonesian products such as camphor, benzoin, cloves, and gold were demand in India and China, moreover to Middle East, Rome and west coast of Africa. Historical evidence however indicates that the main emporia in western Indonesia were not located near the producing center, but instead were in south east Sumatra (Miksic, 1979)

The oldest evidence of long distance trade route, between southern Sumatra’s east coast to elsewhere, are the finding of ceramic jars from the Sui dynasty’s 6th
-7th century, the Arikamedu’s pottery shard of 4th-5th century, also some pottery which as the same as found in Oc Eo site (4-5 C). In Air Sugihan site, not only the pottery but also beads, metal works, and also amulet are similar with those found in 4th-5th century site of Oc Eo.

From the chronology of ceramic finds, ceramic that found in Tanjung Jabung area of Batanghari estuary are mostly latter than those found South Sumatera east coast. It is indicated that settlements in South Sumatra by the Musi River estuary were older (9th-10th C) than Batanghari’s (11th-13th C). The ceramics and other artifacts such as metal work, glass and others found in Jambi and South Sumatra sites are the same as those found in Pulau Buaya, Intan and Cirebon Shipwreck, which mean all those were came from the same period and the same trade business (Taim, 2016).

Some boat fragments found in Air Sugihan or Bangka site shown the use of Southeast Asian tradition of boat making. Southeast Asian boat making techniques that consist of sewn plank technique and lash lug techniques. This technique was flourishing in Southeast Asia so it use to call as Southeast Asian Technique, which starts in early first century (Abas, 2009).

The eastern coastal area of southern Sumatra contains several areas that indicate long-distance maritime and trade activities. The region covers Jambi province, south Sumatra, and Bangka Belitung. Based on the findings of archaeological remains, the Jambi province area relatively younger by archeological findings than the other two regions (southern Sumatra and Bangka). This is in accordance with the chronology of the history of the kingdom of Srivijaya which was mentioned in Sumatra by Coedes (Coedes, Damais, Kulke, & Manguin, 2014). Wolters, an English Historian, also said that Jambi to South Sumatra area are the suitable and strategic location, as enter port while
waiting for the best wind that might bring the ship to east (Manguin, Py., Soeroso MP, 2006)

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Retrieved


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Abstract
Southeast Asia during the first half of the second millennium CE. Their hegemony is particularly apparent in lowland areas throughout the Lower Mekong basin, expressed in both architecture and ceramics. How strongly this control was exercised in more geographically marginal regions – and what the nature of power was after the capital moved southward -- has not been explored. In this paper we present the results of a geochemical analysis of ceramics from absolutely and comprehensively dated mid-15th century CE burial complexes in the Southern Cardamom Ranges of southeastern Cambodia and a nearby
contemporary shipwreck. The wreck assemblage was typical of a Southeast Asian maritime trader. Comparison of burial and shipwreck ceramic compositional data enables us to confirm a provenance for some of the jars and fine wares from production centres in central Northern Thailand. A second group, not represented in the wreck assemblage, is from an as yet unidentified source that we suggest is located in the adjacent Cambodian lowlands. The results of this provenience analysis highlights both the role of the relatively well known maritime trade, as well as a previously unsuspected continuity in local Cambodian stoneware production. This window into 15th c exchange networks expands our understanding of the context of subsequent European 16th-17th c engagement during the Early Modern Period, is one piece of the broader picture needed to more closely define the processes of economic transformation.

Key words: Southeast Asia, ceramics, geochemical analysis, shipwreck, Cardamom Mountains

Introduction

The dramatic expansion of archaeology across mainland Southeast Asia in the last twenty years is beginning to provide the level of detail needed to evaluate previous models of exchange and interaction (e.g., Bronson 1977; Reid 1988). The role of maritime interaction and trade has long been argued to be a critical factor in the development of coastal polities throughout the region (Manguin 2000). However, this perspective has relied heavily on historical data, much of which begins in the Early Modern period for this region. This historical bias has focused attention on economic and political development for the coastal regions and the Early Modern period as an instant of economic and political rupture (Wallerstein 1974). It has also promoted an externalist bias in how mainland political and economic transformations are viewed. Arguably our understanding of the posited economic and political ruptures in the region remains hampered by the still relatively sparse direct archaeological evidence of the local economic trajectories across the transition (Stark 2010).
Here we add to a growing body of material evidence that Southeast Asia was a large scale, internally complex and integrated exchange system prior to European engagement (e.g., Carter 2013; Manguin 2004; Manguin 2014). Ceramic compositional data from exceptionally well dated mid-15th c burial sites in the Cardamom Mountains of Cambodia, as well as from a contemporary shipwreck just off the west coast of Cambodia, are analyzed to better understand these local maritime/coastal economies outside the main political centers, in the decades prior to the Early Modern period engagement in SE Asia and the Pacific.

**Maritime exchange spheres in mainland SE Asia**

The organization of trade and exchange systems in Southeast Asia is a key research area for archaeologists and historians of the region. In the 1970s, Bronson suggested a dendritic model integrating coastal and inland sites (Bronson 1977), while others have focused on maritime patterns over time (Cartier 1988; Evers 1988; Manguin 1993). These earlier models heavily relied on historical data and ethnographic comparisons, but with a few exceptions, little direct archaeological data (e.g., Junker 1993; Junker 1998). More recent terrestrial archaeology across both island and mainland Southeast Asia has greatly expanded our understanding of the development of polities and their interaction beginning in the first millennium CE (Hendrickson 2010; Hendrickson 2011; Manguin 2004; Manguin 2014; Murphy and Stark 2016; Stark 2010; Stark 2006).

Two main types of evidence are used to reconstruct pre-modern trade and exchange in the region: shipwrecks and trade goods. Shipwreck data allow us to track the expansion of maritime trade (and technology). Beginning with the 9th c. Belitung shipwreck in Indonesia, with cargo from China and the Middle East, the shipwreck evidence increases through the early second millennium.
CE. The Gulf of Thailand, in particular, has a shipwreck record of extensive local trade from the 13th-15th c. CE (Brown 2004; Green and Harper 1987). Wrecks like the 15th c. Pandanan, in the South China Sea, reveal the extensive exchange between island and mainland SE Asia, and with points to the west (Diem 1998). In terms of ceramics, these wrecks commonly include a range of jars and fine tablewares (typically glazed bowls and plates) from a wide range of production centres in Southeast Asia and China (Grave and Maccheroni 2009).

With the improvement and expansion of both regional archaeological databases and archaeometric analyses, we can begin to evaluate the regional trajectories of trade across SE Asia. In addition to site excavations and surveys, specific trade goods, such as carnelian beads from burials, provide some evidence of the direction, scale, and intensity of interaction across mainland SE Asia (Carter, et al. 2016; Carter 2015; Carter and Dussubieux 2016; Theunissen, et al. 2000). Patterns of exchange and emulation of South Asian religious items and iconography have also provided insights into inland and maritime exchange networks (Brown 1996; Shaffer 2015).

Large scale changes in economic and political relationships SE Asia took place in the 10th-11th c. CE. These included the development of the Khmer Empire and the expansion of interaction with China (Wade 2009). Chinese interaction and exchange is apparent through both technological adoption and trade goods. Manguin (Manguin 2000) argues that the 10th-13th c CE is one the major phases of intensified maritime exchange that promoted the growth of coastal polities (Baker 2003). However, while the Khmer traded with the Chinese, and expanded northward in mainland SE Asia, their production and exchange appear to have remained internal.
The 15th c CE was a critical nexus in both political and economic reorganization in SE Asia. Documentary sources suggest the Khmer Empire collapsed by the mid-15th c. CE. Post-Angkorian power migrated south to a series of 15th-18th c capitals that flanked the Tonle Sap lake (Srei Santhor, Bakan [Pursat] and then to the Oudong and Longvek area that lies c. 35 km NW of Phnom Penh). At the same time, other polities emerged across the region during this time (Grave 1995), and the expansion of maritime trade was supported by a network of entrepôts (e.g., Melaka, in the Malacca Straits).

Chinese records suggest that 15th c Cambodia was a sea power in close relations with China (Vickery, et al. 2004:43). Despite Ming Dynasty trade restrictions, 15th c private Chinese ships continued their active trade throughout Southeast Asia (Hall 2016:406-409; Wade 2004:19-27). At least one previously-established Ming trade route through Southeast Asia included Siam (Ptak 1998:27), and maritime research on 15th c shipwreck sites offer ample evidence of durable Southeast Asian goods, including high-fired ceramics from kiln complexes in central northern Thailand (Flecker 2001:225-226).

The onset of the Early Modern period, in the 16th c. with the European intervention in the region, arguably, caused a major rupture, redefining production, exchange and scale of interaction. While current research projects are beginning to address the nature of this transformation, we argue that the political and economic relationships of the 15th-16th c. CE in Southeast Asia are critical elements for understanding the impact of the Early Modern economic transformation in SE Asian societies. Our use of two Cambodian case studies allows us to trace one such relationship: mid-15th century commodity flows across the region.

Here we make use of contemporary evidence from mid-15th c. CE isolated burial sites in the Cardamom Mountains as well as a contemporary shipwreck on an
adjacent coastline to assess exchange networks on the eve of the Early Modern Period. Our Cardamom Mountain samples derive from work at “Jar and Coffin burial sites” whose artifacts and bioarchaeology has been reported previously (e.g., (Beavan, et al. 2012a; Carter and Beavan 2014; Halcrow, et al. 2014).

Using Neutron Activation Analysis [NAA] we characterize ceramics from both the burial and shipwreck sites, and compare these results with legacy stoneware data sets from both well dated shipwrecks and production centers in Thailand and Cambodia. These analyses allow us to begin to evaluate the economic relationships of these upland communities with coastal shipping and elsewhere at this key historical juncture.

**Background: The Sample & Context**

A relatively small sample of seventy one ceramics were selected for geochemical profiling from fragmentary material in four contemporary mid-15th c CE archaeological assemblages (i.e. three burial sites in the Cardamom Range and the shipwreck Koh Sdech assemblage)(Fig 1). A total of fifty samples were selected from the three burial sites and 21 samples came from the shipwreck (Table 1). Both the burial sites and the shipwreck included earthenware and stoneware samples. Due to the disparity in sample populations between the burial sites the burial sites are combined into a single Southern Cardamom group to compare with both the shipwreck assemblage and other reference NAA datasets. The contemporaneity of these sites facilitated this grouping.
Fig. 1: Study area and general location within mainland Southeast Asia (inset) showing locations of burial sites and shipwreck discussed in the text.
Table 1: Summary of the NAA geotechnical results for the Cardamom and Shipwreck samples organized by ware type (stoneware/earthenware) and by compositional group (A-D for stoneware, E refers to the celadon singleton; 100-500 for earthenware).

<table>
<thead>
<tr>
<th>Group</th>
<th>Koh Sdech</th>
<th>S. Cardamom</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>C1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>C2</td>
<td>1</td>
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<tr>
<td>D</td>
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</tr>
<tr>
<td>E</td>
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<tr>
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<td>4</td>
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<td>2</td>
<td>2</td>
</tr>
<tr>
<td>300</td>
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<td>5</td>
</tr>
<tr>
<td>400</td>
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<td>0</td>
</tr>
<tr>
<td>500</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Σ</td>
<td>71</td>
<td>21</td>
</tr>
<tr>
<td>SW</td>
<td>40</td>
<td>14</td>
</tr>
<tr>
<td>EW</td>
<td>31</td>
<td>7</td>
</tr>
</tbody>
</table>

The earthenwares include cooking pots, kendis, water jars, while the glazed stoneware are mainly storage jars but also includes a few fine glazed and decorated bowls. The glazed stoneware jar assemblage includes brown, black, and green glazes, and potentially some unglazed samples.

The shipwreck site is located in the Gulf of Thailand near the island of Koh Sdech (20 km off shore). Radiocarbon dating of a piece of short-lived cargo (bamboo core lacquerware box) established a mid-15th c CE date for this assemblage (Beavan, et al. 2012b). The shipwreck included a large assemblage of small, medium and large stoneware jars, predominantly from Singburi / Maenam Noi.
(based on typology (Cort 2017), as well as basins, bowls, mortars, kendis and Sisatchanalai and Sukkhothai bowls (black under-painted and green glazed/celadons). Earthenware types included cooking pots, lids, and stoves. Only a few Chinese ceramic bowls were found, and were interpreted as the private items of the ship crew (Sokha 2013). Non ceramic items included lacquerware, ‘picul’ (lead tokens), a betel box, ingots, a cannon, two ivory tubes, and some sandstone.

The three burial sites, all with secondary interments, are distributed in a cluster within the southern Cardamom Mountain range, 150-700 m asl, ca. 40 km inland from the east coast of the Gulf of Thailand. Both log coffin and jar inhumations are present at these sites. Through an extensive program of radiocarbon dating these burials have also been chronologically bracketed within the mid-15th c. CE (Beavan, et al. 2012a; Beavan, et al. 2015). Other trade goods present in the burials include simple copper finger rings and glass beads (Carter, et al. 2016). The glass beads are consistent with types circulating in the maritime trade of SE Asia at the time.

Methods

The ceramic samples were processed at UNE, and shipped to Maxxam Labs, Ontario Canada for NAA. Processing included documentation, photography prior to sampling. Subsamples were cleaned and crushed to homogenize the sample, and submitted for analysis.

NAA results were structured and grouped using an iterative combination of non-parametric multivariate procedures (PCA) and hierarchical cluster analysis (Ward’s method).

The compositional data from the ceramics were compared with two general reference stoneware compositional data sets from Thailand and Cambodia. For
Thailand the production sites include Sisatchanalai/Sawankhalok, Sukhothai, and Suphanburi (n=24); the production sites from Cambodia, dating to the Angkorian period, include: Tani, Sar Sei, Thnal Mrech, Bangkong, Khnar Po, Torp Chey, Chong Samrong, Veal Svey, and Cheung Ek (n=877). Several of these kiln sites are closely clustered and have similar compositional fingerprints (e.g., Sar Sei/Thnal Mrech as one group, and Torp Chey/Chong Samrong/Veal Svey as another). Our sample of five stoneware samples from the Suphanburi kilns are of unglazed grey stamped jars.

The excavated shipwreck assemblage included a large number of jars of various, all attributable to the Maenam Noi kiln complex in the Singburi province of central Thailand. While we could not include reference results from the Maenam Noi kilns in Singburi, we suggest that there is a common geochemical profile for Singburi and Suphanburi (75 km to the southwest), reflecting the geographic proximity of these two Thai production centres in the same geochemically undifferentiated (?) alluvial plain.

**Results**

The Cardamom Mountains and Shipwreck data (Table 1)

Analysis of the NAA dataset for the combined Cardamom Mountains burial and shipwreck assemblages shows that it is highly compositionally structured with multiple discrete groups. We identified six earthenware groups (n=31) and four stoneware groups (n=40) including one singleton outlier (Group E; a fine ware celadon, typical of Sisatchanalai/Sawankhalok, central Northern Thailand)(Table 1).

The largest stoneware group (Group A, n=20) is split between burial (n=8) and shipwreck (n=12) samples. The samples in the second largest stoneware group,
(Group D n=11), are from burial sites only, and include several samples previously identified as dark brown glazed “Angkorian” jars.

Four of the six earthenware groups are from burial sites only, and are dominated by cooking pots. None of these have compositional matches or external parallels and therefore are treated here as locally produced in the Cardamom Mountains area. The other two earthenware groups are exclusive to the shipwreck samples and include a range of vessel types. Therefore, the distribution of earthenwares in this sample shows no evidence of maritime trade in earthenwares.

Comparison with all SE Asian production centers (Table 2)
Table 2: In this table we compare the burial and shipwreck stoneware samples with the reference kiln ceramics from Thailand and Cambodia. The data presented are a subset of the data illustrated in Figure 2, focusing on the groups found only in the Cardamom Mountain burials and the shipwreck. Singleton samples have also been excluded.

The table notes the total number of samples for each assemblage (N) followed by percentage membership in each compositional group. The letters following groups 3 and 4 refer to group identifications defined in Table 1 (e.g., 3(A)). The matches in the greyed blocks are suggested to be misleading, see Discussion section. The matches in black boxes indicate matches between assemblages. For example, for Group 3, matches are between the Cardamom and shipwreck jars and a production center in Suphanburi/Singburi; the greyed block for Cheung Ek indicates an apparent, but rejected, connection to the Group 3 burial and shipwreck.

<table>
<thead>
<tr>
<th>Site</th>
<th>N</th>
<th>3 (A)</th>
<th>4 (D)</th>
<th>2.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. Cardamom burials</td>
<td>26</td>
<td>42</td>
<td>42</td>
<td>4</td>
</tr>
<tr>
<td>Koh Sdech Shipwreck</td>
<td>14</td>
<td>93</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Suphanburi</td>
<td>5</td>
<td>100</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Sisatchanalai</td>
<td>16</td>
<td>--</td>
<td>69</td>
<td>19</td>
</tr>
<tr>
<td>Chong Samrong</td>
<td>117</td>
<td>--</td>
<td>98</td>
<td>--</td>
</tr>
<tr>
<td>Torp Chey</td>
<td>53</td>
<td>--</td>
<td>100</td>
<td>--</td>
</tr>
<tr>
<td>Veal Svey</td>
<td>41</td>
<td>--</td>
<td>98</td>
<td>--</td>
</tr>
<tr>
<td>Cheung Ek</td>
<td>145</td>
<td>92</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

Given the size of the region with potential production centres, and the strong likelihood there were many more production centers in operation than we have reference material for, we undertook a further comparative analysis to provide more general provenience information. This combined analysis is useful for allowing a better understanding and differentiation of shared or unique geological settings.
We combined the compositional data from the nine Khmer and two Thai ceramic production complexes (n=799). In this analysis, five general geochemical groups were identified (Table 2) which were most clearly distinguished by systematic variations in Fe (iron) and Sb (antimony)(Fig. 2). Four singletons are discounted due to small sample size (with the exception of two fine ware bowls: Sukhothai underpainted and Sisatchanalai celadon sample). The groups and sites with singleton matches, or with production groups not matched in our burial and shipwreck assemblages, are excluded from Table 2.
Fig. 2: Five compositional groups for stoneware samples identified in the combined NAA dataset (n=839) defined by Fe/Sb concentrations in the Southern Cardamom burial sites, the Koh Sdeach shipwreck assemblage, Thai production centres at Sisatchanalai and Suphanburi, and nine Khmer production centres (Bangkong, Cheung Ek, Chong Samrong, Khnar Po, Tani, Thnal Mrech, Torp Chey and Veal Svey). Note group 2 is composed entirely of whitewares from residual clays in the Kulen hills and is not represented in the burial or shipwreck assemblage. It is also distinct from white wares from Sisatchanalai (group 2.9). The singleton 3.9 is the only example of a fine ware bowl produced at Sukhothai (inset) from the Cardamom burials.
At this scale, these groups represent the broad differences in chemical composition of stoneware clays across the region. In some cases, specific kiln complexes can be identified within specific groups, but more commonly where complexes shared geologically similar settings, multiple kiln complexes are grouped together (as noted above). For example, one group combines kiln samples from Torp Chey, Chong Samrong, Veal Svey, and Sisatchanalai although these can be differentiated at a finer level of analysis.

Evaluation of the shipwreck and burial assemblages within this combined analysis of production centers, shows that all of the burial and shipwreck samples can be assigned to four of five general compositional groups (Groups 1, 3-5; Table 2, Fig 2). (The fifth group [Group 2] is composed entirely of whitewares from the Kulen hills which are absent in the shipwreck and burial assemblages.)

Group 3, which matches with the Suphanburi kiln samples, includes both shipwreck and burial site samples. In addition to the Suphanburi reference samples, Group 3 also includes all the Cheung Ek samples. We discount Cheung Ek as a source for this material for several reasons. First, a more detailed separate analysis of Group 3 shows that Group A samples group separately from Cheung Ek reference material. Second, the Cheung Ek kilns date to the 11th c. CE, centuries before the Cardamom Mountains burials. Lastly, there is no evidence for Cheung Ek jars, or any Khmer jars, in Southeast Asian shipwreck assemblages.

However, the burial sites also match a second source (Group 4) that is not found in the shipwreck assemblage. In addition to samples from the burial sites, Group 4 includes the proxemic Angkorian production centers of Torp Chey/Chong Samrong/Veal Svey (also the latest dated Angkorian production center 14th c
CE). While not direct support for an origin in these specific complexes, it does suggest an origin in a similar geological setting within the region.

We would note that Group 4 also includes samples from the Thai reference group of Sisatchanalai/ Sawankhalok. We suggest that the Cambodian reference groups provide a more likely source region for two main reasons. First, Sisatchanalai jars are not found in the shipwreck assemblages; and second, the burial samples are compositionally closer to the Cambodian reference samples when Group 4 is analyzed separately.

Archaeological perspective

Burial site assemblage: The earthenwares from the burial sites are predominantly cooking pots. Their compositional differentiation into multiple groups is likely to reflect local production groups.

The stoneware samples from the burial sites include matches with both the Suphanburi and the Sisatchanalai reference samples (jars and bowls; Groups 3 and 2.9). A further group of jar samples (n=10), is not represented in the shipwreck assemblage and only broadly/generically matches our Thai reference groups. This group (Group 4) includes the “Angkorian” jars and compositionally is better approximated by the geographically proximate Cambodian centres of Torp Chey/Chong Samrong/Veal Svey.

Shipwreck assemblage: The earthenware groups identified in the shipwreck assemblage only occur in the shipwreck. We do not have sufficient data to posit any origin for these earthenware samples. The shipwreck stoneware sample, including typical Maenam Noi jar types, are strongly dominated by one compositional group (93%), which approximates the Suphanburi grouping, supporting a likely origin in this region (Singburi).

Discussion
The unusually fine chronological resolution of these data, based on an extensive dating program of multiple materials from multiple sites, allows a high degree of certainty about the mid-15th c. single generation use of the Cardamom burial sites (Beavan, et al. 2012a; Beavan, et al. 2015). In addition to this inland assemblage, the shipwreck assemblage is also firmly dated to the mid-15th c. from short lived cargo (Beavan, et al. 2012b). In combination these two assemblages provide an unparalleled window on exchange dynamics between inland and maritime trade.

The shipwreck assemblage is typical of other contemporary local trading vessels within the Gulf of Thailand: with a few exceptions, the cargo is composed of locally produced (mainly Thai) goods, cooking pots, multiple jar types, and fine ware bowls (Brown and Sjostrand 2002). The composition of the stoneware samples from the shipwreck are consistent with production from a single complex, in this case jars that are readily typologically attributed to Maenam Noi, Singburi province. The Cardamom Mountains burial assemblage includes locally produced earthenwares, fine wares and jars from Thailand (Sukkhothai, Singburi, and Sisatchanalai), but also a typologically unmatched stoneware jar type.

This distinctive stoneware jar type has no parallels in the shipwreck assemblage, either in form or composition. However, geochemically it is consistent with stoneware samples from the 14th c. Angkorian kiln complexes (Torp Chey/Chong Samrong/Veal Svey) east of Angkor. As the likelihood that this group reflects heirlooming of old jars is small given the number of jars represented (n=11), we suggest this compositional type was probably produced in a similar geological zone (near Torp Chey?) in the 15th c.. The combination of both maritime and inland trade goods in the Cardamom Mountain burials
supports a scenario where upland groups are providing goods in both directions as part of a larger regional interaction sphere.

This is better documented in Northern Thailand where upland and lowland groups were closely connected through an inland exchange economy in the 13th-16th c.. Lowland urban elites controlled production of stonewares, both emulating exotic types and innovating new ceramic types (Grave 1995). Upland groups, thought be harvesting and exchanging forest goods (Wheatley 1959), consumed both these regionally produced ceramics as well as relatively large volumes of maritime trade wares. Again the combination of local and exotic stoneware ceramics were critical to the operation of Northern Thai inland economic networks.

A further parallel is the similar and distinctive mortuary practices of the Cardamom Mountain and upland northern Thai groups, particularly in relation to stoneware consumption. These comparable patterns of consumption suggest that while historically invisible, groups in the upland and inland regions across mainland Southeast Asia engaged in extensive interaction networks which supported local lowland production centers and their controlling elites (in this case, stoneware production, but likely a wider range of goods).

**Conclusion**

Historians have presented the transition from the premodern to Early Modern period in Southeast Asia primarily through the lens of maritime trade (Reid 1993). Arguably, the greatest impact of this transition is in the production and consumption dynamics of groups in the interior of Southeast Asia, who remained beyond the reach of historical sources. While as yet relatively rare (e.g., Grave 1995), archaeological research on the Early Modern period in inland areas offers the potential to understand the interior dynamics of this transition.
Our data provide insight into an economy that was apparently still functional within and beyond the Greater Angkor region after the collapse of the Khmer Empire. This economy utilized (at least) local stoneware production to articulate with a large regionally integrated economy. We conclude that local lowland elites in Cambodia found ways to engage with the larger regional exchange economies after the political collapse of Angkor Wat. How these inland groups negotiated the transformations of the Early Modern period of the following century is now the challenge and opportunity for future fine-grain, chronologically high resolution studies.

**Acknowledgments**

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Session 4: Ensuring a Sustainable Future for UCH: Museums and Public Engagement

Abstract

Cultural heritage derives its value from societal contexts, and so public engagement plays an important role in growing support for, and interest in heritage. Engagement may take many forms, from awareness-raising to formal learning programmes to creating platforms for public participation in the process of heritage conservation, governance, and/or interpretation. Papers bridging theoretical and practical approaches to engagement with UCH are particularly welcome, as are papers which offer collaborative and/or participatory models, stakeholder engagement, capacity-building and development, approaches to the particular challenges of engagement with underwater cultural heritage vs other kinds of cultural heritage.

Of course heritage exists in a variety of cultural frameworks, and ensuring sustainability requires approaches to engagement to be both responsive and sensitive to the overlapping cultural contexts in which UCH may exist. As a culturally diverse region, the treatment of heritage must be also tailored to cultural definitions, heritage management frameworks and conventions which may, in some cases, differ across jurisdictions/countries and their interests. The panel will also attempt to explore the ways in which UCH is managed within diverse cultural frameworks, and invites papers to examine topics including contested UCH, ownership, security, etc.

The panel invites papers exploring significance within local, national and transnational historiographies and the implications for funding and management of UCH. UCH includes material that has been deposited on the seabed as a result of warfare and catastrophe, so papers which explore and/or engage with topics including loss, warfare, conflicted significance and contested heritage are particularly welcome.

Session Chairs:  
Dr. Michelle Damian  
Mr. Raphael Igombo
Merging Museums with the Classroom: Using Collections to Teach Maritime Archaeology

Michelle M. Damian
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Abstract
Although there is a growing interest in studying maritime archaeology even at the undergraduate level, it can be a challenge to bring to life for non-divers both the mechanics of an archaeological investigation, but also the joy of discovery and satisfaction of identification of a wreck site. This paper will describe possible alternative methods of recreating that entire process through the use of museum collections. In particular, I will discuss a project undertaken by undergraduates at Harvard University in partnership with the Peabody Museum of Archaeology and Ethnology. Students were required to choose a ship model from the museum’s collections and, with very minimal initial information, had to research its historical background and construction techniques, treating it as an archaeologist would a shipwreck site. This paper will introduce the benefits and challenges to both the students and the museums in using this type of approach.

Key words: Collections, Ship models, Museums, Public Engagement

Project Description
While a postdoctoral fellow at the Reischauer Institute of Japanese Studies (Harvard University) in spring of 2016, I was invited to teach an introductory class on maritime archaeology in the anthropology department. Even though the Boston, Massachusetts, area has a rich maritime history, such a class had never previously been taught at Harvard. Since my fellowship was a nonrenewable, single-year appointment, there was no opportunity to develop a sustainable maritime archaeology program there. The class, ANTHRO 1281, was therefore
designed as a stand-alone introduction to the field, with no prerequisites for undergraduates.

My two main goals for this class were to give the students as much hands-on experience as possible to evoke the excitement involved in maritime archaeological fieldwork, and to emphasize the need for archaeologists to disseminate our work to a wide variety of audiences. The challenges to the first goal, however, were that the students were not certified divers and even if they were, Boston in the winter months does not provide ideal diving conditions! We were fortunate to collaborate with NOAA staff members from Stellwagen Bank, who did an ROV demonstration one evening at the campus pool, and with Victor Mastone at the Massachusetts Bureau of Underwater Archaeological Resources, who took us to a shoreline wreck site. There the students were even able to do some preliminary mapping of an 18th century shipwreck.

While these experiences were valuable and students cited them in class evaluations as some of the most exciting aspects of the class, they did not provide the in-depth experience of exploring a single site over a longer period of time. Nor are they necessarily able to be replicated in other areas where there might not be a NOAA ROV to borrow or a convenient shoreline shipwreck site. To provide students with at least a sense of the research aspects of maritime archaeology, as well as to achieve the second class goal of emphasizing multiple means of interpreting the site, I approached the Academic Partnerships department at the Peabody Museum of Archaeology and Ethnology (PMAE). Located on Harvard’s campus, the museum was founded in 1866 and is home to over 1.4 million artifacts. As part of its mission, the museum promotes using the collections for “unique opportunities for innovative teaching, research, and
enrichment at Harvard” and other communities (Peabody Museum of Archaeology and Ethnology). The Academic Partnerships Department is excited to work with instructors and make collections available to students, and that made for a natural collaboration between the ANTHRO 1281 class and the museum.

The PMAE has in its collections over seventy different ship models, many of which were donated to the museum in the late nineteenth and early twentieth centuries. Most of the models represent indigenous watercraft from Asian, Oceaniac, and Native American peoples (Figs. 1 and 2). As many of them came to the Peabody from another Boston-area museum that was destroyed in a fire, documentation is minimal for the vast majority of the models. One typical accession card simply reads “Chinese Boat. Peale’s Museum, ca 1840.” Due to space limitations, very few of the models are displayed in the public galleries.
Fig. 1: Representative ship models from the PMAE collection, No. 32-62-60/D4111. (Damian)

Fig. 2: Representative ship models from the PMAE collection, No. 99-12-60/52934). (Damian)
These models became our “shipwrecks.” In class we discussed the anonymous nature of much of maritime archaeology. Few archaeologists know that they are working on a Vasa, a Mary Rose, or a CSS Hunley when they discover a wreck. Instead, they encounter an often unnamed vessel in a particular geographic region, and must identify diagnostic features and do research to determine the type, time period, and origin of the vessel. Students were charged with treating the models in a similar manner, using them as substitutes for a shipwreck. Where was it from? Who might have sailed on this kind of ship? How can we determine what type of vessel it was? The minimal documentation for these models was therefore not an impediment to the process, as students were required to research and discover the answers themselves.

A second component to the museum partnership was to create an online exhibit for the Peabody Museum (visible here: https://www.peabody.harvard.edu/node/2619). In keeping with the course goal of disseminating information to multiple audiences, students were to not only write an academic term paper about their model, but were required to write several shorter, public-focused introductions to their models that became the heart of the online exhibit. The multicomponent assignment therefore spanned the entire semester.

Students each chose a single model as their focus. They arranged with the Academic Partnerships office to visit the museum and investigate their model, taking photographs and making notes and sketches of diagnostic features. They were not meant to be researching the model maker or the actual model itself, but instead were to treat the model as an archetype, treating it as a shipwreck. The first assignment focused on the historic background of the vessel, and the second on a detailed discussion of the
ship construction features. Research was often a challenge if the only information they had to begin with was “Chinese boat ca 1840.” As secondary scholarship on some of these vessel types was limited, students discovered the importance of incorporating multiple lines of inquiry into their research, including artwork, primary source ethnographic accounts, and even films.

Details of the students’ work can be seen on the online exhibit, but a typical example is of work done on a model titled “War Canoe.” The accession notes included information that the model originated in Sarawak, Borneo (Malaysia), and referenced the Iban tribe. Using a flag included with the model, students were able to date the ship to the late 19th or early 20th century (Gilbert). Records from European explorers described the seafaring members of the Iban tribe as the Sea Dyak, and students relied heavily on those sources to discern who may have used this type of vessel and the context in which it sailed (Kimball). The models therefore served as stand-ins for actual shipwreck sites, as the focus was not on the individual model and its creator, but on the model-as-typical-watercraft.

The museum aspect of the project was divided into three different components. As these were put online for a general audience, students were charged with writing to that public, foregoing a more traditional academic writing style. They needed to consider how to draw their readers in to learn more about their vessels, balancing being informative and exciting. The first two assignments consisted of a photo of their vessel (taken by the student), accompanied by a brief introductory paragraph and followed by a more in-depth analysis (2 – 3 pages) of their findings. The third assignment was to create a museum label for their boat, introducing
the artifact to someone who might be walking past the model in a physical exhibit. Once they had learned as much as they could about their watercraft, they needed to consider what was most important for the casual museum visitor to learn about their boat.

The original intent was to announce each component of the project to the public as it was put online and solicit feedback and suggestions. Particularly since many of the models had such limited documentation, crowdsourcing the research in this way was one strategy that could provide the students with more insight into their vessel. Incorporating the public suggestions and feedback from the instructor and teaching assistants, students needed to complete a final assignment rewriting their publicly-focused entries as a more academic term paper. This was meant to help them again consider those multiple audiences and adjust their communication styles accordingly. Some obstacles hindered that ideal realization of this project, however, as I will address in the next section.

The entire project was designed to emulate the archaeological process: the “discovery,” research, and interpretation of a shipwreck site. It spanned the entire semester, allowing students to expand their research as they considered the different aspects of their vessels. While some students expressed frustration at spending “so much time” on a single ship type in their research, I believe it was an effective introduction to the research process for an archaeological project – particularly when some archaeologists can spend years on a single site.

**Challenges to the Project**
Because this was the first time I had taught this class, and because this was the first time the Peabody Museum had partnered with a faculty member to use student classwork to create an online exhibit, there was an element of trial and error to actualizing the project. None of the following comments are meant as criticisms of the PMAE staff, as everyone involved was extremely enthusiastic about the collaboration, and the Academic Partnerships staff in particular were tremendously accommodating. Here I describe the issues that arose simply to note potential pitfalls for future similar projects.

The first issue was simply that of the actual web coding. As I myself am not a programmer, this became an additional project for the museum’s web developer on top of his other duties. In addition, since he was only in-house certain days of the week, progress at putting the information provided by the students online was sometimes slower than I had hoped. Progress was further hindered by my own failure to clarify how best to provide him the data. For example, for the first two assignments the students needed to submit a stand-alone image of their boat to be used as a cover photo, a short paragraph, and a longer paper. Initially the students embedded their cover photos directly into the Microsoft Word documents containing their paragraphs and longer essays, but that became problematic for the web designer to extract and put online. We decided on a file naming convention for both images and documents, and had the students re-submit their files via Dropbox. Streamlining this process took some time, and thus the public launch of the website was delayed until both the first and second assignments were already online. This, then, affected the ability to promote the website and adequately crowdsource feedback as I had initially hoped.
The second, and perhaps more striking, issue came in the form of copyright considerations. Many of the students found different images in their research that they wanted to incorporate into their analyses, and therefore scanned them and included them in their papers, with proper citations. When it came to putting those images online, however, a question arose regarding copyright of those images, regardless of educational fair use. According to the Academic Partnerships department, “Each image would have had to have been reviewed on a case by case basis, to determine whether their use was “transformative” [which would have been impossible due to the time constraints of the class].” (Rose) The public distribution inherent to internet display was the main concern, as it increased the risk that the copyright holder may have discovered that his/her image was being used without permission. It was decided that it would be safer to remove any images that were not either in the public domain or the students’ own photos or sketches from their papers. This put an additional burden on both the students and the instructors, as everyone needed to re-edit their papers and verify the ability to use any embedded images. Students were understandably upset at needing to delete certain images, since in many cases they referred to those sources in their written analyses and felt that the removal would hinder the ability to effectively convey their argument. We therefore compromised by substituting an “image redacted” icon for the deleted images, which we hoped would indicate to any readers that any missing information was not due to student error.

A final concern came from an individual student. Since the Peabody Museum wanted to be sure that students were getting credit for their work online, and since ideally the project would be receiving feedback directed at individual submissions, we decided to have the names of the students
clearly associated with their web submissions. One student approached me with concern, as she had been the victim of online stalking in the past and did not want her name to be searchable. With her permission, we compromised by including the student’s initials instead of her full name.

Most of these obstacles were due to the fact that this was the first time such a project had been conceived of and carried out at the Peabody Museum. If the museum collaborates in the future with faculty to create a similar exhibit, or when this kind of class is taught at other institutions, those issues have now been identified and can be corrected before the project begins.

**Benefits of the Project**

The stumbling blocks noted above were of small concern when compared with the overall benefits of doing this type of project. The Peabody Museum staff were excited to be a part of this project not only because it conformed to their mission, but it also allowed them to breathe new life into old collections. As noted above, the majority of the models cannot be displayed in the main galleries due to their size. When the Academic Partnerships staff first brought out the models for me to view prior to beginning the project, one exclaimed that even as a long-time staff member, this was the first time she was viewing the models. Allowing the students to research the vessels and create an online exhibit of the models enabled the Peabody Museum to make those long-stored objects accessible to an online audience. In some cases, the students’ findings provided additional information or called into question the museum’s classifications of the vessels. One model, labeled a “Chinese barge,” was actually closer to a junk, concluded two students (Barrett, McGough).
As noted above, this project allowed non-diver students to get a sense of the type of research work and methodologies that archaeologists may have to use when trying to identify an unknown shipwreck. Further than that, however, many of the students found the experience valuable for a number of reasons. Several students elected to write a brief “reflections” post for the website, and other comments were gleaned from class evaluations. In these writings, many students noted the benefits in learning to communicate with various audiences. They often acknowledged that it was difficult at first to convey complex technical information in an accessible manner, but that it became easier with practice (Skendarian, Gerberich).

Several also appreciated that this assignment approached work on an actual site as closely as possible within the limitations of the class. One noted the restrictions in working with a model, since special arrangements had to be made with the collections staff each time she wanted to view the model. She acknowledged, however, that this was probably very similar to limitations an archaeologist would encounter on an actual site: repeated lengthy visits are not always possible (Lu).

Perhaps the most notable response, however, was the pride the students took in actively contributing to the field through this project. Comments included statements such as “knowing that my research for this project will be available online for the public to see makes me feel as if I am truly a maritime archaeologist” (Lu), “I’m really glad I had the opportunity to break new ground and contribute to the academic world of maritime archaeology with the research I conducted over the last few weeks” (Skendarian), and “seeing our work go on an actual museum webpage
was a worthwhile finish” (Metoyer). An anonymous comment from class evaluations further stated, “The museum project was one that allowed such a realistic approach to maritime archaeology and further enabled the ability for some realistic learning approach. It was one of the first times within my life that I've actually made a profound difference within the academic world and for that reason, it was an incredible experience.”

The students’ work is still part of PMAE’s online offerings and at present there are no plans to remove it. The class has therefore made a lasting contribution that will remain accessible to anyone interested in maritime history and ship construction of indigenous crafts from Asia, Oceania, and North America.

**Future Possibilities**

In planning this project, I was of course tremendously fortunate to have a museum such as the PMAE located on the same campus, with an incredible collection of ships’ models and staff who were excited to work with faculty and students. Obviously, this scenario is the exception rather than the norm. That being said, there are possibilities. Local maritime museums are likely to be interested in collaborating, and I have spoken with a faculty member of a Georgia university who intends to undertake a similar project in conjunction with the Ships and the Sea museum. Furthermore, in the Spring of 2018 I will be teaching a version of this class at my current institution, Monmouth College in Illinois (USA) – a very landlocked college with no ship model collection at hand. I intend to test the idea that it should be possible to replicate this type of project with other materials. While models provide a tangible, three-dimensional representation of a vessel especially helpful for understanding elements
of ship construction, photographic or even artistic representations of ships may be able to be used to the same effect. As some of the students noted in their analyses, the models were not always perfect representations of actual construction techniques either. While relying solely on two-dimensional depictions of ships may be even more limiting, in other ways it could widen the scope of discussion considerably. Instead of being confined to the extant items in a collection, the possibilities for research of images is nearly endless. Copyright considerations, of course, would still need to be taken into account.

While putting up an online exhibit is ideal in that it can both reach out to a worldwide audience and endure indefinitely, if programming or online access is an issue a physical exhibit could be mounted with the help of any local gallery space. Particularly if students are working with images, all that would be needed is some wall space for mounting the photographs and labels. At Monmouth College, I hope to make use of the resources afforded by the Museum of Underwater Archaeology (MUA; www.themua.org) to create an online exhibit, as well as appeal to the library for the use of gallery space to mount a physical exhibit on campus.

For an introductory class in maritime archaeology to a group of undergraduates who may or may not have prior experience or a desire to continue in this field of study, this type of project provides a good overview of the process of researching and interpreting a “shipwreck.” The satisfaction of creating an actual exhibit and contributing to the field was for many an exciting way to experience a taste of what maritime archaeology is all about.

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I would like to thank the Academic Partnerships staff of the Peabody Museum of Archaeology and Ethnology, most particularly Diana Loren, Laini Schultz, Emily Rose, and Andrew Smith, for their enthusiasm and help in making this project a reality. The students of ANTHRO 1218, spring 2016, at Harvard University were a pleasure to work with and deserve all the credit for researching and presenting their “shipwrecks.” I am also in debt to Ted Bestor at the Reischauer Institute of Japanese Studies for facilitating my being able to teach the class, Jason Ur at Harvard’s Anthropology department for being willing to let me do so, the teaching assistants for ANTHRO 1218, and the faculty and staff of RIJS for providing me the opportunity to spend an incredible year there.

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Antiquities Homecoming: An Experience of Rescue Team of Cultural Relics

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Abstract

Through five thousand years of Chinese culture, there are as many ancient cultural relics as there are stars in the night sky. Much like stars, these artefacts are scattered all over the world. For this reason, we established a small antiquity public welfare organization. In this article, we will introduce some details around working in this department and explore our user experience. Some of these activities include: looking for ancient cultural relics, finding ancient cultural relics, identifying ancient cultural relics, and contacting a descendant of ancient cultural relics, and negotiating with the sellers; with the ultimate goal of sending the antiquities back to their home. We felt the sacred sense of mission by bringing antiquities home. We also began to realize the public welfare and the value of the historical relics are common to people all over the world.

At present, the problem of the antiquities coming home is emerging in the various rescue operations once again. In particular, as the nation becomes generally wealthier, there is an increase in the number of transactions to acquire ancient cultural relics to obtain profits. In addition, historically, overseas organizations and foreign funding agencies have been acquiring Chinese ancient cultural relics strategically. Because of this, bringing the ancient cultural relics back to their hometown or museum, or returning them to their descendants has become even more difficult. Therefore, our team has decided to create and manage the ancient cultural relic’s rescue and homecoming project. Through which, we will advocate that the ancient cultural relic’s protection and public
welfare for ancient cultural relics is paramount. We will do our best to return these ancient cultural relics back to their hometown, and let the ancient cultural relics engage and influence the public.

**Key words:** Cultural relics, homecoming, descendant, collections, cultural and creative industry

**The experience of Germany how they dispose "gray antiquities"**

1.1 Chippindall Law

British archaeologist Christopher Chippindall and Dawid Geere began an unprecedented investigation in 2000, using 7 international collections of cultural relics in the collection system to verify the reliability of their source. Officials have the collection directory with those cultural relics, which clearly record every piece of the source.

However, of the 1396 items catalogued, up to 75% of these cultural relics lack the source of written documents. They also found that there were more than 500 pieces of relics lack any historical transaction record and has been proved that no one knows why this group of cultural relics made its debut on display in the museum. That means these exhibits illegally possess potentially tomb-raided stolen goods. They have a startling discovery after compared with the same marked when the exhibits on display in different provenance. Generally, those first exhibited marked "unknown sources" cultural relics appeared again with a clear source tag, suggesting that these cultural relics may be a fake story. Their research result is called Chippindall Law.

1.2 Museum admitted "gray cultural relics"

There is a hidden rule which allows cultural relics with no transparent background in the marker. A clear experience relic which we call white
cultural relic not only can check all previous possessors and where it came out of that therefore it should be legal. On the other hand, an unclear experienced cultural relic which we call black cultural relic usually came out of the grave or was stolen out of the museum or from private collectors. Actually, most traded relics in the market are gray cultural relics which we do not know where they came out but still could pull wool over some possessors’ eyes. However, archaeologists deem that gray cultural relics are equal to the black cultural relics. In the early 1960s, the British museum with a rich collection of relic objects bought from the market. In 1970, UNESCO issued a convention against cultural products illegally traded, but Germany didn't become signatories until 2007. Although Germany signed, but there were still many excuses to reject the convention, and not to return those illegal cultural relics. Germany started to implement a legislative correction as to ensure the innocence of its collections. It stipulated that acquisitions in the museum should be white relics. Baden state museum curator Eckart Cohen said "museum curator's affection and greed of collection tend to cause them to become accessories of illegal trade.” he said "It is not innocent cultural relics derived from an anonymous Swiss collector".

2 Antiquities Homecoming

People always marvel at the beauty of an ancient cultural relic when they see it. However, does everyone know where it comes from or who its owner is? Is this a clear origin of cultural relics? As we know the cases in Germany and UK. There are many cultural relics with unclear origins. So, a program came out .This is a program to return relics that belonged to certain families or estates. And there is an overwhelming feeling by the members of our organization that this is the right and just thing to do. We plan to return objects, may they be relics to certain descendants or
surviving families or organizations who manage familial assets we trust. There are many reasons as to why relic objects may be in disarray or disregarded. Our goal as a group is to preserve the legacy and spirit of the relic objects. In doing so, we have to secure adequate funding to purchase relic objects in existing markets that to offer prices to said objects. We plan to setup a process by which we will discern the appropriate prices and appraised value that we deem fair for purchase. We will employ a mechanism that is equitable for all parties involved. We will standard governing practices to regulate the process to ensure
stability. An issue that will be addressed in the future is the question of funding. We will establish a funding process for this project.

![Funding Process Flowchart](image)

*Fig. 1: Funding Process Flowchart.*
3 Antiquities homecoming evaluation criteria

There are three indispensable standards for relic objects if they could be sent back home. The first step is to ensure the antiquity has a clear and certain name. Or it has been recorded from other historical documents. Second, it could be traced to a certain dynasty. The last one is to make sure that we could find its surviving generations of the cultural relics, family ancestral hall, museum etc. According to former experiences certain relic objects such as famous calligraphy, paintings, manuscripts, imperial mandate etc. could be easily up to the three standards.

After members of the project found unmistakable name on the relic object and could know its dynasty and background, and antiquary work, they may start searching whether there are descendants of the owner of cultural relic have the intention to collect the family relic from their predecessor. It could be returned to surviving consanguinity of the owners, family ancestral hall, local museums and other related parties. Project team members note the cultural relics "without surviving families" if the descendants could not be found. Then the project team members would start the next steps to find whether there are relevant museums, temples on behalf of the ancestral temple and local administration of cultural heritage that can collect it.

4 The circulation channels of cultural relic objects

General, people purchase cultural relics and works of art mainly as private collections, investment of innovation company, decorations and so on. It is important to purchase cultural relics from formal circulation channels for antiquarians. There are three circulation channels to transaction relic objects beyond the seas:
• Auction companies: The auction companies are considered as the secondary transaction market. It focuses on the arts trade, as they have sensitive professional marketing orientation, and pay more attention on the objects with high benefit in a short-term.

• Galleries: In the art market galleries are deemed as the primary market. The agents would sign contracts with artists strictly, and they have responsibility to the find, nurture and promote potential artists and their works. One risk of investment of arts in the galleries is the difficulty in evaluating the appreciation due to the agents would promote on its own preferences rather than market orientation.

• Private procurement: The term of "private procurement" is relative to the "auction companies". Though it is often misunderstood as lack of professional evaluation, slight influence on art market and low exchange price, so far, top six paintings with astronomical price were unveiled from this channel for the low risks, fewer bidders, efficiency and privacy of transaction, personalized customer services have made it a big draw of investors.

Transaction of arts and paintings in western countries compare that in China mainland, the program members could search relic objects in channels below.

Fig. 2: Top six paintings with astronomical price.
Network: In the information age, the Internet takes over a large part of one's daily life so that cultural relics can be obtained from the Internet, as well as the historical background of cultural relics which help us understanding. It also became convenient sources of obtaining information of the relic objects. The following chat integrated the Internet purchasing channel for the project members to search.

**Fig. 3: Antique markets in the Internet.**
• Commercial market operations for cultural relics: This is for people who prefer to play with, understand the cultural relics in the antiquities market. Here are some famous commercial markets for cultural relics.

![Diagram of cultural relics markets in China](image)

**Fig. 4: Cultural relics market in China.**

• Enthusiastic people informed the members: it is distinct between private contact and warm-hearted people contact report that mainly depend on the interpersonal connections of the team, like the posterity, ancestral hall, temple museum which the team service before. They will tell the project team members they inadvertently discovered the ancient cultural relics in the market, let us work together. In general, the project team members will be released out of the most important introduction of "mysterious ancient cultural relics" through the interpersonal relationships of museums, the community or union of institutions of higher learning like the ancient cultural relics and director of the famous temple ancestral temple. There are numerous propaganda ways to improve the enthusiasm of the alliance like through the network to seek the aid of enthusiasts, clubs or organizations, or through the "human flesh search" and "price set".
Occasionally the team holds the club, in the form of a salon, lectures to promote communication relationship between members.

5 A homecoming case of Guo Rong’s handwritten manuscript

Team members in late 2016 found a handwritten manuscript written by Guo Rong who could be dated back to Qing dynasty, named “Confucius in Hsiang-tang”, listing on the internet priced at 1500 Yuan by a relic collector from Hebei province.

According to the historical recordation manifests that his family members were very famous and many of his relatives were Jinshi (official position in ancient China), and he was a Juren (official position) at that time in Henan province. Lest the scenario of other buyers and speculators from outside purchase this handwritten manuscript once the news of rescue and valve of this relic object has been filtered out occurred. After the agreement of buying this relic first by all the members, rescue plan of this handwritten manuscript initiated. By using all sorts of medium to contact Guo Rong’s descendants with a hope of getting this relic back to where it used to belong, members found an article on the Internet about the big honorable family and its members; released on the newspaper by Mr. Lu Meisong a former director of Research Institute of Culture and History in Fuzhou City. Through whom members found Guo rong’s great-grandson Mr. Guo Zhen, then immediately informed Mr. Guo Zhen of his great-father’s relic object and asked whether they have the intention to purchase the cultural relics, Mr. Guo Zhen first told members: “because it’s hard to know the authenticity of this undeclared cultural relic, together with many of his family cultural relics have been removed to Lin Zexu Memorial Museum, so there was no willingness to purchase it as a private collection... "then
members tried to contact other parties of the family collections of intent, please refer to the contact members shown in the chart below.

