

Doctoral Dissertation (Censored)

博士論文 (要約)

**Bioarchaeological analysis of traumatic and
taphonomic lesions on medieval human skulls from
the Zaimokuza site, Kamakura, Japan**

(鎌倉市材木座遺跡出土の中世頭蓋における外傷と
タフォノミー痕跡の生物考古学的分析)

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Department of Biological Sciences, Graduate School of Science,

The University of Tokyo

東京大学大学院理学系研究科生物科学専攻

Katherine Hampson

ハン普森 キャサリン

ABSTRACT

The Zaimokuza site, located in Kamakura city close to the coast, was excavated three times in the 1950s by a team from the University of Tokyo, Anthropological Department, headed by Professor Suzuki Hisashi. The skeletal remains of reportedly near to 1000 individuals were uncovered along with remains of animals such as horses and dogs, buried primarily in mass graves. Suzuki reconstructed 283 crania from the first two excavations and examined these along with a number of long bones, and the results were published in the original site report in 1956 (Suzuki et al., 1956). For reasons including the unusual burial conditions, dominance of young adult males, and high incidence of human-induced weapon trauma found on the remains, the study concluded that they likely belonged to victims of Nitta Yoshisada's Siege of Kamakura in 1333.

Suzuki's pioneering study has been a standard for studies in medieval Kamakura historical anthropology. However, in the half-century since, archaeological excavations in the surrounding area have recovered numerous human skeletal remains from the contemporary period, and it is now hypothesized that recently excavated sites were once part of a large medieval graveyard. Despite consistencies in burial conditions, osteological studies have shown that frequencies of weapon-related trauma were much lower in these sites. These recent studies raised questions about the large discrepancy in the frequency of violence-related weapon traumas reported at Zaimokuza, particularly 'scratches' which make up the majority of the traumas reported, described as clusters of extremely short and shallow marks on the skulls. This dissertation comprises analyses of the Zaimokuza site from a bioarchaeological perspective, in order to shed light on the reasons for the burials at the Zaimokuza site as a whole.

Chapter 1 is a literary review and examines what we know about the city of Kamakura and its inhabitant's lives and deaths during the medieval from historical, archaeological, and osteological sources. I focus particularly on sites in the surrounding area of the Zaimokuza site where human skeletal remains have been uncovered and osteological analyses performed on

them, as the data will later be used for comparisons in the discussion. The final portion discusses what we know overall about the people and burial practices of the medieval period.

Chapter 2 focuses on the ‘scratches’ reported by Suzuki in the original site report published in 1956 and investigates their causes using scanning electron microscope.

Among the 293 crania from the first two excavations reconstructed by Suzuki, a total of 235 examples of marks matching the description of ‘scratches’, counting 38.2% of individuals were found. They varied in their morphologies and were likely caused by different agents for different reasons. The results indicate that majority were groups of ‘weak and shallow’ marks that display microscopically identifiable features commonly found on marks caused by sedimentary abrasion described in recent taphonomic studies, and rather than being human-induced marks, were likely caused by natural processes before burial.

Chapter 3 focuses on the bioarchaeological analyses performed on three sets of individuals; the first is 300+ individuals restored by myself from the third excavation of the site that were previously untouched. The second is a further 100 crania from the first and second excavations that were untouched and not included in the original study, also restored by myself; and the third is the reanalysis of 293 crania from the first two excavations reconstructed by Suzuki and utilised in the original study. All individuals included were examined for osteological evidence of age, sex, and frequencies of human-induced traumas. In addition, ten individuals were selected for radiocarbon dating. Results show that materials used in the original study show a bias towards adult male individuals and individuals with traumatic injuries. In both sets of untouched materials, the ratios of adult to subadult differed from the original study materials considerably, with more subadult individuals being found in the untouched materials, and a lower frequency of weapon-related traumas. There may be considerable intra-site differences, but no clear connection could be found for frequencies of weapon-related trauma, burial types, or demographic profiles, partly because in many cases data on the individuals and their particular graves has been lost, and even information regarding the exact burial conditions of each grave is not clear from the site report. When combining all the data, whilst human-induced weapon traumas are present (9.1% of total

individuals examined, 71/777) suggesting a prevalence of violence in the medieval period of Japan, they are comparable to frequencies observed in surrounding sites also, and do not match the numbers expected from those who were killed in battle. In addition, ten samples from different graves across the site were radiocarbon dated and do not show good agreement with the date of the battle.

Considering the results of the bioarchaeological studies on the skulls, the radiocarbon dating, and the case study on ‘scratches’, I conclude that the interments at the Zaimokuza site represent normal burial customs of the medieval period such as ‘corpse abandonment’, particularly during times of hardship such as famines and natural disasters, and not only casualties of warfare and violence as previously indicated. Although the inclusion of victims of warfare at the Siege of Kamakura in 1333 cannot be ruled out, weapon-related traumas are indicative of the overall violence that was likely common in society during the period and other social practises that are yet unknown. The main limitation of this study is the lack of information about grave numbers for individuals, meaning that specific intra-site differences could not be studied in full. This study also highlights the difficulty and problems of analysis of bone surface modifications on archaeological specimens as there is currently no completely objective method to accurately classify such marks. Recent research in taphonomy has introduced methods such as 3D digital microscopy and deep learning in an attempt to negate the subjective nature of such studies. Such methods should be applied to the marks on the Zaimokuza site remains in future studies.

