

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 According to the old historical documents, many floods have occurred.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.

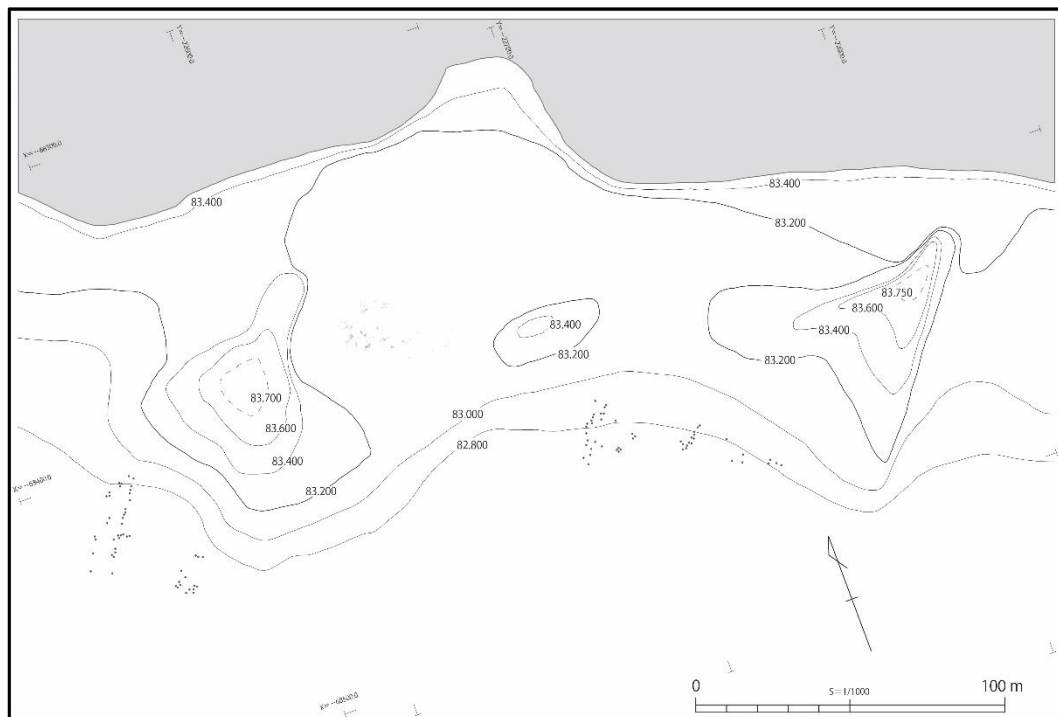


Fig. 1: Topographical lakebed map around the underwater archaeological site of Nishihamasengen.

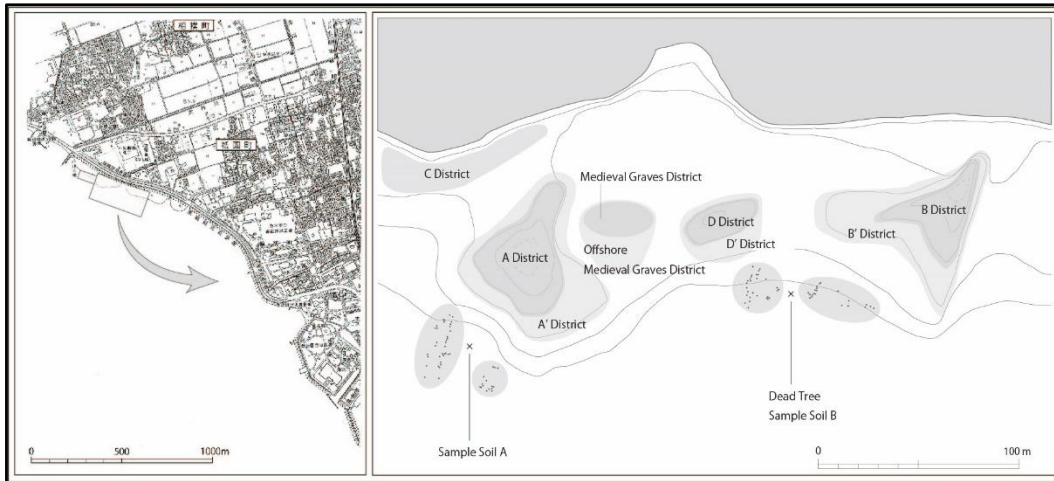


Fig. 2. Research areas of the underwater archaeological site of Nishihamasengen.

