

The Submerged Buddhist Temple of Tanjo-ji in Chiba Prefecture, Japan

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ABSTRACT

The Tanjo-ji is a temple belonging to Nichiren Buddhism at the town of Kominato in Chiba Prefecture, Japan. Nichiren was born in 1222 at a fishing village near the town, and became a Buddhist priest who developed the teachings of Nichiren Buddhism, a branch school of Mahayana Buddhism. When his mother gave birth to Nichiren, according to legends, water for bathing the newborn baby welled up in a garden, lotus flowers came out on the seashore, and plenty of sea breams jumped over the sea. The sea in front of the Tanjo-ji is now named ‘Sea Bream Inlet’, a Japanese natural monument registered by the Agency for Cultural Affairs, where we still could see schools of jumping sea breams or opaleyes. Just before or after his death in 1282, the original temple of Tanjo-ji was built on the site of Nichiren’s birthplace or of his mother’s house, but the temple is said to have flooded and submerged by tsunamis with earthquakes and to have moved to where it is at present. Indeed, a historical document says that the 1605 Nankai Earthquake and following tsunamis damaged and destroyed the area around the bay of Kominato. In the commemoration of the 800th anniversary of the birth of Nichiren, the Kamogawa City Council and Tokyo University of Marine Science and Technology, which is a member institution of the UNESCO UNITWIN Network for Underwater Archaeology, started the underwater survey for the submerged site in the spring of 2019. Because sites of the submerged temple or fishing villages are supposed to be on the bottom of very shallow seas near the coast, Tokyo University of Marine Science and Technology has developed a remotely steerable unmanned surface vehicle with a side scan sonar and an underwater camera for its survey.

Key words: Tanjo-ji, Nichiren, Earthquake, Tsunami, Autonomous Surface Vehicle, Side Scan Sonar

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INTRODUCTION

The Tanjo-ji is a temple belonging to Nichiren Buddhism at the town of Kominato in Chiba Prefecture, Japan. Nichiren was born in 1222 at a fishing village near the town, and became a Buddhist priest who developed the teachings of Nichiren Buddhism, a branch school of Mahayana Buddhism. During the medieval period, the original temple of Tanjo-ji was built on the site of Nichiren’s birthplace or of his mother’s house, but the temple is said to have flooded and submerged by tsunamis with earthquakes and to have moved to where it is at present. In the commemoration of the 800th anniversary of the birth of Nichiren, the Kamogawa City Council and Tokyo University of Marine Science and Technology, which is a member institution of the UNESCO UNITWIN

Network for Underwater Archaeology, started the underwater survey for the submerged site in the spring of 2019.

NICHIREN AND THE BUDDHIST TEMPLE OF TANJO-JI

Nichiren was born in 1222 at a fishing village around the bay of Kominato or the bay of Uchiura. When his mother gave birth to Nichiren, according to legends, water for bathing the newborn baby welled up in a garden, lotus flowers came out on the seashore, and plenty of sea breams jumped over the sea. The sea in front of the Buddhist temple of Tanjo-ji is now named ‘Sea Bream Inlet’ or ‘Tai no Ura’, a Japanese natural monument registered by the Agency for Cultural Affairs, where we still could see schools of jumping sea breams or opaleyes. Nichiren said that his village was named the medieval hamlet of Kataumi, but it does not exist anymore because it is said to have been submerged by tsunamis with earthquakes (Suzuki, 1992).

One local tradition tells us that the medieval hamlet of Kataumi used to be on the south side of the Buddhist temple of present Tanjo-ji in front of the Pacific. There, indeed, the so-called ‘Pond of Lotus Flowers’ or ‘Renge ga Fuchi’ still exists, and in 1702 the Buddhist temple of Tanjo-ji erected ‘Stone Monument for the Pond of Lotus Flowers’ or ‘Renge ga Fuchi no Hi’ (Fig. 1) on the Pacific shore in commemoration of Nichiren’s birthplace. The stone monument itself was submerged and lost because of the 1703 Genroku Earthquake and its tsunamis. At the end of the 19th century, it was recovered from the sea bottom by local fishers and re-erected in the precincts of the present temple (Terao, 2000). Other than this monument, however, there no historical material saying that the medieval hamlet of Kataumi might be on the south side of the Buddhist temple of present Tanjo-ji in front of the Pacific.