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INTRODUCTION

In 1952, a human skull was discovered during construction work on a road in the Yuigahama area of Kamakura, Japan, between the west bank of the Nameri River and the road leading up the Hachiman Shrine. This skull was examined by Professor Hisashi Suzuki of the Department of Anthropology, University of Tokyo and was deemed useful for his research, so the decision was taken to excavate the area in order to extract further human remains for study. A team from the Department of Anthropology, University of Tokyo, in collaboration with Professor Mikami of the Department of General Education, University of Tokyo undertook the first excavation of the area from the 13th to the 20th of May 1953, which proved to be fruitful, and a second excavation was undertaken between the 1st to the 10th of October 1953. From these two excavations, human bones from at least 556 individuals along with a large number of bones of horses and dogs were uncovered. The human remains included several individually buried whole skeletons, but the majority of the skeletal material was grouped into 24 burial pits of varying sizes and depths, some of which consisted almost entirely of human crania not associated with mandibles or post-cranial bones.

Select crania were reconstructed by Suzuki, and these along with a small number of long bones found at the site were examined, and the results of these studies were published in the *Medieval Japanese Skeletons from the Burial Site at Zaimokuza, Kamakura City* (Suzuki et al., 1956). This original site report contains detailed information about the excavations, and the results of various osteological analyses that were undertaken on both the human skeletal material and some of the faunal remains. The main objective of the study was to examine historical microevolutionary change in the Japanese archipelago, and Suzuki found that many of the skull measurements lay outside of the range of local modern-day populations from the same region (Suzuki et al., 1956). This was explained as possibly stemming from factors including dietary and environmental conditions. In addition, Suzuki supposed that for various reasons including the dating, unusual burial conditions, demography, and high incidence of

human-induced weapon traumas found on the remains, that the individuals belonged to victims of Nitta Yoshisada's Siege of Kamakura, a battle that took place in the city in 1333 (Suzuki et al., 1956). The materials from this study have since been stored in the Department of Anthropology and Prehistory at the University Museum, University of Tokyo. Based on the unusual cranial measurements and the possibility of them having died in battle, Brace et al. (1989) argued that the individuals were samurai, which themselves were ancestors of the Ainu, an indigenous group of Japan. However, 'a wide range of evidence from archaeology, history, folklore, and physical anthropology' has refuted this (Nagaoka and Hirata, 2006: 117), and the individuals are now seen as representative of common people from the Kamakura period of Japan. The materials have been utilised in other studies including analyses of weapon trauma (Fujita, 2013), investigations of Japanese medieval battle techniques (Karasulas, 2004; Shackley, 1986), and studies of Japanese microevolutionary change (Dodo and Ishida, 1990). The results from the original study have also been used numerous times as comparative data, particularly in relation to studies relating to violent weapon trauma from more recently excavated sites in Japan (Hirata et al., 2002, 2004; Nagaoka et al., 2006, 2009, 2010, 2013, 2018; Sakaue, 2014, 2016).

In the half-century since the Zaimokuza excavations, human skeletal remains dating to the contemporary period have been recovered from numerous archaeological sites around Kamakura, and it is now known that the area it lies in was once part of a large medieval graveyard, stretching from the bank of the Nameri River to halfway across the Yuigahama bay. Despite consistencies in burial conditions across the sites, instances of violence-related weapon trauma, while present, are much lower in all the surrounding sites (Hirata et al., 2004; Matsushita, 2002; Nagaoka et al., 2009, 2010, 2013; Sakaue, 2016). It is now supposed that people in the burials represent normal townspeople, and mass burials were likely due to famine and natural disasters, rather than warfare (Minami et al., 2012). Questions have been raised about large discrepancies between the findings from the original Zaimokuza report and those of recent studies ones. Were there mistakes and biases in the original study? Or perhaps the bodies of the victims of warfare reported were mixed in with burials of everyday people.

Results of the research conducted after the original Zaimokuza site report have shown that the burials in the Yuigahama medieval graveyard are particularly complex. The Zaimokuza site is no longer an isolated burial site; rather one of many within a much larger graveyard, which contains numerous interments. Different burial types may represent different chronological dates of the burials and different situations of death for the people buried within. The variety of different burial conditions reportedly found within the Zaimokuza site suggest that all the burial pits may not be contemporaneous, such as is the case with the surrounding sites. This in turn brings into question whether the long thought assumption that the Zaimokuza site consists of victims of the Siege of Kamakura in 1333 is correct or whether the site is more intricate than previously thought. The goals of this research were to test Suzuki's hypotheses about the Zaimokuza site and previous researchers' hypotheses about burials and customs of the medieval period, particularly in Kamakura city.

Chapter 1 is a literary review and examines what is known about the city of Kamakura and its inhabitant's lives and deaths during the medieval from historical, archaeological, and osteological sources. There is a focus on surrounding sites where human skeletal remains have been uncovered and osteological analyses performed on them, as the data will be used for comparative studies. The final section in this chapter discusses what is currently known overall about the people and burial practices of the medieval period in order to give a background to the study as a whole.

Chapter 2 focuses on the 'scratches' reported by Suzuki in the original site report published in 1956 and investigates their causes using scanning electron microscopy. Recent studies have questioned the large discrepancy between the amounts of weapon-related traumas from the Zaimokuza site compared with the surrounding sites. It has been already postulated in recent literature that plausible differences could be due to an overestimation of violence-related trauma in the skeletons from the original Zaimokuza study, in particular the number of 'scratches' (Nagaoka, et al., 2009; Sakaue, 2016). As these authors have not yet directly examined the Zaimokuza materials, this has neither been confirmed nor denied. Therefore, reanalysis of these 'scratch' marks was necessary. Among the crania reconstructed by Suzuki,

a total of 235 examples of marks matching the description of ‘scratches’ and were found on 38.2% of individuals examined. They varied in their morphologies and were likely caused by different agents for different reasons. The results indicate that majority were groups of ‘weak and shallow’ marks that display microscopically identifiable features commonly found on marks caused by sedimentary abrasion described in recent taphonomic studies, and rather than being human-induced marks, were likely caused by natural processes before burial.