Table 1: Willingness to retrieve Guo Rong’s relic

<table>
<thead>
<tr>
<th>Name</th>
<th>Identity</th>
<th>Willingness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guo Zhen</td>
<td>great-grandson of Guo Rong</td>
<td>NO</td>
</tr>
<tr>
<td>Guo Yongmei</td>
<td>Guo Baiyin’s descendant</td>
<td>NO</td>
</tr>
<tr>
<td>Sina Blogger of &quot;Guo’s descendants&quot;</td>
<td>Guo Baiyin’s descendant</td>
<td>NO</td>
</tr>
<tr>
<td>Lu Meisong</td>
<td>former curator of Research Institute of Culture and History in Fuzhou city</td>
<td>NO</td>
</tr>
<tr>
<td>Chen Jiyong</td>
<td>Lin Zexu’s memorial museum</td>
<td>NO</td>
</tr>
</tbody>
</table>

6 Why relic objects may be in disarray or disregarded

There is an interesting phenomenon in cultural relics market that people would buy other people's cultural relics in the commercial market rather than collect the relics of their fathers. And descendants may sell or destroy the inherited collections of cultural relics for various reasons leading to the
cultural relics ending up with vicious circle of disappear or disregarded. The ultimate purpose of establishing homecoming project by the members is to resolve the scenario of never-ending speculation by contacting the museum that could collect and display the relics, other public sectors, and conservation of cultural studies, ancestral hall and surviving generations. Project team members would try their best to preserve the legacy and spirit of the cultural relics.

From what have been discussed about the Guo Rong’s case, it could now be speculated that the descendants may or may take the excuse of lacking the financial ability to afford the price. And to some extend this is also attributed to lacking a sense of recall of their old generations due to the functions of modern core families are not tightly connected as it was in hundreds years ago. At that time ancestors were highly respected and earned widely worships by their descendants. Another reason may the owner was a traitor in history, the family members might break off all relations with owner in order to evade from the punishments or outside criticism about this family. So if the descendants receive the relic object belonged to a traitor predecessor, they will bear pretty much stress form the public. The third reason may lay in the distrust the appraisal of cultural relics, as in this profit-driven society, everything could be faked let alone these cultural relics with sophisticated procedure of appraisal its value, all sorts of suspicious attitudes reflect today’s descendants pay more attention to its physical valve rather than its old glories and the meaning of educating and reminding their roots.

7 The indispensable explanation of using the fund-raising as the management costs of the non-profit organizations
All the governments in the world are making great efforts to encourage more public-interest activities and services, and also put their endeavor to develop the explicit rules and stipulations to make the charitable work more efficient and use their funds more smartly to against corruption. Taking the comparison of the two laws for example, the newly launched Charity Law of the people’s republic of China in May, 2016 (http://www.gov.cn/zhengce/2016-03/19/content_5055467.htm) and the regulations of charitable organizations initiated in Taiwan province May, 2006 (http://law.moj.gov.tw/Eng/LawClass/LawAll.aspx?PCODE=D0050138) about utilizing fund-raising in managing the charitable organizations and pay the labor costs through charitable activities and other necessary expenditures. Please look at the chart below.

Table 2: Comparison of purpose and amount of charitable assets utilization in China mainland and Taiwan (province)

<table>
<thead>
<tr>
<th>The charity Law of the People’s Republic of China</th>
<th>Charity Donations Destined For Social Welfare Funds Implementation Regulations(Taiwan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 6 Charitable Assets Article 51. The financial assets of charitable organizations include: (1) Founding capital from fund-raising; (2) Assets collected from fund-raising; (3) Other legal assets. … Article 60. Charitable organizations shall carry out charitable activities actively, use charitable assets fully</td>
<td>Article 5 Fund raising groups as referred to by these regulations are described as below: (a) Public schools. (b) Incorporated Administration. (c) Corporation who has Social welfare character. (d) Corporate bodies. Based on considerations for social welfare, all agencies/levels of</td>
</tr>
</tbody>
</table>
and efficiently, apply the most necessary principles regarding management fees, practice frugality, and cut unnecessary expenditures. Annual expenditures for charity activities by foundations with the qualifications for public fund-raising shall be no less than 70% of the average revenue of the past three years and the annual management fees cannot meet the previous regulations due to special circumstances, the foundation shall file with which it registered and explain the situation publicly.

Standards for annual expenditures and the management fees of charitable activities by charitable organizations other than foundations with public fund-raising qualifications are regulated by the civil affairs departments of the State Council together with the treasury and tax departments of the State Council according to the principles stipulated in the last paragraph.

If the expenditure and management costs of an individual charitable donation activity are specified in the donation agreement, then the agreement should be followed.

government shall be permitted to accept financial funds and gifts donations, bestowed by concerned person[s]; however, such donations are not permitted to be initiated by such governmental agencies. Exempted from this ruling, are incidents of major disaster [force majeure] and international rescue missions. …

Article 8 All financial funds and gifts collected through donations, can and must be used only for the purposes as listed below:
(a) For Social Welfare Activities.
(b) For educational & cultural affairs.
(c) For social charity affairs.
(d) For international humanity rescue affairs.
(e) Other relevant affairs recognized by central governmental agencies.

…

Article 11 If relevant documentations provided, for the application of governmental permission for charity donations, contents therein were to be found to be
falsified, then previously granted permission is to be annulled immediately.

Article 17  All necessary administrative fees/charges occurred during the conducting of charity donations activities, shall following the tabulation limits as described below:

(a) Total solicited donation amount under NT$10,000,000.00: Basic toll of NT$8,700,000.00 + 1% of remaining amount over 1 billion NTdollars.
(b) Total solicited donation amount between NT$10,000,000.00 and NT$100,000,000.00: Basic toll of NT$1,500,000.00 + 8% of remaining amount over 10 million NTdollars.
(c) Total solicited donation amount over NT$100,000,000.00: 15%.

If solicited charity donations are physical items [instead of cash funds], then relevant tabulation should be based on the "then" current market prices of the items concerned.
We will standard governing practices to regulate the process to ensure stability. An issue that will be addressed in the future is the question of funding. We will establish a funding process for this project. Introducing the club membership system might be a suitable way of adjusting to this circumstance mentioned above in its future development: one has to register a membership of the relic home returning organization and then provide the historical information of their predecessors. Doing by this at least shows their willingness to buy their own relics. All the information provided will be recorded in our file system. Members have the priority when we scrutinizing thousands of relics in this huge relics market and then match to their owners. When undergo the scrutiny in the selecting procession a series of reduplicative and automatic works in matching and confirming relics and their owners and time waiting for their willingness of buying their dispersed relics can be saved by this targeted combing progress.

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Beijing newspaper,
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Forgotten Past? Alternative Forms for Museological Approach to interpret Egypt's Maritime Heritage

Nevine Nizar Zakaria

Abstract

In the past decades, Ministry of Antiquities (MA) has invested many efforts in excavating underwater archeological sites, and mapping them to reveal the navigation routes during ancient times. Remarkable discoveries have been made by the European Institute of Underwater Archeology (IEASM) as well as others archeological projects on Egypt's coasts. Despite this wealth of Egypt's maritime history and intellectual resources, it lacks a Maritime Museum till present or even an exhibition gallery dedicated to elucidate maritime' legacies to the local community. It also lacks a special legal placement for Maritime cultural heritage with scientific management principles oriented towards interconnects the society, local governing authorities and museums professionals with cultural purposes to promote and preserve Maritime History of Egypt. Maximizing awareness is the key element to preserve and publish the Maritime Heritage. So, How to make it accessible to the public? How to foster this richness past in the minds of young generations? This paper presents approachable alternative forms to ensure effective engagement with the public and develop new strategies for sustainable future of Egypt's UCH.

Key words: Egypt, UCH, public engagement

Introduction

Maritime history of Egypt dates back to thousands of years where Egypt was at the center of the global commerce and at the axis of trade routes linking Asia, Europe, and Africa. It's blessed with a rich maritime history and diversity of underwater archeology holds the memories of our nation's past and the legacy of Egypt's history that still preserved beneath the sea.

Hence, this paper is rooted in several interconnected purposes and concerns contribute to developing understanding of maritime Egypt which is crucial for preserving and promoting the tangible and intangible of
maritime cultural of Egypt as living heritage. The central aim of this paper is to propose new alternative approaches to go beyond to raise interest among the public with maritime cultural, and foster the involvement of local community in an awareness-raising process lead to major endearment towards shaping the national identity of Egypt maritime.

The framework is consisting of three main sections 1) elucidate the historical value and cultural significance of Egypt maritime; 2) define how maritime cultural interpreted in the Egyptian antiquities museums; 3) setting up new effective solutions for imparting knowledge and information of Egypt's maritime and encourage interaction and engagement among the public.

1) The Cultural Setting

The cultural setting of maritime Egypt is commitment to two main factors; a) maritime material cultural that's derived from the human interaction with the seas, Nile river, lakes, etc (which is known today as maritime archeology); b) underwater archeology that is relate to the archeological sites submerged beneath the water in old times (Bass, 2013), taken into consideration that most of Egypt' underwater archeological sites of the Mediterranean Sea were originally maritime sites (served as trading ports) before disappearance in the waters due to seismic factors and geological subsidence (Stanley, et al., 2007).

A) Cultural significance of Maritime Egypt

‘When the Nile covers the land, only the towns are visible above the water, and they look like nothing so much as the Aegean islands. The rest of Egypt becomes open sea, with only the towns rising up out of it’. (Herodotus II.97).

On the geography of the country, the Greek historian Herodotus (c. 484-425 BC) called Egypt ‘the gift of the Nile’ (Herodotus, 1998). Egypt's
landscape is determined by the presence of the Nile River, the largest river in the world, stretching from Africa to the Mediterranean Sea, and unquestionably most important element for the geography of both ancient and modern Egypt (Rice, 2003, Shaw and Nicholson, 1995).

In addition to the riverine environment of Egypt, it has a special geographical location overlooking the Mediterranean Sea by the north and Red Sea by the east. With this unique nature, Egypt is considered in its role as seafaring nation influencing and interaction with others through well-established shipbuilding technology that permitted the Egyptians to sail round-trip journeys as early as ancient times. (Ward, 2012).

The wealth of maritime Egypt materials (textual, iconographic, and archeological) comes from the ancient Egyptian cultural, which is called 'Pharaonic Egypt' [ Fig. 1] with many historical and archeological evidence provide significance data on the ancient Egyptian maritime activities and tasks; diversity of ships and boats representations, seafaring, sea power and naval forces operations, nautical expeditions, shipbuilding technology, models of boats left in tombs, full-size boats buried in the ground, mariners with their nautical titles, nautical themes within religious practices and much more meaningful resources reveals to what extent and variety the maritime influences on all levels of the ancient Egyptian civilization and penetrated in every aspect of its culture.
<table>
<thead>
<tr>
<th>Period</th>
<th>Dynasty</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paleolithic Era</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neolithic Era</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Predynastic Period</td>
<td>Maadi Culture</td>
<td>C.4000–3106 BC</td>
</tr>
<tr>
<td></td>
<td>Naqada I Culture</td>
<td>C.4000–3600 BC</td>
</tr>
<tr>
<td></td>
<td>Naqada II Culture</td>
<td>C.3500–3150 BC</td>
</tr>
<tr>
<td></td>
<td>Naqada III Culture</td>
<td>C.3150–3000 BC</td>
</tr>
<tr>
<td>Early Dynastic Period *</td>
<td>Dynasties 1-2</td>
<td>C.3000-2584 BC</td>
</tr>
<tr>
<td>Old Kingdom *</td>
<td>Dynasties 3-6</td>
<td>C.2584-2147 BC</td>
</tr>
<tr>
<td>First Intermediate Period</td>
<td>Dynasties 7-10</td>
<td>C.2117-2166 BC</td>
</tr>
<tr>
<td>Middle Kingdom</td>
<td>Dynasties 11-12</td>
<td>C.2161-1781 BC</td>
</tr>
<tr>
<td>Second Intermediate Period</td>
<td>Dynasties 13-17 (including Hyksos Period: dynasties 15-17)</td>
<td>C.1781-1549 BC</td>
</tr>
<tr>
<td>New Kingdom *</td>
<td>Dynasties 18-20</td>
<td>C.1549-1069 BC</td>
</tr>
<tr>
<td>Third Intermediate Period</td>
<td>Dynasties 21-25</td>
<td>1069-664 BC</td>
</tr>
<tr>
<td>Late Period *</td>
<td>Dynasties 26-31</td>
<td>664-332 BC</td>
</tr>
<tr>
<td>Graeco-Roman Period</td>
<td>Macedonian Period</td>
<td>332-304 BC</td>
</tr>
<tr>
<td></td>
<td>Ptolemaic Period * (the Great)</td>
<td>304-30 BC</td>
</tr>
<tr>
<td></td>
<td>Roman Period *</td>
<td>30-640 AD</td>
</tr>
<tr>
<td>Islamic Period *</td>
<td>Till Ottoman Period</td>
<td>640-1905</td>
</tr>
<tr>
<td>Modern Era</td>
<td>Khedival Period</td>
<td>1805-1919</td>
</tr>
<tr>
<td></td>
<td>Monarchy</td>
<td>1919-1953</td>
</tr>
<tr>
<td></td>
<td>Republic</td>
<td>1953-till present</td>
</tr>
</tbody>
</table>

Fig. 1: Chronological Periods of Egypt. An asterisk (*) used to refers the periods mentioned in text.

This has been formulated with references to:

The Petri Museum’s Digital Egypt for Universities: [http://www.ucl.ac.uk/museums-static/digitalegypt/chronology/index.html](http://www.ucl.ac.uk/museums-static/digitalegypt/chronology/index.html) accessed on 10th of July 2017
It is worth mentioning that Egypt maritime had direct impact on the formation of the Egyptian state in Pharaonic times, as the earliest kings used maritime forces not only to facilitate communication and trade within Egypt and its neighbors, but also to conquer their enemies, threaten their rivals, and to consolidate their power (Gilbert, 2008).

Egypt's shipbuilding technology was well-developed by late Naqadah II period (Vinson, 2009) indicate considerable navigation linked Egypt with Asia to the east and Sudan to the south. Great innovation in nautical technology was promoted by Predynastic period, in which Egyptian kings sent mining expeditions involving maritime forces along the Nile and cross the Red Sea to the south of Sinai (Gilbert, 2008). [Fig. 2]

**Fig. 2:** Major trade routes used by Egyptian seafarers for mining and trade missions cross the Nile and the Red Sea’s coastline during the Early Dynastic and Old Kingdom periods. (Gilbert, 2008)

The seafaring activities is documented since old Kingdom and continued throughout ancient Egyptian History referring to maritime Egypt contact with the Late Bronze Age civilizations of the Eastern Mediterranean and
Aegean (Vinson, 2009). The Egyptians seafarers used both the Red and the Mediterranean seas for military expeditions to protect Sea Power ashore, as well as tribute and trade expeditions to obtain valuable products (Gilbert, 2008). [Fig. 2]

Broad seagoing ships are seen in Queen Hatshepsut's expedition to Punt (probably the Horn of Africa) [Fig 3] provides clear evidence of seagoing ships arriving at Punt through the Red Sea. (Ward, 2012, Vinson, 1994, Landström, 1970).

![Fig. 3: Queen Hatshepsut's expedition to Punt commemorated in reliefs on her Funerary temple at Deir el Bahri, it is portray eight seagoing ships arriving at Punt loading with products. (Vinson, 1994)](image)

Close relationship between both Egyptian and Greek Civilizations initiated in the Saite period through maritime trade cross the Mediterranean Sea admitted Greek and Phoenician traders into Egypt (Goddio. and Masson-Berghoff, 2016) up to the trading point of Naukratis at the east Delta. (Vinson, 2009) [Fig. 4]. After Alexander death 332 BC, the New city of Alexandria turned into one of the most important commercial port and

![Map of Egypt and the Eastern Mediterranean](image)

**Fig. 4: Map of Egypt and the Eastern Mediterranean illustrate the Greek cities and islands involved in the foundation of Naukratis according to Herodotus. (Goddio and Masson-Berghoff, 2016)**

The eastern trade was facilitated by the construction of a canal linking the Nile to the Red Sea. Subsequently, an open-water trade route between Egypt and India has been established by the Roman period "the Red Sea-Indian Ocean route" turning Egypt into nexus of a far-flung international maritime system that tied the Mediterranean to distant ports in East Africa, Arabia, and India (Vinson, 2009, Meyer, 1992).

(A) **Underwater Heritage**

Beyond the evidence offered by the representations and epigraphy of ancient Egypt maritime, enormous numbers of archaeological remains
submerged beneath the waters of the Mediterranean Sea and Red Sea, contribute information on new archeological sites with all its harbours, temples and towns that still preserved under the sea. In addition to large number of shipwrecks that's still lie on the seabed of both Mediterranean Sea and Red Seas.

Hence, Egypt's Underwater cultural Heritage (UCH) have been stepped in the beginning of the twentieth century with individual amateur efforts reflect the growing interest in Egypt's underwater archeology especially in Alexandria (Khalil and Moustafa 2002). In late 1996, the foundation of the Department for Underwater Antiquities (DUA) supervised by Ministry of Antiquities (MoA) to survey and carry out topographical study for the submerged landscape in collaboration with international institutions (Abd-el-Maguid, 2012). This has been resulted in the discovery of many new underwater archeological sites in the Mediterranean Sea, the Red Sea, the Nile, and Lake Qarun, spans the history of different periods including the Pharaonic, Hellenistic, Roman, Byzantine and Islamic periods (Abd-el-Maguid, 2012, Khalil and Moustafa 2002).

Major efforts are promoted by the Institut European d’Archeologie Sous-Marine (IEASM) in co-operation with MoA to allocate, identify and excavate the major ancient sites that vanished into the Mediterranean, specifically in the Eastern Harbours of Alexandria. It led to the rediscovery of two ancient sunken cities; Thonis-Heracleion and Canopus. (Goddio and Masson-Berghoff, 2016). Excavations uncovered monumental building, heads of Pharaohs, sphinxes, basins, columns, stelae, sizable assemblage of pottery and coins, and other significant colossal artifacts (Goddio and Masson-Berghoff, 2016, Goddio, 2007).
Archeological remains submerged in Red Sea indicate the wealth of UCH of the Red Sea with considerable efforts invested by the Institute of Nautical Archaeology (INA-Egypt) and In Situ Institute working alongside with DUA to revealing and surveying Red Sea underwater heritage (Abdel-Maguid, 2012).

2) Define and assess the presentation of maritime materials in the Egyptian Antiquities Museums

This approach is largely depends on How maritime Egypt exists within the narrative structure and communication styles of the Egyptian Antiquities museums? And how the social interaction formulation exists both within and beyond the museums walls? In fact, the answers to these questions have direct impact on the content, context and consequences of interpreting maritime heritage of Egypt.

Accordingly, we need first to examine the current museums setup that provides any context relate to maritime aspects of Egypt and obtain baseline information upon which we could define the missing aspects, subsequently generate creative solutions to messages communication and interpretation for the maritime heritage of Egypt.

Egypt has different types of museums, ranging in size and activity from main national museums to small provincial museums. They vary too in their purpose, their collections, the ways of display, and the public they seek to serve.

According to the programme set by the Ministry of Cultural and the Supreme Council of Antiquities (later MoA) in 2005, the Egyptian museums subdivided into five main categories; (1) Regional civilization museums (2) Site museums (3) Specialized museums (4) Graeco-roman, Coptic and Islamic museums (5) Main national museums (Hawass, 2005).
However, this classification did not support the national identity of the Egyptian heritage.

Doyon classify the full range of Egyptian museums by subject-type using the five basic distinction of archeology (from prehistoric to Islamic), history, art, ethnography, and natural history (Doyon, 2008). Compared with the classification and types of museums that are seen nowadays around the world, there is a specific type for maritime history and nautical activities specialized in displaying ships, navies, military use of the sea and all that is related to any human activity at the sea. (Bass, 2013, Neill and Krohn, 1991).

In this view, and despite the wealth of Egypt’s maritime history and the massively intellectual resources, it lacks that type of maritime museum or even a comprehensive gallery disseminates the cultural identity of Egypt maritime and its legacies to the local community with well-constructed interpretive model.

Although that a wide range of archeological objects of ships, boats, and other related materials can be seen broadly in many galleries at the Egyptian museums, but the composition of the archeological displays does not elucidate the maritime heritage of Egypt at any level or reflect the historical and geographical significance of the Egyptian civilization that rely heavily on the development of the maritime and the utilization of the sea power (see Gilbert, 2008).

In researching the presentation of permanent displays for boats and ships among the Egyptian museums, two main museums become evident. One is Solar Boat Museum (Cheops) at Giza that displaying full-size vessel from ancient Egypt used for religious purposes. The other is that the local regional museum of Suez; the Suez National Museum which tells the
history of Suez Canal at ancient times, and displaying a round 1500 archeological artifacts span the full order of Egyptian history from prehistoric period till modern times with themes highlight on the Suez as an important port and navigational link at ancient Egypt, in addition to remarkable collection for boats accompanied with maps and illustrations.

Both museums are classified as Archeological museums (Doyon), and the thematic archeological exhibits are avoiding constructing narrative that would inform the public about the existence of distinctive maritime cultural in Egypt, moreover they have yet to produce any educational programmes communicate the maritime pasts to the public.

Hence, it should be mentioning that, there is a series of exquisite touring exhibitions for Egypt's sunken treasures occurred throughout the last decade till present on loans to different destinations; France, United Kingdom, Spain, Italy, Switzerland, United states of America, Japan, presenting objects of underwater excavations of IESAM in collaboration with MoA (Goddio and Masson-Berghoff. 2016, Goddio and Clauss 2004). A variety of remarkable collections ranging between 250-500 underwater objects on displays in diverse venues all over the world attracting millions of visitors with focused scope on the lost world of the pharaohs beneath the sea and the relevant aspects of maritime Egypt.

A good example is the Sunken Cities Exhibition at the British Museum in 2016. The Exhibition's narrative aimed to explain the encounter between ancient Egypt and Greek with understanding of the deep and meaningful interconnection between both Greek and Egyptian Communities through many themes highlighting on the cultural integration between Egypt and Greek world through the Sea, religion aspects interaction, trade and exchange cross the open water of Mediterranean Sea, Thonis- Heraclean
and Naukratis as international ports, long history entanglement between Egypt and Rome, Navigation of Osiris boats (Goddio and Masson-Berghoff. 2016). The narrative is conveyed through a variety of explanation materials help communicate the information to the audience.

In comparison with the local underwater venues of Egypt, there are number of permanent exhibitions in Alexandria’ museums dedicated to display the recent excavations of underwater archeology, but without constructive narrative for neither Egypt maritime, nor intended messages rendering cultural/historical interpretation for the displayed objects.

The concept is focusing only on presenting the recovered objects from the Eastern Harbour of Alexandria and Aboukir Bay and put them on display with textual description (artifacts labels) in different venues; the renovated Alexandria National Museum gallery presenting underwater artifacts, thematic section at the Bibliotheca Alexandrina Antiquities Museum demonstrate the submerged Antiquities, and part of the open –air landscape of the Roman Theater at Kom Al-Dikka display a number of underwater sculptures.

Noticeably, the absence of maritime identity in the exhibitions context is related to the narrative content which avoiding the maritime scope and subsequently affect all levels of presented information and related public programmes. The main intention is to display the archeological materials of maritime form archeological point of view without considering any conjunction with the distinctive cultural of maritime Egypt.

In general, the original formulation and fundamental structure of the display at all the Egyptian Antiquities museums derives from Egyptological and archeological prospective (Doyon, 2008). The methods of presentation the archeological collections rely on the repetition of
certain themes within the multiple periods of the ancient Egyptian history following the chronological order.

Within a larger framework of presentation maritime materials, there is an ambitious plan to establish Underwater Museum in Alexandria's bay supported by the Egyptian authorities and UNESCO to preserve and exhibit the underwater heritage of Alexandria in situ (Abd-el-Maguid, 2012).

3) Proposing innovative ways for interpreting maritime Egypt

Maximizing awareness is the key element to preserve and publish the maritime heritage of Egypt and foster this richness past in the minds of young generations. Thus, this section aims to present approachable alternative forms to ensure effective engagement with the public and develop new strategies for sustainable future for Egypt's maritime and UCH through the following:

- **Formulating an illustrative and modern shape web-site for maritime**

It is now an uncontested fact that technology is pervasive throughout our lives; technology has become an integral part of the way that we communicate with each another and has increasingly taken the place of face-to-face communication (Kotler et al., 2008). We need to use these modern technologies advancement to communicate that level of engagement with the public and lead them gradually to embrace their maritime cultural heritage virtually.

This approach will provide comprehensive information and broader and more cohesive picture on the overall maritime heritage of Egypt; subsequently will open up new opportunities for public to learn about varied aspects of maritime and UCH in an engaging way. In fact, it will fill
the gap for the absence of maritime museum in Egypt and will serve as a powerful engine for regeneration both tangible and intangible maritime heritage of Egypt.

Keeping up with what the global museums offers nowadays for their users, and by adopting the current use of technologies and digital media particularly the revolutionary use of both AR and VR application and 3D modeling technology (Gutiérrez et al. 2016), this trend can take many forms; from building a virtual maritime museum with interactive stories arranged in chorological order (INDICAT, 2012), to diversity of meaningful visual narratives reveal the maritime legacies and the submerged heritage underwater arranged thematically, or virtual field trips to maritime cultural landscape and long coastlines of Egypt, or diving virtually into the depths of seas and encounter the treasures of the sunken cities, or using the visualization technology to reconstruct the UCH and maritime sites and get glimpse of lifestyles of the people in the past.

In this concern, it should referring to the remarkable efforts of IEASM in create reconstruction for the discovered underwater cities Thonis-Heracleion and Canopus, also the international harbour town of Naukratis with its Egyptian and Greek temples (Goddio and Masson-Berghoff, 2016) [Fig. 5].
These virtual experiences will promote the UCH and make it accessible to the public. On another hand, implementing interactive visualization technology and 3D modeling/mapping on underwater archeology will safeguard and preserve this endangered heritage under the seas. This approach can be achieved through active collaboration between MoA and Center for Documentation of Cultural Heritage at Egypt (CULTNAT), with support from IEASM and together with other local and international cultural authorities that concerned with maritime cultural and underwater archeology.

- **Online Exhibitions for Maritime Series**

Indeed, online viewing of maritime cultural heritage whether movable (museums) or immovable (underwater archeological sites) will attract visitors and encourage them to make actual visits, but what if the visitors themselves share their maritime memories online?
Online Exhibition is online display of collections with the aim of engaging an audience that is not necessarily expert (Museum Association, 2011). It’s a new approach allow to share the museum collection through build online exhibits with objects, and invite visitors to share their memories (INDICAT, 2012, Roy Rosenzweig Center for History and New Media, 2011).

This online experience is relatively affordable in comparison to other techniques of display and considered to be interactive digital experience allows to use social media and search to build audiences, thus, it is two – way conversation process with the audience provide immersive engagement to the maritime cultural (Museum Association , 2011).

In fact, these online maritime series can serve as social media platforms help in building maritime memories and promote two- ways communication with the local community through offering them the opportunity to share their maritime stories and other related memories. Hence, it can used broadly to preserve the intangible heritage and oral history of Egyptian maritime identity and linked the public with their maritime history as living heritage.

- Visitor Center as interpretive tool for maritime cultural heritage of Egypt

Visitor center is a powerful tool can be used effectively in the raising awareness process to stimulate the public towards understating their history of both maritime and the underwater archeology. visitor center has been identified as physical buildings located in a city or in historical and natural sites to provide visitors with services and information, it vary from a small building with modest services to great one with entertainment center and even a museum. (Mohamed, 2015, Pearce, 2004).
One of the main aspects of the visitor center is adopting interpretation content and technological components to communicate the provided information and related context to users (visitors, staff, and local community) (Pearce, 2004). Due to the International Conference organized by the Getty Conservation Institute and Paul Getty Museum in May 1995, the main role of visitor center is to prepare the visitor to enjoy and understand the history behind the archeological site using different interpretive tools accompanied with walking tours whether guided or independent. (Mohamed, 2015).

Bibliotheca Alexandrina (semi-governmental institution), one of the main cultural institute in Egypt has publish a book stressing the importance of visitor center in Egyptian community as a crucial tool for the preservation of archeological sites as well as participate in the community development (Hassan and Youssef 2008).

In this light, considering a visitor center at the coasts of both Mediterranean and Red seas will emphasis particular interest for the local community and enabling them to understand the precious maritime heritage of Egypt.

In the same context, it should be referring to the ambitious project that carried out in 2008 with the purpose of creating a network of visitors centers in the southern region of the Red Sea, entitled; 'Visitor Center Information Distribution Network – VCIDN' from Marsa Allam to Shalateen within a distance of 200 km. among the overall objective of this project, it aim to provide a deeper understanding of the cultural and marine history environment of the Red Sea region. Despite the construction of these networks of visitors’ centers, it didn't open to the public till present. (USAID 2008).
Another project in the Red Sea region funded by the United States Agency for International Development (USAID) regarding the restoration and transformation of historical ottoman fort dates back to 1571 at the Quseir (located on the Red Sea ashore) into heritage visitor center with the involvement of the local communities. It served as learning center teaching the history of the Red Sea’ legacy to the local by using creative interpretive methods (e.g. they were able to revive the oldest fishing boat used in the port called the Gatira and create an identical replica based on the local’s memories). Unfortunately, after shifting this center under the jurisdiction of MoA, it loses many of its authenticity as heritage building due to lack of training for the staff. (Mohamed, 2015)

However, the proposed venues for creating visitor center for interpreting the context of Egypt maritime and UCH can be located in different places; in the Red sea coastline; underwater archeological sites of Mediterranean Sea coastline particularly at Alexandria as a unique attraction point for both tourists and locals; the Bibliotheca Alexandrina or Qaitbay fort -the top-visited cultural site in Alexandria- since they both overlooking the Mediterranean Sea; or we might consider using one of the historical buildings in the Alexandria and transformed into a visitor center.

This visitor center of maritime cultural and UCH could enrich both locals and tourists with a wide variety of maritime topics and encourage them to visits museums, thus will lead them to deeper engagement with the displays of sunken treasures collections and other related exhibitions in the Alexandria museums.

- Cultural Network

Egypt lacks a special legal placement for Maritime cultural heritage with scientific management principles oriented towards interconnects the
society, local governing authorities and museums professionals with cultural purposes to promote and preserve maritime history of Egypt.

In this regard, we need to fostering cooperation on international scale between MoA, Alexandria Centre for Maritime Archaeology, IEASM, together with UNESCO and ICOM committee for Maritime ICMM, and all relevant stakeholders to build up a "cultural network" tasked with developing sustainable strategies for preserving and communicating maritime cultural heritage of Egypt. The focused actions should be 1) Create thorough databank compiles all the UCH sites and maritime resources of Egypt both tangible and intangible; 2) create cultural map for all UCH sites and maritime sites of Egypt ; 3) develop methodology with standards and guidelines for promoting social and cultural programmes to the local community education; 4) set up implementation strategies for disseminating explanation materials and information, as well as collaborative projects with community participation.

- **Heritage Tours and Water Adventures**

By recognizing the vast submerged landscape that facing the Mediterranean and Red Seas, daily nature cruises and heritage tours with interpretive storytelling and explanatory materials can help the audiences to unlock the historic past beneath the water and had immersive engagement with maritime legacy. This might be led by museums staff, DUA staff, trained docents.

**In conclusion**

Egypt's maritime cultural is rich and diverse; its tangible and intangible aspects exerted a dominating influences on the formation and consolidation of the Egyptian civilization and its interconnection with the neighbors. Maritime Egypt still not defined, it is in need to identified,
explained and interpreted as powerful tool for the Egyptian history linked
the public with their maritime national identity, and affect on their
perception to the riverine and maritime nature of modern Egypt through
developing and delivering meaningful and engagement offerings.

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Biography

Nevine Nizar Zakria, has PH.D in Egyptology (2016), member staff of Ministry of Antiquities since (2001) till present. She has 15 years' experience of curatorial work and museological practices, involved in the process of developing the exhibition content of the Grand Egyptian Museum (2004-2015). She promotes her experience in Museology professionally by joining the international training programme of the British Museum (2012), and extra training in 2015. She has exposed to the best practices in the field of museums at UK, USA, Germany and India. Since (2015) She joining Helwan University as Lecturer in Museum Studies.
Session 5: Iran’s Maritime Cultural Landscape

Abstract

The country of Iran benefits from having a long coastline. Sea spaces and coastlines were attractive settlements for humans throughout history. These extensive maritime landscapes have resulted in interactions between human and sea along the northern (Caspian Sea) and southern (Persian Gulf and Sea of Oman) coastlines of Iran. Iran’s rivers and lakes contain a great deal of evidence of human habitation and interaction. Due to the country’s long history of maritime culture, we can also observe sea effects on coastal communities in Iran. Maritime archaeological studies in Iran, however, are at a nascent stage.

In the 1990’s, a small group of archaeologists from the Iranian Center for Archaeological Research (ICAR) investigated in the north of Persian Gulf to decode its unknown history. In 2000, the first coherent and planned activities of that group produced the "Underwater Surveys around the shores of Siraf Port in Bushehr Province". After that, the team surveyed "Bandar-e Rig" (Rig port), Portuguese castles in Siraf port, Southern Shores of the Bushehr Peninsula in the Persian Gulf. The team has worked on sites from "Shushtar’s Band-e Mizan" (Shushtar barrier), "Takht-e Suleiman" Lake, and the Amir Abad and "Zaghmarz" shipwrecks; the "Tammīsheh and Gorgān" Underwater Walls, and the "Ghorogh" and "Rudsar" shipwrecks. These projects were published in Persian by a domestic magazine. The team then prepared and distributed a booklet titled of "Iran, Underwater Cultural Heritage and It's Share in Maritime Archeological Studies" for the annual meeting of States Parties of The UNESCO Convention on the Protection of the Underwater Cultural Heritage in 2016. Next, UNESCO and ICHTO held the "Training Workshop on Underwater Archaeology with a Focus on the UNESCO 2001 Convention" in Iran. These activities are continuing and we hope for some continued progress in maritime archaeological studies and international cooperation.

Session Chairs: Hossien Tofigham, Ph.D.
Ramin Adibi, M.A.
Abstract

Gilan province is one the northern states of Iran which is located in south west of Caspian Sea and has relatively long coastlines. According to historical and geographical location of Gilan, in 2017, Maritime archaeology group of Iranian Center for Archaeological Research (ICAR) decided to do a project as “Archaeology of maritime landscapes of Gilan Province”. Main goal of perform this project was identifying immaterial and material of maritime culture across of Gilan province maritime landscape. Our Research area was from "Astara" county to "Rudsar" county in Gilan province. We were surveying about navigation and Boatbuilding in rivers, Lagoon and coastlines of Caspian Sea. For example: in "Estil" Lagoon in Astra county we observed a kind of Simple Watercraft which is more look like to a Dugout canoe. During this project, we observed and investigated about wooden boats with simple construction in different sizes that locals called "lutka/loodka" or "Nodonbal". Nowadays, fishermen use flat-bottomed, double-ended vessel (in local dialect called "karaji") that linked to past period. So we were investigating on remains of "Ghorogh" wooden shipwreck in "Talesh" County and wooden shipwreck "Lalehrūd" in "Rudsar" County. We visited Traditional Wooden Boat Factory and interviewed with locals. This article based on desk and field research on traditional and historical boat and ship in each city of Gilan province.

Key Words: Caspian Sea, Gilan province, boat and ship.

1. Introduction

According to Iran Cultural Heritage, Handicrafts and Tourism Organization (ICHTO) is responsible for Cultural heritage in Iran. Recently, in 2017 Iranian Center for Archaeological Research (ICAR) issued a license titled
as "Archaeological survey of maritime landscapes of "Gilan" Province relying on pervious assessments and some Main principles of Convention on Protection of Underwater Cultural Heritage and identifying potentials in order to do future protection measures. "Hossein Tofighian" is the director of archaeological survey. The main goals of the Project were:

1. In Situ Preservation, as first option.
2. Obey legal protection of archaeological sites.
3. Organizational and archaeological monitoring in order to avoid of material culture for further degradations.
4. Necessary measures about protection of sites.
5. Making Reports and documents of archaeological finds.
7. Protect underwater cultural heritage for future generations.

We used "Christer Westerdahl's approach" - the Maritime cultural Landscape - that published in international journal of nautical archaeology in 1992 for Maritime archaeological surveys in Gilan province. Because his approach, we can get to our holistic understanding about this subject. Our Research area was from "Astara" county to "Rudsar" county in Gilan province. We were surveying about shipwrecks, local maritime culture, navigation and Boatbuilding in rivers, Lagoon and coastlines of Caspian Sea. This article derived from this project and shipwreck as a time capsule and dating instrument mixed with historical report.

2. Maritime Archaeological studies in Caspian Sea

Based on Encyclopedia of Lakes and reservoirs: "The Caspian Sea is the largest closed water body in the world. Five states are situated on its banks: Russia, Azerbaijan, Islamic republic of Iran, Kazakhstan, and Turkmenistan. The area of the sea at present equals to 0.4 million km
making 18% of the total area of lakes of the Earth. The volume of water equals to 79,000 km. The maximal extension of the sea from north to south equals to 1,200 km, its width varies from 200 up to 450 km, and the greatest depth equals to 1,025 m. The Caspian Sea accepts water of 130 rivers from the catchment area which is approximately ten times greater than its own one (3.5 million km²) (Fig. 1). The main feature of the hydrological regime of the Caspian Sea is significant fluctuation of its level which is the reason of significant damages and ecological accidents" (Bolgov, 2012) and This is why various archaeological monuments were inundated by the Caspian Sea water (Okorokov, 1993). Caspian Sea and its coasts have many important aspects such as Strategic, Environmental, social and economic (fisheries, transportation and tourism) factors. In these days, we should have added maritime archaeological significance to the Caspian Sea.

Fig. 2: Caspian Sea; (Rucevska and Simonett, 2006)
There are some of historical and considerable reports that mentioned to the Caspian Sea, include: Herodotus (5th cen. BC), Ptolemy (AD 2 cen.), Estakhri (AD 10th cen.), Masʿudi (AD 10th cen.), Al-Idrisi (AD 12th cen.), Abu Zeyd al-Balkhi (AD 9th cen.), Adam Olearius (1599-167), Jan Janszoon Struys (1630-1694), Captain John Elton(1751), Jonas Hanway (1712-1786), Guillaume-Antoine Olivier (1756-1814), Pierre Amédée Jaubert (1779–1847), James Baillie Fraser (1783-1856), charles feranics Mackenzie (1788–1862), bohler(1853-?), Grigoriy Valerianovich Melgunov (his travel to southern coast of Caspian sea:1858-1860), Jakob Eduard Polak (1818-1891), Madame Carla Serena (1824-1884), Ernest Orsolle (1858-?), Henry Binder (1886-?), Frederick Charles Richards (1878–1932), Wipert von Blücher (1883- 1963) and etc. (Zonn and et al.,2010; Nikouyeh, 2007). Also, we have many reports from Medieval Islamic travel writers about Relations between "RUS" and Iran on that time when Volga maritime route was open. Some of these writers include: "Al-Masʿudi, Yaʿqubi, Yaqut al-Hamawi, Gardezi, Al-Muqaddasi, Ibn Rustah, Ibn Khordadbeh, ibn athir al jazari", particularity "Ahmad ibn Fadlan" and current western scientists' researches such as Thorir Jonsson Hraundal are very important for our maritime archaeological researches.

Also, in 1870, Naser al-Din Shah Qajar in "Ruznameh-ye safar-e Gilan" mentioned a list of many different types of watercrafts which are located in southern of Caspian sea called: "karaji"(a kind of barge), "Navid"(kind of watercraft),"ka(e)šti ātaši"(a kind of Steamboat), "Nāv"(a kind of cruiser), "ka(e)šti bozorg tojjāri"(a kind of Merchant vessel), "ka(e)šti muzik"(Musical watercraft), "ka(e)šti boxār bozorg v kuča(e)k" (Big and small Steamboat ), "Qāyeq lotke/Lodka"(a kind of Russian boat), "ka(e)šti dudi"(a kind of Steamboat) and so on.
Maritime Archaeological researches on coastal and marine regions of the southern part of the Caspian Sea do not date back to long ago. For example, a couple of them are as follow:

In the early eighteenth century, several Russian scholars wrote their observations of stone structures in the coast of Baku. In 1840, an attempt to locate the submerged town was undertaken. It did not succeed, although two Russian naval brigs took part. In 1933, the Azerbaijan Academy of Sciences conducted underwater investigations in the area by "I. M. Djiafar-Zade" and "E. A. Pakhomov". Totally, 636 frieze fragments with tile decorations were raised and their inscriptions deciphered. In 1961, the Leningrad Branch of the Institute of Archaeology headed by L. N. Gumilyov started exploration of the underwater part of "Derbent" Fortress. The expedition examined about 300 m of the fortress wall underwater. These investigations confirmed the abrupt variations of the Caspian Sea-level (Okorokov, 1993). According to "Viktor Kvachidze" says: "in 1968, I had the idea to create an underwater archaeological expedition in conjunction with the Azerbaijani History Museum and the first dive was organized in 1969" (Kvachidze, 2006). The expedition lifted a lot of very valuable material culture from the seabed some of them included: The remains of settlements of "Bandovan I" and "Bandovan II", swallowed by the Caspian Sea. They were found in ancient channels and on the bank of the Kura River. Bandovan I, is ruins of "Gushtaspi" city, which existed in the 11th-13th centuries, and "Bandovan II" is ruins of "Mugan" city (9th-12th centuries), too (Ibrahimov, 2016). In 1982, underwater specialists examined a ship which sank with the Russian Army treasury in the Bay of Baku at the beginning of the 19th century (Okorokov, 1993). In 2000, a fishing company observed the wrecked body of an old ship and some objects such as samovars, porcelains and some hardware artifacts obtained from there. Objects obtained from the
The shipwreck of "Amir Abad of Lahijan" confirmed the issue that the vessel had been a "cargo ship". These retrieved artifacts from the vessel were made in Russia include porcelains made in "Kuznetsov Factory" (Mirsalehi, 2001). In 2003, it was reported a shipwreck appeared in the north of "Zaghmarz" Village in 17 Km away from the north of "Neka" Town (Sourtchi, 2004). In 2006, "Zhenya Anichenko" published a report of her short research trip to Azerbaijan. She wrote reasons of this short scientific trip: collecting additional data about "Sababyil" submerged Castle based on writings of middle-age historians, investigating submerged lands, Caspian Sea archeological potentials and the history of this region (Anichenko, 2006). Between 2007 and 2009, Julian Jansen Van Rensburg et al, investigated "Tammīsheh" and "Gorgān" Underwater Walls (Rensburg and et al, 2013). In 2013, the recording form of "Ghorogh" shipwreck on Talesh coastlines prepared and submitted to Cultural Heritage Administration of Gilan Province. In 2016, remains of wooden ship appeared to seem that belong to the Afsharid Era, has recently explored on "Rudsar" coasts in "Gilan" Province (Alizadeh, 2015) (Fig 2). In 2016, the divers of the Russian Geographical Society's (RGS) expedition found an object, which looked like an anchor in the Caspian Sea near the coast of Derbent. Presumably, it belongs to one of the ships flotilla of the Peter the Great, - the press-secretary of the Tatarstan branch of the Russian Geographical Society "Irina Sadykova" says (RIA Dagestan, 2016).
3. Study area

Gilan is one of the Circum-Caspian Iranian provinces (Ostan). This province is situated on north of Iran and located in southwestern shore of the Caspian Sea. Gilan has about 14044 kilometers extent area and population – 2.4 million people with 16 Counties (in Persian: Shahrestan). Gilan connects to the Caspian Sea in north, to the Mazandaran Province in east, to the Ardabil Province in west, to the Zanjan and Qazvin Provinces in south. It also has borders with the Republic of Azerbaijan in the north as well as Russia via the Caspian Sea. The main city is Rasht and The main river is the "Sefid Rud" (Zonn and et al., 2010) (Fig 3). It has the best type of weather and climate in Iran with a moderate and humid climate that is known as the moderate Caspian climate. The effective
factors on such climate include the Alborz mountain range, direction of the mountains, the height of the area, and the Caspian Sea, vegetation surface, local winds, as well as the altitude and weather fronts (Kazemi Rad and Mohammadi, 2015). Our Research area was from "Astara" county to "Rudsar" county in "Gilan" province. We were surveying about local maritime culture, navigation and Boatbuilding in rivers, Lagoon and coastlines of Caspian Sea.

Fig. 3: Location of "Gilan" Province. 
A: "ASTARA"; H: "HAŠTPAR" (Tâleš ); BA: "BANDAR-E ANZALĪ"; Lh: "LĀHIJĀN"; Lr: "LANGARUD"; Rs: "RUDSAR" (Authors, 2017)

3.1 ASTARA

In 1843, "Keith Edward Abbott" mentioned: "Astara" as "dehkade dahne kenār" which is situated in the mouth of the "Astara River". Also, Astara hasn't any harbor and cargo of ships were unloaded via boat nearby Astara water (Sotuda, 1995). There are many subjects about maritime archaeological and ethnographical studies in Astara. One of them is "Estil
Lagoon”. We observed a kind of Simple Watercraft which is more look like to a Dugout canoe (Logboat) around the Lagoon (in local dialect called "Lodka"). Also, traces of axe observed on hull's Dugout canoe (Fig4). Undoubtedly, dugout canoe is one of the oldest vessels (Okorokov, 1995). According to Sean McGrail (2004): “Dugout canoe are shell-built”. The technique of Dugout canoe building as: "The trunk of a heavy tree was carved out with a crude stone knife or axe: the men would then plug up both ends of the hollow trunk with some form of boarding" (Agius, 2008:123). The use of this boat building technique, dated back to Mesolithic (McGrail, 2001:11). It should be noted that boats are first known among settled peoples-farmers and fishermen. Hunters seem to have confined their water transport to occasional ‘vessels’, such as tree trunks, and primitive rafts. To have confined their water transport to occasional ‘vessels’, such as tree trunks, and primitive rafts. Many such these Dugout canoe observed and recorded in Russia, Ukraine and Latvia (See, Okorokov, 1995; Burov, 1996). During our investigation in study area, we observed and recorded plank boats with simple construction in different sizes that locals called "lutka/lodka" or "Nodonbal" or "Karaji".
3.2 HAŠTPAR (or Šahr-e Ėlāš “Ţāleš City”)

A city in the western part of "Gilān" Province, center of the "şahrestān" (sub-provincial district) of "Ţāleš" (or Tāleš). The city is located at lat 37°48′ N, long 48°55′ E, at the head of the delta of the "Kargānrud" River (Bazin, n.d.). Natural dynamic of "Talesh" coast area has caused “unstable conditions” in this region during different periods. Hence, “several water level fluctuations” in the Caspian Sea has led to “emerging or submerging of the neighbor lands.”Kargan-Rud" constitutes the biggest Caspian Sea water basin in Western Gilan. It should be noted that there is considerable wooden shipwreck in Ghorugh Village of Talesh County. Here is the exact location of this vessel, according to geographic coordinate system. It is located on the latitude of 37°51´20.88"N and longitude of 48°57´27.77" E with the elevation of -28 below the sea surface. The shipwreck is accessible through "Anzali-Talesh-Astara" road. In this area, the forest is closer to the shoreline, as if the sea and
the forest are intertwined. At the present, only some parts of the vessel’s keel and hull are remained. It is more than 28 meters long and about 6 meters wide. It is not clear yet what method used for construction of Ghorogh’s hull. However, according to observations, a complex method, strong timbers and wooden pieces used to construct this vessel. Also, long and robust metal nails were used to fasten the wooden elements. The ship’s file is prepared for national registration. It is probable this vessel played an important role in wood trade during the Qajar era between Iran and Russia. In 1880, "Ahmad Ibn-xudāwirdī Lankarānī" in "Aḥmad Ibn-xudāwirdī Lankarānī" in "Axbārnāma"; tārix-i Tālišān az saltanat-i Nādir Šāh tā saltanat-i Muḥammad Šāh Qāḡār" said: "There was a naval warfare between Iranian Navy and Stepan Razin". Also he mentioned: "There were some exchanges cargo such as Timbers and Cereals from Gilan to Russia". Also, we were investigating on remains of "Ghorogh" wooden shipwreck in Talesh County by helishot and Details of shipwreck were mapping (Fig 5.). In these days, Fishermen use flat-bottomed double-ended vessels (in local dialect called "karaji") in this area linked to past period. Those watercrafts look like flat-bottomed double-ended vessels were using in 18 and 19 centuries.
3.3 Anazali

A city and sea port as well as an Iranian naval base on the Caspian Sea in Gilan Province (Zonn and et al., 2010). After the 1979 Iranian revolution, the name of the place reverted to its original name of "Anzali". In 1860, "Grigoriy Valerianovich Melgunov" reports: "The Melgunov party aboard the "Lankoran/ Lankara" arrived off Anzali at half past the hour of eleven in the morning on October 7, 1860. The “famed tower” of Anzali was in plain view. The breeze did not permit the ship to draw any closer and so the ship dropped anchor at some distance from the shore. The local karaji came out competing among themselves to reach the ship, hoping to sell their goods to the passengers and crew and provide transportation back to shore. As it turned out, on that day, only two passengers were due to disembark at Anzali, and there was no cargo to land. Even though it was called a “town,” Melgunov observed, Anzali consisted of two villages, one at each side of the straits that separated the sea from the lagoon. Tiny sea shells, reeds, and shifting sand bars marked the southern approaches.
to Anzali. On each side of the straits stood a tower set in about a mile from the water's edge. The tower on the west or northern part of Anzali stood some 94 feet tall and the smoke from its signal could be seen as far east as "Piri Bazar". Anzali itself consisted of some 200 houses and 160 shops, 2 bathhouses, 3 mosques, and 3 shrines. Each house boasted a garden often bearing citrus trees. In the southern part of the lagoon lay "Miyanposhteh" Island, mostly covered in reeds. The inhabitants wove straw goods, grew silk and melons, and drove "karajis".

The ships from Baku and Astrakhan, chiefly carrying consignments of coal and petroleum, would anchor offshore opposite the Russian trading houses, as Anzali itself did not have much of an anchorage. Melgunov observed that Anzali had the Caspian’s worst harbor; its bottom was rocky and storms arose in its vicinity without much warning. Steamers were prohibited from approaching the shore and were obliged to anchor some three miles off. The trade of Gilan, including Rasht and Anzali, according to Melgunov, consisted chiefly of silk and fisheries. The silk, in particular, was exported to such destinations as Constantinople in Turkey, Marseilles in France, and Russia. Among the foreign trading houses active in Gilan at the time were Riley and Company, which dealt in silk; the House of Diner, belonging to a Swiss entrepreneur; and the Kavkaz and Mercury Steam Navigation Company (Mirfendereski, 2001). During archaeological survey around the Anzali, we observed a few Shipbuilding factories where they are still building wooden fishing vessels in different size for navigating
in the sea and river (Fig 6). It should be noted that, today, a number of such these factories were decreased than previous periods.

![Small Shipbuilding factory](image)

Fig. 6: Small Shipbuilding factory. (Authors, 2017)

### 3.4 Lahijan

A city in the province of Gilān, located at 37°12’ N, long 50°0’ E, to the east of the lower reaches of Safidrud at an altitude of 4 m. (Bromberger, 2012). Around the coastline of Amirabad village in Lahijan that connect to Caspian Sea found the remains of wooden shipwreck. According to artifact recovered confirms the vessel has used as a cargo ship. The objects recovered from the vessel are mainly made in Russia and include some porcelain objects made by Kuznetsov Factory (Fig 7) (Mirsalehi, 1380). The porcelain factory took its name from the merchant and founder Terenti Kuznetsov. He established the factory in 1832 in Dulyovo [present Likin-Dulyovo]. Soon after, the factory's
products became very popular and products exclusively produced since that time, they were known as “Imperial Porcelain Factory” in Russia. Kuznetsov porcelain designed and produced based on Eastern and Western tastes; so it had many customers. The factory had a wide range of products. For example, it produced 150 different types of lunch, tea and coffee sets and about 370 types of cups and various types of teaspoons, butter dishes, fruit dishes, sugar bowl, ashtrays, candlesticks, money boxes and other products (Torchinsky, 2010). The ship’s cargo recovered in 2001 and part of the cargo is currently displayed on Lahijan Anthropology Museum.

