
Violence Leaves Scars:

A Biocultural Approach to Violence in Prehistoric Jomon Japan

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Abstract

The current study adopts a population-based biocultural approach to the investigation of prehistoric violence in the hunter-gatherer Jōmon period of Japan (15,000-2750 cal BP). It challenges two incompatible beliefs: the view widely held in Japan that the Jōmon were peaceful people, and a relatively new ‘orthodoxy’ in archaeology which asserts that all ancient hunter-gatherer societies were frequently violent.

Skeletal remains of 1208 individuals from across the Japanese archipelago were examined for evidence of violence-related trauma. Wherever possible, skeletons were physically examined to confirm previously reported cases of Jōmon violent injuries contained in the archaeological literature, and to uncover new cases in old osteological collections. Both the ‘Minimum Number of Individuals’ (MNI) and the more sophisticated ‘Effective Number of Individuals’ (ENI) methods were employed. This was especially important given the generally poor preservation conditions and completeness of Jōmon skeletons predominantly due to Japan’s highly acidic soils. The resulting data were analysed to establish the prevalence of violence, and its distribution spatiotemporally, as well as by age-at-death and biological sex. Trauma timing, type, and quantity were determined, in addition to identifying the skeletal element and side most affected. To help assess the level of violence, this direct bioarchaeological data was augmented by indirect archaeological evidence: weapons; settlements; defensive structures; iconography, and warrior graves. Combined with an exploration of the environmental, geographical, and sociocultural contexts, the thesis shows that a multi-layered framework is better at identifying patterns of (non)violence in prehistoric societies.

To deduce whether Jōmon Japan was more or less violent than other prehistoric hunter-gatherer societies, it was compared with Mesolithic Europe and California. The Jōmon were found to be significantly more violent than previously thought, but nevertheless somewhat less violent than Mesolithic Europeans as a whole and especially prehistoric Californians. Overall, the prevalence of violent trauma in all three regions hovered around 4~5%, but unlike for the latter, there is no definitive evidence—direct or indirect—to suggest that the Jōmon people engaged in large-scale organised intergroup conflict (warfare). Blunt force traumatic injuries predominated in Japan, whereas in California sharp force/projectile trauma were more prevalent. Furthermore, in contrast to California where young to middle-aged adult males exhibited the most violent trauma, in Jōmon society, males sustained only slightly more trauma than females, and old adults were more likely to have suffered (antemortem or perimortem) trauma. Moreover, clear evidence of trophy-taking and ritualised violence have been unearthed in central and southern California, respectively, but not in Japan. The fallibility of population estimates and the imprecision of skeletal dating make it impossible to identify clear causes or reach any definitive conclusions about the effects of violence on these societies. No single factor can explain the disparate and fluctuating patterns of violence, but a combination of climate, topography, population, resources, and socio-political structure goes some way towards solving this riddle.

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Notes

- 1) The 47 prefectures which subdivide the Japanese archipelago today (see Fig. 2.1) did not exist in the prehistoric period, but are frequently used by archaeologists to situate sites in Japan. However, the eight official regions—Hokkaidō, Tōhoku, Kantō, Chūbu, Kansai, Chūgoku, Shikoku, and Kyūshū—are based on natural geographic divisions of the archipelago, which also existed during Jōmon times, and hence represent a more appropriate basis for analysis.
- 2) Names in parentheses following Japanese archaeological sites refer to prefectures, unless otherwise stated.
- 3) In this thesis, the traditional Japanese name order is employed throughout, namely, the family name precedes the given name.
- 4) As part of this thesis, a wide variety of written sources, including academic papers, book chapters, osteological datasheets, and archaeological site reports were translated from Japanese. All translations are the responsibility of the author.
- 5) All tests performed to measure the statistical significance of differences were Z-tests, unless otherwise stated.
- 6) Permission was sought for all images used in this thesis that are not the author's own. If the owner of an image objects to its inclusion, please contact me via the university. Some of the images used are in the public domain, but as a courtesy the original source has been cited.

1. Introduction

‘Looking back over the human past, one obvious feature stands out: the amount of time, energy and human life which has been expended in that most destructive of all man’s activities – war.’

(Marwick 1976:112)

‘It is traditionally believed that ancient population groups were inherently peaceful’

(Gordón & Bosio 2012:640)

Violence leaves scars; whether on landscapes, structures, human bodies, tools, artefacts, or in the memories of victims, perpetrators, and witnesses. From assault to homicide, slavery to warfare, violence has an ancient lineage and still poses an existential threat to humanity. Paradoxically, the modalities of violence are simultaneously universal and culture specific, intimate and impersonal, inherent and dehumanising. Violence has played an essential role in interactions between individuals, groups, and nations. Indeed, it is hard to overestimate its influence on society since most, if not all, modern states were forged in the crucible of war. Yet, human social evolution has also been subjected to an equal and opposite force: nonviolence and cooperation. In the past, (non)violent activity was often not recorded or documentary sources have not survived into the present, and thus is inaccessible to historians. This is where archaeology tries to fill the void. In the archaeological record, some physical scars are deeper, longer lasting, and more obvious than others; yet those left on human remains can be especially difficult to identify.

Archaeological Approaches to Studying Violence

Archaeologists are skilled at unearthing physical evidence and reconstructing the lifestyles of ancient peoples. They have long acknowledged the importance of violent conflict in shaping human history. However, in the past, archaeological studies of violence commonly focused narrowly on description and analysis of individual sites or artefacts, rather than developing a broader conception of prehistoric violence and warfare (Vencel 1984:118). Moreover, they typically examined instruments of war, such as weapons, armour, and fortifications, leaving examples of skeletal trauma to biological anthropologists.

Bioarchaeology—a sub-discipline which emerged in North America during the 1970s—aims to understand complex human interactions within their natural and cultural environments (Sahara 2005:104; Martin & Anderson 2014:5). It uses the analysis of (mainly) skeletonised human remains, combined with archaeological reconstruction of their burial context and the local environment, as a lens through which to observe cultural processes (Martin & Anderson 2014). This may provide vital information about how and why people have responded to various problems with violence by situating skeletal data within the broader social, economic, political, and cultural circumstances in which the violent acts occurred (Harrod et al. 2012a; Martin & Anderson 2014). Yet, personal motives for fighting are still generally considered indecipherable through archaeology (Vencl 1984:119).

Published bioarchaeological studies of violent skeletal trauma tend to focus on individual cases or injuries to certain body parts. They reveal many details about the past use of violence, often identifying the same types of injuries (blunt force, sharp force, and projectile) as seen in modern forensic science (Larsen 2015:177). While such case studies may provide insights into the types of violence present in a society, unless considered within the context of cases exhibiting no trauma, even *en masse* these incidents do not automatically constitute an accurate record of the prevalence or levels of violence (Roberts 2000; Pardoe 2014).

A growing interest in exploring the prevalence of violence and patterns of trauma in prehistoric societies eventually led to the development of a ‘population-based biocultural approach’ (Roberts 2000:337). This method combined biological (skeletal) evidence of trauma with the cultural context at a societal level, and proved beneficial for reconstructing patterns of injury on a large scale (geographically, chronologically, and demographically). Supplementing this with research from other disciplines meant that archaeologists were now capable of interweaving three levels of analysis (individual, group, and societal), and contributing to the larger multidisciplinary debate about the origins and evolution of violence. A heterogeneous biocultural approach that assimilates multiple lines of evidence will underpin this thesis.

Definitions

As semiotics teaches us, the language used to describe and categorise actions directly influences how they are perceived (Redfern 2017:3). The word ‘violence’ (from the Latin *violentus*, via *violentia* ‘impetuosity’, thirteenth century) has no universally accepted

definition; its meaning mutating over time, across cultures, and academic disciplines. From a bioarchaeological perspective, a useful starting point is the World Health Organisation (WHO) definition (2002:4):

The intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation.

Needless to say, this definition was not crafted with archaeologists in mind. Hence, this thesis will narrow the focus slightly by excluding psychological dimensions (being invisible in the archaeological record), as well as the accretion of damage resulting from a lack of basic necessities. Admittedly, the WHO definition centres on the violent act itself and ensuing bodily harm, rather than the broader (and culturally specific) socio-political context. Drawing on critical theory, American bioarchaeologist Debra L. Martin (et al. 2012), for instance, emphasises the importance of ideology, inequality, and power embedded in cultural notions of violence. This is relevant, although how applicable such concepts are to ancient hunter-gatherer societies is uncertain.

No less controversial, the term nonviolence (1831) is religious in origin (translated from the Sanskrit word *Ahimsa*, fifth century BC or earlier), and is generally defined as not causing harm to oneself or any other living thing. Although in modern times it has come to incorporate the peaceful pursuit of social change, here it will simply be defined in the negative as the absence of violence.

The narrower term ‘trauma’ (from the Greek word for ‘wound’, 1693) is especially important in bioarchaeology, where it usually describes a physical wound or injury (such as a fracture or blow) caused by an external force, that may affect soft tissue and/or bone (Roberts 2000:337; Redfern 2017:4-5). Injury and skeletal trauma will be used interchangeably here. Psychologists subsequently broadened this definition to embrace emotionally disturbing experiences, but again this aspect leaves no archaeological trace. However, by recording the time and place where physical trauma occurred, a more comprehensive view of the history of violent events can emerge.

Finally, war (from the Germanic *werra*, ‘confusion’, twelfth century) and peace (from the Latin *pax*, twelfth century) are a similarly opposed pairing, respectively denoting the presence and absence of hostile interactions between organised polities; although the latter

may also imply active friendship or group harmony. War is based on parochial altruism, group loyalty, and obedience to an acknowledged leader, or as the Dutch philosopher, diplomat, and jurist Hugo Grotius (1583-1645) put it, war is not ‘a contest but a condition’, embedded in sociocultural and ethical contexts (Gould & Kolb 1964:754). If culture and morality are regarded as exclusively human characteristics, then warfare is necessarily confined to human groups (Matsumoto 2018:36). Whether or not prehistoric hunter-gatherers engaged in warfare is a central concern of this thesis, but the moral dimension of violence and warfare is beyond the scope of this study.

Since disciplines have different methods of studying violence, it is not surprising that there is no cohesive definition of warfare (Sahara 2005:103). One anthropologist has even gone so far as to claim that scholars of warfare are at war with each other (Otterbein 2004:11). In most fields of study, however, research has involved attempting to distinguish between different levels of aggression: interpersonal; intra- and inter-group, or interstate (warfare). In simple terms, interpersonal violence may be defined as small-scale, physical force against an individual or handful of people, for example homicide or assault, and often without the use of weapons. Intra- and inter-group violence is medium-scale conflict either within or between defined communities, such as ambushes, skirmishes, raids, ritual violence, or acts of terrorism, invariably involving the employment of weapons; although it may be spontaneous. Lastly, large-scale and organised armed conflict (domestic or international) between distinct social groups, usually involving some sort of command hierarchy, sustained fighting, and numerous casualties, is defined as warfare.

In theory, interpersonal and intragroup acts of violence are almost always distinguished from warfare, which is generally seen as a state-level activity, but some scholars (e.g., Kobayashi 2003) label intergroup conflict among hunter-gatherers as ‘warfare’ (Redfern 2017). Agreed terminology that differentiates clearly between the various types of socially organised intergroup violence has yet to emerge: for instance, should feuding between communities be classified as warfare? (Ember 2020:10-11). Japanese scholars often use terms such as ‘war’ (*sensō*), ‘battle/fight’ (*sentō* or *tatakai*), and ‘conflict’ (*tōsō*) interchangeably, although the debate between Japanese experts is apt to mirror that among western academics.

Archaeological Evidence of Violence

Violence in the archaeological record is represented by a range of both direct and indirect physical evidence. It is often supplemented with ethnographic data, which sometimes offers important insights into violent behaviour. Evidence of nonviolence, however, is often inconclusive and ambiguous.

Skeletal trauma is one of the most common pathological conditions seen in the bioarchaeological record (Larsen 2015:131). When properly identified, injuries on human remains afford the only direct evidence of violent incidents (both lethal and non-lethal) in archaeological contexts (Martin et al. 2012:3; Schulting 2013:19). Skeletal analysis allows a more objective and accurate understanding of historical trauma and violence to emerge (Larsen 2015). Analysis of skeletal trauma can also help to dispel myths about past societies, such as whether they were more or less aggressive/peaceful than previously thought. Still, this approach is not without its limitations. Inaccurate estimates of the number, frequency, and proportion of violent injuries and deaths may result from a range of factors. Not only is the number of human bodies which sustained injuries limited in both space and time, but even fatal wounds to soft tissues sometimes leave no trace on skeletal remains (Vencl 1984:127). Furthermore, regions with acidic soils and eras when cremation was widely practised preserve little, if any, evidence of trauma. Moreover, some forager groups (e.g., Aboriginal Australians) disposed of the bodies of those who suffered violent deaths in non-burial contexts, producing the same result. Sometimes the picture is further complicated by the difficulty of distinguishing between unintentional (accidental) and intentional (malevolent) violent acts, wounds inflicted as part of legal punishments or rituals, and even bone damage caused by natural conditions (e.g., taphonomy) unrelated to past human behaviour (Walker 2001:575-76; Larsen 2015:115-16; see also Chapter 6). Given the susceptibility to selection biases, it is also easy to exaggerate the extent of lethal aggression (Bowles 2009:1293-96; Fry & Söderberg 2013:271-72). Finally, skeletal trauma may always be misinterpreted: archaeologists sometimes disagree over whether or not they are observing violence-related injuries.¹

Archaeologists recognise that the level of violence in the past has varied spatiotemporally, but in practice it is often difficult to separate these different patterns using excavated remains,

¹ See, for example, the controversy over the apparent early Holocene massacre at Nataruk, Lake Turkana, Kenya (Lahr et al. 2016; Stojanowski et al. 2016).

and like comorbidities, they frequently occurred together in a society (Vandkilde 2015:608). In particular, attempting to distinguish the subtle differences between skeletal injuries caused by intra- or inter-group conflict is virtually impossible, especially if the remains are fragmentary and/or poorly preserved (Bowles 2009:1296; Allen et al. 2016:12120). Even distinguishing between injuries resulting from interpersonal violence or warfare are challenging. For example, in their study of intergroup violence at Nataruk, Lahr et al. (2016:396, 399) proposed three diagnostic tools indicating, somewhat confusingly, either the presence of prehistoric ‘deliberate violent trauma’, ‘intergroup conflict’, or ‘warfare’. Projectile points embedded in skeletal remains or found within the body cavity, cranial blunt force perimortem trauma, and cut marks associated with dismemberment and trophy-taking are important direct evidence of violence, but depending on the cultural context, not necessarily of warfare.

Given these shortcomings, direct evidence of violence is often augmented by indirect evidence in the form of weaponry, settlement patterns, defensible site locations, fortifications, iconographic depictions of fighting, and warrior graves (Vencel 1984; Lambert 2002; Sahara 2005; Larsen 2015). To this list Sahara (2006) added the burial of weapons as grave goods, weapon-shaped ceremonial tools, and models of warriors and battle scenes. Such features help to reconstitute the cultural context for violence. Considered individually, indirect archaeological markers may only indicate the threat of conflict rather than its consequences, but viewed collectively, and in conjunction with skeletal remains, such evidence helps to confirm the presence and function of violent behaviour. Yet, indirect evidence may also be ambiguous or disappear from the archaeological record. For example, earthworks, ditches, and fences may have served non-defensive functions, and weapons are sometimes invisible if they are also everyday tools and objects. Many weapons utilised by prehistoric peoples were made from perishable organic materials, and specialised weapons are usually too precious or significant to discard as grave goods (Vencel 1984:125-26). Thus, indirect evidence is often no more reliable than direct evidence when estimating the scale and frequency of violent incidents in prehistoric societies.

Some scholars (e.g., Ember & Ember 1997; Nash 2005; Lambert 2007; Bowles 2009; Pardoe 2014) also draw on ethnographic evidence to fill gaps in the archaeological record. This includes written documents pertaining to incidents of lethal conflict, stories, songs, and dances about war that have been passed down the generations, or objects and illustrations

depicting battles. However, relying on data from historical and surviving hunter-gatherer communities as a guide to violent behaviour among our prehistoric ancestors may be misleading; colonisation, modern technology, and other processes have impacted on the prevalence and levels of violence (Fibiger et al. 2013). In short, they are not ‘living fossils’ (Redfern 2017:13). Moreover, anthropologists bring their own sets of assumptions about ancient societies in an effort to reconstruct the past, and in doing so they cannot escape the cultural values and social perceptions of their times (Keeley 1996; Larsen 2015).

Nonviolence is not rare—it may even be the norm—but it is rarely acknowledged (Sponsel 2015:624). Although the concept influences archaeological thinking on the origins and prevalence of violence, what constitutes tangible evidence of nonviolence is a difficult question to answer. As Sahara (2005) asserted, the lack of widespread evidence of violent conflict in the archaeological record is not necessarily proof that it did not exist. However, such a proposition is fundamentally unscientific since it cannot be disproven.² Almost certainly, no human culture has succeeded in eliminating violence completely, but where there is little direct and indirect evidence of violence in scale and/or frequency (presuming the existence of sufficient well-preserved skeletons), then it may be deemed a relatively ‘peaceful’ society.

Violence among Prehistoric Hunter-Gatherers

The conventional view of violence (and especially warfare) was that it began with the introduction of agriculture, which was associated with population growth, contests over land and other resources, and increasing social complexity (Matsumoto 2018:22). This position implied that prehistoric hunter-gatherer societies were essentially peaceful. However, in the mid-1990s, the balance of opinion amongst archaeologists began to shift (Vandkilde 2015).³ Since then, multiple avenues of archaeological and anthropological research have converged on a significantly more violent image of the ancient past than previously supposed. In other words, a relatively new ‘orthodoxy’ in archaeology asserts that all ancient hunter-gatherer societies were frequently violent. Evidence supporting this theory has been found in several regions of the world, including North America and Africa (Keeley 1996; LeBlanc & Register 2004; Bowles 2009), but many popular studies (e.g., Pinker 2011) have relied on a handful of

² Sahara adopted a ‘heads I win, tails you lose’ position, namely that evidence of violence proves there was violence, but a lack of evidence of violence only implies that it is yet to be found.

³ *The Penguin Dictionary of Archaeology* (1982) does not even have entries for violence or warfare.

rather atypical sites to represent large swathes of prehistory (Fibiger et al. 2013). Whether this thesis applies to prehistoric Japan is debateable. Strangely, the rich seam of data from the Jōmon era (15,000–2750 cal BP) has been largely overlooked by comparative archaeological studies of violence in prehistoric hunter-gatherer societies. The reasons for this are many, but apart from the obvious language barrier, very little data has been compiled into an accessible format.

From the end of the Pleistocene through to the Holocene, the Japanese archipelago was inhabited by the Jōmon people (see Chapter 2). They represent an unusually long-lived and complex hunter-gatherer culture, which survived for over 12,000 years. Archaeologists have conducted innumerable excavations of Jōmon sites in recent decades. Their research has revealed that the Jōmon were rather unusual hunter-gatherers, for in addition to hunting and fishing, their ability to store foodstuffs, manage tree species (especially nuts), and cultivate plants, enabled them to live increasingly sedentary lives. This led to the establishment of large, semi-permanent settlements, the manufacture of and trade in prestige goods, the development of complex belief systems, the construction of large ceremonial structures, and perhaps the emergence of some kind of hierarchical society. As many Japanese archaeologists have suggested, abundant natural resources enabled the Jōmon people to develop extremely rich cultures, although climatic changes brought about increasing challenges, especially towards the end of this long era (Habu 2004:61-62).

In Japan, violence in the Jōmon period has been studied by scholars since at least the 1930s. Given the apparent absence of weapons or defensive structures, however, and the paucity of skeletal evidence of violent conflict, mainstream Japanese archaeologists have long characterized the Jōmon as peaceable; an outlier compared to the contested violent hunter-gatherer norm (Uchino 2013:472). Consequently, coinciding with the traditional view amongst western archaeologists, they have generally accepted the argument that violence and warfare followed the introduction of wet-rice agriculture and metallurgy to the Japanese archipelago by Yayoi immigrants from mainland Asia beginning around 2750 cal BP (Imamura 1996a:10; Kobayashi 2003; Sahara 2005; Steinhaus & Kaner 2016:153; Nakagawa & Nakao 2017b:65).

The lack of comprehensive studies on violence in the Jōmon period has helped to reinforce the established interpretation that they were peaceful hunter-gatherers. Skeletal injuries among the prehistoric people of Japan are less well known than those in Europe and America

(Suzuki 1958:115). To date, only a limited number of studies have been published describing Jōmon skeletal trauma, many of which dismiss inconvenient evidence of violent injuries as accidental (Uchino 2013:472). Moreover, as seen in much western bioarchaeology, the majority of Japanese studies detail isolated cases, rather than looking at the overall prevalence of violence across the archipelago during the Jōmon era. Admittedly, in the last two decades, several researchers (e.g., Suzuki 1999; Yamada 2006; Uchino 2013; Nakao et al. 2016) have compiled lists of individual Jōmon skeletons which exhibit evidence of trauma. Some are more extensive than others, but instead of directly examining skeletal remains, all have simply collated cases from earlier papers and archaeological site reports. Furthermore, very few researchers have contrasted the Jōmon evidence with violence in other hunter-gatherer societies. Where a comparative perspective has been adopted, they have preferred to use the subsequent agriculturalist Yayoi peoples; not a valid comparator if seeking to understand prehistoric hunter-gatherer violence. In short, an appropriate comparative population perspective has been lacking because existing studies on violence in Jōmon Japan are imperfect.

Research Aim, Questions, and Significance

This thesis aims to estimate the prevalence and level(s) of violence in prehistoric Jōmon Japan. Three main questions will be addressed:

1. Does archaeological evidence support the prevailing Japanese view that the Jōmon were predominantly peaceful hunter-gatherers?
2. Were the Jōmon people significantly more or less violent than other prehistoric hunter-gatherers in comparable (environmental) contexts?
3. If so, what factors—social, cultural, and/or environmental—explain the difference? If not, does this imply that all hunter-gatherer societies were equally violent?

This is the first study of Jōmon violence to employ a biocultural approach in a comparative context, contrasting Jōmon evidence with that from other prehistoric hunter-gatherers. On the one hand, if this research confirms that the Jōmon were significantly less violent than other hunter-gatherer groups, then it would challenge the idea that the level of violence in prehistoric hunter-gatherer societies is positively correlated with growing complexity. This would also prompt investigation of how they managed to remain relatively peaceful for such

a long period of time. On the other hand, if this research reveals that the Jōmon were substantially more violent than previously thought, it will challenge the widely-held sense of Japanese exceptionalism (specifically, the notion that the Jōmon were uniquely peaceful hunter-gatherers), and necessitate a revision of Japanese prehistory.⁴

Research Design

To answer these questions, it is first necessary to determine the overall prevalence of violence in the Jōmon period. Variation in the prevalence across different geographical regions and chronological time frames in Jōmon Japan will also be investigated in an effort to discover patterns and potential causes for varying levels of violence. To this end, a biocultural approach will be adopted, and multiple lines of evidence examined—both direct and indirect—which collectively signify violence in the archaeological record.

Uncovering direct evidence involves the identification and analysis of violent trauma on Jōmon skeletons, while indirect evidence requires the study of weapons, settlement locations and patterns, defensive structures, iconographic depictions, and burial practices. This will involve an assessment of whether: hunting technologies were repurposed for violent acts; the slightly elevated location of settlements reflected defensive considerations; features resembling watch towers or moats served defensive purposes, or the absence of warrior graves or images depicting violence against humans should be interpreted as evidence of nonviolence. Since the range of indirect evidence is so broad, this aspect represents an interpretation of the primary finds of Japanese archaeologists and secondary reports. Where relevant, additional aspects of Jōmon culture, such as subsistence practices, stone circles, exchange networks, and environment fluctuations will also be examined to help understand (non)violence.

Nevertheless, the main focus here is on direct evidence, as traumatic injuries found on human skeletons provide the most accurate indication of violent interactions. Rather than relying on previously published cases of Jōmon trauma which principally offer anecdotal evidence, wherever possible first-hand data was collected through the analysis of Jōmon skeletal remains in osteological collections at eight universities and museums in Japan. New cases were uncovered which have helped to produce a more reliable estimate of the prevalence of violence in the Jōmon period. The remains of 1208 individuals excavated from one hundred

⁴ For further discussion of Japanese exceptionalism, see Dale's (1986) book *The Myth of Japanese Uniqueness*.

Jōmon sites across the archipelago were osteologically examined. Skeletal remains from the Nagano Prefectural Museum of History (166 individuals) were analysed separately due to poor preservation conditions of the bones. Hence, data from a total of 1042 individuals (864 crania and 302 postcrania) was used for the purposes of statistical analyses.⁵

Establishing whether victims of violence were more commonly male or female, young or old, whether lethal or non-lethal injuries had a higher prevalence, and which type of trauma predominated illuminated the nature of violent incidents in Jōmon society. It required aging and sexing each individual in the skeletal sample, determining the presence of blunt force, sharp force, and puncture/projectile injuries, and identifying the timing of trauma (antemortem, perimortem, or postmortem). The location of trauma on the skeleton and angle of injury(s) revealed the direction of attack, and perhaps the number of assailants and weapons used. Prevalence was established through both the ‘Minimum Number of Individuals’ (MNI) and ‘Effective Number of Individuals’ (ENI) methods; the latter taking into consideration the preservation and completeness of individual skeletal elements to produce more accurate estimates of the prevalence of violence.

Variations across geographical regions (east-west, coastal-inland sites) and chronological time frames (subperiods) in Jōmon Japan were also investigated in an effort to uncover patterns and identify any potential violent ‘hot/warm spots’ (or nonviolent ‘cold spots’). Discovering the locations of Jōmon sites from which skeletal remains were analysed and to which subperiod each skeleton has been dated enabled these comparisons. It is important to compare different Jōmon subphases and regions of the archipelago, since overall prosperity and lifestyles (and perhaps the prevalence of violence) differed due to diverse environments.

Finally, a comparative framework was necessary to determine whether the Jōmon were significantly more or less violent than other prehistoric hunter-gatherers in similar environmental contexts. Where sufficient data was available, this thesis contrasted the prevalence and spatiotemporal distribution of violence in Jōmon society with those established for Mesolithic Europe and prehistoric California. In particular, results from central and southern California were combined and juxtaposed with the Jōmon because of numerous similarities between these societies (see Chapter 8). The prevalence of blunt force, sharp force/projectile, and trophy-taking/dismemberment, as well as healed and unhealed

⁵ See Chapter 6 for an explanation of why these figures do not appear congruent.

injuries attributed to violence were collated from published studies, focussing on those few which investigated violence at a regional level rather than single archaeological sites. Statistical analysis was conducted to determine whether or not differences in violence-related trauma were significant. Where there were significant differences, a range of independent and intervening variables from the environmental, geographical, and sociocultural contexts were considered in an effort to identify potential determinants.

Thesis Structure

This thesis is divided into nine chapters. After introducing the basic geographical characteristics of the Japanese archipelago, Chapter 2 describes the Palaeolithic era in Japan, before exploring the environmental, cultural, and social context of Jōmon society, and ending with a brief description of the transition to the Yayoi period. This chapter is intended to provide essential background for the subsequent discussion on violence in the Jōmon era, rather than engage in a critical analysis of the Jōmon literature in general. A brief (though wide-ranging) discussion of the theoretical understandings of violence in various academic disciplines follows. More specifically, Chapter 3 examines theories about whether (prehistoric hunter-gatherer) societies were inherently violent, or if not, under what circumstances some cultures were able to avoid major conflict.

Chapter 4 concentrates on indirect archaeological evidence for violent conflict among the Jōmon people. On the one hand, it explores the possibility that they may have repurposed existing tools and structures for offensive and defensive purposes, while on the other hand, it reveals the resource-driven nature of settlement patterns, the lack of warrior graves, and the absence of iconographic evidence of inter-human violence. Chapter 5 critiques the Japanese archaeological and anthropological literature on Jōmon violence as evidenced by skeletal remains. In other words, it interrogates the intellectual basis for the prevailing Japanese view of the Jōmon as essentially peaceful hunter-gatherers.

In Chapter 6, attention turns to the materials and methods used to conduct skeletal analysis in an effort to confirm previously reported cases of Jōmon violent trauma and to uncover new cases in osteological collections. The findings are presented in Chapter 7. This includes an analysis of trauma cases by: overall prevalence; spatiotemporal distribution (subperiod, region, site location, ‘hot/warm/cold spots’, coastal versus inland); timing (antemortem versus perimortem); number of injuries; age group; sex; type; skeletal element, and side most

affected. Data collection results from Nagano Prefecture are also discussed, albeit separately from the main study sample.

In Chapter 8, the Jōmon results are contrasted with data from Mesolithic Europe and especially prehistoric California. Overall prevalence, spatiotemporal prevalence (including potential ‘hot/warm/cold spots’), types of violent trauma, and indirect evidence of violence are each systematically compared, before an analysis of factors influencing the levels of violence experienced is conducted. Finally, Chapter 9 presents a summary of the major findings from this thesis, and an indication of future avenues for research.

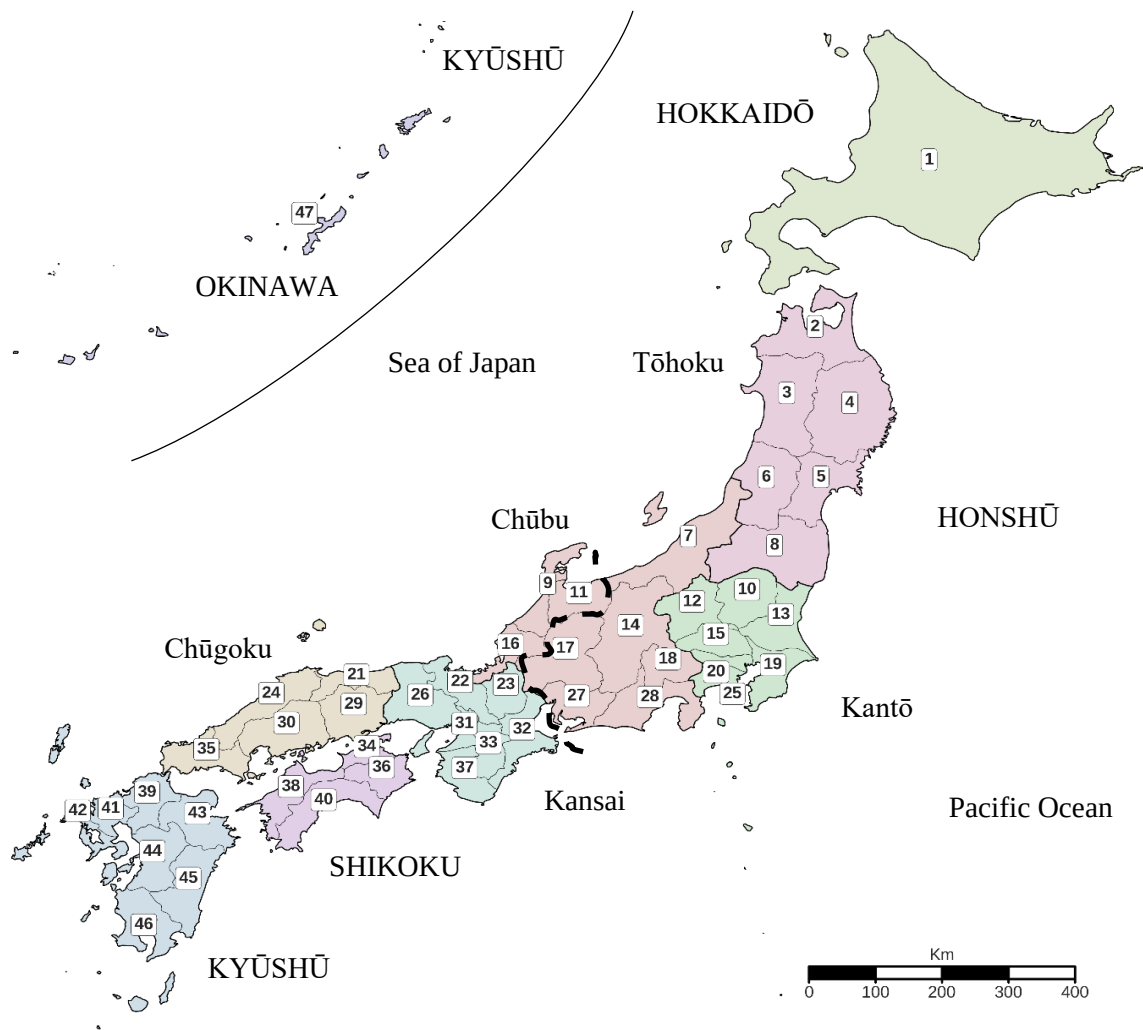
2. Jōmon Japan:

Environmental and Archaeological Framework

The Japanese Archipelago

Extending for nearly 3,000 kilometres along the Pacific coast of East Asia, the Japanese archipelago consists of four large main islands—Hokkaidō, Honshū, Shikoku, and Kyūshū—and 6,848 smaller ones (Fig. 2.1). Originally attached to the eastern coast of the Eurasian continent, the archipelago was separated from mainland Asia over the course of hundreds of millions of years by the subduction of oceanic plates under continental plates (Barnes 2003). This process gradually pulled the islands of Japan eastward, and created the Sea of Japan around 15 million years ago. Located on the Ring of Fire, as well as sitting at the juncture of four major tectonic plates, Japan is prone to volcanic eruptions, earthquakes, and tsunamis.

Japan's four main islands lie roughly between latitude 30°~46°N and longitude 128°~146°E. This orientation has created distinct climatic zones and environmental regions from north to south. Apart from Hokkaidō (subarctic) and the Ryūkyū Islands (subtropical), it sits in the north temperate zone and boasts the highest rainfall among countries in this zone (Japan's average annual rainfall is 1,000-3,000 millimetres). This has encouraged dense forests to grow across much of the archipelago: coniferous in the northernmost and high mountain areas; deciduous broadleaf in the northeast, and broadleaf evergreen in the southwest (Imamura 1996a). Overall, two-thirds of the country is mountainous, with areas of low-lying coastal plains, but no natural grasslands. Farmland is scarce, and introduced agricultural plants such as cereals can only survive with regular human attention. However, highly productive wet-rice cultivation is the primary reason why such limited arable land is able to support one of the world's most densely populated countries (Imamura 1996a:4-5).



- | | | | | | |
|----------------------|----------------------|---------------------|-----------------------|----------------------|----------------------|
| 1. Hokkaidō
北海道 | 2. Aomori
青森県 | 3. Akita
秋田県 | 4. Iwate
岩手県 | 5. Miyagi
宮城県 | 6. Yamagata
山形県 |
| 7. Niigata
新潟県 | 8. Fukushima
福島県 | 9. Ishikawa
石川県 | 10. Tochigi
栃木県 | 11. Toyama
富山県 | 12. Gunma
群馬県 |
| 13. Ibaraki
茨城県 | 14. Nagano
長野県 | 15. Saitama
埼玉県 | 16. Fukui
福井県 | 17. Gifu
岐阜県 | 18. Yamanashi
山梨県 |
| 19. Chiba
千葉県 | 20. Kanagawa
神奈川県 | 21. Tottori
鳥取県 | 22. Kyōto
京都府 | 23. Shiga
滋賀県 | 24. Shimane
島根県 |
| 25. Tōkyō
東京都 | 26. Hyōgo
兵庫県 | 27. Aichi
愛知県 | 28. Shizuoka
静岡県 | 29. Okayama
岡山県 | 30. Hiroshima
広島県 |
| 31. Ōsaka
大阪府 | 32. Mie
三重県 | 33. Nara
奈良県 | 34. Kagawa
香川県 | 35. Yamaguchi
山口県 | 36. Tokushima
徳島県 |
| 37. Wakayama
和歌山県 | 38. Ehime
愛媛県 | 39. Fukuoka
福岡県 | 40. Kōchi
高知県 | 41. Saga
佐賀県 | 42. Nagasaki
長崎県 |
| 43. Ōita
大分県 | 44. Kumamoto
熊本県 | 45. Miyazaki
宮崎県 | 46. Kagoshima
鹿児島県 | 47. Okinawa
沖縄県 | |

Figure 2.1. Map of the Japanese archipelago (numbers correspond to the modern prefectures). The dotted line represents the approximate division between eastern and western Japan.

Chronology of Prehistoric Japan

Japanese prehistory is generally divided into four main periods: Palaeolithic, Jōmon, Yayoi, and Kofun (the last is also Japan's protohistoric period, so has been excluded from Table 2.1). Each period is further subdivided into subperiods or phases, but date ranges are approximate and vary depending on the researcher as there is currently no agreement among Jōmon archaeologists. The dates in Table 2.1 are given in calibrated radiocarbon years before present (BP), except for the start of the Palaeolithic which is based on other dating methods.

Table 2.1. Chronology of Prehistoric Japan

Period	Divisions	Dates
Palaeolithic 旧石器時代		c. 40000 BP–15000 cal BP
Jōmon 縄文時代	Incipient 草創期	c. 15000–11950 cal BP
	Initial 早期	c. 11950–6950 cal BP
	Early 前期	c. 6950–5450 cal BP
	Middle 中期	c. 5450–4350 cal BP
	Late 後期	c. 4350–3200 cal BP
	Final 晩期	c. 3200–2750 cal BP
	Epi* 続縄文	c. 2250–1250 cal BP
Yayoi 弥生時代		c. 2750–1700 cal BP (800 cal BC–AD 250)

Modified from Steinhaus & Kaner 2016; Nakagawa & Nakao 2017a.

*Note: the Epi-Jōmon period is only found in the northern Tōhoku and Hokkaidō regions, and was contemporary with the Yayoi and Kofun periods elsewhere.

The Palaeolithic Period – Japan's Earliest Inhabitants

Predating the advent of pottery technology in Japan, the Palaeolithic era—also known as the Pre-ceramic (*sendoki jidai*) or Iwajuku period in Japanese archaeology—is the earliest phase of Japanese prehistory. It was ‘characterised...by volcanic ash layers within which the majority of sites are found.’ (Imamura 1996a:19) These layers are easily distinguishable from each other, and by allowing for the construction of relative chronologies based on clear stratigraphic relationships, help to date the unique lithic assemblages discovered at many of these sites. Research into this period began quite recently: the first Palaeolithic site was not discovered until shortly after World War II at Iwajuku (Gunma).⁶ Japanese scholars had

⁶ Palaeolithic artefacts (stone tools) were first discovered at Iwajuku by amateur archaeologist, Aizawa Tadahiro, in 1946, and subsequently verified through excavation by Meiji University archaeologists in 1949 (Imamura 1996a:19).

previously assumed that the archipelago was uninhabited until the start of the Jōmon period (Imamura 1996a:19). Thus, in previous excavations, digging ceased after the Jōmon cultural layers had been excavated. Despite a lack of skeletal and food remains due to poor preservation conditions, it is now thought that human habitation of Japan started between 40,000~30,000 years ago (although archaeological evidence before 35,000 years is disputed) (Underhill 1990:15; Bellwood 2013:81). Being closest to the continent, northern Hokkaidō and northern Kyūshū were the main entry points into Japan from mainland Asia.

The first inhabitants of the Japanese islands were hunter-gatherers who probably migrated from the Korean Peninsula. They created a unique stone tool industry that comprised both ground and polished stone tools which is among the world's oldest, since this technology is usually associated with the Neolithic period elsewhere (Imamura 1996a; Bellwood 2013:83).⁷ Lithic assemblages changed from tools made of blade to micro-blade technologies at various times, with regional variability of implements, such as knife-shaped tools and bifacial spear points, appearing towards the end of the Palaeolithic (Habu 2014:728).

Using spears and other stone tools, the humans hunted large terrestrial megafauna of the Pleistocene era, such as Naumann's elephant (*Palaeoloxodon naumanni*) and Yabe's giant deer (*Sinomegaceros yabei*), until their extinction which roughly coincided with the onset of the Last Glacial Maximum (LGM) (Harunari 2001:517; Iwase et al. 2012).⁸ Discoveries of numerous pit traps (e.g., at Hatsunegahawa, Shizuoka), which are thought to have targeted Sika deer (*Cervus nippon*) and/or wild boar (*Sus scrofa leucomystax*), indicate that these smaller and quicker mid-sized terrestrial ungulates were also caught by Palaeolithic hunters (Habu 2014:729). It is also likely that they supplement their diet with fish and plant foods.

In stark contrast to the Jōmon period, however, few vestiges of habitation have been found dating from the Palaeolithic era (Barnes 1993:60, 2015:87). Poor preservation of organic remains, reuse of the same habitation sites, and the inundation of many sites located on wide coastal shelves contribute to this scarcity. However, it also suggests that the Palaeolithic hunter-gatherers were highly mobile generalists, who exploited diverse resources by

⁷ The stone tool set included large blades, transverse-bladed points, and polished trapezoid and edge-ground stone axes.

⁸ Analysis of sediment cores suggest that the LGM started at ca. 30,000-29,000 cal BP and ended at ca. 19,000-18,000 cal BP (Lambeck et al. 2002; Yokoyama et al. 2007; Iwase et al. 2012:121).

migrating seasonally between different environments.⁹ A few shallow, pit-dwelling-like features have been unearthed at several Late Palaeolithic sites, but settlements with multiple pit-dwellings only appeared in the Jōmon period (Sahara 1992:229; Habu 2014:729).

Since 1946, over 10,000 Palaeolithic sites have been reported from across the archipelago. Most are small, date to the Late Palaeolithic, and consist of concentrations of stone tools and/or clusters of burnt cobbles (Mizoguchi 2002:56; Habu 2014:727-28). However, sites reliably dated before 35,000 BP are extremely scarce. This is mainly due to Japan's highly acidic soils (resulting from volcanic activity) that destroy organic material,¹⁰ but the fabrication of Palaeolithic artefacts by amateur archaeologist Fujimura Shinichi (revealed in the 'Japanese Palaeolithic hoax') has also played a part.¹¹

The majority of Japanese Palaeolithic skeletal remains have been found on the Ryūkyū Islands. Most significantly, the well-preserved remains of four individuals found at the Minatogawa limestone quarry site in 1970 are among the oldest hominid skeletons discovered in Japan. Amongst these individuals, a 25~30 year old male (Minatogawa 1) is one of the best preserved Late Pleistocene *Homo sapiens* from East Asia (Suzuki & Hanihara 1982).¹² Until recently, the Jōmon were thought to have descended from the Minatogawa people, but studies published over the last decade have challenged this theory (see Matsu'ura & Kondo 2011; Suwa et al. 2011; Kubo et al. 2012). Genetic and morphological analysis reveals that the Jōmon people have ancestral links to Northeast Asians, and, to a lesser extent, Southeast Asians (Omoto & Saitou 1997; Hanihara & Ishida 2009; Nakashima et al. 2010). Although their exact geographic origins and migration routes are not well understood, the ancestors of the Jōmon migrated to Japan from Northeast Asia—probably while the archipelago was still joined to mainland Asia—after the Minatogawa people had arrived from Southeast Asia. This mixed origin makes the Jōmon 'one of the key populations for the studies of the evolution of eastern Asian diversity.' (Nakashima et al. 2010:782)

⁹ This is in contrast to specialist hunter-gatherers, who form large residential bases to intensively exploit a specific type of food resource (Habu 2014).

¹⁰ Consequently, until recently early human specimens from Japan were usually overlooked by evolutionary studies of prehistoric Asians (Baba et al. 1998:27).

¹¹ Immediately following the discovery of the hoax, the Japanese Archaeological Association formed a special committee to thoroughly investigate the incident. It released a report in May 2003, and presented further reports at a symposium held at the Archaeological Institute of America in April 2004 (Nihon Kōkōgaku Kyōkai 2004).

¹² Radiocarbon dated to the Late Pleistocene (18,250±650 BP and 16,600±300 BP) (Baba et al. 1998:27-28; Kaifu 2007:159, 162).

Palaeolithic to Jōmon Transition

It is now believed that the Jōmon people started to arrive in Japan approximately 16,000 years ago, thus beginning a period of transition labelled the Incipient Jōmon. This process was accelerated by the Pleistocene–Holocene transition, which caused significant and rapid climate change in Japan (Perri 2016:1167). The generally cool and dry climate of the Palaeolithic period began to warm towards the end of the Pleistocene epoch. This warming trend—which characterised the first half of the Holocene—caused sea levels to rise, the environment to stabilise, and forests to cover much of Japan, replacing the grasslands and sparse woods of the Palaeolithic era (Underhill 1990:15; Imamura 1996a:29). In addition to inundating many coastal Palaeolithic sites, the rising sea levels also submerged the land bridges that connected the Japanese archipelago to the Eurasian continent, thereby isolating the existing (Palaeolithic and/or Jōmon) populations. Although coastal shelves were flooded, hunter-gatherers maintained their habitation of caves and open sites during the transitional period, leaving little to no remains or features. This suggests the continuation of a relatively mobile settlement system at the start of the (Initial) Jōmon era (Habu 2004:247).

The rapidly warming climate also triggered dramatic changes in the postglacial flora and fauna of Japan. Deciduous broadleaf forests with nut trees became widespread, replacing the mainly coniferous trees of the Palaeolithic, and shifting the habitats of terrestrial mammals. Meanwhile, sediment deposition from the increase in sea levels and rainfall created favourable conditions for marine animals to grow. This environmental transformation altered available food resources, and humans adapted to the new conditions by reorganising their subsistence strategies and making advances in technology. For example, changes in prey species and increasing dependence on abundant plant foods are reflected in the abandonment of the Palaeolithic micro-blade technology, and the development of new Jōmon-type stone tools, including arrowheads, chipped and ground stone axes/adzes, and grinding stones (Aikens & Higuchi 1982:95). Pottery was another major technological innovation that appeared ‘more than 14,000 years ago, before the glaciers of the last Ice Age had retreated, and before the sea-level had risen to create the coastline of modern Japan’ (Kaner 2009:40). These major changes enabled the flourishing of a semi-sedentary hunter-gatherer lifestyle that came to characterise the Jōmon period.