Chapter 3 focuses on the bioarchaeological analysis performed on three sets of individuals; the first is individuals restored by myself from the third excavation of the site that were previously untouched. The second is crania from first and second excavations that were not included in the original study and also restored by me; the third is the reanalysis of crania from the first and second excavations reconstructed by Suzuki. All individuals included were examined for osteological evidence of age, sex, frequencies of human-induced traumas, and taphonomic damage. Where available, additional information about their burial types was recorded to investigate whether certain demographics and trauma characteristics were confined to certain burial types, as indicated by previous studies. In addition, ten individuals were selected from the Zaimokuza site for radiocarbon dating to see whether they show good agreement with the time of the battle in 1333. In this chapter I also attempt to clarify whether there are temporal differences in burial types. Results show that materials used in the original study show a bias towards adult male individuals and individuals with traumatic injuries. There may be considerable intra-site differences, but no clear connection could be found for a frequencies, burial types, or demographic profiles, partly because in many cases data on the individuals and their particular graves has been lost and even information regarding the exact burial conditions of each grave is not clear from the site report. Combination of data shows that whilst human-induced weapon traumas are present suggesting a prevalence of violence in the medieval period of Japan, they are comparable to frequencies observed in surrounding sites also, and do not match the numbers expected from those who were killed in battle. In addition, the results of the radiocarbon dating suggest that the ten samples do not match the date of the battle in 1333.

Based on the results, I conclude that the interments at the Zaimokuza site are more complex than previously reported and may represent normal burial customs of the medieval period such as ‘corpse abandonment’, particularly during times of hardship such as famines and natural disasters, not only casualties of warfare and violence as previously indicated. Although we cannot rule out the inclusion of victims of warfare at the Siege of Kamakura in 1333, weapon-related traumas are indicative of the overall violence that was likely common in society during the period, particularly if communities were subjected to numerous hardships, and other social practises that are yet unknown.

CHAPTER 1

ARCHAEOLOGICAL AND HISTORICAL EVIDENCE OF LIFE AND DEATH IN MEDIEVAL KAMAKURA

1.1 Introduction

The medieval era of Japan spans roughly from the latter half of the 12th century at the end of the Heian period (794-1185) to unification of the country by the third and final militant government, the Tokugawa Shōgunate, in the early 17th century (Henshall, 1999). The era itself is generally split into the Kamakura Period (1185-1333), the brief Kenmu Restoration (1333-1336), the Muromachi period (1336-1568), and the Azuchi-Momoyama Period (1568-1600). Prior to the medieval era, power was in the hands of the imperial family and centred in the cities of Heiankyō (modern-day Kyōto) and Nara in the West, and politics was dominated by those of hereditary wealth and status. However, in 1185 after a series of wars between two clans, the Taira and Minamoto, Minamoto Yoritomo defeated the Taira and usurped power by force (Sansom, 1987). He established the Japan's first military government, the Kamakura Shōgunate, announced himself Shōgun in 1192, and made Kamakura the de facto capital city and the base of his operations. Kamakura was mainly chosen due to its geography. It is located on the coast and surrounded by mountains on three sides, only being accessible by seven man-made passes, therefore making it a strategically important, easily defensible, natural fortress (Figure 1). During the Kamakura period, the city evolved from a small fishing village to a huge bustling city with an estimated population of between 50,000 and 70,000 people (Ishii, 1989; Kawano, 1989). It was the most populous city in the whole of the country by the 13th centuries, as well as the fourth most populous in the world (Tertius, 1987). However, in 1333 the Kamakura Shōgunate was defeated, many members of the ruling Hōjō family committed suicide, much of the city was destroyed, and Heiankyō was named the capital by the ruling Ashikaga Shōgunate. Kamakura became the seat for the local lords of the Kanto provinces during the tumultuous civil war of the 15th and 16th centuries (Mutsu, 2012), and was almost

destroyed twice again after being burnt to the ground, once during the Kyōtoku Incident in 1454, and again during the Siege of Kamakura in 1526. At the turn of the Edo period and the unification of the country under the Tokugawa Shōgunate, Edo (modern-day Tōkyō) was made the capital city and became the main city in the Kanto region, and Kamakura returned to being a small, quiet coastal town (Mutsu, 2012).

First-hand accounts of life in medieval Japan are documented in historical chronicles such as the *Azuma Kagami* and the *Gunki Monogatari* and their associated *emakimono* ('picture scrolls'), but they are few in number, often written after the events that took place, and are frequently romanticised or exaggerated accounts of the aristocrats and the Shōgunate (Blomberg, 1995, Tsang, Butler, 1969; Conlan, 2002; Oyler, 2006; Varley, 1994). Archaeological excavations have helped to shed light on the conditions of the city, and osteological studies on numerous human skeletal remains recovered have given an insight into the lives and deaths of the people living there during the period. This chapter examines what the city of Kamakura, where the Zaimokuza site is located, was like during the period and discusses general burial practises of the medieval period from both historical and archaeological perspectives and introduces the sites from where skeletal remains used in this study.