Figure 1: Stone Monument for the Pond of Lotus Flowers

The field research around the pond in front of the Pacific in 2019 derived the conclusion that the medieval hamlet of Kataumi might not have been there. First of all, the area is rocky around the mouth of the bay of Kominato; building even fishermen's houses is out of the question. It is true that its topography has been drastically changed since the medieval period by frequent earthquakes and tsunamis. Secondly, the main road used to pass beside the pond, but it has already been destroyed and submerged (Muragishi, 2009). Although roads could be opened on cramped spaces between rocky cliffs and coastal lines, fishers who knew the sea and its dangers well cannot have built their huts just in front of the Pacific with impetuous heaving waves.

The other local tradition tells us that the medieval hamlet of Kataumi used to be in front of the innermost portion of the bay of Kominato. According to some historical materials, the village of Kominato on the east in front of the innermost portion of its bay, where the Buddhist temple of present Tanjo-ji is, and the village of Ichikawa on the west in front of the innermost portion of its bay frequently disputed over lands. The medieval hamlet of Kataumi is said to have belonged to the village of Ichikawa. There are some archaeological sites of medieval graveyards or temples around the village of Ichikawa (Suzuki, 1984). The probability that Nichiren was born at the medieval hamlet of Kataumi in front of the innermost position of the bay of Komiinato is extremely high, but the classic ground of its hamlet may be under the sea at present.

Nichiren died in 1282 in Tokyo far away from the medieval hamlet of Kataumi. In 1264 he once went back to his home village, visited his father's grave, and visited his ill mother. For the purpose of praying for her speedy recovery, he is said to have built a small Buddhist hall dedicated to prayers for her health inside the hamlet (Suzuki, 1984). Whether this Buddhist hall was built on the site of his birthplace, or of her mother's house, or on a new plot, is unknown, but it is said to have been the primordial place of the original temple of Tanjo-ji. Nevertheless, this story might not have been the historical fact, because in 1264 near the hamlet of Kataumi Nichiren was attacked and injured by his local opposition party on the way back from the hamlet. This famous incident is known as 'Komatsubara Honan'. If he had built a Buddhist hall at the hamlet of Kataumi, it would have been destroyed by the same local party.

According to the temple legend, on the other hand, the original temple of Tanjo-ji was founded in 1276 by Nichiren's pupils, viz. Nike and Niho, perhaps in the medieval hamlet of Kataumi. However, this foundation in 1276 is highly improbable, partly because the teachings of Nichiren Buddhism was still oppressed at that period (Suzuki, 1984), and partly because, strange to say, Nichijo did mention neither Nike nor Niho (Nagae, 2014). In addition, there is neither historical document about the Buddhist hall in 1264 nor one about the Tanjo-ji in 1276 at all.

The only one trustworthy material has been discovered from inside the abdomen of a seated statue of Nichiren at the Buddhist Temple of Tanjo-ji. It was written in 1363 by Nichijo, mentioning that he founded a Buddhist hall dedicated to the sect founder, Nichiren, who had been born in the hamlet of Kataumi in 1222, for the sake of housing the seated statue of Nichiren (Terao, 1992). Although it cannot be denied completely that Nichiren might found a small Buddhist hall in 1264 at the medieval hamlet of Kataumi, the rudiment of the original temple of Tanjo-ji may have derived from the hall built by Nichijo in 1363. Later the hall at the medieval hamlet of Kataumi was flooded and submerged by tsunamis with earthquakes, but they do not seem to have been large enough to destroy

it totally, because the seated statue of Nichiren at the original temple of Tanjo-ji has not been lost at all.

EARTHQUAKES AND TSUNAMIS

According to oral traditions, the original temple of Tanjo-ji was flooded and submerged by tsunamis with two large earthquakes, viz. the 1498 Meio Earthquake at first and the 1703 Genroku Earthquake secondly. On the 23th of August, 1498, the precincts of the temple sank because of big tsunamis with an earthquake, and all buildings were submerged. The temple's red seal was lost as well. Therefore, the temple was moved to on the hill in front of 'Sea Bream Inlet'. If temples lost their red seals, according to the rule at that time, they lost their powers, either. As a place to pray for the protection of the nation and the peace reigns in the land, however, the new red seal was granted to the temple by Iemitsu Tokugawa, 3rd Tokugawa Shogun, on 17th July 1629. The temple was ranked as 'dokurei', being allowed to use the palanquin named 'ajirogoshi'. During the Genroku era, Mitsukuni Tokugawa was the most credited with reviving the restoration of Tanjo-ji, as he showed his belief in the temple. On 21st November 1703 again, the temple was flooded and submerged by tsunamis with an earthquake and it moved to where it is at present (Chiba Prefecture, 1926).