The Jōmon Period – Japan’s Unique Hunter-Gatherers

Jōmon refers to the prehistoric era when the Japanese archipelago was inhabited by hunter-gatherers, who over the course of roughly 13,000 years achieved a significant level of cultural complexity and sedentism. This process began with the development of pottery. The Jōmon were the first people in Japan to make pottery—which is accepted as being among the oldest dated in East Asia and the world (Kuzmin 2006; Craig et al. 2013)—and are named after the cord-marked decorations which they applied to most of their ceramic vessels.

The term cord-marked was first used by American zoologist and archaeologist Edward S. Morse to describe rope-like markings found on pottery sherds excavated at Ōmori shell midden (Tōkyō) in 1877, and subsequently translated into Japanese as ‘Jōmon’ (Morse 1879a:259-260, 1879b:4). At Ōmori, he unearthed an abundance of pottery, as well as stone and bone tools, and animal and human bones: this was the beginning of scientific excavation in Japan (Morse 1879a, b; Fukasawa 1998:5).¹³ Subsequently, settlements dotted with pit-dwellings, a vast array of tools and ornaments, and large quantities of pottery vessels and enigmatic clay figurines—for which the Jōmon are renowned—were unearthed across Japan, especially since the 1970s. Decades of archaeological research has revealed that the Jōmon people were rather unusual hunter-gatherers. Some of these characteristics will be explored below, after a brief explanation of the chronology and dating of Jōmon remains, and the existence of subcultures within Jōmon Japan.

Chronology and Dating of the Jōmon Period

The Jōmon period is commonly separated into six chronological divisions (subperiods): Incipient, Initial, Early, Middle, Late, and Final (see Table 2.1). The earliest of these was the last to be recognised by Japanese archaeologists and is the least well understood, though, by definition, it must have been when certain fundamental aspects of the Jōmon era emerged. The five other subperiods comprised the bulk of the era during which Jōmon culture blossomed, diversified regionally, then declined before being replaced (in most places) by an agricultural society in the subsequent Yayoi period.

The Jōmon period is most famous for its spectacular pottery. A large variety of styles was produced throughout Japan, although it was usually dull grey in colour and heavily decorated

¹³ However, Morse was unaware of the fact that the shell mounds at Ōmori had been discovered long before, ‘and collections of paraphernalia from them existed in the Tokugawa era, if not earlier’ (Moos 2007:58).

(Habu 2004). Since shapes and patterns varied spatiotemporally, a detailed chronology was developed based on pottery typology, allowing each subperiod to be divided into blocks of a few centuries or less (Bleed & Matsui 2010:358). Jōmon sites and objects are dated primarily using pottery typology, and to a lesser extent, radiocarbon and other scientific dating techniques. Given insufficient radiocarbon (absolute) dates, the chronology of the Jōmon period remains an approximation. But as scientific dating methods and calibration techniques improve and become more widely employed in Japanese archaeology, the dates of the Jōmon era will continue to be amended.

Jōmon Subcultures

Despite often being regarded as a single cultural entity that dominated the archipelago for over 12,000 years, various subcultures emerged within the broader Jōmon tradition. The cultural diversification process began with the dispersal of Jōmon people throughout the archipelago, which is thought to have coincided with the onset of the hypsithermal around 9000 years ago. Rising sea levels brought about by the warming Holocene climate inundated low-lying coastal plains and river valleys—known as the Holocene or Jōmon (Marine) Transgression—which forced the Jōmon people to relocate to higher ground (Matsui & Inoue 2013:180).¹⁴ Jōmon shell middens discovered about 100 kilometres from the current coastline of Japan provide evidence of the altered landscape (Imura 2013:32). A number of geographically discrete cultural-environmental zones appeared across the archipelago, each with a distinctive style of pottery (Aikens & Higuchi 1982; Kaner 2009). Archaeological evidence indicates that there was also significant regional and temporal diversity in subsistence practices, diet, population density, and material forms among the subcultures, as well as varying degrees of social complexity (Temple et al. 2011:324). Some surviving human skulls even exhibit evidence of physical modification in the form of ritual tooth ablation. This social practice was thought to have been used to express local or immigrant identity, although stable isotope studies reveal that it probably reflected dietary differences in

¹⁴ As a consequence of the global climatic warming, the relatively stable sea levels of the Incipient Jōmon (approx. 40 m lower than present) rose rapidly during the Initial Jōmon, and reached levels around 4–5 m higher than at present by the Early Jōmon. Many coastal sites were eroded or submerged in the course of the culmination of the transgression, before sea levels gradually decreased (Imamura 1996a:63; Habu 2004:730–32; Imura 2013:32).

subsistence task groups, or represented membership in kinship-based descent groups (Harunari 1986; Takenaka et al. 2001; Kusaka et al. 2008, 2009, 2011; Temple et al. 2011).¹⁵

The Jōmon Transgression culminated around 6500-5000 years ago (during the Early and Middle Jōmon periods), coinciding with the warmest part of the postglacial era—the Holocene Climatic Optimum—when the temperature was up to 2°C higher than at the start of the 21st century (Habu 2004:42-46, 2014:730). Although the loss of landmass displaced populations and necessitated more intensive subsistence patterns to maintain food levels (Pearson 1977:1240), due to the warm climate, natural resources were abundant in the Early and Middle periods. This enabled groups to prosper in most regions of Japan, particularly in the Kantō and Tōhoku regions (Matsui & Kanehara 2006:260; Kaner 2011:2).

A basic northeastern-southwestern division existed in the environment of Jōmon Japan. It appears that Jōmon lifestyles were better adapted to coastal areas and northeastern regions covered by temperate deciduous forests, or mountainous areas of boreal evergreen or coniferous forests, than to the warmer, subtropical evergreen woodlands of the southwest (Imamura 1996a:3; Bleed & Matsui 2010:359; Okamura & Takada 2013:9). Biotically rich and diverse ecotones—where mountain, river, and ocean resources converged—were especially densely occupied, such as around Tōkyō and Matsushima Bays. Favoured interior regions included the Japanese Alps (Aikens & Higuchi 1982). As coastal and interior peoples were ‘well established and quite self-sufficient within their particular small regions’, generally there would have been little need to migrate seasonally between coastal and inland living (Aikens & Higuchi 1982:184).

Current debates revolve around regional and temporal variations in Jōmon culture. Some Japanese archaeologists, such as Katō Hirofumi, advocate further division of the Jōmon period due to the existence of subgroups and subcultures (personal communication, 2018). This is an important topic that warrants further research.

¹⁵ Ritual tooth ablation (the practice of deliberately extracting teeth in various patterns) was a widespread custom from the Middle to Final Jōmon periods, with similar patterns seen among human skeletal remains across Japan (Kusaka et al. 2009:2289). The precise symbolism behind this practice remains a mystery, and may have varied geographically.

Subsistence Practices

Hunting, Fishing, and Gathering

Applying Lewis Binford's collector-forager model, people in the Incipient Jōmon period most likely relied on forager systems, implying high residential mobility. However, as new environments emerged across the Japanese archipelago at the beginning of the Holocene, an abundance of seasonally available natural resources enabled communities to become less mobile and more devoted to collecting.¹⁶

Subsistence activities included hunting terrestrial and marine mammals and birds, capturing forest ungulates (such as deer and wild boar) in pit traps, catching marine and freshwater fish, and gathering shellfish, eggs, and plant foods, including fruit and nuts, tubers, and mountain vegetables (*sansai*). Discarded food scraps reveal the species that were commonly utilised, some of which have been depicted in Kobayashi Tatsuo's Jōmon seasonal calendar (Fig. 2.2). The calendar illustrates that 'many activities undertaken by Jōmon people took place in particular seasons and coordinating these activities required a high degree of planning and scheduling.' (Kobayashi 2004:94) As a basic guide to Jōmon activities, this calendar overlooks subcultures by not showing regional and temporal variability in resources and subsistence practices, division of labour, or the relative importance of different types of resources in Jōmon diets (Aikens et al. 1986; Habu 2004; Perri 2016).

Jōmon people possessed intimate knowledge of their environment, its flora and fauna, and the properties of different (raw and processed) materials. They fashioned a large variety of general and specialised tools out of stone, bone, shell, wood, plant fibres, and animal tissues (classified as primary or type 1 tools in Jōmon archaeology). Shale and obsidian, for example, were used to make projectiles—bows and arrows were the main hunting tool—as these stones produce sharp blades when knapped. Researchers have long assumed that the Jōmon people also kept dogs (*Canis familiaris*) to assist with hunting in dense upland forests. Compared with their wild ancestors, the discovery of morphologically distinct dog and boar remains in villages, intentionally buried individually or alongside humans in graves, suggests that the Jōmon people domesticated dogs and likely tamed pigs (Crawford 2011:336; Okamura & Takada 2013:46-47; Perri 2016:1167). Dugout canoes carved from various timbers have been found in waterlogged deposits near rivers and lakes (Pearson 2009:vi),

¹⁶ In his collector-forager model, Binford (1980) emphasises the interconnectedness of resource distribution, subsistence activities, and settlement patterns.

indicating that the Jōmon not only possessed the technology necessary to negotiate coastal waters, but also skilfully manoeuvred canoes when fishing.¹⁷ Excavated fishhooks and harpoon heads imply that relatively large fish were caught by line fishing and spearfishing, and smaller fish in fishing nets with sinkers. The Jōmon people also understood the need for many plant foods to be processed—by cutting, grinding, pounding, leaching toxins, and/or cooking—in order to make them edible. This knowledge is reflected in the creation of various plant-food processing tools (e.g., grindstones and slabs, blades), stone and wood-lined facilities for processing with water, and residues from processed plants.

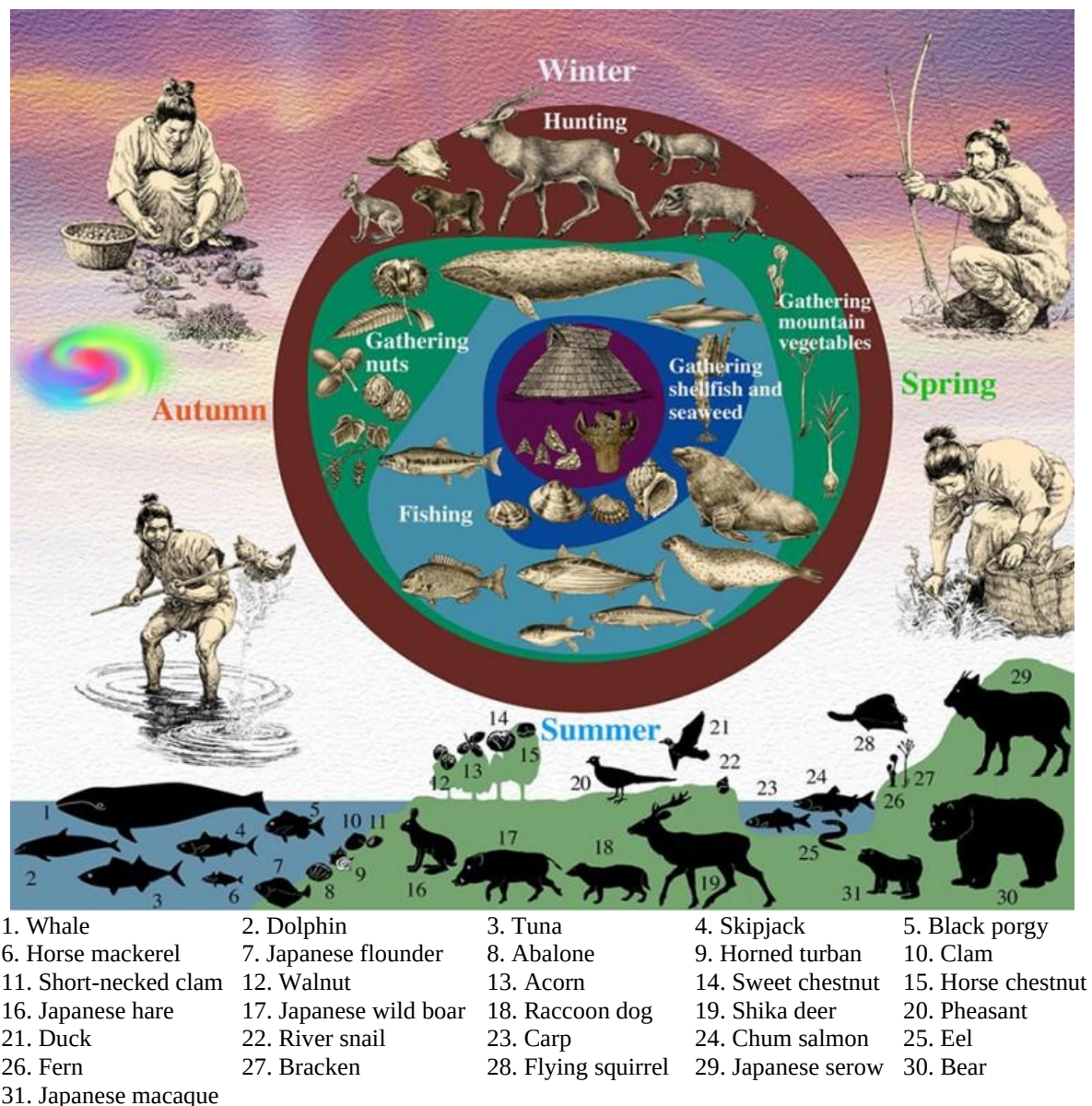


Figure 2.2. The Jōmon seasonal calendar (Kobayashi 2004:94).

¹⁷ Over 100 dugout canoes have been recovered from Early to Final Jōmon period sites (Naumann 2000:51), made from timbers including Japanese cedar, Japanese nutmeg, oriental elm, and camphor (Habu 2004:236).

The Jōmon diet varied across the archipelago.¹⁸ Yet, while terrestrial and marine resources were important, terrestrial plants were the staple food source, and when plentiful could support large populations (Imamura 1996a:90-91; Kusaka et al. 2015:300). This is unsurprising given that changes to vegetation resulting from the climatic warming increased the quantity and variety of edible plant foods.¹⁹ The creation of pottery vessels also helped people to utilise plant resources more widely, as it enabled them to process, cook, and store foodstuffs. Dietary differences between Jōmon populations inhabiting coastal and inland sites is strongly suggested by stable isotope studies of bone collagen (Koike & Chisholm 1991; Chisholm & Koike 1996; Yoneda et al. 2002a, b, 2004; Kusaka et al. 2010, 2015; Naito et al. 2013). The Jōmon are considered atypical hunter-gatherers since few other societies were able to sustain a relatively stable lifestyle and support such apparently high population densities prior to the advent of farming (Kaner 2009:15).²⁰ This difference appears to be the result of the people's ability to store foodstuffs, as well as cultivating plants and nut trees.

Food Storage

As specialist hunter-gatherers, the Jōmon were often dependent on a relatively narrow range of food resources, particularly in the temperate deciduous and evergreen broadleaf forests, where important nut-bearing trees grew (Habu 2004:63). Jōmon subsistence strategies centred around useful trees (e.g., acorns, sweet chestnuts, horse chestnuts, and walnuts) rather than grasses, as exemplified by the abundance of nut remains found in belowground (wet) storage pits (*chozōketsu*) throughout Japan, 'nut-shell' middens, and their practice of arboriculture.²¹ Nuts were valued as a nutrient-rich, staple food source that could be stored to help regulate the food supply. Cured meat and fish, ground nuts, seeds and grains, and fermented foods likely supplemented their reserves. Purpose-built raised-floor storage houses

¹⁸ The Jōmon diet has been largely reconstructed through analysis of floral and faunal remains, stone and bone tools, carbonised material, and pottery residues excavated at archaeological sites, as well as skeletal pathology and tooth decay (see Koike & Chisholm 1991; Fujita 1995, 2009; Fujita et al. 2007; Temple & Larsen 2007; Horiuchi et al. 2015; Kusaka et al. 2015).

¹⁹ At least 58 plant food species have been discovered dating from the Jōmon period (though few would have been major foods), which are characterised by abundance, ease of collecting and carrying, good taste, richness in nutrients, and degree of satiation after eating (Imamura 1996a:105).

²⁰ Other societies that may have achieved this include California, the Northwest Coast of America, Southern Florida, and possibly also Mesolithic southern Scandinavia.

²¹ The function of water-soaked wet *chozōketsu*—whether it was a convenient way to leach out nut tannins, prevent nuts from germinating, or an efficient way to eradicate insects—is still debated, but the preservation conditions of these pits are excellent. For example, an acorn discovered in a pit at Sakanoshita (Saga) sprouted after being dormant for 3000 years! (Imamura 1996a:121). In contrast, very few food remains have been recovered from dry *chozōketsu* due to poor preservation conditions. It is assumed that they were also used to store nuts, perhaps in baskets or other containers (Habu 2004:66-67).

(*hottate-bashira tatemono*) are also commonly found in Jōmon villages, especially in eastern regions (Bleed & Matsui 2010:362-63). These were valuable food processing technologies which allowed the Jōmon to focus on other activities such as pottery making, and would have provided security against poor harvests when they began to experiment with plant cultivation.

The oldest *chozōketsu* containing nuts date from the Incipient Jōmon period (e.g., deciduous acorns at Higashi-Kurotsuchida, Kagoshima), which suggests that the process necessary to make acorns edible—by boiling or soaking in water to remove the bitter tannic acid—was already acquired (Imamura 1996a:56-57, 88; Habu 2004:64).²² The number and scale of *chozōketsu* increased in the Early and Middle Jōmon indicating plentiful food supplies during the warm periods; implying a reduction in residential mobility and growth in population (Habu 2004:69). Still, it is too simplistic to suggest that food storage alone brought about a stable food supply. Many researchers suggest that plant roots may have also played an important part in the Jōmon diet, because chipped stone axes thought to be used in collecting plant roots are abundant in Middle Jōmon sites in the Kantō and Chūbu regions (Habu 2004:70). But the Jōmon people did not rely entirely on foraging wild resources; there is evidence that they also practised some form of plant and nut tree cultivation (arboriculture) (Kotani 1981; Habu 2004:69; Matsui & Kanehara 2006; Bellwood 2013:182).

Plant Cultivation

The Jōmon hunter-gatherers are thought to have created artificial ecosystems throughout the archipelago by managing useful plants, and encouraging certain tree species (e.g., chestnut, oak, beech, and buckeye) to grow through forest burning, although the evidence is inconclusive (Kitagawa & Yasuda 2004).²³ DNA, pollen, and macro fossil analyses indicate that chestnut (*Castanea crenata*) and horse chestnut (*Aesculus turbinata*) trees were cultivated, and perhaps even domesticated, during the Jōmon period (Habu 2004; Kitagawa & Yasuda 2004).²⁴ Based on evidence uncovered from Early to Middle period sites, it has been suggested that the Jōmon deliberately increased the size of nuts through artificial selection. Since cultivation of these nuts is fairly simple, it is conceivable that people would have

²² Some researchers consider this a major precipitant for the creation of pottery vessels in Japan, when humans were increasingly forced to rely on resources such as river fish and acorns as the Late Pleistocene terrestrial megafauna gradually disappeared (Pearson 2006:246; Wang & Sebillaud 2019:80).

²³ Chestnut trees require maximum sunlight exposure for optimal growth, so humans would have had to remove other elements in a forest to ensure an increase in fruit production (Kitagawa & Yasuda 2004). For a definition of cultivation see Gremillion (2014).

²⁴ Chestnut trees served many functions for the Jōmon; as food, fuel, building material, containers, and tools.

intentionally preserved or grown particular species near their settlements to ensure a sufficient food supply: a practice called *hansaibai*. It is quite possible that in some regions of Jōmon Japan an economic system based on the harvest and storage cycle of nuts could have been established: a potential model for the later cultivation and domestication of rice and other plants (Kitagawa & Yasuda 2004).

From the Early Jōmon onwards, subsistence strategies apparently embraced the domestication of numerous plant species, albeit not as staple foods (see Imamura 1996a:108; Habu 2004:59). Furthermore, archaeologists have unearthed plausible archaeobotanical and palynological evidence of plant cultivation—such as buckwheat and rice—in the last stages of the Jōmon era (Imamura 1996a:116). In short, a combination of abundant natural food resources, effective food storage methods, and plant cultivation enabled the Jōmon people to survive for over 12,000 years without the need to adopt full-scale agriculture.

Settlements and Sedentism

The transition from a relatively mobile settlement system to a more sedentary one began during the Initial and Early Jōmon periods, starting in the south and spreading northwards (Imamura 1996a:53). This was facilitated by the warming climate and the close proximity of mountains, rivers, and coasts across much of the archipelago, which usually provided abundant, perennial resources within easy reach of settlements (Aikens & Higuchi 1982:182). The degree of sedentism reflected the pattern of resource distribution. The ability to cook and store food in pottery and other containers also allowed a mostly sedentary residential pattern to be established and maintained with a hunter-gatherer-fisher economy.

Across the archipelago, a large number of semi-permanent villages were constructed, typically with pit-dwellings, burials, and storage pits arranged concentrically around a central area, with rubbish dumps (incorporating shell middens at coastal sites) on the periphery (Kobayashi 2004; Barnes 2015:273). Large buildings with thick wooden pillars, raised storage facilities, and earthen mounds for use as ceremonial spaces were also built at some settlements. A settled lifestyle led to population growth, which in turn enabled the development of craft specialisations (e.g., lacquering), a more intensive use of pottery, and the establishment of extensive exchange networks. More abstractly, it also promoted complex belief systems and the enrichment of artistic expression, as well as the construction of large

monuments, the performance of elaborate rituals and ceremonies, and perhaps even the emergence of social hierarchy.

During the Early and Middle Jōmon periods, people were able to adopt an increasingly sedentary lifestyle in Japan's temperate zone. Although there were various types of residential patterns in the Jōmon era, such as seasonal occupation of sites (semi-sedentism), in the deciduous broadleaf forests communities could live in one location all year round (Kobayashi 2004:113-14; Kaner 2009:52, 57; Habu 2014). Trade also helped to offset the necessity for frequent group movement (Gillam et al. 2010:35). Rising prosperity in the Middle Jōmon is evidenced by a further increase in the number and size of settlements, especially in the northeast (Imamura 1996a:93). Large, regional hub settlements formed, most notably Sannai Maruyama (Aomori), which represented the epicentre of Jōmon society for several centuries.²⁵ However, towards the end of the Middle Jōmon, there was a relatively rapid collapse in population, and nucleated settlements essentially disappeared; large settlements dispersed into smaller and more self-sufficient villages (Kobayashi 2010:91).

The Jōmon people often favoured slightly higher ground on which to build their settlements, such as well-drained tablelands, slopes, and river terraces, and close to natural sources of water. However, settlement density was particularly high in some lowland areas, such as the river deltas and coastal plains around Tōkyō and Ise Bays (Kawasumi 2013:30). The people were adept at converting marshy areas and riverbanks into stone and wood lined water storage facilities (reservoirs) (Yamamoto 1989, 1990; Steinhaus & Kaner 2016:24-25). Later, during the Middle-Late Jōmon, settlements were often relocated to lower terraces to ease access to abundant water for horse chestnut processing (Imamura 1996a:101, 116).

In order to protect the natural environment and local resources, and perhaps also to prevent human conflicts, the Jōmon apparently maintained a 'safe distance' of several kilometres from neighbouring settlements of similar size. For example, residents of Kitakogane (Hokkaidō) interacted with other groups living 7~10 kilometres away near Uchiura (Funka) Bay and beyond, but did not merge with them.²⁶ Some scholars have suggested that in certain areas during some phases, Jōmon people may have established quite distinct territories, but

²⁵ Covering an area of 42 ha, Sannai Maruyama is the largest Jōmon settlement yet discovered in Japan.

²⁶ See 'Pit Dwellings' information board located at the Kitakogane Shell Mound Historic Park site in Date city.

further research is required to confirm this hypothesis (Taniguchi 1993 in Kobayashi 2004; Horikoshi 1972 in Perri 2016).

Population

It is impossible to calculate accurately the population of a prehistoric society, leading inevitably to a range of estimates. This is especially true of the Jōmon era due to the relative scarcity—or rather very uneven distribution—of skeletal remains, and their semi-sedentary hunter-gatherer lifestyle. Some scholars have used changes in the number and size of settlements, as well as the relative proportion of stone tool types (indicating different subsistence practices) to assess population shifts over time (e.g., see Imamura 1996a for Kantō). Others, such as Koyama Shūzō, used the size and number of dwellings as their basis for calculating population density or, like Yamanouchi Sugao, basic comparisons with similar cultures elsewhere to estimate a total population (Sahara 1992:212-14).

Although the Jōmon population probably never exceeded 300,000 (Farris 1998:6), it fluctuated greatly over time (Table 2.2), as did the population density (Fig. 2.3). Both peaked in the Middle Jōmon, at levels rarely seen in hunter-gatherer societies, except for California. However, there were regional variations. Both population and density were higher in the east than in the west. The density was perhaps as much as ten times greater in the east; although in the southwest the apex was not reached until the Late Jōmon (Sahara 1992:214; Kawahata 2009:16). As discussed elsewhere, climate change and the intensity of food resource use were major contributors to overall population variations, while the east-west differential primarily reflected the abundance and types of food resources available (e.g., salmon, trout, and tree nuts were more plentiful in the former) (Kawahata 2009:16; Perri 2016:1170).

The average life expectancy of a Jōmon person was thought to be roughly 30 years (Shigehara 1994:337; Naumann 2000:61). Naturally high mortality rates associated with reproduction and childhood are largely responsible for this low figure; possibly accentuated by the practice of infanticide, especially if the baby was frail at birth (Sahara 1992:211). Above the age of 15, life expectancy improved to approximately 47 years, although mortality rates for females was highest among 20-24 year-olds, while for males it was a decade older (Nagaoka et al. 2008; Kawahata 2009:17).²⁷ Despite ample evidence of rich natural resources, some skeletal remains exhibit signs of malnutrition, illness, disease, congenital and

²⁷ This is based on the analysis of 234 skeletons over age 15, dating from the Early to Final Jōmon periods.

acquired disabilities, tooth decay, fractured and broken bones, and violence-related trauma; all of which indicate the hardships of life in prehistoric Japan (Naumann 2000).²⁸ Hence, very few Jōmon people lived beyond sixty years.

Table 2.2. Population Estimates in the Jōmon Period

	Incipient	Initial	Early	Middle	Late	Final
Total*	Unknown	20,100 (0.07)	105,500 (0.36)	261,300 (0.89)	160,300 (0.55)	75,800 (0.26)

Modified from Kawahata 2009. *These calculations exclude Hokkaidō and the Ryūkyū Islands.

Numbers in parentheses indicate population density per km².

Note: there are errors in Kawahata (2009) Table 2. The population in the Late Jōmon Chūbu region should be 22,000, and total population for the Early Jōmon should be 105,500.

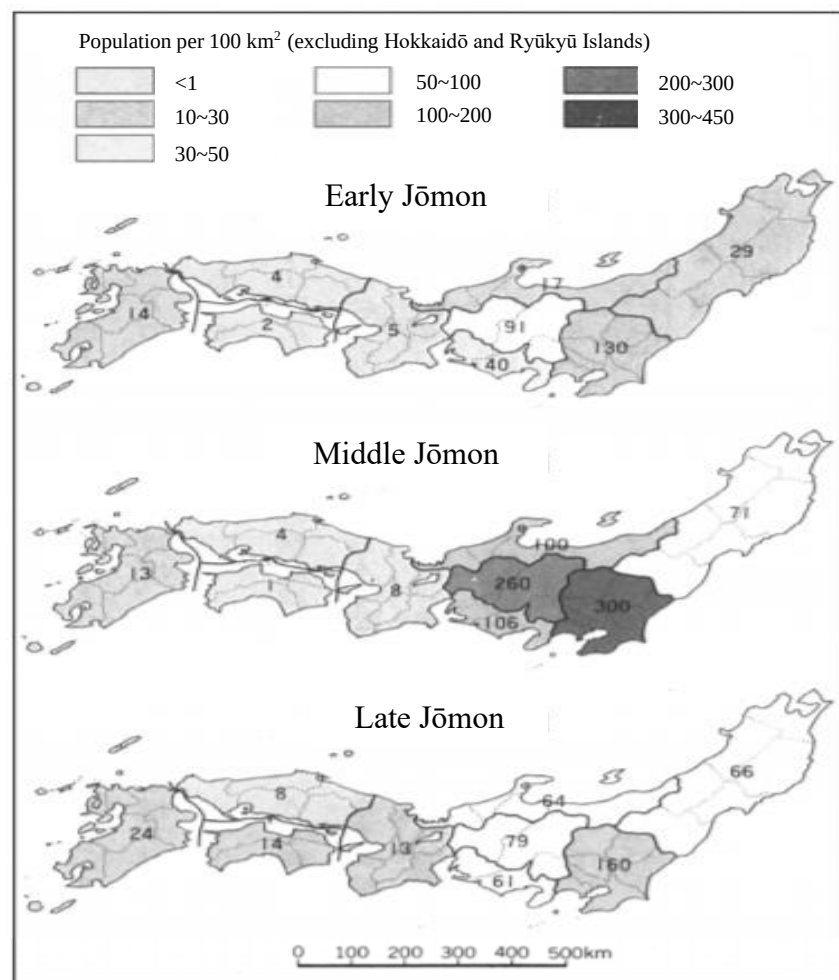


Figure 2.3. Population density in the Early, Middle, and Late Jōmon periods (modified from Kawahata 2009:16).

²⁸ Temple (2007, 2008, 2010, 2011) also found that the Jōmon people suffered from long and severe periods of physiological stress, chronic illness, and a variety of nutritional and other health issues, including linear enamel hypoplasia, cribra orbitalia, and periostitis.

Craft Specialisations and Trade Networks

With a rising population adopting increasingly settled lifestyles, the Jōmon hunter-gatherers were able to develop craft specialisations and establish extensive and long-distance trade networks across the Japanese archipelago. The enrichment of artistic expression saw the creation of, *inter alia*,

- more elaborate pottery forms (e.g., flame pots or *Kaen-gata doki*) and clay figurines (*dogū*),
- a multiplicity of jewellery made from diverse materials (e.g., decorated clay earplugs, stone slit-earrings, bone and antler hairpins and pendants, shell bracelets, jade bead-necklaces),
- labour-intensive stone implements (e.g., phallic-shaped stone rods (*sekibō*), obsidian tools),
- functional items made from perishable materials (e.g., textiles, basketry, woodwork), and
- lacquerware (e.g., red-coloured pottery and wooden vessels, wooden combs).

Such products—many of which were traded and probably used as prestige goods—demonstrate the advanced skills of Jōmon craftsmen.

Wide-ranging exchange networks supported the trading of resources—both raw materials and (semi) finished products—such as amber, asphalt, jade, lacquer, obsidian, salt, serpentinite, and exotic shells. The prosperous Middle Jōmon period saw numerous exchange systems thrive, especially jade and obsidian in the central, eastern, and northern regions of Japan.²⁹ Dugout canoes facilitated long-distance exchanges. Jade beads, for example, were transported hundreds of kilometres along the Japan Sea coast by canoe, from its main source in Itoigawa (Niigata) to northern Jōmon sites such as Sannai Maruyama (Braddick 2015).

Spiritual Culture and Mortuary Practices

The Jōmon people also developed complex belief systems that helped them to comprehend the natural cycle of life and death and their place within the world. Their worldviews and spiritual beliefs—of which animism and the existence of incorporeal beings are thought to have been a part—were expressed in countless artefacts made for ritual purposes, in large-scale monuments built to facilitate communal ceremonies, feasts, and festivals, and in mortuary practices.

²⁹ See Bausch (2003, 2004, 2010, 2012) for studies on jade, amber, obsidian, serpentinite etc. in central and eastern Japan, and Braddick (2015) for a detailed study of the Jōmon jade trade in northern Japan.

Ritual Artefacts

A multiplicity of ambiguous artefacts, including ornaments shaped like humans, animals, and even mushrooms, have been unearthed across Japan, particularly at ceremonial sites such as monumental stone circles. These are classified as secondary or type 2 tools in Jōmon archaeology since their specific functions are uncertain (in contrast to primary tools), and are considered unique to the Jōmon culture.³⁰ Based on excavation contexts, however, secondary tools such as *dogū*, *sekibō*, and sword-like stone objects (*sekitō*) are thought to have been used in ceremonies and rituals to pray for, *inter alia*, fertility, abundant food supply, and safety in hunting and childbirth (Habu 2004). The wildly imaginative forms and elaborate ornamentation featured on many of the artefacts also seem to reflect their ceremonial nature. Commonly identified motifs such as fire, water, snakes, and the womb are believed to symbolise birth and rebirth (Kobayashi 2004). Markings found on figurines suggest that such designs may have been tattooed on humans as well. Given their strangely exaggerated and unhuman-like features (particularly on their heads/faces), Kobayashi (2004:155) asserts that *dogū* transcend gender and represent the physical embodiment of invisible elusive spirits whom the Jōmon believed were responsible for the regeneration of flora and fauna (Inoue 2009:118-19; Kaner 2009:62; Miho Museum 2012:222-23). Though their precise functions in society remain unclear, *dogū* and other secondary tools played an important role in supporting the spiritual views of the Jōmon people.

Stone Circles

From the Initial to Final phases, rituals and ceremonies were often performed at special locations within the landscape where monuments had been constructed. Similar to his interpretation of *dogū*, Kobayashi (2010) believes that monuments were the physical manifestation of the Jōmon people's intangible worldview. In their attempts to reveal important elements of their belief systems, they built numerous circular features, and erected stone and wooden structures (often aligned with the sunrise/sunset of the solstices) to determine the cardinal points and the timing of calendric rituals.

The Jōmon people constructed many large stone circles (*kanjō resseki*); coinciding with similar structures from the Late Neolithic and Early Bronze Age in north-western Europe

³⁰ Since no Jōmon type 2-like tools have apparently been found in contemporary cultures on the Korean Peninsula, continental China, or coastal Siberia, they symbolise the Jōmon people's individuality and originality (Kobayashi 2010:28).

(Burl 2000; Bradley 2001). These appeared across central and northeastern Japan, with prominent examples from the Late and Final phases concentrated in northern Honshū: Ōyu; Isedōtai; Ōmori Katsuyama; Komakino, and Washinoki. Stone circles were typically built away from villages, and often where a symmetrical cone-shaped mountain was visible; mountains being of particular interest to the Jōmon (Kobayashi 2010:25-26).³¹ They are thought to reflect the circular shape of settlements, although others consider their prototype to be *kanjō haisekibo*; a burial practice from the Middle Jōmon where a grave pit was encircled by arranged stones (Okamura & Takada 2013:78).

The purpose of Jōmon stone circles is much debated, but in many respects discussions mirror those from north-western Europe. The discovery of pit graves, jar burials, and stone grave markers adjacent to the circles suggest that they functioned as cemeteries, but since some stone circles lack these features, the prevailing view is that they fulfilled a broader range of ceremonial and ritual activities (Kodama 2003; Okamura & Takada 2013). Their geographical setting and the discovery of countless type 2 tools (e.g., clay figurines, bell-like clay objects, stone rods, and triangular stones), reinforces the theory that they played an important role in the period's spiritual culture. More recently, however, it has been suggested that stone circles were in fact villages (Okamura & Takada 2013:78). This idea is based on the proximity of excavated remains of everyday structures such as pit-dwellings, storage pits, and rubbish dumps, as well as clay and stone implements used in daily life (type 1 tools). Yet, some stone circles were enormous feats of civil engineering that likely required the cooperation of several villages to construct and operate, making the village theory less plausible.

Monumental structures like stone circles were created to be prominent landmarks, and would have required a high degree of planning, group mobilisation, cooperation, social organisation, and many people and man-hours/generations to complete (Kobayashi 2004). Archaeologists estimate that construction of the massive Ōyu stone circles (Akita)—measuring 52.25 metres and 44 metres in diameter with over 7200 stones—for example took more than 200 years, and likely involved the participation of multiple villages in the surrounding region. The Jōmon peoples' understanding of the flow of time is thought to have evolved from monumental construction projects (Kobayashi 2010:22). The past was represented by sections completed

³¹ Cultural landscapes located in mountainous regions symbolised the spiritual links between a community and its environment, and likely evoked a sense of topophilia.

by the ancestors, the present by parts added with friends, and the future by descendants in whom they trusted to finish the construction. Thus, the building of monuments not only facilitated communal ceremonies, but also served to strengthen and maintain social bonds across space and time.

Mortuary Practices

Burial methods varied regionally and temporally, but the Jōmon people typically buried their dead in simple pit graves (*dokōbo*), with the body placed in an extended (*shintensō*) or flexed position (*kussō*). Infants and children were usually buried separately in pottery jars. Double or multiple burials occurred less commonly, and cremation burials were rarer still. Jars and pit graves were also used for secondary burials; the latter being generally smaller than primary grave pits and frequently associated with stone arrangements. Graves are often difficult to identify, particularly at inland sites, due to the poor preservation of skeletal remains in highly acidic soils (Kaner 2009:60).³² In many cases, the only indication of their existence are stone grave markers and/or the pit itself, although some have grave goods such as pottery, stone tools, jewellery, and *dogū*, or a scattering of red pigment inside.³³ Skeletons tend to be better preserved at coastal sites, where they were protected from disintegration by shell middens.³⁴ Besides being a rubbish dump, shell middens also functioned as a sacred place where bodies of the deceased were buried (Kobayashi 2010:19).

Burial sites migrated over time from within settlements to without. Relatively few burials have been found from the first half of the Jōmon period, a scarcity that Naumann (2000:75) suggests might be partly due to the dead being left exposed to the elements. Yet, with the establishment of a sedentary lifestyle, graves in the late-Initial, Early, and Middle phases were usually incorporated into settlements or in defined burial areas (communal cemeteries); rarely were pit graves built in isolation (Habu 2004; Okamura & Takada 2013:74, 77). There was little difference in the size and structure of graves, and grave goods were not common.

³² Jōmon skeletons are subject to similar environmental threats to preservation as those found elsewhere in the world; from human activity (e.g., agriculture, construction) and natural processes (e.g., taphonomy, climate, sea level changes, seismic activity). However, overwhelmingly the main threat to the survival and preservation of Jōmon skeletons is Japan's highly acidic soils.

³³ Hashimoto (2004) suggests that red pigments such as ochre were scattered in burials either as protection against evil spirits or to pray for rebirth. This mortuary ritual dates back to the Late Palaeolithic in Hokkaidō, but was rare elsewhere in Jōmon Japan.

³⁴ Acidic soil is neutralised when rain water dissolves the calcium carbonate in shells in the surrounding soil. This adheres to and permeates buried bones, solidifying and preserving them by promoting their fossilisation.

From the Late Jōmon period, burials increasingly occurred outside villages, including at large ceremonial sites such as stone circles, perhaps reflecting shifting views concerning the dead. This shift is manifested in the construction of around 70 *shūteibo* (communal graveyards within a circular embankment) at thirteen sites in Hokkaidō (Kobayashi 2010:56-57). Most notably, a group of eight monumental *shūteibo* were found at Kiusu where at least 70 graves are known to exist, some with grave goods (Horikoshi 2001; Sakaguchi 2011; Okamura & Takada 2013:92).³⁵ A pit-structured burial facility without an accompanying barrow is unusual among the world's prehistoric cultures, and shows a mortuary system peculiar to the Jōmon culture. There was also an increase in secondary burials and stone-lined graves (*sekikanbo*), which were often built away from settlements (Okamura & Takada 2013:75). Discoveries at some communal cemeteries of multiple grave goods within small groups of graves are thought to perhaps indicate hierarchical status differences. Moreover, exquisite grave goods (e.g., amber and jade beads) found only in the centre grave may reflect the deceased's special position within the community (Okamura & Takada 2013:22).

Social Structure and Hierarchy

The emergence of social hierarchy in the Jōmon period remains a matter of dispute amongst scholars. The mainstream view is that there was no significant hierarchy among the Jōmon because in hunter-gatherer societies people generally work together to collect food, and then share it communally. However, Kobayashi (2004:133) argues that a high degree of social organisation existed in this period, since it was essential for the creation of large-scale structures and monuments. Indeed, it is difficult to imagine how enormous earthworks, massive stone circles, and large village buildings were raised without some kind of group organisation, planning, division of labour, and perhaps some form of leadership (Okamura & Takada 2013:21). According to Steinhaus and Kaner (2016:27), 'It is now widely accepted that Jōmon society was structured in various complex ways, with community leaders, considerable levels of group organization, task distribution and systematically planned actions.' The existence within settlements of defined groups has also been proposed, based on variations in the arrangement of stone piles in stone circles, implying that tasks were assigned to specific groups (Steinhaus & Kaner 2016:27-28). Disputes between these different social units may *in extremis* have resulted in intragroup aggression.

³⁵ With a volume of roughly 3000 m³, the largest burial circle at Kiusu (measuring 75 m in diameter and surrounded by a 5.4 m embankment) is estimated to have taken 20 people roughly 150 days to construct.

Evidence of individual status differentiation is limited, but such conditions might have led to the emergence of social stratification within Jōmon society. Some scholars (see Nakamura 1999, 2000; Pearson 2007) have used grave goods to determine whether or not there was social inequality. Kobayashi (2004) even posits the existence of slaves who were not buried in graves, based on the discovery of fewer graves than dwellings at some settlements. Habu (2004) and Okamura and Takada (2013) date the emergence of social inequality to the Late through Final Jōmon period, especially in eastern Japan. An organised social structure in the Jōmon era is apparent, and almost certainly facilitated the adoption of wet-rice agriculture in the subsequent Yayoi period, but this does not necessarily presuppose the appearance of established hierarchies.

Decline of the Jōmon

The relatively warm and stable climate that had facilitated and supported the prosperity of the Early and Middle Jōmon periods began to deteriorate around the end of the Middle phase. For the next several thousand years, Japan experienced a cooling trend or neoglaciation which saw an overall temperature decrease of around 2°C (Habu 2004:42-43, 2014:730). The slowly cooling climate caused turmoil throughout the archipelago and had a dramatic impact on the people, particularly those residing in inland regions, whose stable lifestyle had depended on the abundance of natural resources in forested areas.

With a less productive environment the population inevitably declined, as indicated by a sudden decrease in the number, density, and average size of known settlement sites, especially in western Kantō and the Chūbu highlands.³⁶ This waning did not occur at an equal speed or with equal effect across the archipelago; some areas even enjoyed a cultural efflorescence. Nevertheless, most remaining communities were forced to move to lowland coastal and waterlogged areas, and rely instead on marine resources for sustenance (Imamura 1996a:90; Kaner 2009:18, 38). The slight increase in shell midden sites along the Pacific coast of Honshū in the Final Jōmon phase demonstrates this shift. Generally, settlement patterns were transformed from large centralised sites to smaller decentralised villages (Aomori-shi Kyōiku Inkai 2006:166).

It is quite likely that disease and stress exacerbated the serious challenges confronting Jōmon communities across Japan during the increasingly uncertain times. For example, Temple

³⁶ These areas had enjoyed the highest level of prosperity in the Middle Jōmon (Imamura 1996a).

(2010) discovered that among the Jōmon people in western Japan, teeth affected by linear enamel hypoplasia were especially prevalent during the Late and Final periods, which he argues was caused by nutritionally inadequate food and seasonal scarcity. This problem was likely compounded by the arrival of ‘climate change refugees’ from eastern and central Japan (Perri 2016), which led to an increase in population that strained the region’s carrying capacity.³⁷

Spiritual practices became very important during the Late and Final phases, perhaps in response to the cooling climate. Following a sharp decline in the production of objects such as pottery and *dogū* during the Middle-Late Jōmon transition (as a consequence of the deteriorating natural environment), the subsequent periods saw a revival with new and distinctive forms introduced (Kaner 2009:44).³⁸ In particular, northern Tōhoku and Hokkaidō (where the Kamegaoka culture flourished) witnessed an increase in the number of secondary tools and structures, whose function was most likely ceremonial. In northern Honshū, stone circles emerged in the Late and Final Jōmon, where large quantities of ceremonial pottery, clay figurines, masks, bells, stone knives, and other artefacts have been found, indicating a preoccupation with rituals (Kobayashi 2010; Kaner 2011). In short, the dramatic change in climate caused a decline in populations and settlements, but regional growth in the number of ceremonial sites and ritual artefacts, which lasted until the Final Jōmon in northeastern Japan and until the Initial Yayoi in southwestern Japan (Imamura 1996a:120).

Jōmon to Yayoi Transition

Though the origins of the Jōmon era are somewhat opaque, its demise is more clearly understood. Political turmoil on the Asian continent caused waves of migrants to arrive in northern Kyūshū from Korea (some having originated in China), whose physical appearance differed markedly from that of the Jōmon people (Steinhaus & Kaner 2016).³⁹ Yet, due to a lack of archaeological and especially skeletal materials dating to this time, debate continues regarding the length of the transition period from the Final Jōmon to the Initial Yayoi (Nakahashi & Iizuka 2008:131). The same problem makes the scale of migration difficult to

³⁷ However, using strontium isotope analysis of dentition, Kusaka et al. (2012) found that a gradual population increase in western Japan during the Middle–Final Jōmon period was not caused by climatic cooling-induced immigration, but was mainly the result of rises in indigenous populations.