1.2 Historical References to Kamakura City

Historical chronicles such as the *Azuma Kagami* dictate the conditions of the city as follows. From the early half of the 13th century, the city was becoming more and more disorderly and as a consequence dirty, due to the influx of residents. General sanitary conditions were poor despite the government's multiple attempts to clean the city. Between 1251 and 1265, the government designated commercial areas of the city where the tethering of cows was made illegal (Yamamura, 1997). In 1261 the Shōgunate issued an edict prohibiting the abandonment of orphans and sick people and the discarding of carcasses of cows and horses on and along the streets (Shudai, 1996). The burial of corpses within the city limits was also prohibited under an edict known as *fuchū bochi kinshirei* (Kawano, 2005: 167).

In spite of this, there are records of corpses having been left on the roadsides (Shudai, 1996). On top of these conditions, the city and its residents withstood major earthquakes, a tsunami, famines, and other hardships brought about the social and cultural changes over the two centuries under the rule of the Shōgunate (Blomberg, 1995; Conlan, 2003). There were a few small intermittent battles in the city during the period, most of which were quashed by the Shōgunate forces, but eventually the city did fall to forces aligned with the imperial family in a siege led by Nitta Yoshisada in 1333. Table 1 summarises the major incidents that occurred in Kamakura city during the medieval period.

1.3 Archaeological and Osteological Evidence of Life and Death in Kamakura City

The life and death situations of the townspeople of Kamakura recorded in historical chronicles can be traced in archaeological and osteological evidence from numerous sites across the city. Archaeological investigations of gutters and ditches around the city have uncovered the remains of animals and other refuse discarded without order (Kawano, 1989, 1995). Contrary to the ban on the burial of corpses within the city limits, skeletal remains have been excavated from numerous sites throughout the city dating from the 13th to 15th centuries (Hara 1992; Kamakurashi Kyōiku Iinkai, 2005, 2008, 2013, 2014; Kawano, 1990; Koyama 2005; Morimoto, 1987; Morimoto et al., 1984; Ohkouchi 1986; Saiki 2002; Suzuki 1998). The majority of sites with large numbers of human remains (in excess of over 5000 individuals) are located in an area known as Yuigahama, adjacent to the coastline. The area is cited in contemporary historical records under its former name, Maehama. It is described as detached from the centre, where communities undertook various activities such as woodworking and butchery and served as both a site for living and working. According to the historical chronicle *Shinpen Sagami no Kuni Fudoki*, the area was a known settlement and industrial site during the medieval period (Saiki, 2002), and this is supported by archaeological evidence of storehouses covering the area towards the end of the 14th century (Kamakura Kyōiku Iinkai, 2005; Kawano, 2005). The most dominant finds from the area, however, were large amounts

human skeletal remains, which led archaeologists to name the area *Yuigahama chūsei shūdan bochi* ('Yuigahama medieval graveyard') (See Figure 2).

The Zaimokuza site excavations in the 1950s resulted in the first discovery of large number of people buried in mass graves dating to the medieval period. The burial conditions at the site, particularly the pits consisting only of human crania supported the idea that the buried people were victims of battle, as mass graves are often a consequence of war or massacres (Bennike, 2003; Haglund et al., 2001; Kjellström, 2005; Marjanović, et al., 2007; Renshaw, 2016; Schmitt, 2001; Sutherland, 2003). In Japan, it has been known that *kubizuka* ('head burial mounds') were constructed to memorialise warfare victims during the medieval period (Suzuki, 1989; Endo, 1973). However, the subsequent excavations in the surrounding area and across the city have indicated different ideas based on accumulated archaeological data (Hara 1992; Koyama 2005; Morimoto et al., 1984; Ohkouchi 1986; Saiki 2002; Suzuki, 1998). Large numbers of skeletal materials have undergone detailed osteological analysis, where the frequencies for violence-related weapon trauma have been reported to be much lower than those reported in the Zaimokuza site despite the similarities in burial conditions (Hirata et al., 2002, 2004; Nagaoka et al., 2006, 2009, 2010, 2013, 2018; Sakaue, 2016). The following section gives a description of the Zaimokuza site and the surrounding sites, summarizes what is currently known about them, and the hypotheses of why the individuals within came to be buried. Figure 3 shows the location of all the sites described in this study.

1.3.1 Zaimokuza

The Zaimokuza site, the focus of this dissertation, is famous for being the first systematic study of human skeletal remains dating to the medieval period discovered in Kamakura. As described by Suzuki et al. (1956), the site is situated between the East bank of the Nameri River and the main procession road leading up to Tsurugaoka Hachiman Shrine and towards the Eastern boundary of 'Yuigahama medieval graveyard' and was excavated three times from 13th to the 20th of May 1953, the 1st to the 20th of October 1953, and the 27th of March to the 4th of April 1956. From the first two excavations, a minimum number of 556

individuals were uncovered. Burial conditions were described as 24 pits containing comingled human remains and ten individual burials scattered over an area of around 170m². Most of the human skeletal remains were crania, with two of the pits consisting almost entirely of only them (Figure 4). Many of the graves contained faunal remains, mainly those of horses and dogs. There were few associated archaeological artefacts: a small number of shards of ceramic plates, old coins, and flakes of wood and bamboo. A third excavation of the Zaimokuza site was undertaken in an area five meters South-East of the first two excavations and was briefly described in a postscript in the original site report (Suzuki et al., 1956: 169-170). The total area excavated was 32m² and the minimum number of human skulls discovered reportedly totalled at least 354, bringing the total number of all the three excavations to at least 910 individuals. The skeletal remains were exhumed from six grave pits in total. As with the first two excavations, the burials consisted mostly of human crania with comingled post-cranial bones along with the bones of animals (Figure 5). There was one mass cranial grave containing a minimum of 209 individuals with few associated mandibles or post-cranial bones as well as several individual burials. The skeletal materials from the third excavation were only briefly written about by Suzuki, but he noted that deep head injuries ‘caused by swords’ were also recognizable during the course of excavation (Suzuki et al., 1956: 169-170). All the grave pits found at Zaimokuza are listed and summarised in Table 2 and a diagram of the excavation area constructed using information from the original site report can be seen in Figure 6.