At first, the 1498 Nankai Earthquake or the earthquake of Meio Jishin in 1498, having a magnitude estimated at M8.2-8.4, occurred along the eastern Nankai trough, and the tsunamis generated by the earthquake induced major geomorphological and social changes along the Pacific coast of central Japan; the large-scaled impact caused by this earthquake and tsunamis were linked to the landform changes and the rapid disappearance and abandonment of coastal towns and villages (Fujiwara et al., 2013). In 1522, for example, Socho visited the port of Tsu, which was located at the base of the Kii Peninsula and faces Ise gulf in central Japan, mentioning that it had lapsed into ruin since 1498 (Socho, 1975). As for the Boso peninsula on which the Buddhist temple of Tanjo-ji existed, however, excluding for the above-cited record which was written 400 years later than the earthquake, there is no historical material which says that the 1498 Nankai Earthquake might destroy any towns or harbours there, although they might have been damaged by small-scaled tsunamis.

Secondly, the 1703 Genroku Earthquake or the earthquake of Genroku Jishin in 1703, having a magnitude estimated at M7.9-8.5, occurred the coseismic crustal subsidence in the Boso Peninsula and its tsunamis destroyed some villages along its coast (Muragishi, 2009). Around the bay of Uchiura, 164 people are said to have been killed by the tsunamis. On a map drawn in 1700, however, the Buddhist temple of Tanjo-ji was in its current location (Terao, 2000; Muragishi, 2009); this map seems to have been drawn on the basis of the old map in 1616 (Fig. 2). If the description is true, the Buddhist temple of Tanjo-ji had already been in its current location before 1616. The 1703 Genroku Earthquake did not relate to the Buddhist temple of Tanjo-ji at all.



Figure 2: Map in 1770

It is the 1605 Nankai Earthquake and its following tsunamis that might have done great damage to the original temple of Tanjo-ji to move to where it is at present. The 1605 Nankai Earthquake or the earthquake of Keicho Jishin in 1605, having a magnitude estimated at M7.9, occurred along the Nankai trough. Nobody felt this earthquake in western Japan, while its tsunamis attacked the Pacific coast of central and eastern Japan. Two seismic centres might have existed, viz. the Nankai trough and the seabed off the coast of the Boso peninsula. Its tsunamis caused severe damages to towns and villages, including ones around the bay of Uchiura, along the Pacific coast of the Boso peninsula (Ito et al., 2005). Although the details of the 1605 Nankai Earthquake and its tsunamis have not been known yet, the original temple of Tanjo-ji might be flooded and submerged by tsunamis with the 1605 Nakai Earthquake and then moved to where it is at present.

Other than the 1498 Nankai Earthquake and the 1605 Nakai Earthquake, indeed, we had several earthquakes which might do damage to the Boso peninsula, such as the 1293 Kamakura Earthquake, the 1433 Kanto Earthquake, or the 1495 Kamakura Earthquake. In particular, the 1495 Kamakura Earthquake and its large-scaled tsunamis are said to have washed away the Great Buddha Hall at Kamakura (Kamakura, 1937). However, no historical record has been found on tsunamis' influences toward the Boso peninsula because of these earthquakes. The geological survey along the Pacific coast of the Boso peninsula will be absolutely necessary.

ACOUSTIC SURVEY

Survey area of this archaeological site is expected to be very shallow (1 to 5 metres) where human occupied boats are not able to access to avoid risks of stranding and overturn caused by waves at the beach of shallow water. Autonomous Underwater Vehicles (AUVs) and Remotely Operated Vehicles (ROVs) are the candidate platforms to survey underwater site, but it is too shallow to deploy the underwater vehicles. Therefore, the authors have decided to design and build an Autonomous Surface Vehicle (ASV) with a towfish for shallow water survey.

As for the operation of this vehicle, a human operator will be accompanying to supervise or control remotely from the nearest coastline or from on the boat cruising near at the safe (i.e. deeper) area, although the vehicle has capability of autonomous control. The ASV is planned to be launched at the nearest port and towed by a boat or remotely controlled by human operator to be guided to reach the survey area. When the vehicle is entered into the area it will be switched to the autopilot or auto-tracking modes by receiving control commands over a radio communication link. The survey-lines are planned in advance of the survey mission considering of the swath of the side scan sonar and camera, then a list of waypoints is given to the vehicle. Cruising speed is designed to be about 1 to 3 knots depending on the survey sensors. The autonomous mode can be cancelled by the operator at any time of emergency when the ASV is pushed by wind or current to be unable to control by itself or when the vehicle is encountering boats and ships.