³⁸ In the Late and Final Jōmon periods, *dogū* became very elaborate with various abstract features such as goggle-eyes, heart-shaped or masked faces and triangular heads, and some had both male and female characteristics (Habu 2004:144; Miho Museum 2012:98).

³⁹ Due to Jōmon isolation on the Japanese archipelago extending over 12,000 years, they retained physical features from earlier hunter-gatherer populations living in eastern Asia (Nakashima et al. 2010:788).

estimate, although many Japanese archaeologists believe that it was substantial, especially in the Kyūshū and Chūgoku regions (Kazumichi 2001:22-23; Mizoguchi 2002:119; Habu 2004:259).

The Yayoi period is characterised by the rapid introduction of the techniques of metallurgy, animal husbandry, silk spinning, and most importantly wet-rice cultivation. The migrants also brought a radically different belief system, a hierarchical social structure, novel pottery forms, iron tools, innovative building styles, different burial practices and, almost inevitably, new infectious diseases and language(s) (Imamura 1996a:10-13; Kaner 2009:15; Kawahata 2009:17). All of this resulted in a rapid population increase, a surge in the number and size of settlements, and increased population density. People now became more sedentary; constructing large enclosed villages, with above ground thatched houses, shared paddy fields, raised granaries, and cemeteries (Imamura 1996a).

There are few places in the world where the emergence of agriculture brought about such rapid changes as in Japan. One reason is because agriculture began much later on the Japanese archipelago than on the Asian continent, so it arrived in a highly developed form. Yet, many established features of the indigenous Jōmon culture facilitated the introduction of agriculture, including an awareness of the advantages of cultivation and an understanding of the harvesting cycle, pottery, storage facilities, and a semi-sedentary lifestyle. It was recently discovered that the Jōmon people had invented digging sticks, wooden ploughs, and hoes; all of which they used in cultivation (Okamura & Takada 2013:17). In western Japan, where food was scarcer, this led to a basic willingness to adopt the complex structures and intensive form of agriculture introduced as a package by the Yayoi. This caused the Jōmon period to end here earlier than in the rest of the archipelago.

The Yayoi farmers continued some Jōmon practices, such as preserving and storing food in pits, pots, and raised-floor storage houses, and adapted them to preserve their surplus rice. However, they also introduced domesticated pigs and constructed ever more paddy fields—which required vast amounts of land, water, and labour—even in less suitable hilly areas (Imamura 1996a:144). Hence, the migrants gradually spread northwards from Kyūshū, and quickly assimilated, eliminated, or displaced most of the indigenous Jōmon populations and their cultures (Hudson 1999:103; Lee & Hasegawa 2011:2). In the northeast (including the Kamegaoka culture), social complexity and a productive and efficient marine-based subsistence economy meant there was strong cultural resistance to becoming farmers until the

late-Middle Yayoi period (Barnes 1993:176, 185). Nevertheless, it is highly likely that the Yayoi interbred with the Jōmon (Temple et al. 2008:165); a view supported by skeletal remains found in Kyūshū and Kantō (Imamura 1996a:148).

The remaining Jōmon populations were forced to relocate to the northern and southern extremities of Japan, where the landscape and environment was unsuitable for wet-rice agriculture (Imamura 1996a:209). Thus, in chilly Hokkaidō and the hilly Ryūkyū Islands, the hunter-gatherer-fisher lifestyle of the Jōmon era continued for many centuries: known as the Epi-Jōmon and Shellmound periods, respectively. Neither were incorporated into the Yayoi culture, and for much of their history, most Japanese people did not consider Hokkaidō and Okinawa as part of Japan (Imamura 1996a:198).

The Yayoi hastened Japan's conversion to a fully agrarian economy, but also triggered frequent armed conflict over the limited amount of land suitable for rice cultivation, access to water and ore, as well as any agricultural surplus (Bayrd 1974:15). The frequency of conflict is evident from the construction of numerous defensive settlements (some with moats, others on hilltops), the production of large quantities of weapons (including arrowheads, swords, and halberds), and the prevalence of Yayoi skeletal remains with arrowheads and bronze weapon fragments and injuries (Imamura 1996b:460; Lee & Hasegawa 2011:5). With the inter-related development of settled agricultural villages, warfare, and chiefdom-based social ranking, the fundamental structures of the ancient Japanese state were established (Underhill 1990; Hudson 1999; Habu 2004; Mizoguchi 2006; Pearson 2016).

Concluding Thoughts

Characterised by a hunter-gatherer economy, the long Jōmon era began with the development of pottery and ended with the introduction of wet-rice agriculture and metallurgy from continental Asia. Having adapted to Japan's extreme seasonal fluctuations, the Jōmon dominance of the archipelago endured for over 12,000 years. They were unusual hunter-gatherers because in addition to hunting and fishing, their ability to cultivate certain plants and nut trees and cook and store foodstuffs resulted in food abundance, which enabled them to live increasingly sedentary lifestyles (in semi-permanent settlements). Subsequently, this led to the development of craft specialisations, a rich and diverse material culture, extensive and long-distance exchange networks, complex belief systems, intricate ritual practices, construction of large structures, and perhaps ultimately the emergence of some kind of

hierarchical society. As the climate cooled, the environment became less productive, and hence the prosperity and population of the Jōmon slowly declined. The arrival of Yayoi migrants accelerated their demise, although Jōmon culture survived at the extremities. Despite thousands of archaeological excavations and discoveries, much remains to be learned about the Jōmon people. Whether any of these characteristics help to explain the pattern of violence experienced in Jōmon society will be explored in subsequent chapters. The following chapter will narrow the focus to discuss theoretical understandings of violence and nonviolence in archaeology and related fields, and how these ideas have been applied in the study of prehistoric Japan.

3. Violence and Nonviolence: A Theoretical Discussion

‘Violence has played an essential role in human social relations.’ (Pérez 2012:13)

‘Nonviolence and peace are natural, ubiquitous, and normal in the human species throughout its evolution and adaptation.’ (Sponsel 2015:624)

From ancient Sparta to America’s ‘greatest generation’, western history is replete with accounts that glorify violence. Since this history was, until recently, a predominantly male-centric enterprise, it is perhaps not surprising that cultural biases emerged which perceived humans as innately aggressive and competitive rather than cooperative and peaceful. Consequently, the academic literature on violence is vast; having grown to the point where no individual can possibly embrace the totality. In contrast, the field of nonviolence and peace studies has a post-World War II pedigree, although it has expanded rapidly, especially since the 1980s. Yet, despite a preoccupation with discovering the origins of aggressive behaviour, violence in the past is still poorly understood, and its relationship with human social evolution remains controversial; whether humans are becoming more or less violent over time.

To answer such fundamental questions as why humans are (non)violent requires a strong theoretical framework, without which bioarchaeological studies remain primarily descriptive rather than explanatory (Martin et al. 2012:6). As a relatively recent arrival on the scene, bioarchaeology has had to draw on a variety of disciplines and sub-disciplines—biology, ecology, demographics, philosophy, psychology, socio-economics, etcetera—to help inform a discussion on the nature of violent human behaviour. Specifically, this chapter will examine theories about whether (prehistoric hunter-gatherer) societies were inherently violent, or if not, under what circumstances some cultures were able to avoid major conflict.

Violence and Warfare in Hunter-Gatherer Societies

Traditionally, there were two main explanations for the origins of human violence and warfare. One conception, which originated with the English philosopher Thomas Hobbes (1588-1679), asserted that warfare is inherent in human nature. Hence, violence and warfare were pervasive even amongst ancient small-scale hunter-gatherer-forager societies. In contrast, the Swiss-French philosopher Jean-Jacques Rousseau (1712-78) claimed that hunter-gatherers (or ‘savages’ as he called this stage of human development) were essentially peaceful, and intergroup violence only became prevalent after the emergence of sedentary societies with complex socio-political structures (Allen et al. 2016:12120; Nakao et al. 2016:1). In the former, hunter-gatherers were characterised as aggressive, barbarous savages who were constantly fighting each other, whereas in the latter they were romanticised as peaceful, amicable people enjoying idyllic lifestyles in stress-free environments. This debate, sometimes characterised as ‘hawks versus doves’, remains very much alive in anthropology (and archaeology), although the arguments have been refined and become more complex over time. Since the nineteenth century, views on the origins of violence have also been influenced by the field of evolutionary biology.

Evolutionary Theory

Human evolution theory was long dominated by a contest between those who essentially ignored violence, and followers of Hobbesian logic who argued that competition and violent conflict are inevitable; warfare having begun with our ancestral hominids. While controversial (even at the time), in the 1950s anthropologist Raymond Dart devised the ‘killer ape hypothesis’, claiming that the origin of humans began with cannibalism. He used damaged *Australopithecus* skulls and animal bones employed as tool-weapons to argue that human ancestors were distinguished from other primate species by their greater aggressiveness, and hence concluded that the urge to violence was an essential element of human psychology (Sahara 1992; Derricourt 2009). Further evidence of violent trauma on the skeletal remains of Neanderthals (e.g., Sima de los Huesos) and inter-troop killings amongst modern chimpanzees have also been used to buttress this theory (Suzuki 1999:37; Redfern 2017:11).⁴⁰ Gómez et al. (2016) proposed that aggression in mammals, including humans, has a significant phylogenetic component. Their study resulted in a predictive value for lethal

⁴⁰ Interpretations of the skeletal injuries vary from predation by large carnivores to hunting accidents, and from interpersonal violence to group fighting.

interpersonal violence of two per cent for humans—similar to that phylogenetically inferred for the ancestor of apes and primates—and close to that found in the archaeological record for prehistoric hunter-gatherers. This strongly suggests that violence is embedded in our genetic code, although they conceded that culture can temper this inherited propensity for lethal violence.

The Hobbesian hypothesis has not escaped challenge however. Czech archaeologist Slavomil Vencl (1984), for instance, asserted that humans shared an innate biological inhibition against killing their own species until cultural differences emerged with increased settlement density and fixed hunting grounds, e.g., during the Mesolithic era in Europe. More recently, the re-evaluation of existing human and animal data is revealing that cooperation, sharing, empathy, and reconciliation also had an evolutionary source (Fry 2012:879-80). After noting the physical similarities between *Ardipithecus ramidus* (a species of australopithecine) and bonobos, Fry concluded that early humans were unlikely to have been peak predators and, of necessity, this vulnerability imposed on them a kind of defensive group cooperation. Fry and Söderberg (2013:272) have even proposed an evolutionary counter-hypothesis which suggests that ‘lethal behaviour has been strongly selected against, not favoured, in comparison to more restrained conflict behaviour.’

Similarly, in his study of behavioural parallels between chimpanzees, bonobos, and human mobile foragers, cultural anthropologist Christopher Boehm (2012) identified traits that each descendant lineage may have inherited over the past 5~7 million years from our most recent shared ancestor (*Pan*). He concluded that all three have coevolved the capacity for both conflict and conflict management, which we retain. In other words, despite our inherited competitiveness and fighting capabilities, humans have a genetic predisposition to minimise stress (serotonin) levels by avoiding conflict. Examples of tension reducing techniques he cites include reconciliation, third party mediation, truces, and spatial avoidance (Boehm 2012:846). But Boehm’s interpretation of the evidence is questionable; might humans have only developed conflict management skills after experiencing the consequences of significant, enduring violence, as Bowles (2009, 2012) argues below. Other scholars have gone further and directly contradicted Boehm’s conclusion, namely, that in order to release psychological tension, humans act aggressively towards others, arguably as a result of biological evolution (Kobayashi 2003:17; Nash 2005:80). Yet, neuroscientists have also discovered that cooperation induces an immediate oxytocin reward in humans which may

have reinforced collaboration, trust, and altruism in the long term (Rilling 2011:304; Fry 2012:880).

In his study of peace systems, American anthropologist Douglas Fry (2012) added compensation for loss to Boehm's list of conflict resolution strategies. He discovered that several societies, namely, the Upper Xingu River basin tribes of Brazil, the Iroquois Confederacy of upper New York State, and the European Union, have managed to eliminate internecine warfare. Fry identified six common elements in the three systems which he deemed vital to the establishment and maintenance of peace within societies:

1. Overarching social identity;
2. Interconnections among subgroups;
3. Interdependence;
4. Non-warring values;
5. Symbolism and ceremonies that reinforce peace, and
6. Superordinate institutions for conflict management

Fry's three 'peace systems' may not have entirely prevented lethal aggression between member societies, but their existence nevertheless lends credence to the theory that a peaceful social order is attainable, at least in the medium-term. Still, his study is largely based on ethnographic and historical evidence, leaving unanswered the question of whether such factors can be translated into archaeological evidence, and indeed whether 'peaceful' (minimally violent) prehistoric hunter-gatherer societies existed at all.

Hobbesian Theory

Modern proponents of Hobbesian theory highlight archaeological evidence of smashed skulls in burials, skeletons with severed, broken, or missing body parts (particularly heads and forearms presumably taken as trophies), projectile points embedded in bone, and apparent massacre sites such as at Nataruk, Jebel Sahaba, and Ofnet (Bowles 2012:877; Allen et al. 2016:12120). Allegedly populated by 'savages' who regularly engaged in raiding, feuding, and intergroup warfare, prehistoric hunter-gatherer societies apparently experienced high mortality rates. Scholars such as Keeley (1996), Otterbein (2004), and Pinker (2011) have even claimed that ancient hunter-gatherers were more violent than agriculturalists.

Vencl (1984) saw clashes between hunting parties as developing into protection of hunting grounds, and according to Kobayashi (2003), this might have been the starting point for war. While Harrod et al. (2012b:277) dispute Hobbes' belief that humans are intrinsically violent, they recognise that over the millennia the skills honed through hunting and producing weapons made the recourse to arms an easy option. Otterbein (2004, 2011) made similar points, adding that competition between late Upper Palaeolithic groups hunting big game may have occasionally provoked violent confrontations, but thought that such 'warfare' subsided after the animals' extinction. Life was more peaceful when sedentism and agriculture later emerged, until city-states with centralised political systems developed modern warfare. Keeley (2006) dismissed Otterbein's dual origin hypothesis as unrealistic. Drawing on data from ten ethnographic and fourteen archaeological non-state societies, Keeley's (1996) influential study of mortality rates associated with warfare, *War Before Civilization*, had concluded that peaceful hunter-gatherer societies are very rare. He believed that the intensity of trade is a better indicator of the frequency of war than population density. Similarly, ethnographic evidence also reveals that warfare is a primary killer among some recent hunter-gatherer groups (Bowles 2012:877).

In his study of the extent of intergroup conflict among fifteen archaeological hunter-gatherer societies in North America, Europe, and Africa, Bowles (2009, 2012) acknowledged the significance of violence and warfare, but saw this as a precursor for human cooperativeness and altruism. He estimated the mortality rate from warfare amongst adult groups of hunter-gatherer skeletons at twelve to fourteen per cent. Using complex mathematical modelling, Bowles concluded that levels of intergroup violence were high enough to have stimulated a rapid increase in intragroup cooperation (parochial altruism), since this would have improved survival rates in violent clashes with neighbouring groups (Bowles 2012:878). However, it could be argued that human cooperativeness evolved not out of pervasive violence but rather simple companionship. Alternatively, a universal instinct for self-preservation in unpredictable environments and/or extreme climatic events were perhaps the drivers (Suzuki 1960; Redfern 2017). Moreover, violent behaviour is rarely regarded as conducive to cooperation since it facilitates power struggles, encourages the strong to dominate the weak, erodes trust, and degrades the social fabric.

Cognitive scientist Steven Pinker (2011) extended Bowles' work to the present day and gained some notoriety by arguing, *contra* Rousseau, that humans are becoming ever less

violent. In *The Better Angels of Our Nature*, he claimed that hunter-gatherer societies were anarchic and experienced chronic raiding and feuding, and hence the introduction of agriculture resulted in an eighty per cent decline in violent deaths. Using twenty-one hunter-gatherer sites from various periods and regions, he estimated the overall wartime mortality rate at fourteen per cent, and argued forcefully that by creating order the modern state reduced both the lethality and frequency of war. With an increase in sedentism, a specialised division of labour emerged; people became more interdependent, thereby raising the potential costs of violence.

Several recent papers have revealed limitations in both Bowles' and Pinker's research and questioned their interpretations of the archaeological data (e.g., Ferguson 2013). For example, the prevalence of violence in ancient and modern hunter-gatherer societies are not directly comparable (Fibiger et al. 2013; Lahr et al. 2016). Furthermore, Matsumoto (2018) pointed out that Bowles' and Pinker's dataset (the latter largely based on Keeley's work) did not distinguish between types of violent death, but simply lumped them all together as victims of war. Moreover, Nakagawa and Nakao (2017b) noted that the authors also failed to include in their tables the many spatiotemporally neighbouring sites where human skeletal remains without violent injuries have been unearthed, thereby inflating the trauma rate. A similar criticism had been made earlier by Ferguson (2013). Drawing on a much bigger database of 447 Palaeolithic sites (from pre-10,000 cal BC), Kissel & Piscitelli (2014) found the proportion of humans with traumatic skeletal injuries to be just 2.2 per cent. Unlike Kissel & Piscitelli, Bowles and Pinker also essentially ignored the East Asian region in their studies. Finally, although predating Bowles and Pinker, English archaeologist Parker Pearson's (2005:24-25) observation that a few solid examples of violence in a morass of ambiguous evidence are insufficient to conclude definitively that intergroup warfare was endemic amongst hunter-gatherers remains relevant. Like Ferguson (1997:326) before him, he also recommended caution lest intergroup violence such as skirmishes or feuds be mistaken for coordinated warfare.

Since the mid-1990s, however, it has become widely accepted among archaeologists and anthropologists that interpersonal violence was commonplace in many hunter-gatherer societies. Yet, even if all people have the capacity for violence and some are willing to assault and murder their fellow humans, this need not necessarily result in 'warfare'. Indeed, systematic examination of skeletal remains indicates that while the prevalence of violence

was elevated in some small-scale prehistoric hunter-gatherer communities, warfare was relatively rare in pre-sedentary societies (Gordón & Bosio 2012:640; Lahr et al. 2016:394; Matsumoto 2018:23, 36). In their ethnographic study of lethal violence among twenty-one mobile forager (band) societies, Fry and Söderberg (2013) found that more than half of the 148 lethal events involved only a single perpetrator and victim. Furthermore, approximately two thirds resulted from accidents, interfamilial disputes, intragroup executions, or interpersonal motives such as sexual jealousy. However, the authors failed to reveal the time period over which these events occurred, which could distort perceptions of individual societies because the intensity of violence is determined in part by the frequency of such incidents.

Many lethal disputes (even wars) have also arisen from simple insults, theft of property, incest, revenge, and other interpersonal reasons (Boehm 2012:846; Fry & Söderberg 2013:271-72). According to Boehm, our species is uniquely predisposed to retaliation, especially for the death of a close relative. Generally, revenge targets the responsible individual, but such incidents can sometimes escalate into blood feuds, since strong kinship groups foster an insular mindset that draws a clear distinction between ‘us’ and ‘them’. Intra- and inter-group conflict among hunter-gatherers may emerge due to this perceived need for revenge. Ritualised conflict may help communities to diffuse such tensions and escape these cycles of violence (Nash 2005).⁴¹

In contrast, some scholars have emphasised extrinsic rather than intrinsic factors as triggers for violence, such as resource scarcity. Allen et al. (2016) presented this in terms of a cost/benefit analysis. They argued that at times of low environmental productivity or natural disasters when resources are in short supply, competition between neighbouring groups intensifies. In other words, the rate of violence should increase as environmental productivity decreases. Another version of this argument claims that conflict is to be expected among hunter-gatherers because human populations tend to grow until they exceed the carrying capacity of their environment, causing violence over finite food and water resources (LeBlanc & Register 2004). However, extreme adversity also has a tendency to bring out the best in humans.

⁴¹ Ritualised violence is generally defined as structured, repeated, usually non-lethal forms of aggression that may be distinguished from more chaotic forms of violence such as raids and ambushes, but may also include modifications to flesh and bone such as dismemberment and trophy-taking (e.g., scalping) (Fibiger et al. 2013:191).

Rousseauian Theory

Followers of the Rousseauian tradition contend that violence was not common amongst hunter-gatherer groups, and warfare only emerged after the adoption of agriculture and sedentary lifestyles, further developing with the expansion of states and empires (Ferguson 1997; Redfern 2017). Cunliffe (2006), for example, reviewed a swathe of archaeological studies and concluded that while there were incidents of physical conflict among hunter-gatherer groups, they increased with the adoption of agriculture. The reasons cited for this are varied, including population pressures and strengthened competition for land and water resources. Vencl (1984:120) agreed, but cited immediate motives such as the desire for plunder and slaves as the inspiration for Neolithic farmers raiding neighbouring communities. More broadly, migration is seen as a further source of conflict, since it was apparently common amongst farming communities and helped to spur population growth and territorial expansionism (Redfern 2017:14).

The establishment or subsequent reordering of social hierarchy is also seen as a major catalyst for violence. Hierarchical societies (e.g., chiefdoms, kingdoms, states, and empires), often associated with the development of agriculture, are more inclined to participate in large-scale intergroup conflict than egalitarian hunter-gatherer-forager groups (e.g., bands and tribes) (Fry 2012:880).⁴² Some social conditions are more likely to induce and escalate violence than others, especially if there is radical or sudden change (Vandkilde 2015). For example, at the interpersonal level, someone exerting monopoly control over the supply of prestige goods or acquiring the hierarchical status of chieftain might produce violent envy in others. Similarly, individuals may be pressured by leaders to participate in lethal aggression for the benefit of their group, even at the risk of personal injury or death, especially if refusal involves social punishment (e.g., ostracism of ‘cowards’). Alternatively, young people may be enthusiastic participants in such conflicts as a means to gain personal prestige and shorten the path to leadership. In short, *contra* Pinker (2011), incidences of (lethal) violence should be positively correlated with increasing socio-political complexity and hierarchical organisation of human populations (Fry 2012; Allen et al. 2016).

⁴² Bands are small, nomadic, egalitarian groups of hunter-gatherers. Tribes are small, mostly egalitarian hunter-horticulturalists, usually settled permanently in villages. Chiefdoms are hierarchical pre-industrial societies that usually revolve around kinship. Finally, states are politically organised complex societies (Gómez et al. 2016:238).

Echoing Rousseau's theory, mid-twentieth century anthropologists reported that modern hunter-gatherers lived more peaceful lives than their agricultural contemporaries (Nakagawa & Nakao 2017a:91). Some archaeologists and anthropologists have since reasserted that intergroup conflict and warfare were relatively rare in both prehistoric and historic forager societies (e.g., Ferguson 2013; Fry & Söderberg 2013; Nakao et al. 2016; Nakagawa & Nakao 2017a, b; Matsumoto 2018). Vencl (1984), for example, has argued that violence was much less likely amongst hunter-gatherers because of their very low population densities. Sahara (2006) highlighted the weakness of religious motives for warfare due to underdeveloped spiritual belief systems. He added that limited food and other reserves meant there was little to plunder, and hence economic motives for intergroup violence were also weak; something Matsumoto (2018) saw as an incentive to cooperate with other groups in order to minimise the risk of starvation. Ember (2020) interprets the economic factor slightly differently, implying that hunter-gatherers fight less than farmers because they tend to exploit a wider range of foodstuffs, and hence are less susceptible to resource unpredictability and famine. According to Ember, hunter-gatherers that relied on foraging were more likely to engage in intergroup violence, whereas those who were predominantly fishers tended to contain fighting within the group. She ascribes this difference to a gendered division of labour: the female contribution to subsistence being high amongst foragers and vice versa. Matsumoto (2018) believes that hunter-gatherer values such as egalitarianism, autonomy, generosity, and mutual aid beyond the kinship group helped to prevent the concentration of power, and hence intergroup violence. Determining whether prehistoric hunter-gatherers shared these values is challenging, but it seems reasonable to assume that leaders with the acknowledged authority to order others to fight were absent among nomadic forager bands (Fry 2012:880).

Interestingly, while the comparison may be somewhat problematic, Gómez et al. (2016) found that levels of lethal violence were much higher amongst modern hunter-gatherers (bands and tribes) than their prehistoric counterparts (where tribes were more violent than bands). Mortality also increased where socio-political change had resulted in chiefdoms, but subsequently decreased where states evolved. They speculate that the temporal change amongst hunter-gatherers might in part reflect the present-day availability of more detailed data, but also an increase in population density (which led to more frequent intergroup conflicts), and/or contact with violent colonial societies. Moreover, severe violence in chiefdoms was associated with territorial disputes, population and resource pressures, and

competition over political status. Finally, they argue that states are able to reduce the prevalence and level of violence by delegitimising its use by all non-state actors.

Origin of Warfare in the Japanese Archipelago

Although theoretical discussion about violence in hunter-gatherer societies has generally overlooked the Japanese experience, Japanese scholars are cognizant of its parameters and influenced by its trends. Nevertheless, in seeking the origin of warfare in Japan, they have largely limited their theoretical borrowings to three hypotheses, namely, the development of agriculture, sedentism, and social stratification.

Agriculture Theory

Organised battles and war began as a result of the emergence of a new economic system; a change which saw hunting, fishing, and gathering replaced by full-scale agriculture. This view became popular in Japan during the Cold War, apparently in response to a widespread sense of fear and impotence (Mizoguchi 2013:19). Advocates of this now traditional position include scholars such as Sahara Makoto and Imamura Keiji. As seen above, linking conflict with the emergence of an agrarian economy is by no means confined to a Japanese context (Steinhaus & Kaner 2016). It has long been thought in Japan that the simple hunter-gatherer lifestyle of the Jōmon people facilitated development of a peaceful and affluent society; one in which intergroup battles or wars were avoided, albeit interpersonal killings occurred sporadically. This idyllic image has guided interpretation of Jōmon society, but has been coloured by frequent comparison to the agrarian society of the Yayoi period; the subsequent era when large-scale violence and warfare is believed to have started on the archipelago.

The introduction of agriculture (including animal husbandry) and metallurgy from the Korean Peninsula brought about great upheaval in Japan.⁴³ Rapidly increasing food production from wet-rice cultivation spawned large population increases, which ultimately resulted in shortages of suitable farmland and water sources.⁴⁴ This apparently triggered disputes over ownership of land and food reserves (grain and livestock), competition over access to the raw materials necessary for cultivation (e.g., iron for new types of tools), and fighting over unequal distribution and accumulation of resources (wealth disparity) (Suzuki 2010:67;

⁴³ Farming in Japan is traditionally thought to have begun during the Yayoi era, but recent research suggests that it may have developed in the Late and Final Jōmon periods. Full-scale agriculture, however, was not established until the subsequent Yayoi period (Nakagawa & Nakao 2017a:103-04).

⁴⁴ There is a finite amount of land available for wet-rice agriculture in Japan due to the mountainous terrain.

Steinhaus & Kaner 2016:153). Frequent and fierce conflict between settlements ensued, and with the development of social division, hierarchy, and control, this led to the emergence of large-scale battles and warfare from the Middle Yayoi period, particularly in northern Kyūshū (Imamura 1996a; Mizoguchi 2013; Sahara 2005, 2006; Nakagawa et al. 2019).

In contrast, some scholars have questioned whether fighting in the Yayoi era was on a large enough scale to be classified as warfare, believing instead that it was smaller and more skirmish-like (Nakahashi 2003). Fujiwara (2004:52) states that ‘the warfare of the Yayoi was in an excessive stage of ‘Primitive war’ undergoing a transition from small-scale conflict to full-scale war.’ Ritualised conflict formed part of the main focus of Yayoi battles, alongside small-scale fights such as surprise attacks, raids, and ambushes, before the importance of group battles gradually increased in the latter half of the Yayoi era (especially at the end of the Middle to the Late period) (Fujiwara 2004). The small-scale clashes, ritual fighting style, and killing methods employed (from behind and the sides) are tactics commonly used in what anthropologists and ethnologists used to call ‘primitive war’, which differed in many ways from war in the modern sense (see Turney-High 1971).

Evidence from dozens of skeletons in western Japan exhibiting wounds likely sustained during battle—such as traumatic injuries caused by swords and broken tips of weapons embedded in bone—is used to support the theory that armed conflict and warfare originated in the Yayoi period (Imamura 1996a:179-80). The construction of moated and hilltop settlements, together with the appearance of metal (bronze and iron) weapons, some damaged or repaired, may also indicate that there was frequent and extensive fighting during the Yayoi era. Not all areas of Japan experienced regular and heavy fighting, however: there is little warfare-related archaeological evidence in southern Kyūshū, Nagano Prefecture, and the Tōkai, Hokuriku, Kantō, and Tōhoku regions (Sahara 2005:117).⁴⁵ Nevertheless, it is the Yayoi agriculturalists that are considered to have been more aggressive than the Jōmon hunter-gatherers.

Sedentism Theory

Contrary to the widely accepted agriculture theory, some scholars claim that organised armed conflict already existed in the Jōmon era, arguing it was brought about by the development of

⁴⁵ According to Sahara (2005), warfare was uncommon in northern Kantō and Tōhoku because rice production was limited in these regions. Despite showing agricultural characteristics, the Yayoi culture of Kinai, which relied on fishing and gathering food, was also a society without war.

sedentism. Ferguson (1997) and others assert that sedentism was the cause of warfare in past societies. If a correlation between sedentism and war exists in Jōmon Japan, then a substantial increase in the number of violent skeletal injuries should be found from the Initial and Early periods when sedentism emerged. However, a lack of skeletons from the Incipient and Initial Jōmon makes this impossible to confirm.⁴⁶ According to Kosugi (2004), the idea that war began when humans settled and many people were killed in group violence has become the prevailing view among Japanese researchers. Sahara (2000:193) acknowledged that as sedentary complex hunter-gatherers, it would not be strange if the Jōmon people had exercised violence, but did not go so far as to label it ‘warfare’. Naumann (2000:62) adopted an identical position, arguing ‘Although it is hardly conceivable that Jōmon people had no quarrels about gathering or hunting grounds, it seems that they at least were spared from warfare.’

Matsugi (2001) expressed a similar view by recognising the potential for Jōmon warfare, while also positing a reason why it did not materialize. From the middle of the Jōmon era onwards, groups in eastern Honshū for instance boasted large and predominantly sedentary populations, supported by the production of substantial quantities of specific foodstuffs and special objects. The existence of large settlement sites such as Sannai Maruyama demonstrate this affluence, which according to Sahara (2006) is one of the reasons why fighting between Jōmon groups is thought to have been very rare. In addition to hunting and gathering, a more settled lifestyle enabled the Jōmon people to cultivate certain species of plants and nut trees in gardens and groves near their settlements, but despite possessing the requisite intellectual and practical skills, they did not adopt agriculture. Matsugi (2001:18-19) argued that in the East Asian region at that time, full-scale rice cultivation and warfare constituted a set which can be considered as a culture. If so, then the fact that the Jōmon people—who had a strong tendency to protect and preserve their characteristic and unique traditions—rejected rice agriculture (prior to its introduction by the Yayoi) may be associated with a desire to prevent the introduction of warfare.

According to Kobayashi (2003), violence among distinct human cultures is generally thought to have evolved from interpersonal conflict (stage one), to intergroup battles (stage two), and eventually to full-scale warfare (stage three) at different times and under diverse

⁴⁶ In the last few years, over 100 damaged human skeletons dating to the Initial and Early Jōmon periods have been unearthed at the Odake shell midden site (Toyama) and Iwashita cave site (Nagasaki) (Sakaue 2015).

circumstances. In the Japanese context, for Kobayashi the Palaeolithic, Jōmon, and Yayoi periods correspond to these stages. During the first transition, Matsugi (1999) claimed that surprise attacks and night raids occurred, while the later transition saw territorial expansion become an incentive for fighting others, with raids on settlements and group battles (especially during the Yayoi). If raids did occur in the Jōmon period, they may have involved the plundering of food supplies. Despite Sahara's (2006) assertion that there was no economic motive for fighting among hunter-gatherers because they essentially lacked food reserves, the increasingly sedentary Jōmon people certainly constructed storage pits and other facilities near their settlements. These could have been targeted, especially during times of food shortages.

Sahara (2000:193) remarked that 'at present, even if I allow for [the possibility of] quarrels among the Jōmon people, I do not want to recognise warfare'. For this he was criticised by Kosugi (2004:217) for 'slip[ping] into the idea of a Jōmon utopia, which is dangerous and contrary [to evidence]'. As discussed in Chapter 2, the Jōmon era was not a stable and stress-free period over the long term. Sedentism facilitated cultivation (and vice versa) and food storage, which led to an increase in population and settlement numbers and sizes, but the Jōmon people generally suffered from poor health and high mortality rates. They also experienced climatic changes, resource shortages, and sharp population declines, as well as the abandonment of settlements, particularly from the end of the Middle Jōmon onwards. According to Matsumoto (2018), despite the existence of numerous sites across the archipelago where more than ten skeletons have been excavated, none exhibiting violent injuries date from the Middle and Late periods, and hence the occurrence of intergroup conflict cannot be verified. This suggests that while sedentism, food shortages, and shifting populations may have caused interpersonal or small-scale group violence, they did not necessarily lead to war among the Jōmon.

Stratification Theory

Those who believe that warfare existed in Jōmon society point to the development of social hierarchy during the latter half of the period as the cause of intergroup battles. Takahashi (2001:79-80) for instance, stated that since hunter-gatherer-fishers frequently fought wars, rather than the formation and growth of an agricultural society, the start of war is related to the development of social complexity and the establishment of a hierarchical society. These social processes are considered to have appeared in the Late and Final Jōmon phases,

especially in the northern regions of Japan (e.g., Kamegaoka culture). Thus, Takahashi surmised that there was considerable fighting towards the end of the Jōmon era; a time when complexity and stratification had apparently progressed to the extent that it can be compared to a transegalitarian society.⁴⁷

Kosugi (2004:215) claimed that stone rods (*sekibō*)—similar to North American clubs according to Sahara (2006)—with significant destructive power were used for fighting throughout Japan by the Late and Final Jōmon. Scholars advocating the possibility of war in the Final period use the proliferation of stone arrowheads in the Kantō and Chūbu/Tōkai regions, as well as evidence of skeletal injuries at Ikawazu and Hobi shell middens (Aichi) to support their theory (Kosugi 2004; Sahara 2005). As will be discussed in Chapter 4, an increase in the quantity of arrowheads does not necessarily signify escalation of human violence, and might instead indicate the intensification of hunting due to climatic changes and a reduction in available plant resources. These two interpretations are not necessarily mutually exclusive, however, since a greater reliance on hunting might strengthen territorialism, thereby heightening the chance of violence against trespassers. Kobayashi has speculated that the increase in arrowhead production was the result of Jōmon people feeling anxious and threatened by the arrival of Yayoi immigrants in Japan. Yet, he does not present evidence that this increase was more pronounced amongst the Jōmon living closest to the Yayoi. Others suggest it indicates that they were used as weapons.

Sahara (2000:193) stated that frequent fighting between sedentary hunter-gatherers is seen as ‘sudden and accidental group violence rather than systematic’, and full-blown warfare first occurred between ‘sedentary complex gatherers and farmers who were in the process of establishing an agricultural society’. Since the Jōmon are considered to have been sedentary complex hunter-gatherers, this appears to imply that battles may have been fought between the Jōmon and Yayoi people. Yet, Barnes (2015:273) notes the lack of evidence of conflict or fighting between Jōmon and Yayoi individuals at Etsuji, one of the earliest Yayoi villages in northern Kyūshū. Nevertheless, the arrival of outsiders in the Japanese archipelago with different beliefs and strange customs is likely to have caused some strife among the Jōmon, and the possibility of violent clashes cannot be ruled out.

⁴⁷ A transegalitarian society is a transitional stage between an egalitarian and a chiefdom society (Hayden 1995).

Kobayashi (2003) believes that the Jōmon people definitely engaged in ‘Jōmon-style warfare’ based on injuries found on skeletons, and mentions the possibility of finding dozens of buried individuals who had been killed in action. He claims that since many Jōmon people died without any marks on their bones, the discovery of two or three skeletons with injuries from warfare probably signifies that several hundred died in battle. This may be a significant overestimate, but Kobayashi is correct in that not all lethal wounds will be visible on skeletal remains, so the number of skeletons exhibiting injuries is almost certainly an underrepresentation of the number who perished while fighting. To determine whether there was fighting on a large-scale in the Jōmon period requires both the re-examination of previously reported cases of violent injuries and the identification of additional violent skeletal trauma (tackled in Chapters 5, 6, and 7).

Concluding Thoughts

Scholars from the sciences (evolutionary biology, psychology, and neuroscience), social sciences (sociology, politics, international relations, and economics), and humanities (philosophy, history, and especially archaeology and cultural anthropology) have all played a role in refining intellectual understandings of violence. Yet, centuries after their deaths, European philosophers Thomas Hobbes and Jean-Jacques Rousseau still exert a remarkably strong influence over the study of violence. In theory, the various studies examined in this chapter—and indeed the whole academic literature on the origin, development, and determinants of violence amongst humans—could be plotted on a chart where the x-axis represents dove/hawk, and the y-axis nature/nurture. This thesis is situated at the origin, where the two axes meet. It will argue that humans (including prehistoric hunter-gatherers) have always displayed a mixture of violent and nonviolent behaviour, influenced by a combination of genetic predisposition and social context in approximately equal measure. A wide range of plausible arguments have been presented here, but they are open to criticism from a number of directions:

1) The notion that humans have always been violent (or peaceful) is essentially ahistorical, because it overlooks the dynamic interaction between violence and human (social) evolution. This view ultimately derives from the observation of ferocious chimpanzee attacks (or cooperation amongst bonobos), disregarding the fact that 5~7 million years have elapsed since we shared a common ancestor, and thereafter took radically different evolutionary paths. Therefore it fails to distinguish the hunter-gatherer stage in human development from

others, implying that all were engaged in warfare; the only variable being the level of technology.

2) Being fatalistic, biological determinism discounts the influence of cultural diversity in shaping the divergent experiences of violence in human societies. It fails to distinguish between heterogeneous hunter-gatherer cultures and implies that all engaged in violence to the same degree. Yet, there is widespread recognition in archaeology and anthropology of the influence of environmental/social/cultural nexus on the sporadic history of human violence and nonviolence. Human biology (genes) certainly enables people to be aggressive and/or passive, but factors such as social norms constrain or empower those inclined to resort to violence.

3) The hypothesis that humans have become more belligerent (or peaceful) over time is admittedly dynamic, but such assertions imply a linear, unidirectional version of (pre)history which disregards the messiness of empirical evidence. It posits a fixed relationship between the hunter-gatherer era and preceding/subsequent periods, or even between different phases within a hunter-gatherer culture, where violence may have been more or less prevalent.

4) Theories are often still presented in starkly dichotomous terms; ignoring the fact that violence-nonviolence exists on a spectrum. With no universally accepted definitions, too often the judgement of whether or not a society engaged in warfare boils down to a matter of semantics. Many scholars now agree that intergroup violence was present in at least some prehistoric hunter-gatherer societies, but whether the fighting was of sufficient scale, frequency, intensity, and coordination to constitute warfare is still disputed. Positions tend to reflect the specific culture under investigation and especially personal definitions of 'war'; it depends on which criteria are included. For example, given the relatively small populations of prehistoric hunter-gatherers, it could be argued that the definition of warfare should be relaxed to include violent clashes between small groups with few casualties (intergroup conflict). Most anthropologists appear to endorse this view, but might not a separate term, such as 'tribal warfare', help to avoid confusion with modern interstate conflict? Or to take another example, all else being equal, is a society that experiences few, short, intense bursts of fighting more or less violent than one which experiences long-term, low-intensity conflict? Perhaps in the latter community violence had been normalised, whereas in the former a peaceful group was attacked by outsiders. Although difficult to measure in prehistoric hunter-gatherer societies, the prevalence of violence matters as much as the scale of fighting.

5) The relationship between archaeological evidence and theories of violence is a rather troubled one. Perhaps because of its fragmentary nature, few theories appear to rest on solid archaeological foundations. Many theoretical approaches to human violence seem oversimplified or overblown; they gloss over important details that should not only matter to archaeologists. Archaeological evidence must be deployed to verify or debunk these theories, not merely serve to reinforce entrenched positions. This would help to answer basic questions about who, what, where, when, and how prehistoric hunter-gatherers engaged in violence. Taking evidence out of context is equally problematic. Non-archaeologists need to recognise the limitations of archaeological data, lest it be used to explain something beyond its scope. Individual motives cannot be identified in the archaeological record, but by carefully examining physical evidence to reconstruct the cultural context, it can help to explain violent group dynamics. In short, it is necessary to be suspicious of grand theories about hunter-gatherer (non)violence where they draw on a set of assumptions impossible to corroborate archaeologically. Selection bias must also be acknowledged since it can easily distort conclusions. Whether it is reasonable to infer from a limited number of examples that a prehistoric hunter-gatherer society was generally violent or nonviolent must be questioned.

6) The theoretical literature discussed in this chapter has generated surprisingly few hypotheses testable using archaeological evidence. Exceptions include the idea that the rate of violence is inversely related to environmental productivity, or that it is directly related to increasing social complexity. But while archaeologists have examined both of these, neither has yet been conclusively (dis)proven.

7) Somewhat confusingly, the same phenomenon is occasionally used to account for both the lack of violence in one culture and its presence in another, or contradictory evidence is sometimes cited to explain the same outcome. For example, egalitarian values, lack of stockpiling of food, and weak religious values amongst hunter-gatherers are used to explain the avoidance of violence. But amongst agricultural communities, a clear hierarchy, resource stockpiles, strong religious practices, and the state's monopolisation of the legitimate use of force are used to explain their relative peace.

8) Many scholars make relative judgements. For instance, rather than asserting that hunter-gatherers were peaceful, they assess whether they were more or less violent than agriculturalists. A comparative framework is invaluable, but this is rather like comparing apples and oranges and prompts the question, what constitutes a valid comparator for a

prehistoric hunter-gatherer society? The choice rather depends on the question the author is trying to answer. Some anthropologists look for behavioural similarities with primates which has limited applicability beyond biological evolution. Others prefer historic or surviving hunter-gatherers as their reference point, but this is problematic for a number of reasons such as higher population densities, and contact with violent colonial societies. Scholars adopting a social evolutionary model tend to contrast hunter-gatherers with early farmers and later states, but here the problems multiply. Perhaps the only meaningful comparison is between contemporary societies at a similar stage of development, living in similar environments. This chapter has provided the theoretical toolkit necessary to analyse violence in Jōmon Japan, and the following chapters will pursue this theme in a comparative context.

4. Violence in the Jōmon Period:

Indirect Evidence

Prehistoric violence is represented in the archaeological record by a variety of indirect evidence. This usually encompasses some or all of the following indicators: weaponry; defensive structures; defensible sites; settlement patterns; symbolic depictions of weapons and fighting (including ritual or ceremonial tools in the form of weapons), and warrior graves (Vencl 1984; Sahara 2005, 2006; Larsen 2015). Each of these lines of evidence will be considered below, although some are more relevant to prehistoric hunter-gatherers than others. Indirect evidence of violence may be only circumstantial—indicating threat more than consequence—but viewed collectively, and especially in conjunction with direct bioarchaeological evidence (see Chapter 5), such markers may help to confirm its presence (or absence). This will involve an assessment of whether: hunting tools and techniques were repurposed for violent acts; the slightly elevated location of settlements reflected defensive considerations; features resembling watch towers or moats served defensive purposes, or the absence of warrior graves or images depicting violence against humans should be interpreted as evidence of nonviolence.

Since the volume of indirect evidence unearthed from the Jōmon period in Japan is vast, and artefacts and features are so widely scattered, this chapter interprets primary finds by Japanese archaeologists, as well as secondary reports. Although in many ways not the best comparator, discussing the juxtaposition of Jōmon and Yayoi weapons and defensive structures is unavoidable because this is the approach employed by many Japanese scholars.

Tools as Weapons

Whether intact, damaged, broken, or repaired, weapons unearthed at archaeological sites provide important evidence of an ability to inflict violence, if not necessarily the presence of violence in a past society. As Pinker (2002:323) observes, ‘Our species’ vaunted ability to make tools is one of the reasons we are so good at killing one another’. Even in modern times, everyday tools are sometimes employed as weapons on a large-scale, for example, the

use of farm implements in the Tonghak Peasant Rebellion (Korea, 1894–1895), or the machete in the Rwandan massacre (1994) (Meijer & Verwimp 2005; Park 2022). Hence, it can be difficult to know what constituted a weapon in the past, since not all ancient societies created weapons that were specifically designed to harm humans.

One of the main arguments against the existence of violent conflict among the prehistoric Jōmon hunter-gatherers is a lack of weapon finds (offensive or defensive). Apparently, the Jōmon did not manufacture weapons designed specifically to injure people: this began in the subsequent Yayoi period, when wet-rice agriculture and metallurgy were introduced to Japan from China and the Korean Peninsula (Sahara 2006:7; Steinhaus & Kaner 2016:153). The Yayoi armoury initially comprised polished stone arrowheads and ground stone swords, later supplemented with long-handled Chinese spears, halberds, and single- and double-edged metal swords (Uchino 2013; Steinhaus & Kaner 2016). In contrast, since no obvious weapons have been found dating from the Jōmon era, it is thought that when required these hunter-gatherers simply repurposed their hunting, fishing, and tree felling tools as long- and short-range weapons (Sahara 1992:220). Following a brief discussion of Jōmon stone tools and their potential for use as weapons, this section will examine the importance of the bow and arrow; the main hunting equipment of the Jōmon. It was long assumed to account for the most frequent type of injury seen on Jōmon skeletal remains.