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 diameter. 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 diameter, 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.

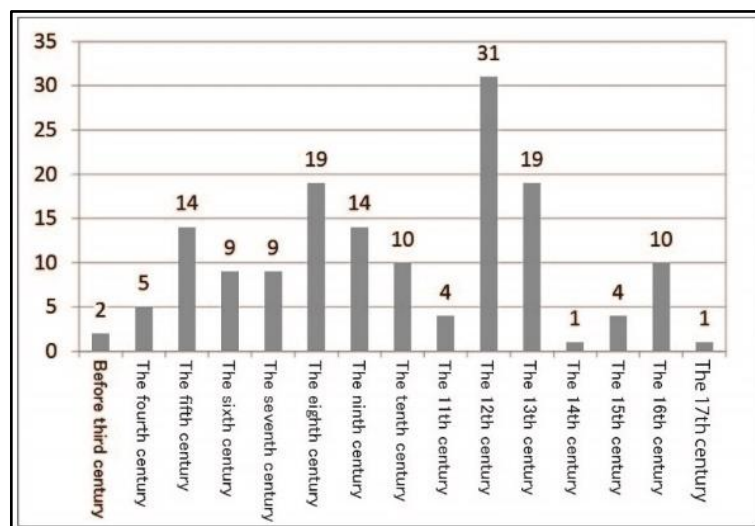


Fig. 3: Numbers of excavated relics.

Only one relic from the 14th century at the survey ward of C is either 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.