Design requirements of the ASV are the followings:

- 1) Possibly minimize the draught to be able to operate in the very shallow water.
- 2) Use towfish to obtain high quality sonar imagery data.
- 3) Have a stabilization mechanism for towfish to compensate waves.
- 4) Have remote controllability together with autopilot and auto-tracking capability while giving an operator choice to switch them wirelessly.

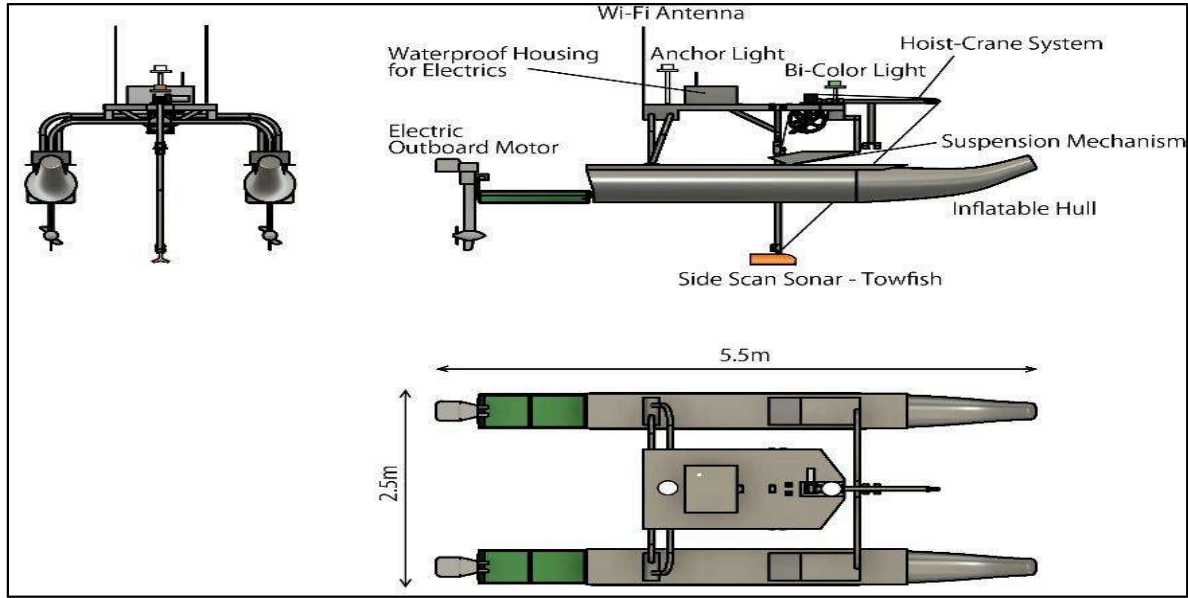


Figure 3: General Arrangement of the ASV

The ASV has been designed considering the above-mentioned requirements. Fig. 3 shows the general arrangement of the ASV. To meet the requirements an inflatable hull structured catamaran boat with suspension mechanism to stabilize roll and pitch motion against the waves is selected as a base unit. It provides stable and plenty of space to mount hoist and crane mechanism for towfish at the midship of the boat. Electric outboard motor is chosen to secure silent environment for side scan sonar to provide better imagery. No power generator is onboard and every power for instruments are fed by battery systems to reduce electric and acoustic noises. Sensory systems for underwater survey are a small-sized side scan sonar using 1MHz CHIRP signal. Side scan sonar is usually towed by a boat with a cable, however, to avoid wake produced by the ASV's propellers which disturb sonar measurement and to maintain its posture stable in the very shallow water, it is rigidly fixed on the bottom end of an arm structure that is mounted under the stabilized tray of the ASV. The sonar head is located at 1 meter depth. For navigation, the ASV is equipped with a GPS receiver, an Inertial Measurement Unit (IMU) contained with 3-axis accelerometers, 3-axis gyroscopes and 3-axis fluxgate magnetometers, a wind speed and direction sensor, an acoustic echosounder. For communication and control, it has a 429MHz radio MODEM for long-range communication, 2.4GHz and 5GHz Wireless LAN system for short-range communication, and a 2.4GHz radio control receiver module for remote control. A microcontroller unit is onboard to control all onboard equipment and communication systems. Two embedded computer systems are integrated to process and store the side scan sonar data and camera image respectively. A hoist and crane system is designed and mounted for deploying and recovering the towfish.