Offensive Weapons

The Jōmon toolkit changed little over time and comprised many different types of sharp and blunt implements for hunting, fishing, processing plant materials and animal hides, chopping wood, making tools, and other daily activities. There were arrowheads (*sekizoku*); spear-tipped projectile points (*yarisakigata sentōki*); axes (*sekifu/ishiono*) and adzes (*teono*); slings (*tōsekiki*); scrapers/knives (*ishisaji*); drills (*ishikiri*); harpoons (*mori*); hammerstones (*tatakiishi*), and grinding stones (*suriishi*) (Fig. 4.1). Made of stone, bone, wood, shell and antler, any one of these tools could potentially be used to wound, but most Jōmon skeletal injuries were probably caused by stone axes, stone/wooden clubs, and stone arrowheads.

Stone Axes

A comparative study of subsistence diversity and cultural differences by Akazawa (1982) highlighted the preference for different types of stone axes in eastern and western Japan. He conducted discriminant function analysis of 91 lithic assemblages from Late to Final Jōmon

settlements across the Japanese archipelago (excluding Hokkaidō). The results revealed that on average ground stone axes (and stone arrowheads) were most common in the Kantō and Chūbu/Tōkai regions (predominantly in eastern Japan), whereas the highest number of chipped stone axes and grinding stones were typically found in western Japan.⁴⁸ This finding is significant because the Kantō and Chūbu/Tōkai regions are where the majority of Jōmon sites with injured skeletons are located (and where most Jōmon skeletons have been found), implying an association between ground stone axes and violence. For example, Suzuki (1960) inferred from the shape of cranial injuries that a large elliptical ground stone axe was responsible for the death of a young adult male at Hobi shell midden (Aichi).

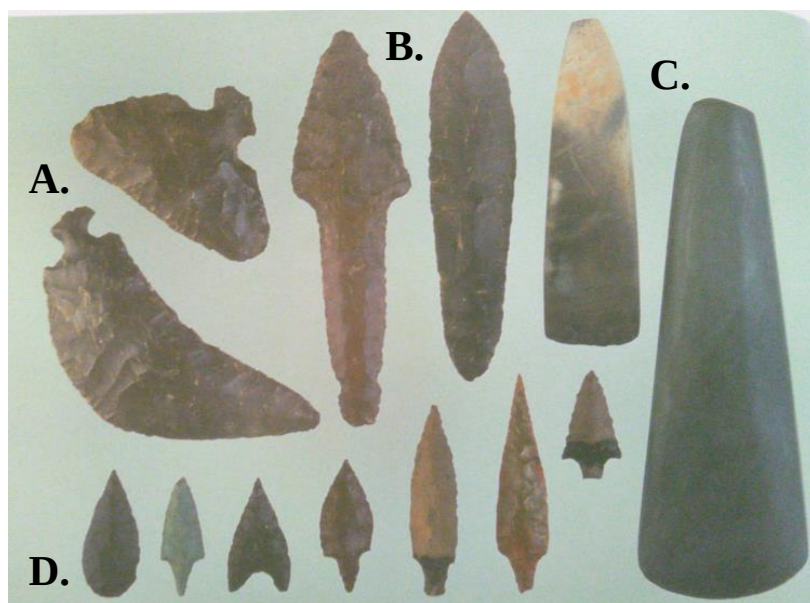


Figure 4.1. Stone tools from Sannai Maruyama (Aomori). A. Two knives. B. Two spear-points. C. Two ground stone axes. D. Seven types of arrowheads (Okamura & Takada 2013:34).

Use-wear analysis indicates that chipped stone axes were utilised as digging tools (possible hoes), and ground stone axes for felling trees and chopping wood (Barnes 1993:89; Imamura 1996a:103). Both types probably also served as close contact weapons with which to strike blows on an opponent's body, particularly the head. Thorpe (2000) makes a similar inference for axes in Mesolithic Europe. Typically viewed as tools of forest clearance, Thorpe cites evidence of a healed axe-wound found on the skull of a male buried at Møllegabet (Denmark). Moreover, he dismisses as wishful thinking suggestions that such weapons had merely symbolic value, 'for an axe can hardly symbolise power unless its use, as an enforcer of power, has been practically demonstrated' (Thorpe 2000:10). Stone axes are thought to

⁴⁸ This indicates that there was greater emphasis on hunting and fishing in the former regions, whereas people living in the latter area focused on intensive plant collecting and/or incipient plant cultivation of wild species.

have been the most powerful Jōmon weapon, but their use as offensive implements ceased in the Yayoi period, being supplanted by even deadlier (metal) instruments (Uchino 2013:460).

Potential Weapons

Before assessing the significance of the bow and arrow in the Jōmon period, it is important to explore the possibility that other implements thought to have served ceremonial functions (known as ‘secondary tools’) might also have been employed as practical weapons by the Jōmon. Stone phallic-shaped rods (*sekibō*), swords (*sekken*, *seiryūtō-gata sekki*), knives (*sekitō*), crown-shaped (*sekkan*) and *dokko*-shaped artefacts (*dokkoishi*), and both doughnut-shaped (*kanseki*) and multi-edged (*tatōsekifu*) mace heads could all have been wielded as stone clubs to strike an opponent (Fig. 4.2). Such tools were particularly abundant during the Late and Final Jōmon periods (Kosugi 2004; Sahara 2005). Maces and clubs existed in the toolkit of other prehistoric societies around the world. The former are found at Mesolithic sites in Europe, for example, and are also common in the ethnoarchaeological record of America, while wooden clubs were probably once common in Mesolithic Europe as well, but rarely survive (Thorpe 2000:10; Sahara 2005:116).

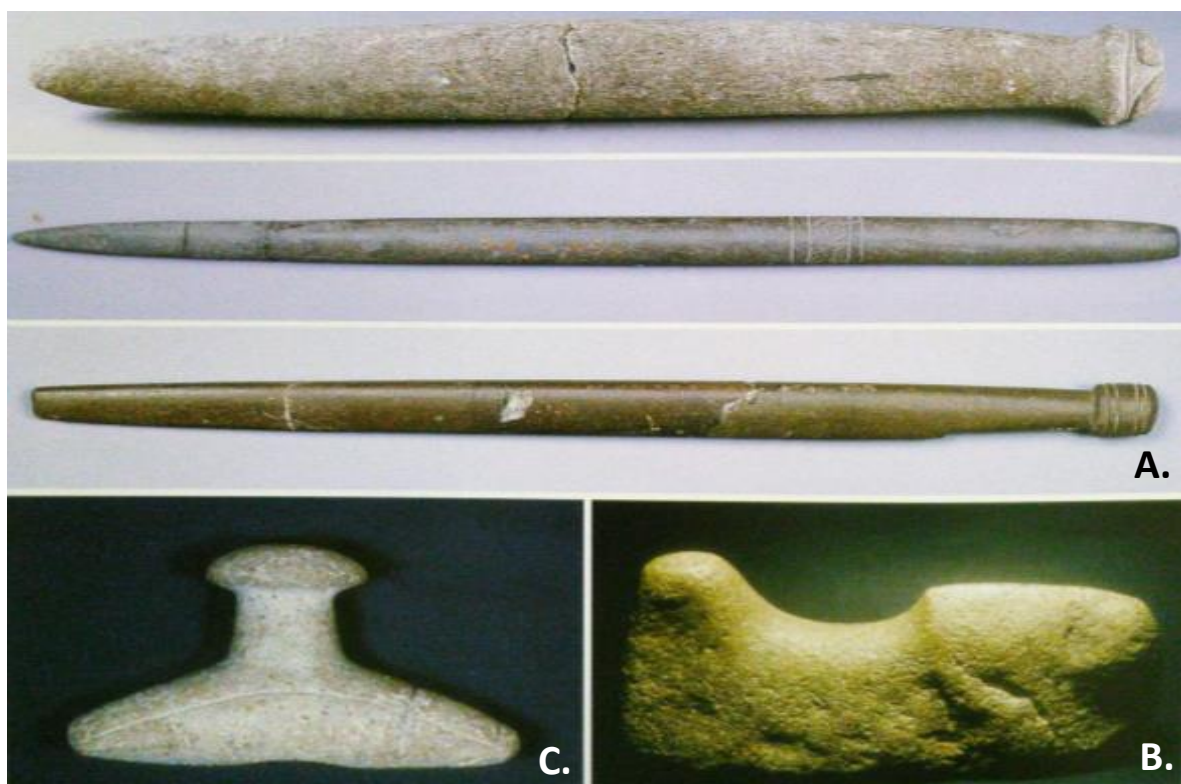


Figure 4.2. Jōmon period ‘ritual’ implements (type 2 tools). A. Three polished stone rods from Kamegaoka (Final Jōmon, Aomori). B. A carved, polished stone bar from Okyōzuka (Final Jōmon, Ishikawa). C. A tanged stone crown from Okyōzuka (Late-Final Jōmon, Ishikawa) (Kobayashi 2004:140).

Based on their characteristics and excavation contexts, the Jōmon tools are thought to have been ritual objects used in ceremonies and festivals. Yet, had their function extended to weaponry, then like the whalebone clubs from the Northwest Coast of America, they may well have been used to inflict blunt force trauma. However, according to Sahara (2006), none of the 4000~5000 excavated Jōmon skeletons are reported as exhibiting evidence consistent with being beaten (to death) with a *sekibō*. Admittedly, indistinct or healed wounds could be easily missed during osteological examination, but there remains the possibility that some stone club injuries have been mistaken for those caused by stone axes. Kosugi (2004) argued that double-headed *sekibō* were made as clubs, and the peculiarity of Late and Final Jōmon *sekibō* forms were devised not for rituals but to instil fear, given their sword-like shape. Apparently, by this time Jōmon society had reached a stage where intergroup battles using *sekibō*-type clubs as weapons were occurring in various part of the archipelago, and Kosugi even asserted that there were cultural systems in place to deter the escalation and intensification of this fighting. This seems unlikely, and Kosugi provides no evidence to support his claims. Nevertheless, measuring the circumference of the rounded edges of a *sekibō* may help to determine whether they could have caused some of the blunt force trauma identified on Jōmon skulls. Still, it is often difficult to measure accurately skeletal fracture dimensions due to postmortem damage, or only partial fracture arcs remaining. Moreover, since *sekibō* vary in shape and size, unless they are found in close proximity, it would be impossible to assert with any degree of confidence that a particular *sekibō* was responsible for a specific fracture.

Akin to *sekibō*, long, hard wooden clubs for ritual killing of salmon (*anrakubō*) are also known from the Jōmon record, for instance at Momijiyama No. 49 site in Hokkaidō (Matsui 2005). A blow to the skull with this implement could certainly have caused serious injury.⁴⁹ Horrific injuries might also have been inflicted by a wooden implement edged with shark teeth, of which fragments dated to the mid-Final Jōmon phase were excavated at Kitakomatsu (Miyagi) (Fig. 4.3). Analyses revealed that the teeth were inserted into grooves made in the wood (with the apices facing outwards) and secured using lacquer. The wooden surface was also coated with a lacquer and red iron oxide (*bengara*) mixture (Miyagi-ken Kyōiku Inkai 2014:380-83). Shark tooth mounted tools are rarely found in Jōmon contexts, although shark

⁴⁹ Interpretation of these clubs as ritual salmon-clubbing sticks is based on parallels with those used by pre-modern Ainu peoples during their salmon ceremonies (Matsui 2005). In modern Japanese, *anraku*—meaning ease, comfort, and carefree—is also used in *anrakushi* which means euthanasia or an easy/painless death.

teeth have been excavated in orderly rows at Nishi-Shimamatsu 5 and Site N30 (Hokkaidō), suggesting that they may once have been part of such a tool. Due to its rarity, the function of the Kitakomatsu implement—whether a practical sharp-edged tool or a ritual ornament—is unknown, although it certainly resembles a deadly weapon. Its similarity to shark tooth swords and other weapons found in the South Pacific region (e.g., Kiribati) is notable. Thus, the possibility of ritualised fighting with clubs and similar close contact weapons—identified in the southern Californian archaeological record as a non-lethal form of conflict resolution (Walker 1989)—should not be dismissed for the Jōmon.

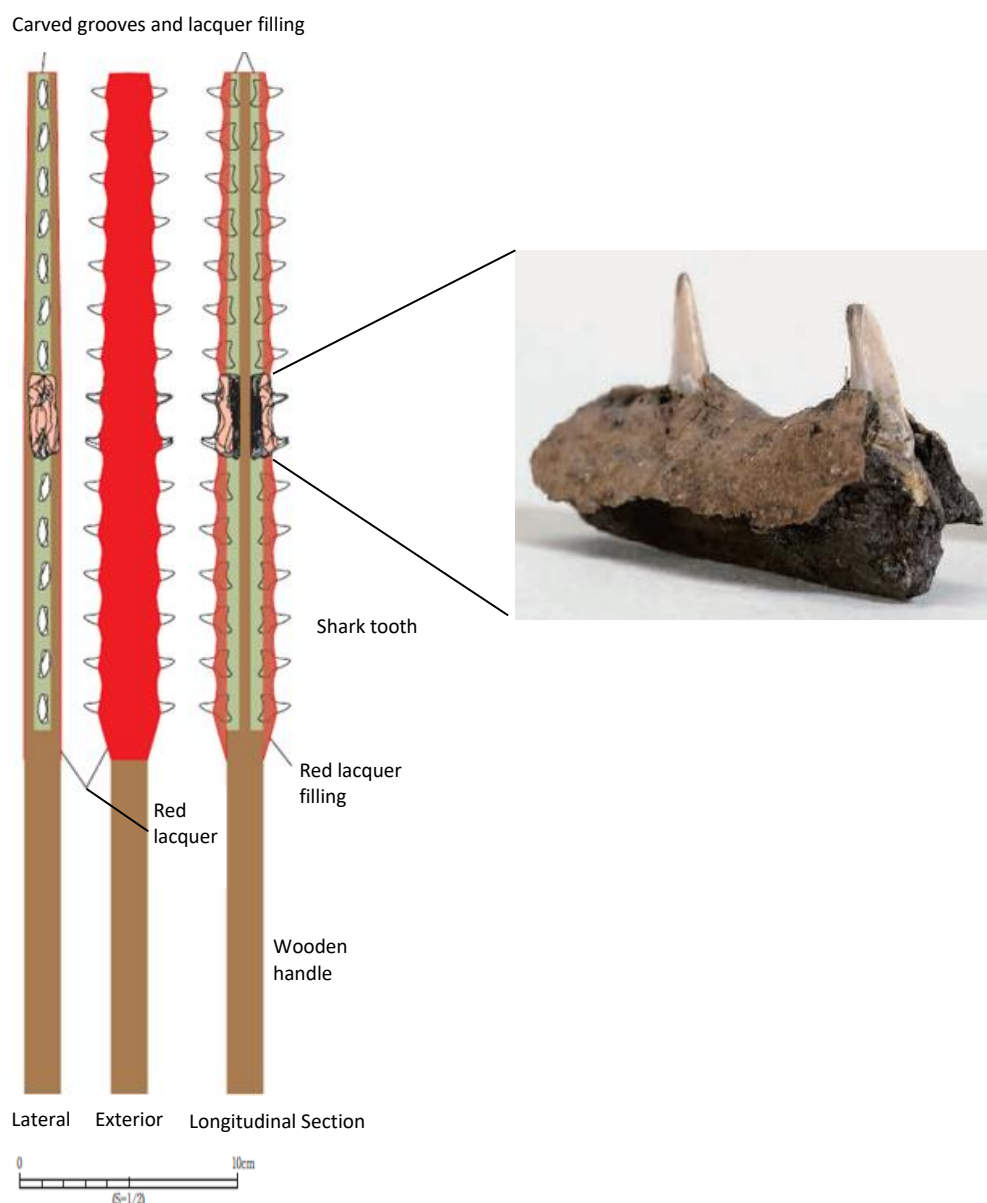


Figure 4.3. Reconstruction of the shark tooth implement from Kitakomatsu (mid-Final Jōmon, Miyagi) showing one of the excavated fragments (modified from Miyagi-ken Kyōiku Iinkai 2014:382, cover photo 6. In the collection of Tōhoku Museum of History).

Sword wounds are first seen on Yayoi period skeletons after metallurgy was introduced into Japan (Suzuki 2010:82). Yet, the concept of a sword seems to have existed much earlier: a sword-like implement made from the rib of a whale was unearthed at the Early Jōmon Kitakogane shell midden (Hokkaidō) (Fig. 4.4). Though originally straight, the bone sword is thought to have become bent when thrown into a fire, presumably during a ritual (Kobayashi 2010:37-39). A clear separation is visible between the hilt and blade, but with a blunt blade and rounded tip, it is unlikely to have been useful in actual combat. Suzuki (2010) claimed that its purpose was to embody a clear intention to kill people; its uncanny resemblance to a sword prior to the manufacture of such weapons in Japan is noteworthy. Non-metal swords, such as those made out of hard wood by Australian Aborigines, are known to have caused major skeletal injuries when used in violent conflict among hunter-gatherer groups (Ortner 2003:142). Similarly, Kosugi (2004) assumed that Jōmon stone swords and knives were used against humans (rather than animals), which implies they were weapons proper. Given its characteristics, however, the whale bone sword is more likely to have been a ceremonial tool, or was perhaps used as a club rather than a sword.



Figure 4.4. Whale bone sword from Kitakogane shell midden (Early Jōmon, Hokkaidō) (Kobayashi 2010:39).

Despite the difficulty of recognising them archaeologically, pebbles/slingstones and slings are also regarded as offensive weapons.⁵⁰ Simple to prepare and deploy, pebbles can be hand-thrown or propelled from a sling; small light pebbles will travel further and faster than heavier ones, but the latter will perhaps cause more damage (Sahara 2005:113). It is an especially practical tool for shooting downwards at a target from above, but can be used

⁵⁰ Pebbles are practically invisible in the archaeological record, unless they are found in a distinct pile, or comprised of stones that do not naturally occur in the area (Sahara 2005).

almost anywhere, making it an effective projectile weapon. Examples have been found at the Iron Age hillfort at Maiden Castle (Dorset) (Sharples 1991; Redfern 2009; Robertson 2017), and at the Yayoi sites of Mukibanda and Odaka-azayama (Tottori) and Tawayama (Shimane) (Sahara 2005), but definitive discoveries have yet to be made at any Jōmon site.

Bows and Arrows

The Jōmon people had a variety of hunting and fishing tools that they utilised in their daily lives. However, the bow and arrow (together with pit traps) was the most prevalent and therefore representative of Jōmon hunting technologies (Habu 2004:29; Kobayashi 2004:96). Moreover, prior to this study, stone arrowheads accounted for the most frequent type of injury encountered on Jōmon skeletons.

From the Spear to the Arrow

The origin of the bow and arrow in Japan is generally thought to lie in the Jōmon period.⁵¹ With the exception of Hokkaidō and Tōhoku, spears—the main hunting tool of the Palaeolithic (Iwajuku) period—largely disappeared from the Japanese archaeological record, to be replaced by small triangular stone arrowheads in the Incipient Jōmon (Fig. 4.5) (Sahara 1992:99-100; Imamura 1996a:88, 101; Habu 2004:247). This shift coincided with the extinction of large game during the Palaeolithic, which were replaced by medium-sized game as the main targets of Jōmon hunting. Jōmon arrows had several advantages over the Palaeolithic spears: being lighter and faster; able to fly further (using a bow); easier to control, and more adaptable to changing circumstances during a hunt (Sahara 1992:101-02).⁵² Given that the range of early bows (perhaps 100 metres at most) ensured the archer could usually see the victim, the bow and arrow represents the start of weapon developments which enabled humans to kill without being in direct contact.

⁵¹ Sano (2016) disputes this notion, arguing instead that based on microfracture and morphometric analyses, the small stone trapezoids of the early Upper Palaeolithic period in Japan were probably used as arrowheads.

⁵² Sahara (1992) even went so far as to claim that this innovation represents the origin of modern impersonal weapons of mass destruction.



Figure 4.5. Reconstruction of Jōmon hunting equipment (type 1 tools) from Sannai Maruyama (Aomori). A. Arrows. B. Spear (Okamura & Takada 2013:35).

Importance of the Arrowhead

The importance of hunting as a subsistence practice, and hence the prominence of the bow and arrow, changed over the long Jōmon period. This is revealed by the fluctuating proportions of arrowheads and other stone tools in the Japanese archaeological record. Despite data limitations (e.g., variations in the number of sites between different phases), Yamamoto's (1989, 1990) studies demonstrate that the proportion of arrowheads in eastern Honshū dropped from 23.7% to 13.5% from the Early to Middle period, before rising sharply to 55.6% in the Late Jōmon (Table 4.1). The decline in the Middle phase is attributed to a sharp rise in the proportion of chipped stone axes (increasing nearly fourfold from Early to Middle) and other plant food processing tools, especially in southwestern Kantō and the Chūbu Highlands (Imamura 1996a:103; Habu 2004:252-53). Note that the proportion of polished stone axes changed little over this time. In other words, the warm Middle Jōmon saw an increase in the exploitation of plant foods at the expense of hunting, which reversed in the Late Jōmon as the climate deteriorated due to the neoglaciation.

Table 4.1. Stone Implements of the Early, Middle, and Late Jōmon Periods in Eastern Honshū

Period	Sites	Arrowhead	Drill Point	Chipped axe	Polished axe	Pounding stone	Ground/ pitted stone	Quern	Total
Early	12	714 (23.7%)	147	43	289 (9.6%)	208 (6.9%)	74	1393	143 3011
Middle	32	917 (13.5%)	132	30	2554 (37.7%)	463 (6.8%)	396	1912	364 6768
Late	9	879 (55.6%)	150	59	96 (6.1%)	85 (5.4%)	35	223	55 1582

Data from Yamamoto 1989, 1990. Proportions in parenthesis calculated separately.

Arrowhead numbers fluctuated over time, but production increased substantially in eastern Japan during the Final Jōmon period. Vast quantities have been recovered from sites such as Goshono (Iwate, approx. 1000-2000), Kitahara (Gifu, approx. 8000), and Hobi/Inariyama (Aichi, approx. 5000) (Amino et al. 1998:192; Sahara 2005:116). The reasons for this surge are as yet unknown. Several possibilities have been suggested by Amino et al. (1998), including growth in the numbers of game and use as burial goods (particularly in Hokkaidō), but also violent conflict.

A shift in the subsistence balance from plant foods to hunting should also be considered. This is demonstrated by the prominence of animal bone middens in the Final Jōmon—more so than during any other subperiod—as well as a decrease in the overall number of sites, indicating a large decline in human population. Since, as Imamura (1996a:90) states, ‘the prosperity of the Jōmon period was supported mainly by plant foods’ (followed by fishing), shortages of this key resource would have led to depopulation. A similar situation had occurred at the end of the Early Jōmon in the Kantō region. A lack of plant foods caused a stronger dependence on hunting and open sea fishing, and an abrupt fall in the number and scale of sites (Imamura 1996a:91). Heavier reliance on hunting ungulate prey for example, may be reflected in greater numbers of dog burials in eastern Honshū during the Late and Final Jōmon phases (Perri 2016). This signifies a growing dependence on hunting dogs, which appears to coincide with an increase in arrowhead production.

Nevertheless, some researchers believe that the sudden increase in arrowheads during the Final Jōmon in the Chūbu/Tōkai and Kantō regions indicates that they were used as weapons (Sahara 2005:116). For example, at a symposium in the late 1990s, Kobayashi Tatsuo speculated that the proliferation of arrowheads was due to confusion and stress arising from a new threat, namely, rumours of Yayoi immigrants arriving in Japan from the Asian mainland (Amino et al. 1998:191-92).

Differences Between Jōmon and Yayoi Arrowheads

For several thousand years, the bow and arrow technology used in the Jōmon period did not undergo any significant innovation. In fact, from the Incipient Jōmon to the Early Yayoi period (approx. 13,000 years), stone arrowheads had remained relatively unchanged; predominantly triangular in shape, their weight was under two grams, and length between one and three centimetres (Uno 2002:46; Sahara 2005:38-39). The chipped or flaked Jōmon arrowheads transformed into polished or ground varieties in the Yayoi era (Suzuki 2010:68).

In the Middle Yayoi phase, new types of arrowheads appeared: designed for easier and deeper penetration, they were heavier and deadlier, fashioned out of bronze and iron (in addition to stone), and were mass produced (Farris 1998:37; Sahara 2005:39). Moreover, the manufacture of very large quantities coincided with the appearance of hill-towns, as well as an increase in stone weapons. Collectively, this is taken as evidence that the bow and arrow had transformed from being a simple hunting tool to a weapon of war.

Uno's (2003) experimental archaeological reconstruction, which examined the effectiveness of Japanese bows and arrows from the Jōmon period to modern times, supports this interpretation. Using replicas, his comparative study showed that the main discrepancy in performance between Jōmon and Yayoi bows and arrows was due to differences in their arrowheads. The Jōmon produced stone arrowheads of two grams or less, whereas the Yayoi manufactured both light and heavy (five grams or more) varieties made of stone, bronze, and iron. Making an arrowhead heavier will reduce the arrow's range while increasing its penetrative force: this was designed to cause maximum injury (Uchino 2013:461). Uno does not discuss the accuracy of the Jōmon and Yayoi arrows that he tested, but factors including the skill of the archer, terrain, weather conditions, and whether or not the target was moving, would influence accuracy. Nevertheless, the conventional view is that Jōmon arrowheads were used for hunting animals of all sizes, while the Yayoi employed light arrowheads to hunt small animals, and heavier ones for large game and warfare (Uno 2003:15).

Uno's (2003) study also demonstrated that it was probably rather difficult for Jōmon hunters to kill large game with their light arrowheads, and when fighting, their arrows were more effective if shot from long-range. The latter finding is not explained and is unexpected, since the penetrative power of an arrowhead (speed at any given weight) is greater at close range. It is possible that the light Yayoi arrows were also shot from afar, but since the heavier variety and metal ones were more powerful, they could be shot from close range to inflict lethal damage (Uno 2003:15; Fujiwara 2004:47). It is also easy to imagine that a heavier arrowhead would have been more advantageous when shooting at an opponent from up in a watchtower or on an embankment, especially if the opponent was wearing armour. Another battle advantage of the Yayoi bow and arrow was the bowstring loop, which could be easily hooked onto the bow and quickly changed if broken, thus wasting little time in the heat of battle (Uno 2003:14). Such innovations clearly imply that the new heavier Yayoi arrowheads were used for the purposes of war.

Hunting Tool and Weapon

The Jōmon people did not only use their bows and arrows for hunting animals, as Uchino (2013) discovered in her study of human skeletal trauma patterns from the Jōmon and Yayoi periods. Uchino identified twenty-two Jōmon individuals with skeletal trauma across Japan, of which fourteen (63%) exhibited injuries consistent with a stone arrowhead (or possibly a spearhead). Based on this sample, she concluded that penetrative injuries were the most frequent type seen in the Jōmon period (Uchino 2013:464). In some of these cases, the arrowhead had become embedded so deeply in the bones of its victim that it was stuck. This might suggest that the arrow had been fired from close range, but the arrowhead design is also a relevant factor. Accidents do happen, but archers—especially those who have crafted their own arrows by hand—generally take careful aim before letting fly. Nevertheless, Amino et al. (1998:186) claim the Jōmon people used a spring-release bow to hunt game. This may have increased the risk of accident, but it is still more likely that projectile injuries were caused by other people.

When analysing the different locations and types of trauma on Jōmon skeletons, Uchino (2013:462) noticed that arrowhead wounds only occurred on the upper body, whereas most of the stone axe injuries (five out of six) were found on the cranium. Examples of arrowhead injuries to the skull have been found, but perhaps given the influence of gravity and the fact that Jōmon stone axes were heavy and not especially sharp, they were more effectively used in an overhead rather than in a horizontal motion. Stone axes could certainly have broken bone, especially if swung hard enough. Nevertheless, these patterns more likely suggest that arrows were aimed at the torso—the larger and more lethal target because of the vital organs—whilst those with stone axes targeted the head. Although Uchino emphasises stone axes, some of the cranial injuries were probably made by clubs.

In contrast, there are no clear patterns of injury in Uchino's Yayoi skeletal sample, although cranial trauma decreased and upper body injuries increased around the time that stone axes disappeared from the archaeological record (Uchino 2013:462-63). Uchino argues that this was because the Jōmon had not developed interpersonal weapons, so in order to kill their opponent the attacker had to aim for the head. But in the Yayoi era, weapons such as swords and halberds were specifically designed for interpersonal use, and could inflict fatal wounds even to the upper body. About half of the Yayoi injuries examined in this study were produced by swords (47%), followed by arrowheads (31%). This contradicts the earlier

findings of Sahara (2005), who claimed that long range weapons (bow and arrow, slingshots) accounted for more injuries than short range ones (pikes, swords, daggers). In short, fighting techniques changed from the Jōmon to the Yayoi era: a logical adaptation to the new technology which improved the chances of success in individual combat by offering a larger kill target (see Chapter 5).

Jōmon violence is often contrasted with that in the Yayoi period, when a new agricultural lifestyle frequently resulted in conflict between groups over land and water resources, and eventually led to full-scale warfare. For example, as seen above, several studies have compared Jōmon hunting tools (particularly the bow and arrow) to the more sophisticated and complex Yayoi weapons. However, this comparison is of limited value; the former were largely made of stone and were for hunting purposes, while the latter included metal varieties which were intentionally designed to be effective human killing instruments. Hence, it is more appropriate to compare Jōmon stone tools with similar tools from other prehistoric hunter-gatherer societies, such as those of California, to determine if they were also used to inflict bodily harm (see Chapter 8).

Sahara (2005) maintained that there were no genuine weapons in the Jōmon period, but what is a real weapon? Perhaps the main problem lies in how we define ‘weapon’ in a hunter-gatherer society that did not possess the knowledge (or desire?) to use metal. Uno (2002:46) asserted that in the Jōmon era, the distinction between weapons and other tools (processing and hunting implements) is difficult to draw. A similar argument is made by Chapman (1999), Boylston (2000), and Schulting (2013) for the European Neolithic and earlier, where the notion of actual weapons and their identification is problematic because tools and domestic implements were adapted and functioned as weapons whenever required. According to the OED, a weapon is defined as ‘anything designed *or used* to inflict bodily harm’ (emphasis added). So, if an implement is intentionally developed as a weapon but not used, or used as a weapon even though it was not designed for that purpose, it is still a weapon. In other words, all that a tool requires to turn it into a weapon is human intent. Although they were not specifically designed to kill humans, Jōmon tools (both primary and secondary varieties), and especially those made out of stone, were certainly capable of inflicting grievous bodily harm and even causing death. Thus, Jōmon bows and arrows, stone axes, and clubs should be considered as hunter-gatherer tool-weapons (or dual-use technologies), since they caused the vast majority of injuries found in the Jōmon skeletal record.

Defensive Weapons

Palaeolithic and Mesolithic hunter-gatherer communities in Europe also possessed ‘tool-weapons’, specifically axes, knives, and projectiles, that they utilised instead of specialised offensive and defensive equipment such as swords, helmets, and armour found in the later Copper and Bronze Ages (Redfern 2017:13). Similarly, no armour, helmets, or shield-like objects have been found dating to the Jōmon period, even in the few waterlogged sites. In a society with no metallurgy, if such gear existed then it would have been made from perishable materials such as wood and animal hides. As with offensive weapons, however, evidence points to the introduction of defensive wooden shields and armour into the Japanese archipelago during the subsequent Yayoi period (Steinhaus & Kaner 2016:154). The development of armour and helmets in the Middle Yayoi accompanied the spread of bronze and iron arrowheads, though the armour was apparently more effective against stone than metal arrowheads (Sahara 2005:41). Nevertheless, the lack of defensive equipment in the archaeological record suggests that violent incidents in the Jōmon era probably did not form part of large-scale organised warfare. Specialised defensive equipment is unlikely to precede the development of specialised weapons, which are a prerequisite of war.

As domesticated canines have a natural instinct to protect their master, it is possible that the Jōmon used their dogs as more than just a hunting companion or pack animal. Despite the absence of any archaeological evidence, Jōmon dogs may have served defensive (and perhaps offensive) purposes as well, being trained as guard and/or attack dogs. Although this is highly speculative, historic records show that in later periods dogs were sometimes used in battle, for example, by the ancient Romans and Greeks, though more often they were employed as sentry or patrol dogs (Forster 1941). The use of dogs as weapons by hunter-gatherers is an area for potential future research.

Settlement Locations and Patterns

Settlements located on particularly elevated land or places with natural defences might indicate a society where violence was commonplace, especially if coupled with evidence of defensive structures in and around settlements or destroyed villages. The Jōmon hunter-gatherers built their settlements on diverse landscapes, often favouring slightly higher ground such as well-drained tablelands, river terraces, and hillsides, as well as on areas with andosols

(Yamamoto 1989, 1990; Edamura & Kumagi 2009; Steinhaus & Kaner 2016).⁵³ Residential bases were generally located in close proximity to water sources, and regularly distributed on what Uchiyama (2016) calls eco-junctions—the borders between different environments—to enable the year-round exploitation of a wider range of resources with minimal residential mobility (Aikens & Higuchi 1982). Villages in coastal and riverside areas, for example, could acquire both terrestrial and aquatic foodstuffs based on seasonal availability. Uno (2003) discovered that Jōmon sites (in Kōchi) were equally distributed between the coastal plains and mountains, with spaciouly organised dwellings and product exchanges. Perhaps this dispersal helped to minimise incidents of violence. In contrast, Yayoi sites and dwellings were largely concentrated on the plains (especially the Kōchi Plain), and conflicts over resources increased, suggesting that access to food and water outweighed security considerations when it came to selecting settlement locations (Uno 2003:16). Jōmon settlements constructed on hillsides and at higher elevations were probably not intentionally positioned in defensible locations within the landscape. Other possible reasons for selecting such a site might include flood avoidance and situational awareness.

Despite the difficulty of tracking changes in settlement patterns archaeologically, the dispersal and/or nucleation of villages within a certain area may also suggest the occurrence of frequent violent clashes (Arkush & Tung 2013; Larsen 2015). In times of recurrent or sustained intergroup conflict and warfare, smaller settlements might merge with or be built closer to larger settlements for safety and defensive purposes; while in times of peace, settlements may be more widely spread across the landscape. But other explanations of hunter-gatherer settlement organisation are possible. A detailed investigation of Jōmon settlement patterns is beyond the scope of this study, and here the focus will be on reported reasons for changes in settlement patterns.

Following Rousseau, scholars such as Kobayashi (2003) and Uchino (2013) believe that fighting in the Jōmon period developed after people began to adopt a settled lifestyle; having established semi-permanent settlements during the Initial and Early Jōmon phases. They claim that there was definitely violent conflict on a small-scale between Jōmon groups, although it differed markedly from the fighting which occurred in the subsequent Yayoi era (Uchino 2013:460). Nakahashi (2003) anticipated their argument, asserting that if population

⁵³ Andosols are very fertile soils usually found in active volcanic areas. The term is derived from Japanese: ‘an’ meaning dark, and ‘do’ meaning soil. They represent only 1-2% of the Earth’s land surface, but are often densely populated (Dahlgren et al. 2008:39).

increased as a consequence of sedentism, then it would have led to more intergroup conflict. Inhabitants of large Jōmon settlements likely expelled smaller groups from prime territory, such as that near natural springs or abundant resources (Kobayashi 2003:18). In other words, once human groups settled in one place, they became possessive of their territories and protective of their belongings, and this sometimes resulted in violence.

Larger, nucleated settlements developed during the Middle Jōmon period, due to high population densities from intensified use of certain plant resources.⁵⁴ Subsequently, the climate cooled from the late-Middle to Final Jōmon, thereby reducing the availability of these resources and generally resulting in depopulation and shrinking settlement size, as well as fewer and more widely dispersed villages (Bevan et al. 2013:45; Sekine 2014:203; Barnes 2015:270). These changes are reflected in the adaptation of stone tool assemblages. The proportion of plant food processing tools in eastern Honshū, for example, was highest in the Middle Jōmon but declined thereafter, being replaced by an abundance of hunting tools in the Final Jōmon, especially arrowheads (see above). Jōmon settlement nucleation and dispersion thus appears to have been controlled by shifts in subsistence practices, reinforcing Imamura's (1996a) argument that plant foods mainly supported the high Jōmon populations, and these decreased when shortages in this crucial resource forced greater reliance on hunting.

Many studies have examined long-term changes in Jōmon settlement locations and subsistence patterns (e.g., Edamura & Kumagai 2009; Gillam et al. 2010; Bevan et al. 2013; Crema 2013; Sekine 2014). As semi-sedentary hunter-gatherers, changes in settlement patterns are often explained as driven by alterations in subsistence activities and/or a decline in the productivity of nearby food sources, both ultimately a result of climatic changes. Crema's (2013) study explored Jōmon settlements in eastern Tōkyō Bay—which were characterised by repeated transitions between clumped and dispersed patterns—and offered additional potential explanations for the cyclical changes in settlement history, in particular, the overexploitation of available resources.⁵⁵ Earlier studies (e.g., Uchiyama 2006) argued similarly that humans may have contributed to such environmental degradation, perhaps leading to intra/inter-community conflict. While these explanations of changes in Jōmon settlement patterns are plausible, Steinhaus and Kaner (2016) posit an inverse relationship

⁵⁴ Population growth from the Initial to Middle Jōmon period, as reflected in the number and size of settlements, was the result of natural resource intensification rather than territorial expansion (Imamura 1996a:88).

⁵⁵ In clumped patterns, there were a few large settlements and many small ones, while dispersed patterns consisted of 'a more uniform distribution of settlement sizes' (Crema 2013:1171).

between warfare and settlement patterns, suggesting that violence acts as a catalyst for the political agglomeration of small villages. But no scholars appear to have attempted to relate settlement data directly to evidence of physical violence or potential defensive structures in Jōmon Japan. This requires future investigation.

Defensive Structures

Archaeological evidence of frequent violent clashes and warfare in past societies often includes the discovery of defences. A variety of such structures existed in ancient Japan; from hillforts to moated settlements, watchtowers to beacons, and bulwarks to abatises. The origins of such features in the archipelago are still debated, but most scholars agree it was in the Yayoi period that fortified settlements with moats, palisades, and elaborate defensive earthworks first appeared in Japan (Steinhaus & Kaner 2016). Such evidence implies that violent conflict, or the threat of it, was commonplace in this agricultural society. In contrast, Jōmon sites lacked defensive works such as enclosed ditches/moats seen at other Neolithic settlements on the Korean Peninsula and elsewhere in Mainland Asia (Barnes 2015:273-75).

Defensive Moat or Ditched Enclosure

At present, there is only one known ditched enclosure dating from the Jōmon era. It was discovered at the Shizukawa 16 site in 1982, located around fourteen metres up a hillside near the modern-day city of Tomakomai in southern Hokkaidō (Fig. 4.6-A).⁵⁶ Based on pottery unearthed at the bottom of the ditch, it was constructed around the end of the Middle Jōmon. Resembling a bent horseshoe or gourd and with a total length of 138.5 meters, the ditch encloses a relatively level area of roughly 1600 square meters. It is open to the west, but the ground falls away sharply (approx. 45 degree slope), making it very difficult to climb. Two or three ‘bridges’ cross over and cut the ditch, each one metre wide (Fig. 4.6-B). Roughly 244 cubic meters of soil was excavated to create the ditch, which is equivalent to around 24 or 25 average Jōmon pit-dwellings (Horikoshi 2001:50). Within the ‘enclosed’ area the remains of two circular buildings were found dating to the same period as the ditch (similar pottery unearthed), and a T-shaped pit thought to be a pit-trap. Evidence of a further 15~33 dwellings, also from the same period as the ditch, were unearthed outside of the ditched

⁵⁶ The well-preserved trench is between 1~1.8 m deep, 2~3 m wide at the top, narrowing to 20~50 cm at the base. It has a U- and V-shaped cross section, and encloses an area approximately 56 x 40 m (Tomakomai-shi Kyōiku Iinkai 1987:2; Sahara 2005:115).

enclosure on the south-western side of the site, accompanied by numerous pits and a grave (Fig. 4.6-C) (Tomakomai-shi Kyōiku Inkai 1987:2).

The sheer scale of the Shizukawa ditch indicates that it required a significant investment of labour and time (probably several years) to construct, as well as substantial collaborative effort using simple digging sticks. The reasons for its construction remain a mystery. One interpretation offered by Kobayashi (2004) is that it played a role in domesticating deer, but if this were the case then why have no similar features been discovered elsewhere? Given its scale and location, it is possible that Shizukawa represents a very rare example of a Jōmon ditch-enclosed settlement. Its use as a defensive moat seems unlikely, however, since only two buildings were constructed within the enclosed area; both lacking hearths and with only a small amount of pottery and stone implements. Furthermore, the bridges were located on opposite sides and would have been harder to defend than just one.

Hearths were unearthed within many of the dwellings outside the enclosure, as well as numerous earthenware and stone tools used in daily life, and a large number of ornamental (amber and serpentinite) stone beads of various sizes. Perhaps the enclosure was used as a sacred place for performing ceremonies, or even as an emergency refuge for residents of the main settlement on the neighbouring hill (Kobayashi 2004:125-26). Similar examples of straight ditches separating living spaces—such as dwellings and rubbish pits—from ritual areas and graveyards have been found at Oba (Middle-Late Jōmon, Ibaraki) and Miyaai shell midden (Late-Final Jōmon, Saitama) (Sahara 2005:115-16).

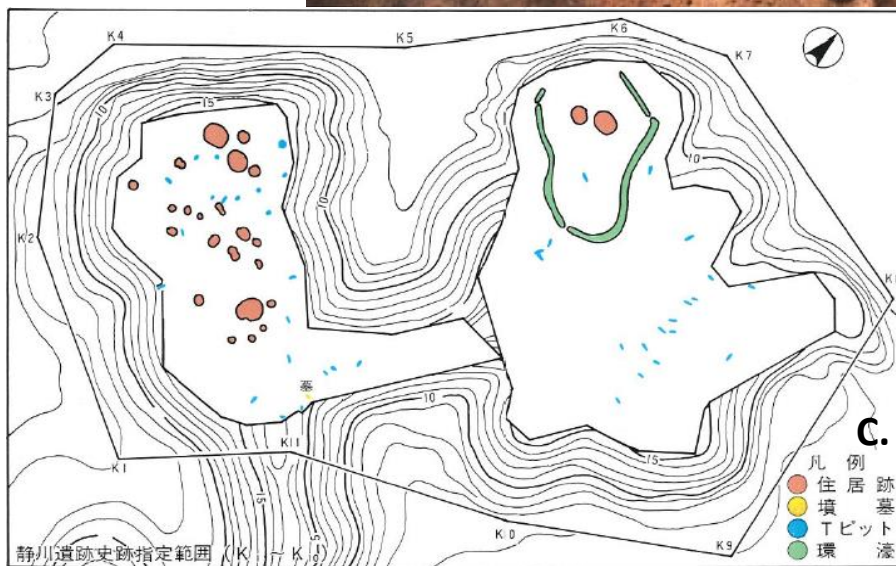


Figure 4.6. Shizukawa site (Hokkaidō). A. Aerial photograph showing the ditched enclosure on the right. B. Close up of the ditched enclosure and two circular buildings. C. Topographic map of the site (red dots: dwelling remains; yellow dots: grave pit; blue dots: T-pits; green lines: ditched enclosure) (Tomakomai-shi Kyōiku Iinkai 1987:1-2).

Watchtowers and Fences

The function of a large six-pillar wooden structure with one metre wide postholes found at Sannai Maruyama (Middle Jōmon, Aomori) is another unsolved mystery (Fig. 4.7-A). The established view is that it was used for ceremonies, perhaps as a shrine, although another interpretation is that it was a base for a tower (Habu 2004). Archaeologists excavating the site discovered that the postholes were placed 4.2 meters apart and tilted slightly inward, indicating that the pillars probably supported between one to three platforms and a roof. Constructed from roughly fifteen meter tall chestnut trees, the structure would have afforded 360 degree views of the surrounding area, providing a commanding presence within the landscape. Its resemblance to massive observation towers at the Yayoi era Yoshinogari site (Saga, Fig. 4.7-B) perhaps suggests that it too was used as a watchtower, which would imply defensive purposes. However, unlike at Yoshinogari, no other defensive structures, equipment, or other evidence of violence has been found at Sannai Maruyama.

Earthen bulwarks were another protective feature of Yayoi sites (being especially notable at Yoshinogari), but thus far none have been discovered at Jōmon settlements. The difficulty of identifying them in the archaeological record, due to their frequent construction/destruction from soil dug out to form a moat, may account for this (Sahara 2005:105). In contrast, wooden fences are easier to recognise from the remains of their post holes, even if the wood has rotted away. They were a common feature in the Yayoi era, being found at both hilltop settlements (e.g., Ichinokuchi, Fukuoka) and flat lowland sites (e.g., Yoshinogari), where they were erected atop defensive walls (Sahara 2005:110). Fences were also built in the Jōmon era—two rows were unearthed at Kamishinjyō (Final Jōmon, Akita), for example—though apparently they did not surround sites in a protective manner (Sahara 2005:115). Steinhaus and Kaner (2016:26) suggest that the Jōmon sometimes used fences to create funnels into which prey such as deer were driven, but like the ditches, they may have also served to separate different sections of a settlement. The absence of protective structures in and around Jōmon settlements does not necessarily signify a peaceful society devoid of violent incidents, however, as an examination of Jōmon skeletal remains will attest (see Chapters 5-7).