![Fig. 7: The cargo and hull of the Amirabad shipwreck. (Mirsalehi, 2000)](image)

### 3.5 Langarud

A city and sub-provincial district (šahrestān) in Gilân located at lat 37°11’ N, long 50°09’ E on the Langarud River, which cuts through the city. From 1611 to 1899, Anthony Jenkinson and other Englishmen report: “Langroe (Langerud) is situate in low, swampy ground, and at the time of Gmelin’s
visit, was in a ruined state; nothing but a few reed hovels were to be seen, and a half -ruined bridge and a masque. It was near here that the remains of the ship built by John Elton for Nadir Shah were to be seen. — Holmes' Sketches on the Shoi‘es of the Caspian. (Jenkinson et al., n.d.). "(t)he city owes its fame to the commercial and administrative functions it has performed throughout history. Located in the heart of a region that produces rice and silk, with the nearby quarter of Čamḵāla functioning as its commercial port, Langarud witnessed strong growth late in the 19th and early in 20th century when Iran’s trade with Russia and Europe was flourishing (Fig 8)(Bazin and Bromberger n.d). Chaf and Chamkhaleh is a city in the Central District of Langarud County, in Gilan Province northwest of Iran. The city is located on the Caspian Sea. In this area, we visited a Traditional Wooden Boatbuilding Factory, which they are building in different sizes that locals called "lutka/lodka" or "Nodonbal"(Fig 9).

Fig. 8 (left): River landscape of Langarud. (Holmes, 1845) and Fig 9. Traditional Wooden Boat Factory in Chaf and Chamkhaleh (Authours, 2017)
3.6 Rudsar

A city and sub-provincial district (šahrestān) in eastern Gilān. The city is located at lat 37°08’ N, long 50°18’ E, at the place where the Caspian coastal highway crosses the small river Rudsar or Kiārud, 14 km southwest of Langarud (Bazin, n.d.). River "Shalman Rud" passed through Rudsar and flows into the Caspian Sea. Around the river where "Lalehrūd or Allah Rūd" village is suited; there are remains of a grounded wooden shipwreck. It is very significant for archaeological research. There are some clues in historical accounts on this matter, for example: "Jonas Hanway" reports as titled "an historical account of the British trade over the Caspian Sea": "Elton with locals built many warships for Nader Shah in a place that called "Langroud". It should be noted that the site of shipwreck is near to this location. Maybe this shipwreck belongs to Afsharid Era? Also, we were investigating on remains wooden shipwreck’s Lalehrūd Rud in Rudsar County. Group members were recording all details' shipwreck in a special recording form (Fig. 10). We got some wooden samples from shipwrecks for dendrochronological studies. In relation to this matter, we are staying in touch with international scientists.
4 Conclusion

Unfortunately, over several Decades of forming maritime archaeological studies in the world in this area of Iran is intact and need more maritime archaeological survey. In the nascent stage of maritime archaeological survey in Gilan province, we tried to identify maritime archaeological potentials and some historical accounts that mentioned to maritime spaces of Gilan province. It should be noted that in this paper we tried to mix historical accounts with archaeological records to clarify dating maritime culture heritage, but there are many hypotheses about seafaring in this area based on archaeological records. According to historical accounts, it is clear to us, there were seafaring activities in the Caspian Sea region since AD 9th century contemporary with Opening "Volga maritime trade" route until today. Also, it is noticed that, different kinds of watercrafts from shell-built to skeleton-built were used in this area.
Unresolved hypotheses of this issue move forward us to use of Multidisciplinary Studies and international contacts.

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A survey on a petroglyph illustrating a watercraft at the hinterland site of Dehtal

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Abstract:

Dehtal is an important hinterland site, located 170 km away from the shores of the Persian Gulf in Bastak County, Hormozgan province. Dehtal is a petroglyph site possibly dating to the pre-Neolithic, according to various sources of evidence such as stone tools found within the Bastak area and the Dehtal plain. The petroglyphs themselves, however, more likely date to the 3rd millennium BC. According to historical written sources, the Bastak area was located on the road linking the so-called Silk Road to the East Asia-Persian Gulf maritime trade routes.

One of these petroglyphs, which is located beside a seasonal river, illustrates a watercraft. The image shows a round-hull, double-ended craft with two masts and a long saturi (bowsprit). A long saturi is a characteristic feature of a “boom” ship. Booms were used for long-distance voyages within Indian Ocean and they are still in use today but now work with engines.

Firstly, this article attempts to discern the shipbuilding details of the watercraft depicted in comparison with other ship illustrations as those found in the Maqamat al-Hariri and the vessel depiction uncovered by Whitehouse at Siraf. Secondly, we will discuss Dehtal as a passage from Persian Gulf to so-called Silk Road with a focus on archaeological reports and historical written sources.

Introduction:

This article firstly, introduces a hinterland rock art site named Dehtal dated back to a period from the Paleolithic Age to the Islamic era. This site took its name from the nearby village with the same name. Secondly, a petroglyph illustrating a watercraft that is situated within the Dehtal site
will be introduced and a typology of the craft will be discussed by comparing it with other similar watercraft illustrations. Regarding a long Saturi (bowsprit) showed in the watercraft illustration and due to this fact that such a long satri is a characteristic of Boom ship, it is believed that the namely illustration shows a Boom ship. There is no evidence for dating the petroglyph, however, we will try to estimate it. Thirdly, the paper will discuss the reason why a Boom ship has been drawn in an inland desert.

**Rock Art site of Dehtal**

Not far from the ancient village of Dehtal in Godeh area, a rock art site of the same name has been located. Dehtal is in Bastak County at 170 kilometers north of the Persian Gulf and 110 kilometers south of Lar (Movahhed, 1970). The pictures of this site include all the categories of rock arts; human, animal, and plant motifs and symbols.

Most of the motifs in the Dehtal site have been carved on circle or oval rocks made of limy sandstone with an average diameter of one meter and a height of half meter from the ground level using Petroglyph technique in an abstract style. Due to the climatic conditions of the area - high temperature difference between day and night, and extreme heat during spring and summer - some of the carved stones have been broken and divided into two halves. There has been no research done as to the makers of Dehtal petroglyphs. The measure of erosions and the repeat of drawings on over each other can be a sign of the importance of this site to the aboriginal inhabitants or being on the way of ancient roads for centuries. So, the scattered stones of Dehtal probably were a suitable bed for transferring the thoughts and rituals of inhabitants or recording observations by passengers. According to archeological findings and historical data derived from the Godeh area and Dehtal sites, the Dehtal
petroglyphs can be dated to a period between the Paleolithic Age to the Islamic era (Fig.1).

![Fig.1: A Landscape of the Dehtal site. (Authors)](image)

**Bastak: History and historical Geography**

Dehtal is located in Bastak province, regarding this, we will have a look at the historical geography of Bastak in this part. It could help for understanding the land and marine trade roads which connected this site to the internal regions of Iran and shores of Persian Gulf as well as the probable role of the commercial caravans in making the figures of Dehtal.

Bastak is one of the southern regions of Iran plateau placed between Bandar Lengeh, Hormozgan and Larestan. In fact, Bastak, as the gate of Fars to Persian Gulf, was on the way of commercial caravans from the past. So, it has had the considerable economic position. Also, Bastak always has involved in the trade and policy of the Persian Gulf. It has been the center of governing the extensive district between Lar province and Persian Gulf over the time, especially late three hundred years (Movahed, 1970).
According to the historical sources, like Farsnameh Naseri, Bastak is a new name for a bigger zone called Jahangireh (Fasaii, 1988). In fact, it was a part of the ancient Irahistan. It is a name recorded for Larestan within the sources of fourth to seventh H.D and encompassed the hinterlands between Siraf and modern Bandar Abas (Vosoughi et al., 2008). On the basis of the record of Farsnameh Ibn Balkhi, the rulers of Irahistan had never been the subordinate of the central government, unless there was a powerful governor in Fars (Ibn Balkhi, 1995).

**Bastak as a Carrefour:**

The ancient roads in Bastak and Irahistan region can be summarized as following: 1- A caravan road started from the nearby ports of Persian Gulf and after passing Kachouyeh, Kemshak, Tarakameh and Lamerd reached Jahrom and continued to Shiraz. This way has been used in flourishing of Kish Island. 2- The second road also started from the close ports of Kish Island and get to the Larestan with passing Jenah and Kouhaj. There are traces of caravanserais and reservoirs along this way. 3- The third road came from Lar to Tadrouyeh and finally ended to Ilud. Also the roads of Bastak to Bandar Lengeh, Lar, Faramarzan, Godeh, Rouydarat, Lamzan and Dezhgan are documented in 1970. All of these routes from Bandar Lengeh to Bastak and Lar, the similar caravanserais with a distance of three Farsang (6 myl) can be seen are mostly named Shah A'basi (Movahed, 1970). (Fig.2)
Fig. 2: Three main ancient roads in Bastak and Irahistan region. (Authors)

But Bastak is located on the most important route of the ancient world; the Southern route of the Silk Road and the Sea Route of the Spice Road (Advieh Sea Route). This south way separated from the east-west main route of Silk Road passing Rey and Isfahan, reached to Shiraz and finally after passing Irahistaan and Bastak regions ended at the port of Kish. Then, it joined the Sea Road of Spice, connected the east and the south of Asia through the Persian Gulf to the Europe and the Mediterranean's shores. During this route traded different goods such as silk, spice, pearl and so on (Reza, 1997). (Fig.3)
The important rivers of Bastak region are Shoor Galedar and Mehran. These rivers originate from around the Galedar desert and finally flow into the Persian Gulf (Movahhed, 1970; Vosoughi et al., 2008). The Shoor River streams into Godeh region, where the Dehtal site is located. This is a rich area in archaeological terms, containing prehistoric, historic and Islamic sites.

Larestan and Bastak's regions are pointed during the Achaemenid period under the names of Yaoutiya, Tāravā and Praga/Forag in Daryush's manuscript at Biston (paragraph 5, 7, column 3) (Sharp, 2005). Yaoutiya was probably in the south-east of Fars, i.e. contemporary Larestaan (Fry, 2003). It is the territory that Vahizdata rioted and named himself Bardia. Finally, he defeated against the arm of Daryush in Tāravā and beside Praga, a town and mountain in Yaoutiya respectively (Sharp, ibid). Tāravā located at the east of Larestan on the commercial route of
Hormoz toward Kerman and Darab, and Praga is a region in the north of Taram, East of Larestan and North-east of Bastak most probably (Vosoughi et al., 2008). After the invasion of Arabs to this region, the name of Praga changed to Farag or Forag, while it has been recorded Praga in the geographical books of the initial times of Islam like Farsnameh Ibn Balkhi (Ibn Balkhi, 1995)

Another historical name which could be adopted with the sphere of Bastak is Apostana. This name has been mentioned in the book of Aryan, as the anchorage of the navy of Nearchus, the admiral of Alexander at 325 B.C (Arrian, VIII, p. 38). We have to notice that the first part of the word "Apostana" can be "Ab" which means water and the second part is "stan" that means the place. So, Apostana can be "Abestan" which means the “land of water” with its native accent Bostaneh or Bostano. One of the features of this place mentioned in history of Aryan is being a center for hunting pearls (pearl diving). This indication directs us to two ports with the name of Bostano. One near the Asalouyeh port and another one close to Bandar Lengeh (Zarinkoob, 2008). The last one located at the east of Bastak, exactly beside the place of entrance of Shoor River to Persian Gulf. After this time, there is no exact data from the history of Bastak region until 656 H.D. But undoubtedly, the existent ports and roads in the sphere of this area have had an important role in the economy of governments over this gap. After the invasions of Mongols to Baghdad, some of Arabs emigrates to Bastak and its environs from Basreh and some Persian Gulf ports (Salami Bastaki, 1991).

The rulers of Irahistan and Bastak didn't totally accept the obedient of the central government. Unless a powerful governor appeared in Fars, like getting power of A'zad dowlah Deylami and its campaign to Irahistan for
subduing the people of this region in the second half of fourth century (Ibn Balkhi, 1995).

Also, the independent power of Larestan and Bastak have been overthrown by Shah A'bas Safavi at 1009 H.D, due to kicking out Portuguese from Gheshm and Hormuz Islands (Movahed, 1970). The tribe of Ghavasem or Al Ghasem converted to a power at Jolphar, contemporary Ras al-Khaimah, and started robbery of the ships on Persian Gulf at the end of Safavid period. For a while they suppressed by Nadershah Afshar. After his death Bani Moen, Mashayekh (ruler) of Geshem and Hormouz, resisted against them, but finally they had to get help of the ruler of Bastak (Bani A'basiyan Bastaki, 1339: 125-127).

Along 1161 and 1162 H.D, in the time of the reign of Shahrokhshshah in Khorasan, the south part of Iran got into the invasion of robbers and revolt of nomads like other regions. In this condition, Mohamd Khan Bastaki, the ruler of Bastak, stood up against these attacks. Finally these conditions due to supervision of the governors of Bastak and Laar on the ports like Kong, Lengeh and Abasi, and even surveillance on far islands like Gheshm and Kish (Bani A'basiyan Bastaki, 1960).

In the time of Karim Khan Zand (18th century) and with his sentence, a large area from the North shores of Persian Gulf, Bandar A'bas and Minab to Lar with some south islands ruled by governors of Bastak (Salami Bastaki, 1991). In the time of Qajar (18th -20th century), Bandar Lengeh became the most important port of Persian Gulf against the commercial stagnation of Bandar A'bas and Boshehr. So Bastak raised up and developed with locating on the way of the caravan road from Bandar Lengeh to Shiraz (Movahed, 1970). In the reign of Pahlavies (20th century), Bastak and its subsidiaries were still part of Larestan province.

**The Petroglyph:**

The petroglyph depicts a starboard side of a double ended, almost belly shaped watercraft (Fig.4). Double-enders are the most primarily hull shape of the Western Indian Ocean crafts (Agius, 2008; McGrail, 2001). Early pre-historic watercrafts depicted on Mesopotamian and Elamite seals and seal impressions are double-ended as well.¹ Also, dhows are still in use in the Persian Gulf, except Ghanja and Baghla, which are mostly double-ended (Al Bastaki; Paris, 1886). It can be said that prior to the 16th -17th century A.D, the transom stern was non-existent within Persian Gulf (Agius, 2008, Hourani, 1951).

![Petroglyph Image](image)

*Fig.4: The petroglyph in situ on the right (Hamzeh Qobadian) and its drawing on the left. (Authors)*

The craft illustration shows two horizontal parallel curved lines on its hull, the three lines between the curved lines could be consider as planks, so, the craft is obviously timber-made not reef-bundled (Fig.4). Furthermore, the curved lines caused a perspective in the illustration of hull and makes it more tangible. Plus to the horizontal lines, there are two vertical lines on the outside of the hull that perpendicularly cut the horizontal lines which
probably showing that joint planks were used to make the craft. Since antiquity, Persian Gulf’s ship builders’ ideal timber has been Saj (Tectona grandis), it can be bent and joined to the frames, following the curves of the ship’s sides and it is also long-lasting (Agius, 2008).

The depicted craft, has two masts. According to Bozorg, 10th century AD, (Nakhoda Bozorg- Ibn-Shahriyar-e- Ramhormozi, 1969) 50 span of a hand of timber was needed to build a mast. Each hand span is about 23 cm. (Agius, 2008), so, we can estimate that a mast was more than 100 m. heightened. As it is mentioned above, this vessel is double-masted, if each mast be more than 100 m, then relative to the height of the masts, its hull – from bow to stern- must be approximately 100-150 m. so, she must be a seagoing ship not a boat! Undoubtedly, Bozorg exaggerates in recounting the stories but he is often honest in giving technical information. It is said that a medieval double-masted craft required crews of 200 (might be exaggerated) and modern ones draw about 240 kg with crews of thirty (Whitehouse, 2009).

It can be noticed from the masts and jack-yards that the craft has lateen sails and it is believed that lateen sail is a characteristic feature of medieval seawatercrafts of the Western Indian Ocean (Hourani, 1951). Lateen rigs are triangular and set along the craft. It permits to sail fore and aft (parsa, 2012).

The most characteristic feature of this craft is its long Saturi (bowsprit) which typically represents a Boom ship; the only watercraft of Persian Gulf that has such a long saturi (about 4-5 m.) is the Boom (Agius, 2008; Eghtedari, 1966; Parsa, 2012). (Fig.5)

The boom distinguishes to two different types: for voyage, or for fishing and pearl diving (Parsa, 2012). The voyage one is bigger with two or three
masts (Eghtedari, 1966). The hull of a Boom, just similar to namely petroglyph, is belly shaped and double ended which makes the craft safer against the waves of seas and oceans. Also, its long saturi and masts obviously show that a boom has giant rigs which makes the craft high-speeded (Parsa, 2012). (Fig.5)

![Fig.5](image)

*Fig.5: a modern double-masted Boom ship on the right (Ethnological Museum of Kong, Iran) and a Saturi of a modern Boom in Abadan, Iran. (Authors)*

Unfortunately, no more technical detail, such as being swan or nailed, rudder, deck, anchor and etc., could be obtained from the petroglyph. But, according to the characteristics discussed above (the long saturi, belly shaped and double ended hull, being timber-made and double-masted), it can be understood that the illustration represents a for-voyage Boom ship. The most famous and certain illustration of Boom ship is the ones in Maqamat-al-Hariri (13th century) which will be discussed subsequently. (Fig.6)
Fig.6: Two Boom ships in two different versions of Maqamat of Al-Hariri, the one on the left is archived in the Bibliothèque Nationale de France, Paris (Al-Hariri, 1237). The middle one archived in the Library of the Academy of Sciences, St Petersburg (Agius, 2008) and the right one is a graffito engravened in Siraf, Iran. (Whitehouse, 2009).

On the left side of the scene, there is a man / woman depicted riding a horse (?). On the right, just under the hull of the ship, a fish can be seen. The depiction of horseman is not obvious because of the erosion, neither the fish (fig.4). The scratched lines of all described illustrations, ship, horseman and the fish are in a same color and it shows their concurrency (scratched lines of the petroglyphs in Dehtal turns darker over time). It seems that this scene aims to recount a story of voyaging on the seas to a port in South of Iran and then riding to a central city of Iran.

**Comparative Consideration:**

**Maqamat Al-Hariri:**

There are two miniatures of two different versions of Maqamat which are believed to illustrate Boom ship (Fig.6), one at the National Library of France, Paris (Hourani, 1959) and one at the Library of the Academy of Sciences, Saint Petersburg (Agius, 2008). They both are obviously double
ended with a long saturi and they both are evidently timber-made just like what we see in the namely petroglyph. There is no doubt that the Maqamat`s miniatures are more detailed rather than Dehtal`s petroglyph, and the rudder, crews and even paddles can be seen but, the mutual features between Dehtal`s petroglyph depicting ship and Maqamat`s miniatures illustrating ships are firstly, the long saturi, secondly, being double- ended.

Unfortunately, there is only a few pictorial evidence of medieval ships within Iran and archaeological evidence of Perso-Arabian ships are even less than the pictorial evidence. One might say there are lots of illustrated ships between Iranian miniatures but we should keep this fact in our mind that these miniatures generally recount Iranian myths which are believed to have been happened in the past, so, the artists just tried to copy the antiquity depictions of watercrafts and rarely useful information of Iranian medieval ships could be driven from these miniatures; In fact, it is highly recommended to Iranian medieval artists to copy their ancestors (Beig-e-Afshar, 1969). Furthermore, these miniatures were mostly done by royal artists who were inhabitants of inland Iran and so far away from seas and ships.

**Ship Graffito of Site “K” in Siraf:**

Another pictorial evidence of Iranian shipbuilding is the graffito that David Whitehouse engraved at site “K” of Siraf³ (Fig.6). This is dated back to the 10th -11th century and it is tree-masted. As it is mentioned before, a modern two-masted vessel of Persian Gulf draws 240 tonnes and requires crews of thirty (Whitehouse, 2009), so, a tree-masted craft must be even greater than a two-masted one! The ship shown in the graffito is double-ended as well as the other watercrafts that are so far introduced in this article, but unlike the others, nor saturi neither timber planks can be
recognized in this graffito because of the erosion. Furthermore, its hull obviously is not belly shaped!

**Belitung ship wrecked:**

Archaeological evidence of Perso-Arab ships are really rare. But, in 1998, a wrecked ship has been found in Belitung, Indonesia by local divers. The vessel was carrying the Changsha wares which were in operation during the Tang dynasty (618-907 A.D). Belitung ship is believed to have a length overall of 18 meters. Flecker (2001) deduced that Belitung ship was designed for carrying light cargo and she has not being deep-drafted! Unfortunately, no bowsprit could be recognized in Belitung wrecked, solely it is mentioned that its stern was vertical (ibid). So, it seems not to be much similarities between Dehtal ship petroglyph and Belitung ship wrecked.

**Dating of Dehtal Ship Petroglyph:**

Maritime trade since Neolithic era within Persian Gulf is proved but, archaeological and pictorial evidence show that the watercrafts that were used in pre-historic era have being reed-bundled not timber-made (Carter, 2006), so, pre-historical water crafts could not be comparable with Dehtal’s ship petroglyph. Furthermore, the Achaemenids (550- 330 B.C) adapted Phoenician ships which were totally different from the water craft that we discuss in this article⁴ (Hassan, 1928).

According to Vosoughi (2016), the history of maritime trade between Iran, under the name of An-Xi and Far East goes back to the Parthian empire (247 B.C- 224 A.D). In that time, because of the unsecurity of the inland Silk Road caused by Central Asian tribes, Parthians decided to sail to Far East. During Sasanian period (224- 651 S.D), Iranians were named Possū
by Chines and they have been sailing from Persian Gulf to China and back (Whitehouse and Williamson, 1973). Archaeological evidence such as Sassanian glass vessels found in ports of Japan evidently proves maritime trade between Sassanians with Far East (Priestman, 2016). To conclude, we can’t date this petroglyph as early as pre-history, because it is obviously timber-made, on the other hand, while we have no pictorial or archaeological evidence of Partho-Sasanian ships, we can’t deduce that exactly since when Boom ships were used. The oldest evidence of Boom are the miniatures of Maqamat (13th century AD) and Booms are still in use but they work with engine! We can’t deduce that exactly since when Boom ships were used in Persian Gulf; so, it looks impossible to present a dating.

Conclusion:

As it is argued above in "The Petroglyph part", namely illustration depicts a double-ended, belly-shaped hull watercraft which is timber-made and has two masts and jack-yard. But the most important feature of the depicted craft is its long satri (bowsprit) which is the characteristic of Boom ships. So, it can be concluded that the petroglyph depicts a Boom ship. The oldest depiction of Boom are two miniatures in Maqamat Al-Hariri (13th century AD) and she is still in use in Persian Gulf but works with engine.

Dehtal is an inland rock art site situated in Bastak province and Bastak was located 170 km. away from the sea on the passage that connected so-called Eastern-Western Silk Road to the Persian Gulf-Far East Maritime route. The petroglyph scene that is discussed in this article (including a ship and a fish under it on the write and a horseman on the
left), probably, recounts a story of a passenger who traveled from somewhere in the East to a port in northern shores of Persian Gulf, then maintained his/her way to the North by riding on back of a horse and on his/her way, passed from Dehtal.

Unfortunately, there is no evidence that helps us with relative dating but forthcoming studies of the authors of this article on absolute dating of the lichens may be useful.

Endnotes


2 The height of the mainmast is a little bit less than the length of the craft (Eghtedari, 1966).


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Biography

Mina Safa graduated with B.A. degree in Archaeology and with M.A. degree in History of Ancient Iran from University of Tehran. She received a Ph.D. degree from Shiraz University in History of Iran after Islam. Her initial interest in the field is around Art History of the Middle East, particularly around three thousand B.C. She follows the cultural, commercial, and political relations between neighboring civilizations and their roles in making a final format of artistic objects and thoughts. Until now, She worked on rock art of Homyan and Mirmelas (two ancient sites
of west Iran) and the Deh-Tal rock art site, as well as studying the artifacts of Jiroft (an old civilization of south Iran).

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She is also a former member of Iran national Canoe/Kayak team. Because of this background, in her early undergraduate years, she was interested in ancient boatbuilding and subsequently, nautical archaeology. Soon after, Shadi started scuba diving and studying nautical archaeological methods.

Her focus, currently is on pictorial evidence of watercrafts (rock reliefs, seal impressions, petroglyphs and miniatures) around the Persian Gulf and Western Indian Ocean as well as ethno-archaeological studies on boat/ship building.
An Introduction to the Maritime Construct of Khashabat in the Persian Gulf

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Abstract

The history of maritime routes and communications in Iran dates back to a long time ago. In ancient times, to prevent dangers for their ships such as water thinness and thawing near coasts, the shallow depths and narrowness of rivers at the mouth of seas, Iranians installed a mechanical device called khashabat or Khushab (lighthouse). This maritime device has been made out of teak wood in the form of a catapult and imperfect pyramid. The height of a khashabat was about 40 meters above the sea level. Its materials were pottery and stones. The watches on a khashabat were deployed in four-arched chambers on its top. The significance of the khashabat was because of natural disasters, the invasion of pirates, and expiration of their fuel. Historical resources indicate that khashabats or lighthouses in the sea exited until the 13th century. The present study is aimed at investigating functions and significance of khashabats in traditional cruise and the reasons for their construction. In addition, places where this Iranian technology and engineering were used are introduced.

Key words: Khashabat, the Persian Gulf, navigation, maritime hazards, lighthouse.

Introduction

The history of technology is just a small part of the profile of the human civilization in their temporal visions, but it is an important part of human culture and civilization as well. Therefore, investigating the history of Iranian technology is very significant. Iranian culture is very rich in terms of maritime technology and shipbuilding. Waters of the Persian Gulf, Oman Sea, Indian Ocean, and rivers in the southwest of Iran have been scenes for people’s navigation since the ancient times.
According to myths, Jamshid Jam, from the Pishdadian Dynasty, built the first ship. He also established the first “maritime rituals” and other national rituals for leading people toward seas and navigation. He then started sailing and navigation in seas and sailed from one country to another.¹ (Ferdowsi, 1966:27) According to Ferdowsi's narration, after the transfer of government from Pishdadian to Kianian dynasties, occurrences of events changed from Sarandib to Hamavaran. During his travel to Iran, Kay Kavus passed Zabol (Nimrouz) and reached Makran coasts and decided to suddenly invade Hamavaran:

“Key Kavus ordered the army to play drums and proceeded from Nimrouz. Then he, the King of the world, became happy. He deployed his army toward Turan and China and then he invaded Makran.²

Then the king ordered shipbuilders to build boats and ships. The king and his army boarded and passed seas a thousand miles until they reached a land.

Key Kavus ordered shipbuilders to build abundant ships and boats and then he deployed his army to invade. The people of Hamavaran were informed that Key Kavus and his army were invading from the Makran Sea.”³

Sailing in Iranian waters was common in the Phoenician, Elamite, Achaemenid, Parthian, and Sassanid times, as well as during the Islamic era. With a glance at the sailing tradition, shipbuilding and using maritime devices have been common in Iran since the ancient times. Many maritime and shipping instruments were created by Iranians, and some other instruments were used by Iranian sailors who traveled to other lands in the ancient era. Compasses, steerages, depth finders, distance finders, measurement tools, flyers (drawings), electric pellets, and khashabats (marine lights) were among instruments innovated by Iranians.
(Nourbakhsh, 2003:75 and 81, Raein, 1976:288-289). The present study aims to investigate the functions and applications of khashabats, as one of the most important innovations and instruments of Iranian sailing in the shipping industry of those periods based on historical resources.

a. What is a Khashabat?

The word “khashabat” (کشبات) which is the plural form of “khashaba” (کشبه) means sea minarets. They are in a place behind Abbadan (Dehkhoda, 1998:9802). A khashaba literally refers to a piece of wood. It also refers to a ship metaphorically. But generally in resources such as Murravej ul-Zahab of Masoudi and other geographical resources, the term khashabat refers to a minarets of wood established as a wooden scaffold in the sea, and the fire was lit on the top of it in a small chamber. As a result, it led ships toward safe passages. It in fact was equivalent to a lighthouse in the modern shipping era. Nowadays there are some maritime guides-being lit at night by wires and power- which are called “Bayeh”, but they are floating in the sea (Hadi, 1992:180).

b. Navigating and trading in the Persian Gulf

The maritime routes of the Persian Gulf is the most ancient connecting maritime routes in the world. They have been connecting Central Asia to the Middle East since several thousand years. Since the very ancient times, Chinese, Indonesian, and Malayan, and Indian, and African, goods have been shipped with the efforts exerted by Iranian sailors to ports in the Persian Gulf such as Bayan (Lian), Oboleh, Riv Ardeshir, and Forat Mishan ports and were unloaded there from where those goods were transferred to Palmira and Syria. Sometimes windships headed toward
their destination through the bay in the west of Iraq and stretched out to Al-Hirah and unloaded their goods near that city which was the dock of caravans from Badia –al-Arab.

Since that time, the Persian Gulf, as currently known for its oil reservoirs all over the world, has been famous for connecting trade routes in the east to the west of the ancient and modern world (Rasaei, 1972:42).

c. Reasons for the advent and construction of khashabats

To build a light to guide ships in dangerous and difficult passages, human beings thought of fire and light; therefore, lighting and igniting wood were some strategies for guiding ships and fleets. Then, human beings succeeded to use viscous black liquid, also called petroleum (from Greek: petra: "rock" + oleum: "oil".) for igniting fires in seas. However, since this liquid was flammable, it was poured in special containers or holes were delved in heights and it was poured into those holes and ignited (Rasaei, 1972:40)

Indeed the geographical situation of soils in the head of the Persian Gulf was not like the present time. In the ancient time, downstreams of the Euphrates, Tigris, and Karun rivers were separately poured into the Persian Gulf; as a result, salty water of the sea spread out the surrounding lands through bays stretched out near Basra even in the Sassanid era (Rasaei, 1972:42). In addition, the Persian Gulf is more roaring than other seas because of its shallow depth and its rugged submarine topology. The Persian Gulf joins the Indian Ocean (Eghtedari, 1966:10).

Thus the ancient Iranians thought of finding safer routes for facilitating navigation, preventing damages to ships, and guiding ships toward northern parts of the Persian Gulf. As a result, they constructed a type of maritime guide board called “khashabat” in historical resources.
In addition, in the guidebook of Rani Kia Tan, written between 785 to 805 AD, it is mentioned that Iranians constructed special towers in the Persian Gulf and ignited them at night for guiding ships and boats. The flammable materials used for igniting those towers were unknown but they could be wood or petroleum (Hadi, 1992:170).

Professor Hadi Hassan quoted from Hiret Veracqui, the author of the book *the Chinese and Arab Trade in the Twelfth and Thirteenth Centuries* that a ship is made out of wood and a shipmaster is a human, as there are land mice, there are water mice as well, and there are bandits as there are pirates. In addition, there are other hazards such as typhoons and rocks. Therefore, there were some decorated columns in the Persian Gulf which were ignited in order to guide ships toward true destinations” (Hadi, 1992:171).

According to Muqaddasi, in 985 AD around Basra, people constructed chambers on palm trees and ignited fire in them in order to prevent the crash of ships with rocks. But since it was difficult to navigate in that area, ships sailed mostly in days in such a way that shipmasters climbed decks and watched the horizon. Then, they transferred their commands to helmsmen to steer ships. However, when their ships got away from coasts and reached the sea, they had to steer their ships via the sun, the moon, and stars (Muqaddasi, 1897:17). Those khashabats were established and worked until the thirteenth century.

The most important reasons of constructing khashabats can be as follows:

1. Specific geographic features of the north of the Persian Gulf;
2. The sea level rise in the Persian Gulf in the bay stretching out Basra and the shallow depth of water;
3. Prevention from big ships’ grounding in muds which the Tigris, Euphrates, and Karun rivers carried from mountains and embedded at the mouth of the head of the Persian Gulf;
4. Determination of the shipping routes in shallow areas of the Persian Gulf at night; and
5. Protection of commercial goods exported from or imported to the area.

d. Geographic range of khashabats in the Persian Gulf

In this section, the study is to investigate in which areas of the Persian Gulf khashabats were employed.

Distribution of khashabats in the Persian Gulf until the 13th century

Darius the Great ordered that the first lighthouse be installed at the mouth of Indus River under the supervision of Scylax. When Nearchus, Alexander’s Admiral, sailed into the Persian Gulf in 326 BC, he was astonished by great lighthouses. As a result, he praised the miracles he had observed in the area in his travelogue. According to Nearchus, Iranians’ lighthouses were installed in different parts of the Persian Gulf (Nourbakhsh, 2003:77). The Persian Gulf was considered as a part of the fourth gulf of the Bahr ul-Azam Sea. In the book Hudud al-Alam, The Persian Gulf is described as “a gulf with narrow width which stretches out Indus River” (Sotoudeh Ed, 1960:12).

Muqaddasi writes in the book Ahsan al-Taqasim that khashabats’ origin is thought to be from Basra. They are very shallow and dangerous. Wood columns were installed and chambers were built on top of them. At night, the fireplaces were lit to warn them not to approach. Muqaddasi writes also that a captain once said that there were a lot of calamities there; his ship grounded several times. Only one ship out of 40 ones can return from there (Muqaddasi, 1982:18).

Nasir Khusraw who voyaged to Mahrouban Harbor via Basra in a ship in 1051 observed khashabats and attributed their constructions to ancient
kings. He narrated that when they voyaged from Basra in May 1051, firstly they boarded a boat and voyaged for four miles to reach Abbadan (Abadan). Abbadan was close to the sea as an island with two branches. As they approached and anchored, they saw some towers and asked natives what were they? They answered them that those towers are khasbabats (Ghobadiani, 1976:161).

Soleiman Sirafi writes in the book *Sequence of Histories* (Silisilat ul-Twarikh) that the beginning of the Persian Gulf was the area of khashabats of Basra. That area covered Basra, Oboleh, and Bahrain. Then, there was Laravi Sea beside which there were khashabats of Saymur, Subareh, Taneh, Sandan, and Konbayeh regions which were parts of India and Indus River. The beginning of the Perisan Gulf there was maritime rugged topologies around Basra where khashabats or konkalas had been installed. Those khashabats were constructed out of wood in order to be guides for sailors and helmsmen. The distance from the beginning of the Persian Gulf to the Oman Sea is about 300 miles. In addition, the distance from Persian coasts to Bahrain is about 300 miles (Sirafi, 2002:160).

In his observations of the Persian Gulf from 947-956, Masoudi describes its range as follows: “the beginning of this sea starts from Basra, Oboleh, and Bahrian where areas of khashabats of Basra are located. Therefore, the beginning of the Persian Gulf is from khashabats of Basra, also called Konkala, that are signs made out of wood and installed in the sea. The distance from this area to Oman Sea is about 300 miles” (Masoudi, 1864:147).

According to the above discussions, it can be concluded that marine lights were mostly employed at the head of the Persian Gulf. In most historical and geographical resources, the area of using khashabats were Basra, Oboleh, Abbadan (Abadan), Mesopotamia⁴ (Hamavi, 1987:239), Bahrain,
Mahrouban, Siraf, and even Masqat, and Sohar in Oman and at the mouth of Indus River. All in all, it can be claimed that khashabats were constructed and established at the mouth of big rivers ending in Persian Gulf from where muds and sediments entered the sea and resulted in creating bays. In the Persian Gulf where the Tigris, Euphrates and Karun rivers reaches each other, a relatively big bay is emerged. As a result, the sea becomes shallow. This issue results in problems for ships. Iranians solved this problem in the Persian Gulf using khashabats. [Fig. 1]

![Fig. 1: Geographic range of khashabats in the Persian Gulf.](image)

**e. The structure and features of khashabats**

Nasir Khusraw who visited khashabats, describes their structures:

“[t]heir columns are four big teaks like catapults with wide bases. Their heads are narrow. Their heights above sea level are about four feet. On their tops, there are stones and pottery containers fastened to each other with wood. They are called
khashabats. Some people say that they were constructed by a merchant and some others say they were constructed by a king. Nevertheless, they both had intentions: to save ships from getting stuck in sediments of that area, and secondly to warn them of pirates. When we passed by khashabats, we saw a Nabeh without any dome. After that, were reached Mahrouban” (Ghobadiani, 1976:163).

Hafiz-i Abru describes khashabats as follows:

“khashabats exist near Abbadan- around Basra- where marshes and drainage of the Euphrates and Tigris rivers poured into the sea. The distance from Abbadan to that place is about six miles. The depth of the body of water in that area is shallow; thus ships may be in danger. In those locations, timbers have been raised up as catapults. The bases of those khashabats are reinforced with a lot of pieces of wood. There are domes of pieces of wood for watches to ignite fires on the top of those khashabats. Those khashabats cannot be seen in days because their distances is very far from the coast. The mouth of the Tigris River is the border where ships must not trespass” (Hafiz i-Abru, 1996:239).

As discussed, the structural features of khashabats can be explained as follows:

- Each khashabat (lighthouse) had four bases made of wood. Wood has been used as one of the materials in Iranian buildings since the ancient time. Wood was used in chambers of royal emirates in Shush and Persepolis in the Achaemenid era (Farsahd, 1987:730).
- In the design of khashabats, the quadrangular bases were underwater. As they went up, the quadrangular got smaller, that is to say their heads were smaller than the bases. This design was adopted for the increase in the strength and resistance against typhoons.
- Their heights were 40 meters above the sea level.
- On the top of them, there were dome shaped and pottery-roofed cubicles for watches.
- In their cubicles, there were places for igniting fire.
- The distance of one khashabat with another was in such a way that when one of them was out of sight, another appeared.
f. The function and significance of khashabats in navigation

With regard to descriptions and explanations of Muqaddasi, Nasir Khusraw, Soleiman, and Sirafi, Hafiz i-Abru, and other historians and geographers, it can be inferred that khashabats and lighthouses were of two types which in spite of commonalities in goals and duties, they had different functions. Apparently, one type of khashabats were merely used for watches; therefore, ignition in them seems unlikely because the fire for guiding ships must have been very big to be seen by captains. On the top of that type of khashabats, there were some tombs and chambers as shelters for watches. The significance of khashabats type one is in their determination of shallow places of a body of water and the existence of underwater big rocks. In addition, sailors and watches in those khashabats were responsible for transferring news about the coming of ships to officials in ports or in case of observing pirates, they informed military bases to fight them. Therefore, khashabats had military functions as well. [Fig. 2]
But the khahsbats type two were lacking in chambers and tombs because fire was ignited on the top of them. However, there were some officers responsible for igniting fire at night. The significance of this type of khashabats was for nights because the ignited fires were for guiding ships in order to find their ways at night and in mists, while khashabats type I were used in days. Nevertheless, these two types both had common function of indicating shallow places of a body of water and guiding ships. [Fig. 3]
As a result, it can be concluded from the above discussions that khashabats were considered significant in the ancient navigation. Ferdowsi describes khashabats in Shahnama that:

“Come to explain you what are khashabats***a wise man has established them in waters… When a ship observe them from a distance***and see fires blazing out of them… It follows the right direction as fires show***and the shipmaster thinks so.”

Therefore, khashabats have been very significant for maritime transportations and the development of business and trades in the Persian Gulf in that the economic life of people living in ports and harbors of the Persian Gulf ranging from the eastern coasts of the Tigris River to Makran plains and Baluchistan, and from the western bank of the Tigris River to southern coasts of the Persian Gulf and around Arab Peninsula.
as well as those who were known as Babylonian, Sumerian, Arabic, Zangi and Yemeni having lived in other parts of the region all needed the sea and maritime business. As a consequence, residents in the coasts of the Persian Gulf have always intended to find routes, instruments, and technologies for ships to navigate as rapidly and safely as possible, and one of those technologies was khashabats.

**Conclusion**

According to information obtained from writings and observations of historians and geographers, navigation has been a dangerous profession when ships are approaching coasts of the Persian Gulf. Therefore, in the ancient times (the Achaemenid and specially Darius the Great), Iranians constructed constructions made of wood and ignited fires for signing the ships and warning them of dangerous and shallow parts of the body of water in coasts. In navigation of the previous centuries, this type of construction has been called khashabat. Those khashabats played a significant role in navigation of the ancient sailors in that their structure acted as lighthouses for the current sailors and helmsmen. The distance of those khashabats from each other was as far as when one got out of sight, the other appeared. The most reasons and goals of constructing those towers were as follows:

1. To guide ships at night by igniting fires on the top of them because when the sea level went up in shallow lands, there was a danger that ships got stuck in sediments of that area;
2. When sailors saw lights in darkness, they could find their ways among mists and darkness;
3. They were used for watching and determining routes for ships in days.
As observed, lighthouses and maritime signs have been one of the innovations of ancient Iranians; therefore it can be assured that current advanced lighthouses and maritime signs mixed with modern technologies and completed with modern advances are rooted in Iranians’ intelligence used in the Persian Gulf.

EndNotes

1 گنر کرد از آن پس به کشتی بر آب *** ز کشور به کشور برآمد شتاب
2 بزد کوس و برداشت از نیمروز *** شده شاد دل، شاه گیتی فروز - ز ایران بشت تا به توران و چین *** گنر کرد از آن پس به مکران زمین
3 بی انداره کشتی و زورق بساخت *** مبیاراست لشکر بدو در شناخت خبر شد بخیاران که کاوس شهر *** برآمد ز آب زره با سپاه
4 - An island where Abadan is in its west beside the Aravand River. It was called Mesopotamia. “Mesopotamia means in between rivers and it is a kind of island in lower parts of Basra of which Abadan is a part”.
5 - Iranians called it “Mazun” in the ancient times.
6 - Khashbab
7 - They were mostly made of palm trees.
8 - Its design were in the form of current towers.

Bibliography:


Biography

Mostaf Karimi holds an M.A. in history, focusing on Persian Gulf Studies. Graduating from the University of Tehran, his dissertation title is: “The historical process of maritime culture in the Persian Gulf”. He is currently a lecturer at the University of Tehran. He is the author of "Maritime Culture of The Persian Gulf" and Co-author of the encyclopedia of the Persian Gulf. He has written several articles about the Persian Gulf for international and domestic magazines.
Underwater Archeological investigation of Bushehr coastlines in Persian Gulf

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Abstract:

When the Research Department of the University of Medical Sciences of Bushehr was studying marine biomedicine around the Bushehr peninsula they inadvertently discovered some pottery fragments. They then reported it to the Bushehr province Cultural Heritage organization. In the summer of 2016, the underwater archaeology group of the Iranian Center for Archaeological Research (ICAR) surveyed the Bushehr coastlines for a month. During this field research, we identified and recorded the distribution of Sassanid pottery over approximately one kilometer square in the seabed around the Bushehr peninsula. Based on findings of pottery assemblages consisting of fragments of food storage vessels, Torpedo amphora, and turquoise ceramic glaze; it was assessed that this archaeological site represents the cargo of a shipwreck which sank in shallow water near the coastline. Over time, the cargo then spread across the seabed. We can observe the shipwreck processing in this case. At the first season of this field research, we could not identify the remains of the shipwreck hull but lots of fragments of torpedo shaped ceramic vessels were recored. Relative dating proved that all of the ceramic findings are related to the Sassanid era (224 to 651 CE). The quantity of sherds found proved that this is in fact a shipwreck site. Identification of the archaeological sites with torpedo shaped ceramic vessels distributed around the Persian Gulf indicate that regional maritime trade was widespread, in particular the Sassanid wine trade, and that seafaring practices were occurring in one of the ancient canals of Indian ocean. In this article, we explain about underwater archaeological investigations of Bushehr coastlines and outstanding ceramic findings including torpedo shaped ceramic vessels and turquoise
ceramic glaze wares that were used in maritime trade in the Persian Gulf during the Sassanid and early Islamic periods.

**Keywords**: Persian Gulf, underwater archaeology, Bushehr port, Sassanid era, torpedo–shaped ceramic and turquoise ceramic glaze.

1. Introduction

The Persian Gulf (also Persian Sea), is a crossroad connecting all civilizations, which is also a place of shipwrecks. Over recent years and as a consequence of underwater archaeological investigations in the northern shores of the Persian Gulf, a number of historical areas and wrecked ships have been identified (Tofighian, 2014, 2014a, 2014b, 2016, 2017). Bushehr Port is one of those underwater archaeological areas in which historical ships have wrecked. This area has a special significance for researchers. During the field study, a number of dragon-shaped jars, pottery containers, glazed pottery parts, and a stone anchor were found. This underwater area, which was first identified by researchers of the Marine Medical Center affiliated to the Bushehr University of Medical Sciences, is within 500 meters of the shoreline of Bushehr Port and from the Customs wharf to the building of Bushehr City Council. The site covers a spread of pottery containers at a depth between 3 to 6 meters. Before starting underwater investigations, the objects found were documented by the Marine Medical Center affiliated to Bushehr University of Medical Sciences. Given that some part of the explored pottery containers had been identified by researchers of the Marine Medical Center, no information of exact location of the underwater objects was at hand, but big jars for water and food storage informed the researchers that a ship had wrecked on the seabed. Only does the diversity of the explored containers and their abundance show the existence of a large and important underwater archaeological site. In addition, big jars of water and
food storage signify the existence of a shipwreck in the seabed. The efforts exerted by a group conducting underwater investigations and explorations were successful in spite of difficult conditions caused by insufficient underwater visibility and significant destruction having imposed to the underwater area. As a result, underwater archaeologists succeeded to explore a number of dragon-shaped jars and turquoise glazed pottery in the seabed.

2. The research area

Bushehr Port is the capital of Bushehr Province, one of the Iranian southern provinces. "Nadir Shah Afshar" re-boomed the current Bushehr port in 1736. The name of this port was "Rishahr" in the ancient times. The foundation and construction of this port date back to "Ardeshir" I of the Sassanid. The resources referring to "Ardeshir" the Unifier mention a port called "Bokht Ardesshir". Those resources, along with other documents, show the significance of the Persian Gulf for the early Sassanid kings. The significance of Bushehr Port was so great that "Bokht Ardesshir" was connected by a road to Kazeroun and Shiraz through which exported goods were transported to other areas. But the current Bushehr Port with a history of 300 years was founded by Abu Mahiri, the son of Shaikh Nasser Khan Al-Mazkur (the shipmaster of Nadir Shah and the founder of Al-Mazkur dynasty) in 1735. The reason for the foundation of this city was that Nadir Shah wanted to construct a port in the south of Iran and establish navy. This port became so prosperous that was considered as rival to Basra (Fig. 1 & 2) Traces and works dating back to pre-history (such as "Tal sabz or Tal Pitel", the Elamite period (Lian), and the Sassanid and Islamic periods can be observed in Bushehr Peninsula. The Castle and Port of "Rishahr", the Sassanid Cemetery in "Shoghab", and the Sassanid "Hezar Mardan" Port are some of the monuments in this
area. The underwater ancient area studied in the present research is located at a distance of 500 meters from the shoreline of Bushehr Port and between the customs dock and the building of Bushehr City Council. This area is located at a depth of three to six meters under the sea covering an area about 700 meters along the shore and an approximate width of two hundred and fifty meters on the sandy bed of shallow body of water of Bushehr Peninsula. This area has been severely destroyed because of its proximity to the shore and the expansion of customs docks on the one hand and military maneuvers on the other hand.

Fig. 1 Location of Bushehr and the surrounding archaeological site. (Tofighian, 2016)
3. Methodology

The explored underwater objects are the most important instruments for underwater investigations (Maarleveld, 1987: 35). But in investigating shores of Bushehr Port, lowest light and water clarity was available for divers. The area for investigations identified by the research team of the Marine Medical Center (Fig. 3) was drawn on a base map. This area with seven hundred meters long and two hundred and fifty meters wide was investigated. To begin underwater investigations, the team had to identify the starting and ending points on the seabed. With regard to permanent water movements, identification of the points were possible only via a few floating watermarks attached to heavy weights. The starting point of the investigation was recorded by GPS on a boat and the first buoy was fixed.
in the area. To start underwater investigations, the two following methods were employed:

1. The beginning and the end of the area was determined by two buoys (watermarks). Then, the investigators started searching along the rope and after finishing this search round, the two buoys were displaced in the width direction of the area and the other part of the seabed as searched.

2. Appropriate spots of the study area were recorded by buoys and GPS. Then, a rope was fastened to a buoy and divers started searching around this point in circularly. After completing each round, the radius of this circle got opener and a larger area was investigated. With regard to severe underwater streams, diving was impossible without the rope and buoys. In the second method, the second part of the area was conducted and all investigated spots were recorded via GPS and drawn on the basemap.

In modern methods, the seabed are scanned via devices and techniques such as Sonar; then the obtained pictures are interpreted on a monitor via which underwater topologies and cultural phenomena are identified.
Nowadays, Iranian archaeologists have no access to efficient and advanced underwater equipment.

For better understanding of the conditions of the shores of the study area and the possibility of identifying the potential shipwreck with regard to the shallow body of water, the investigators imaged the study area employing a quadcopter. Imaging from a low height in the shallow shores of the area and with regard to possible penumbras can be effective on identifying the traces of docks and debris of historical harbors. Thus the investigators tried to identify possible evidence and historical findings via the quadcopter. However, the taken pictures were not effective on underwater archaeological investigations in Bushehr shores. In addition, the study area was investigated via the Sonar Scanner Finger Feeder installed on a boat. But due to smoothness of sandy shallow seabed in Bushehr shores, the pictures obtained from Sonar were not effective. Therefore, the only possible method for investigating those shores was that professional divers search the seabed with under the supervision of the Marine Medical Center of Bushehr. This method was also conducted with difficulties.

4. Findings

The results obtained from survey investigations of the dispersion of broken and intact pottery as well as the stone anchor indicate the existence of an area belonging to a shipwreck in the shallow part of Bushehr Peninsula. The objects were obtained in different time intervals and no unity was found among them. The dragon-shaped pottery containers were in fact middle-sized jars with horizontal handles and a number of turquoise glazed jars as well as a number of small deposited containers made dating the site possible (Fig. 4-6).
Fig. 4 (left): The remains of torpedo amphorae in shallow water around the southern of Bushehr Peninsula. (Tofighian, 2016)

Fig. 5 (below): The remains of second torpedo amphorae in shallow water around the southern of Bushehr Peninsula. (Tofighian, 2016)
Dragon-shaped pottery jars dated back to late Parthian period to Sassanid period as well as the two first centuries of the Islamic period in maritime trading of the Persian Gulf for shipping valuable liquids such as olive oil, salty fish, wine, and seeds from Iranian ports to Arabian ports of the Persian Gulf, the Indian subcontinent, East Asian and East Africa with bitumen-painted inside surfaces for making them water-resistant. In addition, turquoise and green glazed pottery, as the most significant pottery of the Sassanid period, were observed among the explored objects which in addition to historical Iranian ports and areas of the Persian Gulf, have been found Arabic shores, East Africa, Indian subcontinent, and East Asia. It shows the expansion of the trading network of the Sassanid era in the Persian Gulf.