The ASV was brought to the bay of Uchiura and survey missions were conducted in September and November 2020 (Fig. 4). Survey area was set along with coastline where the depth was about 1 to 5 metres with sandy bottom, with mind that some clues should be buried under the sand for a long time and might be discovered when the sand is washed away by current and waves. The maximum range of the side scan sonar was set as 35 metres at both sides, and each survey line was set to maintain 10 metres separation with each other considering the swath of the side scan sonar. The

ASV was accompanied by a boat with ASV operators on board to monitor the position and the status of the ASV in real-time together with a boat operator who knows the underwater environment of the area very well to give advice.



Figure 4: The ASV Surveying at the Site

The survey data was brought back to our research laboratory for post processing to make mosaiced image of the survey site. Fig. 5 is the mosaiced image of the side scan sonar draped over the satellite image taken from the Google Earth. Fig. 6 is a side scan image taken at a pinned point of the Fig. 5 as an example.



Figure 5: Mosaic Image of Acoustic Survey

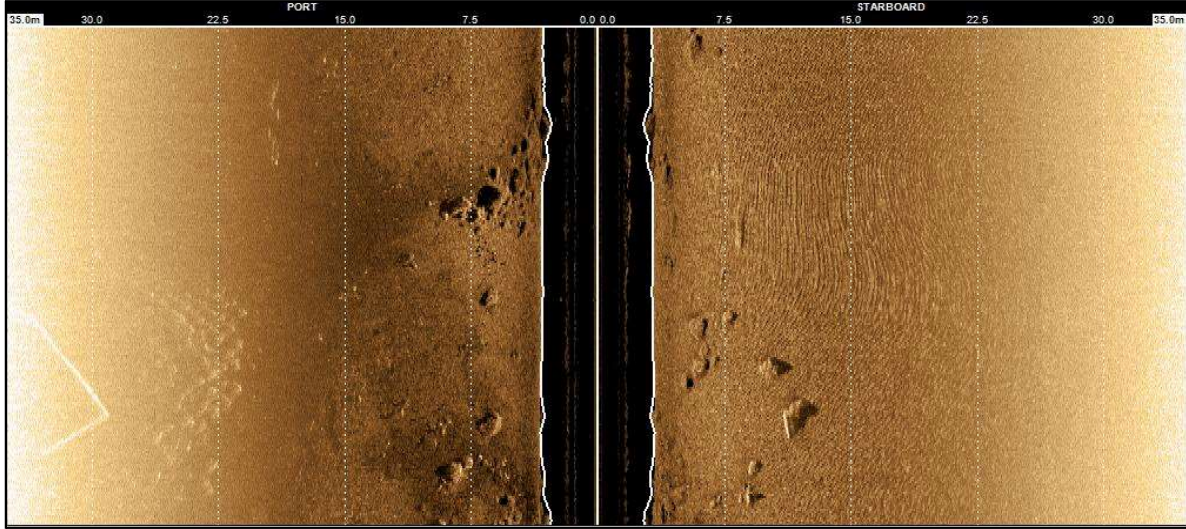


Figure 6: Acoustic Data of the Seabed (A Part)

CONCLUSION

A few candidate points, where some protuberant objects could be seen on the seabed, were selected after the post processing. To decide whether these are artifacts such as submerged traces of old dwelling ruins or reef rocks, however, survey dives in near future after the Covid-19 pandemic are absolutely necessary. In parallel, land-based excavations along the seashore might need to be done, because a part of old fishing hamlets may still be under the beach and a part under the sea.

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Biography



Akifumi Iwabuchi is Professor of Maritime Anthropology and Nautical Archaeology at Tokyo University of Marine Science and Technology, which is a member institution of the UNESCO UNITWIN Network for Underwater Archaeology. He is the ICOMOS-ICUCH National Representative for Japan, a Vice-President of the Japan Society for Nautical Research, or a director of the Asian Research Institute of Underwater Archaeology. Since the 3rd Asia-Pacific Regional Conference on Underwater Cultural Heritage in Hong Kong, he has been a member of its organizing committee as the East Asia Liaison. He received his PhD from the University of Oxford in 1990. His publications include *The People of the Alas Valley* (Clarendon Press, 1994) and *Cultural Heritage under the Sea: An Introduction to Underwater Archaeology* (Kagaku-Dojin, 2012).



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