Figure 4.7. Reconstructions of Jōmon and Yayoi period structures. A. Six-pillar wooden structure at Sannai Maruyama (Aomori) Photographed by DD Padilha. B. One of four watchtowers at Yoshinogari (Saga) Photographed by IR Braddick.

Iconographic Evidence

Iconographic representations of human-like figures depicted wielding weapons in two or three-dimensional scenes of conflict provide another, albeit more symbolic, indication of violence in the past. Information about the techniques and technology of fighting may be gleaned from these action scenes. However, according to Nash (2005:75), such data has ‘...been largely ignored, especially within prehistoric hunter-gatherer research’, primarily due to the limited number of Rupestrian panels found worldwide with images of orchestrated violence and models of warriors and battle scenes. The rock art assemblage of Levantine Spain—one of the best-known examples of hunter-gatherer violence—portrays scenes of executions, skirmishes, and warfare, while rare images of humans struck by projectiles have been identified in Upper Palaeolithic cave sites across Europe (Thorpe 2000; Nash 2005). Moreover, a scene depicting possible human torture (organised strangulation) or a cruel initiation ritual dating to c. 10,000 BC at Addaura cave near Palermo (Italy) demonstrates the difficulty of interpreting prehistoric rock engravings (Guilaine & Zammit 2001).

In lieu of cave walls, the Jōmon people chose to decorate their pottery vessels (and pebbles) with scenes of childbirth (Fig. 4.8-A) and hunting; events that featured prominently in their daily lives.⁵⁷ The importance of hunting, for example, is demonstrated by an incised pebble depicting a human aiming an arrow at a deer, discovered at Yama no kami (Late-Final Jōmon, Fukushima) (Fig. 4.8-B). Similarly, a relief decoration on a pottery vessel from Nirakubo (Late Jōmon, Aomori) (Fig. 4.8-C) shows a bow and arrow pointed at a small animal with the noose of a snare or similar device and fir-trees (Naumann 2000:44-45). The Jōmon also created thousands of enigmatic anthropomorphic and animal figurines made of stone, bone, and clay. Pottery was one of the main media for artistic expression in this period. Yet, no representations of violence have been found in the Jōmon record thus far, suggesting that violent incidents may have been exceptional, deemed insufficiently important to depict, or censored by a desire to protect peaceful coexistence.



Figure 4.8. A. Pottery vessel depicting childbirth from Goshomae (Middle Jōmon, Yamanashi). B. Hunting scene incised on a pebble from Yama no kami (Late-Final Jōmon, Fukushima). C. Hunting scene depicted on a pottery vessel from Nirakubo (Late Jōmon, Aomori).

⁵⁷ Fugoppe and Temiya caves in Hokkaidō are the exceptions, containing numerous rock engravings of human figures dating from the Epi-Jōmon period (Ogawa 2019:32).

Warrior Graves

The graves of warriors constitute another important indicator of warfare in the archaeological record (Vencel 1984). The burial of weapons with the deceased is generally considered indicative of a warrior's grave, examples of which have been found across numerous ancient societies around the world. The mainstream view among archaeologists is that evidence of weapons deposited in graves first appeared in Japan during the Yayoi period. For instance, Steinhaus and Kaner (2016:153) point out that weapons in graves, fortified settlements with moats and earthworks, as well as oversized weapons for ritual purposes indicate Yayoi society 'had an organised character, and that conflict was becoming more commonplace.' However, in a hunter-gatherer society such as the Jōmon that neither produced implements specifically designed to kill humans, nor seems to have possessed defensive equipment, the existence of expert warriors is questionable.

Traditionally, Japanese archaeologists have assumed that since the Jōmon people were primarily hunter-gatherers, their society must have been essentially egalitarian, especially when contrasted with the succeeding agricultural and highly stratified Yayoi society (Imamura 1996a; Pearson 2007). Apparently, no social hierarchy developed in the Jōmon period, although not all scholars agree (e.g., Suzuki 1999; Steinhaus & Kaner 2016). Community leaders and elders are thought to have existed, and certain figures such as shamans and skilled hunters may have played notable social roles (Habu 2004:138; Perri 2016:1176). Whether such positions were expressed in the mortuary record through the construction of special burials with particular grave goods remains uncertain.

It is generally believed that little differentiation existed in the style or size of Jōmon graves, and grave goods were relatively uncommon and few in number, though exceptional cases have been unearthed at some sites (Yamada 2006:75; Steinhaus & Kaner 2016:28). Mizoguchi (2013:95-96) asserts that Jōmon burial assemblages probably represented 'a range of idealised, task-based social persona, such as those of good hunters, priests and so on.' This interpretation is supported, for instance, by the discovery of three particularly rich graves (of 37) found at the Late Jōmon Karimba site (Hokkaidō). These are thought to have belonged to female shamans because of the scattered red ochre and numerous personal ornaments unearthed, including lacquered combs (Pearson 2007:368). Moreover, Gotō (1986:184) claimed that skeletons buried with *sekibō* as a grave good must have been the village shaman.

Following a basic tenet of mortuary archaeology that grave goods represent one of the elements generally indicative of the deceased's former social status, tools found within a grave may hint at their occupation.⁵⁸ If, as previously argued, we consider that some Jōmon tools were also used as weapons, then perhaps the discovery of these tool-weapons—accompanied by evidence of violent trauma on the skeletal remains—within a grave might suggest the presence of a hunter-warrior. Indeed, Nakamura's (1999, 2000) studies of grave goods at hundreds of Jōmon burial sites across Japan indicate that everyday stone tools (type 1 tools) were part of the burial assemblage. Vencl (1984:127) warned against overlooking 'morphologically inconspicuous' weaponry, such as pebbles used as projectiles and axes as weapons, as it might produce a distorted image between the ratios of graves with and without 'arms'. On this basis, data from Yamada's (2006) burial study reveals that 5.49% of the 2443 Jōmon graves examined had at least one actual or potential tool-weapon as a grave good (Table 4.2).⁵⁹ However, as the skeletons span both sexes and age groups (including children), and only one individual exhibited skeletal injuries as well as a potential tool-weapon, identification of hunter-warriors in this sample of Jōmon burials seems unlikely. In short, the clear distinction previously drawn between warrior and other graves based on the presence/absence of weapons may need to be reassessed for hunter-gatherer societies, and other evidence taken into consideration to aid identification.

Table 4.2. Jōmon Graves Containing Tool-Weapons

Tool-Weapons	Male	Female	Unknown	Total
Stone Arrow-head	22	35	28	85
Bow	-	-	6	6
Ground Stone Axe	5	2	15	22
Chipped Stone Axe	8	23	10	41
Stone Rod/Club	1	1	5	7
Spear-Tipped Projectile	1	1	2	4
Antler Thrusting Tool	-	1	-	1
Stone Crown	2	-	-	2
Blade/Sword	-	1	-	1
Pebble	2	-	2	4
Total Graves	36	48	*50	134

Figures calculated from Yamada 2006. *Including 7 children's graves.

Note: some graves contained more than one type of grave good, so they were counted in multiple grave tallies.

⁵⁸ In addition to the analysis of any grave goods found within a burial, the structure of cemeteries, the relative location, construction, and size of individual graves, and the posture of the interred is also examined to help determine the deceased's social standing and occupation during their lifetime (Steinhaus & Kaner 2016:28).

⁵⁹ Yamada's (2006) study provided data from 2490 graves, but 47 were excluded from the calculation of tool-weapon grave good frequency; 43 being from an unknown period and four dating to the Yayoi era.

Overall, grave goods were relatively rare in the Jōmon period, and only a small number of burials exhibited tool-weapons (see Yamada 2006); too few to suggest the existence of full-time Jōmon warriors or a warrior class. It is always possible that thieves or poor preservation conditions robbed the buried of their possessions, but given that stone tools are inorganic and virtually imperishable, and evidence of Jōmon grave robberies is yet to emerge, neither appears likely. Ultimately, the lack of concrete proof of warrior graves implies that the protection of settlements, if necessary, was more often a community effort rather than the work of specialist warriors in this era.

Concluding Thoughts

The absence of obvious offensive weapons, such as metal swords and halberds, in the prehistoric Jōmon period is one of the main reasons why these hunter-gatherers are thought to have been peaceable or nonviolent. The Jōmon did, however, possess a wide range of hunting and manufacturing tools made from a variety of natural materials. Humans are an adaptable species, capable of utilising the same object for different purposes depending on the situation. Thus, it is not surprising that when the need arose, similar to hunter-gatherer societies in Mesolithic and Neolithic Europe, the Jōmon repurposed their everyday tools like bows and arrows and stone axes as implements with which to inflict injuries and to kill. They may have also used their so-called ritual artefacts (e.g., *sekibō*) as clubs to strike an opponent, indicating that tools can serve multiple functions. Identification of prehistoric weaponry is further complicated by morphologically inconspicuous weapons.

The main problem, however, lies in how we define ‘weapon’ in a hunter-gatherer society which did not possess the knowledge (or desire?) to use metal. With malicious intent, most tools can be used to kill or at least injure, thereby effectively converting them into weapons. Uchino (2013) believes that by employing the most powerful weapons available to fight, both the Jōmon and Yayoi people showed a clear intent to kill. Although Jōmon tools were not specifically designed to injure and/or kill humans, since bows and arrows, stone axes, and (probably) clubs, in particular, caused the vast majority of skeletal injuries found in this era, they should be considered as hunter-gatherer tool-weapons. In contrast to the Yayoi period, the lack of defensive equipment (such as armour and shields) suggests that violent incidents in the Jōmon period were more likely to have been small-scale interpersonal or intragroup acts rather than organised intergroup warfare.

Settlement patterns appear to support this argument. Fighting in the Jōmon era is thought to have been instigated by the development of a settled lifestyle and the construction of semi-permanent settlements, as people became possessive of their territories and protective of their belongings. Being semi-sedentary hunter-gatherers, Jōmon village locations reflected the need to be in close proximity to important natural resources. Settlements were often built on eco-junctions to maximise available foodstuffs, as well as near sources of water and on slightly elevated land, but were probably not deliberately situated in defensible locations within the landscape. Jōmon settlement aggregation and dispersion are primarily attributed to climatic changes and the consequent alterations in subsistence practices and/or decreases in the productivity of nearby food sources, as well as the overexploitation of available resources. Such conditions may have led to an increase in violent conflict, but few studies have attempted to link settlement data to evidence of physical violence or potential defensive structures in the Jōmon period.

This is perhaps because the existence of defensive structures in and around Jōmon settlements is questionable, yet, the function of some features thought to have served ceremonial purposes may have been misinterpreted. The Sannai Maruyama six-pillar wooden structure might have been used as a watchtower, and the ditched enclosure at Shizukawa perhaps as a moated settlement or emergency refuge, but these are unique examples. Humans are capable of constructing and using a structure for more than one purpose; as with tools. The various functions of a building are often determined by changing circumstances. For instance, a school that is usually employed as a teaching institution may become an evacuation centre during emergencies or a polling station during elections. Thus, the Sannai Maruyama structure and Shizukawa ditched enclosure could have served both ceremonial and defensive functions, as the need arose.

Rock art and models depicting warriors and group battles are cited as another form of indirect evidence for organised conflict. The Jōmon people decorated their pottery vessels with images of important daily events, but the lack of scenes portraying killings or battles suggests that violent incidents were either rare or not considered significant enough to depict. Perhaps the absence of concrete proof of warriors in Jōmon society, as implied by the mortuary record, signifies that if fighting did occur then it was concealed rather than glorified in visual media. The dearth of evidence of warrior graves also supports the argument that violence among the Jōmon was not on the scale of organised warfare.

Considering the available archaeological data, the indirect evidence discussed in this chapter reveals that violent conflict, or the threat of it, was not commonplace in Jōmon society. The absence of defensive structures, iconographic depictions, and warrior graves creates an impression of almost exclusively peaceful development. Lack of evidence, however, does not in itself constitute evidence. It is not impossible that in the future archaeologists will uncover indirect evidence of large-scale violence in Jōmon Japan, but it is more likely to be found in the skeletal record, to which we now turn.

5. Violence in the Jōmon Period:

Direct Evidence

Human skeletal trauma from the archaeological record, such as weapon injuries, bone fractures, and postmortem modification, add significantly to our understanding of violence in the past. Although a skeletal injury may capture only a fragment of the lived reality of violence, it is nevertheless the preeminent source of information for the study of conflict in prehistoric societies, where indirect evidence is scarce and/or difficult to identify.

The mainstream view that the Jōmon hunter-gatherers of Japan did not engage in large-scale intergroup conflict rests in part on the limited number of excavated Jōmon skeletons with violent injuries. A resurgence of interest in the study of violence has intensified archaeological investigation, but until recently, emphasis was placed on publishing individual examples of skeletal trauma rather than examining the prevalence of violence on a population level. No strong spatiotemporal pattern has emerged, with cases scattered and isolated across the archipelago; implying interpersonal or at most intragroup acts rather than intergroup conflict. However, the fact that Japanese scholars often fail to distinguish clearly between levels of violence in the Jōmon period complicates this picture.

This chapter will analyse the disparate literature produced by archaeologists and anthropologists who address—often only tangentially, or in comparison with the agricultural Yayoi people—direct bioarchaeological evidence of violence among the Jōmon hunter-gatherers. Following a brief overview of trends in the study of Jōmon skeletal trauma, previously reported injuries will be examined according to trauma type; clarifying which cases will be included in the prevalence calculations presented in Chapter 7. After reviewing alleged examples of ceremonial violence and cannibalism, fighting techniques will be briefly discussed, before the validity of comparing Jōmon and Yayoi violence is questioned.

Trends in the Study of Jōmon Skeletal Trauma

In Europe and America, expertise in the discipline of palaeopathology and the examination of prehistoric skeletal trauma has developed over an extended period of time. In prewar Japan,

anthropologists Kiyono Kenji and Suzuki Hisashi were pioneers in this field of study. Since then, anthropologists interested in skeletal remains have tended to focus on unravelling the ethnic origins of the Japanese people, rather than violence in prehistoric Japan. In the Japanese literature, injuries on Jōmon skeletons, when noted at all, have been generally interpreted as resulting from hunting mishaps or other accidents, instead of deliberate acts intended to wound or kill (Uchino 2013). Consequently, little research has focused specifically on identifying trauma attributable to violence in the Jōmon record. A handful of early studies mention violent injuries, but thus far the number of cases identified are relatively few. According to Suzuki (1958), just two examples of arrowhead injuries to human bones had been reported by this time. The first was discovered by Kiyono embedded in a vertebra at Tsubue shell midden (Middle Jōmon, Okayama) (Kiyono & Hoshijima 1922). Suzuki (1938) himself identified the latter case; an ulna at Ikawazu shell midden (skeleton 20, Final Jōmon, Aichi). This prompted a careful examination of roughly 270 skeletons stored at the University of Tōkyō, among which Suzuki found five with injuries. This groundbreaking study was the start of the systematic investigation of Jōmon skeletal trauma.

One of the first multi-case studies to be published was written by Gotō Kazuhito (1986), who reassessed four adult skeletons apparently injured in battle. The first case, a male from Hobi shell midden (skeleton 20, Final Jōmon, Aichi), exhibited two cranial perforations seemingly produced by the same stone tool (probably a large axe), which Gotō (incorrectly) claimed was a non-fatal case of trepanation. The other cases were projectile injuries: a stone arrowhead embedded in the right ulna of a male from Ikawazu (mentioned above); another in the right ilium of a male at Sanganji shell midden (skeleton 22, Final Jōmon, Fukushima), and a bone spearhead in the pelvis of a female (originally identified as male)⁶⁰ at Kamikuroiwa Iwakage (Initial Jōmon, Ehime).⁶¹ Judging by the entry angles of the projectiles, Gotō interpreted these cases as resulting from hunting accidents. Later, Uchino Nana (2013) deduced that both the Ikawazu and Kamikuroiwa injuries were probably not accidental, since the implements were lodged so deeply in the bones that they must have been used at close range. Gotō concluded that the Jōmon people did not engage in warfare because as hunter-gatherers they had an even greater ‘enemy’ to confront, namely, nature). While

⁶⁰ A recent re-examination of the Kamikuroiwa hip bone revealed that it was mistakenly identified as male, and belongs in fact to a female (based on the pubic morphology and presence of a distinct preauricular sulcus or groove, thought to indicate multiple childbirths) (Nakahashi 2015).

⁶¹ The Hobi, Ikawazu, and Sanganji trauma cases are from Suzuki (1960), but Gotō (1986) seems to have mislabelled Sanganji as Shinchi shell midden.

natural disasters, climatic changes, and starvation posed real problems, such challenges may have spurred violence rather than prevented it.

Surpassing Gotō's limited sample, Suzuki Takao's (1999) study was perhaps the first systematic attempt to compile a comprehensive list of published Jōmon skeletal trauma cases. Suzuki included nineteen individuals from fourteen sites: nine were thought to have died instantly from their injury(s); six whose trauma was healing or had healed (he does not distinguish), and four in unknown condition. With one exception, all were apparently caused by either stone axes (26%) or arrowheads (68%), and the proportion of injuries was slightly higher on postcranial (53%) than cranial (47%) remains. While all axe wounds were located on the skull, arrowhead injuries were found on cranial (31%) and postcranial (69%) bones; the upper body suffering the most (76%). Similar findings were later presented by Uchino (2013).

Amassing data from a wide range of secondary sources, Yamada Yasuhiro (2006) published an impressive catalogue of 2443 Jōmon period graves.⁶² Classifying available information according to 37 attributes, including the presence of skeletal injuries (trauma type, timing, and location), he provided ample material for others to analyse. Sixteen individuals with a total of eighteen injuries were reported, though the majority (83%) were healed/healing fractures. However, only five individuals (four adult males, and one female age unknown) exhibited violence-related injuries: two ulnae fractures; one cranial fracture, and projectile trauma to a humerus and a pelvis.⁶³ These five cases were excavated from sites dated to the Initial (1), Middle (2), and Final (2) Jōmon, and those from the same era were not proximate. This sample represented an overall frequency of 0.2% for violent injuries. These results suggest that violent encounters which left visible injuries on the skeleton were rare in the Jōmon period (or were rarely sought and recorded systematically in the original studies).

The traditional view which portrayed the Jōmon people as peaceful came under serious challenge, probably for the first time, by Matsugi Takehiko (2001). Citing just ten examples, he stated that personal attacks were not uncommon in Jōmon society. Yet, based on the same

⁶² Yamada's (2006) study provided data from 2490 graves, but 47 were excluded from the skeletal trauma calculations; 43 being from an unknown period and four dating to the Yayoi period. Data were only collected for skeletons with clear burial conditions.

⁶³ Unless they were sharp force or projectile trauma, only injuries to the cranium and possibly the ulna can be considered as most likely resulting from violence (see Chapter 6). Data were insufficient to determine whether a nasal bone fracture was caused by violence.

ten cases, Sahara Makoto (2005:116) drew the opposite conclusion, since coincidentally, this represented less than 0.2% of the ‘5000 or 6000 human skeletons that have been found dating to the long Jōmon period.’⁶⁴

As awareness of violent acts committed among the Jōmon people spread, several scholars compiled lists of known examples and compared them to trauma cases from the Yayoi period. Historian Fujiwara Satoshi (2004) focused on the Yayoi—contrasting Jōmon and Yayoi weapons and fighting techniques in order to understand methods of killing and maiming in the latter—whereas Uchino (2013) adopted a similar approach but instead emphasised the former. Uchino (2013:469-70) reported 22 cases from seventeen Jōmon sites; including healing cranial lesions and depressed fractures apparently sustained during group fighting, as well as at least ten cases of defensive ulna fractures. The latter may have been the result of accidental falls instead of violence. Rather than examining Jōmon skeletal trauma herself, however, Uchino relied upon the observations and reports of Suzuki Hisashi and other anthropologists, which may have prejudiced her classifications of injury patterns. She is nevertheless correct that the limited evidence of skeletal trauma does not necessarily indicate a lack of fighting in the Jōmon period; a sentiment shared by Kobayashi (2003). Despite being small-scale and differing markedly from warfare in the Yayoi period, Uchino and Kobayashi agree that the Jōmon engaged in violent conflict in a style unique to their society.

During the last two decades, as archaeological interest in the origins of violence grew, attention shifted to exploring Jōmon violence on a population level. This is an important development because determining the frequency of violent interactions will help to reveal the pervasiveness and scale of conflict in a society. It is imperative that skeletal trauma be analysed both geographically and chronologically (Roberts 2000:351), and recently, some scholars have broadened the scope to the whole of Jōmon Japan. Nakao et al.’s (2016) study is among the first to use skeletal data to look at the spatiotemporal pattern of violence in this period. Examining ‘mortality rates due to violence’, their results suggest that violent conflict among the Jōmon was rare.⁶⁵ Injuries were identified on only 23 of 2582 skeletons (0.89%) excavated from across the archipelago dating to the Initial (0), Early (1), Middle (5), Late (7), and Final (10) periods. The trauma prevalence increased to 1.82% (19/1044 adults) when

⁶⁴ Although not a bioarchaeologist or biological anthropologist, Sahara was an eminent Japanese archaeologist whose research on prehistoric violence predated the 21st century surge in interest.

⁶⁵ Nakao et al. appear to conflate healed and unhealed trauma cases in their study.

children's remains and data from sites with fewer than ten skeletons were excluded.⁶⁶ Jōmon sites with injured skeletons totalled just thirteen, with most concentrated on the east coast and containing a single victim, but as with Yamada's study, no 'hotspots' of violence were found.

Despite the significance of this study, it is not without problems. Most importantly, rather than directly examining skeletal remains for evidence of injuries, or re-examining reported cases of violent trauma (to verify the original diagnosis), Nakao et al. used published data on injured skeletons from two secondary sources: Yamada (2006) and Uchino (2013).

Furthermore, they did not accurately represent all of the cases identified in these two studies. For example, the Kamikuroiwa case was excluded because Nakao et al. assumed that the injury was postmortem ritual damage. The unusual findings at Itoku (Final Jōmon, Kōchi) (see below) were also omitted because agricultural tools were discovered, which they argue indicates that the site belonged to the Yayoi period, although this is debatable.⁶⁷ The total also includes cases from Yamada's study labelled as dating from the Yayoi or an unknown period (see 62). Moreover, the authors neglected to mention that some of the injuries were in the process of healing. Stating this fact would have further strengthened their argument that mortality due to violence was low, as healing/healed trauma indicates not all violent incidents in the Jōmon era resulted in instant death. Unlike other Japanese scholars such as Suzuki H. (1938), Dodo (1983), Matsumura (1989), Suzuki T. (1999), and Uchino (2013), Nakao et al. chose not to include any cases from Hokkaidō or the Epi-Jōmon period. Selection criteria and the lack of detail regarding sites is also problematic, especially when attempting to cross-reference individual cases with other studies, and physically re-examine specific skeletons. Although listed in the supplement, the number of sites is not clearly stated in either paper (around 201, or 242 including sites that span more than one phase). This oversight might be explained by the authors' aim to determine the overall prevalence and spatiotemporal pattern of violence in Jōmon society, rather than focusing on individual cases of trauma.

The following year, Nakagawa and Nakao (2017a, b) updated the compiled skeletal data, recalculated the percentage of Jōmon trauma, and added Mesolithic Europe as a comparator (see Chapter 8). Slightly revised figures show 0.89% of 2576 skeletons from the Initial to

⁶⁶ Sites with less than ten individuals are usually excluded from calculations because if there are too few excavated human remains, then even if the injury rate can be calculated, it is likely that it will show a biased frequency of violent trauma (Nakagawa & Nakao 2017a:94).

⁶⁷ Given the recent discovery that the Jōmon people had invented tools for cultivation, such as digging sticks, wooden ploughs, and hoes (mentioned in Chapter 2), it is possible that the so-called agricultural tools unearthed at the Itoku site were made in the Final Jōmon period.

Final Jōmon exhibited violent trauma, or 1.81% of the 1269 adults in this sample (Table 5.1). The authors claimed that the particularly high trauma rate seen in the Middle Jōmon (when sedentism became widespread) supports the theory that a settled lifestyle is the cause of warfare. However, village sizes and locations changed substantially over time, indicating that the Jōmon people were not completely sedentary, and the differences in injury rate between the phases are not statistically significant.⁶⁸ Thus, the extent to which sedentism is related to increased violence and potential warfare among the Jōmon requires further investigation.

Table 5.1. Quantity and Prevalence of Human Skeletal Remains Exhibiting Injuries from the Jōmon Period

Period	Total	Adults	Injured Skeletons	ID X Ch.	Adults*	ID*	ID X Ch.*	ID/ Total	ID X Ch./ adults	ID X Ch.*/ adults*
Initial	113	39	1	1	28	1	1	0.88%	2.56%	3.57%
Early	216	117	0	0	98	0	0	0.00%	0.00%	0.00%
Middle	371	172	5	5	97	3	3	1.35%	2.91%	3.09%
Late	944	470	7	7	398	6	6	0.74%	1.49%	1.51%
Final	932	471	10	10	430	9	9	1.07%	2.12%	2.09%
Total	2576	1269	23	23	1051	19	19	0.89%	1.81%	1.81%

Adapted from Nakagawa & Nakao 2017a. ID = injured individuals. X Ch. = excluding children.

*Excluding data from sites with human skeletal remains of less than ten individuals.

If wars were a frequent occurrence in Jōmon society, then in addition to fortified settlements, one would expect to find many human skeletons exhibiting violence-related injuries over a short period of time, and the corresponding sites clustered in a relatively small area. The spatiotemporal arrangement of the thirteen Jōmon sites with injured skeletons is rather sporadic, however, and the location of many sites along the Pacific coast of Honshū probably reflects the distribution of shell midden sites in this region. Moreover, with a few exceptions (e.g., at Ikawazu), only one or two violently injured skeletons were found at each site. This result prompted Matsumoto (2018) to assert that there is no clear evidence of mass killings in Jōmon society. The lack of injuries to children's skeletons is also used to argue that the possibility of intergroup warfare is extremely low. Violence between groups is thus thought to have been infrequent during the Jōmon period, despite increases in settlement and population densities, and fluctuations in climate and the availability of resources.

Nakagawa and Nakao (2017a) reported a more than three-fold increase in the prevalence of skeletal injuries from the Jōmon to Yayoi period (0.89% to 3.03%, respectively): a

⁶⁸ Fisher's Exact Probability Test: Initial-Early $p = 0.34$; Early-Middle $p = 0.16$. Z-test: Middle-Late $p = 0.30$; Late-Final $p = 0.45$ (see Chapter 6 for discussion of statistical methods).

statistically significant difference ($p < 0.0002$) likely due to the intensification of conflict and competition for resources. While they concluded that warfare among the Jōmon was unlikely, its existence in the Yayoi era was highly probable, although not in all regions and phases. The skeletal evidence contained in this study seems to substantiate the traditional view in Japanese archaeology that warfare in the archipelago began as a direct result of the introduction of agriculture. Nakagawa et al. (2017:9) similarly concluded that their data supports the agriculture-induced subsistence model rather than Bowles' (2009) parochial altruism model, since the 'level of violence [in prehistoric Japan] was too low to exert selective pressure for the evolution of altruism'.

While Matsumoto's (2018) article recycled results presented in earlier studies, it discussed the wider context regarding violence and warfare, which many previous Japanese studies have failed to do. Matsumoto explored the factors which promote or prevent warfare and other intergroup violence by examining current arguments concerning the origin of war (e.g., whether hunter-gatherers engage in war), and discussing the characteristics of a peaceful society. Matsumoto emphasised the need to consider the relationship between economic and cultural factors in the Jōmon period to better understand the absence of warfare.

A long-standing theory in archaeology suggests that climate change invariably promoted violence between prehistoric humans, via mechanisms such as food shortages (Ember & Ember 1992; Keeley 1996; Otterbein 2004). In response, Nakao et al. (2020) questioned the applicability of this hypothesis to Jōmon society. Still reliant on bioarchaeological data from Yamada (2006) and Nakao et al. (2016), they attempted to explain relatively small fluctuations in the frequency of injured individuals from the Middle to Final Jōmon periods, when the climate cooled. Whilst acknowledging that climatic changes affected the Jōmon people in various ways, Nakao et al. determined that there was no causal relationship with the prevalence of violent incidents in this era, or at most had only a limited influence. They considered a wide range of plausible reasons to explain this finding, and the introduction of the climate factor into this debate is significant (and long overdue). However, Nakao et al.'s conclusion is moot since they repeated the methods of their 2016 study. They did not physically examine the skeletal remains, missed clear published cases of violent trauma, and used only Yayoi violence as the 'context' for assessing their claim that violence was rare in the Jōmon era. The imprecise dating of many Jōmon skeletons further hampered this ambitious project.

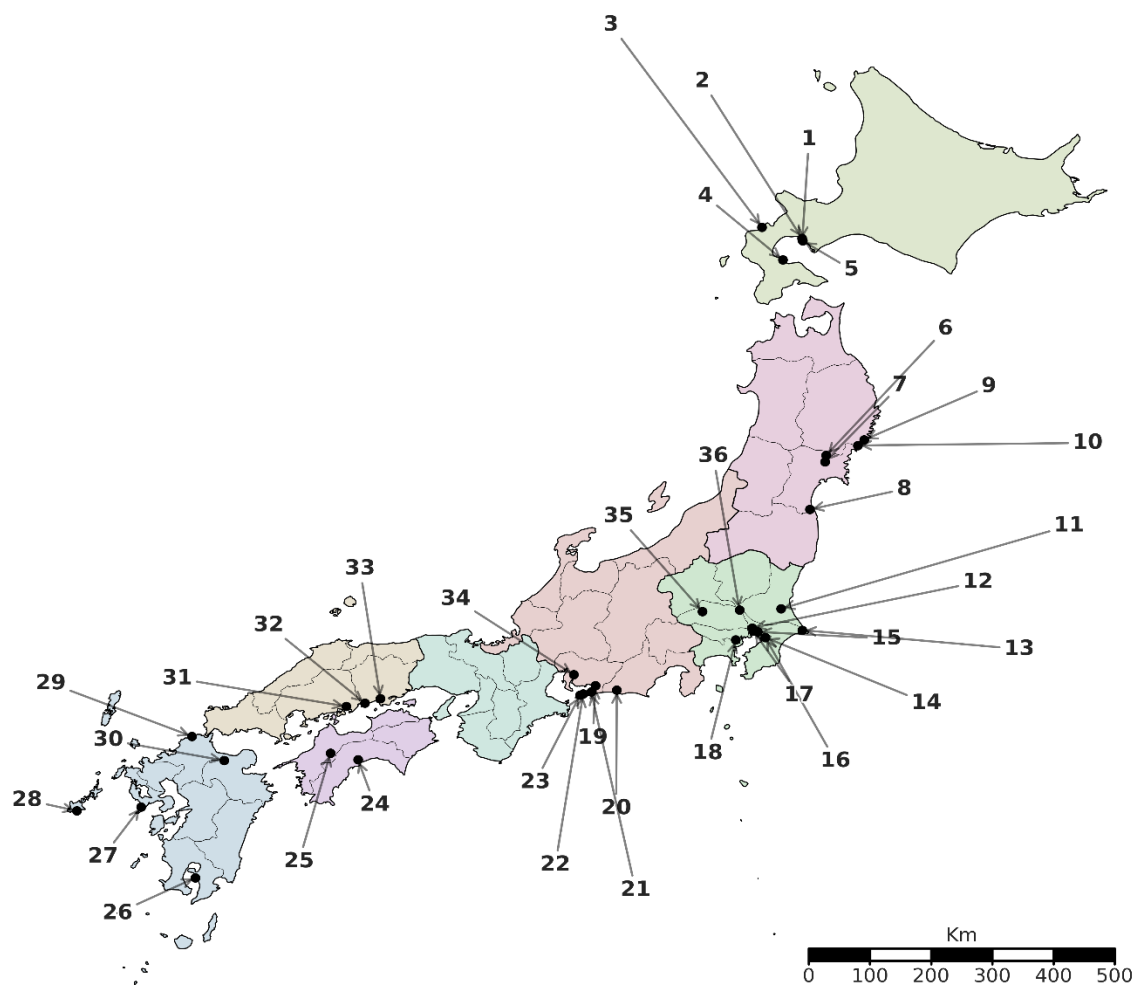
Reported Cases of Jōmon Skeletal Injuries

Collating published cases of skeletal violence helps to reveal the types of traumatic injuries suffered and the fighting techniques employed during the Jōmon period. Prior to the invention of firearms, violent injuries were mainly caused by blunt force, projectiles, and cutting (Larsen 2015:174). The locations of Jōmon site with previously reported cases of skeletal injury are displayed in Figure 5.1. However, not all were caused by violence. Here, published trauma cases have been divided between two tables; those which could be verified as the result of violence (Table 5.2), and those that could not (Table 5.3) (see Chapter 6 for an explanation of violence-related trauma). Since it was not possible to physically examine every case, verification was based on whether sufficiently detailed descriptions and photographic evidence of the injuries were available. The cases listed in Table 5.2 have been included in the trauma prevalence calculations in Chapter 7. Trauma cases that were analysed in Japan for this study have also been noted in Table 5.2 ('Physically Examined' column) in order to avoid double counting. Cases listed in Table 5.3 may be revisited in the future, but at present the accessible information was insufficient to decide whether or not the injuries were violence-related. Although not exhaustive, these lists provide a useful starting point to examine the direct evidence of violence in the prehistoric Jōmon era.

Projectile Trauma

Projectiles injuries were the most commonly identified type of violent trauma in the Jōmon skeletal record. In Uchino's (2013) study, 82% of the injured Jōmon reportedly suffered at least one projectile wound. Unlike tools which cause blunt force trauma, arrows and spears were designed to be shot or thrown at great speed to penetrate flesh and bone. They occasionally become embedded in the victim, making them easier to recognise.

Dating from the Initial Jōmon, the earliest case of violence-related skeletal injury was found at Kamikuroiwa (Nakahashi 2015:117). Morimoto Iwatarō discovered a spatula-shaped deer bone spearhead (roughly 10 x 2 centimetres) protruding through the right iliac wing of an adult female (Fig. 5.2-A~C) (Morimoto et al. 1970:239-41). Morimoto et al. determined that the individual had been speared from relatively short range at considerable speed. The absence of periosteal reaction around the injury site showed that death followed rapidly (presumably from perforation of the intestines), as no other fatal injuries or pathological changes were observed.



- | | | | |
|------------------------------------|------------------------------|-------------------------------|--------------------------------|
| 1. Usu-Moshiri
有珠モシリ遺跡 | 2. Takasago SM
高砂貝塚 | 3. Sakaeiso Iwakage
栄磯岩陰遺跡 | 4. Sakaehama 1
栄浜 1 遺跡 |
| 5. Minami-Usu 6
南有珠 6 遺跡 | 6. Kaitori SM
貝鳥貝塚 | 7. Aoshima SM
青島貝塚 | 8. Sanganji SM
三貫地貝塚 |
| 9. Miyano SM
宮野貝塚 | 10. Nakazawahama SM
中沢浜貝塚 | 11. Wakaumi SM
若海貝塚 | 12. Kowashimizu SM
子和清水貝塚 |
| 13. Yoyama SM
余山貝塚 | 14. Kasori SM
加曾利貝塚 | 15. Takanekido SM
高根木戸貝塚 | 16. Kasori-Minami SM
加曾利南貝塚 |
| 17. Ubayama SM
姥山貝塚 | 18. Shimo Numabe SM
下沼部貝塚 | 19. Inariyama SM
稲荷山貝塚 | 20. Shijimizuka SM
蜷塚貝塚 |
| 21. Yoshigo SM
吉胡貝塚 | 22. Ikawazu SM
伊川津貝塚 | 23. Hobi SM
保美貝塚 | 24. Itoku
居徳遺跡 |
| 25. Kamikuroiwa Iwakage
上黒岩岩陰遺跡 | 26. Kunugibaru SM
柊原貝塚 | 27. Fukahori
深堀遺跡 | 28. Miyashita SM
宮下貝塚 |
| 29. Yamaga SM
山鹿貝塚 | 30. Hegi cave
粉洞窟 | 31. Ōta SM
太田貝塚 | 32. Tsukumo SM
津雲貝塚 |
| 33. Tsubue SM
粒江貝塚 | 34. Motokariya SM
本刈谷貝塚 | 35. Myōonji cave
妙音寺洞穴 | 36. Fuyuki A SM
冬木 A 貝塚 |

Figure 5.1. Location of Jōmon sites with previously reported cases of skeletal injuries (SM: shell midden).

Table 5.2. Verified Cases of Violence-Related Jōmon Skeletal Trauma Reported in Previous Studies (SM: shell midden)

Site	Prefecture	Period	Sex	Age	Skeleton Number	Tool-Weapon	Injury	Healing	Injury Mechanism	Source	Physically Examined
Fukahori	Nagasaki	Final	M	Adult	12	Stone axe/arrowhead ?	Frontal bone depressed fracture/perforation (near bregma)	Y (Suzuki) N (Uchino)		Nagasaki Uni. Medical School Anatomy Class 2 1967; Suzuki 2010; Uchino 2013	N
Hobi SM	Aichi	Final	M	40~59	Koganei 7		R ulna fracture to midshaft	Y		Yamada 2006	N
Hobi SM	Aichi	Final	M	Elderly	7	Stone axe, stone arrowhead ?	Cranium 8 depressed fractures	N	Multiple blows/shots from behind by 2-5 assailants	Suzuki 1975; Uchino 2013	Y
Hobi SM	Aichi	Final	M	Adult	20	Sharp-edged tool (stone axe)	R occipital-parietal & L parietal 2 large oblong-shaped perforations	N	Attacked simultaneously from behind by 2 assailants	Suzuki 1938; Uchino 2013	Y
Ikawazu SM	Aichi	Final	F	Middle-aged/ Mature	16	Stone axe	L parietal 2 oval-shaped perforations	N	Attacked twice with stone axe	Suzuki 1938, 1975; Suzuki 1999; Uchino 2013	N
Ikawazu SM	Aichi	Final	M	Adult	20	Stone arrowhead	R ulna embedded arrowhead in posterior, cone-shaped injury	Y	Defensive injury, or if victim standing upright, arrow shot from behind, right side	Suzuki 1938; Irago Shizen Kagaku Hakubutsukan 1976; Suzuki 1999, 2010; Uchino 2013	N
Itoku	Kōchi	Final?	F	Adult	[J2]	Bone arrowhead	L femur semi-circular perforation (distal)	N	Arrow fired from front & above, penetrated femur	Matsui 2003; Matsui et al. 2004; Uchino 2013	N
Kamikuroiwa Iwakage	Ehime	Initial	F	Middle-aged/ Mature	6901/ 6902	Spatula-shaped bone tool (spear)	R iliac wing embedded spear projecting 3 cm into abdominal cavity	N	Spear thrown from slightly above, behind, & right side	Morimoto et al. 1970; Sahara 1992; Suzuki 1999; Harunari 2009; Uchino 2013	N
Kasori-Minami SM	Chiba	Late	M	Adult 30-40	Uchino 6	Bamboo/wooden spear	R parietal 2 circular cone-shaped perforations	N	Attacked by 2 assailants from right side, slightly forward & backward (separate holes)	Kasori Kaizuka Chōsadan 1968; Uchino 2013	Y

Minami-Usu 6	Hokkaidō	Epi	F	Middle-aged	6		L parietal oval-shaped depressed fracture	N		Dodo 1983	Y
Miyano SM	Iwate	Middle	M	Middle-aged	BL-2 (101)	Stone arrowhead	R iliac wing arrowhead embedded in posterior edge	Y	Shot from above, behind, & slightly laterally	Suzuki 1999; Yamada 2006; Uchino 2013	N
Sakaeiso Iwakage	Hokkaidō	Final	F	Middle-aged	1	Stone axe	R parietal centre irregular elliptic depressed fracture	N	Blow from right side	Dodo 1973; Suzuki 2010; Uchino 2013	Y
Sanganji SM	Fukushima	Final	M	Middle-aged	22	Stone arrowhead	R ilium embedded arrowhead (anterior edge) encased in bone	Y	Shot from above, behind, & slightly laterally	Suzuki 1958; Uchino 2013	N
Takanekido SM	Chiba	Middle	M	Mature/Elderly	5	Stone arrowhead?	R humerus cone-shaped perforation with surrounding osteophyte (above deltoid tuberosity)	Y	Shot from above & right side	Takanekido Iseki Chōsadan 1971; Suzuki 1999; Yamada 2006; Uchino 2013	N
Takasago	Hokkaidō	Final	F		3		L parietal oval depressed fracture	Y		Suzuki 1999	Y
Tsubue SM	Okayama	Middle	M	Elderly	103	Stone arrowhead	T3 vertebra cut horizontally with embedded arrowhead	N	Shot from front at close range	Kiyono & Hoshijima 1922; Suzuki 1999, 2010; Fujiwara 2004; Uchino 2013	N
Tsukumo SM	Okayama	Final	F	Middle-aged	Kiyono 20		R ulna parry fracture (distal)	Y		Kiyono & Hoshijima 1922; Yamada 2006	N
Usu-Moshiri	Hokkaidō	Epi	F		16B		L parietal irregular circular depressed fracture	Y		Suzuki 2005	Y
Usu-Moshiri	Hokkaidō	Epi	M	Adult	Burial 17	Stone arrowhead (obsidian)	R femoral head (near neck) arrowhead embedded 14mm	N	Attacked at close range with substantial force from diagonally above, behind, & right side	Matsumura 1989; Uchino 2013	Y
Yoshigo SM	Aichi	Final	M	Middle-aged?	Kiyono 375		L parietal elliptic perforation to centre	Y	Trepanation?	Kiyono & Hirai 1927; Suzuki 1938	Y

Table 5.3. Unverified Cases of Jōmon Skeletal Trauma Reported in Previous Studies (SM: shell midden)

Site	Prefecture	Period	Sex	Age	Skeleton Number	Tool-Weapon	Injury	Healing	Injury Mechanism	Source
Aoshima SM	Miyagi	Middle	M	Adult	?	Stone projectile	Projectile point around the thorax			Nakao et al. 2016, 2020
Aoshima SM	Miyagi	Middle	F	Adult	?	Stone projectile	Projectile point around the ilium			Nakao et al. 2016, 2020
Fuyuki A SM	Ibaraki	Late					No details given			Nakao et al. 2016
Hegi cave	Ōita	Late	M	In their prime	? x 3	Stone arrowheads	No injuries identified, multiple arrowheads found in thoracic & abdominal cavities		Close-range shot (arrowheads not removed postmortem)	Kagawa et al. 1977
Ikawazu SM	Aichi	Final	M	Adult	3		R clavicle & R humerus numerous linear cut marks		Cannibalism?	Suzuki 1938
Inariyama SM	Aichi	Final	F	?	211 or Kiyono 4		R femoral head area fracture	Y		Yamada 2006
Inariyama SM	Aichi	Final	?	?	?		L femur cut mark (distal third fragment)	N	Postmortem processing/cannibalism?	Suzuki 1944
Kaitori SM	Iwate	Final	M	40~59	44		Nose root area fracture	Y		Yamada 2006
Kaitori SM	Iwate	Final	F	17~20	30		L radius fracture (distal)	Y		Yamada 2006
Kaitori SM	Iwate	Final	F	21~39	64		L ulna and radius fracture (distal) & pseudarthrosis?	Y		Yamada 2006
Kasori SM	Chiba	Late	M	40~59	3		R femur fracture (midshaft)	Y		Yamada 2006
Kowashimizu SM	Chiba	Middle	M	?	?		Missing skull and cervical vertebrae	N		Takahashi et al. 1963; Kobayashi 2003
Kowashimizu SM	Chiba	Middle	F	?	?		Missing most of skull and C1 vertebra	N		Takahashi et al. 1963; Kobayashi 2003
Kunugibaru SM	Kagoshima	Late	M	21~39	3		Mandibular fracture	Y		Yamada 2006

Miyashita SM	Nagasaki	Late?	M	Adult		Stone spear/ arrowhead?	R tibia (distal) arc- shaped protuberance	Y	Projectile thrown from behind (piercing tibia?)	Suzuki 1999, 2010; Uchino 2013
Myōonji cave	Saitama	Initial	M	21~39			R temporal fracture	N?	Blow occurred while victim was alive	Yamada 2006
Nakazawahama SM	Iwate	Early	M	Adult	?		L femur cut marks near joints	N	Dismemberment; cannibalism/secondary burial ritual?	Suzuki 1938; Sahara 1992
Ōta SM	Hiroshima	Early?	M	Middle- aged	40 or Kiyono 703	Stone axe	R parietal small, roughly circular perforation	N	Blow from stone axe/trepanation?	Kiyono & Hirai 1927; Suzuki 1938; Suzuki 2010
Ōta SM	Hiroshima	Early?	M	Mature	Kiyono 1380	Blunt instrument	L parietal small, roughly circular perforation	N	Trepanation?	Yoshimi 1937; Suzuki 1938
Sakaehama 1	Hokkaidō	Early- Middle	?	?	Group burial	Stone arrowheads?	9 people with 5 arrowheads	?		Yakumochō kyōiku inkai 1983
Sanganji SM	Fukushima	Final	F	21~39	7		L radius fracture (distal)	Y	Colles' fracture	Fujita 2006; Yamada 2006
Shijimizuka SM	Shizuoka	Late/ Final?	F	Young	1	Stone arrowhead?	L temporal squama small oval perforation (on posterior border)	N	If victim standing, arrow shot from above & behind, or stabbed with arrow	Suzuki 1999; Uchino 2013
Shijimizuka SM	Shizuoka	Late/ Final?	M	Adult	12	Stone arrowhead?	R parietal small oval perforation (near lambda suture area)	N	If victim standing, arrow shot from above & behind, or stabbed with arrow	Suzuki 1999; Uchino 2013
Shimo Numabe SM	Tōkyō	Late				Stone axe or club?	Cranial injury?			Uchino 2013; Nakao et al. 2016
Tsubue SM	Okayama	Middle	F	Adult?	Kiyono 111		R parietal irregular oval-shaped perforation	N	Trepanation?	Kiyono & Hirai 1927; Suzuki 1938
Tsukumo SM	Okayama	Final	M	21~39	Kiyono 65		R radius fracture to midshaft, R ulna secondary change?	Y		Kiyono & Hoshijima 1922; Yamada 2006
Ubayama SM	Chiba	Middle	M	21~39	11		L radius and L ulna fracture (distal end?)	Y	Arthritis?	Yamada 2006
Ubayama SM	Chiba	Late	M	40~59	7		L radius fracture (distal)	Y		Yamada 2006

Wakaumi SM	Ibaraki	Middle	M	40~59	1	L tibia fracture (distal)	Y		Tamatsukuri-machi Iseki Chōsa-kai 1999; Yamada 2006
Yamaga SM	Fukuoka	Late	M	40~59	18	R radius fracture (distal)	Y		Yamada 2006
Yoshigo SM	Aichi	Final	M	?	243 (503)	R radius fracture (distal)	Y		Yamada 2006
Yoyama SM	Chiba	Late	?	?	?	R radius short linear cut marks near joint	N	Postmortem processing/ cannibalism?	Suzuki 1941

The Kamikuroiwa skeleton was unearthed in a secondary group burial with the remains of an adult male and child at the back of the rock shelter. It is the only example of a sharp-edged tool (other than stone arrowheads) embedded in the bones of a Jōmon person (Harunari 2009:533). The entry angle and position of the spearhead led Morimoto et al. (1970) to deduce that the spear was thrown downwards at high speed from close behind the victim. Yet, Harunari identified a second perforation close to the first, perhaps caused by the same spear (Fig. 5.2-D~F), and posited an alternative theory: the implement was an ornament used to spear the female individual in a ritual soon after her death. The latter is implausible but difficult to confirm or deny as it would have occurred during the perimortem interval, with the majority of wounds inflicted on the now decomposed soft tissues. Despite the thinness of the iliac wing and overlying muscles, considerable force would have been required to pierce the bone, implying that a handle was attached to the implement to convert it into a spear.