Suzuki reconstructed 283 skulls and a number of long bones from the first two excavations for analysis in the original site report. The overall ratio of adult to subadult was 8:1 and the ratio of male to female was 2:1. A high proportion of the individuals were young adult males. A high frequency of violence-related trauma, particularly marks thought to be from swords, was reported to have been found on the crania (65.7%) as well as some of the long bones. Bite marks from dogs were present on some of the long bones, indicating that the bodies had been left for some time to decompose without burial. Based on his findings, including the burial conditions, the dominance of young male individuals, and the presence of weapon-related trauma, Suzuki assumed that the skeletal remains belonged to victims a battle.

Due to the high number of individuals Suzuki narrowed down the possibilities, and concluded that the most likely battle was the Siege of Kamakura in 1333, the final battle of the Genkō Wars (1331-1333). During the battle, 6000 people were reported to have been killed and large parts of the city were reduced to ashes (Turnbull, 1987). According to Suzuki's theory, with such a high number of casualties, nobody could have cleaned up the bodies and the corpses would have been left unburied and exposed to scavengers. In addition, skeletal remains exhumed by local residents in 1935 from ground directly adjacent to the Zaimokuza site and reburied at the nearby temple, Kuhonji, were found to have Buddhist inscriptions written on them in black Indian ink. The type of calligraphy was dated to the Kamakura period (Suzuki et al., 1956:175), and so Suzuki proposed that after battle, Buddhist monks, who performed funerary rituals during the period, collected what was left of the bodies, removed the remaining skin and wrote mantras on them, before finally burying them in collective mass graves.

1.3.2 Yuigahama Chūsei Shūdan Bochi (No. 372)

Yuigahama Chūsei Shūdan Bochi (No. 372), excavated between 2001 and 2002, uncovered at least 592 individuals (Hirata and Nagaoka, 2005). The site consisted of 27 individual burials, 18 pits containing mass graves of whole skeletons, and one mass cranial grave containing a minimum of 380 individuals. Most of the human bones were excavated from the mass graves. Unlike many of the mass graves at Zaimokuza, the 18 mass grave pits contained nearly complete skeletons, which were buried before skeletonization as they were found in articulated positions. On the other hand, like Zaimokuza there was a mass grave of crania not associated with mandibles and post-cranial bones. Associated artefacts were few, although animal bone assemblages were mixed in the human burials. Osteological examination by Nagaoka et al. (2009) revealed that a large proportion of individuals were adult males and weapon-related trauma was present but only on 1.4% of individuals. Interestingly, trauma was only found on individuals from the mass cranial grave (Nagaoka et al., 2009). Skeletal materials from the mass whole-body burials were radiocarbon dated to the mid-13th century (Minami et al., 2012), around one hundred years older than was previously thought. Minami

et al. proposed that the individuals of the multiple burials were likely those who died in major earthquakes in 1241 or 1257, or as a result of the Shōka famine in 1258-1260, rather than because of warfare.

1.3.3 Seiyōkan

The Seiyōkan site was excavated by the Kamakura Board of Education in 1982. The remains of at least 91 individuals were recovered. Among them, 55 crania without mandibles, cervical vertebrae, or other postcranial bones were found from a mass cranial grave (Morimoto et al., 1984). The remaining 36 individuals were composed of articulated parts of skeletons from single or multiple graves (Morimoto et al., 1984). The materials were dated to the 14th and 15th centuries AD based on pottery typology (Tashiro and Tamabayashi, 1984). Results from osteological analyses revealed that the ratio of adult to subadult was about 9:1 and the ratio of males to females is about 1:1 (Hirata et al., 2004). More detailed analysis of skeletal trauma undertaken by Nagaoka et al. (2010) revealed that violence-related traumas were found on adult crania alone and were all the result of sharp blades striking the bone at high velocity. A case of indeterminate trauma was also found. With this individual excluded, the frequency of violence-related trauma was 6 of 91 individuals (6.6%). They were all from the mass cranial grave, like Yuigahama Chūsei Shūdan Bochi (No. 372). Nagaoka et al. (2009) investigated whether there was a relationship between weapon-related trauma frequency and burial types but concluded that the differences were not statistically significant (Fisher's exact test, $P = 0.081$).

1.3.4 Yuigahama Minami

The Yuigahama Minami site lies just outside the southern boundary of Yuigahama medieval graveyard. It was excavated in 1995-1997 by the Kamakura Archaeological Research Group during construction of a carpark adjacent to the Yuigahama coastline. It was an extremely large archaeological site from which the remains of almost 4000 individuals were excavated (Saiki, 2002), and the burials varied across the site. There were 667 individual burials of whole skeletons, which were judged by Hirata et al. (2004) and Nagaoka et al. (2006)

to have been buried immediately after death. The ratio of adult to subadult was 2:1 and included elderly individuals rarely seen in other sites. The ratio of males to females was 1:1. The frequency of individuals exhibiting weapon-related injuries was 1.3%, and the skeletal series was considered to be the most representative of the population as a whole from the period.