One of the most important findings obtained from archaeological investigations in the shallow bodies of water in Bushehr Peninsula was a piece of oval rock with three holes (Fig.7). Unfortunately, no trace of a shipwreck was observed. Thus only its severely destructed and sporadic shipments were identified. Doing complementary investigations can significantly contribute to better understanding of the real nature of this underwater area.
Analysis and comparison of the pottery explored from the underwater area in Bushehr Port

A large variety of pottery related to the Sassanid period were identified in the areas around the shores of the Persian Gulf. The most important explored pottery were the elegant orange painted pottery (Namard), grey small pottery, kneading pottery, big ornate jars and jugs for water and food storage, and more frequently, dragon-shaped and glazed pottery. Pottery with honeycomb decorations are other types of the Sassanid pottery observed frequently in Siraf, but dating those pottery has been doubted by a number of archaeologists (Simpson, 1992: 296).

In archaeological investigations and identifications of the shores of Bushehr Port, three intact dragon-shaped jars with bitumen glaze inside them and a more number of broken pieces of dragon-shaped jars were explored. In this investigation, a number of glazed pottery containers dating back to the Sassanid era were explored as well. Dragon-shaped
pottery explored in Bushehr Port are comparable with the instances obtained from the Sassanid areas of the northern and southern shores of the Persian Gulf. In addition, the number of Monochrome glazed pottery containers can be observed among the underwater findings of shores of Bushehr Port. This type of Sassanid pottery is comparable with a lot of pottery obtained from Sassanid areas of the Persian Gulf as well as other areas summarily discussed as follows.

4.1 Dragon-shaped pottery

One of the most important findings of the studies conducted on the pottery is that all pottery obtained from northern and southern shores of the Persian Gulf, the Indian subcontinent, and East Africa have been originally Iranian. This pottery is mainly dragon-shaped (Simpson, 1992: 291). The clay of those pottery in which bind materials such as abundant sand and fine dense sand grains are used are yellow or fallow. The external surface of containers are decorated and the inside surface is bitumen-glazed (Connan et al. 1998). Another main characteristic of this pottery type is its coils, cylindrical body without a neck, and a long and hollow insole (Adamz, 1970: 100). This pottery type is also called Torpedo Fuse Point. The bottom of this dish is called Spizfuss (Finster & Schmidt, 1976: 92)

All in all, dragon-shaped jars (Torpedo) refer to those jars that have sharp bases and relatively open mouths. They were appropriate for carrying liquids in maritime trading. Those jars were made in different dimensions. Their inside surfaces were all bitumen-glazed in order that nothing can penetrate into the containers and spoil liquids. The arrangement of amphora were very easy because of sharpness of their bases, openness of their mouths, and the lack of necks in such a way that they did not shake by ships' shaking. According to archaeological studies, dragon-
shaped jars in the Persian Gulf date back the early Parthian period to the early Sassanid period and the two first Islamic period (about one thousand years) (Simpson, 1992: 291)

This pottery has been identified in most parts of northern and southern ports in the Persian Gulf as well as trans-coastal areas such as areas in "Bandar Rig", "Mahrouyan", "Siniz", "Hezar Mardan", "Gurestan Shoghab", "Rishahr", and southern shores of Bushehr Peninsula such as areas of "Jalali", "Siraf", historical shop of Siraf, and Nay "Band" Bay. In addition, some samples in trans-coastal areas such as Shush, Mianab Plain of Shushtar, Galalak of Shushtar, a sample in Museum of Ancient Iran, two samples in the Museum of London, and other samples of dragon-shaped jars are comparable to those explored from underwater areas of Bushehr Peninsula (Tofighian, 2014). In southern shores of the Persian Gulf such as areas of Maliha, Eddor, Sohar, Jazirat al-Ghanam, Qana in Yemen, Kush and Al-Qosur in Kuwait, East Africa, and Indian sub-continent, dragon-shaped jars were explored (Tofighian, 2014).

4.2 Turquoise monochrome glazed pottery

Well-baked glazed pottery with pepper paste and cream color made of binders of sand and better glaze is one of the main characteristics of the Sassanid pottery mainly made in Mesopotamia and Khuzestan (Mason & Keal 1991: 52). Glazed pottery of the Sassanid period, particularly turquoise pottery, are mostly observed in the Persian Gulf ports of the Sassanid and early Islamic periods. In "Mahrouyan" (Tofighian & Esmaeili, 2010: 275), the area of "Jaborj" near "Genaveh Port", "Rishahr", "Najiram (Bataneh)" (Tofighian, 2009), Siraf and a number of areas in "Hormozgan" such as "Ramchah", "Rigo", and "Soza" in "Qeshm" Island (Khosrowzadeh, 2006), instances of the Sassanid turquoise pottery were explored. In shores of the Persian Gulf, East Africa, and East Asia, some
instances of monochrome glazed pottery have been explored. They can be comparable with the glaze pottery explored in underwater areas of Bushehr Port.

5. Conclusion

By doing underwater archaeological investigations and explorations of shores of Bushehr Peninsula, the following results were obtained: in shallow water in opposite Bushehr Port, an ancient site at a depth of 3 to 6 meters was identified. During investigations and with regard to exploration of dragon-shaped jars used for carrying wine, it was identified that the site is probably the place of an ancient shipwreck.

In addition, investigations conducted on the broken and intact pottery as well as a stone anchor, the following results were obtained:

a. Three intact dragon-shaped jars in different sizes in which were bitumen-glazed were explored. In addition, more numbers of broken pieces of dragon-shaped jars indicate a large number of jars in the explored area. In fact, the large number of dragon-shaped jars in those shores have been explored by local fishers. This jars can belong to the identified ancient area in Bushehr Peninsula.

b. A big glazed jar with turquoise green, some smaller jars mainly with pale glaze, and some unglazed small to moderate jars with four handles were explored.

c. A large number of broken and deposited pieces were also explored. The diverse shapes of those broken jars show the abundance of pottery containers in that historical wrecked ship.

d. A stone anchor with three holes on its body were explored as well. This anchor remained in the seabed because of its high weight and big size.
According to initial studies on the pieces of explored pottery, especially turquoise green dragon-shaped ones rooted in the Sassanid period, dating this area may refer to the Sassanid and early Islamic periods.

According to the evidence obtained from the stone anchor, small and moderate containers for food and water storage, and identification of a diverse number of dragon-shaped jars, the explored area may belong to maritime a cargo ship having been wrecked in that site. A large number of the jars were arranged in the cargo carrying valuable liquids such as oils and wine from Iranian ports to other destinations. Better understanding of this area and access to their real identity require more field studies in future.

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Session 6: History and Current Trends of Underwater Archaeology around East Asia

Abstract

East Asia is extremely rich in underwater cultural heritage, such as conventional shipwrecks under the sea, submerged settlement sites on the bottoms of inland lakes and rivers, or prehistoric shell mounds along coastal zones. For instance, the medieval or post-medieval wrecks and their cargos have recently been discovered one after another in the waters, as the underwater cultural heritage or seascape of stone tidal weir is a common cultural trait to the Ryukyu archipelago, western Japan, southern Korea, mainland China, and Formosa, which surround the East China Sea or a northern part of the Asian Mediterranean. No East Asian nation has ratified the UNESCO 2001 Convention, partly because it does not exactly correspond with oriental philosophy, it does not properly resolve the controversial issues upon sovereign immunity of warship wrecks, and so forth. Occasionally, the principle of preservation *in situ* in the convention has not been the first choice as Asian waters have poor water clarity generally. Nevertheless, each country has already moved forward with its own underwater archaeological policies and projects both at governmental and grassroots levels. Some activities are in close cooperation with foreign institutions or universities.

In East Asia, document-based historical study or terrestrial archaeology has a long tradition, which has had a noteworthy impact upon underwater archaeology and its methodology. Even in this region as well as in other Pacific areas, contrariwise, remarkable technological advancement in underwater survey has been made recently; using remote-sensing with satellites, robotics for ROVs or AUVs, or 3D photogrammetry by computer software mitigates or cancels the limitations regarding accessibility and working time caused by underwater environment. The tie between such modern technologies and archaeology has minted new applications and perspectives of underwater cultural heritage study. The multi-disciplinary or holistic approaches are increasingly necessary among Asian researchers.
Session Chairs:  Prof. Dr. Akifumi Iwabuchi
Dr. Kotoro Yamafune
Abstract

Extensive distributional survey of the underwater cultural heritage revealed the disposition of 230 underwater cultural heritage sites in the Ryukyu Archipelago, and 23 sites out of 230 are identified as the wreck sites. Dates of these wrecks vary from the 12th to 20th centuries; nevertheless, all the Western shipwrecks found at six sites are dated to within about 100 years between the latter half of the 18th century to the 19th century. This presentation is about the Western shipwrecks left in the sea area of the Ryukyu Kingdom. From the late 18th century, the ships from the Western powers stared to appear frequently. Historical documents describes that those ships had not intended to come to the kingdom, but were wrecked due to maritime accidents. Such incidents brought opportunities for local population to come into contact with the Westerners through rescuing the wrecks and their crews. Historical documents and local lore, confirmed by the material evidence retrieved from the seabed, show that those contacts in some cases developed to the cultural interaction between local governments, or even nation-to-nation. Moreover, the stories of the accidents and rescue efforts by the local have long been handed down from generation to generation as moving tales. In fact, there are some cases that those tales were materialised, for instance in forms of a reconstructed Western ship
facilitated as play equipment in a local park near the wreck site, as well as an amusement park themed under the country of the wreck’s nationality. This research aims to present how the archaeological evidence confirm historical records related to the Western shipwrecks though the result of investigation of underwater cultural heritage, as well as to analyse how those initial contacts with the Westerners though the wreck accidents developed into the cultural interaction which can be influential even now.

Key words: Ryukyu Archipelago, shipwrecks, survey

Introduction
The Ryukyu Archipelago consists of 199 islands, in a stunning vast sea area over 1200km between Kyushu Island, located at southern end of the Japanese Archipelago, and Taiwan. The largest island among the Ryukyu Archipelago is Okinawa Island, where the present prefectural government is seated. It is located almost at the centre of the archipelago (Fig. 1). Being different from the Japanese Archipelago, the islands of Ryukyu are under subtropical climate, warm throughout the year. Surrounded by the amazingly beautiful ocean and coral reefs, the area is also known for scuba diving and other marine sports.
Various kinds of underwater cultural heritage have been discovered so far and the authors have been continuously undertaking investigations and researches (Katagiri, et al., 2014a and Ono et al., 2016). Results of our distributional survey on underwater cultural heritage and its experimental presentation in the Ryukyu Archipelago were presented at APCONF, Hawaii in 2014 (Katagiri et al., 2014b). Researches on the wreck sites and sea routes of the ships in the Ryukyu Archipelago were presented at IKUWA, Australia in 2016 (Katagiri et al., 2016). This presentation focuses on the Western shipwreck sites among the shipwreck sites discovered in the Ryukyu Archipelago.
Historical Background

There once was an independent kingdom in the Ryukyu Archipelago, called the Ryukyu Kingdom from 1429AD to 1879AD. There was the capital palace, Shurijo, in Okinawa Island, the largest among the archipelago. The palace was the hub of the kingdom where the Ryukyu King who rules the islands lived. The Ryukyu Kingdom was a maritime state having thrived during the medieval, the 15th centuries, owing much to the special relationship with the Ming Dynasty China regarding the trades. It greatly flourished on transit trade connecting Japan, Korea, China and Southeast Asia. The international Naha Port was the centre of the international trades (Fig. 1). In the following early modern times from the 17th to 19th centuries, while subordinating to both Qing Dynasty China and Japan, the kingdom prospered many original aspects in their complex culture. On one hand, the kingdom had established domestic trade networks among the islands. On the other hand, the Tokugawa Shogunate prohibited international trades with other countries than China under the policy of national isolation (‘Sakoku’) and the kingdom was becoming isolated from international community. Nevertheless, since the latter half of the 18th century, the ships of the Western great powers started to appear in the sea areas of the kingdom. People in the kingdom started to have contacts with Western ships and the Westerners through rescue of the Western ships stranded in the neighbouring sea areas. In a historical drawing on the folding screen, ‘Suirinahakozubyobu’ (owned by Okinawa Prefectural Museum and Art Museum) painted in the 19th century, depicting the prosperity of Naha Port, Western ships are also depicted (Fig. 2). Contrary to the national isolation foreign policy, it is proven that the Western ships frequently appeared in the sea area of the Ryukyu Archipelago and was regularly in contact with the Ryukyu Kingdom.
Fig. 2: Western Ships at Naha Port in the 19th Century

**Nationalities and Proportions of the Western Ships Discovered in the Ryukyu Archipelago**

Figure 3 shows the percentage of the shipwreck sites to the entire underwater cultural heritage discovered in the Ryukyu Archipelago, percentage of the Western shipwreck site to the entire shipwreck sites, and percentage of their nationalities. Underwater cultural heritage discovered in the Ryukyu Archipelago includes shipwreck sites, ports, production sites (like quarries, stone tidal weirs and salt pans) and submerged sites due to environmental change. The shipwreck sites total 23 sites, which accounts for ten percent of the whole.
Fig. 3: Percentage of the Shipwreck Sites in the Ryukyu Archipelago.

The shipwreck sites according to its nature can be categorized into three groups; those related to the trading, those not related to the trade, and the World War II related sites. The first group of the shipwreck sites relate to trading; this includes those of Chinese trade ships and domestic trade ships. Among the sites of Chinese trade ships, seven sites are dated to the medieval and one to the early modern period, both in total account for 35 percent of the whole shipwreck sites. All eight domestic trade ships sites are dated to the early modern period, which accounts for 35 percent of the whole showing the same proportion as Chinese trade ships. Chinese and domestic trades ships together count 16 sites, which accounts for 70 percent of the entire shipwreck sites in the Ryukyu Archipelago.

In contrast, the Western ships appeared in the sea area of the Ryukyu
Kingdom not for trades, but for other purposes. According to the historical documents, they were destined to travel to different places, but were stranded and sunk in Ryukyu due to typhoons or the like. Six sites with Western shipwrecks were identified so far, which accounts for 26 percent. The date of all six sites are concentrated within c. 100 years between the latter half of the 18th century and the latter half of the 19th century, which does not conflict with the historical background of the kingdom. Nationalities of the most Western shipwrecks were identified through the historical records. Four sites out of six are British ships, one Dutch, and one unidentified. Even though the evidence is limited, the British overwhelm the others.

**Location of the Western Shipwreck Sites**

Figure 4 shows location of the Western shipwreck sites found in the Ryukyu Archipelago (No. 1 to 6), as well as the location of the iron stock anchors of the Western ships (A to C) discovered both underwater and on land. Figure 5 is the respective pictures.
Fig. 4: Location of the Western Shipwreck Sites in the Ryukyu Archipelago.

Fig. 5: Pictures of the Western Shipwreck Sites.
Three Western shipwreck sites are identified in Okinawa Island (No. 1 to 3) where the capital Shurijo used to be located, two in Miyako Island (No. 4 and 5) and one in Tarama Island (No. 6). In Yaeyama Islands located at the southern border of the Ryukyu Kingdom, no site with Western shipwreck has been discovered so far. Moreover, regarding the iron stock anchors of the Western ships, two are found on land, one in Okinawa Island (A) and one in Tarama Island (B), as well as one underwater in the sea area around Yonaguni Island (C).

The Outline of the Respective Western Shipwreck Sites.

**Ginama Underwater Site (No. 1; A):**
The site is located off the coast of Kunigami Village in Okinawa Island, on the seabed of about seven meter deep. Nansei Islands Underwater Cultural Heritage Research Group discovered the site in 2002 (Miyagi et al., 2004). Fragments of the hull, such as copper nails, European ceramics, wine bottles and Chinese pottery pieces were found on the seabed. Historical documents revealed that the ship is a British ship called the Benares, departed from Hong Kong destined to San Francisco (Watanabe and Nii, 2013). Building stones of granite and an iron stock anchor reportedly retrieved from the British ships were left in the neighboring areas on land.

**Minamiukibarujima Underwater Site (No. 2):**
The site is located off the Coast of Minamiukibaru Island in Uruma City, Okinawa Island on the seabed of about 17 metre deep. It has been known for long by the local fishermen. Okinawa Prefectural Archaeological
Centre identified it as the Western shipwreck sites (Katagiri, 2009). Fragments of the hull, ballast, European ceramics, glass products, bullets and Chinese pottery pieces were found on the seabed. Historical documents describe that a Western ship was stranded and sunk in the sea off the island in 1876, but its nationality is unidentified (Heshikiya Azashi Henshu linkai, 2009).

**Indian Oak Wreck Site (No. 3):**
The site is located off the coast of Chatancho in Okinawa Island and found at a depth of about three metres. The Board of Education in Chatancho undertook the underwater investigation in 1984 and retrieved fragments of the hull like copper nails and pieces of copper sheathing, ballast stones, European ceramics, glass products, Chinese pottery pieces and the like were found. Historical documents revealed that the ship was the Indian Oak who had been fighting in the Opium War in 1840. The ship was drifted to the sea area while she had been transporting supplies (Nakamura, 1994).

**Yabiji Underwater Site No.3 (No. 4):**
The site is found at a depth of about 13 metres around the coral reef called Yabiji located in the sea area north of Miyako Island. The site was identified by the survey of Okinawa Prefectural Archaeological Center (Katagiri, 2009). Metal parts of the hull, European ceramics, glass products and iron ingot like products were discovered from the seabed. Historical documents indicate that the ship could be assumed as HMS Providence stranded in 1797 during her exploratory voyage in the North Pacific (Nagamine, 1997).

**Yoshinokaiganoki Underwater Site (No. 5):**
The site is located off Yoshino Coast of Miyako Island, found on the seabed at about five metres deep. The Okinawa Prefectural Archaeological Centre discovered the site in 2008 (Katagiri, 2009). Many pieces of granite stone blocks processed into cuboid shape are scattered on the seabed. Fragments of the hull, for instance copper sheathing, as well as Thai pottery pieces were also found (Arakaki, 2017). Historical documents indicates that the ship could have been a British ship stranded and sunk in 1853 on the way from Guangzhou in China to San Francisco. The document shows that only 6 crew out of 30 and 24 Coolies out of 243 survived, and thus 243 people died of this accident (Taira, 2001).

**Takadakaigainoki Underwater Site (No. 6):**
The site is located off Takada Coast of Tarama Island. Many pieces of pottery are scattered on the seabed at about 25 metre deep. The place was reportedly known among the islanders as the site where a Dutch ship had been stranded and sunk. The Okinawa Prefectural Archaeological Center undertook the first underwater survey in 2008 and identified that the site covers large area (Katagiri, 2010). Fragments of the hull, including copper nails, metal products, and Chinese ceramic pieces were found on the seabed (Arakaki, 2017). Historical documents reveal that the ship was a Dutch ship called Van Bosse, stranded and sunk in 1857 on the way from Shanghai to Singapore (Kaneda, 2001). There is an iron stock anchor reported to be retrieved from this ship (B) left on land, as well as a ceramic piece incised as ‘AMSTERDAM’ and Chinese pottery assumed to be the cargo (Miyagi et al., 2004). The Tarama Village Board of Education and Kyushu National Museum recently undertook comprehensive investigation and the use of metal detector revealed that the fragments of the hull were still buried in the sandy seabed (Sasaki, 2017).
Iron Stock Anchor off the Coast of Irizaki, Yonaguni Island (C):
It is not identified as a Western shipwreck site, but an iron stock anchor of Western design was discovered off the coast of Irizaki at Yonaguni Island, on the seabed about 26 metre deep (Katagiri and Yamamoto, 2014). Its nationality and other details are unknown.

**Influence on the Contemporary Society**

It is generally said that Captain Basil Hall was the first Westerner visited Ryukyu and introduced to Europe geography, customs, political and economic states and the like of Ryukyu based on his careful observation. On his way going back to Britain, he interviewed to Napoleon Buonaparte at St. Helena Island. It is a famous story that he told Buonaparte that people of Loo Choo (Ryukyu) had no arms, used no money and knew nothing of Europe and His Majesty Napoleon Buonaparte (Hall, 1851 and 1986). Interestingly, Hall was convinced that the people in Ryukyu did not use money as they did not receive payment of any kind from Hall’s company for gratitude to all good things sent on board (Hall, 1851). This description coincides with descriptions often seen in the historic document of the western sides that shows surprise on Ryukyu people’s hospitality with no expectation in return. Since then, Western ships coming to Ryukyu dramatically increased. The phenomenon was not only reported by oral histories and historical records, but also proved by the material evidence at many underwater wreck sites of the Western ships by their discoveries around the Ryukyu Archipelago.

The influence of those Western shipwrecks is seen even now. There is a park near the wreck site of Indian Oak (No.3), a British ship joined the
Opium War in 1840, and the play equipment set there in the design of the reconstructed Indian Oak (Fig. 6). Moreover, there is a theme park caller ‘German Village’ in Miyako Island near the reportedly wreck site of a German ship, the R. J. Robertson (even though the site not mentioned above in this presentation as was not identified in the sea). The theme park is run by the municipality of Miyako City and people of the island are proud of the history of the rescue. Triggered by those rescue stories, the UK Prime Minister Tony Blair and the German Prime Minister Gerhard Schröder visited Chatancho and Miyako City respectively to strengthen cultural exchanges when a summit conference had been held at Okinawa in 2000. In case of HMS Providence, although no park nor theme park, the local volunteers organised a group to commemorate HMS Providence (HMS Providence wo Kataru Kai). The group promotes cultural exchanges with England as the country of her origin and Hokkaido where she called at.

Fig. 5 (left): Picture of the Western Shipwreck Sites.
Curiously, it is often said in gossip that many beautiful women with fair skin were born in the villages near the sites where the Western ships had stranded and the Westerner crews were rescued. Those incidents prove that history of shipwrecks and their rescue stories dated back to more than a hundred years ago still has great influences on current society as bridging cultural exchanges between the Western world and Okinawa. Shipwreck sites in Okinawa are the valuable heritage as the material evidence of those incidents. In the future, further investigation and research on the Western shipwreck sites could promote cultural exchanges of the related countries and local places through exchanging and sharing information. The result of such activities could even be a trigger to develop large-scale international cultural interactions which could be a leading model-case project representing current globalised society.

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Biographies

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Who Were the Africans in Eastern Asia? : The Christian European Period 1500-1900 AD

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Abstract

Seaways, especially monsoonal ones, allow movement on two directions. However Eurocentric approaches have tended to create hierarchies of cultures which have biased movements in particular directions to the historical exclusion of some narratives. This is a fresh look at a cultural connection from a perspective that has evaded investigation and seeks to balance the research on Chinese interactions with Africans in Africa. Africans have been trading with Asia for hundreds of years, yet their history and presence in East Asia has been barely suggested or investigated. The role of African crewmen is an important part of this narrative and one that brings a new dimension (if not challenges) to ethnographic studies of maritime cultural landscapes and seascapes.

Key words: Africa, China, interactions, exchange, ethnography

Introduction

In this paper an African is defined as a person whose ancestors were born in Africa, Therefore discourse not limited to people who are perceived or perceive themselves as Black or indeed Black African.

Eastern Asia is defined as the territory roughly east of a line 92° East of the Meridian to 146° East, that is inclusive of Japan, North and South Korea, Taiwan, the Philippines, China and both mainland and maritime Southeast Asia.

The paper proposes to answer four fundamental yet simple questions:
1) Who were the Africans that came to Eastern Asia (Origins)?
2) How did they get to Eastern Asia (Routes)?
3) What were they known as in Eastern Asia and why (Exonyms)?
4) What was the nature of their lives in Southeast Asia (Socio-economic and Political Agency)?


1) The Hindu-Buddhist Asian period 300BC-700 AD.
2) The Islamic Asian period 700-1500 AD
3) The Christian European period 1500-1900 AD
4) The Modern Period 1900-2000 AD.

It is impossible to cover such an immense timeframe within this paper; however, a concise bibliography is included for reference and future research. This paper will concentrate on the evidence provided for period 3, which has been termed ‘The Christian European period 1500-1900 AD’ for the simple reason that the majority of the evidence for this period is from European sources. The paper examines this and other available evidence before reaching the conclusion.

The Evidence

Prior to the sixteenth century, Africans that were not Christians or Muslims were regarded as infidels or *Qaffiri* (**كافر**, singular) by the Arabs and Persians in Africa and in India (Pankhurst, 2003) and were allowed by the tenants of Islam to be enslaved. Generally, Christians in the Horn of Africa were mainly from the Amhara, Tagaru (or Tigrayna) people, and Muslims were from the coastal Tigre, Tagaru, Afar and Somali peoples. The major
pagan peoples at this time were mainly Oromoo and Sidama. All of these were Cushitic speakers. The coastal peoples were in-part the descendants of the Axumites – an important African maritime people.

Research has already established that the main flow of Africans in the Islamic Asian period 700-1500 AD (including the Tang, Yuan and Early Ming Dynasties) was ultimately from the Horn of Africa and along the Maritime Silk Route to Eastern Asia (Pankhurst, 2003 and Powers, 2010). This trend continued into the sixteenth century when the majority of Africans arriving in India, including pre-Portuguese Goa came through the port of Zeila which was the main exporter enslaved pagan Oromoo and free Abyssinians destined for India where they were called Habshis (Pankhurst, 2003) and this is confirmed by Linschoten (2005) ‘there are many Arabians and Abexiins in India’ and he notes that ‘there are many of them [Abexiins] in India that are captives and slaves’.

From the sixteenth century European records provide evidence of African presence in East Asia, starting in succession with the Portuguese, Spanish, Dutch, English and the finally the French.

Portuguese experiences in the Iberian Peninsula and in the Maghreb, had led them to describe all Muslims as Mouros or Moors. They understood that the process of Arabisation meant that Arabs were not a race, but a people. Arriving in East Africa in 1498 the Portuguese regarded the Muslim people that they encountered on the coast (i.e. Arab, Persian, Somali and Swahili) all as Moors – a term that they extended with their travels right across the Indian Ocean to the spice-producing Sultanates of the Malukas and Southern Philippines. Mistrust and trading necessities meant that they were reluctant to enslave these Moors. In fact, vastly
outnumbered and economically reliant on these Muslims produced a ‘keep your enemies close’ approach.

After the Portuguese established themselves in Southeast Africa (modern day Mozambique) enslaved Africans increasingly came from through Mozambique Island which they held from 1507, but this trade was still far below the Arab-Persian trade from the Horn of Africa. The Portuguese were quick to adopt the Arabic term as *Kaffirs* or *Cafres* for the enslaved pagan Africans as a trading commodity, a labour force, militia, and a prospective Catholic convert (de Silva Jayaruraya, 2008a).

There were in Goa ‘Many Persians, Arabians and *Abexijns*, some [of them] Christians and some [of them] Moors’. Linschoten (2005) notes the tattoos that identify the Christians and makes it clear that ‘these Abexiins… such as are free doe serve in al India for sailors and seafaring men with such merchants as sailed from Goa to China, Japon, Bengala, Mallaca, Ormus and all the Oriental coast.’ Linschoten explains that after arriving in India the Portuguese sailors are ‘ashamed to live in that order and think it is a great discredit unto them’. Interestingly he also explains that the *Abexiins* are hired on low wages and travel with their wives under a Portuguese Captain but possibly an Arab boatswain who oversees the *Abexiins*.

Charles Boxer (1997), historian of the Portuguese Empire noted that ‘Portuguese shipping in the inter-port trade of Asia was increasingly operated from the days of Albuquerque onwards, by Asian seamen working under a very few white or Eurasian officers. Even the great carracks of 1,000-2,000 tons which plied between Goa, Macao and Nagasaki might be entirely crewed by Asians and negro slaves’. However
Boxer is incorrect. The reputation of the Christian and Muslim Abyssinians as good sailors was widespread, though the enslaved Abexiin were actually animist (i.e. *kaffir*) Oromoo tribesmen, who had a strong military tradition and were often good horsemen. In several areas of the Indian Ocean and Western Pacific, piracy was endemic and Africans were rare enough for their presence to cause fear. It was therefore wise for the Portuguese to man their ships with *Abexiin* crew and for the Jesuits to have *kaffir* retainers and body guards. This explains the Africans arriving in Macau from the 1550’s on Portuguese ships and those depicted on the Japanese *Nanban Byobu* (southern Barbarian folding screens) in Japan.

In Siam (Thailand) King Chairacha entered relations with the Portuguese and allowed a trading and religious presence at Ayutthaya. In 1538 as an assurance against Burmese invasion and eager for Portuguese military technology he requested that the Portuguese actually retain a military presence which resulted in 130 Portuguese men being based in the established Portuguese settlement. Bearing in mind the paucity of Portuguese men in Asia, it could well be that many of these “Portuguese” were in fact Africans. There were definitely Japanese and Chinese Christians, and other Luso-Asians at the settlement which lasted until 1767 when the Burmese destroyed Ayutthaya.

During the early years in Goa the Jesuits employed slaves, and the Church Provincial Council of 1567 laid down precise rules for the keeping of slaves (Borges, 1994). Though in reality this was not the case in Eastern Asia. Perhaps the best known African of this period in East Asia was the one called Yasuke, who was an African retainer of the Japanese warlord Oda Nobunaga (1534-1582). Yasuke appears to have arrived in Japan in 1579 as part of the entourage of the Jesuit Visitor Alessandro.
Valignano. It was Nobunaga who gave the African the name Yasuke (Lockley, 2017). Both free and bonded helpers were members of the domestic staff of the Jesuits in the Japan Province, the majority of the former were Japanese, while the enslaved ones were Africans, Indians, Malays, Koreans or Japanese (Borges, 1994). Another African is mentioned in Japanese sources as a gunner in the service of Arima Harunobu in 1584.

The unification of the Portuguese and Spanish crowns between 1580 and 1640 resulted in the wars with the Dutch and ultimately the downfall of the Portuguese Eastern Empire. The same wars resulted in an acute shortage of soldiers throughout the seventeenth century. But the Portuguese considered sepoys (Indian soldiers) as physically unfit and preferred the more robust African soldiers (Sequeira-Antony, 2004). By the early seventeenth century, slaves were the largest non-Goan group living in the city of Goa, most of these were Africans who had come through Mozambique Island and other parts of Eastern Africa, and the rest were Asians. They served as caretakers, guards, servants, concubines and artisans. From Goa slaves were shipped to other Portuguese settlements and even to Lisbon (Borges, 1994). The first recorded African to enter the territory of modern South Korea was a personal servant attached to the Portuguese trader João Mendes, who was on a Japanese vessel blown off course by a typhoon while travelling between Phnom Penh and Nagasaki. They drifted on to the island of Tong Yong in 1604. It appears that João Mendes was on a diplomatic mission for Shogun Tokugawa Ieyasu (1543-1616) to the Khymer Kingdom (Kim, 2008). There was a Portuguese merchant and a Jesuit presence at Hoi An in Vietnam, but no substantial research has been done on the community to confirm an African presence.
Friar Domingo Navarette recorded the presence of African soldiers in Guangzhou in 1618 and confirmed that they were runaways from Macau (de Silva Jayaruraya, 2008a). In 1622 enslaved Africans defended the Portuguese base at Macau which the Dutch attacked with a force of 13 ships and 1300 men. The Portuguese numbered only 150 – two thirds of which were residents, mostly *mestiços*. Additionally there were Jesuit artillerist and decisively up to 100 armed African slaves. There are also observations in 1637 of the few Portuguese *cavalleros* (horsemen) being accompanied by Africans servants dressed in expensive red damask bearing lances on which were placed the crests of the Portuguese families. It appears that there were two Africans in Macau who acted as interpreters between the Portuguese and the Chinese. One of these, Antonio was a ‘Capher Eathiopian Abissen’. The other is described as a ‘Chincheo runaway from the Portugal’s at Macau’. He was therefore an enslaved African who had escaped from Macau possibly to the Chenghai District of Eastern Guangdong Province. Both men appear to have learnt Cantonese and therefore to have been in Southern China for some time (Pankhurst, 2003).

By the time Portugal gained her independence from Spain in 1640 as many as 5000 Africans lived in Macau and there were even special masses for their wives. They were employed mainly as enslaved personal servants to the men, as labourers and guards or soldiers. Enslaved Chinese females were preferred as household maids, cooks, wet-nurses and personal servants to the ‘Portuguese’ wives who were often *mestiços* (de Silva Jayaruraya, 2008a). By the early Qing Dynasty (1644-1912) Africans were definitely present in small numbers in Guangdong province as well as at Macau (de Silva Jayaruraya, 2008a). In 1651 the Governor of Macau requested ‘Negro’ soldiers rather than Mestiços from India (de
Silva Jayaruraya, 2008b). Friar Domingo Navarette again recorded the presence of African soldiers in Guangzhou in 1686 (de Silva Jayaruraya, 2008a). According to Brother José de Jesus, in 1745 there were in Macau:

‘twelve thousand men who at the same time dwelt there [...] between Portuguese, half-castes, Nhons [Japanese], Malays, Canarins [Goans], Timorese, Mozambicans [Mixed heritage from Mozambique Island], Malabars, Moors [Muslims], Kaffirs [Non-Muslim Africans], and other nations…….’ (Puga, 2013).

No information is available on the African presence in Spanish Formosa (1626-1642). The people of the Philippine islands had their own form of slavery before the arrival of the Spanish. In Tagalog these were called alipin. Africans must have arrived on the Spanish vessels across the Pacific from Acapulco as sailors, servants and slaves. The Spanish in the Philippines initially had their local Asian slaves, but in 1586 Philip II of Spain proposed to slowly eliminate enslavement of his Spanish Indies subjects by requesting all children to be born free and banning new slave purchases. The laws proved very successful but started a trend of purchasing foreigners (including Indians, Chinese and Malays, Koreans and Japanese) who were not subject to the king’s laws. The Portuguese seized the trading opportunity and brought enslaved Africans from the Indian Ocean for sale to the Spanish in the Philippines, these were known as esclavavos negros (negro slaves). By 1621 Africans constituted about a third of the Intramuros population at Manila. A Little work has been done on the African presence in the Spanish Indies in the Marianas which suggests an African presence from at least 1602. With the termination of Portuguese interaction, Africans disappear after 1640 and for the entire Tokugawa period. However, it would be interesting to know of any
evidence of Africans resident at Hirado or Deshima, or in Taiwan attached to the Dutch presence in the East Indies.

While the European trade in Africans from the Horn of Africa decreased the late eighteenth century saw Africans sold at Mozambique Island arriving at Macau through the Portuguese colonies of Diu, Damman and Goa. One of the traders was a Portuguese called Joaquim do Rosario Monteiro (Machado, 2003).

There is no information on Africans in the Maluku Islands. Considering their troubled history and the use of Africans as soldiers in Sri Lanka by the Dutch since the mid-seventeenth century one would expect some African presence in the region. Between 1831 and 1842 the Dutch attempted to recruit no fewer than 2,200 Africans for service in their colonial army, primarily in the Dutch East Indies. In the end they only contracted 44 men from Elmina Castle (Ghana). But another push for men recruited from Kumasi, mainly from non-Ashanti peoples in the North of present-day Ghana produced 2,200 men serving 15-year contracts. While a second attempt among the Ashanti produced 235 men. A consequence was that this militia was composed of men from different ethnic groups that spoke different languages. Mistrust among them was a challenge to the Dutch. To ensure against a mutiny the Dutch distributed them into separate companies and battalion. It appears that African liaisons with the Javanese and Sumatrans resulted in many of them being more fluent in Malay than Dutch. This gave them an advantage when organising themselves and making demands for equal pay or better living standards. By December 1841 there were 1,318 Africans in the Koninklijk Nederlandsch-Indisch Leger (Royal Netherlands-Indies Army). Recruitment had been vastly reduced at Africa, but in 1850 The Dutch
decided to resume African military recruitment in Elmina and 800 were 
recruited between 1860 and 1872, mainly from the Ashanti. In the Indies 
they were known by the term Londo Ireng in Javanese or Belinda Hitam 
(Black Dutch) in Malay. This recruitment ended in 1872 when Britain took 
over the Dutch possessions in the Gold Coast (i.e. Ghana), but many of 
these Africans stayed in Indonesia (mainly in Java) and married Malay 
women. They also had their own area of Purworejo called Kampung Afrikan. Here the community retained its distinct Afro-Indonesian culture. 
Soldiers who lived in other areas and were simply assimilated into 
Indonesian societies (van Kessel, 2008).

Around 1879 the Portuguese Governor of Timor had a battalion which 
included 200 Africans who the Timorese called Falikas. The 1881 census 
of Singapore includes Africans though their numbers were small (de Silva 
Jayaruraya, 2008a).

**Conclusion**

Initially most of the Africans who came to Eastern Asia on board 
Portuguese ships where from the present day Ethiopia and Eritrea, 
including the Tigre and Tagaru crewmen and pagan Oromoo or Sidama. 
Then increasingly from the seventeenth century onwards Africans came 
from among the Makua, Yao/Nyanja, and Maravi, of Mozambique, Malawi 
and Zimbabwe though the island of Mozambique from the seventeenth 
centuries.

Africans arriving with the Dutch in the eighteenth and nineteenth centuries 
initially came from West Africa, among the Akan and Dagbane language 
groups in modern day Ghana, Burkina Faso. There may have been a few 
Malagasy boarded at Cape Town.
Three distinct routes to East Asia for enslaved Africans can be discerned; the first and oldest route is from Zeila to Oman or Hormuz and on to the Gujarat on Arab Persian or Gujarati vessels. After purchase in Gujarat the route was through Goa to Macau and then to any Portuguese or Spanish port. From around 1600 the route was entirely on Portuguese vessels from Mozambique Island to Macau via Goa. The nineteenth century Dutch route was from Elmina in Ghana to Cape Town and directly to Batavia on Dutch vessels.

This period stands in stark contrast to previous ones for Africans and other people of colour arriving in Eastern Asia. Formally Africans had arrived as envoys, merchants, soldiers and slaves into a realm that was composed roughly of the same elements of stratified society that existed in Eastern Asia.

But the arrival of Africans with the Europeans was different. Africans of this period (1500-1900) arrived on European ships as sailors under European captains, or often in the entourage of the European merchants, and Jesuit missionaries. The Chinese used the term *Gui-nu* (Ghost-slave) for Africans, or in Cantonese *Gui-lo* (ghost man). In Japanese Africans were called *Kurobo* (Lockley, 2017) or *Kuronbo* in the Nagasaki dialect (Screech, 2017). So the Africans often arrived in a position subservient to Europeans who themselves were perceived, at least by the Chinese and Japanese, as Southern barbarians (*Nanbanjin* in Japanese) and therefore below the status of the Chinese and Japanese. This is perhaps most evident in the seventeenth century use of the Cantonese term *Gui-Nu* (ghost-slave) for Africans in Guangzhou, but also in the Japanese term *Kuronbo* (black novice monk). Both of these terms place the Africans as
African features and physique were clearly admired for strength (Lockley, 2017), however the subservient status that Africans held almost everywhere in Eastern Asia (in contrast to South Asia) fed into indigenous concepts of colour based on working status, caste, or in the case of the Burmese, Thais, Filipinos and Taiwanese on the perception of subjugated peoples such as the Mons, Khymers, enslaved Ternate Islanders, Taiwanese Aboriginals or Philippine Aboriginals (Blussé, 2009) who they thought of as Blacks. With the exception of Korea, Japan and much of China, Asians themselves would be colonised by Europeans adding to the stigma of dark colour, and its association with race, enhanced by the Atlantic Slave Trade and Euro-American concepts of racism.

Nevertheless, the adoption of Catholicism brought the Africans some support from the Catholic Church that effectively managed the civic life of both Portuguese and Spanish Asia. Friar Domingo Navarrete mentioned the wives of the “negroes” in Macau at mass, and in 1637 Peter Mundy mentions that these wives were Chinese slaves. So legitimate intermarriage between Africans and Chinese took place in Macao (de Silva Jayasuraya, 2008) and the resulting Afro-Chinese were absorbed in the Macanese community. Little work has been done on the African presence in the Philippines or in the Marianas, but presumably the same Catholic system was at work.

It seems that during the sixteenth and seventeenth centuries the largest concentration of Africans in Eastern Asia was at Portuguese Macau. Of course Macau was governed from Goa which was the terminus of all
Asian trade to and from Europe via Mozambique Island, and the African presence in both cities continues to the present day. But foci shifted to the Dutch city of Batavia in the nineteenth century. Africans arriving with the Dutch were concentrated in the Batavia area, where they served the Royal Dutch Indies Army. They married Indonesian and Luso-Indonesian women and settled mainly in Java. In 1965 when Indonesia gained independence the Belinda Hitam were offered Dutch citizenship and immigrated to the Netherlands. Little work has been done on the African presence prior to the twentieth century in French Indo-China (Laos, Cambodia and Vietnam).

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References


**Biography**

Clifford Pereira is a Historical Geographer specialising in ‘hidden histories’ and migrations from and within the Indian Ocean World. A graduate of Geography and Asian Studies from the University of Ulster, he is a long-term fellow of the Royal Geographical Society (with IBG), where he was also curator, consultant and facilitator on outreach projects (2006-2013). Pereira was Honorary Research Assistant with Royal Holloway, University of London (2010-2013), and Visiting Assistant Researcher for Dalian Maritime University, China (2011-2015). He is currently a Researcher on the African collection of the Museum of Anthropology (MOA) at UBC, Canada and specialist researcher and for the international heritage consultancy firm Barker-Langham, London (2008-Present).
European Ships of Discovery

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Abstract

The ships and boats of the 15th and early 16th century European voyages were the space shuttles of their time, and yet we don't know much about them because most have been destroyed by looters and treasure hunters. This paper will focus on a particular type, the caravel, and presents an overview of the early European watercraft that crossed the Atlantic and sailed along the American coasts during the first decades of the 16th century.

Key words: caravel, 16th Century, Europe, ships, looting

Introduction

The earliest Iberian voyages into the Atlantic were carried out in the existing ships. Soon however the need to adapt the existing watercraft to the sailing conditions of the open sea triggered a process of evolution that is poorly understood, but that reflects the existing cultural, scientific and economic conditions in the Iberian kingdoms. This is an interesting process of technological evolution that is in its earliest states of investigation.

The main ships of the European expansion were sailing ships, mainly caravels, naus, and galleons. Rowing ships were also used in the European factories abroad, sometimes shipped in the holds of sailing ships, and sometimes built in Africa and Asia, in the beginning according to European standards, but very soon incorporating local features as they
were understood as advantageous. This paper deals with caravels, a versatile and small ship type that is still poorly understood.

**Caravels**

Caravels are among the least understood of all historical vessels. Mentioned in hundreds, perhaps thousands of books, these ships are associated with the Iberian exploration of the Atlantic in the 15th century, and are considered the space shuttles of their time, allowing the Portuguese and Spanish explorers to sail down the African coast, and open the maritime routes to the Caribbean, the west coast of Africa, and the Indian and Pacific Oceans. A few authors have dedicated lengthy works to this ship type, such as Quirino da Fonseca (1934 and 1935), Pimentel Barata (1972), Tengarrinha Pires (1980, 1985, 1986, 1988 and 1990), Malcolm Elbl (1985), Francisco Contente Domingues (1989), or George Schwarz (2008).

Their agility is legendary, and more than 150 years after the first mid-15th century references to the new exploration caravels, they are mentioned in an account of a 1597 expedition to the Azores under the Earl of Essex as fast and highly maneuverable: *Whilest we thus stayed about the Rocke, ye carvalls of Lyshbourne and of the parts thereabouts would daylie come swarminge about us like butterflies soe neare us as that we might cast a stone into some of them, and yet could we never catch any one of them, soe warie and nimble they are* (Gorges, 1604, transcribed by Richard Barker, 2007).

These vessels probably originated in the Mediterranean. The Portuguese and the Spanish probably changed and adapted this type of vessels to the navigation along the coast of Africa. Venetian merchant and chronicler
Alvise da Ca’ da Mosto wrote in the late 15th century: ‘...essendo le caravelle di Portogallo i migliori navilii che vadino sopra il mare di vele, ed essendo quelli bene in punto d’ogni cosa che gli fa di bisogno...’ (Ramusio, 1600). Ca’ da Mosto mentions eyes painted on the bow of these caravels, something characteristic in the Mediterranean since long. He says, about the inhabitants of the African coast: ‘...e pensavano che gli occhi che si fanno a prova alli navilii fussero veramente occhi, che ’l navilio per quelli vedesse dove gli andava per mare ‘(Ramusio, 1600).

This technology spread to northern Europe and the expression ‘carvel-built’ still refers to watercraft built with flush laid planks, nailed to pre-erected frames, a structural improvement that originated in the Mediterranean and spread along the Atlantic coast of Europe and into the Baltic, during the late 15th and early 16th centuries.

Although much has been said and written about caravels, these vessels have never been thoroughly described in historical sources, their representations are few and impressionistic, and no ship identified as a caravel has been archaeologically excavated. Replicas have been built with mixed results, never based on solid supporting information. This paper is a tentative summary of what is known about these ships, both from documental sources, written and iconographic, and from the archaeological record.

Pictures of caravels labelled as such are rare but clear enough to allow historians, already in the 19th century, to have a fair picture of what they may have looked like. Portuguese historians Quirino da Fonseca (1934) and Tengarrinha Pires (1980) inventoried the most important representations of caravels in existence. Pimentel Barata (1989) published an interesting drawing of a caravel, depicted as the signature of a caravel master from the 15th century named João de Lião, dated to
1488 according to the author. This drawing was first published by Avelino Teixeira da Mota (1971, Fig. 4) who noticed that this is the earliest drawing of a caravel, designated as such, and one of the earliest dated representations of a stern panel, which is clearly defined (Fig. 1).

Fig. 1: Signature of a certain João de Lião, master of caravels, dated to 1488, on a document pertaining to the supply of hardtack to a caravel departing to Africa. (Arquivo Nacional da Torre do Tombo, CC II-I-781, in Mota 1971)

**Documental Evidence**

Before 1500 we can only guess what the word ‘caravel’ means. All we have to work with are a few textual references: medieval boats named carávos, two 12th century Italian references to a type of boat called Caravellum, one 13th century reference to caravelas in the chart of the Portuguese village of Gaia, one 14th century reference in Spain, and the 15th century caravels of the Discoveries.

Auguste Jal and Corominas explored the origins of the words căravo and qârib, both referring to small boats, sometimes coracles. As to the word caravellum, there is no way to tell what kind of boat the 1159 Genoese caravellum coopertum was. These boat type appears in two Genoese 12th century documents, the first mentioned is decked (coopertum)
serving a *navis* (1159), and the second (1190) is small, belonging to a *caravelator*, presumably working as a harbor tender (Ciciliot, 2005). Furio Ciciliot points out the fact that in the 12th century the word *caravelum*, referring to a small boat, is masculine, and does not become feminine until it is assimilated to a larger vessel: *navis sive caravellae* (Ciciliot, 2005).

Historian Malcolm Elbl mentions a 1226 reference to a Portuguese caravel taken by English ships on a return trip from Gascogne (Elbl, 1985). He cites the French translation Francisque Michel’s *Histoire du commerce et de la navigacion à de Bordeaux* (Michel, 186). Michel mentions only ‘*un navire portugais, appelé le Cardinal*’ and indicates the *Rotuli Litterarum Patentium* (Rot. Litt. Pat., 10 Hen. III, m. 5) and the *Rotuli Litterarum Clausarum* (Rot. Litt. Claus., 10 Hen. III, m. 27 et 14; t. II p. 89, col. 2; et p. 119, col. 1) as her sources. The *Rot. Litt. Pat.*, mention a ‘*navem que vocatur la cardinale*’ (1971, p. 36), and the *Rot. Litt. Claus. Membrane 14*, mentions an unrelated incident pertaining to wine trade with Bayonne (1916, 5). I could not access *Membrane 27* of Henry’s 10th year, and I am not sure that all of Henry’s rolls are published.

The caravels referred to in the Chart of Gaia (1255) seem to be fishing vessels, of which we know nothing. Square rigged vessels were rare in the Mediterranean between the early 6th century and the mid-13th century, and most references to caravels mention lateen sails (Bellabarba, 1999).

Some authors have proposed that caravels were mentioned in Alfonso X’s *Libro de las Leyes* or *Siete Partidas*, as it is better known, written between 1254 and 1265. Most authors, however, agree that the passage in question – Partida Segunda, Titulo XXIV, Ley VII – mentions *haloques*, and not *caravelas*. 


It seems that caravels are not mentioned in Portuguese documents during the 14th century. There is a reference to caravels in 1307. Malcom Elbl (1985) places it in Biscay, Spain, and cites Quirino da Fonseca. Quirino cites Auguste Jal, and places the caravels in northern Europe (1978), and Jal (1848) is silent about the place and cites Pierre Carpentier (1766), who does not place these caravels anywhere, and gives a source for it I could not find: Charta an. circ. 1307.

From the mid-15th century onwards chroniclers mention caravels engaged in the exploration of the Atlantic, and later carrying Columbus into the New World. There are some documents describing caravels, the best known pertaining to the caravels Niña and India, used by Columbus in his fourth trip (Smith, 1993), or the caravelões de Arguim published by Alexandre Monteiro (Monteiro at al., 2011). Carlos Etayo transcribed a 1450 contract for the construction of a caravel for a Catalanian mariner named Gracia Amat with one central and two side rudders, and a length to beam ratio around 4/1 (Etayo, 1971). Jacques Paviot and Erich Rieth published a paper relating the construction by Portuguese shipwrights of two caravels in Brussels, in 1438 and 1439, for the Duke of Burgundy, Philippe le Bon (Paviot and Rieth, 1989).

Bibliographic research in Italy, where caravels probably originated, is scarce. Lucien Bash refers to 24 caravels sent by the Republic of Venice in 1490, with 24 men each, and 30 caravels in 1499 with capacities between 100 and 400 botte (Bash, 2000). A botta was close to half a Portuguese tonel, if we are to trust a 1519 document mentioned by Lane (1964): ‘Per lettere di Sibilia deli 9 ditto erano avvisi, come a di 6 era venuta una caravella di portata de 60 tonelle, videlicet 120 botte, a qual era stata a discoprire le Indie (Mexico)…’(Fulin, 1881).
Although Portuguese and Spanish historians combed the most important European archives more than one century ago (Domingues, 2004), almost nothing is known about caravels. Around 1600 we have the first lists of timbers for the construction of a caravel in the Lisbon National Library manuscript known as Livro náutico (Anonymous, c.1590), dated to the 1590s, and two cryptic regimentos by Manoel Fernandez, dated to 1616 and illustrated, but difficult to understand because the drawings are not always represented in the same vertical and horizontal scales (Fernandez, 1616).

Iconography is scarce and doesn’t shed light on the most important questions. For instance, they do not tell us whether the early Portuguese 15th century caravels had a stern panel and a central rudder. Around 1500, when we have the first images and descriptions, caravels seem to be small ships of 15 to 50 tons, built with flush-laid planking, rigged with one, two, or three masts, all mounting lateen sails. Sometimes they appear with a foremast rigged with a square sail (Fig. 2). Generally, the mainmast is placed on the center of the keel, and the second and third masts are stepped abaft it, with a small stern castle and no forecastle, a stern panel and a central rudder.
Central rudders first appear in Denmark, in the 12th century (Hocker and Dokkedal, 2001). The earliest explicit reference to a central rudder is probably Gracia Amat’s contract, in the middle of the 15th century. Stern panels appear in the iconographical record after 1475, and at least in the in 15th century iconographical record, central rudders seem to be characteristic of square-rigged ships.

As it often happens, the word caravel designated a wide range of watercraft, even in the 16th century: caravelas latinas, caravelas de Alfama, caravelas redondas, caravelas de armada, and caravelões. In some cases, we have a fair idea about the main differences between them, and in other cases circumstantial evidence allows some provisory hypothesis. Below are presented short description of what each type may have looked like.
Caravelas latinas

As already mentioned, during the 14th century they are not mentioned in Portuguese documents. In the mid-15th century caravels appear as lateeners with a capacity around 50 tonéis and crews between 20 and 25 men. It looks like small caravels with 2 or 3 masts with lateen sails endured for over one century without much change. But we don’t know what characteristics defined a caravel, or what separated a caravel from the other lateeners of their time.