A bamboo/wooden spear-like implement, or perhaps an excavation tool, was responsible for the fatal, penetrative injuries found on the well-preserved parietal bone of an adult male at Kasori-Minami shell midden (Late Jōmon, Chiba). The former suggestion is the more plausible since the injury surface is the same colour as the surrounding bone, and the lack of cracks implies that the holes were made while the bone retained its elasticity (i.e. within the perimortem interval) (Kasori Kaizuka Chōsadan 1968).

Since spears disappeared from most parts of Japan after the Palaeolithic era, it is not surprising that more Jōmon skeletal injuries resulted from bows and arrows. As Suzuki (2010:73) succinctly put it, ‘embedded arrowheads seem to be a Jōmon era thing’. Relative to other trauma types, they are common, particularly in postcranial remains. At Tsubue, for example, an arrow was shot into the chest of an elderly male. The arrowhead tip severed large blood vessels in the thoracic cavity and almost bisected the third thoracic vertebra, where it became deeply embedded in the vertebral body. With no evidence of healing, it is inevitable that this individual died quickly (Suzuki 1999:41-43, 2010:72-73).⁶⁹

⁶⁹ Tsubue skeleton 103 was identified as female by Kiyono & Hoshijima (1922) and Suzuki (1999, 2010), and male by Fujiwara (2004) and Uchino (2013).

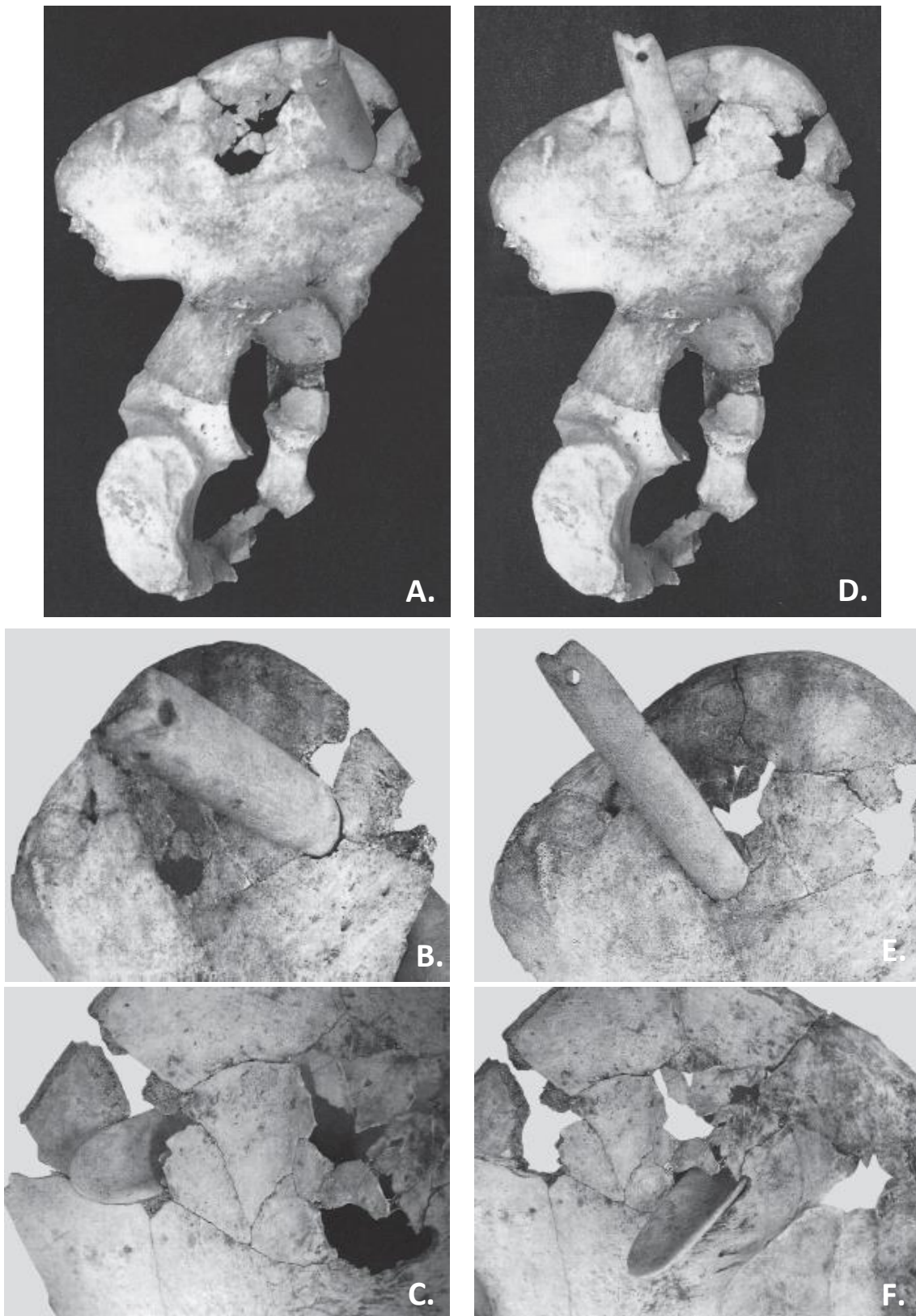


Figure 5.2. Bone spearhead embedded in the right ilium of an adult female at Kamikuroiwa Iwakage (Initial Jōmon, Ehime). A. Anterior view. B. Closeup of A, anterior. C. Closeup of A, posterior. D. Reconstruction of a second similar perforation probably caused by the same implement, anterior view. E. Closeup of D, anterior. F. Closeup of D, posterior (modified from Harunari 2009:535).

Matsumura Hirofumi (1989) found a similar case at Usu-Moshiri (originally named Usu-10) (Epi-Jōmon, Hokkaidō); an adult male skeleton with a broken obsidian arrowhead embedded in the posterosuperior part of the right femoral head. Since there is no evidence of healing, this individual probably did not long survive. However, the injury itself would not have been fatal, as there are no arteries that the arrowhead could have severed as it penetrated the femur.⁷⁰ This implies that either he suffered a fatal wound elsewhere on his body (although no other artificial skeletal injuries were found), or he died from an illness (Matsumura 1989:131-32). Matsumura speculated that the arrowhead was poisoned, perhaps with aconite (wolfsbane) or tetrodotoxin (found in pufferfish), as the Jōmon people are known to have used poisoned arrowheads as a hunting technique.⁷¹

Sometimes victims of projectile injuries recovered. Suzuki (1958) identified a non-fatal arrowhead injury at Sangani. The stone tip was embedded in the right ilium of a roughly forty-year-old male, with the bone having healed around the foreign body. As a result, rather than simply viewing such finds as grave goods (as was customary among Japanese archaeologists at the time), Suzuki asserted that arrowheads found with skeletons may have caused injuries. A virtually identical case was found at Miyano shell midden (Iwate). Despite the pelvic cavity of the Sangani male being pierced roughly seven millimetres, there was evidence of healing around the stone protuberances in both cases, indicating that the men survived being shot (Suzuki H. 1958:115, 1960:76-77; Suzuki T. 1999:43-44, 2010:73-74). Further investigation revealed that if the victims were standing and their assailants were roughly ten meters away, then the arrows were shot from diagonally behind at a height of approximately six meters (see Fig. 5.9 IIX) (Suzuki 1958:114, 1960:79; Gotō 1986:190-91). This technique was also used when hunting. A wild boar found at Shijimizuka shell midden (Shizuoka) had a stone arrowhead embedded in its left ischium with the tip protruding about six millimetres into the pelvic cavity (Okamoto 2001:42). These men might have been mistaken for animals, but equally they could have been attacked intentionally.

In cases where an arrowhead has been removed, recognising a projectile injury is challenging but possible using trauma characteristics. At Takanekido shell midden (Middle Jōmon,

⁷⁰ Along the path which the arrowhead travelled through the femur runs the superior gluteal artery. According to Matsumura (1989:132), even if this artery had been damaged, then clinically speaking there is little chance that the Usu-Moshiri individual would have died from excessive bleeding.

⁷¹ The poisonous tail-spine of a sting ray or guitarfish was found lodged in a deer scapula at Satohama shell midden (Miyagi), which must have been used as an arrowhead (Naumann 2000:43). Such practices continued in subsequent periods of Japanese history, for instance, a stingray spine arrowhead was found embedded in a human femur at the Okhotsk period Uedomari 5 site (Hokkaidō) (Schulting et al. in press 2022).

Chiba), a small, deep hole in the right humerus of an adult male had reached the medullary cavity, but was surrounded by a bony growth as though the bone had healed around a piercing object (Takanekido Iseki Chōsadan 1971; Suzuki 2010:74-75). In contrast, no signs of healing were evident on the left femur of one of the females (bone J2) found at Itoku. At its distal end, the bone exhibited a perforation thought to be the result of a Sika deer bone arrowhead having penetrated the leg (Fig. 5.3) (Matsui 2003:7). The arrowhead entered from the front; the anterior periphery of the hole had been pushed inward and the posterior surface outward. Uno (2003) believed that she was shot from point-blank range while immobile, but could not determine whether the projectile trauma was sustained during interpersonal or intergroup violence.

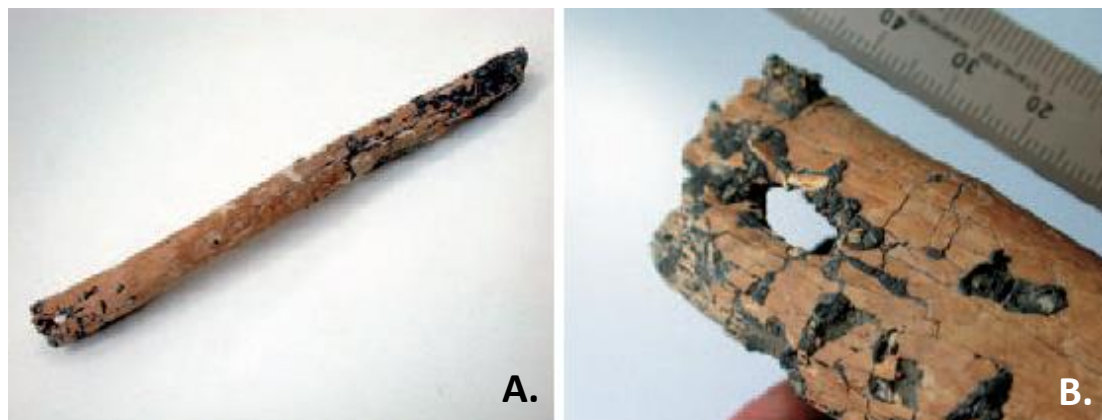


Figure 5.3. A. J2 femur excavated at Itoku (Final Jōmon, Kōchi), proximal end to the right. B. Close up of the perforation on the distal end (Matsui et al. 2004:232).

Similarly, arrowheads are thought to have produced the small, unhealed elliptical holes detected on the crania of two individuals at Shijimizuka (Suzuki 2010:75-76). Uchino (2013) proposed two hypotheses to explain the mechanism of injury: if standing, the victims were shot from behind and above, or stabbed while horizontal. The former is considered the more likely scenario as no other skeletal injuries were found, and the arrow shaft(s) would have probably broken during the attack and been unable to pierce the skulls deeply enough to perforate them (Uchino 2013:466-67). Nevertheless, the Shijimizuka cases have not been included in Table 5.2, as the details could not be verified.

Multiple individuals buried in a single grave (*gassōbo*) was a relatively common burial method in the Jōmon period. What is unusual about the examples discovered at Hagi cave (Early-Late Jōmon, Ōita) and Sakaehama 1 (Early-Middle Jōmon, Hokkaidō) is the possibility that they contain the remains of several people who died violently. One of the Late

Jōmon burials at Hegi cave contained four, deliberately placed adult male skeletons, with multiple broken-tipped stone arrowheads within their thoracic and abdominal cavities.⁷² Scholars surmised that the men had died from being shot with arrows, perhaps during a fight with a neighbouring village (Kagawa et al. 1977:98; Sahara 2005:116; Suzuki 2010:75). In an even rarer find, nine haphazardly positioned skeletons were unearthed in a group burial at Sakaehama 1, accompanied by five stone arrowheads. The projectiles are presumed to have been used as weapons against these individuals, rather than being deposited as grave goods (Yakumochō Kyōiku Iinkai 1983:95). Very poor preservation conditions hindered identification of age and sex, however, and prevented the bones—which had been reduced to dust—from being removed from the ground for further analysis (Kubo Daisuke, personal communication 2018). The absence of detailed descriptions or photographs of the skeletal remains precludes nonviolent explanations from being ruled out, and hence they are excluded from Table 5.2.

Blunt Force Trauma

One of the most striking incidents of Jōmon violence is the brutal attack on an elderly male from Hobi (skeleton 7). This individual suffered eight injuries to his cranium; primarily blunt force trauma (Fig. 5.4). No other skeleton from the Jōmon period has been found with so many contemporaneous violent injuries. Based on the trauma characteristics (shapes and angles), Suzuki (1975) determined that the man had probably been attacked by two or three assailants (four or five according to Uchino 2013), wielding Enshū-style stone axes and shooting stone-tipped arrows. If this male was standing upright at the time of the attack, then judging from the trauma characteristics (especially on the endocranial surface) most of the blows came from above and behind him, suggesting an ambush. The lack of healing indicates that the injuries were fatal, although some are questionable as perimortem trauma. In addition to artificial tooth ablation of the mandibular incisors, this individual's remaining maxillary incisor had been filed into a fork-shape; an unusual finding with merely 2~3% of the Final Jōmon population exhibiting this trait. Thus, it is thought to be a marker of authority or special social status in Jōmon society (Suzuki 1975:272; Irigoien Shizen Kagaku Hakubutsukan 1976:13). At nearby Ikawazu, Suzuki (1975) discovered similar depressed cranial fractures on a female skeleton (No. 16), and deduced that an Enshū-style stone axe also produced these

⁷² There is some confusion regarding the number of injured individuals within this group burial. Suzuki (1999, 2010) reported that three of the four males had arrowheads within their central cavities, while the 1977 site report (Kagawa et al.) mentions four males.

injuries. It is a tool commonly found at shell midden sites on the Atsumi Peninsula in Aichi Prefecture.

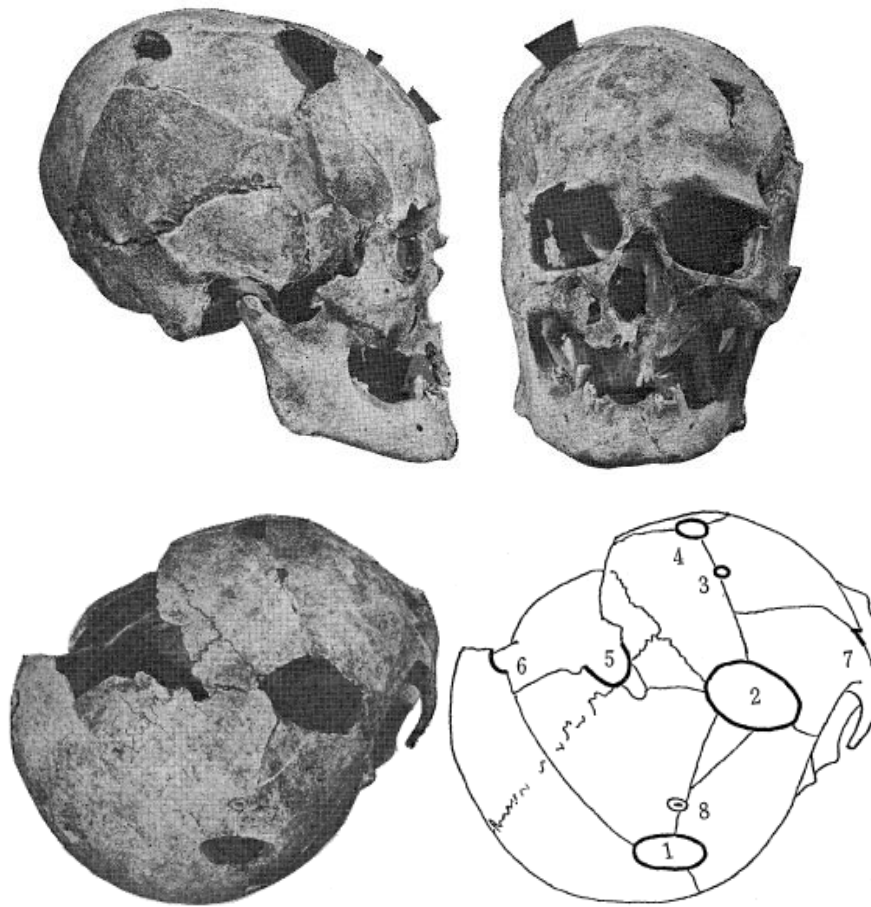


Figure 5.4. Skull of an elderly male exhibiting eight violent injuries from Hobi shell midden (Final Jōmon, Aichi) (Suzuki 1975:276).

Skull fractures found at Sakaeiso Iwakage (Final Jōmon, Hokkaidō), Hobi (skeleton 20), Ōta shell midden (skeleton 703, Early Jōmon, Hiroshima), and Fukahori (Final Jōmon, Nagasaki) have also been attributed to sharp-edged tools such as stone axes. Assessment as blunt force trauma is based on the injuries expanding in a funnel shape inwards from the ectocranial to endocranial surface (internal bevelling) (Suzuki 2010:76-77). Dodo Yukio (1973) described the diploë of the Sakaeiso cranium as being the same colour as the surrounding bone (thus not postmortem damage), and stated that the blow was fatal as it would have severed the middle meningeal artery causing traumatic brain injury. A ten millimetre difference in diameter between the two perforations identified on the Hobi man's cranium is thought to indicate that they were caused by two different stone axes, wielded by two separate attackers (Uchino 2013:467). Physical examination of these specimens confirmed the injuries as violence-related, but more likely caused by a club; hence both were included in Table 5.2.

Suzuki (1999) and Uchino (2013) listed the Ōta cranial perforation as possibly resulting from a blow with a stone axe, but Kiyono and Hirai (1927) originally reported it as a case of accidental death during trepanation.⁷³ A mere handful of suspected examples of trepanation exist from the Jōmon period; all were found on parietal bones (Naito 1973). Kiyono and Hirai (1927) also identified cases at Tsubue (skeleton 111) and Yoshigo (skeleton 375, Aichi) shell middens, while Yoshimi (1937) added a fourth: a different individual from Ōta (skeleton 1380). Excluding Tsubue, Suzuki (1938) questioned the reliability of the other three as examples of trepanation. Except for Yoshigo (which shows healing), the perforation edges are described as serrated and/or with sharp external and blunt internal margins. The authors do not mention any scrapes or cut marks around the perforations characteristic of trepanation, and it is not possible to confirm their existence from the poor-quality monochrome images. Kiyono and Hirai also failed to explain clearly how the alleged trepanations were performed, except to remark on the directions in which the instruments were used (e.g., obliquely from external to internal surface), further complicating assessment of the trauma. Even the Tsubue case is doubtful. The injury appears to be postmortem damage since the trauma bevel is seen on the ectocranial (rather than endocranial) surface, but apparently the serrated edge slopes inwards, indicating that the instrument was operated obliquely from the outside inwards.⁷⁴ Without directly examining these skulls or obtaining clearer photographs, it is difficult to properly assess their accuracy as examples of trepanation or violence. Consequently, none of these cases have been included in Table 5.2.

Despite its similarity to the Yoshigo perforation, the frontal bone fracture on the Fukahori skeleton is not claimed to be another example of trepanation (Fig. 5.5). The bone appears to have been scraped with a sharp-edged tool from the outside inwards, with three small holes reportedly surrounding the main perforation; two of these may have been made artificially with a cone-shaped implement while the man was alive (Nagasaki Daigaku Igakubu Kaibōgaku Dai Ni Kyōshitsu 1967). Externally, a circular depression surrounds the main perforation, and slight bevelling can be seen around the hole on the internal surface. Healing is evident (though Uchino (2013) disagrees), with the main perforation shaped like an irregular circle, signifying that the individual survived for some time after the incident. The cause is unclear. Suzuki (2010) cited a stone axe and Uchino (2013) a ‘stone arrowhead?’,

⁷³ Trepanation is the ancient surgical procedure of perforating a skull for medical, religious, or other purposes.

⁷⁴ The Tsubue perforation looks remarkably similar to a modern skull exhibiting a typical externally bevelled exit wound caused by a bullet (see Pavlovic et al. 2020).

while the 1967 site report is equivocal on the issue of trepanation. Based on the trauma description and comparison with known cases of trepanation (e.g., Roberts & Manchester 2010; Pavlovic et al. 2020), this is perhaps the most convincing case from the Jōmon period. Yet, it remains more likely to have been violence-related: a blunt force healing depressed fracture caused by a stone axe or even a *sekibō*.

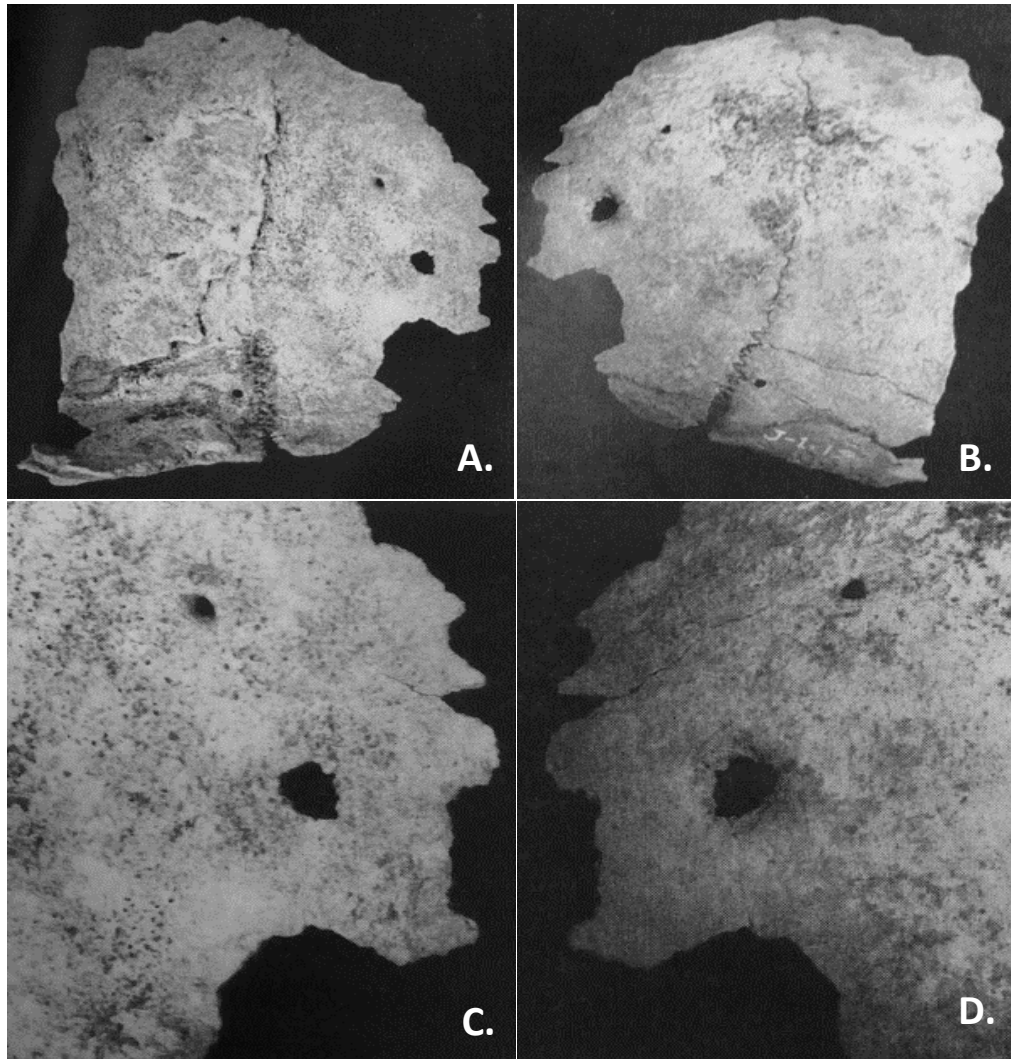


Figure 5.5. Depressed fracture on the frontal bone of an adult male from Fukahori (Final Jōmon, Nagasaki). A. & C. endocranial surface. B. & D. ectocranial surface (Nagasaki Daigaku Igakubu Kaibōgaku Dai Ni Kyōshitsu 1967, Figure 19).

Similar tool-weapons might also have been responsible for ‘an artificial injury’ identified by Dodo (1983) on the left parietal bone of an adult female at Minami-Utsu 6 (Epi-Jōmon, Hokkaidō). She was unearthed from a pit grave accompanied by an Esan culture axe/adze. Dodo did not provide a detailed description of the injury, but judging from the monochrome image, it appeared to be a large oval-shaped depressed fracture with possible rounded

margins and radiating fissures (Fig. 5.6). The presence of an internal bevel could not be determined from the photograph, and postmortem damage has likely altered the fracture margins, distorting the original dimensions. Based on its overall shape and location, the injury may have been caused by a blow, but the direction of attack is difficult to determine. Insufficient trauma description and photographic evidence would normally preclude this case from Table 5.2, but it was later confirmed by physical examination (see Chapter 7).



Figure 5.6. A depressed fracture on the left parietal bone of an adult female from Minami-Usu 6 (Epi-Jōmon, Hokkaidō) (Dodo 1983:176).

Suzuki (1999:45) asserted that careful examination of Jōmon crania will reveal numerous examples of healed or healing fractures which have been overlooked, as ‘basic research concerning depressed lesions and their frequency and variation in form has not sufficiently progressed [in Japanese archaeology]’. His preliminary research purportedly uncovered geographical differences in this type of cranial trauma, leading Suzuki to assume that if a high frequency of healing depressed fractures is discovered among specific Jōmon groups, then it might indicate armed intergroup conflict. This is not necessarily true, however, since healing depressed fractures can also result from situations where the goal is not to kill the person: for example, non-fatal ritualised violence; competitive games; medical procedures (trepanation), and hunting accidents. Moreover, almost all individuals with cranial trauma in Suzuki’s (1999) study are reported to have ‘died instantly’. Yet, supposing that violent armed conflict did occur among Jōmon groups, defensive injuries sustained from fighting, such as long bone fractures, should also be present on at least some excavated skeletons.

Defensive Injuries

When a stone club is wielded with the intention to kill, an opponent's head is often targeted (Suzuki 1999:44, 2010:78). In this situation, the opponent will instinctively raise their arm to protect their head from a vigorous blow, usually causing a (parry) fracture to the ulna shaft; a defensive injury. First reported by Kiyono and Hoshijima (1922), approximately ten parry fracture cases are known from the whole Jōmon period (Suzuki 1999:46). Healed examples have been found at Hobi (Koganei 7) and Tsukumo shell middens (Kiyono 20, Final Jōmon, Okayama). Kiyono and Hoshijima reported three cases from Tsukumo, but in this study only one could be confirmed. Suzuki (1999) argued that finding a high frequency of parry fractures within a particular group, such as at Tsukumo, strongly suggests a group battle. While this is not impossible, the Tsukumo fractures were all to the right ulna. Since most humans are right-handed, one would expect to find defensive injuries predominantly to the left ulna in a battle situation. A surprise attack against individuals is perhaps a more likely scenario. A similar defensive reaction can occur when someone is attempting to protect themselves against flying arrows, often resulting in the person suffering a piercing arrowhead to their raised forearm: a scenario suggested by Uchino (2013) for Ikawazu skeleton 20 (Fig. 5.7).

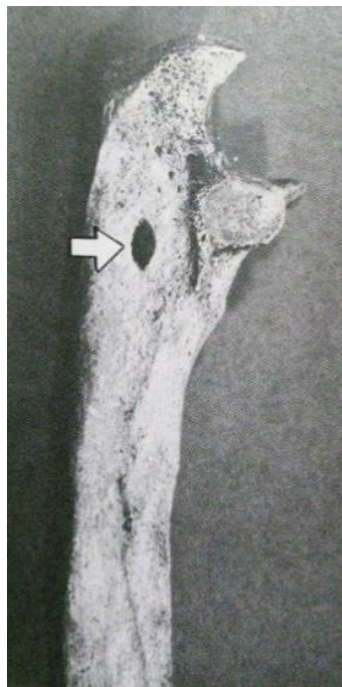


Figure 5.7. Stone arrowhead embedded in the right ulna of an adult male from Ikawazu shell midden (Final Jōmon, Aichi). The bone had healed around the projectile (Irago Shizen Kagaku Hakubutsukan 1976:14).

Sharp Force Trauma

In contrast to projectile and blunt force injuries, very few examples of sharp force trauma (cut/chop marks) have been reported from the Jōmon period. Findings are usually interpreted as either cannibalism or part of a postmortem processing ritual. One of the most controversial cases of Jōmon violent trauma is the unusual discoveries made at Itoku (Final Jōmon, Kōchi). Fragmentary remains of at least ten skeletons (five females, four males, and one unknown) were unearthed in a rubbish pit containing animal bones. They apparently exhibited traces of arrowhead perforations, claw-like markings, and deep cut marks.

Several aspects of this case are unresolved, including which tools/weapons caused the sharp force trauma, the precise dating of the skeletal remains, and the level of violence experienced at the site. In addition to claiming that the claw-like incisions were made by a chisel-shaped thrusting tool, Matsui Akira (2003) posited the existence of metal tools in the Final Jōmon phase as being responsible for the cut marks. Soga Takayuki (2003a) agreed that some of the Itoku injuries were possibly produced by metal implements. Yet, even after comparing the injuries to sharp force trauma found on Yayoi skeletons, Nakahashi Takahiro (2003) was unable to determine what thin, sharp-bladed tool had cut two-thirds of the way through the J2 femur. No weapon fragments were found at the site, and supposedly it would have been difficult even with a *katana*. Metal is not generally thought to have entered Japan until the Yayoi period, however, which calls into question the dating of the Itoku skeletons. Based on the possible use of metal tools and domestication of wild boar, as well as the discoveries of wooden hoes, continental bone tools, and consumption of dogs at the site, Soga (2003a, b) asserted that the Jōmon to Yayoi transition was underway at Itoku. Indeed, numerous excavated artefacts and organic remains dating from the latter half of the Final Jōmon to the Early Yayoi period at the site further complicates the picture.

Nevertheless, Soga (2003a:15) believed that taken collectively the injuries found at Itoku suggest a group battle, while Hashimoto Hirofumi (2004:116) argued that this example of a whole group being killed contradicts Sahara's (1992) peaceful Jōmon theory. However, it should not be assumed that the injuries occurred concurrently, since rubbish pits were used continuously for months and even years at Jōmon sites. The J2 bone's discovery in a rubbish pit, and the cut marks being located near the joints and running parallel to the long axis led Nakahashi (2003) to assert that postmortem dissection and possible cannibalism were more likely scenarios than battlefield injury. Kobayashi (2003:18-19) imagined an alternative fate

for this individual; she was a slave killed by her owner as a demonstration of their property and wealth. If this individual was treated as a slave, then a combination of the following markers should be seen: poor health; disease; non-specific infections, as well as signs of stress (e.g., anaemias, porotic hyperostosis, cribra orbitalia) and trauma (e.g., healed cranial depressions, broken ribs, and fractured long bones) (Martin & Anderson 2014:9; Larsen 2015:176). Such conditions would imply a deprived and violent lifestyle, yet neither Kobayashi nor other scholars mention finding such evidence on the J2 remains, making slavery an unlikely scenario as the cause of the trauma. More recently, following re-examination, Hudson et al. (2021) concluded that the Itoku skeletons were too poorly preserved to confirm traumatic injuries. Given the ambiguity surrounding J2, only the arrowhead injury has been included in Table 5.2.

Ceremonial Violence and Cannibalism

It has long been argued that some ancient societies engaged in ceremonial violence and anthropophagy, and several scholars have raised this possibility for Jōmon Japan. As evidence of ceremonial violence, Kobayashi (2003:19) highlighted two examples of headless skeletons (one of each sex) lying supine in a pit house at Kowashimizu shell midden (Middle Jōmon, Chiba). Both were missing their skull and most or all of their cervical vertebrae, but it is unclear whether their deaths were due to violence, and hence they are excluded from Table 5.2. Apart from the disturbed right arm of the male, neither skeleton was in an unnatural position. No cut marks were observed on the extant C2 vertebra of the female (C1 missing), indicating that beheading was an unlikely cause of death. The bodies may have been arranged on the floor; a feature which Takahashi et al. (1963) found meaningful. They suggested that the remains may have been accidentally discovered in the pit house, and the skulls and cervical vertebrae removed postmortem, perhaps for ancestor rites or secondary burial.

Discoveries of human limb bones arranged in a ‘parallel cross’ (井) pattern with the skull placed in the centre are also cited by Kobayashi (2003) as evidence of ceremonial violence. There is no mention of any injuries on the bones, but nevertheless Kobayashi suggested that the bone piles might have been the result of an attack related to ceremonial warfare, or (more likely) a rare type of secondary burial known as *banjō-shūsekibo* (Fig. 5.8). These are predominantly found at Final Jōmon period shell middens in Aichi Prefecture, including Hobi, Ikawazu, Motokariya, and Yoshigo (Habu 2004; Hashimoto 2004).

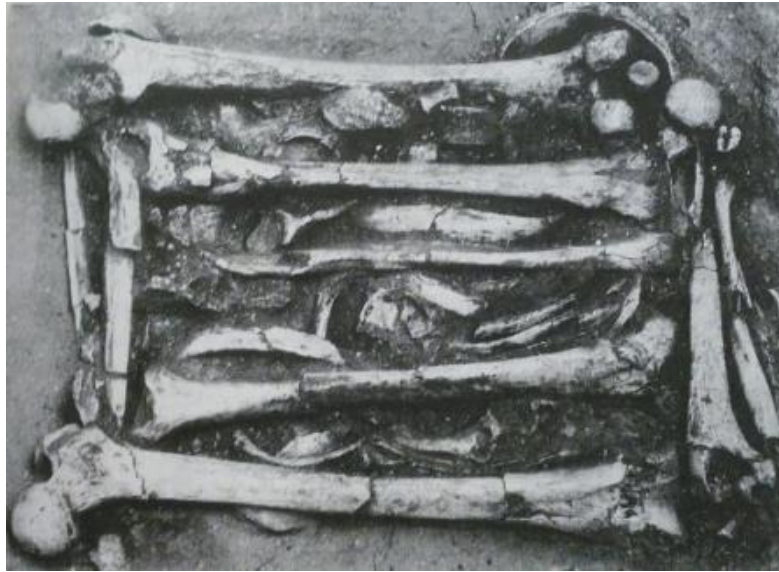


Figure 5.8. A parallel cross shaped bone-pile burial (*banjō-shūsekibo*) at Motokariya shell midden (Final Jōmon, Aichi) (Habu 2004:173).

Jōmon skeletal remains are frequently unearthed with animal bones, and occasionally similar cut marks have been identified on both. Cut marks concentrated in the vicinity of joints typically indicate dissection, and some scholars regard this as evidence of Jōmon cannibalism (Suzuki 1944:28). In 1877, Edward S. Morse shocked the Japanese people by reporting the occurrence of cannibalism at Ōmori shell midden (Late-Final Jōmon, Tōkyō) (Sahara 1992:214). Animal and human long bones had been broken in the same fashion, allegedly to fit into a cooking vessel or to extract the marrow (Morse 1879a:263, 1879b:17). Suzuki (1938) refuted Morse's conclusion when he re-examined the remains and found that the bones had not been deliberately broken. However, Suzuki made his own claims of butchery and cannibalism in the Jōmon period at Nakazawahama (Early Jōmon, Iwate), Ikawazu, Inariyama (Final Jōmon, Aichi), and Yoyama (Late Jōmon, Chiba) shell middens.⁷⁵ More recently, Gotō (1986) argued that all of the alleged Jōmon cases were mere conjecture; based upon superficial cuts on a few scattered bones. Even then, the presence of cut marks need not imply that humans were consumed after dismemberment.

Conflict may sometimes result in cannibalism, but identifying its cause is problematic if based on the analysis of human remains alone (Larsen 2015). Reasons for the alleged

⁷⁵ Cut marks located near the joints of human femurs—similar to those found on deer and boar bones—indicated the occurrence of dismemberment at Nakazawahama and Inariyama, which Suzuki speculated might have been used to make bone tools (Suzuki 1938, 1944; Sahara 1992). Similarly, Suzuki (1941) argued that a human radius fragment found at Yoyama, with short linear cut marks encircling the shaft, may have been processed to create earrings. Jōmon ear ornaments were typically made from the proximal radius of a monkey, but it is similar in shape to a human's radius (Hasebe 1941:42; Suzuki 1941:350).

incidents are unknown, but ritual purposes have been suggested rather than sustenance (Irago Shizen Kagaku Hakubutsukan 1976:14). There is a strong possibility that postmortem dissection was part of a ritual for secondary burial (perhaps cleaning the bones to accelerate decomposition), which were relatively common in the Jōmon period. This interpretation is slowly gaining ground (Gotō 1986; Sahara 1992; Naumann 2000). Although such claims are notoriously difficult to substantiate, since no cases of cannibalism in Jōmon Japan have been verified, they are not included in Table 5.2.

Fighting Techniques

As hunter-gatherers who utilised their everyday tools as weapons (when necessary), it is hardly surprising that Jōmon fighting techniques sometimes resembled those employed in hunting. When groups attack individual humans, this repurposes a hunting technique commonly used against animals. Similarly, hunters will often creep up on unsuspecting prey and strike from behind; a method of attack apparently favoured by Jōmon assailants, with examples found at Hobi, Ikawazu, Kamikuroiwa, Miyano, and Sangani (see Table 5.2). As Suzuki (1938, 1958, 1975) pointed out long ago, many Jōmon skeletons exhibit injuries sustained from the rear, as illustrated by Uchino's (2013) classification of injury patterns (Fig. 5.9). For Uchino (2013:460), such methods are 'immature' when compared to Yayoi techniques; developed for hunting rather than fighting. However, rather than an implied juvenile incompetence, perhaps this reflects an efficient response to a lower level of threat.

Jōmon fighting techniques are widely thought to have become obsolete in the subsequent Yayoi period, although some question this view. From early on, the Yayoi period witnessed an increase in violent conflict, commonly involving attacks from behind with daggers or arrows, as well as battles involving small groups. Fujiwara (2004:48) argued that 'whether interpersonal [violence] occurred in the Jōmon or Initial~Middle Yayoi periods, there is no qualitative tactical difference when 'killing from behind'.' While perhaps true of this particular mode of attack, from the Middle Yayoi onwards they developed various novel fighting techniques appropriate to changing weapons technology and socio-political conditions. Fighting with metal arrowheads and swords (shoot first and slash later), alongside the discovery of numerous injured skeletons clustered at single sites (e.g., Aoyakamiji, Tottori) suggest that large-scale battles, and even warfare, became prominent (Fujiwara 2004; Nakagawa & Nakao 2017a).

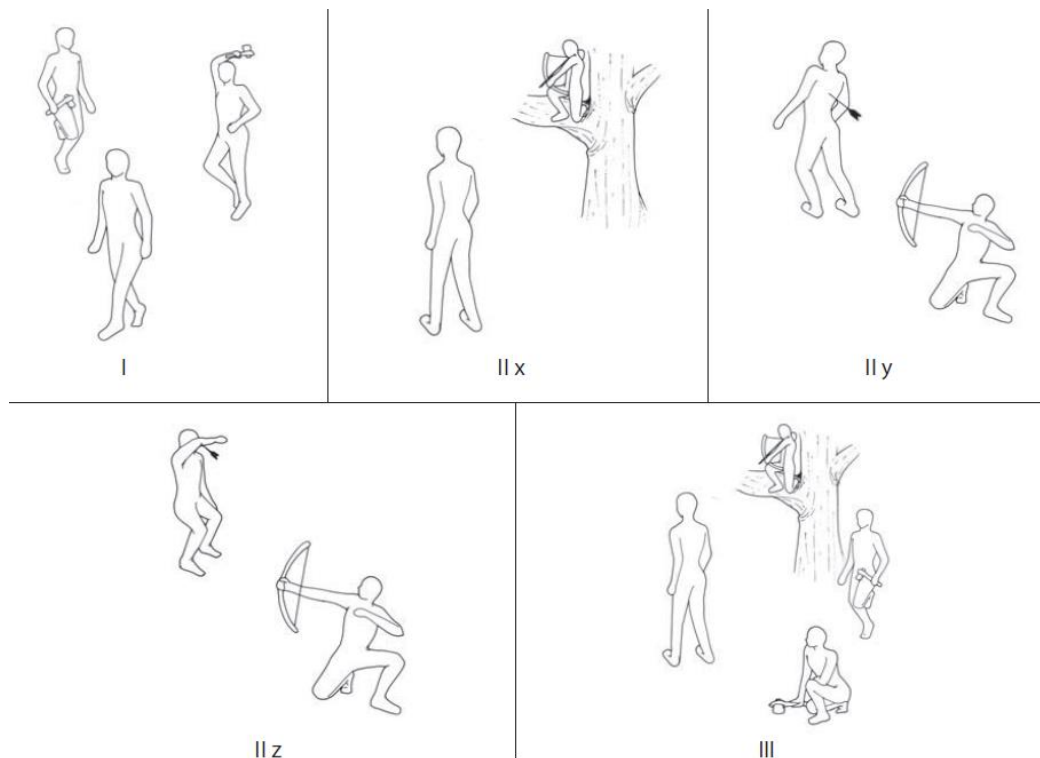


Figure 5.9. Jōmon period injury patterns. I. Injuries to the head from attacks at point-blank range from behind. IIx. Injuries caused by arrows shot from a height (in a tree). IIy. Injuries caused by arrows (atlatl/spear thrower) from a short distance. IIz. Injuries caused by protecting/shielding oneself against flying arrows. III. Injuries caused by multiple tools/weapons from both near and far away (Uchino 2013:464).

Jōmon Violence: Shattering the Yayoi Lens

With a few notable exceptions, Japanese archaeologists are prone to view Jōmon violence through a Yayoi lens, rather than assessing this phenomenon on its own terms. The framework for understanding Japanese warfare has been created mainly using cases from the agricultural Yayoi and Kofun cultures (Kosugi 2004:216). As a result, with regard to the presence or absence of warfare in the hunter-gatherer Jōmon culture, the predominant view is that violent incidents occurred but warfare did not. Sahara (2005:116) reasserted that the available evidence is insufficient to state that warfare existed in the Jōmon period. But perhaps the presence of intergroup conflict and ‘war’ is not recognised for the Jōmon because Jōmon violence is routinely (and inappropriately) compared with Yayoi violence.