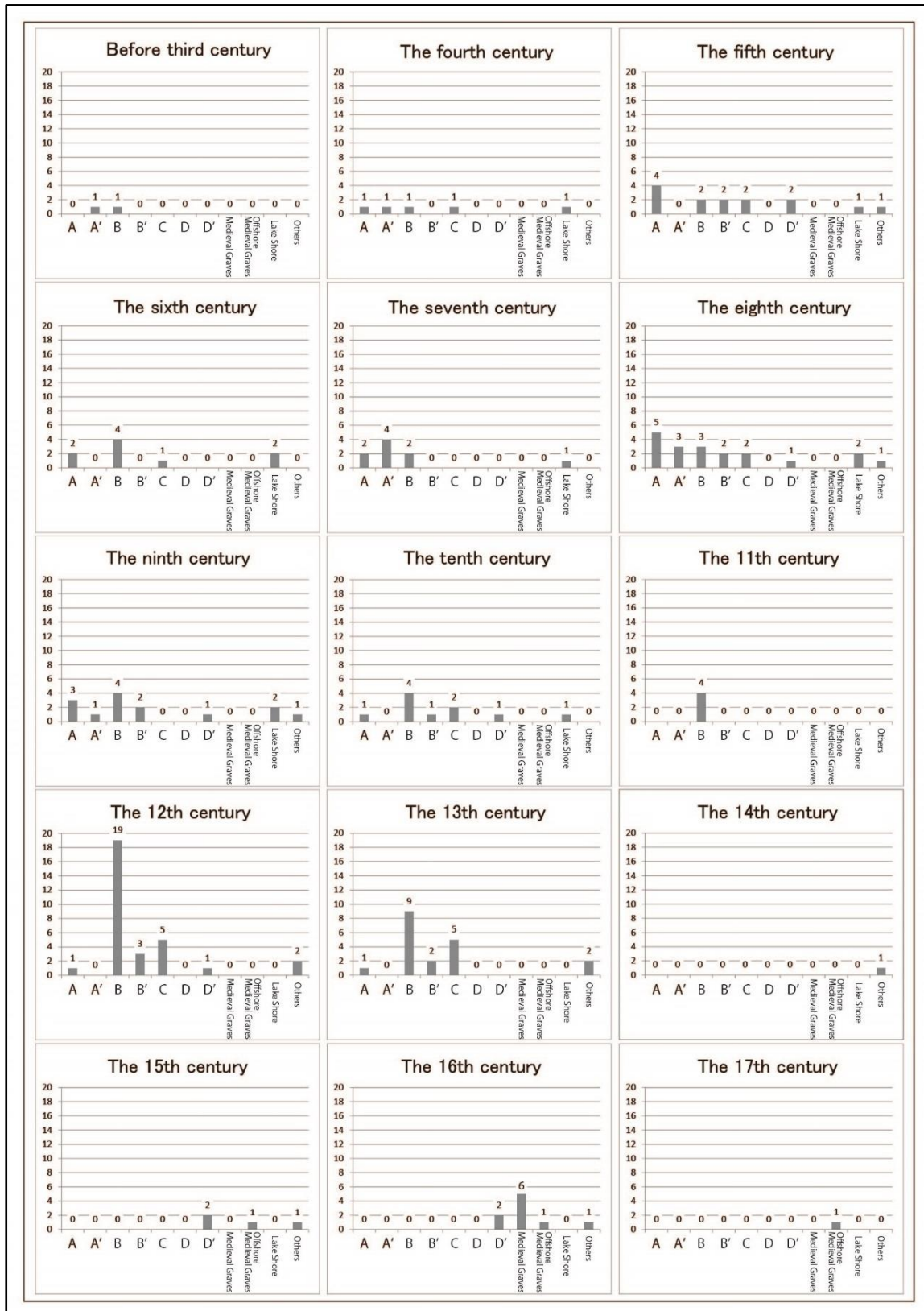


Fig. 4: Numbers of excavated relics at each research area.

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 necessities 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.

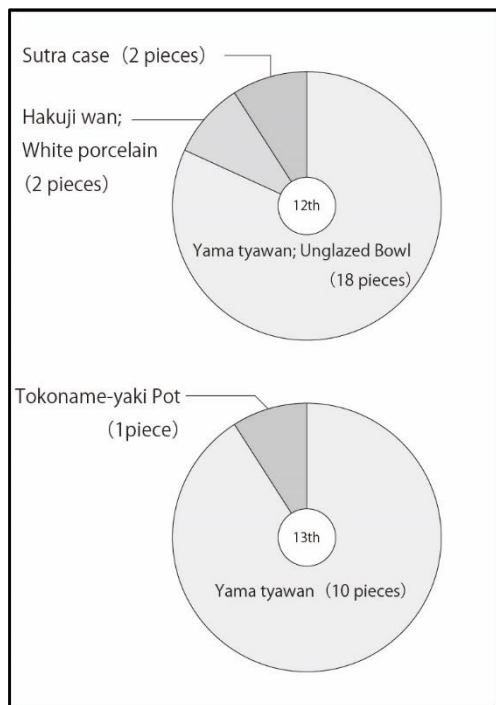


Fig. 5 (left): Relics at the research area of B from the 12th to 13th Century.

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.

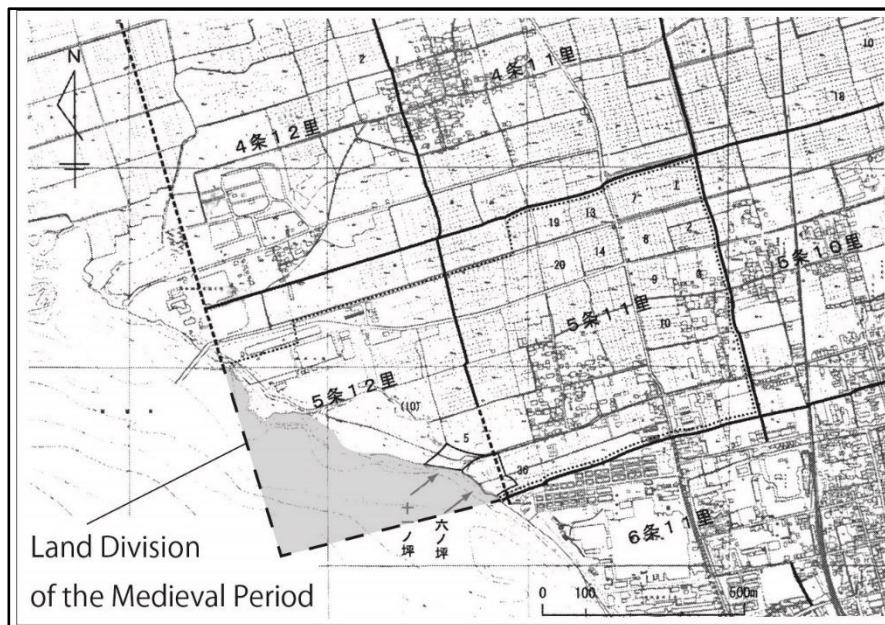


Fig. 6: Land division of the Medieval Period. (S. Mizuno)

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 been 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 to 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 were 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.

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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.