Fig. 3: Representation of a caravel in the Retábulo de Santa Auta, dated to c. 1517. (Photo: author)

Quirino da Fonseca mentions Braancamp Freire describing 54 caravelas leaving Lisbon in 1488 and 1489, with capacities varying between 15 and 50 tonéis (Fonseca, 1935).

This range of capacities is compatible with other accounts, some written much later. In 1571, in A vida e feitos de el-rei D. Manuel, D. Jerónimo Osório, describes caravels as rather small vessels. These caravels don’t have tops (cestos de gávea), nor their yards make right angles with their masts, but hang, inclined, secured under the masthead, and the base of the sail is triangular and almost touches the bulwarks. The yards, which
are fastened to the ship’s bulwarks, are as thick as topmasts in their lower part and have smaller sections upwards (Fonseca 1935).

Sometimes these small two- and three-masted lateeners are referred as typically Portuguese, but José Luis Casado Soto found references to 125 caravels in the Registro General del Sello in the Archivo General de Simancas between 1476 and 1496, and they seem to come from all over the Iberian Peninsula. His figures show that 45% of the caravels registered were from Andalusia, 21% from the Cantabric region; 19% from Portugal, 12% from the Mediterranean, and 3% from France, England and the North Sea (Soto, 1991).

There is no mention of any possible difference between them. Were Cantabrian and Andalusian caravels much different from each other? How different were they from the Portuguese ones? Or how did the Portuguese ones differed from each other?

We have a long way to go before we can say that we understand this ship type. Iconography can provide some clues if we are to trust the illustrations in the Atlas of Georg Braun (1541-1622), published between 1572 and 1617 (Fig. 4). The quality of the illustrations in Braun’s Atlas is known, including the figures in local dresses. It is not uncommon for painters and illustrators to register in the mapmaker’s guilds and work on map illustrations when they and an opportunity (Binding, 2003 and Unger, 2010). The ship illustrations in Braun’s Atlas seem to be reliable as well, and vary from city to city. Although no systematic study of the Atlas’ ships has been done yet, the caravels represented in several Portuguese and Spanish cities, in Iberia or around the world, seem plausible and accurate, and consistent with the descriptions below.
Caravelas de Alfama

Paulo Monteiro found this reference in a Spanish late 16th century document: ‘(...) También se quedan despalmando dos caravellas pequeñas destas que aquí llaman de Alfama que las pide el Almirante para llevar consigo...’ (Monteiro pers. comm. 2009).

Were at least some of the Spanish caravels larger than the Portuguese ones? José Luis Casado Soto mentions a witness account of Columbus’ second voyage, Pedro Mártir de Anglería, who claims that Columbus took 17 vessels: 3 large cargo ships with tops, 12 caravels, and 2 large caravels, with masts large enough to support tops. Nothing is said about their rigging arrangements. Were these typically different from those of the Portuguese caravels?

Caravelas redondas

Navarrete calls caravellas redondas ‘castellanas’. They have three masts, the foremost mounting a square sail and the main and mizzen masts mounting lateen sails. Quirino da Fonseca cites him: “caravels were divided into Portuguese and Castilian, the first exclusively lateen-rigged, could sail cinco ou seis quartas (56° to 67°) into the wind, facilitating the Portuguese routes to the African gold mines. Castilian caravels used in their seas with square sails, or better, with a square sail on the foremost.”
Quirino also refers to a 1512 letter from D. Fernando to Pedrarias Davilla in Panama: ‘Yo vos mando que … se hagan luego tres o cuatro carabelas, al modo de Andalucía, las dos, e las otras dos, pequeñas, latinas, como las de Portugal…’ (Fonseca 1935).

In Columbus’ *Diario de a bordo*, transcribed by friar Bartolomé de las Casas, the entry for August 9, 1492, famously mentions the explorer decision to change the rigging of his caravel *Pinta*: ‘y adobaran muy bien la Pinta con mucho trabajo e diligencias del Almirante, de Martin Alonso y de los demás; (...) Hicieran la Pinta redonda, porque era latina;’(Colón, 1991).

In the 14th century Mediterranean it was common to rig two-masted cargo vessels with a square sail on the foremost and a lateen sail on the mizzen. Sergio Bellabarba called this rigging arrangement *quadra-latina* and proposed two possible roots for the development of three-masted, ship-rigged vessels, one from the two-masted lateeners and one from the one-masted square-rigged cogs, both common merchant ships in the mid-14th century Mediterranean (Bellabarba, 1999). According to Bellabarba’s plausible theory, both ship types at some point may have adopted a *quadra-latina* rigging arrangement, the two-masted lateeners by changing to a square mainsail, the cogs by adding a lateen-rigged mizzen mast.

The earliest representation of a ship-rigged three-masted vessel dates to 1409 and appears in a Catalanian document. It shows a *cocca* with a *quadra-latina* rigging arrangement to which a foremost was added, mounting a square sail (Mott, 1997). *Caravelas redondas* seem to have evolved in a similar way. It looks like they were two-masted lateeners – which show the mainmast always stepped on the middle of the keel – with a third mast, a foremost stepped far forward. This type of vessel is
represented in Braun and Hogenberg’s *Civitates orbis terrarium*, especially in Spanish harbors. (Fig. 5)

![Image](image.png)

*Fig. 5. Lateeners in Lisbon, c. 1530 (detail from the Leiden view of Lisbon, COLLBN J.29-15-7831-110-30)*

Two documents dated to 1498 (before Columbus’ fourth voyage) contain the inventories of the rigging of two caravels, *Santa Clara*, or *Niña* (60 toneles – probably not the *Niña* of the first voyage – and *Santa Cruz*, or *India*, built in Hispaniola during the second voyage with the remains of the ships lost in the hurricane that swept La Isabela in 1495.

Both these caravels had four masts, and both had square sails on the fore and main masts, and lateen sails on the mizzen and bonaventure. Additionally *Santa Cruz* had a bowsprit and a spritsail; and *Santa Clara* has ‘*dos botalos vno del trinquete y otro de la cont[ra]*’ (Smith, 1993).

Gaspar Correia states that Vasco da Gama sailed to India in 1502 with ‘*cinco caravelas latinas, que mandou muito bem concertar*’ and ‘*iam com velas redondas armadas, para com elas navegarem quando cumprisse*’. He does not mention how many masts these ships had, and the representations we have date to around 1565, more than half a century later.
Large cargo ships – *naus or naos, caracche, or hulks*, as they were known in the Atlantic, Mediterranean, and Baltic – tend to have three masts and square sails on the bowsprit, fore, and main masts, and a lateen sail on the mizzen mast.

When a fourth mast appears, in the late 15th century, square sails are always present, either on the fore and main masts, or only on the foremast. The first type of rigging is common on larger vessels, such as galleons, developed around 1500, or on the Spanish *caravelas redondas*, such as the *Santa Clara* and the *Santa Cruz*. The second type, with square sails only on the foremast, is typical of the Portuguese *caravelas de armada*.

**Caravelas de armada**

It is curious to notice that in the 1550s Fernando Oliveira is skeptical about the qualities of the *caravelas de armada*. In his *Arte da guerra no mar* he states: ‘*A mim me pareceu sempre, que caravelas de armada, não eram tão boas como são gabadas, por serem um género de navios misturado e neutro, e as partes que tomam de cada um dos outros géneros serem as piores*’ (Oliveira, 1555).

Later, in his *Livro da fábrica das naus*, Oliveira states: ‘*Aqui me lembra e quero o dizer, antes que me esqueça, que nunca me pareceu bem, fazer da caravela navio redondo, diga cada um o que quiser, que tudo será afeiçoado*’ and ‘*porque, mudando-se a forma da vela, cumpre mudar-se a fábrica do fundo, a qual já não pode ser mudada*’ (Oliveira, c. 1580).

In the middle of the 16th century these caravels were purposely built with a forecastle and four masts, rigged with square sails on the foremast and lateen on the remaining three, and later would be as large as 180 *tonéis*.
As mentioned above, there are two *regimentos* for the construction of these caravels in Manoel Fernandez treatise (1616), and they both have two decks. We have their main dimensions:

- **Folios 16 and 107**: The caravel with 11 *rumos* (17m) of keel has 23.2m of length overall, a max beam of 6.42m, a depth of hold of 4.1 m, and a flat amidships of 2.05m.
- **Folio 24 (and 108?)**: The caravel with 12 *rumos* (18.5m) of keel, has 25.5m of length overall, a max beam of 7.19m, a depth oh hold 4.40m, and a flat amidships of 2.31m.

These *caravelas de armada* have length to beam ratios of 3.61 and 3.55 respectively, values that are compatible with the extensive iconography, often with reliable, albeit impressionistic, characteristics.

**Caravelões**

It seems that the smaller caravels were sometimes referred to as *caravelões* (Pico, 1955). Alexandre Monteiro transcribed two early 16th century documents relating to *caravelões de Arguim* that describe 3-masted vessels with bowsprits, square sails on the fore and main masts, and a lateen sail on the mizzen (Monteiro et al., 2011). Both caravelões have hatch covers, so there is no doubt about the fact that they were decked, as it should be expected in ships that are engaged in oceanic trips. One of these *caravelões* had a crew (*companha*) of nine: pilot, six sailors, and two apprentices. This information gives us a hint of the ship’s dimension, if we are to believe Fernando Oliveira, who one generation later, in the mid-16th century, states that crews should be calculated as follows:

- Up to 10 *tonéis*: 2 sailors, 1 apprentice;
- 10 to 20 *tonéis*: 3 sailors, 1 apprentice;
• 20 to 30 tonéis: 4 sailors, 2 apprentices;
• Above 30 tonéis: add 1 sailor / 4 tonéis and 1 apprentice / 3 sailors.

According to Oliveira, both the master and the pilot must be counted as sailors, thus suggesting a ship with a capacity around 42 tonéis (Oliveira, 1555).

One of these documents (1508) is particularly interesting because it refers a bowsprit, fore and mainmasts, and a bonaventure mast with its yard. Although there is no mention of a mizzen mast and yard, there is one mizzen sail, and one mizzen halyard (ostaga). It is not clear whether this is a mistake, or there were caravelões with 4 masts (Fig. 2).

**Conclusion**

The sample of shipwrecks of probable Iberian origin is small and the preservation is often poor. Moreover, it is impossible to say for sure that these archaeological remains are even remotely related to caravels. The size, shape, structure, construction sequence, and rigging of the Iberian caravels of the 15th and 16th centuries are far from well-understood. In spite of the many excellent historical publications available for almost one century in certain cases, we have more doubts than certainties when it comes to reconstruct these mysterious ships. Most data on caravels and other small vessels dates to the end of the 16th and beginning of the 17th centuries, more than a century after the first voyages into the Atlantic. A small sample of measurements from contracts and technical texts suggests that all caravels, even the Portuguese *caravelas de armada*, were small vessels, that they all relied primarily on lateen rigs, and that by the 16th century they all had stern panels and central rudders, no forecastle, one to four masts with a minimum of two lateen rigged masts,
a low sterncastle, and no topmasts. For the Iberian Peninsula all caravels had length to beam ratios between 3 and 4, tonnages between 50 and 150 *toneles*, corresponding to lengths overall between 15m and 25m.

The archaeological record suggests that vessels of this size had similar basic construction features and scantlings. In other words, that there was an ‘Iberian way’ of designing and building small ocean-going vessels, of which some were possibly caravels. However, only the full publication of a much larger sample of shipwrecks will help shed light on this subject.

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Biography

Filipe Vieira de Castro is Professor of Anthropology, holds the Frederick R. Mayer II Fellowship of Nautical Archaeology, and is the Director of the Ship Reconstruction Laboratory at Texas A&M University. He has a degree in civil engineering from Lisbon’s Instituto Superior Técnico, a Master of Business Administration from the Catholic University of Lisbon, and a PhD in Anthropology from Texas A&M University. He has conducted field work in Portugal, Panama, Puerto Rico, Brazil, Italy, and Croatia, and his main interests are the history of wooden shipbuilding technology and European seafaring in the late medieval and early modern periods.
The 17th Century Wooden Shipwreck off Hatsushima Island, Japan

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Abstract
The Asian Research Institute of Underwater Archaeology (ARIUA) at Fukuoka and Tokyo University of Marine Science and Technology, which is a member institution of the UNESCO Underwater Archaeology Unitwin Network, have researched upon the 17th century wooden shipwreck off Hatsushima Island in front of Atami city, Shizuoka Prefecture, since 2011. The shipwreck lies on the seabed at the depth of 20 metres, 200 metres from the western shore. It consists mainly of a cargo of roof tiles or grinding bowls and some parts of the wooden hull. Judging from them, the original vessel seems to have been a 17th or 18th century wooden freighter or kaisen (廻船), which left a port of western part of Japan for the capital town of Edo; most of well made roof tiles were not made in eastern part at that time. Because most of the roof tiles are high-quality and one of them is marked by the wild ginger trefoil coat of arms of the Shogunate family, they might mean to have been used for the Edo Shogunate castle. In 2011 and 2012, archaeologists with financial assistance from the Nippon Foundation, did the submersible survey upon this wreck site, about which local fishermen had already known to identify its exact position. In 2013, then, its bathymetry was made with a multibeam sonar. In order to make a precisely measured drawing of the 5 metre square wreck site, an AUV in 2013 and a ROV in 2015, both of which were developed uniquely by Tokyo University of Marine Science and Technology, and divers in 2016 were deployed to collect numerous underwater photos to generate 3D photogrammetric models with photogrammetry software Agisoft ‘PhotoScan’.

Key words: Shipwreck, survey, Photogrammetry
**Introduction**

Hatsushima Island is approximately 4km around and located in the Sagami bay off east coast of Izu peninsula. In terms of its administration, it belongs to Atami city, Shizuoka Prefecture. From the mainland city, we could always see the island and vice versa, and regular ferry services are frequently available between them (Fig. 1). Hatsushima Island has approximately 200 inhabitants, most of whom engage in fishery and tourist industries. There is only one elementary school, about 30 guest houses, and a resort hotel on it. The surrounding sea around Hatsushima Island is managed by the Fisheries Cooperative Association of the Hatsushima Island; without permission from the association, neither recreation fishing nor fun diving around the island is allowed.

*Fig. 1: Location of Hatsushima Island.*
The so-called Hatsushima shipwreck lies on the seabed at the depth of 20 metres, being 200 metres from the western shore. Its cargo mainly consists of roof tiles or grinding bowls and some parts of wooden hulls. Judging from them, the original vessel seems to have been a 17th or 18th century wooden freighter or kaisen (廻船), which left a port of western part of Japan, might be Osaka or Hyogo, for the capital town of Edo, which is currently known as Tokyo. During the Edo period, Japan was in national isolation, called sakoku (鎖国); consequently, there was only limited contact with foreign countries, while domestic seaborne transportation systems were highly developed. Almost all areas in Japan were connected by the shipping traffic with wooden freighters. Using ships, rice was transported from northern Japan to Edo or Osaka, which was the largest town in western Japan; earthenware from western Japan to Edo; marine products from Hokkaido to western Japan, and so on.

The shipwreck site was officially found in the latter half of 1970s by a constructor of underwater pipelines which supplied pure water to Hatsushima Island from mainland. Even before, however, it has been known by fishermen that roof tiles and grindstones have sometimes been caught by fishing nets. In addition, the islanders have inherited legends testifying that at the shipwreck, night after night, a sodden samurai who wore armour used at that time, landed on the western shore of Hatsushima island from the bottom of the sea. Since the area was opened as a diving spot, some leisure divers have recognized the shipwreck. Because the Fisheries Cooperative Association of the Hatsushima Island has strictly managed the wreck, its destruction has been prevented somehow.
A series of surveys have been done mainly by the Asian Research Institute of Underwater Archaeology (ARIUA) and by Tokyo University of Marine Science and Technology, a member institution of the UNESCO Underwater Archaeology Unitwin Network. The Asian Research Institute of Underwater Archaeology is the only active academic society for underwater cultural heritage in Japan. Although its headquarters is situated at Fukuoka city, Kyushu, the institute has not only Japanese members but also foreign scholars including from Korea and Germany. It was founded in 1986 under the name of the Kyushu Okinawa Society for Underwater Archaeology or KOSUWA, and then in 2005 it became a non-profit organization. The president director is Kenzo Hayashida, who is an expert advisor of the Submerged Sites Study Committee at the Agency for Cultural Affairs. The institute has regally published a journal titled *The Journal of Underwater Archaeological Studies* which is the only one periodical specialized about underwater cultural heritage in Japan.

In November 2011 and in February 2012, several ARIUA underwater archaeologists did the underwater survey upon the Hatsushima shipwreck site to locate its exact position. The third diving campaign was executed on April 2012, which was covered by a TV programme, and the fourth diving campaign was executed on October 2012 in order to create plans for future surveys and excavations. On March 2013, the multibeam sonar survey and pilot survey using an autonomous underwater vehicle (AUV), which was built by Tokyo University of Marine Science and Technology, were executed (Kondo, 2017). Figure 2 shows the bathymetry around the site generated by a multibeam sonar mounted. A group of embossments surrounded in a circle shows the wreck site. A sonar used for this multibeam survey was a SONIC 2024.
Archaeological Relics

The shipwreck site itself measures 4.7m from east to west and 5m from north to south. In an area of 5m square, the freighter’s cargos, such as roof tiles, grinding bowls, and whetstones are spread (Fig. 3). Although decorative ridge-end tiles, pan eaves-tiles, and whetstones are found dispersedly, other cargo components such as pan-tiles, round eaves-tiles, and grinding bowls are well aligned. It could be imagined that, when this freighter sank, the heavy cargos might be placed bottom on the wooden hull. The number of pan-tiles, round eaves-tiles, and grinding bowls were spread far more than that of decorative ridge-end tiles, pan eaves-tiles, and whetstones. As for the hull, its greater part seems to be buried inside the sandy seabed; after the sand is push aside, a few wooden plates from the ship could be observed between the group of aligned pan-tiles and grinding bowls.
At the southern part of the relics-concentrated site, pan-tiles are aligned in five rows and two layers to the east-west directions; and others are aligned in one row and one layer to the north-south directions. About the northern part, round eaves-tiles are aligned in two rows and two layers. Contrarily, pan eaves-tiles and decorative ridge-end tiles are sporadically spread to relatively outside of the relics-concentrated site.

Judging from their forms and characteristics, the grinding bowls were produced from the middle of the 17th century to the beginning of the 18th century in the Tamba region of western Japan, which is now in Hyogo Prefecture. This Tamba ware or Tamba-Tachikui ware had started to be made around 1000 years ago, and then became famous in Japan.
especially for its grinding bowls. Before the 18th century almost all Japanese grinding bowls came either from the area of Tamba or from Seto. After the middle of the 18th century, however, the cheap bowls produced in a town of Sakai, near Osaka, became much more popular.

As for roof tiles, the original production area might be Awaji Island, which is also now in Hyogo Prefecture. Throughout Japanese History, we had three famous roof tile production areas, viz. Awaji Island at Hyogo, Sanshu at Aichi, and Sekishu at Shimane. The roof tile production at Awaji Island is said to have started around the 6th or the 7th centuries. The roof tiles produced at Awaji Island are characterized by their beautiful silvery colour, which could be observed on some roof tiles at the Hatsushima wreck. Indeed, it would be possible that not all roof tiles belonging to the wreck came from Awaji Island, but other roof tiles might have also been produced at some tile kilns, at least near Awaji Island, such as kilns around Osaka or Kyoto.

Most of roof tiles found on the shipwreck seem to be relatively high-quality products. One of the decorative ridge-end tiles has a well-known mark, its centre displays the wild ginger trefoil coat of arms (三葉葵文) of the Tokugawa Shogunate family or clan. The decorative cap of each round eaves-tile presents the crest of three comma-shaped figures (連珠三巴文) in a circle without circular line. On the other hand, the decorative cap of each pan eaves-tile has the 'Osaka-typed' motif of arabesque (均整唐草文) which is marked by elongated calyxes and y-shaped sides both on the right and left. All the roof tiles were polished-up beautifully that even did not display trace of polishing marks.
These high-qualitied roof tiles seem to have been produced especially for the Edo Shogunate castle as one of the decorative ridge-end tiles that has the crest of the Tokugawa family or clan. In 1657, the Great Fire of Meireki burned down more than the half districts of Edo, including the castle; therefore, the roof tiles of the Hatsushima wreck might be ordered for the reconstruction attempt of the castle after the fire. Also, there is a record that the Genroku earthquake hit Edo in 1703, yet the physical damage on the castle against the Edo castle was minor; only some gates or guard houses were reported to be collapsed. Consequently, it is natural to consider that the roof tiles were to be used for the repair works after the fire rather than the earthquake.

The roof tiles of the Hatsushima wreck must be specially ordered products by the Tokugawa Shogunate family or clan, while the grinding bowls seem to have been general-purpose products. As this freighter carried both products, it was not a ship owned by the government but rather a private merchant vessel. During the Edo period, two types or systems of mercantile operations were recorded. One was ‘kaizumi (買積)’, in which vessels itself went to productions, factories, or industrial areas to buy goods directly in order to bring those goods back home ports or to bring them to the big cities such Edo or Osaka to sell. The other one was ‘unchinzumi (運賃積)’, in which vessels carried cargos for customers, for instance the government and other merchants, based on orders and requests of customers. The Hatsushima wreck did belong to the latter system. The wreck of the same trading type was discovered off of Kozushima Island (Iwabuchi, 2012).

Survey after 2015
The main purpose of the survey after 2015 was to map the wreck site accurately using a 3D photogrammetry technique. The obtained data will help us to understand the whole archaeological site off Hatsushima Island including the shipwreck. Presumably the evaluation of this site by using this data would open a way that the site will be registered as a place of buried cultural properties which will be a legal evidence to help the site. Another purpose of this survey is to consider the potential usage of underwater vehicles and underwater photogrammetry for archaeological site.

Methodology: A remotely operated vehicle (ROV) was operated to take pictures while keeping close distance over the wreck for mapping. Divers were attended at the seabed to prevent any accidents. To complement for the mapping, visual inspections and measuring were operated by divers. The survey area was set to 5m square focusing on the relics-concentrated area. A small boat was locally hired to serve as a research vessel which delivered divers and instruments from pier to the site; and operation of the ROV was also done from the boat. The survey operations were completed by both photo-shooting by the ROV and visual inspection by divers; any destructive operations such as excavation and rising artefacts of the relics were not executed.

Homemade Remotely Operated Vehicle: A simple ROV was designed and constructed by Kondo laboratory of Tokyo University of Marine Science and Technology. Figure 4 shows the general arrangement of the vehicle. The length of the ROV is 1m, width is 0.58m and the depth is 0.48m (excluding hanging points). The weight is about 70kg, yet it is neutrally buoyant in seawater. Four propeller thrusters are mounted on the vehicle; two horizontal thrusters are mounted horizontally to make the
vehicle move forward and backward; the other two thrusters are mounted vertically (see Fig. 4) to make the vehicle to move upward and downward.

![Diagram of ROV](image)

**Fig. 4: General arrangement of the homemade ROV.**

Four cameras are mounted on the vehicle as observational equipment. Main camera has Type 4/3 sized, 3296 x 2472 resolution CCD. An F mount lens was attached to the camera. The camera is sealed in a homemade pressure bottle with underwater connectors. Still images are transmitted from the ROV to the surface boat via an umbilical cable, and stored in a laptop computer. This main camera is mounted vertically/perpendicularly as the camera face-down to the seabed. Other used cameras were wearable cameras (GoPro), one camera was mounted perpendicularly to take top-view movies. Other two were paired as works as stereo cameras, and mounted slightly diagonally angled down to take slant-view movies of the site. Three original underwater LED lights were also mounted to provide lighting.

A syntactic foam, which is a buoyancy material made of glass microspheres and compound was mounted on top of the vehicle. A main pressure bottle made of aluminum alloy was attached beneath the buoyancy material. Microcomputers, control units, a depth sensor and batteries were stored in the main bottle. The main bottle was relatively
heavy to make the long separation between centers of buoyancy and gravity to provide better stability for the vehicle’s motions.

An umbilical cable which encloses ethernet and power lines connected the main bottle and a laptop computer on the boat. Operator can control the vehicle’s motion and onboard equipment from the laptop. The structure of the ROV consists of High Density Poly Ethylene (HDPE), which is positively buoyant in seawater, free from corrosion and easy to let any equipment to be mounted.

Results: Although divers supported the ROV (Fig. 5) because of electric failure of thrusters, an orthophoto mosaic of the wreck (Fig. 6) was obtained from 3D spatial data generated by photogrammetric processing using digital images taken by the ROV. Agisoft ‘PhotoScan’ was used for photogrammetric processing. Although blank parts can be seen on the orthomosaic because of the bad image conditions, distortions of the orthomosaic are minimum, and this orthomosaic can be used for archaeological drawings.
Fig. 5: A photo taken by a diver during the Survey.

Fig. 6: Orthophoto mosaic of the wreck site.
In November 2016, to obtain better 3D photogrammetric data, several ARUIA divers took numerous underwater photos of the Hatsushima shipwreck. At that time, two grapnels were discovered at north-east from the wreck site (about 10 metres apart from the site). However, the relationship between these anchors and the wreck is still under investigation. Both in 2015 and in 2016, the open briefing sessions of the survey for the general public living in Hatsushima Island were organized by ARIUA and Tokyo University of Marine Science and Technology during the campaigns. Many islanders, including members of the Fisheries Cooperative Association of the Hatsushima Island, attended the sessions and displayed their high interests to this underwater cultural heritage (Hayashibara et al., 2016). We have once again understood that working together with local people is necessary.

Additionally, foreign researchers participated in the surveys at Hatsushima Island both in 2015 and in 2016. In 2015, one Indonesian student from the graduate school of Tokyo University of Marine Science and Technology received hands-on training of underwater archaeology in this field campaign. This was a part of the programmes of the UNESCO Underwater Archaeology Unitwin Network at TUMSAT. In 2016, two Italian scholars from the International Research Institute for Archaeology and Ethnology, one Dutch from ICOMOS Netherlands, and one American from the Oxford Centre for Maritime Archaeology, attended the survey to help the underwater investigations. Complying with the UNESCO international standard, ARIUA and Tokyo University of Marine Science and Technology are planning to make good use of this underwater archaeological site for education and training, not only as a touristic attraction.
Conclusions and Perspectives

An orthophoto mosaic of the wreck was generated from 3D spatial data generated by photogrammetric processing using digital images taken by the ROV and divers. Line art (2D site plan) for the cultural heritage documentation is under drawing. Currently, the team is planning more data collection in order to obtain sectional drawings. The ROV operation was executed twice and its total time is about one hour; this is a large saving for divers’ underwater operation time for underwater archaeological sites. The advantage of underwater vehicles for archaeological survey has been confirmed by the orthophoto mosaic of the wreck. Also, we are planning to evaluate the validity of increasing the image quality and usage of underwater technological instruments.

The goal of these investigations is to produce a site map as an orthophoto mosaic, and share detailed and accurate information of the site with the Board of Education of Atami city. Although it has already recognized its existence, the Hatsushima shipwreck has not designated as a ‘Buried Cultural Property’ or ‘Historic Site’ under the Japanese domestic law of the Cultural Properties Protection Act (Hayashibara, 2013). The board of education believes that more detailed information is required, for instance its historical values or current situation including the complete picture of the hull buried beneath the seabed. Without raising all archaeological components of the site, which is against the Convention on the Protection of the Underwater Cultural Heritage, its general view of the site could not be appeared and observed. The other reason why the board of education does not want to protect this site under the civil law is that the Agency for Cultural Affairs has ordered every board of education to execute the Cultural Properties Protection Act upon all sites before the Middle Age,
but this order also implies that it is not priority to apply this order to heritage sites dated after the Early Modern Age.

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**Biographies**
Hayato Kondo is Associate Professor at Tokyo University of Marine Science and Technology. His research interests include ocean-related autonomous system, high-resolution ocean observation, AUV system design, and its payload system including optical and acoustic sensors. He received his PhD from the University of Tokyo in 2002 on naval architecture and ocean engineering, M.Eng. and B.Eng. from Waseda University on mechanical engineering. He is a co-chair of the technology committee on
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Toshiaki Hayashibara was born in Tokyo in 1960. He received his MA from Toyo University in 1986. He is a director of the Asian Research Institute of Underwater Archaeology at Fukuoka and lecturer in underwater archaeology at Tokyo University of Marine Science and Technology. He is also a member of the Japanese Archaeological Association. His archaeological specialties include prehistorical bronze wares in Japan, underwater cultural heritage, and heritage management. In the process of participating in underwater researches all over Japan, he has most gradually come to have his doubts about treatments of underwater archaeological sites and their managements in Japan.
The Historical Transition of Lakefront Environment and Use in Lake Biwa, Japan

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Abstract

Lake Biwa is the largest and oldest lake in Japan. It has approximately 4,000,000 years of history, and many people have lived on this lake. More than 90 underwater archaeological sites exist here, and we are able to understand the subtleties of history. As an example, the Awazu-bottom site is dated to the middle of the Jomon period approximately 5,000 years ago, and is the largest freshwater shell mound in Japan. It was formed near the lakefront at first, but now submerged on the bottom of lake. The Shiozu-port site is a late Heian period dated to 800 years ago, and is one of the oldest harbor sites in Japan. It was constructed to reclaim the lake, and prospered as water transport area. Many important remains, not only port facilities but also shrines and more, have been excavated, but it disappeared in the 12th century. The causes of this sites’ submergence is closely related an environmental transition of the lakefront. The water balance is particularly important problem. Approximately 460 rivers flow into this lake, but the discharge is only through the Seta-River. Therefore, the water level is greatly fluctuated by the sedimentation situation of the riverbed. According to the old historical documents, many floods have occurred. Therefore, sometimes dredging is carried out by the government to this day. Not only are water levels problematic, but ground sedimentation is as well. The lakefront is convenient for fishery and water transportation, but on the other hand, the land is soft. In a certain study, the ground water level is slightly 20cm higher than water level of lake. As a result of this, serious damage to the settlements have occurred by earthquakes. The extreme effect of this has settlements bring submerged to the bottom of lake by lateral Flow; landslide by the soil liquefaction. In this paper, I would like to study a historical transition of the lakefront environment and its use.

Key words: landscape, Lake, Japan, riverine
Introduction

Lake Biwa is the largest and oldest lake in Japan and many people have lived on this lake. There are more than 90 underwater or lakeside archaeological sites that exist here. As it has approximately 4,000,000 years of history, its form has been changed due to a variety of factors such as crustal deformations or sediment depositions. In recent years, the relation between these geographical or geological changes and lives of the local people has gradually been revealed by a lot of archaeological materials acquired through some investigations of the submerged sites (Nakagawa, 2016). In this paper, the underwater archaeological site of Nishihamasengen in Nagahama city is discussed in order to describe the natural and historical environmental changes at Lake Biwa from the ancient times to the middle age.

General Description of the Site

The underwater archaeological site of Nishihamasengen site is located at the bottom of Lake Biwa in front of the town of Gion in Nagahama city, which is in northeastern part of Shiga Prefecture. Local oral tradition tells us that ‘the village called Nishihama formerly existed here, but it was submerged into the bottom of lake by a big earthquake during the Kansho year of the Muromachi period (1460-1466)’.

Before examining historical facts, first of all, some current aspects of the bottom topography found from survey maps and sedimentation situations have to be shown. The investigation area is shallow off shore; around 100m. It is less than 1.5m deep and more than 82.8 m of altitude. There 3 topographical elevated points are characteristically observed (Fig. 1). These points have been named A, B, and D as each survey ward (Fig. 2). In addition, the survey ward of C has no elevation, and a medieval
graveyard does not have any elevated peaks, either. In more than 80m of offing, the more clay-like topography regarded as former ground is still spread. Its average bottom attitude is less than 82.8m (about more than 1.5m deep). In this very peculiar area, old withered trees have been excavated. Because some botanical analyses prove that its soil contains large amounts of plant opals from bamboo grasses, this area was certainly dry land in earlier times.

Fig. 1: Topographical lakebed map around the underwater archaeological site of Nishihamasengen.
In the survey ward of A, its highest bottom elevation is approximately 83.7m (about 0.6m deep). This relatively elevated ward is situated on the western part of the investigation area, measuring about 40m from east to west and 60m from south to north. Around the survey ward of A, the gentle collapse-like topography which was caused by the power waves from the offing direction could be seen (survey ward of A’). In the survey ward of B, its highest bottom elevation is approximately 83.75m (about 0.55m deep). This relatively elevated ward is situated on the east part of the investigation area, measuring about 40m from east to west and 50m from south to north. Around the survey ward of B, as A, the gentle collapse-like topography could be seen (survey ward of B’). In the survey ward of C, the average bottom elevation is approximately 83.3m (about 1m deep). It is on the western part of the investigation area along the lakeshore, measuring about 80m from east to west and 15m from south to north.

In the survey ward of D, its highest bottom elevation is approximately 83.4m (about 0.9m deep). This relatively small and oval elevated ward is situated at the centre of the investigation area, measuring about 35m from...
east to west and 15m from south to north. Around the survey ward of D as well, as A and B, the gentle collapse-like topography could be seen (survey ward of D’). The survey ward of a medieval graveyard is situated about from 50m to 70m off the lakeside, and its average bottom altitude is 83.1m (about 1.2m deep). There many stone materials, most of which used to be grave stones, are found; each medieval grave consisted of many stones, which were nearly a size larger than a fist of a grown-up man or smaller than human skull, forming a rectangular section or a cairn.

The bottom material at the flat part (less than 83.2 m of altitude) at the investigation area consists of small grains of sands. They seem to have been brought there later by wave action or longshore currents. The survey ward of a medieval graveyard is buried under these sands by half. Contra to this, the bottom material of elevated wards of A, B, and D consists of round-shaped small river stones, each of which is from approximately 5cm to 10cm in diametre. Although one of the survey ward of C consists mainly of such river stones, many bigger stones, each of which is from 20cm to 30cm in diametre, are also observed sporadically on this ward.

As for the reason why there are some topographical elevated points there, as this area used to be a river delta. Because of this fact, small river stones are found in the elevated wards of A, B, and D. Each ward still looks like the shape of a river delta. Judging from the survey map, around four tributary branches might have flowed into Lake Biwa, but the direction of water flows may have been altered in later years. So presumably the river was about 250m wide at the mouth.
Historic Environmental Transition Judging from Old Topographies and Relics

Development Process of the Sites

Figure 3 shows the graphic chart of the number of excavated relics from this site for each century. Obviously its peaks were the 8th and the 12th centuries while only one relic from the 14th century was found. Since the 15th century, this site seems to have restarted as a new site. The tendencies at the 12th and the 13th centuries look similar, but almost all relics from the 12th century consist mainly of unglazed pottery named ‘yama cha wan’, which disappeared before the first quarter of the 13th century. In the survey ward C, the remains of a well was found which seems to be abandoned deliberately during the 13th century. The cultural discontinuation of this underwater archaeological site of Nishihamasengen could be observed around the 13th century; this place itself was deserted with awareness.

![Fig. 3: Numbers of excavated relics.](image)

Only one relic from the 14th century at the survey ward of C is either an air ring of a five-ring stone pagoda. It was originally made in the 14th century,
but later after the 15th century it was reutilized as a tomb stone. In the
same elevated zone as the pagoda was found, an elected stone Buddha
statue from the 16th century was also found. The end time of the
underwater archaeological site of Nishihamasengen might be the latter
half of the 16th century, because only one relic, i.e. a cup made from
celadon porcelain, from the 17th century was found there.

The transition period of the underwater archaeological site of
Nishihamasengen could be divided into three or four phases, viz. Phase I
around the 8th century, Phase II in the 12th century which was the most
flourishing time of this site, Phase of Rupture from the middle of the 13th
century to 14th century, and Phase III from the 15th to 16th centuries
when the site had been revived.

**Distribution Situation of Relics Every Investigation Area**

Then, is such situation universal at the whole survey wards of the site?
Figure 4 shows the graphic chart of the number of excavated relics for
each survey ward for each century. Before Phase I, all wards had relics
although its number was relatively small. This trend seems to have
continued until the 10th century. Because this investigation area used to
be a river delta, these small relics were flowed there together with
sediment along the river branches. At first, it was the secondary centre to
accumulate broken relics. Some relics, in particular, from the 10th
century, are not broken at all and not obliterated; the original places of
those relics would not have been so far away. Perhaps, they might be used directly above this site.

Fig. 4: Numbers of excavated relics at each research area.
Phase II is completely different from Phase I. Almost all relics from this phase were found only around the survey ward of B, although only one relic was found around the survey ward of A. Relics from the 11th century, as well as ones from the 13th century, have been excavated only at the survey ward of B. This distribution of relics does not seem to be originated from the natural sedimentation but from real human activities.

After Phase of Rupture, this site might have been developed as a new zone at Phase III after the 15th century. Relics belonging to this period were mainly distributed over the survey ward of a medieval graveyard and the offshore places of each survey ward. As no relic is found in the survey wards of A and B and the survey ward of a medieval graveyard is situated between the survey wards of A and B, the site of Nishihamasengen had been changed into land or from drying at Phase III.

**Constitution of Relics and Land Use in Phase II**

At Phase II around the peak period of the 12th century, what kind of human activities were observed on the site? When did its rivers run dry? The compositions of relics from the survey wards of B are shown in Figure 5. Most of the relics are things for offering only, while ones for boiling or for storing do not exist. Therefore, the survey ward of B at Phase II was not a waste site of general daily necessaries near commoners’ hamlets, but maybe it would have had several mounds of Buddhist scriptures. Because some sutra cases or substitute inkstones are excavated, literate people, which differed from common villagers, might be living there at Phase II.
In former days, men of weight who wished for peaceful death built mounds of Buddhist scriptures in order to bury the scriptures under the mounds. The height of prosperity of this custom was the 12th century in Japan (Sugiyama, 2007); this historical fact may correspond to the case of the site of Nishihamasengen. As for substitute inkstones, they started to be used in the latter half of the 11th century in Japan. Literate people intentionally built mounds of Buddhist scriptures at the survey ward of B, because at the time of Phase II, which extended over 150 years from the latter half of the 11th century to the first quarter of the 13th century, the survey ward of B was dryland, not half-submerged land. This fact is also proved by the restricted size of ward, measuring about 40m from east to west and 50m from south to north; throwing sutra cases and substitute inkstones away from the lakeshore is the out of question.

The concentration of the relics and its conglomeration at the survey ward B suggest that this zone began to become dry before the middle of the 11th century. A study of historical geography (Mizuno, 2011) says that
during the Hoen period (1135-1141) the shrine territory of the Gion Shrine was established around this investigation area and its territorial land-subdivision would have been spread far into under the current Lake Biwa (Fig. 6). It could also be imagined that sutra cases and substitute inkstones from the survey ward B would have been used by some men of weight who managed this shrine territory and conducted its religious activities.

![Fig. 6: Land division of the Medieval Period. (S. Mizuno)](image)

**New Development after Phase III**

It is after 15th century that human beings restarted to live around the site of Nishihamasengen. No relic has been excavated at all at the survey wards of A and B, while at the survey wards of a medieval graveyard, C along the lakeshore, and offshore sinking parts of each ward small amount of relics have been found. These consist of not only stone material cultures but also old china plates, earth pottery plates, pots, grinding bowls, many variations of receptacles. On the grinding bowls some use-wear is observed, which proves the existence of real human living there at this time.
The medieval graveyard must not have built on the submerged land but on the riverbed of some flow channels when the survey wards A, B, and C were formed as a river delta at the beginning, which was not suitable for plotting rice fields. This ward seemed to have been looked like the actual banks of hell at the middle age. According to some botanical analyses and natural scientific dissections of lakebed soil, much larger offshore areas of the current underwater site of Nishihamasengen were used for dryland agriculture at Phase III after the 15th century.

Some oral traditions and historical materials tell us that there used to have been a village named ‘Nisihama-mura’. The relics discovered in the underwater site of Nishihamasengen prove that the village of Nisihama-mura was founded after the 15th century. The oldest and first historical material titled *Eikyo Shichinen Kanjin Sarugaku Hogacho* which mentioned this village was written in 1435. Since the number of relics near the lakeshore is relatively small, the village centre at that time might have been on more offshore place among agricultural fields.

**Cause of Its Submergence and Time**

What was the actual cause of the submergence of the underwater archaeological site of Nishihamasengen and when? From the 15th to the 16th centuries, undoubtedly, the water level of Lake Biwa varied from 84.2 m 84.7m approximately above sea level (Nakagawa, 2017).

Judging from many aspects of the excavated relics from the site of Nishihamasengen, Phase III was terminated at the latter half of the 16th century. Although some stone materials were sometimes reutilized, no relics from the Edo period was found and the newest one is from the first half of the 17th century. During Phase III, the highest peak attitude of the ward of a medieval graveyard is 83.2m (about 1.2m deep). If its ground
attitude nowadays were the same as one in the middle age, villagers had built their graveyard on the bottom of Lake Biwa. Indeed, the water level fluctuation of Lake Biwa is about 1m throughout the year all through the ages, but its fluctuation could not explain why a medieval graveyard is now under Lake Biwa. Some botanical analyses also tell us that around the graveyard the ground was dry at that time. Therefore, the ground subsidence must have happened between the end of the 16th century and the beginning of the 17th century.

The most probable movement of the earth's crust was the big earthquake occurred on 18th January 1586. According to Luís Fróis, a Jesuit missionary, because of this earthquake many ground cracks ate thousands of houses and villagers, and the remaining ones were destroyed by fires. He also described its ground liquefactions, saying that from ground cracks black and liquid soil was coming out (Ida, 1987). The legendary village of Nisihama-mura or the contemporary underwater archaeological site of Nishihamasengen was submerged under Lake Biwa in 1586.

**Conclusion**

Lakeshore and seashore has changed due to water fluctuation, soil sedimentation, crustal movement, and so on. Underwater archaeology could investigate some causes of those changes, studying submerged sites. In Japan, however, most think that underwater archaeology is the study of shipwrecks and not many archaeologists are interested in the historical transitions of waterfront environment or underwater settlement sites. In the Japan archipelago, on the other hand, there are still to be many unknown underwater sites, which are similar to the underwater archaeological site of Nishihamasengen. Researching upon them will be able to cast a new light on the history of Japan or human beings generally.
**References**


**Biography**

Hisashi Nakagawa was born in Aichi Prefecture in 1988. During the undergraduate level, he learned underwater archaeology and supervised by Prof. Hiromichi Hayashi at the University of Shiga Prefecture (2007-2011). Prof. Hayashi did study underwater archaeology from Prof. Yoshio Oe, who is respected as "Father of Underwater Archeology in Japan". In 2013 he completed the master program (Human Culture) at the University of Shiga Prefecture, and then, he had been a PhD candidate in the same university, and a Research Fellow of Japan Society for the Promotion of Science (2013-2016). He works now at the Toyohashi City Museum Art and History.
Legal Status of Sunken State Vessels and Sovereign Immunity

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Abstract

The entry into force in 2009 of the UNESCO Convention on the Protection of Underwater Cultural Heritage (hereinafter referred to as ‘UCH Convention’) adopted in 2001 could be regarded as a welcome development to elaborate or clarify any ambiguity of only two marginal provisions as Article 149 and 303 with regard to underwater cultural heritage in United Nations Convention on the Law of the Sea in 1982 (hereinafter referred to as ‘UNCLOS’). Some texts of the UCH Convention, however, give controversy in fact to the comprehensive international order of the seas in relation to the other provisions of UNCLOS and customary international law, e.g., the definition of underwater cultural heritage, the ‘creeping’ expansion of coastal states’ jurisdiction especially in the EEZ and on the continental shelf, and the sovereign immunity of sunken state vessels. [The paper primarily follows to the terminology of the UCH Convention which uses ‘state vessels’. It is defined as ‘warships, and other vessels…that were owned or operated by a State and used, at the time of sinking, only for government non-commercial purposes’ in Article 1(8).] This presentation will especially focus on the issue of sovereign immunity of sunken state vessels amongst them. International law in relation to warships is complex and uncertain and the issue has high political sensitivity as Article 2(8) of the UCH Convention reflects such a circumstance. The purpose of the presentation, therefore, is to explore the legal status of sunken state vessels. It examines the related provisions and their drafting process of the UCH Convention, the legal status of warships which UNCLOS provides and in the rules of customary international law. It will also observe some cases including notable States practices.

Key words: UNESCO, UNCLOS, UCH
**Introduction**

The entry into force in 2009 of the UNESCO Convention on the Protection of Underwater Cultural Heritage (hereinafter referred to as ‘the UCH Convention’) adopted in 2001 could be regarded as a welcome development to elaborate or clarify any ambiguity of only two marginal provisions as Article 149 and 303 with regard to the protection of underwater cultural heritage in United Nations Convention on the Law of the Sea in 1982 (hereinafter referred to as ‘UNCLOS’), though it is called as ‘A Constitution for the Oceans’ with 320 Articles and 9 Annexes. Some texts of the UCH Convention, however, give controversy in fact to the comprehensive international order of the seas in relation to the other provisions of UNCLOS and general rules of international law.

The treatment of sunken state vessels\(^1\) is also one of the most controversial and challenging issues which the drafters of the UCH Convention faced. International law in relation to warships is complex, uncertain, and politically highly sensitive. The key provisions of the UCH Convention regarding this issue, the legal status of sunken State vessels, are Article 2(8), 7(3), and 10(7) and, due to them, most of maritime States do not have wish to ratify the Convention\(^2\).

This article will focus on the reason and background of such controversy. First, it examines the existing international law and related State practices in order to evaluate the legal status of sunken State vessels under customary international law. Second, it reviews mainly Article 2(8), 7(3), and 10(7) of the UCH Convention. The purpose of this article is to clarify the gap between the UCH Convention and customary international law in relation to the legal status of sunken State vessels and, thereafter, try to explore a key to resolve the gap.
**Sunken State Vessels in General International Law**

**Definition of Warships in UNCLOS**

According to Article 29 in UNCLOS, ‘warship’ means ‘a ship belonging to the armed forces of a State bearing the external marks distinguishing such ships of its nationality, under the command of an officer duly commissioned by the government of the State and whose name appears in the appropriate service list or its equivalent, and manned by a crew which is under regular armed forces discipline’.

Warships had enjoyed specific right for centuries under customary international law and it codified in Article 95 that they ‘have complete immunity from the jurisdiction of any State other than the flag State’ on the high seas. Also Article 96 provides that ‘[s]hips owned or operated by a State and used only on government non-commercial service shall, on the high seas, have complete immunity from the jurisdiction of any State other than the flag State’.

This principle also extends in Article 58(2) to the vessels navigates in the EEZ of coastal States ‘in so far as they are not incompatible’ with the provisions relating to the EEZ set out in Part V of UNCLOS. Also in Article 32 which provides as below, the rules of innocent passage (Migliorino, 1985) are respected in the territorial sea of the coastal states:

‘With such exceptions as are contained in subsection A and in articles 30 and 31, nothing in this Convention affects the immunities of warships and other government ships operated for non-commercial purposes.’
Sovereign Immunity

Until early nineteenth century, the immunity of foreign States was absolute (absolute doctrine). Then, towards the end of the nineteenth century, a restrictive view gradually took place (restrictive doctrine). An exception was envisaged for acts performed \textit{jure gestionis} or \textit{jure privatorum} that is, performed by a foreign State in a private capacity as a legal person subject to private law (Cassese, 2005).

In the line with the restrictive doctrine, whereby immunity is confined to circumstances in which a State acts as a State, immunity extends only to State craft that are engaged in non-commercial service. Government-owned ships operated for commercial purposes are subject to the same treatment as privately owned merchant ships (Dromgoole, 2013).

The question is that whether or not the principle of sovereign immunity continues to apply to a State vessel even after it has sunk. There are two streams; first, immunity does \textit{not} apply after a warship sunk on ground of that a warship is not a warship any longer once it sunk, and a ship is not a ship any longer. Sunken vessel is not the object which can meet the definition of vessel. With regard to warships particularly, as Article 29 provides a ship must be ‘under command’ and ‘manned’ and the conditions which are only possible while it is operational (Caflisch, 1983; Strati, 2005). Sunken warships are not the objects to meet the definition of warship. As such, they are not subject to flag state jurisdiction any longer and therefore not retain their immunity any longer. This position leads to the conclusion that the flag State, \textit{qua} flag State, cannot prohibit a salvage attempted by another State or private operator.
Second position is more promising that sunken State vessel retains immunity because the argument for immunity is on the fact that such craft are state property. States have reasons for maintaining an interest in State vessels after their sinking and these interests are not confined merely to casualties. There are therefore legitimate basis for affording such property indefinite immunity (Rubin, 1975).

A number of maritime States defend the second position and according to general rules of international law the title of the sunken warships may be only lost or transferred by: express abandonment; or capture or surrender under the law of war (Yamamoto, 1981).

**International Conventions and State Practices**

International legislation and State practices show that the legal status implies that sunken State vessels, such as warships and vessels on government service, regardless of location or of the time elapsed since their wreckage, remain the property of the State owning them at the time of their sinking, unless it explicitly and formally abandon its ownership. Such sunken vessels should be respected as maritime graves or reservoir of classified information of the flag State. Thus, it is applied sovereign immunity to sunken State vessels and they shall not be salvaged without the express consent of the flag State (Aznar-Gómez, 2003).

This position is confirmed by several international instruments, e.g., Article 14 of 1910 Convention for the Unification of Certain Rules with Respect to Assistance and Salvage at Sea\(^3\), Article 4 (1) of the 1989 International Convention on Salvage\(^4\), 2007 International Convention on the Removal of Wrecks\(^5\). There are also some representative cases where State have recognized the sovereign immunity and title of sunken State vessels; the Exchange of Note Constituting an Agreement between
UK and Italy Regarding the Salvage of *HMS Spartan* in 1952; Italy recognized the British title to the wreck; Australia recognized the Dutch title to the Old Dutch Shipwrecks belonging to the Dutch East India Company, covered by 1972 Agreement; France recognized US title to the *CSS Alabama* in 1989; US recognized the French title with *La Belle* in 2003.

There are remarkable cases in the US, the *Juno* and *La Galga* case in 2000 and the *Mercedes* case in 2011. It should be noted that after these cases, some particularly concerned States, including US, Germany, Japan, Russia, Spain, UK, clarified their position in their unilateral declaration on the legal status of sunken State vessels by stating that sunken state vessels continue to enjoy sovereign immunity after sinking, wherever they are located.

**The Juno and La Galga Case**

In 1990s, a commercial salvage company, Sea Hunt Inc., submitted an *in rem* claim respectively against two Spanish frigates, *La Galga de Andalucia* and the *Juno*, which were sunk in 1750 and 1802 in the US contiguous zone (Vierucci, 2001). The Sea Hunt was issued with a permit by the State of Virginia to search for the wrecks and, when they were found, Virginia claimed title to them under the Abandoned Shipwreck Act of 1987 (ASA). When the Spanish government knew that a permit for commercial exploitation had been awarded, it issued a diplomatic note of protest and expressed its wish to protect the sanctity of its maritime gravesites. Despite the protest, intervention at the site went ahead and Sea Hunt initiated an *in rem* salvage action in the District Court in Norfolk. Although the District Court partially supported Sea Hunt Inc., the Court
of Appeal of the 4th Circuit fully supported Spanish claims to the two wrecks\textsuperscript{12}. The US Supreme Court then finally confirmed this legal position in 2001\textsuperscript{13}.