Sociocultural and geographical factors help to determine the location and prevalence of violent incidents; hence, ‘hunters undoubtedly have a different pattern of traumatic conditions in the skeleton than sedentary farmers’ (Ortner 2003:119). Exposure to a diverse range of terrain and technologies tends to produce different risks of injury and death (Larsen

2015:116). Given the differences in fighting techniques and types of weapons used, variations in skeletal trauma between the Jōmon and Yayoi are inevitable. Yet, Suzuki (1999) was confounded by the dearth of evidence in the former, especially when compared to the latter period. From a palaeopathological perspective, there is a Yayoi and Kofun bias regarding the observation of skeletal injuries (Kosugi 2004). Jōmon skeletal trauma is commonly interpreted as resulting from accidents rather than deliberately inflicted, and many skeletons only exhibit healed wounds, which are more difficult to identify than unhealed cases. Less conspicuous injuries—such as cranial depressions and defensive parry fractures of the ulna—are often overlooked during skeletal analysis in comparison to injuries from sharp-edged tools, such as stone arrowheads embedded in bone and cranial fractures caused by stone axes.

In contrast, Yayoi skeletal trauma tends to be more obvious, especially cut marks from metal swords, since they are often lethal and thus leave no signs of healing on the bone(s). Consequently, Suzuki (1999:39) claimed that whether or not such wounds were deliberately inflicted would be clear-cut. In particular, sword injuries to the head/face stand out, so the Yayoi period offers a record of graphic injuries and sudden deaths that easily draws attention (Suzuki 2010:82). The more inconspicuous nature of Jōmon skeletal trauma means that both the number of individuals with injuries and the number of violent incidents has been underestimated. This implies that Jōmon violence was more abundant and perhaps occurred on a larger scale than is currently accepted (although probably still less than in the Yayoi).

Besides weapons and defensive structures (see Chapter 4), there are many fundamental aspects of Jōmon and Yayoi society which show that they represent different stages of development. Thus, it is necessary to depart from the problematic Jōmon-Yayoi comparison and focus instead on how Jōmon violence compares with that seen in other hunter-gatherer societies around the world (see Chapter 8). As Kosugi (2004:215) aptly states, ‘Separating the ‘archaeology of war’ from research on the Yayoi and Kofun has the potential to liberate research on the Jōmon, which has been viewed as a society governed by magic and ritual, and to introduce the question of politics into Jōmon studies.’

Concluding Thoughts

In their attempts to uncover the origins of violence and warfare in Japan, mainstream Japanese scholars established an image of the nonviolent Jōmon based in part on the paucity of injured skeletons. Yet, rarely have they offered reasons why the Jōmon people are

considered to have been relatively peaceful, let alone explain fluctuations in the prevalence of violence. At the other extreme, Kobayashi (2003) is not alone in his conviction that since some skeletons exhibit evidence of violent injuries, there was definitely ‘Jōmon-style warfare’ (*sensō*); without really defining what this means. Combined with a tendency to study violence through the lens of individual skeletons in their local context, this divergence has led to something of an intellectual cul-de-sac. However, as Uchino (2013:460) correctly stated, ‘To think that the Jōmon lived a peaceful idyllic lifestyle simply because few examples of weapons or skeletal trauma has been found is to look away from the essence of the problem.’ In other words, the scarcity of such evidence does not necessarily mean that the Jōmon remained at peace for over 12,000 years. Somewhere along this violence spectrum stood scholars such as Sahara (1992:219), who admitted that ‘even among the Jōmon, there were times when people fought and killed each other’. A decade later, in work published posthumously, he went further in accepting the bioarchaeological evidence of fighting between Jōmon groups, but still maintained that it cannot be considered warfare. More recently, scholars such as Nakao and Nakagawa have adopted a population-based approach and attempted to place Jōmon violence in a comparative perspective (see Chapter 8), with mixed results.

Some Japanese archaeologists (e.g., Suzuki 1944) long ago projected that the number of human skeletons found with violent injuries from the Jōmon era would increase, but several factors have delayed the fulfilment of this prediction. Highly acidic soils in Japan dissolve bone, dramatically reducing the sample size and hindering the examination of trauma. Moreover, the lack of focus in original studies on systematically recording violent trauma on skeletons has also contributed to the mainstream view of the peaceful Jōmon; hence the need to re-examine remains in old collections. In addition, this partly reflects the Yayoi-Kofun bias of many Japanese archaeologists and anthropologists, who believe that battles originated in the Yayoi period (Suzuki 2010:67). When considering the origin of violent conflict in Japan, the differences seen in skeletal trauma between the Jōmon and Yayoi periods may be significant. Yet, there is little benefit in comparing injuries from these two eras using the same criteria to reconstruct patterns of violence because the former lacked specialised weapons, and their fighting techniques also differed. Clearly, evidence of violence among the Jōmon in Hokkaidō and in the Epi-Jōmon period, which has been largely overlooked by Japanese scholars, should be explored. It is also necessary to contrast Jōmon violence with evidence from a range of other hunter-gatherer societies (e.g., North America) to determine

whether or not the former can be classified as warfare. Calculating the proportion of Jōmon skeletal trauma is important to help assess the accuracy of the mainstream view, though it is essential to exercise caution when interpreting prevalence data because it alone cannot identify the level of violence in a society.

In sum, bioarchaeological evidence of violence has been reported from the hunter-gatherer Jōmon period, but no ‘hotspots’ were identified as cases seem to have been scattered, isolated incidents, usually involving a single victim. Hobbesian scholars may be right to assert that warfare is an inevitable aspect of all human societies, yet the burden of proof rests with those seeking to establish that this ‘universal law’ also applies to the Jōmon. If intergroup warfare existed in the Jōmon era, then convincing evidence of this remains absent in the published literature. Having established the current understanding of violence in Jōmon Japan, it is now time to explain the materials and methods employed in this thesis to analyse Jōmon skeletal remains.

6. Jōmon Skeletal Analysis:

Materials and Methods

To determine the prevalence of violence among the Jōmon hunter-gatherers, this study re-examined existing skeletal remains to verify published cases of violent trauma, and to reveal new evidence that has been overlooked. The invaluable data gathered over decades by Japanese archaeologists and anthropologists has not been systematically organised at a national level (despite most institutions producing catalogues of their collections), making skeletal analysis on a population-scale challenging. To date, the most comprehensive catalogue of Jōmon mortuary data was produced by Yamada Yasuhiro (2006), and helpfully includes skeletons both with and without trauma. However, its reliance on information from site reports is somewhat problematic, since in the past their focus rarely embraced violent trauma as a category. This means that less obvious skeletal injuries may have been missed.

Careful examination of skeletal remains is essential because the likelihood of an injury being identified and reported is contingent upon the state of bone preservation, and on the interpretation of the recorder (Matsumoto 2018). The survival rate of human bones in the archaeological record depends greatly on, *inter alia*, the properties of the soil in which they were buried. On the volcanic Japanese archipelago, the fertile but highly acidic soils pose a significant problem for the preservation of organic material, and hinder the study of trauma on skeletons. Discovery of well-preserved bones is rare, except at shell middens, sand dunes, and in caves. The vast majority of skeletons dating from the Jōmon period have been unearthed at shell midden sites.

Data Collection

This chapter explains the information gathered from each skeleton during data collection, and the methods employed for recording certain categories. All data were recorded on MS Excel spreadsheets. Details of violent trauma discoveries, a list of photographs, examination dates, recorder's initials, and other information regarding the skeletal collections (e.g., previous bone sampling) were also noted. No changes were made to the examination methods

employed during the three summers of data collection, although several cases of violent trauma were reassessed.

Skeletal Examination Inventory

For the skeletal examination inventory, information regarding the specific identification of each skeleton was recorded. This included the site name, location (prefecture, region/district), the Jōmon subperiod to which the skeleton (or the site where it was excavated) has been dated, the institute where it is stored, and the skeleton number. When available, the year of excavation and any additional details, such as old catalogue numbers, were also recorded to aid identification of individual skeletons.⁷⁶

Identification of Jōmon Skeletons

Skeletons examined in this study were identified as belonging to Jōmon populations based primarily on the assignment made following excavations (noted on the storage box labels), and on general morphological characteristics if preservation was sufficient. Site reports were consulted when available to confirm that the sites date to the Jōmon period. Most Jōmon skeletons have not been directly radiocarbon dated; their relative dates were established using detailed typological chronology of Jōmon pottery determined for each region (Habu 2004).

Distinguishing the skeletal remains of Jōmon hunter-gatherers from Yayoi agriculturalists is difficult but important to consider in Japanese archaeology. Apparent physical differences between them ‘has given rise to one of the most hotly debated issues in Japanese history and archaeology; the debate about the origins of the Japanese’ (Steinhaus & Kaner 2016:88). In addition to differences in facial features, the Jōmon people were typically shorter in stature and more stocky and muscular compared to the Yayoi, as exemplified by robust limbs and stronger muscle attachments (see Table 6.1 and Fig. 6.1) (Nakhashi 1999, 2003; Steinhaus & Kaner 2016). However, morphological features of the Yayoi immigrants appear to have

⁷⁶ The burial contexts of individual Jōmon skeletons were recorded where available. However, limited access to site reports, and even where accessible, the inability to link those skeletons exhibiting violent injuries to specific skeletons discussed in site reports prevented this data from being used to identify any patterns in the burial treatment of victims of human violence. A superficial examination of the literature revealed that a variety of burial practices existed for victims of violence in prehistoric small-scale societies, ranging from the abandonment of unburied bodies in Australia (see McDonald et al. 2007, Pardoe 2014) to their careful placement in graves in Germany, such as the ‘skull nests’ at Ofnet (see Orschiedt 2005, and also Meyer et al. 2009 for Eulau). With few possible exceptions (e.g., the *gassōbo* found at Hagi cave and Sakaehama 1, see Chapter 5), no distinctive burial practices for Jōmon victims of violence have been reported. A systematic study on this issue is warranted.

gradually merged with those of the indigenous Jōmon, especially in Kyūshū (Imamura 1996a), further complicating differentiation between the two populations.

Table 6.1. Morphological Differences between Jōmon Hunter-Gatherers and Yayoi Agriculturalists

Anatomical Features	Jōmon	Yayoi
Neurocranium	large, low	rather large, high
Face shape	wide, flat, square	remarkably elongated, oval, slender
Flat facial features	weak	strong
Eye socket	rectangular, low	rounded, deep
Nasal bone	wide, strongly curved, prominent, high-bridged	barely curved, very flat, straight, low bridged
Bite	edge-to-edge bite	overbite
Teeth	small, rather monotonous	large, quite varied
Dental pattern	sundadonty (southeast Asia)	sinodonty (northeast Asia)
Height (men)	158~159 cm	163~164 cm
Height (women)	148~149 cm	151~152 cm
Proportion of limbs	lower arms/lower leg relatively long	lower arms/lower leg relatively short
Femoral shaft	robust	fragile
Tibial flatness	robust, narrow width, flat cross-section	fragile
Muscle attachments	strong	weak

Modified from Steinhaus & Kaner 2016.

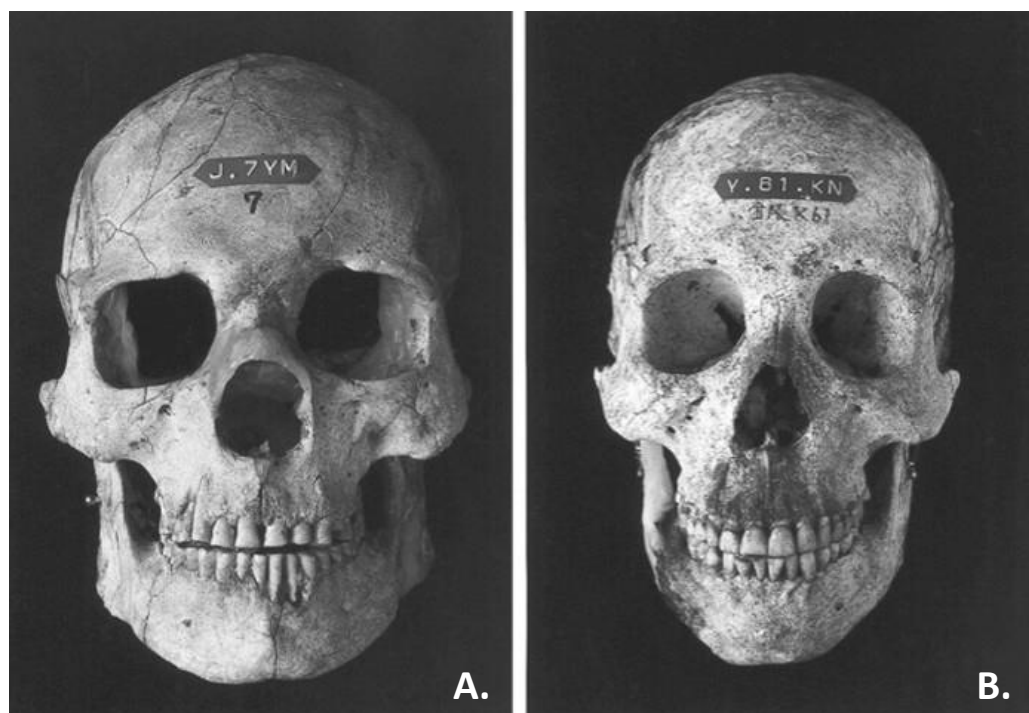


Figure 6.1. Comparison of a Jōmon skull (A.) and a Yayoi skull (B.) from sites in Fukuoka Prefecture (Nakahashi 1999:128).

Age and Sex Assessment

Age and sex assessment were based on standard osteological methods (Buikstra & Ubelaker 1994; White & Folkens 2005). Age categories used are as follows:

Infant	≤ 2 years
Child	3-12 years
Adolescent	13-17 years
Young adult	18-34 years
Young~Middle adult	18-49 years
Middle adult	35-49 years
Middle~Old adult	35-50+ years
Old adult	50+ years

Where present, dentition was used to estimate age-at-death, and where absent, age-at-death was based on skeletal indicators such as epiphyseal fusion. As the main focus of the skeletal analysis was to record cranial trauma (see below), recording age-at-death focused on the dentition in order to avoid any ambiguity in associating cranial and postcranial remains (which were often stored and numbered separately). Ageing the cranial remains of non-adults involved observing stages of tooth development and eruption (Ubelaker 1999), and for adults, eruption of the third molars and tooth-wear patterns were used (Smith 1984; White & Folkens 2005). This was especially relevant given the often poor preservation of the pubic symphysis. Fusion of the sphenoid-occipital synchondrosis could not be systematically recorded as this part of the cranium was not usually preserved. As a rule, cranial bones outlast most other skeletal elements that are deemed indicative of age, but the degree of closure of the ectocranial sutures was not employed as it is generally considered an unreliable method for ageing adults (Cox 2000:68). Additional age assessment methods were applied where postcranial remains were complete or sufficiently well preserved. This included recording the presence/absence of epiphyses and extent of epiphyseal fusion for non-adult remains (Scheuer & Black 2000), as well as morphological changes of the auricular surface of the ilium and the pubic symphysis for adult remains (Lovejoy et al. 1985; Brooks & Suchey 1990; Cox 2000).

Adult skeletons which could not be classified to a specific age group due to incomplete dentition (especially if missing molars) were assigned broader categories of ‘Young~Middle Adult’ or ‘Middle~Old Adult’ based on available information. Moreover, if the preservation of adult remains were insufficient for detailed age assessment, they were broadly categorised

as ‘Adult’. Tooth wear is diet- and population-specific. As such, the age groups employed in this study should be viewed as general categories intended to be considered in relation to each other rather than reflecting absolute numerical age (Smith 1984). The ‘Old Adult’ category is particularly problematic as prehistoric life expectancy is often thought to have been lower than in later periods. Thus, the possibility of accurately determining whether an ‘Old’ individual died in their late thirties, forties, or older remains a matter of debate.

Sex assessment was carried out on adult and adolescent remains by scoring morphological features on the skull and the pelvis, where sex differences are the most marked (see Table 6.2, Table 6.3) (Phenice 1969; Buikstra & Ubelaker 1994; White & Folkens 2005). Often only cranial elements were available for analysis. However, sexing the adult skull alone has been shown to provide accuracy rates of up to 90% (Mays & Cox 2000:119). Individual scores of observable features were totalled and sex assessed as male (M), possible male (M?), female (F), possible female (F?), or indeterminate (I). In cases where both cranial and postcranial remains were present, sex was estimated separately and then cross-checked.

Table 6.2. Morphological Features of the Skull for Sexing Adults and Adolescents

Morphological Feature	Morphological Characteristics
Supraorbital margins	Male - rounded, thick; Female - sharp
Supraorbital ridges/glabella	Male - more pronounced, rounded, loaf-shaped projection; Female - smoother, little or no projection at midline
Height of forehead	Male - receding; Female - steep/bulbous
Frontal eminences	Female more pronounced/larger than Male
Parietal eminences	Female more pronounced/larger than Male
Nuchal crest	More pronounced/rugged in Male than Female
Mastoid process	Larger in Male than Female
Zygomatic root	Male - extends beyond external auditory meatus
Gonial flare/rugosity	More pronounced in Male
Gonial angle	Male - approx. 90°; Female - >90°
Mental eminence	Male - more projecting, square, often bilateral eminence; Female - less projecting, rounded, one eminence
Height of mandibular symphysis	Male - large, higher; Female - small, lower
Occipital condyle	Larger in Male than Female
Breadth and thickness of ascending ramus	Male greater/broader than Female

(After Buikstra & Ubelaker 1994; Komar & Buikstra 2008)

Table 6.3. Morphological Features of the Pelvis for Sexing Adults and Adolescents

Morphological Feature	Morphological Characteristics
Ventral arc	Present on Female
Subpubic angle	Greater in Female than Male
Subpubic concavity	Male - convex; Female - concave
Greater sciatic notch	Male - narrow, deep; Female - wide/broad, shallow
Preauricular sulcus	More common in Female than Male
Pelvic inlet	Male - heart-shaped; Female - circular, relatively wider
Ischiopubic ramus ridge	Male - flat, broad, and blunt; Female - narrow/thin, sharp edge/crest-like
Acetabulum	Male - large/laterally divergent; Female - smaller/anterolaterally divergent
Ilium	Male - high, vertical; Female - laterally divergent
Obturator foramen	Male - large/ovoid; Female - smaller/triangular

(After Phenice 1969; Buikstra & Ubelaker 1994)

Sexually dimorphic characteristics, particularly on the skull, may differ across populations (Mays & Cox 2000). To account for this, the sex identified for individual skeletons (noted in the institutes' osteological records or on the storage boxes) by local scholars with experience in sexing Jōmon remains was also recorded to verify assessment. Who performed these sex assessments and their level of experience was not always made explicit, but in most cases the assessments agreed, and where they did not, the material was re-examined, a decision made, and the discrepancy noted. Ambiguous cases were also discussed with colleagues in the field. For a number of skeletons, age and/or sex assessment was not possible due to poor preservation or highly fragmentary remains.

Skeletal Preservation and Completeness

The state of bone preservation was assessed on the extent of fragmentation and fragility, and the presence of erosion, adhering sediment, crushing, cracking, and flaking. A scale of one to three was used to indicate the level of difficulty in observing trauma based on surface conditions, with one signifying good condition, two as moderate, and three as poor (see Fig. 6.2 and Table 6.4). Cranial and postcranial remains were scored separately, and those with a score of three were excluded from statistical analysis. A substantial number of skeletons with very poor preservation were not recordable. In this study, particular attention was paid to analysing the skull—and the ulnae when present—where the patterns of violent trauma are most diagnostic (Boylston 2000). Thus, the skull was systematically recorded in more detail than postcranial remains.

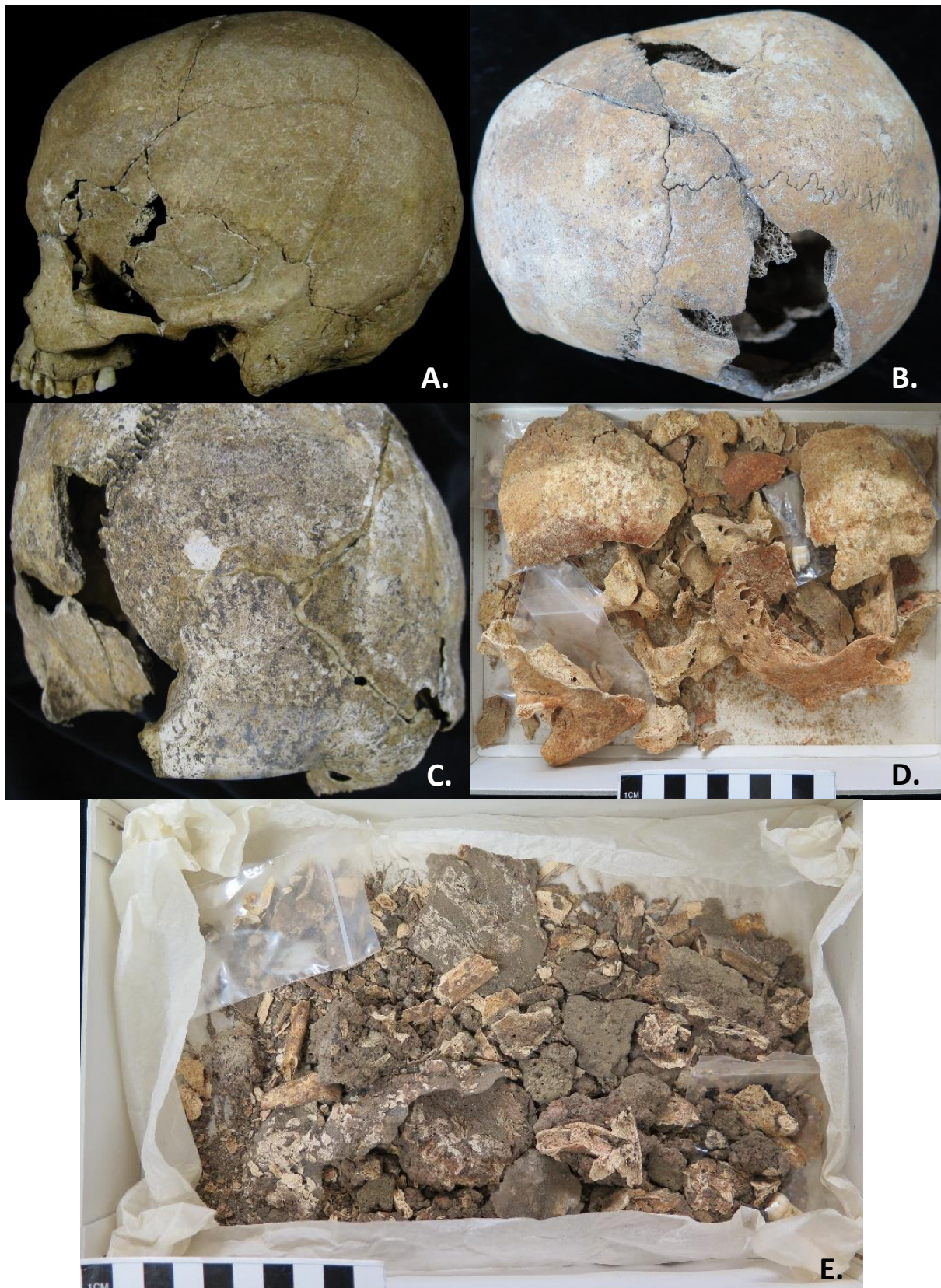


Figure 6.2. Examples of the range of preservation conditions observed on Jōmon skeletal remains. A. Score 1 (Funadomari, Hokkaidō). B. Score 1.5 (Sanganji shell midden, Fukushima). C. Score 2 (Inariyama shell midden, Aichi). D. Score 2.5 (Bibi 4, Hokkaidō). E. Score 3 (Higashi-Kushiro, shell midden, Hokkaidō). Photographed by RJ Schulting.

Table 6.4. Bone Preservation Scale for Observing Trauma on Jōmon Skeletal Remains

Score	Condition	Surface Conditions
1	Good	Small cut marks and shallow depressions identifiable on approx. 80% of the skull
1.5	Good-Moderate	Small areas of poor surface preservation
2	Moderate	Post depositional damage to outer table to the extent that cut marks would not be identifiable over approx. one-third or more of the cranial vault
2.5	Moderate-Poor	Post depositional damage to outer table to the extent that cut marks would not be identifiable over approx. two-thirds or more of the cranial vault
3	Poor	Difficult or impossible to recognise small healed depressed fractures on one-third or more of the cranial vault surface

For each individual examined, the completeness of extant skeletal elements was assessed on a scale of one to zero, where one indicated presence of the whole bone and zero its complete absence (left and right sides considered separately). Intermediate scores estimate how much of the bone was preserved. This method has been employed effectively by researchers such as Robb (1997), Schulting and Wysocki (2005), Fibiger et al. (2013), Gordón (2014), and Schulting and Fibiger (2014). Evaluating completeness is vital because a direct relationship exists between the number and condition of bones present, and the likelihood of recording trauma.

Common techniques used to calculate the frequency of violence-related trauma include the crude prevalence and true prevalence methods. In the former, the ‘Minimum Number of Individuals’ (MNI) represented in a sample is quantified from duplicate bones present, while the latter considers the proportion of injuries identified on individual skeletal elements. For the overall trauma prevalence to be calculable, it is necessary to record the rate of trauma as a percentage of the total number of bones and of individuals in the study sample (Roberts 2000:350-51). In particular, as Fibiger et al. (2013:190) state, ‘Considering crude prevalence for skull trauma and prevalence of trauma for individual bones of the skull allows for a more comprehensive understanding of interpersonal violence in the region’. However, true prevalence was not initially developed to record skeletal trauma specifically, but primarily to document postcranial completeness for other purposes, such as determining the prevalence of degenerative changes. Individual elements of the skull that are less than a specified level of completeness (usually 75%) are arbitrarily excluded from the analysis (Fibiger et al. 2013:195). This is problematic when such fragments may present reliable evidence of violent

trauma. More importantly, true prevalence records the proportion of individual skeletal elements affected by trauma, rather than estimating the number of people affected, which is of primary interest (cf. Robb 1997; Schulting & Wysocki 2005).

Instead of relying on such methods, here completeness scores were recorded in order to determine the ‘Effective Number of Individuals’ (ENI). ENI is the number of ‘whole’ skull equivalents available to examine for evidence of violent trauma within a given sample. This method considers both the preservation and completeness conditions of skeletal remains, which is especially important for more ancient skeletons, and in areas such as Japan where highly acidic soils dissolve organic remains.

ENI is calculated by averaging the completeness scores of the major elements of the cranium (frontal, parietal, and occipital) or postcranium (humeri, os coxae, femora, and tibiae), dividing this number by 100 to convert it to a proportion, then multiplying that value by the MNI (Schulting & Wysocki 2005). These major elements are used because they have the greatest probability of survival in the archaeological record due to their size and thickness. Essentially, the higher the ENI the more complete the skull, and hence the better the chance of discovering any extant injuries. The ENI value will likely be smaller than the MNI due to the differing completeness of individual skeletons, unless all remains were well preserved.

Poor skeletal completeness should be considered when examining remains for violent injuries as it directly affects the likelihood of trauma identification. Thus, the ENI method provides a more accurate way to estimate the pervasiveness of violence in a society. Moreover, utilising the true prevalence method would be inappropriate as this study aims to determine the prevalence of violence among the Jōmon people, rather than on specific skeletal elements. The crude prevalence (MNI) method will also be employed, however, to enable comparison of the Jōmon data with studies of violence in other hunter-gatherer societies, where the authors did not use the ENI method.

Skeletal Trauma

In the archaeological record, evidence of traumatic injuries such as fractures is a relatively common condition encountered on human remains. The term fracture is broadly defined as any traumatic event, whether accidental or intentional, which leads to the partial or complete discontinuity of a bone, and is usually caused by the exertion of abnormal physical stress (Roberts 2000; Ortner 2003). This stress can either be dynamic (sudden and high pressure) or

static (starting low but with pressure increasing until a fracture results); the former being more frequently seen on archaeological skeletal material. Stress in bone results from the application of one or more of the following types of force: 1) tension; 2) torsion or twisting; 3) flexion or bending; 4) compression, and 5) shearing (Ortner 2003:120). These forces produce different patterns of fractures (e.g., depressed, oblique, transverse) that have been clearly defined by medical and forensic sciences (see Roberts 2000). Specific causes for fractures in archaeological contexts may be hard to recognise, but can range from pathological conditions that weaken bone to biomechanical stress, therapeutic or cultural (cosmetic) practices, as well as accidents (unintentional) or intentional violence. Analysing skeletal trauma involved drawing three levels of distinction: cause of trauma (accidental or violent); type of trauma (blunt force, sharp force, or puncture/projectile), and timing of trauma (antemortem, perimortem, or postmortem).

Evidence of skeletal trauma was identified through macroscopic observation, photographed, and recorded in detail. Injuries were analysed using a hand-held 40x illuminating magnifying glass, and linear dimensions measured with a millimetric digital calliper. Each bone was examined separately to determine trauma patterns on a skeleton. The location, morphology, dimensions, distribution, and type of trauma were noted, as well as the extent of healing, qualitative descriptions of the wound edges, and presence of any associated radiating and/or concentric fractures and adhering bone fragments. Fracture type and the direction of impact were recorded where identifiable. With cranial trauma, the endocranial surface was inspected to check for inner table involvement. In most cases, radiographs were not available. Trauma resulting from pathological conditions not related to violence, such as osteoporosis and infections, and postmortem damage were excluded from the list of violent trauma cases.

Cause of Trauma: Accident or Violence

This study centred on identifying violence-related lethal and non-lethal injuries on prehistoric human skeletons. In archaeological contexts, virtually all skeletal trauma can be attributed to either accident or violence. Distinguishing between them is often problematic, and with the exception of circumstances such as earthquakes and other natural disasters, it is virtually impossible to identify accidental death from the archaeological record. Violent death is nearly as invisible, except where embedded projectiles such as arrowheads are found in bone, lethal blunt force trauma identified on a skull, or a sharp-edged weapon has directly damaged bone with no signs of healing (Larsen 2015:115). In contrast, accidental injuries typically

demonstrate the hazards of daily life, such as gathering and preparing food, participating in certain dangerous activities like hunting, traversing demanding terrain, or physio-pathological factors including osteoporosis (Standen & Arriaza 2000:239). Fractures due to accidents are commonly found on the clavicle, vertebra, ribs, humerus, radius (Colles' fracture), hip region (especially the femoral neck), and the tibia and fibula (Larsen 2015). Accidental injuries on the skull due to falls and other impacts occur most frequently in subadults (under 15 years) and older adults (over 50 years). Intentional traumatic injuries reveal incidents of conflict ranging from the interpersonal to warfare, and occasionally even self-mutilation and suicide (Fibiger et al. 2013:191). Generally, they involve the use of tools and weapons. Skeletal injuries usually attributed to deliberate violence include various fractures to the skull, incisions from sharp blades, embedded projectile points, and parry fractures of the middle to distal third of the ulna. Although accidents may be responsible for some cranial trauma cases, it is widely acknowledged that healed and unhealed injuries to the skull are most commonly the result of intentional violence (Schulting 2006:227).

The angle of a fracture may help to determine whether an injury was intentional or accidental. Although not definitive, the former is more likely to produce transverse breaks (perpendicular to the shaft), while the latter more often results in oblique breaks (Ortner 2003:136). Interpretation is further complicated by the fact that oblique fractures may be a consequence of a victim being shoved or thrown.

Parry fractures are difficult to interpret because they can be sustained from violent incidents or accidental falls (Lovell 1997; Roberts 2000; Judd 2008). Typically, these fractures are understood to be the consequence of a person using their forearm defensively in an attempt to protect their head or upper body from an attacking blow. They often coincide with violent cranial injuries. Given their occasional association with Colles' fractures, however, certain parry fractures may be accidental, and, if so, should be excluded from violent trauma counts (Larsen 2015). Nevertheless, particular fractures are known to occur more frequently in some situations than others. In the bioarchaeological literature (Lovell 1997; Roberts 2000; Ortner 2003; Judd 2008; Suzuki 2010; Pardoe 2014; Larsen 2015), the most common cause of discrete ulna shaft fractures (without involvement of the radius), is still considered to be warding off a blow. When a parry fracture was identified, the radius and skull (if present) were carefully examined.

Location of Trauma

Patterns of trauma—the location of injuries on a skeleton—was an important feature to consider, as particular traumatic incidents may affect specific body parts (Standen & Arriaza 2000). According to Roberts (2000:338), the location of a fracture might indicate whether or not it was accidental; unintentional injuries being more common on the postcranial skeleton, and less likely to be the cause of head and neck injuries. This is logical since the head houses the brain, eyes, and ears, which means that even a mild blow may briefly disable (disorient) the victim, leaving them vulnerable to further attack (Fibiger et al. 2013:191-92). Moreover, the face is a prime target as it represents individual identity, and facial injuries are especially painful, bruise easily, and bleed profusely (Larsen 2015:173-74). In short, while only representing approximately 12% of the average human's total surface, the head and neck draw much aggressive violence, although the ribs, scapulae, forearms, and hands also suffer frequent attacks. Fractures to postcranial bones are commonly found, and with the exception of parry fractures (see above), it could be argued that many, if not most, long bone fractures are accidental (Ortner 2003). Thus, analysing cranial remains for evidence of violent trauma was the main focus in this study.

The location of skeletal trauma may also suggest details about the context. Many cranial injuries are found on the left side of anterior elements, which would imply that the victim was struck from the front by a right-handed attacker during face-to-face combat (Boylston 2000; Larsen 2015). Conversely, cranial injuries sustained on the right side or on posterior elements may indicate a victim fleeing their attacker or lying prone (Larsen 2015:174). The distribution of injuries might also reveal the parts of the body targeted, although this could be difficult to interpret in a crowded battle scenario, a group ambush of a single victim, or a long-range attack.

Types of Trauma

Tools and weapons may leave evidence of more than one type of injury on human remains. Swords and daggers, for example, can be used to slice and stab, while axes can chop or smash depending on which end is wielded (Boylston 2000). Unless the implement remains embedded in the bone, it is rarely possible to connect an injury to a particular tool/weapon. Rather than attempting to determine the specific instrument used to inflict each of the newly discovered injuries, this study classifies the type of trauma found into one of three distinct categories: blunt force; sharp force, or puncture/projectile (Fig. 6.3-A~E).

Blunt Force

Blunt force trauma 'is produced by low velocity impact from a blunt object or the low velocity impact of a body with a blunt surface' (Kranioti 2015:25). More specifically, it results from a blow involving compressive forces that may have been produced by a percussive tool/weapon, where bone is splintered, cracked, or dented. The mechanism of force is usually crushing, bending, or twisting, and is typically caused by clubs, maces, stones, fists, or feet (Kimmerle 2014:964). Blunt force injuries are frequently located on the skull, as the head is often the main target for blows in interpersonal/intergroup violence (see above) (Roberts & Manchester 2010:108). They can be identified from the presence of roughly circular lesions, often combined with a pattern of radiating and/or concentric fractures extending out from the point of impact (Boylston 2000:374). With blunt force cranial trauma, energy is diffused across a broad section of the skull, with the fracturing of the outer table more likely to reveal a concentric pattern centred on the point of impact. The extent of damage caused to bone depends in part upon the amount of force applied when the blow is delivered, as well as on intrinsic factors such as bone strength and the age and sex of the victim. While lighter blows may only cause linear breaks, more powerful strikes may result in a comminuted fracture (bone is broken into numerous fragments) with lines radiating outwards from the wound (Boylston 2000; Guyomarc'h et al. 2010).⁷⁷ To aid in the discrimination between falls and blows, Guyomarc'h et al. established nine criteria which point towards a blow, including: three or more lacerations ≥ 70 millimetres in length; comminuted or depressed calvarial fractures, and the presence of facial fractures.

Both lethal (perimortem) and non-lethal (antemortem) blunt force depressed fractures (where bone fragments are displaced inwards towards the brain) are often described in the archaeological record (see Walker 1989 for southern California; Schulting 2006 for Europe; Allen et al. 2016, Pilloud et al. 2014, and Schwitalla et al. 2014a, 2014b for central California; Pardoe 2014 for Australia). On the skull, antemortem depressions can usually be recognised by a distinctive circular dent in the vault (Fig. 6.3-A), while perimortem depressed fractures may exhibit radiating fractures from the impact site and perforation of the inner table in some cases (Fig. 6.3-B) (Berryman & Haun 1996; Ortner 2003). Broken fragments still attached to the surrounding bone indicate that the incident occurred perimortem.

⁷⁷ Linear fractures are more commonly ascribed to accidental falls than intentional blows.

Wherever possible, the type of blunt force cranial trauma was recorded, but in many cases the bone surrounding the initial point of impact was no longer present. Depressed cranial fractures measuring less than one millimetre in depth were excluded from this study as nonviolent, except in cases where the depression had a clearly defined shape and the other dimensions measured more than ten millimetres, or smaller depressions were deeper than one millimetre. Though arbitrary, some size restrictions are necessary to exclude small imperfections unlikely to have resulted from violence. These criteria were applied consistently to all crania. Perimortem blunt force trauma to postcranial remains—which may produce a butterfly or comminuted fracture (e.g., on long bones)—was excluded from this analysis as it has also been identified in cases of postmortem breakage (Boylston 2000:365).

Sharp Force

Narrowly focused, linear, dynamic forces applied to the surface of a bone produces sharp force trauma, which is perhaps the most easily recognisable type of trauma on the skeleton. Incisions produced by sharp-edged implements (e.g., swords, daggers, and axes) are identified by a near straight line with well-defined edges, a flat, smooth, and polished cut surface, and often parallel striations which are occasionally visible to the naked eye (Boylston 2000:361). Not all sharp force trauma found on ancient bones was caused by violence, however. Cranial cut marks and scrapings were excluded from this analysis because they are often associated with trepanation. Postcranial cut marks were also omitted since they may be the result of postmortem processing, such as mortuary rites that involved disarticulation and cleaning of a skeleton. However, chop marks were included because they are very rarely associated with accidents or ‘surgeries’ (Fig. 6.3-C). Compared to the other types of trauma, sharp force injuries on Jōmon skeletons are generally rare because they lacked metal weapons.

Puncture/Projectile

Puncture/projectile trauma has penetrated or perforated bone, and is typically produced by pointed tools/weapons such as arrows and spears. While puncture marks are sometimes found on cranial remains (Fig. 6.3-D), projectile trauma is more often identified on the postcranium because it offers a larger target (Fig. 6.3-E). A projectile’s velocity and whether or not the victim wore protective equipment determines the amount of damage that may be caused to bone (Boylston 2000). Bone is not always struck, however, and inferring penetration based on a projectile’s location in relation to a skeleton is problematic (Schulting 2006:225).



Figure 6.3. Examples of the types of trauma observed on Jōmon skeletal remains. A. Depressed fracture on a left parietal bone from Kitakogane (Hokkaidō). B. Perforation on a left parietal bone from Minami-Usu 6 (Hokkaidō). C. Chop mark on a left parietal bone from Koboro cave (Hokkaidō). D. Two puncture marks on a right parietal bone from Kasori-Minami (Chiba). E. Arrowhead embedded in a right ilium fragment from Koboro cave (Hokkaidō). Photographed by RJ Schulting.

Projectiles unearthed in burials are often misinterpreted as grave goods, although they do not necessarily indicate that the deceased had been shot during their lifetime. In this study, projectiles were considered as evidence of violence when found directly embedded in bone, or if a distinctive shape survived in a bone after a projectile was removed. The latter are difficult to identify and thus easily overlooked during osteological analysis (Smith et al. 2007). Similarly, small nicks on bone resulting from projectiles passing through the body are often missed, especially as the probability of hitting a bone is only about one in three. In short, projectile injuries recognised on skeletons likely only represent a relatively small proportion of the total number of people struck. Given that embedded projectiles would have been relatively easy to find in Jōmon postcrania, it is assumed they were recorded prior to this study. Thus, with the exception of parry fractures to the ulnae, the examination of postcranial remains focused more on recording skeletal preservation, and particularly the completeness of individual elements.

Timing of Trauma

The timing of trauma—antemortem, perimortem, or postmortem—determines the lethality of violence present in prehistoric societies, and perhaps hints at the intentions of assailants. For example, the higher prevalence of non-lethal injuries seen among some Aboriginal Australian groups, and along the southern Cape coast of South Africa, might imply that they exercised a degree of restraint in their use of violence (Morris 2012; Pardoe 2014). In contrast to scholars who confine their studies to mortality rates due to violence, or indiscriminately record cases of skeletal trauma (e.g., Nakao et al. 2016), this study clearly distinguished between lethal and non-lethal injuries to understand better the character of violent behaviour in Jōmon society. Moreover, to ensure the reliability of the statistical analysis, it was necessary to identify cases of postmortem damage to bone and exclude them from calculations of violent trauma.

Antemortem

Skeletal trauma sustained sometime prior to death, which is not associated with the death event, and exhibits evidence of healing around the area of injury is indicative of an antemortem process (Kimmerle 2014; Martin & Anderson 2014). In archaeological contexts, observed antemortem fractures have generally ‘undergone the first two stages of the healing process (circulatory/cellular and metabolic)’ and have entered into the ‘final (and longest) mechanical phase, where bone...is gradually remodelled back to its normal anatomical shape’

(Roberts 2000:340). Externally, visible change includes the rounding and smoothing of the wound margins, the presence of a periosteal reaction or new bone growth, porosity, and the formation of a bridging callus that arches over the fracture site (Ortner 2003; Barbian & Sledzik 2008). Identifying fractures sustained during a person's life, particularly in childhood, is almost impossible once it has fully healed; healing occurs more rapidly in childhood but slows with age. Skull fractures typically take longer to heal than postcranial (especially long bone) fractures, making them easier to identify (Ortner 2003:126).

Perimortem

Trauma inflicted at or around the time of death, which is associated with the death event, and shows no evidence of healing or infectious response at the injury site is termed perimortem (Kimmerle 2014). Perimortem trauma on the cranium is characterised by the presence of patinated internal bevels (delamination on endocranial surfaces), sharp, even, and patinated fracture margins, and oblique, curvilinear, radiating and/or concentric fractures from the point of impact. The injured bone(s) may bend inward or away from the direction of force, the colour at the injury site is consistent with the surrounding bone (or darker), and sometimes hinging fracture edges (adherent fragments of bone) are present (Berryman & Haun 1996; Boylston 2000; Ortner 2003; Fleming-Farrell et al. 2013; Kimmerle 2014; Martin & Anderson 2014; Kranioti 2015).

It is difficult, and sometimes impossible, to distinguish perimortem fractures occurring around the point of death from those that take place shortly thereafter (Larsen 2015). This is important because the former may be associated with the cause of death. Neither will show evidence of remodelling because bone 'retains its highly collagenous 'fresh' composition' for some time after death, and exhibits 'similar fracture patterning and colouration' (Roberts 2000:346). The perimortem interval persists until the bone dries; potentially many months, depending on climate and local taphonomic conditions. Taphonomic processes such as soil pressure, animal scavenging, or damage caused during archaeological excavation, inevitably deform skeletons in the ground. Classification is further complicated when, for example, the fracture edges have been weathered by the burial environment (Scheirs et al. 2017:867-68). If the periosteum and soft tissues were intact when the fracture occurred, then small bone fragments sometimes stick to bones adjoining the fracture site (Ortner 2003). When combined with other evidence, these fragments aid identification as perimortem trauma, although this depends on careful recording and recovery in the field.

Postmortem

Differentiating between perimortem trauma and postmortem damage becomes easier once bone has lost its elasticity (organic content such as collagen dissipates in the burial environment), and become a dry and brittle mineralised framework (Boylston 2000). Dry and fresh bone respond differently under similar forces. The former produces identifiable fracture patterns with broken edges that appear jagged and uneven, rough in texture (often with flaking), and transverse or at right angles to the bone surface without radiating fracture lines. Dry bone fractures may exhibit differentially stained (lighter edges) or more recently exposed surfaces, and there is no bending as the bone's elasticity is greatly reduced (Buikstra & Ubelaker 1994:120; Fleming-Farrell et al. 2013:162.e4; Kimmerle 2014; Martin & Anderson 2014:44). In contrast, in fresh bone there is a flexible, plastic response to fractures, fracture angles are generally obtuse or acute, and the edges appear smooth, sharp, and bevelled with occasional flaking (Fleming-Farrell et al. 2013:162.e4; Kranioti 2015:27; Ubelaker 2015:96).

Shovels and trowels used during excavation may damage bones in ways that resemble blade cuts. This problem is well-known, but there are other types of post-depositional alterations which may be mistaken for traumatic injuries. When examining skeletal remains it was necessary to consider weathering and erosion from soil and water, cracking, root stains and blood vessel grooves, breakage due to trampling and scavenging marks, as well as scratches from pebbles, sand, and shells pressing and rubbing (Ogata 1981:190; Kimmerle 2014; Larsen 2015:116).

A flow chart was employed to aid interpretation of injuries identified during skeletal examination (Fig. 6.4). All injuries were assigned a probability score of low, medium, or high to indicate the confidence with which the trauma was assessed as antemortem or perimortem (see Schulting & Wysocki 2005; Schulting & Fibiger 2014). For example, a skeleton exhibiting perimortem trauma with a p-score of 'high' signified a strong probability that the injury was caused while the bone was fresh. Injuries scored as 'low' were not included in the violent trauma results in Chapter 7. Other studies exploring violence-related skeletal injuries in South America (Gordón & Bosio 2012; Gordón 2014), for instance, have utilised a similar method, but it has not been used on Jōmon samples in the published Japanese literature.