The skeletal materials from mass graves, often mixed with faunal remains of dogs, cows and horses, were examined by Matsushita (2002), although the results were revised by Saiki in the final site report (2002). The minimum number of individuals was 3059 excavated from 83 mass graves, 14 of which contained more than 50 individuals. The mass burials were thought to be linked to disturbances and natural disasters in which large amounts of people perished around the same time. Much like Zaimokuza, long bones also showed signs of bite marks from carnivores, so they were thought to have been buried after substantial skeletonization. The ratio of adult to subadult was 1:1, and the comparative number of subadults was higher than found in other locations. Weapon-related trauma was found on a minimum of 68 individuals (2.2%), the proportion of which was low in average, but some pits had upwards of 40% of individuals displaying weapon-related trauma, particularly those containing a high proportion of infants. Unfortunately, a more in-depth analysis has not yet been completed to see any association between burial type and weapon-trauma in this site.

Both the individual and mass burials from Yuigahama Minami were radiocarbon dated by Minami et al. (2012). The results showed that the individual burials were used for a relatively long time and date to the latter phase of the Kamakura period (1290-1333), and so they were thought to represent normal populations from the late 13th to 14th centuries. On the other hand, the mass burials dated to the mid to late Kamakura period (1288-1304) contemporaneous with the mass burials at Yuigahama Chūsei Shūdan Bochi (No. 372) and were thought to be interred in a small space as well as in a short time after a catastrophic event. Based on the dating, it is considered that they were most likely victims of the 1293 Kamakura earthquake and tsunami (Minami et al., 2012).

1.3.5 Yuigahama Chūsei Shūdan Bochi (Seika Ichiba)

The Yuigahama Chūsei Shūdan Bochi (Seika Ichiba) site was excavated in 1986 by the Kamakura Board of Education (Ohkouchi, 1986). The skeletal remains of 51 individuals dating to the 14th-15th centuries were uncovered, the majority of which (35) were individually buried whole skeletons. There was also one mass cranial grave containing four disarticulated single crania. Nagaoka et al. (2013) reported the ratio of adult to subadult (2:1) and the ratio of female to male (1:1). The frequency of sharp-force traumas on the crania and the limb bones were 2% in both cases, which was like those from the majority of comparative sites.

1.3.6 Gokurakuji

The Gokurakuji site was discovered in 1959 during construction of a new road through Gokuraku pass, one of the seven medieval period entries into the city, around 1km West of Yuigahama. The site was excavated by Professor Suzuki and a team from the Anthropology Department, the University of Tokyo, and an outline of what was found was published in his book (Suzuki, 1998). The site consisted of human skeletal remains of around 1000 individuals, mainly crania, found in five mass burial pits with disarticulated post cranial and animal bones much the same as Zaimokuza. One of the pits was a mass cranial grave containing many of crania not associated with mandibles. The animal bones were primarily those of horses but also included cow, dog, and deer. Although there was not much archaeological evidence to date it, according to the similarities between it and the Zaimokuza site, including the sandy ground, burial conditions, and the state of the skeletal remains, it was assumed to be from the same period. Suzuki also remarked that during excavation, weapon-related trauma marks were found on some individuals and thus he thought that these were the bones of those that had fallen as Nitta Yoshisada's army tried to enter Kamakura through Gokuraku Pass on May 18th-20th, 1333, a battle that was part of the Siege of Kamakura.

However, Sakaue (2016) reconstructed and examined the skeletal remains from the site and proposed a different idea. The ratio of adult to subadult was 12:1, and the male to female ratio was 3:2. The amounts of weapon-related trauma were 27 out of 331 individuals,

(8.2%). Sakaue deemed this to be too few number of casualties for a battle in medieval Japan and concluded that it was unlikely that these are the bodies of victims of the Battle of Gokuraku pass. However, the cause or reason of the buried dead are still unclear, although he postulated that there may be a link to a nearby sanatorium run by monks during the same period for lepers and other afflicted poor people.

1.4 Overall Trends of Kamakura Medieval Cemetery Sites

Table 3 shows a summary of the sites. Although each site has its own unique characteristics, there are some general patterns across the burials as a whole. Most of the skeletal remains discovered are believed to be those of common townspeople, as the bodies of higher ranked members of society such as the warrior classes were often cremated and their remains buried in *yagura*, manmade tombs in the hills around the city (Matsuba, 2010). In relation of the burial positions to their chronological ages, it is thought that the further West across the graveyard the newer the burials become (Saiki 2002). The burials themselves can be roughly divided into five categories, individual, mass graves of articulated whole bodies, mass graves of disarticulated bodies the majority of which are crania, mass graves of only crania, and small pockets of isolated crania and post-cranial bones. Individual burials seem to become more common moving into the 14th century and may be linked to status and wealth (Saiki, 2002; Nagaoka et al., 2013). Skeletal remains with bite marks from animals found at many of the sites, particularly from graves with disarticulated comingled remains show that those corpses were probably left to skeletonize before burial. Whether such patterns can be attributed to catastrophes where large numbers of dead bodies could not be buried immediately is debated (Cain et al., 2019). Some historians argue that *shitai hōchi* ('corpse abandonment'), the practise of leaving corpses without proper burial, would have been carried on well into the Kamakura period in other cities such as Heiankyō and Fukuoka (Katsuda, 2003).