The salvor insisted that the vessels had been abandoned by their owner and that it was entitled to recover artefacts by the permit issued by the state of Virginia. It concluded that vessel had not been expressly abandoned by Spain, by reversing a finding of the District Court that Spain had expressly abandoned \textit{La Galga} when it entered into the 1763 Definitive Treaty of Peace between France, Great Britain and Spain. Spain had transferred most of its New World territories to Great Britain in the Treaty. Court of Appeal noted that the terms of the treaty did not provide the ‘clear and convincing evidence’ of express abandonment that was required, because of the absence of specific reference to vessels or shipwrecks in the Treaty. It continued that ‘[i]t is the right of the owner of any vessel to refuse unwanted salvage’\textsuperscript{14}

This case shows some important points; first, it gave the opportunity to several States to explicitly state their position regarding the legal status of sunken State vessels including warships. It was confirmed in US Presidential Statement in 2001 that ‘title to foreign sunken State craft may be transferred or abandoned only in accordance with the law of the foreign flag State\textsuperscript{15}’ and US ‘recognizes that title to a United States or Foreign sunken State craft, wherever located, is not extinguished by passage of time, regardless of when such sunken State craft was lost at sea’.

Second, the Court of Appeals held that sovereign vessels must be treated differently from privately owned ones. The so-called ‘implied abandonment standard’ would seem therefore to be least defensible where a nation has stepped forward to assert ownership of its sovereign shipwrecks\textsuperscript{16}.
Third, unauthorized salvage of sunken State vessels is legally precluded, the salver is denied any kind of reward, and artifacts removed from the bottom of the sea must be returned to the sovereign owner (Aznar-Gómez, 2010).

The Mercedes Case

Odyssey Marine Exploration (OME) in the US discovered a shipwreck in international waters about 100 miles west of the Straits of Gibraltar in 2007. A number of coins and small artefacts were recovered from the site and flown into the jurisdiction of the US District Court of Tampa, Florida, by OME\(^{17}\). Spain asserted; (a) the vessel was the *Nuestra Señora de las Mercedes*, a frigate of war of the Royal Spanish Navy that had exploded with great loss of life in 1804; (b) Spain had not abandoned its sovereign rights over the vessel; (c) under international and domestic US law, foreign State vessels should be afforded the same legal regime as those of the US; (d) the court lacked subject-matter jurisdiction over the *res* under the Foreign Sovereign Immunity Act of 1976 (FSIA).

In 2009, the Magistrate Judge Pizzo issued Report & Recommendations (R & R) in favour of the legal position of Spain. He concluded, on the balance of evidence, that the wreck was the Mercedes and ‘unquestionably’ the property of Spain\(^{18}\). Under the FSIA, which set out the basis for US court jurisdiction over foreign States, a foreign State and its property are presumptively immune from the jurisdiction of the US courts unless an exception applied\(^{19}\). Judge Pizzo concluded that none of the exceptions put forward by OME was applicable and consequently, the court was ‘without jurisdiction to adjudicate the claims against Spain’s property’\(^{20}\). He recommended OME to return the recovered items to Spain\(^{21}\).
The Treatment of Sunken State Vessels in the UCH Convention

Drafting Process

The 1994 International Law Association (ILA) draft and 1998 UNESCO draft of the UCH Convention excluded warships and other state-owned or operated vessels and aircraft used for non-commercial purposes from the scope of application of the Convention by following the approach of many maritime treaties because of its high political sensitivities. It meant that most of the UCH in the world put outside of the protective framework of the Convention and that it would seriously undermine the object of the Convention.

One of the obstacles to removing the exclusion was the provision in the 1998 draft for abandonment “to be deemed” in certain cases. The application of such a provision to state vessels was unacceptable to many States that strongly insisted that their ownership rights could be lost only through an express abandonment (Dromgoole and Gaskell, 1999) and it was dropped.

The preferable outcome for the maritime States would have been for the Convention to codify their stance on express abandonment and immunity by providing that the express consent of the flag State would be required in all cases of proposed interference with sunken State vessels. However, a number of Latin American and Caribbean States refused to recognize the title of the flag State to colonial-era vessels in their coastal waters. They asserted that the UCH ‘is the property of the State in which it is found and through this it is the heritage of the humanity’. As a consequence, a specific regime for sunken state vessels set out in the final text proved to be unacceptable to most of maritime States.
Definition of “State Vessels and Aircraft” and General Principle

Article 1(8) of the UCH Convention defines ‘state vessels and aircraft’ to mean:

‘warships, and other vessels or aircraft that were owned or operated by a State and used, at the time of sinking, only for government non-commercial purposes, that are identified as such and that meet the definition of underwater cultural heritage.’

The definition is consistent with those in other Conventions, including UNCLOS and Salvage Convention in 1989 and it excludes state-owned vessels that were engaged in trade or other private service.

With regard to sovereign immunity, there were concerns about the extent to which any new convention would afford coastal State jurisdiction in respect of State vessels. The final text of the Convention draws a compromise between the interests of flag States and coastal States. In Article 2 (8), it is stated that:

‘(N)othing in this Convention shall be interpreted as modifying the rules of international law and State practice pertaining to sovereign immunities, nor any State’s rights with respect to its State vessels and aircraft.’

Control Mechanisms in each maritime zone

Despite of the Article 2(8), Maritime powers such as France, the UK, Russia and US voted against the adoption of the UCH Convention. One of the main reasons of this was that the Convention prepares some challenging provisions with regard to the control mechanisms in each maritime zone, especially in Article 7(3) and 10(7), and they understood
that the text did not cover all their legal expectation as flag States protecting their sunken State vessels, particularly their sunken warships.

One of the most controversial is the regime of the territorial waters. Article 7(3) states:

‘Within their archipelagic waters and territorial sea, in the exercise of their sovereignty and in recognition of general practice among States, States Parties, with a view to cooperating on the best methods of protecting State vessels and aircraft, should inform the flag State Party to this Convention and, if applicable, other States with a verifiable link, especially a cultural, historical or archaeological link, with respect to the discovery of such identifiable State vessels and aircraft. [Emphasis added.]’

In this Article, the problem is the use of term ‘should’ rather than ‘shall’ and it is highly contentious. It means the notice to the flag State is not legally obliged and no consent of the flag State is required to conduct activities directed at their sunken State vessels.

The mechanism in the EEZ and continental shelf is also highly contentious. Article 10(7) states:

‘Subject to the provisions of paragraphs 2 and 4 of this Article, no activity directed at State vessels and aircraft shall be conducted without the agreement of the flag State and the collaboration of the Coordinating State.’

It provides that no activity shall be conducted without the agreement of the flag State, however it made two exceptions in cases; first, emergency measures are required to prevent ‘immediate danger’ to UCH from ‘human activities or any other cause, including looting’, in which case the consent of the flag States does not have to be obtained first; second, the sovereign rights or jurisdiction of a State party in its EEZ or on its continental shelf
may be interfered with unless it takes action to prohibit or authorize activities directed at UCH located in that zone.

In such cases, a State party may prohibit or authorize those activities without first consulting the flag State. It seems that this is in consistent with what Article 2(8) provides and gives rise to the confusion. Flag States are bound to see the possibility of a coastal States acting under one of these exceptions as an infringement of their sovereign rights, and therefore, by using Article 2(8), they may challenge the coastal State’s right to act (Dromgoole, 2003).

**Conclusion**

The UCH Convention seems to attempt challenging the existing international law and State practices on the sovereign immunity issue in order to accomplish the purpose of this Convention. It must be said, however, the UCH Convention has failed to provide a satisfactory compromise between the interests of flag States and coastal States on the issue and it is the major obstacle to the ratification of the Convention by a number of States. In fact, when the UK abstained from voting on the final text of the Convention, it noted that the UK considers that ‘the current text erodes the fundamental principles of customary international law, codified in [the UNCLOS], of Sovereign Immunity which is retained by a State’s warships and vessels and aircraft…. until expressly abandoned by that State’. ‘The text purports to alter the fine balance between the equal, but conflicting rights of Coastal and Flag States, carefully negotiated in [the UNCLOS] in a way that is unacceptable’ to the UK. It highlights a conflict between existing international law and the UCH Convention.
In order to resolve such a conflict, it is needed to interpret once again Article 2(8) which states ‘nothing in this Convention shall be interpreted as modifying the rules of international law and State practice’ (emphasis added) and observe the building process of customary international law which is crystalized through the accumulation of States practices. The UCH Convention has already entered into force with more than 50 State parties. The Article 2(8) leaves the elaboration of the argument of the legal status of sunken State vessels and their sovereign immunity in the future State practices for building of customary international law and the Convention itself might have the possibility of the evidence of them, although several maritime States attempt to stop such a stream by stating their position on the sovereign immunity of sunken State vessels as mentioned above after the Juno and La Galga case and the Mercedes case.

In observation, in the favor of the UCH Convention, of the process of crystallization of customary international law on this issue, ‘cooperation among States’ which is the basic philosophy of the UCH Convention as it is stated in its Preamble could be any key element. Cooperation, in fact, can be seen in several bilateral agreements as introduced above and might lead a new stream. In this context, some special circumstances might give the wreck a particular status when it is considered to be either a human grave (Aznar-Gómez, 2010; Garabello, 2004) or/and a historical or cultural site.

When we consider thousands of military vessels and aircraft lost during the First and Second World Wars in the twentieth-century, they will have involved many human fatalities and the primary concern of States will be to preserve the sanctity of the site and to ensure that any human remains are afforded appropriate treatment (Dromgoole, 2013). The debate of
this issue on sovereign immunity of sunken State vessels should keep re-opening among States and their practices are needed to be continued to observe carefully.

Endnotes

1 The paper primarily follows to the terminology of the UCH Convention which uses “state vessels” in Article 1(8).
2 France ratified the Convention in 2013.
7 Concluded on 6 November 1972, Australian Treaty Series, No.18 (1972).
9 Signé à le 31 mars 2003, Journal officiel de la République française, No. 144, p. 10560.
10 These unilateral declarations can be found in Federal Register, Vol.69, No. 24 (2004) pp. 5647-5648.
12 Sea Hunt Inc. v. Unidentified Shipwrecked Vessel or Vessels, 221 F.31d 634 (4th Cir. 2000).
14 Sea Hunt Inc. v. Unidentified Shipwrecked Vessel or Vessels, 221 F.3d 634 (4th Cir. 2000), pp. 640-641.

Sea *Hunt Inc. v. Unidentified Shipwrecked Vessel or Vessels*, 221 F.3d 634 (4th Cir. 2000), p. 647.


FSIA, Section 1609.


There were other parties to file a claim against the res, such as Peru and 25 descendants of passengers transporting goods on the Mercedes.


One of the Japanese main concerns is recovering remains in the naval battle site in the Pacific War. See (Iwabuchi, 2012) p.88-90.

**References**


Biography

Kaè OYAMA is an Associate Professor of International Law at Chukyo University Japan. She finished her Ph.D. course and LL.M course at Keio University, Japan. Before her academic position, she was a fellow at the Ocean Policy Research Foundation, and an international legal analyst at the Ministry of Foreign Affairs of Japan. She also experienced a Visiting Professor of the United Nations University (2006-14) and a visiting fellow at Lauterpacht Centre for International Law, University of Cambridge (2012-13). Her main publications include *Introduction to International Law* (2014), *International Order of the Seas and Ocean Policy* (2006), and so forth.
Uraga Port between Manila and Acapulco

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Abstract

Uraga Port at the southern end of the Miura Peninsula, located at the entrance of Tokyo Bay, is formed as a deep cove from the Pacific Ocean, it is less susceptible to weather conditions and is suitable for the natural environment. In the 16th and 17th centuries, Japan opened three international trade ports. Holland and England is Hirado, Portugal is Nagasaki, Spain is Uraga. Ieyasu Tokugawa begins dispatching shipbuilding engineers and miners from Spain and as a result of negotiating with the Philippine Governor General, the Spaniards of Manila visited Uraga Port every year since 1604 and the Franciscan Monastery in the town was built. Ieyasu Tokugawa also sent British William Adams to Manila and negotiated to continue dealing with Spain However, contrary to the intention of Ieyasu Tokugawa, Spain did not convey shipbuilding technology and mining technology. In 1611, Mexican envoy Sebastián Vizcaíno came to Uraga, but only the east coast of Japan was investigated. At the beginning of the Edo period Christianity was forbidden in 1613. Just before the death of Ieyasu Tokugawa, Diego de Santa Catalina came to Uraga, Ieyasu Tokugawa questioned Spain's attitude, banished him to Spain, and the transaction with Spain was completely completed. Japan took an isolation policy and only Uraga Port quietly disappeared as a trade port.

Key words: Galleon, port, Manila, Acapulco

Introduction

When Ieyasu Tokugawa appeared on the political front stage, Japan was isolated from East Asian countries being a disorderly situation both economically and externally. For him, therefore, it was natural trend to
revive the economic infrastructure and turn it into a way to open the country.

First of all, Ieyasu Tokugawa started the normalization of diplomacy in Spain, which had been severed by the San Felipe incident. In December 1598, Ieyasu Tokugawa contacted Franciscan missionaries and negotiated to invite a Spanish ship in Manila to Uraga. He sent a letter to the Spanish Governor of the Philippines to dispatch construction engineers of Galleon ship and innovative smelting engineers of Mexico. As a result, the Franciscan monastery was built in Uraga. Since 1604 a Spanish ship from Manila to Acapulco had entered to Uraga every year, which was opened as an international trade port.

It is worth noting that William Adams from England was closely involved in this Uraga diplomacy. Today, a number of studies on William Adams conducted by Japanese, Dutch, or British researchers, but on him as a diplomatic advisor of Ieyasu Tokugawa for Spain is not considered at all. Despite the fact that politicians did not usually hire foreigners in Japanese history, reasons why only William Adams was hired were not discussed among scholars. Although Nagasaki and Hirado trades have been investigated a lot, no survey on Uraga trade has been done. Why did Ieyasu Tokugawa abandon the deportation order of missionaries by Hideyoshi Toyotomi and accept Catholicism?

**Request Spanish Miners and Shipbuilding Technicians**
Ieyasu’s negotiations with Spain are not limited to trade. He was trying to invite shipbuilders for western styled Galleon ships and miners. At that time Japan was using troublesome method, called haihuki method, for silver mining. Because of its immaturity, this method led lots of economical loss. On the other hand, Spain used a revolutionary amalgam method in Mexico and Peru that used ‘lead’. This technology was discovered in Mexico in 1557 and was adopted in 1571, whereby Mexico gained a lot of silver. For Ieyasu’s future perspectives on progress of economic policy, introduction of this technology to domestic silver mining had an important meaning. In addition, Japan did not have any construction technologies for large western typed sailing vessels to withstand trans-Pacific voyage, Ieyasu Tokugawa thought that its technological introduction from Spain was important as well.

To accomplish his two plans, in December 1598 Ieyasu Tokugawa summoned a Franciscan missionary Jerónimo de Jesús who had experiences of trade-negotiations in Japan since the era of Hideyoshi Toyotomi. Ieyasu Tokugawa proposed for Spain to use Uraga as a trading post and build big ships there. In order to avoid drifting alike the San Felipe issue, Jerónimo de Jesús considered that using another ports in the Far East between Manila and Acapulco passage was useful. To do so, he thought, it was essential to survey the east coast of Japan for safe voyage
around the Far East. Yet, Jerónimo de Jesús explained that he had to request these plans to the Spanish Governor of the Philippines.

However, the Spanish side did not intend to accept Ieyasu's request at all. Rodrigo de Vivero y Aberrucia mentioned this issue in his *An Account of Japan, 1609* that there were abundant of silver veins in Japan; even though they did not have a good smelting technology, production is surprisingly vast. He also remarked that if Japan had had foreign miners and mercury for production of silvers, wealth of Japan might have become a threat for Spain.

As for shipbuilding technologies, Antonio de Morga, an aide of the Spanish Governor of the Philippines remarked about this issue in his *Sucesos de las Islas Filipinas*, he said that giving technology of shipbuilding to Japan was not a wise decision. Manila did not receive any attacks from Japan before that time because only because Japan did not have any technologies to build large sailing vessels. If Japan became to possess such technologies, Japan would come to Manila by ship to attack the Spanish territories. If those trading posts were attacked by Japanese troops, 500 Spaniards in a castle have no power to fight back.

**Japanese Laws Regarding Shipwrecks and Extinction of Yawata Ships**

In Japan it was believed that shipwrecks were caused by Gods of the sea since the ancient times, and cargos and trade goods of the wrecked ships
were legally confiscated by the owner of the coastal land. To ease the anger of the sea gods, thereafter, new temples or shrines were built using sales-profits of such goods from the wrecks. No captain of the ship had any rights to repair the ships or to retrieve properties and cargos from the wrecks. The substantial loss of the San Felipe confiscated by Hideyoshi Toyotomi exceeded 1 million pesos. Therefore, the Spaniards from Manila to Acapulco had to avoid getting stranded in Japan.

Ieyasu Tokugawa was concerned that this Japanese custom regarding shipwrecks was a biggest obstacle against the negotiations with Spain. In 1602, Ieyasu Tokugawa noted to the Spanish Governor of the Philippines that ‘in the future we would not confiscate any cargos and trading goods of drifting ships from your country, and Japan should also provide some foods and places to repairs Spanish ships’. The similar political statements were written in the trade patent form with the Netherlands and with England later.

In a letter of July 1599, the Spanish Governor of the Philippines requested three issues to Ieyasu Tokugawa, viz. control and punishment of the Yawata ships (Japanese pirates) in the Philippine Sea, prohibiting Japanese from visiting Manila without permission, and not dispatching more than three vessels each year ('Ikoku Nikki'). Spanish asked for a proof or an insurance of a public trade to Japanese side, and requested as many permission documents (Watanai Seal Imprint) for trading with Ieyasu Tokugawa. According to a study by a Japanese scholar, Ieyasu
Tokugawa enacted an order that any ships having neither seal nor permission document should not be allowed to go to the Philippines. This new regulation or red seal system was executed from 1600; the origin of red seal trade system was born from the Uraga diplomacy by Ieyasu Tokugawa.

**Two Spanish Vessels Drifted into Kanto**

There were two records of drift incidents of Spanish ships from Manila to Kanto. The first one is commander Don Juan Esquerra drifted to Otaki Kazusa in the fall of 1601. At this time, Ieyasu Tokugawa provided a sailing ship built by William Adams in Japan and provisions. He successfully returned to Luzon in 1604 (*Ikoku Nikki*). After that, an ambassador visited to Uraga in May 1606 to display their appreciation for Ieyasu’s treatment on commander Don Juan Esquerra. This visiting was recorded as "Sagami-kun to Miura Odori Hanedai" in 1606.

The second wreck occurred in September 1609. The Spanish Governor of the Philippines Rodrigo de Vivero y Aberrucia or Don Rodrigo wrecked at Kanto Iwawada on his return trip to Acapulco. This time, Ieyasu Tokugawa sent William Adams to Iwawada. In *An Account of Japan, 1609*, Rodrigo de Vivero y Aberrucia mentioned ‘Ieyasu’s favorite British officer William Adams brought a passage-permission “salvo conducto” and a red seal “chapa”’. At this opportunity, Ieyasu Tokugawa tried re-negotiating with Rodrigo de Vivero y Aberrucia, regarding the dispatch of miners. The agreements of this negotiation between them were listed below:
1. Providing provisions and foods for Spaniards.
2. Repair for ships shall be provided by Japanese shipbuilders with normal wages.
3. Ambassadors shall be treated respectively in Japan, and accommodations are provided to them.
4. Between 100 and 200 Spanish miners shall be dispatched to Japan. When a vein was discovered by Spanish, half of the smelted silver will be divided among miners, and the remaining half shall be divided into Ieyasu Tokugawa and King Felipe.
5. Priests have to be allowed to stay in Japan for the Spanish miners, and all jurisdictions for them were controlled by Spanish side.
6. When Spanish were attacked by Japanese, the Japanese king shall punish the offenders.
7. Exorcise Dutch from Japan.
8. Permit Spanish to survey on east coast of Japan.

The reason why ‘shipbuilders and Galleons’ was not a part of this agreement was that Ieyasu Tokugawa already owned sailing vessels which were built by William Adams and their construction techniques. To Rodrigo de Vivero y Aberrucia, Ieyasu Tokugawa gave a 120 ton ship which was designed and built by William Adams for his return trip. This ship was named San Buena Ventura and, in August 1610, Rodrigo de Vivero y Aberrucia left Uraga port for Acapulco. In the maritime history of Japan, the first ship crossed the Pacific Ocean was this vessel built by William Adams.

**William Adams' Negotiations with Manila**

Since 1604, Uraga Minato in the Kanto area had been used as a trading post by Spanish mercantile ships every year. On the other hand, Portugal
tried to prevent Manila from its trading with China and Japan. According to Lorenzo Pérez's *Apostolado y martirio del Beato Luis Sotelo en el Japón*, following this notion, in May 1606 the Spanish Roundtable Conference was held at the Kingdom of Spain, and the king ordered the Spanish Governor of the Philippines to stop Manila from its trade with Japan. To mitigate and solve this problem, Spanish captain Francisco Moreno Donoso together with a missionary Beato Luis Sotelo visited Ieyasu Tokugawato in order to seek a solution. Beato Luis Sotelo suggested Ieyasu Tokugawato to send William Adams to Manila as a negotiator with Spain. As a result, William Adams visited the Spanish Governor of the Philippines Rodrigo de Vivero y Aberrucia on 15th June 1608 at Manila. This was thirteen years before the beginning of Japan’s commerce with England, i.e. Adams’ home country. This was also one year before Rodrigo de Vivero y Aberrucia drifted to Kanto Iwawada on his return voyage to Acapulco in 1609.

Rodrigo de Vivero y Aberrucia understood the potential of profits that the Philippines gained from trade and relationships with Japan. On 9th July 1608, he released all Japanese prisoners in order to finish, or get rid of, issues related to Yawata ships (Japanese pirates) which had been pending. Then, Rodrigo de Vivero y Aberrucia wrote a letter to Ieyasu Tokugawa on the same day. This letter in *Ikoku Nikki*, which was translated by one of Ieyasu’s personal scholars, is as follows:
捧　前将軍家康尊公書云

本国伊須波二屋之帝王　当国呂宋為守護拙夫被仰付　今度致渡海候。然者、前々於守護人　御懇意之段令承知候。到我等、無御異議候様可恭候　縦雖隔雲山万里候。心中者非其儀候。彌々可申談候。次又拙夫、此国参着砌　当所数年逗留之日本人徒者共候而所之騒ニ罷成候之間　当年者壹人も不相残帰国之儀申付候。雖然每年渡海之商客　何も無竦意人等候之間　致馳走候。向後別儀有間敷候。如例年　今年も黒船差渡候。則到関東可乗入之旨　安子申付候。併海路不任雅意候へは　日域中者、皆以御国之儀候之間何所へ成共　風次第可入津之由申付候　此加飛丹同船中者共　御馳走奉仰候。兼又貴国居住之ふらて之儀　如前々被加御哀煑候様　是又奉仰候。少進物以目録申上候。奉表寸志而已。恐惶敬白。

慶長拾三年五月廿七日　鈍、ろちりこで　朱印びへいろ　判也

謹上

日本国御主、大御所様

(Rodrigo de Vivero y Aberrucia, who arrived in Manila was the Governor of the King of the Spanish Kingdom. In order to strengthen the bond for long-lasting relationship with your country (Japan), Rodrigo de Vivero y Aberrucia released all the Japanese prisoners who had been imprisoned in Manila for several years. Rodrigo de Vivero y Aberrucia believed that two nations shall have good relationship and conflicts in
such will not reoccur. This year, Rodrigo de Vivero y Aberrucia will send one ship, and he will give an order the ship to enter Kanto, and Rodrigo de Vivero y Aberrucia has already mentioned so to ‘Ange’ and requested provisions and other hospitality for its captain.)

The author believes that, together with one captain and one navigator of the ship, William Adams was onboard this ship to Japan in 1608. A person, who was described as ‘Ange’ in the letter, was also known as Miura Anno. Indeed, his person was William Adams. His presence onboard was also described in Lorenzo Pérez’s letter, saying that he ordered William Adams to enter the Kanto area. The Minister of State of Mexico for Japanese and Chinese affairs, C. A. Lera also mentioned and described William Adams as ‘Anjin’. In the book of *Ikoku Nikki*, additionally, William Adams was written and named as ‘Anza’, ‘Anji’, ‘Ann’, or ‘Anzin’, and in *Japanese Travel Book* written by John Saris, William Adams was named ‘Ange’.

William Adams’ trip to Manila, indeed, solved the problems related to Yawata ships (Japanese pirates) that had been causing problems in Philippine waters, and he managed to resume the Uraga trade. In the same year, to avoid unnecessary conflicts, an ordinance was enacted in Uraga that was to forbid Uraga residency to do any violence activities against Spanish people. According to *Apostolado y martirio del Beato Luis Sotelo en el Japón*, written by C. A. Lera, this ordinance was created based on William Adams’s advice. In Uraga, a Franciscan monastery was
constructed in the same year as well which was also based on advice of William Adams. These generous treatments toward Spanish people in Uraga were not because Ieyasu Tokugawa mitigated his attitude against Christianity but because rather Ieyasu Tokugawa needed to withhold his negative opinions toward Christianity in order to make his business with Spain more successful.

**Importance of William Adams**

Why Ieyasu Tokugawa did heavily trust William Adams as a diplomatic adviser? In the history of Japan, his case was extremely exceptional because there were no other cases, except for William Adams. Japanese emperors, shoguns, or important authorities have never used foreigners as their important consultants before. Presumably, indeed, this happened because of the Uraga diplomatic and trading policy by Ieyasu Tokugawa.

1. When William Adams visited Ieyasu Tokugawa first time in April 1600, he asked Ieyasu Tokugawa to give him permission to start business in Japan like other Portuguese or Chinese merchants, but Ieyasu Tokugawa did not give him any permissions, which William Adams recorded in his journal. If Ieyasu’s interest had been to use William Adams for trade purposes with England or the Netherlands, he might not have had been allowed by Ieyasu Tokugawa to trade with Spain. Ieyasu Tokugawa would have asked William Adams on the early stage to look for Dutch or British trading partners as soon as possible. However, the trade with the Netherlands established later in August 1609, nine years after Adams
came to Japan and that one with England was established in October 1613, thirteen years after his arrival. In addition, trading agreements were established with the Netherlands and England because these countries needed Japan for their international competitions. Their positive attitudes toward trades with Japan were so much different from the passive or rather negative attitude of Spanish. Ieyasu Tokugawa himself was the person who eagerly invited Spain to Uraga to establish a good economic relationship with Manila or Acapulco.

2. Indeed, Ieyasu Tokugawa never invited any mercantile vessels from the Netherlands and England to enter Uraga. Both nations were only permitted to build commercial halls in Hirado. If Ieyasu Tokugawa wished, he could easily have invited or ordered mercantile vessels from the Netherlands and England to establish trading posts in Unaga, which is very close to Edo, in order to make Kanto as an international economic center. However, only Spain was frequently asked and invited to use Uraga by Ieyasu Tokugawa.

3. Another interesting fact was that Ieyasu Tokugawa gave William Adams a house at Edo, as well as at the village of Hemi where close to Uraga. Ieyase Tokugawa gave even a fief near Uraga to William Adams, too. These facts clearly indicate that William Adams was expected to work as an Ieyasu’s diplomatic advisor for Spanish issues, not for a simple trading advisor with England and the Netherlands. This is obvious
because another Dutch diplomatic advisor Jan Joosten only received a house at Edo from Ieyasu Tokugawa.

4. On 15th August 1615 when the ambassador Diego de Santa Catalina, who was sent by the Spanish Governor Mexico, arrived in Uraga on Masamune’s ship, *San Juan Bautista*, Ieyasu Tokugawa summoned William Adams from Hirado to Uraga. This event also indicated that William Adams was especially expected to work on diplomatic negotiations, in particular, with Spain.

It is clear from the above that William Adams was a heavily specialized personal for Ieyasu’s Spain diplomacy.

**Relationship between Masamune’s European Ship and Sebastián Vizcaíno.**

In June 1611, to thanks to hospitalities that Rodrigo de Vivero y Aberrucia received from Ieyasu Tokugawa during the wreck incidents on his way returning to Acapulco, Sebastián Vizcaíno, the ambassador of the Spanish Governor of Mexico, entered Uraga. Another mission of his was to survey the east coast of Japan and to discover a legendary island where produced fruitful amounts of gold and silver believed to exist near Japan, and to make this legendary place as Spanish new trading port in East Asia. Not surprisingly, Sebastián Vizcaíno did not manage to find a fictitious gold and silver island, repeatedly encountered storms, and his ship was destroyed eventually and returned to Uraga for repair on 7th
November 1612. After Sebastián Vizcaíno returned to Uraga, he asked Ieyasu Tokugawa to lend his help for construction of a new sailing vessel to go home. However, Ieyasu Tokugawa received from him only some nautical charts and maps of east coast of Japan, not any silver mining engineers. Then, Ieyasu Tokugawa began to realize that his attempt to invite Spanish miners to Japan to improve Japan’s domestic mining system would not be materialized.

Instead, Sebastián Vizcaíno asked Masamune Date, a local lord of Oshu, for help. When he visited the east coast of Japan, such as coasts of Oshu, for surveying, he met Masamune Date who said to him that Masmune Date loved to invite mercantile vessels from Mexico. After that, Sebastián Vizcaíno offered a shipbuilding master to Masamune Date and, thanks to this goodwill, Masamune Date later dispatched his embassy to Europe.

Accordingly, Ieyasu’s attempt to invite Spanish miners to Japan fell apart without any successes. It was 1st February 1614 that Ieyasu’s new executive order to completely ban against Christian propagations throughout the country was enacted. Thus, his plan to transform Uraga into an international trade port was perished and ended.

**Conclusion**

Leyasu ‘s Uraga diplomacy was exclusively focused on relationship with Spain. Moreover, the port that Ieyasu Tokugawa used to invite Spanish mercantile vessels was always Uraga port. Other ports that Ieyasu Tokugawa used to invite other European nations such as England, the
Netherlands, and Portugal were not Uraga but Hirado or Nagasaki. Ieyasu’s true intention was to import and learn new profitable techniques of mining developed in Mexico. For Ieyasu Tokugawa, therefore, William Adams was a very important diplomatic consultant to negotiate with Spain. To build a friendly relationship with Spain, Ieyasu Tokugawa answered to requests by the Spanish Governor of the Philippines to give permissions with red seals to the limited numbers of Japanese mercantile ships. In other words, the original concept of Ieyasu’s red seal trade system was born from his Uraga diplomacy.

From the beginning, Spanish did not have any intentions to send their silver miners to Japan. Ieyasu’s mistake was that he could not disclose their intentions. Failure of his Uraga diplomacy resulted in the complete ban on Christianity in Japan. Nearly 300,000 Japanese who believed in teachings of the Society of Jesuit and Franciscan were killed in the end. Consequently, Japan or Tokugawa-Shogunate decided to close the doors to any foreign countries, except for the Netherlands and for China. It could be said that Ieyasu’s Uraga diplomacy with Spain also triggered the 250 years of Japan’s national isolation.

References


**Biography**

Kahoru Suzuki, born in 1946 at the Kanagawa Prefecture, Japan, is a specialized national public servant in the Japanese government, who was decorated with the Order of the Sacred Treasure, Silver Rays in 2016. She is a member of the Japan Society for Nautical Research and the Society of Japanese Historical Research. In 1993 she received her BA in Japanese History from Kokugakuin University. Her books include The Sagami Miura Clan and their History (Shin Jimbutsuourai Sha, 2007), Diplomatic Relation between Span and Japan by Ieyasu Tokugawa (Shin Jimbutsuourai Sha, 2010), or The Mukai Navy and its Surroundings (Shincho, 2014).
A Methodology for Accurate and Quick Photogrammetric Recording of Underwater Cultural Heritage

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Abstract

In the past seven years, photogrammetry has become one of the main recording methods in maritime and underwater archaeology. The application of photogrammetry allows archaeologists to re-create underwater cultural heritage sites in 3D digital formats, and extract from these 3D digital models data and information required for subsequent scholarly research. The author has been using photogrammetry since 2014 and has successfully created nearly 40 underwater cultural heritage models on more than 10 archaeological projects. The projects have ranged in size, accessibility, and water clarity, introducing a number of variables to the photogrammetry of the artifacts. The variety of experiences gained on these projects have enabled the author to construct his own methodology and workflow for photogrammetric recording. In this paper, the author shares examples of his methodology and workflow for photogrammetric recording of various projects in different countries.

Key words: UCH, photogrammetry, Photoscan

Introduction

Agisoft PhotoScan and other off-the-shelf photogrammetry software became available for archaeologists in 2010. By 2017, after only 7 years, photogrammetry has become a one of the most frequently used recording methods for UCH (underwater cultural heritage) sites. The author of this paper works as a professional maritime archaeologist and applied photogrammetric recording on more than 35 archaeological sites in more than 10 different countries. Because of its submerged circumstances of many shipwrecks, each site has different conditions: such as visibility and
colors of waters, depth, topography, water current and so on. Those different conditions create problems that requires different ways to solve those difficulties. Additionally, each project has different mission statement, or project’s goal. For that reason, each submerged site requires different types of methodologies for data-collection and data processing. Moreover, to use produced 3D digital models as archaeological data, it is important to create 1:1 scale-constrained georeferenced 3D models (Yamafune et al., 2016). Yet, to produce these accurate models, it is essential to takes a week to produce local coordinate system that gives scale and georeferenced on the model. To solve these lengthy problem, the author created a methodology that produces local coordinate system in short time (1 or 2 dives) yet provide fairly accurate results. In this paper, the author shall share his methodology of photogrammetric recording that he has developed and currently using.

**Literature Review and Terminological Confusion of Photogrammetry**

Before the author starts discussions regarding his photogrammetry methodology, there is an important point that must be noted. The point is a confusion related with the word ‘photogrammetry;’ ‘photogrammetry’ has been used repeatedly in history; probably the first time it appeared in/as a discipline of science was during the WWII. When airplane became widely available for military use, cameras were mounted on scouting airplanes; then photos taken from the mounted cameras where meticulously re-calibrated and composed to create a photomosaic, or a map, of enemy’s territories. In other words, ‘photogrammetry’ that were used first during the WWII was a technique to create accurately composed photomosaic (Burtch, 2008; Van Damme, 2015; Konecny, 2003). And it
was a well-known fact that Dr. George Bass and Dr. Frederick Van Doornick, well-known ‘first generation’ maritime archaeologists, used photogrammetry for their Yassiada underwater expeditions in 1960s; detailed site plans were produced based on photomosaic that were taken from a camera that was mounted on horizontally positioned rails on the seabed (Van Doorninck, 1967; Bass, 1972; Bass and Van Doorninck, 1982). In their publications, they used a word ‘photogrammetry,’ however, it must be noted that ‘photogrammetry’ in their article and ‘photogrammetry’ that produces 3D digital models today uses different systems and indicate different recording systems.

Another terminological confusion related to a word ‘photogrammetry occurred in 1990s. In 1990s, maritime archaeologists started practice DSM (Direct Survey Method); many cases this system is referred as trilateration. DSM provides a local coordinate system/network to help production of 2D site plans of submerged shipwreck site. DSM is a method to directly measure distances in between control points and detailed/reference points to create positional networks. Consequently, DSM provides XYZ coordinates of control points and detailed points, and maritime archaeologists use these XY coordinates to produce 2D site plans (Holt 2003: Green and Gainsford 2003). When DSM became a popular method among maritime archaeologists as a mapping method in 90s, another method was also often used to produce 2D site plans; and this another method is also called ‘photogrammetry.’ This photogrammetry is known with the software Photomodeler. Photomodeler is a photogrammetry software; and this photogrammetry mainly applied for underwater excavations in 1990s and 2000s uses a meticulously calibrated camera and its images that captures at least three reference
points in one image. Thanks to meticulous calibration of the camera and its series of images, *Photomodeler* can calculate the XYZ coordinates of reference points; and these reference points are used to produce 2D site plans and 3D CAD drawings. Indeed, the data sets that DSM and this photogrammetry produced were very similar; both system provides XYZ coordinates of reference points on submerged sites. A few articles were published in 1990s and the early 2000s related to this photogrammetry that produce XYZ coordinates of reference points, or a local coordinate system (Green *et al.*, 2002). However, photogrammetry that related *Photomoder* is different from photogrammetry that can produce 3D models. Confusingly, around 2010, when photogrammetry that can produce 3D models began to become popular recording methods, EOS system (the software company manufactures *Photomodeler*) released upgraded version of the software called *Photomodeler Scanner*. This *Photomodeler Scanner* can produce 3D models of subjects that uses similar system with ‘photogrammetry’ that the author will discuss in this paper. Nonetheless, it is important to be noted that *Photomodeler* that can provide XYZ coordinates of reference points and *Photomodeler Scanner* that can produce 3D models are different types of ‘photogrammetry.’ And a word ‘photogrammetry’ mainly referred in articles of maritime archaeology in 1990s and early 2000s were mainly focus on *Photomodeler* and its system that provides XYZ coordinates of reference points on archaeological sites.

In 2010, *Agisoft PhotoScan* was released. While *Autodesk 123D Catch*, *Photomodeler Scanner* and other photogrammetry software that produce 3D digital models were also released around the same time, thanks to its georeferencing systems and user-friendly workflows, *Agisoft Photoscan* immediately became popular photogrammetry software among maritime
archaeologists are keen to apply quick and accurate recording methods on submerged sites. By 2017, many maritime archaeology projects enjoy this recording application. Nonetheless, another confusing terminological problem is happening. After 2010, almost all the time ‘photogrammetry’ indicates a system that produces 3D digital models; however, there are many different words were being used to indicate this one system. The author often hears SfM (Structure from Motion) in the United State and Japan, some articles including IJNA (International Journal of Nautical Archaeology) prefer Multi-image Photogrammetry, some Italian scholars sometimes use Close-range Photogrammetry, and scholars form northern European countries sometimes use Computer-Vision Photogrammetry. Yet all these words imply one system that produces 3D digital models based on digital images.

Concluding this section, the word ‘photogrammetry’ implies different systems when it was used for maritime archaeology. From 1960s and 1980s, ‘photogrammetry’ implies a system that produced a photomosaic of sites; from 90s and 00s, ‘photogrammetry’ implies a system that used calibrated digital cameras and its photos to calculate XYZ coordinates of reference points located on the site to produce 2D site plans and 3D CAD drawing (by connecting reference points). After 2010, ‘photogrammetry’ implies a system that produces 3D digital models. Furthermore, this ‘photogrammetry’ after 2010 that produces 3D digital models is called in different names, such as SfM, Multi-image Photogrammetry, Close-range Photogrammetry, Computer-Vision photogrammetry, and so on, yet these all names indicate only one system. In this paper, the author shall use a word “photogrammetry” in his discussions, and this “photogrammetry” indicates a system that produces 3D digital models.
Importance of Local Coordinate Systems

Tying the site plan to a set of local coordinates is a key factor to create 1:1 scale-constrained georeferenced photogrammetric 3D digital models. There are two reasons that creating a local set of coordinates is important. The first reason is to correct scale and distortion of the photogrammetric models and to geographically reference the site plan. One of the advantages of photogrammetry is that it does not require precise calibration of the camera. Although calibration is recommended, the software primarily uses pixel information to reconstruct a site, which means that the construction of the point clouds does not require manual calibration. Moreover, the software reads metadata from the camera and lens and minimizes the errors. Distortions are inevitable, however, and this possible error can be minimized by applying known distances and specific photo capturing sequences, or “flight path.” The second reason to establish local coordinate system is that unless tied to a system of coordinates, models float in unspecified tridimensional fields. To fix the models in the correct position, local coordinates must be included on the models. Without this, it is impossible to export the computer graphics files to mapping software with the correct position. Georeferenced information facilitates a straightforward workflow when models and orthophotos (high resolution photomosaic) are exported.

Also, the processing and rendering capacity of the Agisoft PhotoScan software is limited by both software and hardware configurations. This constrains the maximum polygon count for the mesh (which makes up the surface of the model), and the maximum number and resolution of UV mapped textures (‘UV’ is a XY coordinates for texture), which are composed photomosaic on surfaces of mesh. Large data sets can be divided into smaller Chunks (PhotoScan’s term), which are separately
processed. These Chunks can be imported into a single PhotoScan file afterward without merging (Tool > Append) and other modelling and mapping software applications and merged without decimation (the reducing of the polygon count). When models and orthophotos are georeferenced, the merging process is automatic, and exported files are opened in their correct positions in other software. A set of local coordinates is paramount to ensure an accurate manipulation of models or orthophotos.

**Scale-bar Methods and DSM**

While local coordinates system that is produced by DSM can be used to scale-constrain photogrammetric model, Agisoft PhotoScan also allows the input of measurements in a different way. PhotoScan uses scale bars, or known distance, instead of importing local coordinates collected using DSM. At actual archaeological sites, establishing control points and local coordinates may take a week. This may not be suitable for a short-term survey project. The author had tested the both methods to fix distortions and scale of photogrammetric models. Measuring methods that will be discussed and compared are: trilateration (DSM) using 3H Site Recorder, and scale bars that are placed on the site. To compare and examine the accuracy both methods, local coordinates and known distances of both methods were applied to a photogrammetric model, and each different method was compared to control measurements. The control measurements were taken directly from the wooden model. For this test, the author used a 1:10 scale wooden model of a saveiro, a 20th-century Brazilian coastal sailing boat. In order to simulate an archaeological shipwreck site, the wooden model was laid down on its starboard side,
and its floor timbers were pulled slightly out so that its starboard futtocks lay on the bottom (See also Fig. 2 and 3).

**Direct Survey Method (Trilateration)**

The first method to discuss is trilateration, also known as Direct Survey Method (DSM). Trilateration (DSM) has been repeatedly used in underwater archaeological recordings. For this DSM, the author used 3H *Site Recorder* (Demo Version). In order to acquire coordinates of reference points, a control network first had to be established. The author placed eight control points around the wooden model, set all the control points to a congruent height (40 cm from the ground), and set this height as the surface of the water, or depth of 0 cm. To establish the positions of the control points, or a control network, 19 measurements were taken. The tolerance established for errors was set at 0.3 cm; therefore, all distance errors bigger than 0.3 cm were shown in red (shorter) and blue (longer). Only one distance (CP5 – CP7) showed a + 0.39 cm statistical error after the adjustment of the control points. After the control network, or positions of datum points, was established, 11 reference points were placed on the model. A total of 44 measurements were taken from the control points; each reference point was measured from the nearest four control points (Fig. 1). Two measurements indicated over 0.3 cm error; however, both errors were less 0.5 cm, which is within an acceptable range of error.
Fig. 1: The Local Coordinate Network of reference points and control points around the Saveiro Wooden Model (Top View: Horizontal Plane).

**Scale-bars Method**

Scale bars are often used when pictures of archaeological sites are taken. These scale bars can be extremely useful in photogrammetry. Scale bars give accurate scale information in archaeological photography, and when a site is being mapped using photogrammetry, they can be used to check measurements after other methods, such as DSM, were used to correct distortion and scale of a created photogrammetric model. However, distortions and dimensions can be fixed by using only scale bars, a feature that allows archaeologists to skip the time-consuming DSM system. To test the accuracy of this method, four scale bars were placed on the four sides of the saveiro model. In this particular case, considering the size of the model the four scale bars available were unnecessarily long. Therefore, seven 10 cm scale bars with markers were created on the existing scale bars. These smaller 10 cm bars were entered as fixed distances in the photogrammetric model (Fig. 2).
Comparison of DSM and Scale-bars Methods

To test the accuracy of these two survey methods mentioned above, the measurements from all photogrammetric models of the saveiro were compared within a single set of control measurements. The control measurements were taken directly from the wooden model; 21 selected distances between reference points were taken for this purpose (Fig. 3). The control measurements were compared to the measurements obtained by the other methods (Table 1).
Fig. 3: The photogrammetric model of the Saveiro Wooden Ship Model and the measured distances between reference points for the comparison.
Table 1. Distances between reference points to compare different surveying methods to fix distortions and scales of the Saveiro Wooden Ship Model’s photogrammetric model

<table>
<thead>
<tr>
<th></th>
<th>Control (cm)</th>
<th>Trilateration (DSM) (cm)</th>
<th>Scale Bars (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1 – R2</td>
<td>142.5</td>
<td>142.0</td>
<td>142.2</td>
</tr>
<tr>
<td>R1 – R3</td>
<td>51.2</td>
<td>51.3</td>
<td>51.0</td>
</tr>
<tr>
<td>R1 – R9</td>
<td>51.1</td>
<td>51.8</td>
<td>50.9</td>
</tr>
<tr>
<td>R1 – R6</td>
<td>63.4</td>
<td>63.9</td>
<td>63.2</td>
</tr>
<tr>
<td>R2 – R5</td>
<td>57.6</td>
<td>57.8</td>
<td>57.4</td>
</tr>
<tr>
<td>R2 – R11</td>
<td>50.4</td>
<td>50.5</td>
<td>50.3</td>
</tr>
<tr>
<td>R2 – R8</td>
<td>57.0</td>
<td>57.7</td>
<td>57.4</td>
</tr>
<tr>
<td>R3 – R5</td>
<td>44.9</td>
<td>44.6</td>
<td>45.1</td>
</tr>
<tr>
<td>R6 – R8</td>
<td>46.6</td>
<td>45.4</td>
<td>46.6</td>
</tr>
<tr>
<td>R3 – R6</td>
<td>54.2</td>
<td>53.9</td>
<td>54.3</td>
</tr>
<tr>
<td>R5 – R8</td>
<td>55.3</td>
<td>55.6</td>
<td>55.3</td>
</tr>
<tr>
<td>R4 – R7</td>
<td>57.0</td>
<td>57.0</td>
<td>57.1</td>
</tr>
<tr>
<td>R3 – R8</td>
<td>71.3</td>
<td>71.2</td>
<td>71.2</td>
</tr>
<tr>
<td>R6 – R5</td>
<td>71.0</td>
<td>70.4</td>
<td>71.7</td>
</tr>
<tr>
<td><strong>Length of Keel</strong></td>
<td><strong>115.2</strong></td>
<td><strong>115.0</strong></td>
<td><strong>115.2</strong></td>
</tr>
<tr>
<td><strong>Average Error</strong></td>
<td>0.39</td>
<td></td>
<td>0.19</td>
</tr>
</tbody>
</table>

The results suggest that scale-bar can be a more accurate scale-constrain method in a photogrammetric model. The measurements taken from the photogrammetric model with trilateration (DSM) coordinates display an average error of 0.39 cm. The more accurate results obtained were through the use of scale bars; the scale bars allowed an average error of 0.19 cm.

The results of the experiments with two scale-constrain methods discussed show that the scale bars method provided better results in fixing scales from photogrammetry surveys. The main disadvantage of trilateration (DSM) is that it requires many measurements. For instance,
the saveiro model required 19 measurements to establish the control point network and 44 measurements to calculate the coordinates of reference points. On the other hand, the scale-bars method does not require any measurements. However, it is important to note that the scale-bars methods cannot establish a local coordinates system. This is a disadvantage when compared to the traditional trilateration (DSM) method; scale bars can fix distortion and scale of photogrammetric models, but they need a complementary method to establish local coordinates.

**The Recommended Method to Produce 1:1 Scale-constrained Georeferenced 3D Models**

Following is an experimental methodology that author composed and applied on several underwater shipwreck sites, and these photogrammetric models shows successful results.

**Testing Scale-bar Method on Larger Underwater Sites**

The author tested scale-bars method on various underwater shipwreck sites; including Operation Forager directed by Dr. Jennifer McKinnon and Dr. Toni Carrell (Saipan 2017: 8 wrecks), Fourni Underwater Survey Project directed by Dr. George Koutsouflakis and Dr. Peter Campbell (Greece 2017: 9 wrecks), and Converging the World Project directed by Nicholas Budsberg and Charles Bendig (the Bahamas 2017: 1 sites). While recording those submerged archaeological sites, the author positioned 4 – 8 scale bars on each site for photogrammetric recording. To test possible distortions in a larger submerged site (for instances around 30m x 30m), the author intentionally scale-constrained only one
corner with a 1m scale bar using the Scale-bars method, and check calculated distance using a 1m scale bar on the opposite site. The result showed that the distance error of the 1m scale bar on the opposite side is 2.5mm. And this result stay same with other photogrammetric models of other sites (errors varies in 0.5mm – 3mm). In other words, if a 3D digital model is scaled by one side of the 30m x 30m coverage area, distance error (or distortion) can be less than 2.5mm anywhere if an archaeologist tries to measure 1m-long areas; and it also means that possible maximum positional errors from one end to the other end of the 30m-long site (if this distortion occurs in linear manner) is 7.5cm. Again, the biggest advantage of the scale-bars methods is its simplicity and speed. It doesn’t require any tape measurements; scale-bars can be simply positioned around the sites. More importantly, once ‘Scale Bars’ are created in Agisoft Photoscan, camera locations and scale of the created model can be fixed based on known distances by ‘Optimize Cameras’ command (open ‘reference tab’ > input known distances on ‘Scale bar’ > ‘Update’ > ‘Optimize Cameras’). Using this ‘Optimize Cameras’ command, distance errors on the 1m can be 0.5mm or less. This means possible distance error of 30m-long site is 1.5cm.

**Importance of the ‘Flight Path’**

To obtain good/accurate results with minimum distortions on created photogrammetric models discussed above, the author strongly believes that his distinctive “flight path” is the key factor. The author originally developed his flight path to ensure successful rate in “Align Photos” process. Photo alignment is the most important phase in photogrammetric modeling. To maximize the probability of creating successful photo alignment, the author developed a flight path for sequences of photo
shooting. The best results have been achieved by capturing surrounding area first to lock the site. Then, photographs are taken perpendicularly to capture a top view of the site with appropriate overlap. After complete photo shooting in both transversal and longitudinal paths, additional photographs must be taken with the camera tilted to capture vertical surfaces of rich tridimensional structures (Fig. 4). Actual ‘flight path’ of archaeological sites can vary depending on multiple factors; therefore, meticulous planning of a flight path is an important part of successful photogrammetric recording. Most important factor of flight path is its interwoven manner; sometimes the diver who use photogrammetry only apply transversal path without the longitudinal path and the locking paths. In other words, if only one direction of flight path is applied, directional distance/length of from one point on one side to another point on the opposite side shall be long, and distortions on images will be accumulated. However, if three paths (Locking path, transversal path, and longitudinal path) are properly operated, distance from one side to the opposite side will be shorter hence the distortion can be minimized. For that reason, the author strongly recommends that photo-shooting sequences, or ‘flight path,’ for photogrammetry have to be practiced with interwoven manners.
Applying Local Coordinate System on Scale-bars Method

Next step to create a 1:1 scale-constrained georeferenced 3D models is to apply a local coordinate system on a created 3D digital model. As it was discussed earlier, scale-bars methods can produce fairly accurate scale-constrained 1:1 models; however, these models cannot carry georeferenced/positional information. Having a georeferenced/spatial information is essential for archaeologists to use 3D photogrammetric models as scientific data for their analysis. In order to apply/generate a georeferenced data on a created 3D model, it only requires XYZ coordinates of three control points within a site. The author uses distances between three control points placed on the archaeological site to establish a temporal XY coordinates on the three points. A triangle can be created if distances between three points are known. To obtain these distances from a created scale-constrained 3D model, control point must be created/placed on the model. Control point can be created easily in Agisoft PhotoScan as markers by double clicking on the respective position on the mode (these markers can be created on the photos by right clicking and choose ‘create markers’ in Agisoft PhotoScan). Then scale-bars were
created between these three points to extract calculated distances between the points (choose two respective markers on reference pane > right click on selected markers > create ‘scale bars’ > click ‘view estimated’). Using these distances between three points, a triangle can be created using 3D CAD software such as Rhino 3D. Then orientation of the triangle must be adjusted based on depth-measurements of these control points collected by diver’s dive computer (Fig. 5). This adjusted triangle and positions of its three corners give new/adjusted XYZ coordinates of the three points; the author uses these coordinates to adjust angle of these three control points on the 3D model in Agisoft PhotoScan (open reference tab > input XYZ coordinates of the corner of the adjusted triangles > ‘update’). Once these adjusted coordinates were applied, the 3D photogrammetric model shall contain georeferenced information.