Osteological analyses have suggested that the general sanitary conditions of the city were poor and that the city provided an environment perfect for the spread of bacterial infections and other infectious diseases such as leprosy and tuberculosis (Hirata et al., 2002;

Nagaoka et al., 2006; Shizushima, 2007). Diets and nutritional status were poor for the majority of residents and life expectancy was estimated to be lower than that of latter periods (Nagaoka et al., 2006, 2019). Finally, based on the weapon-related traumas, particularly those caused by sharp weapons such as swords, it has been assumed that violence was not uncommon in medieval society (Hirata et al., 2002, 2004; Morimoto, 1987; Morimoto and Hirata, 1992; Nagaoka et al., 2006, 2009, 2010, 2013, 2018; Sakaue, 2016).

CHAPTER 2
TAPHONOMIC ANALYSIS OF ‘SCRATCHES’ ON MEDIEVAL
HUMAN CRANIA FROM THE ZAIMOKUZA SITE

第2章 (pp. 19-32) については、5年以内に雑誌
等で刊行予定のため、非公開。

CHAPTER 3
BIOARCHAEOLOGICAL ANALYSIS OF REMAINS FROM THE
ZAIMOKUZA SITE

第3章 (pp. 33-68) については、5年以内に雑誌
等で刊行予定のため、非公開。

CONCLUSION

The goal of this dissertation was to investigate human skeletal remains excavated from the Zaimokuza site and examine them for both differences and similarities within site, and between the Zaimokuza series and those of the surrounding archaeological sites. Chapter I gave a background to the Zaimokuza site, subsequent excavations in the area, and also examined historical and other archaeological evidence for the lives and deaths of people living in the city of Kamakura during the medieval period.

以下の部分（pp. 69-72）については、5年以内に
雑誌等で刊行予定のため、非公開。

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Table 1. A list of major events that occurred in Kamakura City during the medieval period

. (Adapted from Minami et al., 2012: 600).

Year (AD)	Event
1181	Yōwa famine
1185	Establishment of the Kamakura Shōgunate
1192	Kamakura made the capital city of Japan.
1213	Wada Conflict
1214	Strong winds and rain
1231	Kangi famine
1241	Jinji earthquake (M7.0)
1247	Miura Yasumura's battle
1257	Shōka earthquake (M7.0)
1258	Shōka famine
1273	Bunei famine
1293	Kamakura earthquake (M7.1) and resulting tsunami
1333	Nitta Yoshisada's Siege of Kamakura
1333	Capital city is reverted from Kamakura to Heiankyō
1352	Ashikaga Takauji's battle
1433	Sagami earthquake (M7.1)
1454	City is burned to the ground during the Kyōtoku incident
1526	City is destroyed during Siege of Kamakura