![Fig. 5: Adjustment of the coordinate triangle (The blue triangle is a temporal triangle that was created based on distances between control points. And the red one is the adjusted triangle; its orientation was adjusted based on depth-measurements of the three control points. Then new coordinates were collected from corners of the red triangle).](image)
Using a 1:1 scale constrained photogrammetric model as new local Coordinate System

On the Conversing the World Project, the team of maritime archaeologists excavated an early sixteenth century Spanish shipwreck in the Bahamas during the summer 2017; this shipwreck is also known as the Highbourne Cay Shipwreck. The author is in charge of photogrammetric recording of the shipwreck site, and he applied the combination of scale-bars and triangle geo-referencing methodology explained above to create 1:1 scale-constrained georeferenced 3D digital models. Furthermore, once a 1:1 scale-constrained georeferenced 3D model of the site was created in Agisoft PhotoScan, it is easy to extract coordinates of any possible points on the 3D model by creating markers (right click on the model or a photo > ‘create makers’ > ‘view estimated’). This means that when 3D models are created on the same area or smaller areas within the site in following day, coordinates of reference points/markers can be collected from the first 1:1 scale-constrained georeferenced model, and apply these coordinates on newly created 3D models. This means once a local coordinate system is generated within the first model, archaeologists can use this coordinate system to both scale-constrain and geo-reference following photogrammetric models. The author prefers to call this first 1:1 scale constrained georeferenced 3D model as ‘Mother Model’, and following 3D models that receive coordinates from Mother Model as Child Models. In other words, the Mother Models itself works as a local coordinate system of the site, and archaeologists can extract XYZ coordinates of any reference points form the Mother models to create another 1:1 scale constrained georeferenced 3D digital models.
Conclusion

Past 7 years, photogrammetry became one of the most frequently used recording applications on UCH (Underwater Cultural Heritage). However, if archaeologists use these 3D digital models as scientific data, it is vital to create 1:1 scale-constrained georeferenced 3D digital models. Once a 3D digital model carries/contains correct/real scale and georeferenced information, archaeologists are able to extract dimensional information, section profiles, DEM (Digital Elevation Models) and contour maps, orthomosaics (high resolution photomosaic), 2D siteplans, and other scientific data. The author's methodology uses simple scale bars placed on site and a triangle created in 3D CAD software based on distances in between three control points. This methodology provide accurate results in a short-term (for instances, if a site is 30m x 30m in size and 20m deep, it will be 0.5mm possible error in 1m, or 1.5cm possible error in 30m, with the optimization, and it takes only 3 - 4 dives with one diver). Once the first model, or Mother Model, is created, following photogrammetric models from the campaign can take advantage of a local coordinate system of Mother Model. In other words, photogrammetric recording processes can be much faster, so that archaeologists are able to create series of 3D digital models during the same excavation campaign. Consequently, maritime archaeologists can obtain enough dataset to study a shipwreck site with layers of information and study stratigraphy of shipwrecks.

References


Biography

Kotaro Yamafune received his Bachelor of Arts degree in history from Hosei University in Tokyo in 2006. He entered the Nautical Archaeology Program in the Anthropology Department at Texas A&M University in September 2009 and received his Master of Arts degree in August 2012. He continued his studies in the Texas A&M University Nautical Archaeology Program and earned his doctorate in May 2016. His research interests include shipbuilding in Medieval Europe and the European Age of Discovery, and ship reconstruction. He also focuses on photogrammetric recording of submerged cultural heritage, including shipwreck sites.
The Shared Underwater Cultural Heritage of Japan and the Netherlands: the Kanrin-maru

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Abstract

In 2014, a non-exhaustive inventory of the shared cultural heritage of the Netherlands and Japan was made by the Dutch government in the context of what the Netherlands calls its ‘Shared Cultural Heritage Policy’. This inventory resulted in an overview of shared cultural heritage grouped into the categories ‘maritime heritage’, ‘built heritage’, ‘museum collections’ and ‘archives’. Spread over seven different themes and linking to an equal number of time periods, the inventory provided insights into where opportunities for cultural collaboration would lie. One of the opportunities of collaboration found revolved around the potentially preserved Dutch shipwrecks in Japanese waters. This sparked the incentive to propose a project-based partnership through a collaborative research project between the Cultural Heritage Agency of the Netherlands and Tokyo University of Marine Science and Technology, to locate and research the shipwreck of the Kanrin-maru. The project, which commenced in 2017, includes the involvement of Dutch and Japanese researchers to facilitate the transfer of knowledge, as well as the involvement of trainees in order to ensure capacity building. The Kanrin-maru was a warship specially built in the Netherlands in 1856 on order of the Tokugawa Shogunate Navy. It was brought to Japan in 1857, but in 1869 during the Boshin War between Shogunate and Imperial forces it was taken over by the Imperial Japanese Navy, and remained in the service of the Imperial Meiji government until it foundered in the Tsugaru Strait in 1871. Although an anchor thought to belong to the Kanrin-maru was found near where it was said to have foundered, no wreck has been found to date. In November 2017, fieldwork in Hokkaido, including material analysis upon its anchor, as well as library or archival research is to be done by Dutch and Japanese archaeologists.
Key words: UCH, Japan, Netherlands,

Introduction

Japan and the Netherlands, two nations sharing a history with over four centuries of relations, have in recent years reinvigorated their cultural bonds by promoting collaboration in topics of shared cultural heritage. While this has already inspired a broad variety of forms of cultural collaboration such as in the Arts and Crafts\(^1\), this also led to collaboration in the specific field of maritime heritage and underwater cultural heritage management. For in 2014, the Cultural Heritage Agency of the Netherlands (RCE)\(^2\) and the Japanese Agency for Cultural Affairs together with the Kyushu National Museum took the lead in this particular field of collaboration. The main mutual benefit of their collaboration is that it could help both nations to familiarize with the implications of ratifying the Convention on the Protection of the Underwater Cultural Heritage. At the same time, both nations have grabbed this opportunity to aim for sustainable preservation of what is considered their shared underwater cultural heritage.

This inspired the current authors to further the collaboration in the field of shared underwater cultural heritage between the Netherlands and Japan by proposing the formation a project-based partnership between the RCE and Tokyo University of Marine Science and Technology, a member institution of the UNESCO Underwater Archaeology UNITWIN Network and Japan’s only university with both graduate and undergraduate courses in nautical archaeology. An official agreement of this partnership is in the making. With this paper, the current authors wish to promote the potential of this project and the shared cultural heritage it represents.
Main aims of the project are knowledge exchange and capacity building by involving experts and trainees. It was decided that the main subject of research and training would revolve around locating, and if found, researching the wreck of the Kanrin-maru (咸臨丸): a Dutch-built screw-propelled steam schooner that supposedly wrecked near Kikonai Municipality in Hokkaido in 1871. Since the story surrounding the ship and its wrecking have become strongly rooted in the local community, and have also been promoted by the local government, efforts will be made throughout the project to involve the local community and government in order to facilitate a sustainable preservation of the wreck, its story and place within the local community.

Since the wreck of the Kanrin-maru has not yet been located, a start was made in 2017 in order to assess whether locating the wreck is feasible. At the time of writing, the initial research is well underway and consists of desk research in both the Netherlands and Japan, as well as a survey in the field planned somewhere between September and December this year. Results of what has been gathered through desk research thus far will be discussed in this paper. The sections further below provide a historical background sketch, information on prior research, a general project definition with corresponding aims, objectives and research questions, and the preliminary results of the initial research. The paper ends with preliminary conclusions and a thought on the implications of these conclusions in regard to the continuation of the project.

**Historical Background**

From around 1639 to the year 1854, in a period now known as the sakokujidai³, Japan had practically kept its doors shut to all westerners but the Dutch. At the time, the Dutch were the only ones allowed to trade with Japan through the tiny artificial island called Dejima⁴ that lay in front
of Nagasaki. This centuries old privilege came to an end when in the years 1853-1854, steam warships of the United States Navy led by Commodore Perry (1794-1858) entered Tokyo Bay and forced Japan to end its isolation policy. Fearing a foreign invasion, the Tokugawa Shogunate hastily sought means to build a naval fleet. And for this, the Japanese turned to the Dutch (Kogure, 2008).

In order to jump-start this naval fleet, Japan ordered from the Dutch arms and warships among other things, as well as instructors who were to provide education and training in virtually all matters associated with the navy (Chijs, 1867). Besides seeing direct economic benefits, the Dutch hoped this deal would also help them in trying to maintain their foothold in Japan in the midst of growing competition from other western nations (Kogure, 2008). Meanwhile, the other naval powers were also planning on catering Japan’s need for a naval force. In an attempt to beat the competition, the Netherlands decided to grant the Soembing, a Dutch paddlewheel steam warship, in 1855 (Stapelkamp, 1999). Sent along with it was a first Marine Detachment of Dutch naval officers and sailors led by G.C.C. Pels Rijcken that was to educate and train the Japanese on their first western-built steam warship.

A year later in the Netherlands, construction commenced on the first warship for the shogun’s navy. In 1857, the vessel originally named the Japan was launched and was brought to Nagasaki that same year. Upon arrival it was renamed to Kanrin-maru and taken into the service of the Shogunate Navy, becoming the first screw-driven steam warship of Japan. Together with the Kanrin-maru, the Dutch government sent a second Marine Detachment that was to replace the first which had remained there since 1855. The Kanrin-maru was used as a training
vessel and thus became instrumental in the founding years of the Japanese navy.

Six years after its introduction in the Japanese naval service, the Kanrin-maru followed in the wake of an American vessel called the Powhatan which had on board an embassy bound for the United States of America in order to ratify a new treaty between the USA and Japan. The vessel crossed the Pacific with the help of a number of American naval officers, including Captain John Mercer Brooke (1828-1906). To the Japanese navy, the crossing was an important show of skills as it was only seven years after Perry's steam-driven ships had entered Tokyo Bay. This now legendary voyage is still commemorated by Japan and the USA today, as it marks an important event in the relations between Japan and the US. What is more, for Japan it also marks as the second time in history that a Japanese vessel is known to have crossed the Pacific (Fig. 1).

Fig. 1: The Kanrin-maru. (Yokohama Archives of History)
In the years that followed, the Kanrin-maru remained mainly in use as a training vessel. When in the years 1868-1869 the Boshin war broke loose, which was a civil war between forces fighting for the shogunate and forces fighting for the restoration of the Emperor as the greatest in power, the Kanrin-maru was used as a military transport vessel in the fleet of the shogunate until it became battered in a storm and was subsequently overtaken by the imperial forces.

After the Boshin war had ended with the restoration to power of Emperor Meiji, the Kanrin-maru remained in the service of the Imperial Navy and was used as a passenger and transport ship. In 1871, it set sail towards Hokkaido. Its mission was to safely transport 400 civilians who were to immigrate into Hokkaido and to colonize it for cultivation. While traversing the Tsugaru Strait, the Kanrin-maru hit a reef off Kikonai Municipality where it began to make water. Almost all the passengers and all crewmembers managed to survive, but the vessel itself supposedly sank and was lost to the sea.

To this day no wreck has been found, although in 1984 a chance find was made when a fishing boat hauled up an anchor supposedly at a location near what is believed to be its wrecking site.

Today, the Kanrin-maru is commemorated through local annual festivities among other things and has clearly conquered a special place in the hearts and minds of the local community and government. This has been most notably achieved by the efforts of the Society of the Kanrin-maru Crew Descendants, who have been actively promoting this cultural heritage and the fascinating story that surrounds Japan’s first screw-driven warship. Through this project, the parties involved can combine their strength to help maintain this valuable source of shared cultural heritage.
**Prior Research**

A chance find occurred in 1984, when an anchor was salvaged from a depth of 20 meters by a fishing vessel (Fig. 2). The exact location of the find is still unknown, but a local newspaper stated that it was situated 2 kilometers off the coast of Kikonai Municipality. Subsequently, the anchor was researched by an expert, who concluded it was highly likely though still not 100% certain that the anchor belonged to the Kanrin-maru.

![Anchor](image)

*Fig. 2: Anchor. (Kikonai Municipality)*

Other prior researches consisting of desk works, as well as fieldworks, have been conducted at the presumed wrecking location before. Although some remains of ship equipment or shipbuilding materials were said to be recovered during those field researches, no definite wreck or potentially associated finds to the Kanrin-maru have been found yet. According to one Japanese underwater archeologist, all the remains of the Kanrin-maru have perhaps already been swept away by the strong currents of Tsugaru Strait.
Project Definition

As shortly explained in the introduction, the main aims of the project are to facilitate capacity building as well as knowledge exchange between the organizations and individuals involved about underwater cultural heritage management. With the Kanrin-maru as the research subject, the project also aims to come to a sustainable preservation of the remains of the Kanrin-maru, if found to be existent. Broader, over-arching aims are to raise awareness of the existence of underwater cultural heritage among an international public, and to further improve the bilateral relations between the Netherlands and Japan.

The main aims will be achieved through the following objectives: Capacity building through inviting maritime archaeologists and students to join in on the search and possible research of the Kanrin-maru; knowledge exchange by inviting underwater archaeologists and specialists in both Japan and the Netherlands to join the project, and to create an atmosphere for open discussions with experts and trainees alike. Sustainable preservation will be achieved not only through the two objectives shown above, but also through the involvement of the local source community and government to build sufficient support for future preservation.

The project is proposed to be conducted in the period between late 2017 and early 2018, encompassing desk research and interviewing informants aimed at gathering historical and contemporary data to establish an initial research area, as well as a field survey on land. Main research questions are as follows: could the wreck of the Kanrin-maru be located?; if so, what is its state of preservation?; and how can it be preserved for future generations to come?
Initial research

Research commenced in April 2017, and at the time of writing is still underway. The overall aim is to come to a thorough assessment in order to gauge the chances of finding the Kanrin-maru or related materials in a preserved state and to establish an initial research area required for the continuation of the project.

The methods used thus far comprised of desk research in the form of library and archival research, the results of which have in part been used to form the historical background sketched earlier above. Fieldwork is also part of the research schedule, and is due to take place somewhere in November 2017. It is planned to consist of conducting interviews with local informants such as the local community near the supposed wrecking site, as well as visiting and surveying the anchor site and wrecking site from land.

Library and archival research in the Netherlands mainly focuses on shining a light on the historical context in which the order, construction and eventual delivery of the Kanrin-maru took place. This includes but is not limited to gathering information on the construction of the ship itself, where it was made, by whom, what materials were used in its construction and where these materials came from, and what the ship’s overall characteristics were including its quality in terms of materials and its sailing ability. On the other hand, library and archival research in Japan mainly focuses on the wreck of the Kanrin-maru in 1871. Indeed, relatively many studies about the Kanrin-maru have been conducted in Japan, but all of them are interested in its building or its first trans-Pacific voyage. No academic work upon its fate in 1871 has been conducted yet.
Preliminary Results

Desk research in the Netherlands

In 1853, Japan handed over their first request for warships and the like to Donker Curtius (1813-1879), contemporary opperhoofd or chief trader (1852-1855) of the Dutch trading post on Dejima. Among the vessels requested by Japan were a number of screw-propelled warships (Chijs, 1867). The Japanese had only just learned of the existence of steamships in 1849 through Dutch books (Arima, 1964), while Perry’s impressive ‘black ships’ were the first real-life steamships appearing before Japanese eyes. Thus in terms of technology, the Japanese knew they fully depended on the knowledge of the Dutch about these type of ships. The Japanese therefore largely left it to the Dutch to decide which type of vessel would be sent first and what equipment it would have in terms of propellant (screw or paddlewheel), armament and other specifics (Chijs, 1867).

One of the earliest mentions of the first screw-propelled steam warship that was to be made for the shogun – and which turn out to be the Kanrin-maru – can be found in a report by contemporary Minster of Colonies, C.F. Pahud (1803-1873). In his report transcribed by Van der Chijs (1867: pp.136), he states that this vessel destined for Japan’s navy had to be built in such a way that it could also serve in the Dutch navy in case the Japanese government would refuse the vessel for whatever reason. It was thought that such a ship could not be purchased, neither could it be constructed on the Navy’s shipyards in the Netherlands nor in the Dutch Indies. Thus it was decided that the vessel had to be constructed on a private shipyard.
Apparently in order to meet these requirements, it was decided somewhere along the way that this vessel had to be identical to a screw-propelled corvette destined for the Dutch navy that was about to be built around the same time on Fop Smit’s shipyard in Kinderdijk. This vessel was given the name Bali, while its sister ship was named the Japan, which later became the Shogunate’s Kanrin-maru.

In a technical report evaluating the performance of the Bali, Naval Engineer Huygens (1857) states that the Bali and the Japan were indeed identical. With this and the above in mind, be it with certain reservations, we may presume that the Kanrin-maru and the Bali were thus virtually identical to each other in terms of construction and onboard technology. This allows taking into account the detailed contemporary reports on the characteristics of the Bali, since not much details are known about the Kanrin-maru specifically at this point in time.

The Bali and the Kanrin-maru were constructed at the shipyard of Fop Smit in Kinderdijk (a UNESCO World Heritage Site). The construction plans were designed by J.W.L. van Oordt, Head Engineer of the Dutch navy. The vessel had a waterline length of 40.8 m, a beam of 8.5 m and a displacement tonnage of 619 tons. It had a depth at the bow of 3.4 m and at the stern of 3.85 m.

As screw-propelled steamships with sails, both vessels represented the state-of-the-art in naval engineering. Steam-powered screw propellers were still a fairly novel technology (Oosten, 1972), having been only introduced in the American, British and French navies in the 1840s, while the Dutch had only just welcomed the Medusa as their first screw-propelled steam warship in 1853. In that respect, at least on paper, the Dutch Navy indeed showed intent of catering the Shogun’s request for the latest in naval technology.
The vessel was mainly constructed of wood, though at this point further details about the materials used in its construction remain unclear. Additional efforts will be made to find more information regarding the materials used, as this could allow assessing the quality of these materials in terms of endurance. This in turn could help in assessing the chances of finding preserved remains of the Kanrin-maru.

The keel of the Kanrin-maru was laid down in 1856 and the vessel was launched in 1857. After it was launched, the company of one Mr. Rietschoten had fitted its three masts with schooner rigging, while its machinery and boilers were built and installed by the ‘Nederlandsche Stoombootmaatschappij’ at Feyenoord (Rotterdam) that same year. This machinery was coal-fired and could nominally produce about 100 metric horsepower. Tests with the Bali proved that it could reach a top speed of 8¼ nautical miles per hour, or 8¼ knots (Huygens, 1857), although this also depended on the effectiveness of the stokers (Huygens, 1860).

The Kanrin-maru, or the Japan as it was still called around that time, was readied in March 1857 and set sail from the Netherlands on March the 25th. Sent along with it was the second Marine Detachment, led by Commander Knight W.J.C. Huyssen van Kattendyke (1816-1866). In his diaries (Huyssen van Kattendyke, 1860), he explains that the construction of the Japan suffered several (undisclosed) delays. These delays may have been due to problems similar to the Bali which revolved around the effectiveness of the screw (Huygens, 1857) but were resolved subsequently.

The Dutch Navy and the Ministry of Colonies followed the Kanrin-maru’s maiden voyage with great interest, since its performance also had implications for the Bali which was destined for the Dutch Indies. With this in mind, Huyssen van Kattendyke explains in his diary that he sailed
straight to Lisbon (Portugal) in order to test the vessel in all circumstances. Upon arrival in Lisbon he concluded that the vessel was very fast and had met his expectations. On the 21st of September that same year, thus after a voyage of 180 days, the Japan arrived in front of Nagasaki bay.

It was officially handed over to the Japanese in October 1857 and was renamed into Kanrin-maru. A great part of the Nagasaki’s Naval Training School then took place on the Kanrin-maru. Training included all aspects of naval training, ranging from deck and rigging lessons to familiarizing with the machinery and many more aspects.

**Desk Research in Japan**

Emphasis of the desk research in Japan was put on the events past 1868 to around 1871 when it wrecked. Literature and archival research was conducted to reveal more information about the period in between these years. Unfortunately, however, the trustworthy historical materials, in particular, between 1869 and 1871, are extremely scarce. No photo of the Kanrin-maru has not been found yet either in the Netherlands or in Japan. Only one painting of the Kanrin-maru by Yujiro Suzufuji, an officer of the Kanrin-maru during the trans-Pacific voyage is kept in the Yokohama Archives of History (Fig. 1.), which is titled ‘the rough voyage of the Kanrin-maru’.

No Japanese newspaper reported the wreck of the Kanrin-maru in 1871, partly because in Japan at that time no paper had been published systematically yet.

Its wreck was said to have happened, therefore, sometimes on 19th September 1871 due to stormy weather, or sometimes on 20th September 1871 due to bad maneuvering the ship. At that time, two U. S. officers handled the Kanrin-maru, viz. one was Francis Etienne, who perhaps was
the captain, and the other was Charline SeLoger Train. Although the official record submitted to Hokkaido says nothing, on 20th September 1871 the drunken U.S. captain seems to have made the Kanrin-maru run ashore on a reef off the village of Izumisawa at Kikonai Municipality (Goda, 2010).

**Preliminary Conclusions**

Desk research in the Netherlands thus far has shown that the Kanrin-maru, at least to contemporary Dutch naval officers, was indeed a vessel that represented the latest in naval architecture and met expectations accordingly. Furthermore, it became part of one of the means available to the Dutch government in its effort to reinforce what was left of the centuries old special bond with Japan. This, and its historical voyage to the US in 1860 as well as its involvement in the Boshin War, provides support for its historical significance today and in the end adds to the list of reasons for pursuing sustainable preservation of this special remnant that has become part of Dutch-Japanese shared cultural heritage. Be it tangible or intangible, above water or underwater.

At the time of writing, initial research has yet to be completed. This includes the remaining parts of desk research in Japan and the Netherlands, as well as fieldwork. Based on the information gathered thus far, it still is difficult to assess whether or not the wreck of Kanrin-maru could still be lying on the ocean floor near Kikonai Municipality. If continuation is indeed desired, detailed plans for an underwater survey using multibeam or sidescan sonar equipment will have to be made, taking into account the marine environmental conditions in a demarcated research area.

**Footnotes**
1. See, for example, the Holland-Kyushu programme, initiated by Dutch Culture and the Embassy of the Netherlands in Tokyo and the consulate-general in Osaka: http://hollandkyushu.com/en/.

2. https://culturalheritageagency.nl/en

3. 鎖国時代, literally meaning ‘closed country period’, though in reality Japan’s isolation from the outside world was highly relative.

4. 出島, meaning 'artificial island' in Japanese.

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**Biographies**

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The Iron Grapnel Supposed to Belong to the Sinan Shipwreck and Other Anchors in East Asia

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Abstract

In 2016 an iron grapnel was shown in some special exhibitions marking the 40th anniversary of the Sinan shipwreck excavation in Korea. The grapnel 2.3m length has four arms, and it had been raised by a fisherman’s net in 1972 before the wreck was discovered. Around the Song Dynasty of China, stone anchor stocks composed of wooden shanks were generally used; their distributions ranged from the Primorsky region of Russia in the north to the south in Vietnam and the Philippines. In Korea and in Japan, crude stone anchor stocks modelled after Chinese anchors were widely used at that time. From the Takashima underwater site associated with the Mongolian invasion of Japan in the 13th century or during the early Yuan Dynasty, stone anchor stocks of separate type were frequently discovered. After the Ming Dynasty, iron grapnels started to be used in large, but at the same time wooden anchors were also kept in use on different styles from region to region. In Japan, iron four-armed grapnels were appeared in some art pictures after the Muromachi Period, and then during the Edo Period those grapnels became popular as the mainstream of Japanese anchors. The iron four-armed grapnel, which is considered to have belonged to the Sinan shipwreck, seems to have equipped on a Japanese vessel dated from the Edo period to early modern times as its characters are found among Japanese grapnels. However, the possibility that it still belonged to the Sinan shipwreck could not be denied completely, because the actual origin of Japanese grapnels is unknown; Chinese manufacturing technology of grapnels, which is known for the time being, was different from Japanese one, but another technology, which would have an impact upon both Japanese and the Sinan shipwreck’s grapnels, might have existed in China.

Key words: Sinan shipwreck, Korea, grapnel, anchor
Introduction: The Iron Grapnel Believed to belong to the Sinan Shipwreck

In 2016, an iron grapnel was displayed along with the reconstruction/restoration model of Sinan Shipwreck in a special exhibition that commemorate the 40th year anniversary of the Excavation of the Sinan Shipwreck in Korea. This iron grapnel displayed along with the restoration model was stated that it was a Chinese steel anchor from the Yuan Dynasty, and it belongs to ‘the Sinan shipwreck’ (National Research Institute of Maritime Cultural Heritage, 2016). The grapnel is 2.3m in length and has four arms. It was raised by a fisherman’s net in 1972, before the wreck was discovered (National Research Institute of Maritime Cultural Heritage, Korea, 2016).

The author has observed iron grapnels at museums in China; these anchors were dated later than the Ming Dynasty. Also in Japan, iron grapnels were used from the Edo Period to modern era. The author only had a brief knowledge of iron grapnels that were widely used in China and Japan, and he never had conducted a research on it. Moreover, the author could not find any researches focused on iron grapnels conducted by other scholars. The author has observed an interesting point on these anchors that, about morphology-wise, the iron grapnel found near the Sinan Shipwreck site was very similar to Japanese type. In this paper, the author shares his comparative studies on iron grapnels that was believed to belong to the Sinan Shipwreck and other ones which were widely used in China and Japan.

Chinese Iron Grapnels
Tiangong Kaiwu, a Chinese technical document at the end of the Ming Dynasty, described methods to manufacture ‘Iron anchor anchors’ (Song, 1639). To build an iron grapnel, individually made four arms were joined to a shank on after another at the end. For forging, materials from an old earth wall sieve were sprinkled on the forging areas. On the iconography that explain the forging processes, total 15 people were displayed, including who supported shanks and arms and who forging. From these iconographies, peculiar rectangle sectional shapes of the grapnel were not yet confirmed. Around this time, a ship carries 5 to 6 Iron anchors; the largest one is about 500 loaves, and it is used in an emergency. In addition, it was described/instructed that Iron grapnels could not be used on the stone bottom area; it had to be used on sandy and mud sea bed. Also, there is a description that a ship applied sudden stop by dropping a stern anchor to avoid collisions to ships in front.

According to Guanzhuo Wang, a historian who studies ships in China, it is said that ‘stone anchor’, ‘wooden anchor’ and ‘Iron anchor’ coexisted simultaneously in the Song and Yuan Dynasties, while primarily ‘wood-stone anchor’ was widely used (Wang, 2000). In Chiming Uekgo Picture of the Northern Song Dynasty, a ‘small iron anchor’ was depicted near the bow of the river ship. In Jilin City, Jilin Province in 1975, a small three-arm iron grapnel (22.5cm in length) dated the early in the Kim Dynasty was found. In historical written sources from the Song and Yuan Dynasties, these were descriptions on different types of anchors: ‘iron anchor’ and ‘iron anchor with four nails’ were widely used; in the Ming and Qing Dynasties, ‘iron anchor’ was used in the northern sea area of hard mud bottom; ‘wooden anchor’ was used in the southern deep sea of soft mud bottom, both are respectively used depending on the types of sediments; and for river ships ‘iron anchor’ was widely used. Regarding
archaeological examples of ‘iron anchors’, an iron grapnel was found on the Ming dynasty shipwreck during its excavation in the Songji River, Liangshan, Shandong Province, in 1956. This anchor was 1.36m long and had inscriptions on the surface, and it said ‘Hongwe 5th made’ and ‘85 loaves of heaviness’. Another archaeological example was found from Quanzhou, Fujian, in 1981; it was an iron grapnel which was 2.68m long and 758.3kg.

The author also visited and observed a few iron grapnels; he visited the sea castle in Penglai City in Shandong Province, the Quanzhou Bay Old Ship Museum in Quanzhou City, Fujian Province, the Guangzhou Museum in Guangzhou City in Guangdong Province. Additionally, there are reported documents about iron grapnels excavated from the Penglai Sea castle (Chen, 1989) (Fig. 1). The author analyzed and studied characteristics of those iron grapnels from these materials, but since the amount of information is too big to share in this paper; therefore, detailed descriptions of individual materials shall be reported in another occasion.

Fig. 1 (left): Iron Grapnel Excavated from Penglai Sea Castle. (Chen, 1989)
Chinese iron grapnels were built by forging individually forged arms to the shank; in many cases, the joint points between arms and the shank displayed peculiar shapes of remnants created by the forging (Fig. 2). Additionally, there were examples that used/forged steel sheets on the joinery points as a reinforcement. The cross-sectional shapes of the shank and arms have irregular circular shape or irregular square shape; there are no examples of clear rectangle shapes that can be seen on iron grapnels found in Japan. The anchor ring had a small circular shape, and its inner diameter was relatively small. It indicates that the end of the shank was molded to make a hole. In many cases, those forging marks were conspicuous. Also, there were examples of wood leaf-shaped flukes that were attached at the tip of arms. The shape of four arms formed a ‘+’ shape when it was seen from the crown side (Fig. 3).
Japanese Iron Grapnels

Ishii Kenji, a scholar who studied history of ships in Japan, explained weights of the ‘the first anchor’ of the Bezai ship. He also studied transition/evolution of Japanese anchors (Ishii, 1983). His studies on history of Japanese anchors started with ancient simple stone anchors that composed of a rope tied to a natural stone. On the ships traveled to Tang (China), as well as on ships used between Heian Period and the Medieval Era in Japan, wooden anchors were commonly used. The wooden anchors used on these ships composed of a flat stone sandwiched by two branches of hook-shaped trees. Based on iconography that ‘iron grapnel’ and ‘wooden anchor’ were depicted in the Scroll ‘Jinguu Kougou Engi Emaki’ in 1443, he believed that iron grapnels
might be used on Daimyo’s warships and other large ships around the 15th century.

Yet, Ishii indicated that there must be technical difficulties to forge iron grapnels if Japan tried to build it domestically around that time; and the its cost for mass-production must be another problem. Therefore, he suspects that the iron grapnels in the 15th century were imported from China. In the 16th century, use of iron anchors become popular among warships. Yet, wooden anchors were often depicted with merchant ships in the first half of the 17th century; the beginning of wide spread uses of iron grapnels might need to wait until the middle of the 17th century.

Other Japanese scholars agree with Ishii’s theory about date of its beginning and wide distribution of iron grapnels. Matsui analyzed 49 iron grapnels found mainly northern area (Hokuriku) in the main island of Japan, and he concluded that the transition to iron grapnels occurred sometime in the 18th to the 20th centuries based on morphological analysis on anchor rings and attached rings (Matsui, 2013). Ishihara re-studied researches on wooden anchors conducted by Wang, Ishii, Tamura, and several other researches, and he concluded that transition from wooden anchors to iron grapnels were caused/triggered by shipworms which ate wooden products in the sea (Ishihara, 2015). Ninomiya examined the maritime traffic in Tokyo Bay and the Sodegaura fishery industry based on literature/historical sources; also, he desrcibed the perspectives of trading and distribution of iron grapnels in the Edo Period in Japan (Ninomiya, 2017). Tamura, a folklore scholar, conducted folklore investigations on ‘anchor blacksmith’ in Fukuyama City, Hiroshima Prefecture. Tamura noted that iron grapnel was forged by superimposing plate-like steel called ‘Yao’ (Tamura, 1978). He also
described the manufacturing process of the iron grapnels: each part, such as four parts of arms, a shank, an anchor ring and an attached ring were individually prepared first, and then the arms and anchor rings were forged onto the shank, and arms were spread into form 4 arms, then the loop of anchor ring was expanded. His investigation was very important to conduct a comparative study of manufacturing methodology of different anchors; therefore, his research is especially important for the author’s researches.

In Japan, at least 50 iron grapnels are known to be exist. The author studied characteristics of these anchors; however, its information may be too detailed to share in this paper, so that he has to wait to share such detailed information until other opportunities. In general, Japanese iron grapnels were composed/welded of separately built plate-shaped steels, so that the cross-section of the shank and arms display a clear-cut rectangular shape (Fig. 4).

Fig. 4: Iron Grapnel Raised up off Suzu City, Ishikawa Prefecture.
Although sometimes it displays slight lamellar traces and forge contact traces due to forge weld, surfaces of Japanese iron grapnel are flat. Nonetheless, there are no examples in Japanese grapnels that shows wrapped steel sheets reinforcements on arms alike Chinese grapnels. The arms of Japanese grapnels were forged into the shank, and then the arms were expanded after; henceforward, many of the (side-profile) shapes of anchors showed a gentle ‘J’ shape (Fig. 5). And the shape of the four arms from the crown exhibited a ‘X’ shape (Fig. 6). Although the anchor ring displayed a large almond shape; the introduction of the electric hammer in the modern period has made it smaller and the cross-sectional shape tends to be circular.

Fig. 5: Iron Grapnel at Fukuura Shika Town, Ishikawa Prefecture.
Anchor of the Era before and after the Yuan Dynasty

Regarding the small iron grapnels, the first evidence appeared in the North Song and Kim Dynasties. Although, the word/noun of ‘iron anchor’ and ‘iron anchor four nails’ appeared in literatures of the Song Dynasty, the first archaeological evidence of iron grapnel had to wait until the beginning of the Ming Dynasty (Wang, 2000). Anchors that widely used in the Song Dynasty were ‘wood-stone anchor’ with ‘mono style stone anchor stock.’ Regarding Yuan Dynasty, wood-stone anchors with ‘separate style stone anchor stock’ were main archaeological evidence found from the underwater site at Takashima Island, Nagasaki Prefecture, Japan; this site is also known for the Mongolia Attack to Japan in 1281. Contrarily, mono style stone anchor stocks were rarely found in this site (Takashima Town Board of Education, 1996). In the Takashima Island site, however, a mono-style stone anchor stock was cut in half and
converted as ‘separate style stone anchor stock’. This may indicate that the both types had been coexisted, or it was at their transition period (Ogawa, 2008a and 2008b). Those wood stone anchors with this ‘separate style stone anchor stocks’ was also used at Penglai Sea Castle in Shandong Province and Quanzhou Bay in Fujian Province (Li, 1998). Afterwards, ‘wood-stone anchor’ with ‘mono style stone anchor stock’ had shifted into ‘wooden anchor’ with wooden stock. Iron grapnels appeared at the beginning of the Ming Dynasty, yet it did not mean that wooden anchors disappeared due to the appearance of iron grapnels. An iconography from Qing dynasty displayed sea boats using both wooden anchor and iron grapnels. Therefore, for the Sinan Ship dated the middle of the Yuan Dynasty, there is a possibility that Sinan Ship used wood stone anchors (or wooden anchors) and iron grapnels at the same time.

**Conclusion**

The cross-section of the shank likely belonging to the Sinan shipwreck is rectangular in shape, and a part where the arms as well as the anchor ring are attached to the shank is pounded to connect by a flat piece of iron. The arms curve gradually inward and make a figure of ‘J’. The cross-section of the arm is flat rectangular. The anchor ring is large, narrowly long and almond like shape, moreover, the cross-section is flat rectangular. There features obviously resemble the futures of Japanese iron grapnel; based on those reasons, the author believed that the grapnels that believed to belong to the Sinan shipwreck was most likely belonged to the iron grapnels of the Japanese vessels dated from the early modern period to the modern period.
In the current state, however, it is difficult to establish precise dating of the Japanese style iron grapnels due to lack of the data and information for establishment of manufacturing. On the other hand, there is another possibility for the iron grapnel from the Sinan shipwreck to seek its origin in China. There might be some manufacturing techniques in China that would become the origin of Japanese grapnel manufacture later. This possible original manufacture technique has not been found/confirmed yet in China; however, it could be possible that Sinan shipwreck had carried Chinese iron grapnel that produced by Chinese manufacturing techniques that would be taught to Japanese later was onboard the Sinan shipwreck of the Yuan Dynasty. Nonetheless, the author concludes that, under these circumstances, it was most likely that the iron grapnels that is believed to belong to the Sinan shipwreck was a Japanese iron grapnel from the early modern period to the modern period.

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Biography

Mitsuhiko Ogawa was born in Ishikawa Prefecture in 1968. He received MA degree in Archaeology from the University of Kanazawa in 2005. He is majoring in underwater archaeology, especially, in anchors and stone anchor stocks as well as in Chinese ceramics. He became a member of the Kyusyu Okinawa Society for Underwater Archaeology in 1992 and has been a senior research associate of the Asian Research Institute of Underwater Archaeology since 2011. He has excavated many underwater archaeological sites such as Takashima Island, the Maegata Bay or Ojika Island (Yamami), and has also involved in the survey of underwater cultural heritage around the Japan Sea. He has published many papers related to underwater archaeology in East Asia.
A Preliminary Study on the Barrier of the Sino-French War of 1884 at Tamsui Estuary, Taiwan

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Abstract

During the Sino-French War of 1884, the Qing military intentionally sank a number of wrecks filled with rocks under the Tamsui River and surrounded them with naval mines and many railings to form a barrier against the French invasion. In 2014, one hundred and thirty years later, the government planned to construct a bridge across the river estuary; and, in accordance with the law concerning environmental impact assessments and archaeological impact assessments, the author conducted an investigation to find potential underwater archaeological remains. The survey tools for this project included a side scan sonar, a multi-beam sonar, a magnetometer, and a sub-bottom profiler. A total of 31 anomalies were detected by these sonars; most of them were lain on the surface of the river bed, and these were believed to be modern debris. However, some anomalies were covered by the sand or under the river bed; therefore, the team could not identify these targets further without underwater operations. First, in order to verify the anomalies lying on the surface of the river bed, the team used an underwater camera and diver-based investigation. As a result of the investigation, no specific archaeological remains were found on the surface of the river bed; also the team found out that the sediments of the riverbed had accumulated repeatedly by erosion and floods since 1884. It seems that a strong power of natural dynamics on this region may had destroyed the barrier. In conclusion, the underwater investigation could not confirm archaeological remains of the barrier. Further investigation is required to find archaeological remains. In this paper, the author shall share historical contexts related to the Tamsui Estuary that were found during his historical literature reviews. Also the author shall share his hypothesis of where to find, or what might have happened to, the potential archaeological remains from Sino-French War of 1884.

Key words: Qing Dynasty, China, riverine archaeology, France
Introduction

In 2014, the government initiated a construction plan to build a bridge — Dan Jiang Bridge (淡江大橋) — across the Tamsui River estuary. The bridge was designed to connect Bali at the southern shore) and ‘Sha Lun’ (沙崙) at the northern shore. The total length of the bridge is approximately 980 meters long.

During the Sino-French War of 1884, the Qing military intentionally sank a series of ships filled with rocks in the Tamsui River and surrounded them with naval mines and many railings in order to create a barrier against French invasion. In 2014 after one hundred and thirty years later, the government initiated a construction plan of a bridge across the river estuary; because of the law concerning environmental impact assessments and archaeological impact assessments, this author conducted an underwater investigation for potential archaeological remains. This investigation was conducted because this area contains dozens of archaeological sites around the Tamsui River estuary, dated from the prehistoric cultures from the Neolithic to the Iron Age, estimated about 4800-600 BC.

Also many historical events were known from this region: these were noted as follows:

Between 1626 and 1642, during the Spanish and Dutch occupation, Tamsui and Keelung were the political center. Aboriginal peoples, such as the Senar and the Pulauan (Borao, 1993) lived and the Tamsui River, and they were mentioned in documents by Spanish.
Also the areas located on relatively higher terrains around the northern shore of the Tamsui River, such as You Che Kou (油車口) and Da Zhuang (大庄), and on the eastern shore, such as Sha Lun (沙崙), may had been used by the Spanish as a surveillance spots during their occupation. Indeed, in 1628, Spanish built Fort San Domingo, as well as a church, on the south-east of the Tamsui estuary (Alvaréz, 2006).

In 1712, the Qing government designated a kind of local military unit, called a xun tang (汛塘), his territorial areas covered from Bali to a garrison that located the southern shore of the Tamsui River. Also, there were several settlements along the northern shore of Bali, named ‘Da Wan Zhuang’ (大灣莊) until 1740. Also the Qing government operated a ferry route between Bali and mainland China (Fu Zhou and Quan Zhou) between 1757 and 1788. Nonetheless, the Bali port ceased its function because of siltation until 1796.

In 1862, the Qing government established custom-posts for trading, these custom-posts located in Tamsui harbor, Meng Jia (艋舺), and Da Dao Cheng (大稻埕) where became trading centers of northern Taiwan (Wang, 1998). During the Sino-French War of 1884, Tamsui harbor was compromised by an embargo ordered; however, Tamsui gradually shifted it functions into a political, economic, and religious center by welcoming consulates and merchants, hospitals and churches of foreign regimes.

During the Japanese colonial period, siltation problems of the Tamsui River (caused by flooding and over-quarrying upstream) emerged. As a result, the Tamsui harbor gradually lost shipping functions (Wu, 2013). Between 1945 to the mid-1970s, the population of Tamsui was growing rapidly as a result of immigration concomitant with the growth of companies and
factories triggered by industrial and commercial development. Today, Tamsui become a cultural and touristic area.

**The Study Objective and Expectation on the Types of Underwater Cultural Heritage**

After the historical reviews on Tamsui area were completed, the author chose the ‘barrier’ as the main potential focus of the archaeological investigation. Readers of this paper may get clear understanding about the barrier from following images: a drawing 〈滬尾形勢〉 of 《點石齋畫報》 (Fig. 1), and the map of 1884 (Fig. 2). The Figure 1 displays that the Qing navy carefully positioned ships and bamboo nets loaded with rocks, as well as bamboo fences in the estuary; also the navy placed naval mines around those structures, or components of the barrier. The Figure 2 was produced by the French military; the map showed locations of their battle ships and offense route, as well as the defense line of the Qing military.

![Fig. 1: The Situation of Tamsui. (Dian Shi Zhai Pictorials)](image-url)
Fig. 2: Tamsui Harbor in 1884. (http://www.reed.edu/Formosa/gallery/map_pages/Locality_Maps/Garnot_Tamsui.html)

Unfortunately, due to the lack of written sources, there is no indication for types of ships that were used to form the barricade structures. However, there are several information that mentioned the barrier: a British businessman, John Dodd, noted in his journal that the navy facilitated junks and small boats for the barricade (Garno, 1960 and Dodd, 1888). Some other old historical photos of the Tamsui area, including ones taken by French and ones taken during the early Japanese colonial period display operation of ships in these early period; and ships that appear in those photos were exclusively Guangdong ships (廣船) and another type so-called ‘red-headed ships’ (紅頭船) or colliers (撈煤船). These were small sailboats with a single mast, about 12 meters long, 4 meters wide,
and weighing about 15 tons. The collier had a slender hull with a shed made of bamboos (Fig.3).

3: Guangdong Ships at Tamsui Harbor in the 19th Century. (Wang, 1997)

The author also focused on naval mines that were deployed by the military of the Qing government for this research. Most of the mines of the Qing dynasty were purchased from Britain, and then the manufacture of the mine was replicated by the Tianjin Machinery Bureau (天津機器局) and local original mines were mass-produced (Dun et al., 2001a). The Tianjin Machinery Bureau was founded in 1867 to manufacture high-quality gunpowder and weaponry; this weaponry included bullets, naval mines, and cannonballs (Sun, 1979). Historical documents suggest that they produced hundreds of naval mines that were made of copper or iron every year since 1879. These mines were categorized based on its sizes; 1000 pounds (bottom mines triggered by electrical detonators), 700 pounds,
and 500 pounds (triggered by contact). Also four different types of mines based on its functions were manufactured; these are moored mines, bottom mines, fixed mines, and drifting mines. These four different types of mines were detonated either by contact or by electrical detonators (Fig. 4) (Chang et al., 2001). The Tianjin Machinery Bureau had manufactured a total of 1344 different types of naval mines from 1879 to 1881 (Dun et al., 2001a and 2001b).

![Naval Mines and Landmines in the Late Qing Dynasty. (Chang et al., 2001)](image)

Also some historical documents indicated arrangements of naval mines deployed by the Qing military. A French journal (written between 1884 and 1885) described events on 3 October, 1884; according to the journal, the French Navy was investigating underwater obstacles in the Tamsui Estuary, ‘…..there was a severe explosion just in front of our boat but (it) never really damaged it. The mines had been detonated too early. Judging by this, there must be a sentry post for sure and we must occupy it (Garnot, 1960)’. Another historical document also described about these naval mines: ‘At the entrance of the Tamsui River, the Chinese have laid down six torpedoes in the shape of a semi-circle on the side of the bar.'
When the Fokien and Welle went out and the Hailoong came in on the 9th inst., the steamers were piloted past the torpedoes by the Chinaman who laid them down (Dodd, 1888).

Based on the research on those historical documents, the author suspects that the Qing military deployed mines which were connected to the shore by cables and detonated with wires (Sleeman, 1880 and Stotherd, 1872) (Figs. 5 and 6). Beside the structures and components that formed the barrier, the author also speculates that this survey area may contain other archaeological remains; in 1629, Naval battles between the Spanish and the Dutch took place in the Tamsui Estuary (Lu, 2012) (Fig. 7), and in 1884, French military deployed heavy bombing outside the Tamsui Estuary.

![Diagram of Moorings for Submarine Naval Mines](image)

*Fig. 5: Moorings for Submarine Naval Mines. (Sleeman, 1880)*
Methodology and Results

For this archaeological investigation, the author had the opportunity to use various survey apparatuses, including a side-scan sonar, a sub-bottom profiler, a marine magnetometer, and a multibeam echo sounder. Data obtained by those sonars were cross-analyzed.

Preliminary results indicated that there were 31 sonar contacts, or anomalies. Twenty of them were on river bed; and these appeared in different sizes and shapes (round, linear, or discrete), but none of them showed a shape of ships or boats. The remaining 11 were beneath the riverbed and could not be identified. Additionally, 21 anomalies had magnetic-signals; the highest one with 1739nT and the lowest one with 16nT. The sections of strata indicated that there were 6 objects (A, B, C, D, E, and F) buried under the riverbed.
Unfortunately following diver-based underwater investigation confirmed none of the 21 anomalies were a part of archaeological contents; these detected anomalies from earlier sonar based surveys were natural accumulations of small sand hills, gravel, and mud blocks or modern remains, such as abandoned ropes and fishing nets.

**Conclusion**

The results of underwater investigation showed no signal of possible archaeological remains from the survey area. The author considers that following reasons/conditions may led the results:

1. Since the estuary was an important maritime traffic passage area, these structures that were used to form the barrier (such as ships filled with stones) were removed and cleaned after the Sino-French War ended.

2. The Tamsui area is also located in the pathway of many typhoons. It is possible that strong natural dynamics had washed away all components of the sunken boats into the sea. Also, a long-term siltation cycle in the estuary may push or bury the archaeological components of this region.

3. Regarding naval mines used in the Sino-French War, the author is certain that they have been removed (and recycled) after the end of the war because the port had to be used safely for trading activities. Even if some naval mines were not retrieved and missing, they had probably floated away from the estuary already.

4. Because of the nature of rivers and estuaries, the survey area must be also be affected by an accumulation of sediments for over one hundred years. Even though, if there are still some possibilities of archaeological remains from the Sino-French war within the survey area, they are mostly likely buried under the sediments.
In conclusion, although the authors and his investigation team could not find archaeological remains from this area, rich historical sources from this area suggested potential to find some. Yet records and evidence of strong natural dynamics around this region, such as heavy siltation processes and typhoons, indicated these archaeological remains must be buried under reverbed if there are any left in situ. Further investigations were required to find remains of the barrier from the Sino-French War of 1884.

References


**Biography**

Tai-Lung Lu is an archaeologist has a PhD from Department of Anthropology, National Taiwan University. His thesis titled ‘A Study on the Prehistoric Culture in the North of Taiwan From 5000 to 4000 Years’. He worked as a researcher at National Museum of History from 2006 to 2013. He set up an archaeological consultant company in 2013. Tai-Lung has 20 years practical archaeological survey, excavation experience and specializing in archaeology. He also involved underwater cultural heritage from 2006 until now.
Seamanship and Navigation: Seafarers on Board Daily Skills in Chinese Junk

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Abstract

Chinese sailing traditions changed a little through time; sailors inherited their onboard skills, expertise, and experience by orally imparting others with physical instruction. But these daily skills were rarely recorded or studied in the past. For seafarers, how to operate and maneuver a Chinese junk was their daily work; and apart from sparse historical documents such as Phing-Chou Kho Than (Yu, 1117), Shi Liu-Qiu Lu (Xiao and Xia, 1580) (Fig. 1), and preliminarily observations by G.R.G. Worcester, Joseph Needham, Thomas Hoppe, and others, seamanship and navigation were kept in the minds of surviving successors of living sailors. In 2004, the author had an opportunity to sail on a nearly 100 year old Jin Hua Xin as an apprentice sailor for her last voyage. Several months of onboard experiences provided a rare field investigation to approach the complex mechanism of crew, their organization and their daily work. This experience led the authors to raise a marine ethnographic field investigation project along Fujian coast. Experimental archaeology creates effective scenes for realistic performance of past systems. A small full-size replica LanTay II was built for a series of archaeological voyages; the data gathered from the traces of past sailing routes will verify and add some knowledge for understanding the real daily work of Chinese seafarers onboard. In this paper, the authors shall present combined researches on historical documents, past observations with lively oral materials achieved by marine ethnographic field investigation on traditional sailing ports along South Fujian coast; throughout this research, the authors approach the knowledge about seafarers onboard daily skills and try to present the research about the sailors methods to maneuver the junk and its navigation system by means of a combination of instinct, eyesight, memory, and skill.
**Key words:** Chinese junk, seafaring, ethnography

*Fig. 1:* One of the Earlier Documents to Record the Compass Bearing Direction for Sailing Routes between Fu-Chow to Ryukyu in 1580.

**Introduction**

In 2004, the author had opportunity to sail on the three-masted Jin Hua Xin as an apprentice sailor for her last voyage, this long voyage from Dong Shan Bay of southern Fujian to Zhu-Hai of Canton took 9 days and covered 330 nautical miles. Jin Hua Xin was the last working traditional sailing junk in China coast; nearly 100 years old (Xu, 2010). Several months of onboard investigation voyage provided a rare field experience to approach the complex mechanism of crew, their organization, and their daily work; and this experience led the author to raise a subject of seafarers with a marine ethnographic field investigation project along the Fujian coast in 2001. The details of seafarers daily work on Chinese junks are little known by outsiders previously; yet the last successors of sailors and fishermen recollected their past stories piece by piece. Experimental archaeology creates an effective scene for realistic performance of past systems by sailing a full-scale reconstruction boat. A small full-size replica LanTay II is planning an archaeological voyage to cross the Taiwan Strait, the data gathered from the traces of past sailing routes will verify and add some knowledge for understanding the real daily work of Chinese seafarers onboard.

**Previous Researches**
The studies on seamanship for operating and maneuvering Chinese junks have not yet been explored in detail. To improve productivity, safety and speed standards of the traditional water transport industry, a unique official field investigation and iconographies collected for Chinese cargo junks had been engaged in Fujian during 1958-1959. These works were restrictedly published in book in 1960, also a reference for sail design and use was attached in its appendices. This may be the only short description in Chinese for sailing practices. Sometime in the early 20th century, European scholars tried to understand the composition of Chinese junk. A brief description about the structure and working principle of yuloh has been included in G.R.G. Worcester’s marine ethnographic field investigation (1947). Joseph Needham (1971) also had a brief introduction about the action of wind on a Chinese junk under sail, and the principles of tacking and wearing. There are also a few references about the performance of Chinese sails under different angles of apparent wind in Thomas Hoppe’s English manuscript in 2004.

One of the earlier European scholars who observed Chinese traditional navigation is G. R. G. Worcester (1947). He noticed some important details and technical logic that others had not found before; his description is a following:

“In former days, lighted joss sticks suspended from the deck head were the only timepieces…the cheap alarm chock has greatly simplified navigation for the junk master. The junks carry no charts of any kind. The laodahs find their way by means of a skillful combination of sea instinct, keen eyesight, good memory, and an instinct for direction nearly as a homing pigeon…they stand in for the land, depending entirely upon their knowledge of its appearance and the depth and nature of the soundings to give them position, for to them the bottom of the sea has its hills and valleys like the land, and they acquire an intimate acquaintance with its contours and the type of bottom to be expected in each locality.”
Another European scholar, Joseph Needham, noted the joss sticks used by Chinese seafarers (1971):

“...(besides sand-glass,) Burning incense in stick-like form is a practice which goes far back into China’s Middle Ages, and it would have been very easy to measure time approximately enough with the ‘joss-sticks’.”

Needham (1971) also categorized the history of navigational methods into three periods: (a) primitive navigation (b) quantitative navigation (Measurement): +900 A.D. in East Asia (c) mathematical navigation: +1500 A.D.

In 2008, an original map of the China Seas region was rediscovered in the Bodleian Library Special Collections in Oxford by Robert K. Batchelor (2014) and Timothy Brook (2013). The Selden Map is a detailed map of Southern China dated the mid-16th century; it appears that the old Xiamen port is the beginning of all the sea routes on the map, it also labeled the trade routes departing from Xiamen.

A recent paper summarized the navigation and religion in traditional Chinese junk have listed several historical materials and demonstrated with two collections of sounding lead in Quan-Zhou (Lin, 2015).

**Historical Contexts**

A boat under sail is a very complex historical mechanism; the vessel consists and represents a naval architecture system, as the tools for different functions, as a space to reflect the weather, the waves and the currents, and as a society for the composition of crew and their daily life. In his encyclopaedic work, Heavenly Creations (chapter on boat, Tian-
Gong-Kai-Wu), Song Yingxing (1637) divided the Chinese vessels into sea-going, river and other craft; and then, he classified these for many types according to their different sailing environment. This classification may be applied even today because Chinese sailing traditions have changed little through time, and the last sailors and fishermen of wooden sailing junk still survive/alive. This paper focuses on Sha-Po-Wei, the main area of old Xiamen port until the first half of the 20th century, the ages when wooden sailing boats shuttle in the Taiwan Strait.

Sha-Po-Wei, along with adjacent coast lines, was an ideal port for seafarers due to its location on the sea route connecting East Asia, Southeast Asia, and Taiwan (Fig. 2). The demand of marine transportation and ocean fishery brought seafarers from coastal regions of Quan-Zhou and lower Zhang-Zhou River. Seafarers of Sha-PoWei divided into two types: crews and fishermen. The crews mainly migrated from Hui-An county of Quan-Zhou, while fishermen moved from Zhang-Zhou river basin belong to Hai-Chen county. Fishermen of Sha-Po-Wei called themselves ‘sea beggars,’ and it is subdivided into several groups according different fishing method, namely types and lengths of fishing vessel. Those groups (between fishermen and local resident, fishermen and crews, even between different groups of Sha-Po-Wei fishermen) were rarely communicating each other. Furthermore, both fishermen and crews lived in their own enclosed social space to avoid troubles with others; many of them have not even walked several miles out to countryside in whole their life.
**Organization**

To learn composition of crews is the first step to approach their daily life. In general, 15-20 tons deadweight trade vessel with two sails allocated 5-6 sailors, 30-35 tons also two sails would be 7-8 sailors, 55-65 tons with three sails has 12-13 sailors. Crews were temporary employed between by the ship owner; however, in addition to their lower wage, every sailor was allowed to carry a few private cargo up to 250 kilograms, and usually the ‘laodahs’ (equivalent to captain in Western) had doubled weight and doubled payment more than other crews. There are five chief positions in Chinese trade vessel; these were laodah, (and vice laodah, which is

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*Fig. 2: A Map of South Fujian and Old Amoy Port Sha-Po-Wei.*
equivalent to helmsman in the western world), mast head, sampan, foreboard, and supply chief (besides the ‘chu-hai’ who served as ship owner’s representative also in charge of accounting and port to call for loading and unloading cargo). The crews were on duty during the day and in two shifts in the night; they changed shifts in midnight. Laodah and vice laodah keep working throughout the voyage until they cast the anchor. Chuhai did not participate in onboard works.

For a local long-line fishing vessels crew size was much bigger than a corresponding-sized merchant ship. Lodah and vice laodah had to work day and night during the deep-sea fishing voyage; there were no chief positions for other sailors, hence there were no arranged shifts. After vessel dropped the long liner fishing, sampans were lowered one by one along the fishing route; 3-4 sailors on each sampan were taking back the hooks. This hard work usually lasted all day long.

There is a small shrine at the aft area of the poop deck containing the effigy of the junk’s patron saints, Goddess of Mercy, Matsu, Guandi, etc. The laodah or vice laodah of trade vessel burned incense in stick-like ‘joss-stick’ one by one throughout the voyage to keep alight in the shrine where the compass laid also. For fishing junks, it was same but joss-stick only burned one in morning and one in evening, as well as some important occasions and critical times. Many local long liners have one ‘tong-ki’, a trance-state man while intercommunicated oracles onboard; he would give advice in case of an emergency. The tong-ki was a fisherman in normal times, and they did not receive extra payment.

A living room/quarters was located at the aft area of the ship, or the lower area of the quarter-poop deck; laodah’s bunk on the back on the left, opposite side was for chu-hai. In Chinese junk, portside also named yuloh side while starboard called sail side. Ice butt and stove located in the sail
side, toilet and water bin were in the yuloh side. Sailors carried water in a bin contained 30 ‘dan’, or 1500 kilograms.

**Seamanship**

The bamboo strip sails had been adopted in Chinese junks since the Western Han Dynasty (206 BC-220 AD), and used up until the early 20th century. However, the last successors of seafarers along the Fujian coast, which the average age is 80 years old, mostly never saw the bamboo sails; some of them just heard them from their previous generation or two generations earlier in which these sails were being used. To operate a bamboo matting sail, it has to be rolled and unrolled; it is heavier than one used cloth sail. There is an idiom applied to both sail types, and that says ‘trim one's rubber to the wind’. The cloth lugsail was fasten on odd number of bamboo from luff to leech where could see the balance from the mast; each end of the batten on the leech was connected by the bight and through some euphroes lead the control sheets terminated in one main sheet to the stern of the upper deck. The sail was often very heavy, and it required the whole crew at the winch to set the sail. On Jin Hua Xin, it required approximately 12 minutes with six sailors to turn the winch. The vice laodah held the tiller and order the trimmer to control the main sheet, while the laodah served as a navigator and rarely handled the rudder.

The leeward sailing, windward sailing, and wind abeam sailing were the main points of Chinese sailing junk under different angles of apparent wind. The latter was rarely recorded by previous researchers, both Song Yingxing (1637) and Needham (1971) seemed to be confused between the beam reach and windward sailing. The local seafarers call it ‘tripod sheet’ as the sheet system have fasted the main sail keep it at approximate 50 degree angle with the stern, which is the position in between the leeward sailing and windward sailing. The Old Xiamen
seafarers often used tripod sheet when they set sail to Tainan by the winter monsoon (northeast or north wind). The main sail of Fujian junk was hung on starboard side of the mast, thus the sailors on quarterdeck would see the bamboo battens while sailing with tripod sheet; they called it open sail (all the way on the road was port tack, the batten was force to left the mast). When the boat went back to Xiamen by using same monsoon, no matter sailing with close reach or beam reach ,it was starboard tack; this was call close sail (the batten was pushed to touch the mast) as the bamboo battens could not been seen at the position of laodah. Moreover, Chinese sailors often worked to windward tacking and jibing by turn the stern to wind; accident jibe was deemed to be dangerous especially under the strong wind.

Onboard tools include axes, nails, knives and cloth tec., were used for emergency repairs. The author learnt and experienced to block the bottom loopholes in the towed voyage of Lan Tay II at February 2004 (Fig. 3).

Fig. 3: To block the bottom loopholes of the LanTay II.
Navigation

Just like people live in mountains naturally know and understand their surrounding landform, Chinese seafarers understood that the seabed had hills and valleys similar to the land with different sediment types; sailors used these sediments and topography of the seabed to acquire positions of the vessel on voyages. The last successors of Fujian seafarers did not use the needle sailing route manuscripts, but they relied on their trained eyesight and memories. Yet, some of them also learnt the manuscripts given by their previous generation; therefore, they can read and understand it.

Phing-Chou Kho Than, written between 1111 and 1117 by Chu Yu, described navigation techniques as follow:

“The ship’s pilots are acquainted with the configuration of the coasts, at night they steer by the stars, and in the day-time by the sun. In dark weather they look at the south-point needle (compass). They also use a line a hundred feet long with a hook at the end, which they let down to take samples of mud from the sea-bottom, by its smell they can determine their whereabouts.”

The sounding lead was used to ascertain the depth of water, the head of lead has a hole filled with soap or grease to stick to a few seabed materials to identify if there was sand, mud, or stones. The weight of a sounding lead was between 3-5 kilograms. The word ‘fathom’ and ‘water’ was used by old Xiamen port seafarers to mean a two-arm span, which is approximately 1.6 meters. Usage of the sounding lead was also described by Xiao LiuQiu Man Zhi written in 1755. When thrown into the sounding lead from window of yuloh or shipboard, sailors should remain the boat stationary. Every five waters there was a red sign in the rope.
The laodah or vice laodah burned a joss-stick and kept it alight in the shrine after the ship set sail, and each incense ran about one hour; this also helped them to acquire the positions in the sailing route. Chinese seafarers almost never used the ‘distance’ to describe the sea route, but instead of ‘how long’ it took.

In the middle of the Selden Map, there is an illustration of a Chinese mariner’s compass at the top, this may be the earliest sample can be seen today (Fig. 4). The compass was divided into 24 points represented by the twelve Chinese, earthly branches and the twelve heavenly stems. The most common compass was consisted of a round wood box, where an arrow shaped needle was balanced inside. The oldest style compass was dry-pivoted, later ones were filled with water; yet both were called ‘dry-gen’ by local seafarers. After the compass was improved with 12 Chinese characters, it came to 360 degrees; this compass was called ‘luo-gen’. The seafarers were taught to use the compass and to calculate the tides and winds since they were young. Every seagoing junk had two dry-gens, at least, should one needle lose its magnetic field. The Vice laodah kept one on his side, while the loadah kept another one. In the night, it was illuminated by the laodah’s opium pipe. Even sampans from long line fishing junks had their own small dry-gens.

*Fig. 4 (right): The Chinese Mariner’s Compass on Selden Map.*
Besides compass and sounding lead, Sha-Po-Wei fishermen used primitive astronomical guidance for them to orient themselves. They could read directions by simply by 4 stars during the night. Venus for east, Needle End Star for south, West Star for west and North Star for north.

**Sailing Routes**

There are a least eleven historical documents about compasses and its bearing directions for sailing routes in Taiwan Strait: these are listed as follows:

1. Si yi Guang Ji (四夷广记), written between 1592 and 1598 by Shen Mao Shang.
2. Shun Feng Hsiang Sung (顺风相送 Fair Winds for Escort), written in about 1593.
3. Tung His Yang Khao (东西洋考 Studies on the Oceans East and West), written in 1617 by Chuang Hsich.
4. Chih Nan Cheng Fa (指南正法 General Compass Bearing Sailing Directions), written before 1669.
5. Hai Kuo Wen Chien Lu (海国闻见录), written in 1730 by Chen Lun Jiong.
6. Peng hu Ji Lue (澎湖纪略), written during the reign of Emperor Qianlong in Qing Dynasty by Hu Jian Wei.
7. Xiao Liu Qiu Man Zhi (小琉球漫志), written in 1755 by Zhu Shi Jia.
8. Wai Hai Ji Yao (外海纪要), written in early 19th century by Li Zen Jie.
9. Xia-Men Zhi (厦门志, Xiamen Chronicle), written in 1839 by Zhou Kai.
10. Xia-Men-Gang ji shi (厦门港纪事), written in 1843 by Dou Zheng Biao.
11. Hai Jiang Yao Lue Bi Jiu (海疆要略必究), written in 1856 by Li Yan Yu.
When a ship set sail to Tainan from Xiamen, nearly all the above documents showed similar descriptions for navigation; departing from Nan Tai Wu of Xiamen at direction between ‘chen’ and ‘Xun’ (amount to 127.5°), it takes seven ‘gen’ to Peng-Hu hill, then sail at direction of ‘xun’ (about 135°), and it takes another five ‘gen’ to Luerhmen of Tainan.

Many sailors of old Xiamen port served on merchant junks between south Fujian and Taiwan; they sailed to Tai-Nan in north wind season, went to Wu-Qi of Taichung, Lu-Kang of Chang-Hua, Dong-Shi and Bu-Dai of Chia-Yi, kee-Lung during south wind season. Mostly, they set sail from the old Xiamen port; it took less than one tide to arrive Bay Liao-Luo of Quemoy. After waiting for good wind, they set sail again and used the tripod sheet sailing to Ma-Kung of Peng-Hu for approximately twenty hours. They then waited for suitable winds and tides to Luerhmen; it would take another 10 hours. They would try to sail closer to the east direction when sailed across Taiwan Strait. It would take much less time when ones sailed from Tainan to Xiamen.

**Archaeological Experiment of LanTay II**

On 21st May 2017 at 10 am, LanTay II set sail from port of Liao-Luo of Quemoy planning to trace the historical sailing route by heading 127.5° to Peng-Hu (Fig. 5). The weather forecast for the day were Wind Northeast Beaufort force 3, Swell 1.3 meters, but the author onboard found that the wind had veered to east and increasingly, while the swell is more angular than the wind after the ship entered Taiwan Strait. The course of the ship had to turn in direction of 170°-180° to steer quartering sea. The LanTay II was under control until 16 pm, when the skipper made the decision to abandon the boat at the position 24.1743°N, 118.5535°E, while the situation was Wind East Beaufort force 6-7, Swell 3 meters and 6-7 meters
instantaneous. The 6 years of preparatory archaeological voyage lasted 6 hours, all the crew numbers transferred to companion ship.

![Image](image.png)

**Fig. 5: The archaeological voyage of LanTay II.**

As postmortem reports of the experiment, Sha-Po-Wei indigenous fishermen had compiled the warning signals as below:

a. The day of 21st May was the 26th day of the fourth month in Chinese lunar calendar, one of the brightest days of the Great White Planet in the whole year; and it is the day for brewing disaster the whole year ahead in Taiwan Strait. It means that this is a day with storm surge and a taboo day for sailing.

b. The included angle of wind and wave increasing with the height of the sun which reached the maximum after 12 am, and they stacked up into higher swell. The best set sailing time to cross Taiwan Strait was 4 am.
c. The position where the ship was abandoned is right between seabed valley and hills based on the past records; that was where the swell on the sea surface become rougher (Fig. 6).

![Image](image-url)

**Fig. 6:** *The Sha-Po-Wei indigenous fisherman motioned the topography of the seabed of the Taiwan Strait they recorded half a century ago.*

**Discussion**

The seamanship and navigation of the Chinese Junk requires a plethora of nautical knowledge and a variety of onboard skills. All knowledge regarding Junk ships (including sail and rudder, sounding lead, mariner's compass, joss-stick, compass bearing recorded for sailing route, wind and tide, etc.) formed a closely connected knot of complementary techniques. The information gathered during the marine ethnographic field investigations at old Xiamen port indicated that a series of traditional onboard skills displayed by the last successors of sailors and fishermen may be closely corresponding to skills and techniques described in the historical documents that range from Song Dynasty to Qing Dynasty.

Nonetheless, details of the geographic parameters of sailing routes are still obscure, such as accurate depths and seabed materials, and the sailing directions under the effect on winds and tides. An old local
seafarers proverb says, ‘The stationary compass bearing recorded but flexible brains’, and also says ‘Live performances to speak clearly’, thus experimental archaeological methodologies, or sailing a real ship, shall be used to study their historical context to reconstruct navigational practices and methodologies for sailing in China Seas. The better way forward with archaeological voyages is involving the older seamen and indigenous fishermen into the sailing investigations. The authors believe that expected discoveries of this research-investigation will bring new evidence that significantly extends our knowledge of earlier onboard lives of Chinese Junk ships.

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Biographies

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Yu LongFa (Chinese: 余龙发) is a local fisherman at Xiamen old fishing port, born in 1952 at ShaPoWei. He works as a professional fisherman since the age of 12, being a skillful master of seamanship and navigation in east and South China Sea during past 50 years. He assisted Mr. Xu Lu with the recording and decoding on board skills in Chinese Sailing Junk.
Development of the Sledge-Type Underwater Metal Detection System for Underwater Cultural Heritage Exploration

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Abstract

The National Research Institute of Maritime Cultural Heritage (NRIMCH) in Republic of Korea has promoted the 4-years ‘Development Project of Underwater Cultural Heritage Exploration Techniques’ from 2013 through 2016. During the project, the metallic cultural heritage made of bronze could not be detected with the magnetometer, but NRIMCH has developed the sledge-type underwater metal detection system suitable for exploring metallic material underwater cultural heritage including bronze.
A magnetometer or metal detectors are used to detect metallic objects exposed or buried in the seabed. In case of magnetometer, the depth of exploration is deep and exploration work is fast, but there is a disadvantage that non-ferrous metals except iron is not reacted. When using a metal detector, which is a type of electromagnetic exploration, there is a method using a portable metal detector and a method of towing an antenna in a vessel. In the case of a portable metal detector, since the diver is directly using it underwater, there is a time limitation and a disadvantage that it is difficult to know the position. In addition, when the antenna is towed at the vessel, the antenna is spaced at a considerable distance from the seabed, so that the buried metal cultural heritage may not be detected. To overcome these drawbacks, this system aims to develop an antenna platform as a method for bringing the antenna of the metal detector closer to the seabed. The antenna platform is made of metal-free PVC and designed as a caterpillar. The caterpillar shape allows easy passage of obstacles in the sea floor and allows the antenna to be wrapped and protected. In addition, software was developed to verify and store location information obtained using DGPS and response values for underwater metal cultural heritage obtained through the antenna platform in real time.

**Key words:** UCH, Korea, magnetometer, survey

**Introduction**

Since ancient times, Korea has been active in trade, reverence, and cultural exchanges with neighboring countries; and there are many naval battles from the Joseon Dynasty to the modern times, so it is very likely that various artifacts are buried in the seabed. The artifacts that are buried in seabed are mainly porcelain, metallic artifacts, wooden artifacts, and life products on ships. It is important to find artifacts because buried artifacts are important as historical facts and evidence.

Many studies have been conducted to find metal objects buried in underwater through physical exploration techniques. In Korea, Jung Hyun-Ki and others studied the electric and magnetic exploration used for underwater burial objects investigations (Jung Hyun-Ki et al., 2004), Park In-Seok and others studied the magnetic exploration method for
underwater artifacts (Park In-Seok et al., 2013). E. Weiss and others developed a system using magnetic exploration to detect and to accurately map metal objects buried beneath the shallow waters (Weiss et al., 2007). S. Tripati and others studied the material of a shipwreck through an underwater metal detector and an antenna dipstick metal detector (Tripati et al., 2004). As a result of these studies, the physical exploration technique to find metal objects buried in seabed using magnetic exploration or electromagnetic exploration has been developed.

In the case of magnetic exploration, it is the most effective method of exploration for artifacts made of iron, but it does not respond to metals such as gold, silver, and copper. There are two methods of electromagnetic surveying using the metal detector; one is submerging and diving with the equipment, and the other is towing the antenna in underwater. The method of submerging and exploring divers with equipment is time consuming and has a disadvantage; it cannot precisely locate the position. And the disadvantages of the latter are that if the antenna is located at a considerable distance from the sea floor, it may not detect buried metal artifacts.

To solve these problems, the authors developed the sledge-type underwater metal detection system that can be operated close to the sea floor to compensate for the disadvantages of magnetic and electromagnetic exploration. In addition, the performance of the metal detection system using the antenna platform was verified after the iron pot and the bronze canon were buried in the sea floor, 1m and 2m of the seabed in Geoje sea area, Taean sea area, and Nakdong river area.

**Method and Principle of Metal Detection**

In the physical exploration technique, metal detection methods include a magnetic exploration to detect magnetic metallic materials, and an
electromagnetic exploration to detect non-magnetic metallic objects such as gold, silver, and copper. Magnetic exploration is used to identify the geological structure of the geomagnetic field or its components generated by fluid motion in the outer core of the earth; and this technique is used for ground survey, soil exploration, and resource exploration. And a secondary electric field is generated due to the induction current flowing in the underground conductive body by the primary electric field. By detecting the characteristics of this secondary field, information on the location and shape of metal in the underground can be obtained.

**Configuration of the Sledge-Type Underwater Metal Detection System**

As shown in Fig. 1, the sledge-type metal detection system consists of a metal detector, DGPS, and an antenna platform for bringing the antenna into close contact with the sea floor. It includes software to monitor and store the positional information collected from DGPS and reaction values received from metal detector in real time on PC.

![Fig. 1(left): Schematic Diagram.](image)
1. **Metal detector**

The metal detector used in this study is a method of detecting metal objects by using time difference of transmission and reception by pulse induction method.

Since the time of transmission and reception is different, it is possible to detect metal objects by using one antenna, and it can be used in seawater because it is not affected by medium between metal detector and metal objects. The original metal detector informs the metal response by sound through the instrument cluster and headset. We use DAQ (Data Acquisition) to convert analog signals such as instrument panel and sound into digital signals and to enable real-time monitoring and storage on the PC through software. In addition, it was supplemented with a buzzer so that the change of the reaction value can be immediately recognized (Fig. 2).

![Metal Detector](image)

*Fig. 2: Metal Detector.*

2. **DGPS**

DGPS was used to identify the wake of the exploration vessel. The DGPS uses two or more GPS receivers to reduce positional errors. The location
information comes in the form of NMEA0183, which shows the wake of the exploration vessel through the software.

3. **Sledge-type antenna platform**

The size of the antenna is 20cm x 110cm. A cable (about 30m long) is attached to the antenna. The resistance of the antenna is 1.75Ω and the inductance is 189μH. The antenna platform uses PVC which does not contain metal material. As shown in Fig. 3, the antenna platform is manufactured in a caterpillar shape so that it can be closely contacted to the sea floor. It is designed to overcome obstacles and protects the antenna. The rope was connected to both ends of the antenna platform, and the rope was knotted above the center of gravity to form a ring, and then a descending line was placed to secure land on the undersurface. In addition, it is possible to create a space in which an underwater camera can be placed at a position that does not affect the antenna, so that the sea floor can be confirmed as an image. In addition, a weight was produced to prevent the buoyancy caused by the cable during the survey.

![Fig. 3: Platform.](image)

4. **Software**

It is possible to monitor and record the incoming signal from the metal detector and the DGPS location information on the PC in real time. The software was built using Mathworks' MATLAB GUI. The software installs
a driver for National Instruments USB-6000, a data acquisition device connected to a metal detector, to receive data from MATLAB. The locational information of DGPS is output in the form of NMEA0183, and it is indicated by the latitude and the longitude through parsing. The software records the data in real time, ensuring that material acquired in a sudden emergency is protected. Also, there is a start button with or without DGPS for single use without DGPS.

**Acquisition and Processing Data**

1. **Field experiment**

   The experimental research was conducted in 3 sites: Taean sea area, Geoje sea area, and Nakdong river area. In the Taean and Geoje sea areas, the size of the research area were 100m × 100m; and the size of the research area in the Nakdong river was 50m × 200m. Iron pots, ceramics and bronze cannons were used as experimental samples. They were intentional buried at 1m, 2m deep under the seabed and sea floor. A rubber boat was used to minimize the electromagnetic noise in the acquisition of data, and its operation speed of the exploration vessel was below 4km/h. The exploration vessels operated in the ‘east-west direction’ and the ‘north-south direction’ in the research areas.

2. **Data processing**

   Two kinds of processing were performed to process the data obtained from field experiments. The DGPS was installed on the exploration vessel and collected data of the antenna platform and position. Then, the raw data coming from the metal detector shows DC deflection, which uses a high-pass filter to remove the DC deflection.

3. **Layback calibration**
For layback calibration, the depth of the area where the survey is performed was required; and the length of the cable to lower the antenna platform was also required. For example, if one of the field test sites is 3m in depth with a 23m in cable length, the horizontal distance between the exploration vessel and the antenna platform is 22.5m.

4. DC deflection removal

When data coming directly from the metal detector, DC deflection appeared in some sections and it can be removed through a high-pass filter. A high-pass filter is a filter that removes less than the specified cut-off frequency and passes the higher frequency band. In this study, a cut-off frequency of 0.1Hz was specified and the higher values were separated by passing only the higher frequency components.

Results

Taean sea area

Fig. 4 is the profile of the electromotive force value obtained from the Taean sea area. (a) It is the survey line that goes through east-west upon 1 iron pot, 1 bronze cannon buried at 1m, and 2 iron pots, 2 bronze cannons buried at 1m. The electromotive force value is measured higher in the region of double numbered experimental sample areas. (b) It is the survey line that goes through east-west to 1 iron pot, 1 bronze cannon buried at 2m, and 1 iron pot, 1 bronze cannon on bottom. It shows that the electromotive force value is high near the iron pot, bronze cannon. (c) It is the survey line that goes through south-north to 3 iron pots, 1 bronze cannon buried at 1m, and 3 iron pots, 1 bronze cannon buried at 2m. Through the profile analysis, we could distinguish 3 iron pots buried at 2m which did not appear in electromotive force abnormality. (d) It is the survey line that goes through south-north upon 6 iron pots buried at 1m, and 3
iron pots, 1 bronze cannon on the bottom. The electromotive force value was the highest in 3 iron pots on the bottom; and 6 iron pots buried at 1m showed higher electromotive force than 1 bronze cannon on the bottom.

**Fig. 4: Taean Results.**

**Geoje sea area**

Fig. 5 is the profile of the electromotive force value obtained from the Geoje sea area. (a) It is the survey line that goes through east-west upon 1 iron pot, 1 bronze cannon, 2 iron pots, 2 bronze cannons buried at 1m. The electromotive force values in this region are high around the experimental sample. (b) It is the survey line that goes through east-west upon 1 iron pot, 1 bronze cannon buried at 2m, and 1 iron pot on the bottom. A signal that was observed between the iron pot and the bronze
cannon buried at 2m was not the experimental sample, and the value of the electromotive force value was measured high near the pot and the bronze cannon. (c) It is the survey line that goes through south-north upon 6 iron pots, 2 bronze cannons buried at 1m, and 3 iron pots, 1 bronze cannon on the bottom. It shows the largest electromotive force value at 3 pots on the bottom, and it has large values mainly around the experimental sample. (d) It is the survey line that goes through south-north upon 1 iron pot buried at 1m, and 1 iron pot buried at 2m. Based on the electromotive force value, anomalous signal in the marked area are detected nearby metal objects.
Fig. 5: Geoje Results.

**Nakdong river area**

Fig. 6 is the profile of the electromotive force value obtained from the Nakdong river area water bottom. (a) It is the survey line that goes through east-west upon 3 iron pots, 6 iron pots buried at 1m, 3 iron pots buried at 2m, and 1 iron pot on the bottom. At the place that 1 pot buried at 1m, the electromotive force value is 1.0V; and one that 1 pot buried at 2m, it has 0.8V. And when the antenna passes near the iron pot on the bottom, the electromotive force value measured by the metal detector is as high as about 2.3V. (b) It is the survey line that goes through east-west upon 1 iron pot, 1 bronze cannon, 2 iron pots, 2 bronze cannons buried at 1m,
and 1 iron pot, 1 bronze cannon buried at 2m, and 3 iron pots, 1 bronze cannon on the bottom. The position is greatly deviated from the 2 pots buried at 1m. The electromotive force value of this time was not the iron pot but the value of other objects on the bottom, or it appears as a layback error due to water depth or obstacle on the bottom. Overall, we can see that there is less noise than in other areas.

Fig. 6: Nakdong River Results.

Conclusion

Most of the underwater cultural heritage in Korea are accidentally discovered during fishing activities; a systematic exploration of the region has not been done yet. The operation of metal detectors is
necessary to find non-ferrous metals such as gold, silver, copper, and bronze, but the present operating method has many drawbacks. In this study, the sledge-type underwater metal detection system was developed and applied to the field to overcome these disadvantages. Then, the following results were obtained.

First of all, it can identify iron pots and bronze cannons buried in various depths and numbers. Secondly, it can possibly identify bronze cannons; this was impossible to be identified by conventional magnetic exploration. Thirdly, there is less noise in the Nakdong river area than in the Taean and Geoje sea areas. Unlike the Taean and Geoje sea areas, the Nakdong river area does not have any fishery activity/industry; consequently, this result might be caused by lack of iron abnormalities such as trapping on the bottom. Fourthly, there was a section where the metal reaction/position differed from the actual position of the buried experiment sample. This might be caused by the position error of the DGPS and the error of the layback correction. In conclusion, based on these results, the sledge-type underwater metal detection system will contribute to the discovery and protection of underwater cultural heritage if applied to underwater cultural heritage exploration.

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**Biographies**

Yong-Hwa Jung is a Researcher & Conservator in the Underwater Excavation & Conservation Division of the National Research Institute of Maritime Cultural Heritage of South Korea. He earned his PhD in 2008 from Kongju National University. He has been involved in several maritime research projects including: Exploration Project of Underwater Cultural Heritage by the EOS3D-A (3D Seismic Survey System), Development Project of Underwater Cultural Heritage Research Technology Using Crabster CR200, Development Project of Underwater Cultural Heritage Exploration Techniques, Underwater Archaeology Vessel ‘NURIAN(G/T 290ton)’ Ship building, Underwater Cultural Heritage Preservation Policy in Korea, Analysis of Manufacturing Technology and Production Area of Underwater Excavations Pottery.

Young-Hyun Lee majored the marine geophysical exploration at Dong-A University. He has been working in division of underwater excavation and conservation at the National Research Institute of Maritime Cultural Heritage for 5 years. He had mainly participated in a research project, which is named "Development Project of Underwater Cultural Heritage Exploration Techniques". This project had been conducted by our division from 2013 to 2016. As a marine geophysical researcher, He is still doing my best to apply those developed exploration techniques, which are including utilization methods of equipment and development of equipment, into the underwater archaeology filed.
Jin-Hoo Kim is Professor in Geophysical Engineering. Born in 1955, Seoul, Korea. B.S. from Seoul National University, Korea in 1978. Ph.D. in Geophysics from Colorado School of Mines, U. S. A. in 1986. Currently, he is the department head of Energy and Mineral Resources Engineering Department, and the director of Ocean Resources Research Institute, Dong-A University, Busan, Korea. He has participated in various geophysical exploration projects for in-land and off-shore site investigations, maritime archaeological surveys, and soil and petrophysical researches.

Sang-Hee Lee was born in 1989, Busan, Korea. He graduated from Dong-A University with a bachelor and master degree in Energy and Mineral Resources Engineering. Current, he is studying at Dong-A University to get his doctor’s degree. He has participated in geophysical exploration projects for in-land off-shore site investigations, maritime archaeological surveys, petrophysical researches.

Hyun-Do Kim is a CEO at GeoView Co. Ltd., Republic of Korea since 2005, where he has been dealing with marine seismic and geophysical surveying business. He obtained Ph.D. in geophysical survey from department of ocean engineering, Dong-A University, Busan, Republic of Korea, in 2005. Dr. Kim’s research interests include marine geophysics and geotechnical survey in in-shore and off-shore. Recently, 3D seismic survey system has been developed and applied to underwater archaeology.
Yeong-Hyun Kim was born in 1979, Busan, Korea. He graduated from Dong-A University, Department of Civil Engineering. He studied river port engineering in Dong-A Graduate School. Currently, He is working at Geoview Corporation, a marine survey company and has been working for 8 years. He is a team leader of marine Survey department. He is charge of marine geophysical surveys and geotechnical surveys.
Developing the Foundation for Sustainable Management of Underwater Cultural Heritage Starting from Local Involvement: Case Studies in Okinawa

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Abstract

The Ryukyu Archipelago is well known for its beautiful ocean and coral reefs; and thanks to these beautiful oceans, scuba diving and snorkeling have become one of the most important activities for its tourist industry of the archipelago. Around the islands, 230 underwater cultural heritage sites were found and identified. In this presentation, the authors shall introduce their attempts and case studies regarding the public engagement of local communities with management of underwater cultural heritage, including providing guidelines for sustainable valorization of the site with local marine sports industry. For Yarabuoki underwater site of Ishigaki Island, there are seven iron grapnel anchors and a cluster of Early Modern Ryukyuwan ceramic jars (tsuboya-yaki). To establish a connection/relationship between the site and the local professional divers, who actually go into the sea and see the site most frequently, the authors provided workshops about UCH and a place where
archaeologists and the local professional divers can exchange their opinions. The goal of these activities is to ask professional divers of local communities help to monitor UCH after scientific evaluations led by archaeologists are completed. The Ohajima underwater site is located off the Coast of Kume Island in Okinawa. This site contains a dense distribution of medieval Chinese pottery. Public open-houses were experimentally organized twice for local communities. The Board of education from local communities (for instance, Kumejima Museum) and local diving communities were heavily involved and helped underwater archaeologists and the research team to organize this event. After continuous attempts of public outreach, public awareness and interests for UCH among the local diving communities has increased. More divers have started visiting the sites. However, an increase in public awareness creates another concerns that it exposes the UCH sites into social media such as blogs by visitors, articles on diving magazines, and so on. Henceforth, the next challenge confronting the authors and the local communities regarding these sites are plans to properly monitor those sites and a proposal for a reliable long-term management plans. More importantly, these monitoring and management plans have to involve wide varieties and different type of local communities

**Key words:** Ryukyu, UCH, public engagement, management

**Introduction**

In past few decades, in addition to conventional preservation operations for cultural heritage sites, understanding values of cultural heritages, and utilizing those as cultural resources for local communities has become a very important perspective to manage cultural heritage. Archaeological sites are often turned to site museums where visitors actually visit and enjoy the original sites. This new phenomenon is widely seen not only on terrestrial sites, but also on underwater sites. This paper aims to share the authors’ attempts and experiences of their attempt to establish the involvement of local communities towards sustainable management plans of underwater cultural heritage, and their case studies around the area of Okinawa Prefecture.
Background and Subjects of Underwater Cultural Heritage in Okinawa

Okinawa consists of the southern half of the Ryukyu Archipelago with 199 islands, and its area expands over 1200km between Kyushu Island and Taiwan. Because of its location, islands of Okinawa have subtropical climates which makes Okinawa differs from other areas of Japan, and it gives warm climate through a year. Islands of Okinawa are surrounded by amazingly beautiful ocean with flourishing coral reefs. Therefore, these beautiful waters are very popular among scuba divers and snorkelers. Sometimes, those divers and snorkelers become to be interested in something different from beautiful fishes and corals; they want to see something different yet attractive. Therefore, authors believe that UCH has great potential to be a resources of truism, or diving industry.

Indeed, underwater cultural heritage often attracts non-archaeologists and non-experts. For instance, the wreck-diving is one of the very popular diving-tour options in many countries, such as Malta and other Mediterranean islands. It is already the major tourist attraction in many countries. In the case of Okinawa, a beautiful coral reef with schools of colorful fishes shall provide special background which adds extra value on diving on UCH. 230 underwater cultural heritage sites are identified around the islands in the Okinawa Prefecture. This presentation is about the authors' attempts to establish strong ties between the local public and underwater cultural heritage managements and to provide guidelines for sustainable managements of the site and involving of local marine sports industry into this management plans.

The Ohajima underwater site is located off the coast of Kume Island in Okinawa. The site contains dense distributions of medieval Chinese pottery. Public Open Site Day was experimentally held twice in the island.
Along with the authors’ research team of underwater archeologists and researchers who organized the events, attendance, and support from the Local Board of Education (Kumejima Museum) and local diving communities (Katagiri et al., 2012).

The Yarabuoki underwater site of Ishigaki Island consists of seven iron grapnel anchors and a cluster of Early Modern Ryukyuwan ceramic jars (tsuboya-yaki). During field campaigns, authors and its research team provided workshops and a meeting to exchange opinion with local communities in order to establish a new tie and relationship between the UCH of the islands and local professional divers who visit the the sites most frequently (Ono et al., 2015 and Nakanishi et al., 2016). The aim of these activities and meetings are to ask local diving communities to monitor the sites even after the scientific academic evaluations of the site led by authors is completed in near future, and to share general knowledges and perspectives of protecting UCH as our common heritages and value those heritages in non-intrusive manners.

After the continuous attempts, public awareness and interests in UCH have increased dramatically among the local divers and its communities. More divers began to visit the sites. Yet, this new movements and trends has invoked another potential dangers toward this UCH. The potential dangers is an increased number of divers and exposure of UCH into wider range of the general public; the UCH have started to appear in divers’ SNS, blogs, diving magazines, and so forth. This trend may trigger unfriendly and intrusive activities on the sites, such as lootings and destructions. Henceforward, now the authors have to urgently focus on its plans of site managements and monitoring plans, and to accomplish this task, involvement wide variety of scholars as well as local communities are essential.
**Case Studies in Okinawa Part 1: Ohajima Site in Kume Island, Okinawa: Open Site Day**

**Location and Characteristics of the Site**

The Ohajima underwater site is located off the coast Oha Island where is annexed to Kume Island in Okinawa. The site consists of a dense distribution of Chinese pottery that is dated between the latter half of the 14th century and the beginning of the 15th century. A Public Open Site day was experimentally held twice (in 2011 and 2013). Local Board of Education (Kumejima Museum) and local diving communities supported underwater archaeologists and researchers to organize this event (Katagiri et al., 2012).

The main attraction of the event was a tour to Ohajima underwater site either by snorkeling or a glass-bottomed boat. The event schedule was especially composed for the general public to understand general ideas of UCH; the schedule (described as Step 1 - 5) of the event can be seen below:

- **Step 1: Lecture ‘History and Culture of Kume Island’**
- **Step 2: Material Observation of Ceramics Excavated from Underwater Site**
- **Step 3: Tour of the On-land Site Where Was Important for Maritime Trades.**
- **Step 4: Snorkeling Practice**
- **Step 5: Snorkeling Tour of the Site**

**Step 1: Lecture ‘History and Culture of Kume Island’**

First, archaeologists gave a 30 minute long preliminary lecture prior to the site visit. This lecture was about general knowledge and information regarding history of Kume Island. The authors believed that providing
historical information and knowledge to the participants is very important because the lecture and its information transform this event into a learning opportunity rather than be a just sightseeing for fun (Katagiri et al., 2012).

**Step 2: Material Observation of Ceramics Excavated from the Underwater Site**

As the second step, the participants experienced observation-practice on raised artefacts; those artefacts used for this 30 minutes long observation-practice included pottery pieces were collected from Ohajima site and a stone anchor from Uegusuku (Castle) Site (Fig. 1). The purpose of this practice is for participants to understand the appearances of underwater artefacts; and this experience helped the participants to find/recognize artefacts during the following underwater on-site tour. Experiences of observations on artefacts together with the lecture of preliminary knowledge of the site provided a great preparation for the following tour and this event (Katagiri et al., 2012).

*Fig. 1: Material observation excavated ceramics from underwater site. (Kumejima Museum, Kume Island)*
**Step 3: Tour to the On-land Site Where Was Important for Maritime Trades**

Furthermore, the participants attended a tour to terrestrial cultural heritage sites: on this tour, participants visited the Tenkogu Site, the Kuramoto-ato Site, the Majako Port Site, quarries, and so on. This one hour long tour was organized and guided by archaeologists. The aim of this tour was to explain site-formation processes of Ohajima underwater site and to provide comprehensive knowledge of archaeological sites and its surrounding environments (Katagiri et al., 2012).

**Step 4: Snorkeling Practice**

Before visiting the underwater site, a practice session was provided to participants who decided to visit the site with snorkeling. For this tour, two different options were provided for participants; one is visiting the site by snorkeling, and the other option is to visit the site by a glass-bottomed boat. Twenty participants visited the site by snorkeling, and the other participants who did not want to swim chose the glass-bottomed boat. Both tour lasted one hour-long each. This practice-session of snorkeling was taught by local professional divers for safety reasons of participants (Katagiri et al., 2012).

**Step 5: Snorkeling Tour of the Site**

Finally, as the last activities of the Open Site Day, the participants visited and enjoyed the actual UCH site. Fig.2 displays a scene of the snorkeling tour in Ohajima underwater site (Katagiri et al., 2012).
Discussion

The authors believed that the Open Site Day was successful; this experiment of public outreach that take local participants to the actual UCH sites can be a great case study for other UCH site across the Ryukyu Archipelago. Although this experiment was generally a successful case, the authors also became to acknowledge its difficulties and rooms for improvements in order to use it this experiments using it as a case study of public outreach with other UCH sites across the archipelago. Also, this type of events still requires experienced archaeologists to organize and to provide informative lectures; nonetheless, these archaeologists were most cases not originally from local communities. The authors believe that an ideal perspective of local workshops and public outreach for UCH is ‘sustainability’; local divers and communities became to be able to provide workshops as well as monitoring and management UCH without supports from outside. Thus, next challenge for this public outreach experiments is
to compose a flexible guideline that make those events more sustainable by local diving experts and communities.

**Case Studies in Okinawa Part 2: Yarabuoki Underwater Site**

**Location and Characteristics of the Site**

Yarabuoki underwater site is located off the coast of Yarabuzaki in Nagura Bay of Ishigaki Island in Okinawa Prefecture. This site contains seven iron grapnel anchors of various sizes and a cluster of Early Modern Okinawan ceramic jars (*tsuboya-yaki*). This type of ceramic jars were originally produced in Okinawa Islands between the 16th century and the 19th century, which also corresponding to the time periods of the Early Modern Ryukyu Kingdom Period for Okinawa Islands and the Edo Period for the main lands of Japan (Fig. 3). Also those grapnel anchors found in this site are the only examples of grapnel anchors that are found in Japan.

![Image of Yarabuoki underwater site](image)

*Fig. 3: The assemblage of Okinawa produced pottery in good condition at the Yarabuoki underwater site. (Okinawa Prefectural Archaeology Center)*
The site was discovered by a local professional diver, Seiji Fujii, in 2009. And in 2010, the Okinawa Prefectural Archaeological Center conducted inspection survey with assistances of the Nansei Islands Underwater Cultural Heritage Study Group (Katagiri, 2010 and 2013). This newly discovered UCH site also required an accurate recording by experienced diving archaeologists, and then values of the site have to be evaluated and disseminated. Currently authors and their research team is operating an interdisciplinary research project to evaluate historical and archaeological values of the site, as well as its potentials as a cultural resource for local communities (Ono et al., 2016).

Moreover, authors also believe that geographical and topographical data around site area shall greatly contribute to understand site formation process and its reconstruction. Under this scope, Dr. Kan conducted a multibeam echo sounding (MBES) survey around Yarabuoki underwater site in August 2011 (Kan et al., 2015 and Ono et al. 2016). This multibeam data successfully visualized the bathymetry around the site with lateral grid resolution of one metre. Fig. 4 displays enlarged image of the multibeam bathymetric map of Yarabuoki underwater site with plotted locations of its components. The authors believe that this multibeam map is an essential tool for their public outreach because the map can be a tool to convey accurate academic evaluations of the site to its readers and visitors. The authors have to remark on the importance of scientific and historical values of UCH sites and its dissemination to local communities; without understanding its cultural significance, divers will not be able to appreciate UCH and visiting the sites will be a part of fun dives, not a part of cultural activities. Moreover, without understanding cultural values of UCH properly, its exposures to the general public may trigger negative impacts on the sites.
Workshops with the Local Professional Divers

First, the authors tried to build a network with local professional divers who frequently visit this UCH site. Also Mr. Fujii, who found and reported the site to Okinawa Prefectural Archaeological Center, has been involved in archaeological investigations since the beginning. A goal of this was to establish strong ties with the local diving communities and to ask them to monitor the UCH sites; also the authors tried to share histories and archaeological information of the site based on scholarly researches as well as methods for non-intrusive/non-disturbance recreation diving on UCH sites. With supports from Ishigaki City Board of Education where manages cultural heritages around/in the island, authors organized several workshops and invite local divers; during this workshops, divers also visited the site with authors and diving archaeologists. Then the authors and participants exchange opinions towards UHC of the islands
and discussed values of the sites for local communities and importance of *in situ* preservation (Nakanishi et al., 2016).

These workshops started November 2015, and the authors have tried to share the idea of UCH and its important concepts that is not to touch or remove artefacts and contexts from its original positions. Also as a part of the workshop, the authors and archaeologists invited participants, or local professional divers, to the UCH sites during the archaeological investigations; aims of this activities are to share archaeological methods of underwater recording of UCH, such as measuring and drawing of the sites in scientific manners. Throughout these workshops, the author believes that the local divers become to be aware of significances of archaeological information of the site that may help archaeologists to reconstruct the past (Fig. 5).

*Fig. 5: Site visit with the local professional divers.* (Yuji Yamamoto)
Discussion

For this experimental research in Ishigaki Island, the authors also focused on involvements of local communities into monitoring and management plans. Therefore collaborative efforts with local authorities and the general public were essential. Local divers may be able to visit the sites as their daily activities, yet they also do monitoring while they do so, and when they found a new archaeological site, they can quickly yet properly report their discoveries to the local authorities using established network via authors’ workshops. An ideal goal of this workshops and experimental research is to establish a sustainable management and monitoring plans of UCH site; once archaeological investigations are completed, the authors want local diving communities and their local dive shops to bring their customers (recreation divers who visit the island) to UCH sites with providing proper information of its history and archeology. When those diving tours on the UCH become popular activity, their frequent visit may function as a monitoring activity, not to mention that these tours may have positive impacts on the local tourist businesses by bringing customers to the island by.

The authors’ main question for this experimental research on public outreach and dissemination is ‘how to maintain and protect qualities of scientific information and values of archaeological sites during the course of dissemination’.

Discussion: Developing the Foundation for Sustainable Management Plans on Underwater Cultural Heritage with Local Involvement

The authors’ main purpose of this research is to establish sustainable management and monitoring plans for UCH. It is important to remark that
the sustainable management and monitoring plan is different from other leisure diving activities on shipwreck sites that are often intrusive and destructive to UCH. Also, to make the stated management and monitoring plans different from other uncontrolled leisure shipwreck diving activities, it is very important for archaeologists to provide good scientific information to local diving communities and dive shops where will bring leisure divers to the UCH sites after archaeological investigations are completed. If the local diving communities recognize and share values of UCH, they will respect its presence, and keep non-intrusive and non-destructive methods to enjoy their underwater common heritages. In order to convey values of UCH to the local communities properly, it is important for archaeologists and researchers to provide ‘good’ information and data. For instance, in case of Yarabuoki underwater site, high-resolution multi-beam maps were provided to local communities. Indeed, there are many good case studies of similar concepts: for instance, similar case studies were done for Baia Underwater Archaeological Park (Nogami et al., 2007), protected-sites-tours in Sicily (Soprintendenza del Mare, 2009 and Tusa, 2009) and so forth (Nakanishi et al., 2017). For this authors’ experimental researches around Okinawa areas, authors need to find the most suitable case study and its fittest methodology to accomplish their dissemination and monitoring plans as socio-cultural and natural environmental studies.

Throughout the authors’ researched and the workshops in Kume Island and Ishigaki Island, local communities and diving shops displayed strong interest to be a part of the management and monitoring plans. Now, the authors have to move to next step; that is further development of the local networks and capacity buildings. Those two developments are essential for the plan to be established with local communities for long-term site management. For this purpose, authors composed four-step work-
models; this model can be seen as Fig. 6 (Nakanishi and Katagiri 2017, amended by the authors).

**Fig. 6: Suggested model case: 4 steps and subjects to overcome.**
*(Nakanishi and Katagiri, 2017, amended)*

For an already identified UCH site, four-step process shall be expected to accomplish a sustainable management plan. First, as Step 1, archaeologists and researchers have to investigate and identify values of the UCH site. It is an essential process because these values display how to manage and protect the sites. Also this value shall be shared with local communities; therefore, values of the sites have to be identified and studied before the following dissemination processes. Also, these archaeological investigation by scholars may take multi-years and can be labor intensive; therefore, collaboration with local diving communities are often very helpful. Moreover, this collaborative efforts between
archaeologists and local diving communities can be a positive first steps of local involvement for the management and monitoring UCH.

The second step is capacity building. The capacity building include introduction of UCH to local communities; therefore, providing proper knowledge and methods to protect and manage the sites is essential. For that reason, workshop-style, such as Yarabuoki underwater site, is an effective method to accomplish this step. Additionally, this step may widely expose UCH into the general public; therefore, one of the important tasks for archaeologists is to evaluate preservation condition/status of sites, and its access have to be restricted if it is necessary. In short, it is important for archaeologists and experts to share and disseminate good knowledge and information with the local communities.

The third step is ‘risk management’ and ‘establishment’. UCH has been opened to the general public via the processes of the previous step; and it may trigger influx of tourists into the UCH. The main task of this stage is to closely monitor the UCH. To do this correctly and frequently, supports of local diving communities with proper networking shall become essential. On the other hand, the authors hope another potential of UCH; the beginning of new touristic trends by utilizing UCH may generate new values of UCH for local communities. The authors is hoping that practice of UCH site management and monitoring shall be established throughout this step.

Final stage, or Step 4, is about ‘sustainability’ by the local communities. It is important for local communities to lead site managements and monitoring operation of UCH. While archaeologists and other experts still be able to support the local communities if necessary, the author strongly believe that main groups that manage and monitor the UCH have to be local communities. This shifting process may take long time. However the
authors also hope that the local communities may become to realize their own values on UHCs throughout their experiences of the management. When the local communities understand values and methods to manage and monitor UCH without helps by archaeologists and experts, ‘sustainability’ of the management will be achieved. To accomplish the Step 4, supports from local authorities, such as Board of Education of a municipal government where is responsible for managing cultural heritages found in the region, is essential. Two main important tasks for them are: to secure and maintain academic values of UCH and keep qualities of its management; to report and register new discoveries of UCH within their jurisdictions.

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References


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