M = magnitude of an earthquake

Tables 2-30 (pp. 86-126) については、5年以内に雑誌等で刊行予定のため、非公開。

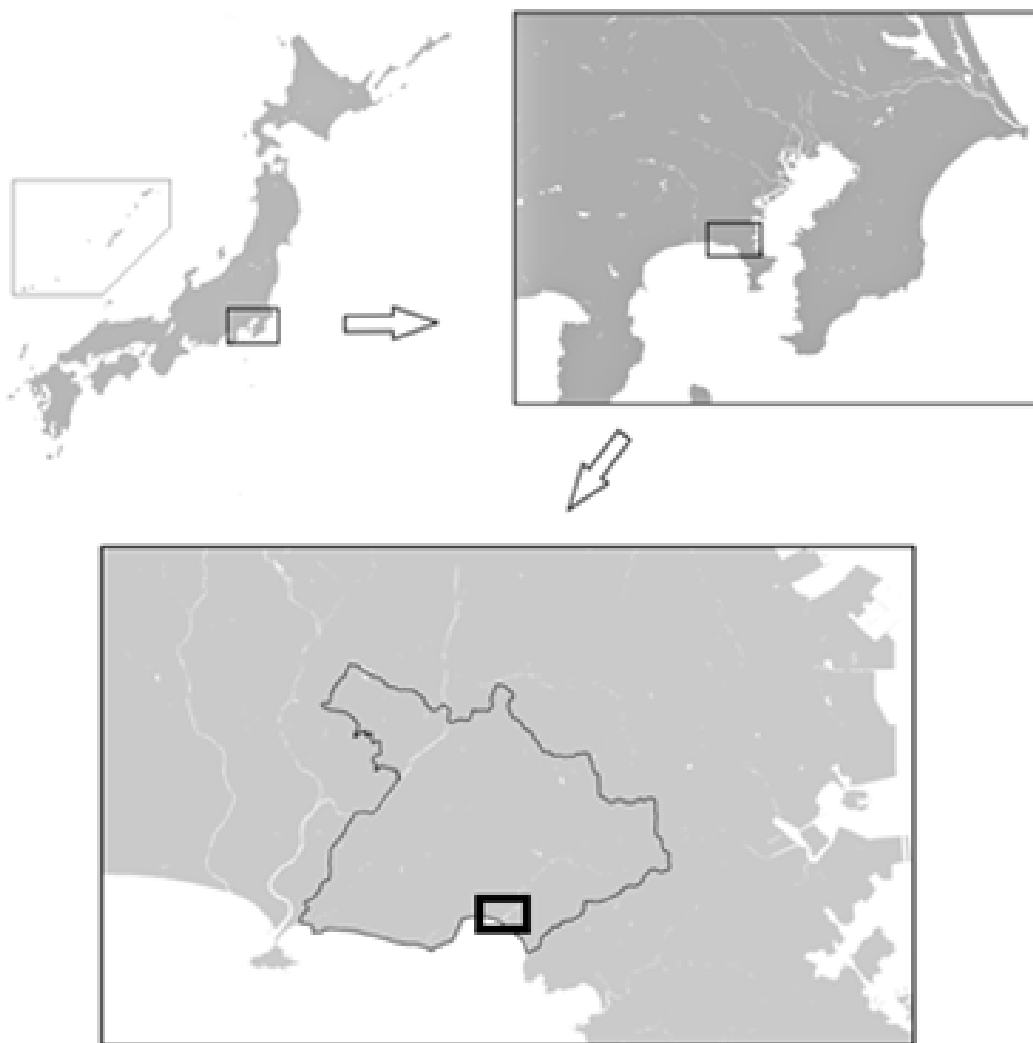


Figure 1. A map showing the location of Kamakura within Japan. The black box indicates the Yuigahama area from which most of the skeletal remains used in this study were excavated.



Figure 2. A map of the Yuigahama area of Kamakura. The Zaimokuza site is circled in red. Black dots indicate archaeological sites from which human skeletal remains dating to the medieval period have been recovered. The black outline shows the area dubbed ‘Yuigahama medieval graveyard’.

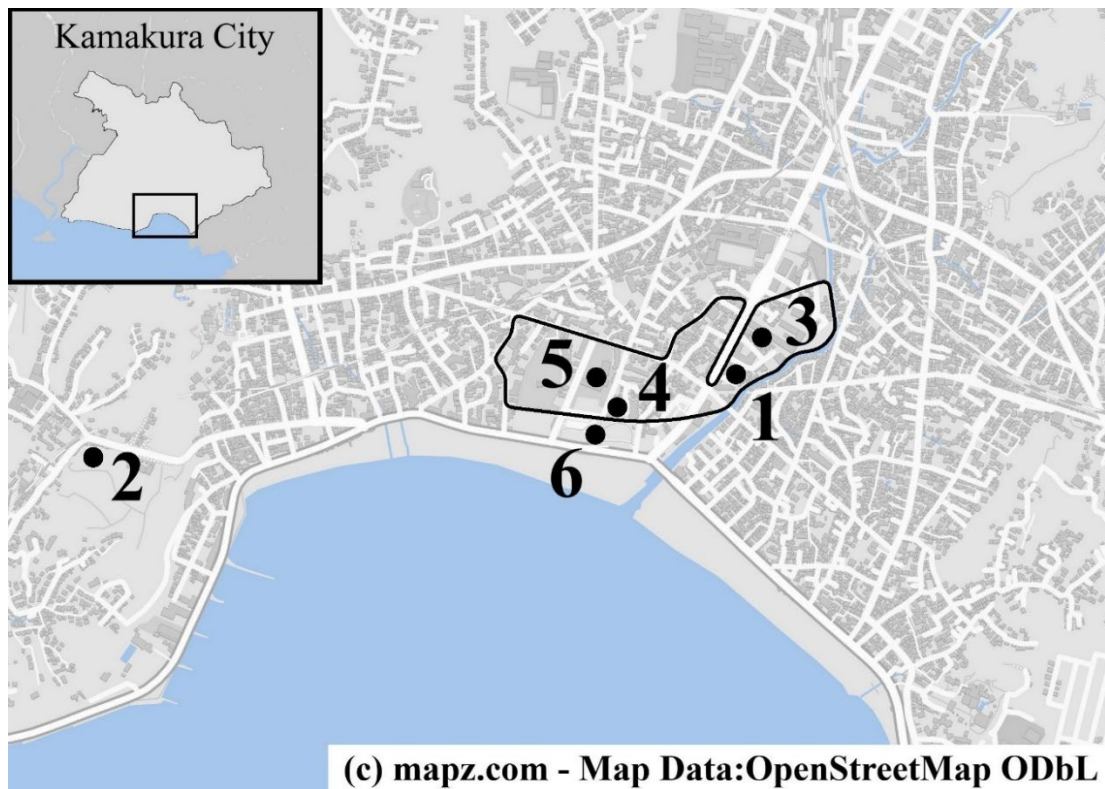


Figure 3. Distribution of the archaeological sites in the Yuigahama area of Kamakura.
 The black line indicates the area dubbed by archaeologists as Yuigahama medieval graveyard (Yuigahama Chūsei Shūdan Bochi). Black dots indicate the sites utilized in this study. 1 – Zaimokuza; 2 – Gokurakuji; 3 – Yuigahama Chūsei Shūdan Bochi (No. 372); 4 – Seiyōkan; 5 – Yuigahama Minami; 6 – Yuigahama Chūsei Shūdan Bochi (Seika Ichiba).



Figure 4. Grave XV, a mass cranial grave discovered during the second excavation of the Zaimokuza site (reproduced from Suzuki et al., 1956: Plate 2).



Figure 5. A photograph of burials discovered during the third excavation of the Zaimokuza site. A large mass cranial grave, XXIX (middle) and a smaller grave mixed burial with horse bones, XXX (left) are pictured (reproduced from Suzuki et al, 1956: Plate 1).

Figures 7-36 (pp. 133-162) については、5年以内に雑誌等で刊行予定のため、非公開。

Appendices A-F (pp. 163-202) については、5年以内に雑誌等で刊行予定のため、非公開。