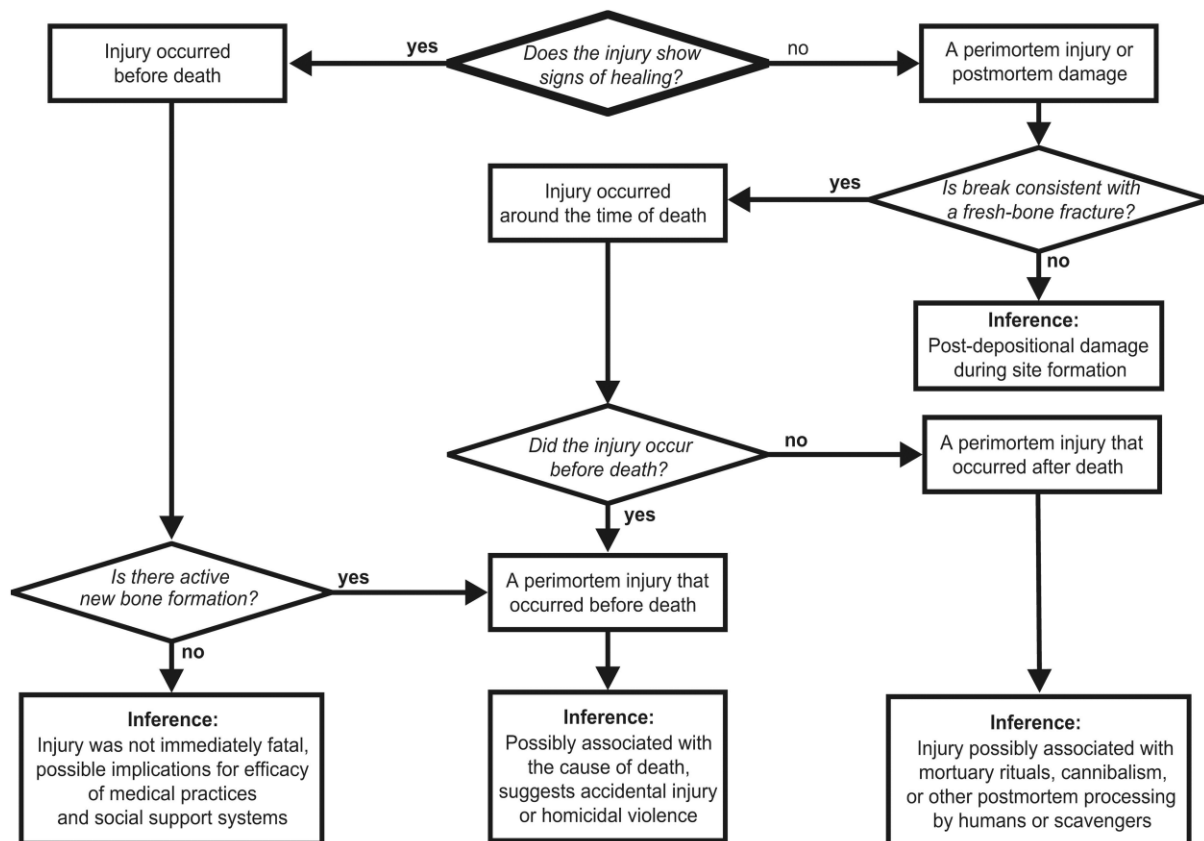


Figure 6.4. Diagram for assessing traumatic injuries on skeletal remains (Walker 2001:577).

The Skeletal Assemblage

With the permission and assistance of curators of skeletal collections at eight Japanese institutes, cranial data were gathered in collaboration with Rick Schulting and J. Alyssa White. Postcranial data were assembled by the author from four of these institutes (Table 6.5). To investigate the prevalence of violence-related trauma in Jōmon Japan, the skeletal remains of 1208 individuals excavated from one hundred sites across the archipelago were osteologically examined (Table 6.6 and Fig. 6.5). Another 44 individuals' remains were also inspected, but excluded from all analyses due to insufficient preservation and/or skeletal completeness. Skeletal remains (of 166 individuals) from the Nagano Prefectural Museum of History (NPMH) were analysed separately due to poor preservation conditions. In cases where an individual's cranial and postcranial remains had survived, these were judged as representing a single person when MNI and ENI were calculated. Thus, for the purposes of statistical analyses, data from a total of 1042 individuals (864 crania and 302 postcrania) were used.

Table 6.5. Japanese Institutes where Jōmon Skeletal Collections were Examined

Acronym	Institute	Crania	Postcrania
DCIFC	Date City Institute of Funkawan Culture	IRB/RJS	IRB
HU	Hokkaidō University	IRB/RJS	IRB
KU	Kyōto University Laboratory of Physical Anthropology & Kyōto University Museum	IRB/RJS/JAW	
Kyūshū U	Kyūshū University	JAW	
NPMH	Nagano Prefectural Museum of History	IRB	IRB
SMU	Sapporo Medical University	IRB/RJS	
SMUSM	St Marianna University School of Medicine	IRB/RJS	
UMUT	University Museum University of Tōkyō	IRB/RJS	IRB

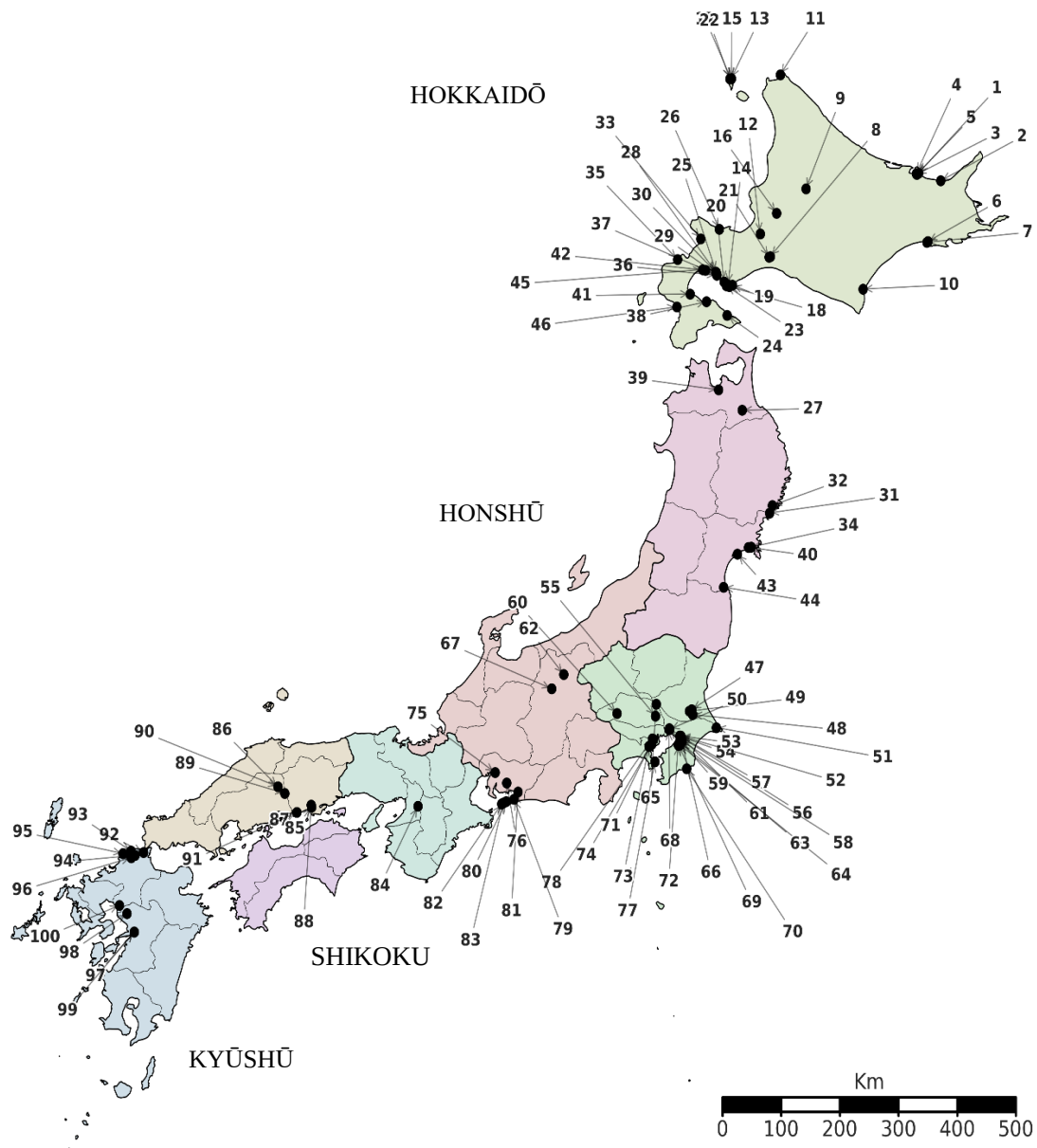
IRB: Izumi R. Braddick; RJS: Rick J. Schulting; JAW: J. Alyssa White

Table 6.6. Number of Jōmon Sites and Skeletons Analysed at Japanese Institutes

Institute	Crania <i>n</i>	Postcrania <i>n</i>	MNI	Number of Sites
DCIFC	22	2	24	3
HU	36	28	56	14
KU	218	0	218	6
Kyūshū U	45	0	45	9
NPMH	145	129	166	2
SMU	92	0	92	24
SMUSM	96	0	96	8
UMUT	355	272	511	39
Total	1009	431	1208	105*

*Skeletons from 5 of the 105 sites were examined at multiple institutes.

The dataset comprises skeletal remains excavated in every decade from the early twentieth century onwards. Some of the older material had not been studied osteologically for many years, and several collections had never been examined for violence-related trauma. Most evidence of violent injuries, especially those found on the skull, had not been previously identified and/or reported in publications. Cost and time factors, as well as practical considerations, prevented the application of further analytical methods such as radiography or scanning electron microscopy.



- | | | | |
|---------------------------|---|--------------------------------|--|
| 1. Moyoro
モヨロ貝塚 | 2. Kushnkotan
クシュンコタン遺跡 | 3. Abashiri
網走遺跡 | 4. Abashiri
Keimusho-ura
網走刑務所ウラ |
| 5. Abashiri cave
網走洞窟 | 6. Tenneru
天寧遺跡 | 7. Higashi-Kushiro SM
東釧路貝塚 | 8. Bibi 4
美々4 遺跡 |
| 9. Midorimachi
緑町遺跡 | 10. Hiroo
広尾遺跡 | 11. Onkoromanai
オンコロマナイ 遺跡 | 12. Bōzuyama
坊主山遺跡 |
| 13. Oshonnai
オションナイ 遺跡 | 14. Ponnai/Motowanishi SM
ポンナイ/本輪西貝塚 | 15. Uennaipo
ウエンナイポ 遺跡 | 16. Urausu SM
浦白貝塚 |
| 17. Funadomari
船泊遺跡 | 18. Wanishi
輪西遺跡 | 19. Washibetsu
鷺別遺跡 | 20. Kitakogane SM
北黄金貝塚 |
| 21. Misawa 1
美沢 1 遺跡 | 22. Hamanaka
浜中遺跡 | 23. Etomo SM
絵鞆貝塚/エトモ | 24. Usujiri B
白尻 B 遺跡 |
| 25. Irie SM
入江貝塚 | 26. Yoichi/Ōyachi SM
余市貝塚/大谷地貝塚 | 27. Shimotai
下平遺跡 | 28. Abuta
虻田遺跡 |

29. Usu-Moshiri 有珠モシリ遺跡	30. Takasago SM 高砂貝塚	31. Nakazawahama SM 中沢浜貝塚	32. Ōhora SM 大洞貝塚
33. Chatsu 4 cave 茶津4洞穴遺跡	34. Numazu SM 沼津貝塚	35. Sakaeiso Iwakage 栄磯岩陰遺跡	36. Minami-Usu 6 南有珠6遺跡
37. Minami-Usu 7 南有珠7遺跡	38. Oshironai 尾白内遺跡	39. Tsukimino 月見野遺跡	40. Sakai 境遺跡
41. Kotan-Onsen コタン温泉遺跡	42. Rebunge 礼文華遺跡	43. Satohama SM 里浜貝塚	44. Sanganji SM 三貫地貝塚
45. Koboro cave 小幌洞窟遺跡	46. Mitsuya 三ッ谷遺跡	47. Okadaira SM 陸平貝塚	48. Fukuda SM 福田貝塚
49. Kokuzō SM 虚空蔵貝塚	50. Mae SM 前貝塚	51. Yoyama SM 余山貝塚	52. Kasori SM 加曽利貝塚
53. Kasori-Kita SM 加曽利北貝塚	54. Arayashiki SM 荒屋敷貝塚	55. Kuroya SM 黒谷貝塚	56. Daimon SM 台門貝塚
57. Kusakariba SM 草刈場貝塚	58. Rokutsū SM 六通貝塚	59. Ubayama SM 姥山貝塚	60. Hashidate 橋立遺跡
61. Hanawa SM 花輪貝塚	62. Yashiro 屋代遺跡	63. Tenaga SM 手永貝塚	64. Karasuhorikomi SM 烏堀込貝塚
65. Fuyuki SM 冬木貝塚	66. Kasori-Minami SM 加曽利南貝塚	67. Kitamura 北村遺跡	68. Kosaku SM 古作貝塚
69. Saihiro SM 西広貝塚	70. Moriya-Kaigan 守谷海岸	71. Chidorikubo SM 千鳥窪/千鳥久保貝塚	72. Gionbara SM 祇園原貝塚
73. Mitsuzawa SM 三ッ沢貝塚	74. Aradate 荒立遺跡	75. Narumi SM 鳴海貝塚	76. Okazaki SM 岡崎貝塚
77. Kōsaka SM 高坂貝塚	78. Shimo Numabe SM 下沼部貝塚	79. Yoshigo/Yasaki SM 吉胡/矢崎貝塚	80. Ikawazu SM 伊川津貝塚
81. Inariyama SM 稲荷山貝塚	82. Kawaji SM 川地貝塚	83. Hobi SM 保美貝塚	84. Kō 国府遺跡
85. Tsubue (Funamoto) SM 粒江(船元)貝塚	86. Yosekura Iwakage 寄倉岩陰	87. Ōta SM 太田貝塚	88. Hashima SM 羽島貝塚
89. Toyamatsu Dōmen cave 豊松堂面洞窟遺跡	90. Sarugami Iwakage 猿神岩陰遺跡	91. Tsukumo SM 津雲貝塚	92. Kokura/Ogura 小倉遺跡
93. Yamaga SM 山鹿貝塚	94. Einomaru SM 永犬丸貝塚	95. Kanazaki (Kōjō) SM 鐘崎(上八)貝塚	96. Kitsuki SM 木月(古月)貝塚
97. Adaka SM 阿高貝塚	98. Wakazono SM 若園貝塚	99. Goryō SM 御領貝塚	100. Shimokusuda SM 下楠田貝塚

Figure 6.5. Distribution of Jōmon study sites on the Japanese archipelago (excluding the Okinawan islands, SM: shell midden).

Across the archipelago, approximately 5000~6000 human skeletons have been unearthed dating to the Jōmon period (Sahara 2005:116). No comprehensive database exists specifying the precise number of skeletons excavated at every Jōmon site (let alone detailed information on each skeleton).⁷⁸ Nevertheless, if Sahara's total is taken as a guide, then the 1208 skeletons analysed in this study constitute approximately 20~24% of the total recovered. Many Jōmon remains are incomplete and/or poorly preserved; the latter problem being especially common at inland sites, such as those in central Chūbu.

While the physical examination of Jōmon cranial remains took place at institutes across Japan, due to time constraints, it was not possible to analyse all available postcranial remains. Access to the osteological records of Hokkaidō University and The University (of Tōkyō) Museum enabled the study of additional postcrania. These records provide photographs and diagrams of the skeletal elements present in each box (although ribs and vertebrae were not often marked), allowing the completeness of postcranial elements to be estimated (Fig. 6.6 and Fig. 6.7). This method of data collection does not permit a detailed assessment of violent trauma on discrete postcranial elements, but it is presumed that more conspicuous injuries such as embedded projectiles would have been identified by the original analyst.

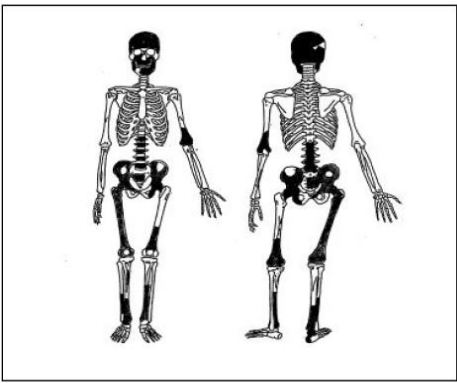
管理No : 203-002	旧骨箱番号: 69-②, 1385	
標本名 : 虻田2	Abuta 2	
標本名補足: 採集場所: 虻田町字高砂町六二 時代区分: 縄文時代晩期(亀ヶ岡式土器副葬) 年代測定: 採集年月日: 昭和26年11月~昭和27年9月(付随紙片による) 西暦: 1952 収蔵経緯: 個人所有畑地より出土、大場利夫持参 台帳情報有無: ☐ 一体化: ☐ 記録類: 発掘台帳には「虻田2/成年/頭部破損/亀ヶ岡式土器副葬」とある。付随紙片には「昭和二十七年九月十一日 虻田役場ヨリ大場持参 亀ヶ岡式土器副葬ト云ワレル」、「字高砂町六二、右頭骨(= 虻田1)の出土カ所から山手二尺位はなれて出たもの(虻田石時代2)」とある。		性別: 女 歯牙萌出状況: 21+ 骨端癒合状況: prox femur 18+
整理備考:  		整理日: 2015.8.5/2017.6.19

Figure 6.6. Data sheet example from the osteological collection record of Hokkaidō University.

⁷⁸ The Comprehensive Database of Archaeological Site Reports in Japan (*Nara Bunkazai Kenkyūsho*) provides limited information about excavated Jōmon skeletons, but few site reports are accessible online.

UMUT 130140	小金井 (KG) 番号 100
通称 保美	長谷部 (HS) 番号
時代 縄文晩期	鈴木 (SZ) 番号
標本名 保美 (22) 1	遠原 (HN) 番号
	馬場 (BB) 番号

カタログ備考 individual, 100(KG), 「保美平城貝塚B地点777群葬地取リノ際偶然出土モノ」 (小金井記) collected by Amano.

出土報告文献 大山 (1923)

出土報告番号 第1号

発掘調査者 小金井良輔、柴田常恵、大山柏

発掘調査地区 B地点 (大山, 1923, 遠藤・遠藤, 1979)

実測図

写真

年代情報

人骨記載報告

頭骨 頭骨ケース 歯の有無 あり

性別

歯牙萌出状況 6+

骨端癒合状況 clavicle sternal end 28+

特記事項

整理日 2001.8.2/2001.8.9 整理者 松川水嶋

整理備考 歯: Cx1, Px4, Mx8
 ・左右大臼歯、左右前歯、腭骨が混入。
 ・遠藤・遠藤 (1979) は本標本に關して「collected by Amano」と記している。天野が収集したのはB地点の第1号人骨である (大山, 1923) ことから、本標本を発掘報告書における第1号人骨と判断した。

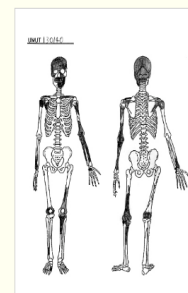


Figure 6.7. Example of a data sheet from the osteological collection record of The University (of Tōkyō) Museum.

Chronological and Geographical Distribution

The chronological and geographical distribution of the study sample was determined by dividing the examined skeletons into the subperiod(s) to which they (or their sites) have been dated, and the Japanese regions in which the sites are located. Regional boundaries reflect natural geographic features that likely existed in the Jōmon period, and as their use is standard practice in Japanese archaeology, they represent a convenient tool for comparative purposes. Sites were selected to maximise the number of Jōmon subperiods and to minimise the inevitable bias towards coastal shell midden sites. However, in practice this ambition was hampered by the generally poor preservation and scarcity of skeletal remains from both the early subperiods and inland sites.

Over 80% of the skeletons in this study sample date from the Late and Final Jōmon periods, while those from the Early, Middle, and Epi-Jōmon comprised only 16% of the total examined (Fig. 6.8 includes the Nagano sample). Less than a handful date to the Initial phase, which is not surprising given that so few skeletons survive from this time (Shigehara 1994). Five individuals (0.4%) could not be assigned to a specific subperiod and have been placed in a broad ‘Jōmon period’ category, while 31 (2.6%) spanned two phases. Skeletons from the Nagano sample date to the Middle and Late periods, but since these remains were analysed separately, the general Jōmon sample numbers were 82 (7.9%) and 402 (38.6%), respectively.

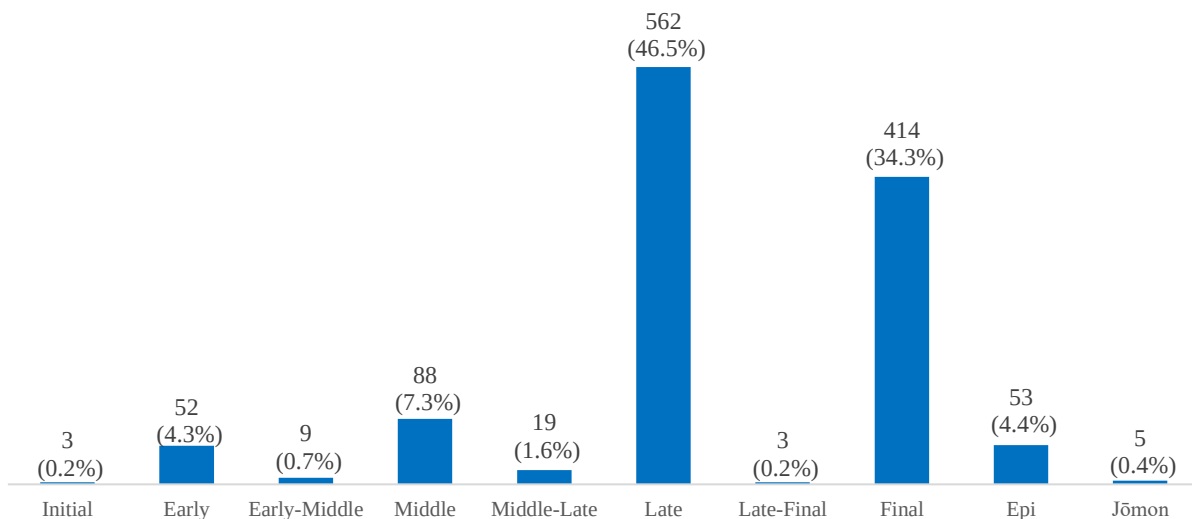


Figure 6.8. Chronological distribution of skeletal remains by Jōmon subperiods ($n = 1208$).

The regional distribution of the one hundred study sites revealed two main concentrations, namely, Hokkaidō (38) and Kantō (28), followed by the roughly equal Kyūshū (9), Chūbu (9), Tōhoku (8), and Chūgoku (7), with Kansai represented by a single site. The high proportion of sites in Hokkaidō is partly associated with Jōmon culture enduring in this region even after Yayoi immigrants had begun to dominate the rest of the archipelago. Favourable environmental conditions and an abundance of natural resources in the eastern Kantō region resulted in a high density of both settlements and populations. Clusters of sites are especially noticeable around Uchiura (Hokkaidō), Tōkyō, and Mikawa (Aichi) Bays, where the concentration of shell middens (some very large) mean that many well-preserved human skeletons have been excavated (Habu 2004; Edamura & Kumagi 2009).

The distribution of analysed skeletons is particularly dense along the Pacific coast of Honshū, where a productive environment and local access to a variety of (forest and coastal) resources resulted in flourishing populations and a proliferation of settlements (see Chapter 2) (Habu 2004; Perri 2016). In terms of the 1208 skeletons examined, the largest share was excavated in Chūbu (over 35%) while the smallest came from Kansai (1.1%) (Fig. 6.9 and Fig. 6.10). When the 166 skeletons from landlocked Nagano Prefecture were excluded, Chūbu (25.1%) dropped to second place behind Kantō (31.2%). On a spatiotemporal basis, it is clear that the majority of Late Jōmon skeletons were excavated from sites in Kantō and Chūbu; the latter also had the largest quantity of skeletons dating from the Final Jōmon phase (Table 6.7 includes the Nagano sample). Late and Final Jōmon skeletons were examined from all regions except for Kansai. Hokkaidō boasts skeletons from all subperiods, especially the Late and Epi-Jōmon.

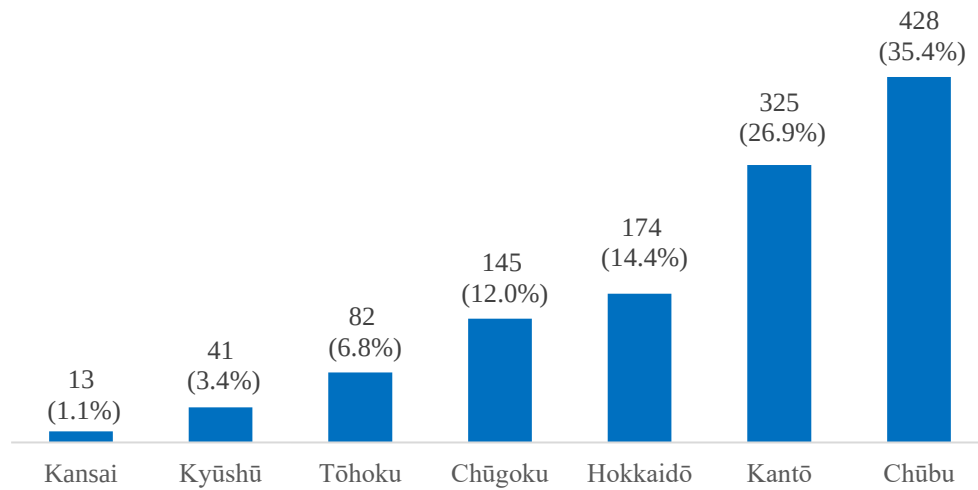


Figure 6.9. Number and proportion of Jōmon skeletons examined by region ($n = 1208$).

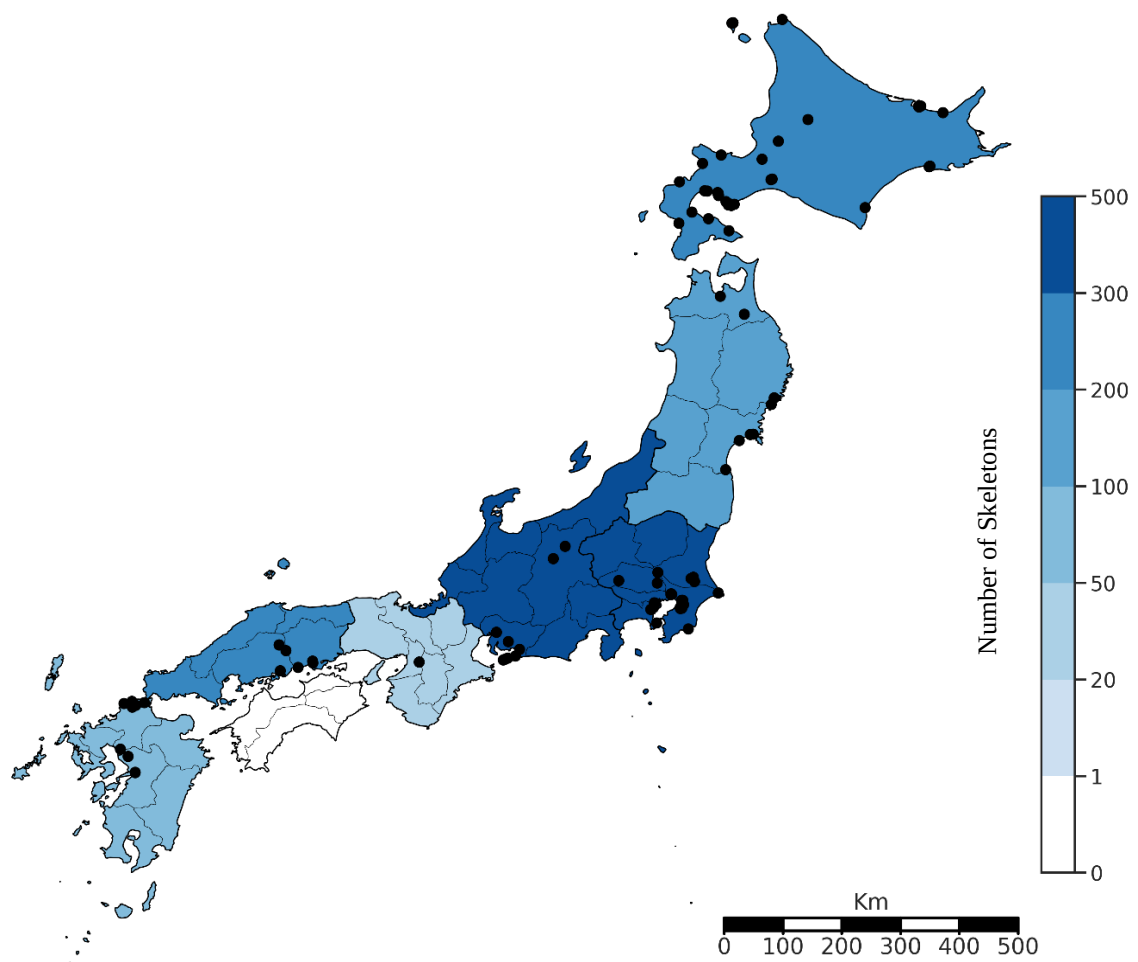


Figure 6.10. Regional distribution of Jōmon skeletons and sites in study sample.

Table 6.7. Regional and Chronological Distribution of Jōmon Skeletal Remains

Region	Initial	Early	Early-Middle	Middle	Middle-Late	Late	Late-Final	Final	Epi Jōmon	Total
Kansai		13								13
Kyūshū					13	21		6	1	41
Tōhoku						27	1	53	1	82
Chūgoku		5		24		46		70		145
Hokkaidō	3	29	9	19	5	42	2	11	53	174
Kantō		5		39	1	262		17		325
Chūbu				6		164		257	1	428
Total	3	52	9	88	19	562	3	414	53	1208

Differences in the availability of resources (quantity and variety), which are linked to climatic and sea-level changes, led to larger populations and a higher density of settlements along coastal areas (see Chapter 2). Thus, a higher prevalence of violence among inhabitants of coastal Jōmon sites is a distinct possibility. To test this hypothesis, the one hundred study sites were classified as either coastal or inland. Rather than employ an arbitrary cut off, this study made an individual case-by-case assessment based on each site's current altitude above sea level and distance from the ocean.⁷⁹ Habu's (2004:44) diagram summarising the environmental and estimated sea-level changes during the Jōmon era was consulted. Sea levels fluctuated greatly during this long period (ranging from approximately –40m~+6m compared to present levels), further complicating the task of estimating the location of sites. The effects of erosion, earthquakes, tsunami, and other natural phenomena make precision impossible. The presence of shell middens at a site was suggestive of a coastal origin, although they also occurred along river valleys. Where available, coordinates and detailed geographical information were assembled from the Nara National Research Institute for Cultural Properties' archaeological site database, and the Comprehensive Database of Archaeological Site Reports in Japan, as well as other sources. Where unavailable, the nearest present-day town to a site was used to approximate its location.

⁷⁹ These criteria are not entirely satisfactory because the Jōmon marine transgression (which peaked around 7000 BP and ended about 5000 BP) not only caused coastal flooding but also transgression of river valleys, forcing the Jōmon to build on higher ground and perhaps move further inland during these times. However, the data necessary to assess the situation in every river valley is unavailable. Moreover, relatively few skeletons examined (4.5%) date from this period.

The vast majority of Jōmon sites and skeletons in this study sample were excavated from coastal regions of Japan (Table 6.8). The former may be ascribed to favourable conditions (rich and diverse resources), and the latter to the presence of shell middens. The high calcium carbonate content of shells, which turns middens alkaline, helps to preserve organic material such as bone by slowing the typical rate of decomposition caused by soil acidity.

Table 6.8. Distribution of Jōmon Study Sites and Skeletons (MNI): Coastal versus Inland

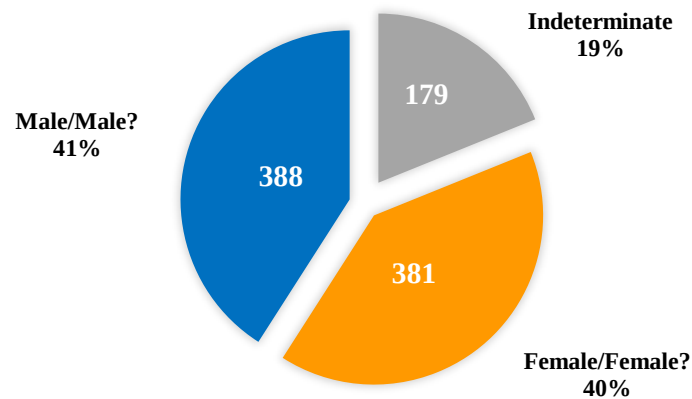
	Coastal	Inland	Total	Coastal %	Inland %
Sites	89	11	100	89.0	11.0
Crania	792	217	1009	78.5	21.5
Postcrania	302	129	431	70.1	29.9
Skeletons	970	238	1208	80.3	19.7

Age and Sex Distribution

The vast majority of the 1042 individuals analysed in this study were adults (87%). Adolescents contributed 4%, children 6.8%, and infants 2.2% of the total (Table 6.9). Due to poor preservation and recovery bias, this sample is heavily skewed against infants, who were typically buried in pottery jars and separated from adult graves. This was not a major issue for the recording of violence-related trauma. In the adult sample, Young adults were the most predominant, followed by Adult and Middle adults. A substantial proportion of individuals (23.8%) could only be broadly categorised as Adult. Adolescents and adults are probably more likely to sustain violent trauma than infants and children, thus a row for ‘Total (excluding children)’ was added to the age distribution tables to reflect this bias. This approach also enables a direct comparison with the results presented in Nakao et al. (2016). Within the adolescent and adult sample, over 81% of individuals could be assigned probable or possible sex: 381 females and 388 males (Fig. 6.11). Sex could not be ascribed to 179 individuals who were labelled indeterminate.

Table 6.9. Age Distribution of Jōmon Sample

Age Group	Crania <i>n</i> (%)	Postcrania <i>n</i> (%)	Individuals <i>n</i> (%)
Infant	7 (0.8)	17 (5.6)	23 (2.2)
Child	56 (6.5)	20 (6.6)	71 (6.8)
Adolescent	37 (4.3)	5 (1.7)	42 (4.0)
Young adult	244 (28.2)	60 (19.9)	260 (25.0)
Young-Middle adult	48 (5.6)	15 (5.0)	49 (4.7)
Middle adult	167 (19.3)	36 (11.9)	177 (17.0)
Middle-Old adult	81 (9.4)	18 (6.0)	82 (7.9)
Old adult	85 (9.8)	18 (6.0)	90 (8.6)
Adult	139 (16.1)	113 (37.4)	248 (23.8)
Total	864 (100.0)	302 (100.0)	1042 (100.0)
Total (adult)	764 (88.4)	260 (86.1)	906 (86.9)
Total (excl. children)	801 (92.7)	265 (87.7)	948 (91.0)

**Figure 6.11. Sex distribution of Jōmon adult sample (*n* = 948).**

The skeletal remains of 176 individuals excavated from the Middle and Late Jōmon inland sites of Kitamura and Yashiro (Nagano) were examined at the NPMH. Data from these skeletons were separated from the general Jōmon sample due to their very poor preservation and incompleteness (see below). Ten individuals were removed from analysis due to a lack of recordable data. Among the remaining 166, the age-at-death of twenty-two individuals (fourteen crania, twelve postcrania) could not be established, reducing the sample size to 144 (Table 6.10). Adults comprised the vast majority (over 85%) of those analysed, and no infant remains were identified. For some individuals, only cranial remains were sufficiently well-preserved to record, thus accounting for the difference in cranial and postcranial totals. Similar numbers of Young adult, Middle adult, and Old adult individuals were examined, but roughly a third of the 144 individuals could only be broadly identified as Adult. Within the

adolescent and adult sample, probable or possible sex could only be determined for 51% of individuals (44 females and 36 males), while the other 49% (77 individuals) were categorised as indeterminate (Fig. 6.12).

Table 6.10. Age Distribution of Jōmon Sample from Kitamura and Yashiro (Nagano)

Age Group	Crania <i>n</i> (%)	Postcrania <i>n</i> (%)	Individuals (%)
Child	9 (6.9)	4 (3.4)	9 (6.3)
Adolescent	9 (6.9)	8 (6.8)	9 (6.3)
Young adult	29 (22.1)	21 (17.9)	29 (20.1)
Middle adult	29 (22.1)	24 (20.5)	29 (20.1)
Old adult	25 (19.1)	21 (17.9)	26 (18.1)
Adult	30 (22.9)	39 (33.3)	42 (29.2)
Total	131 (100)	117 (100)	144 (100)
Total (adult)	113 (86.3)	105 (89.7)	126 (87.5)
Total (excl. children)	122 (93.1)	113 (96.6)	135 (93.8)

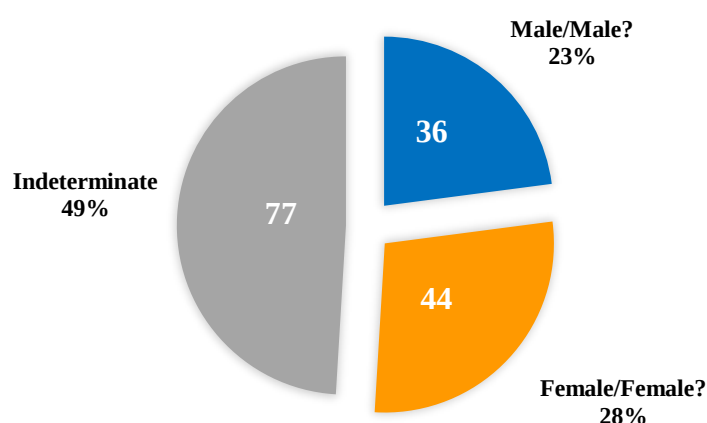


Figure 6.12. Sex distribution of Jōmon adult sample from Kitamura and Yashiro (Nagano) (*n* = 157).

Preservation and Completeness

Cortical surface conditions of skeletal remains were considered in terms of the degree of fragmentation, surface erosion, and cracking/flaking to determine the overall preservation of each individual analysed. Of the cranial remains in the general Jōmon sample, approximately 87% were in good or moderately good condition (score 1-1.5), whereas the equivalent ratio for postcranial remains was over 91% (Fig. 6.13). A substantial number of crania and postcrania were not recorded due to very poor preservation (e.g., boxes of crushed bone and dust), thus score 3 is underrepresented.

The preservation condition of individuals from the Kitamura and Yashiro sites was considerably worse than that of the general Jōmon study sample. The vast majority of cranial (81%) and postcranial remains (86%) were in a moderate or poor condition (score 2-3) (Fig. 6.14). No remains were in a good condition. Due to poor burial conditions at Kitamura, the excavators used polyurethane foam to halt further disintegration of the better preserved skeletons, and removed them whole from the ground with the surrounding soil and artefacts (Fig. 6.15-A) (Nagano-ken Kyōiku Iinkai et al. 1993). Over time, the soil solidified to a cement-like consistency, and can no longer be separated from the bones without risking their complete disintegration (Fig. 6.15-B).

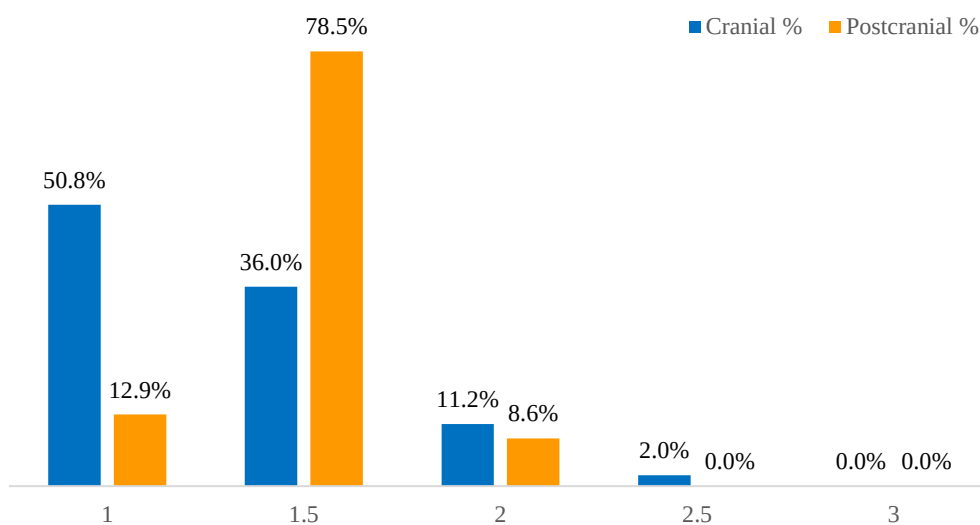


Figure 6.13. Skeletal preservation of Jōmon study sample.

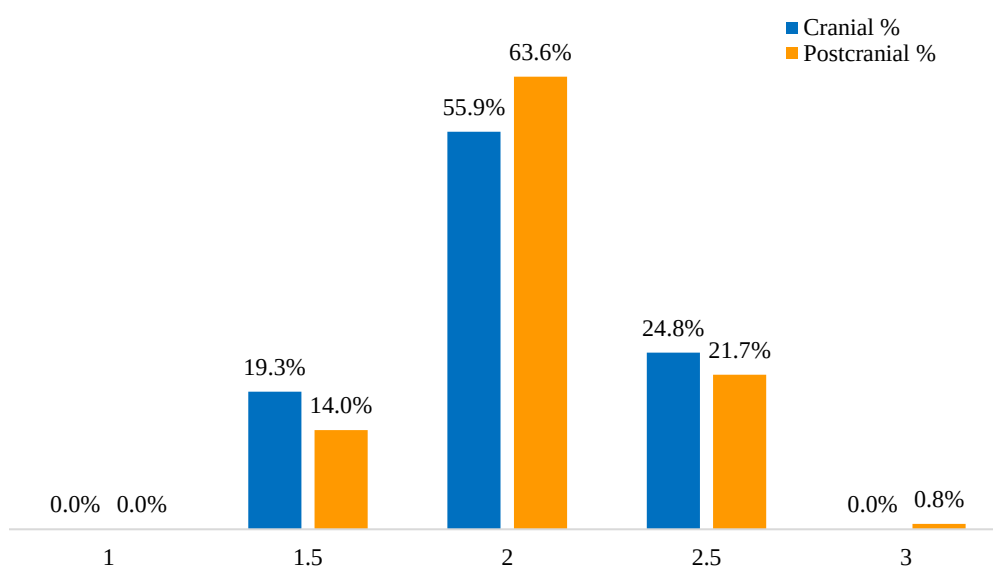


Figure 6.14. Skeletal preservation of Jōmon study sample from Kitamura and Yashiro (Nagano).



Figure 6.15. Skeletal preservation at Kitamura (Nagano). A. One of the better preserved and relatively complete skeletons. B. Poorly preserved, fragile remains fused to clumps of sediment. Photographed by IR Braddick.

The completeness of skeletal elements was recorded to determine the ‘Effective Number of Individuals’ (ENI), and establish more accurately the prevalence of violence in Jōmon society. The parietal bones (70%) were the most complete cranial element in the general Jōmon sample, followed by the frontal (69%) and occipital (67%) bones (Fig. 6.16). The nasal bones (15%) were the least complete due to their fragility. For all elements, there was only a marginal difference in the completeness of right and left sides. In comparison, the difference between the left and right side of postcranial elements appears to be marginally larger (Fig. 6.17). The left femur (49.2%) was the most complete bone in the general Jōmon sample, followed closely by the right femur (49%) and the left humerus (48%). Undoubtedly, the completeness scores of the vertebrae and ribs have been underestimated, as these elements were generally not included on the skeletal diagram records.

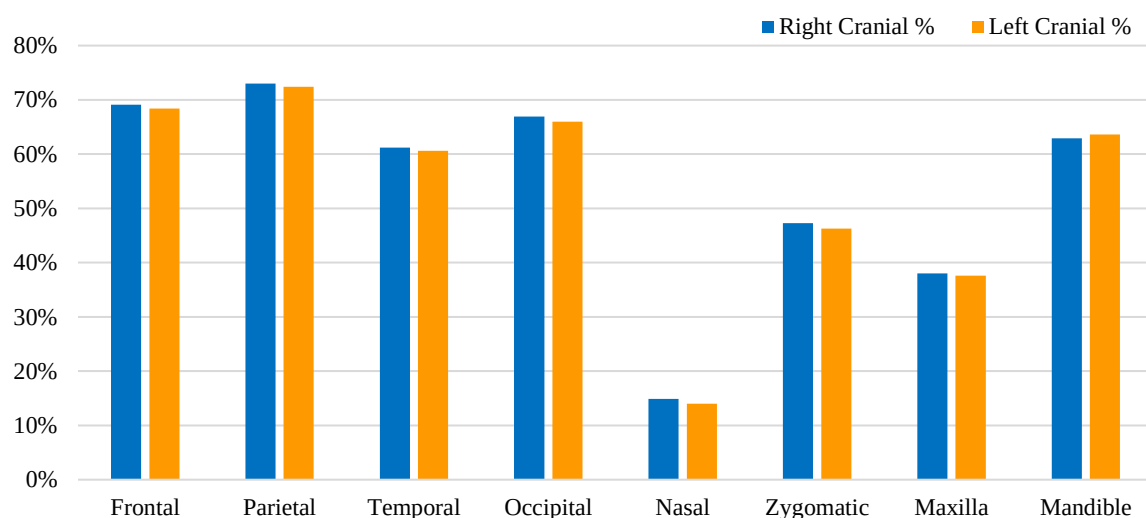


Figure 6.16. Completeness of cranial elements in Jōmon sample ($n = 864$).

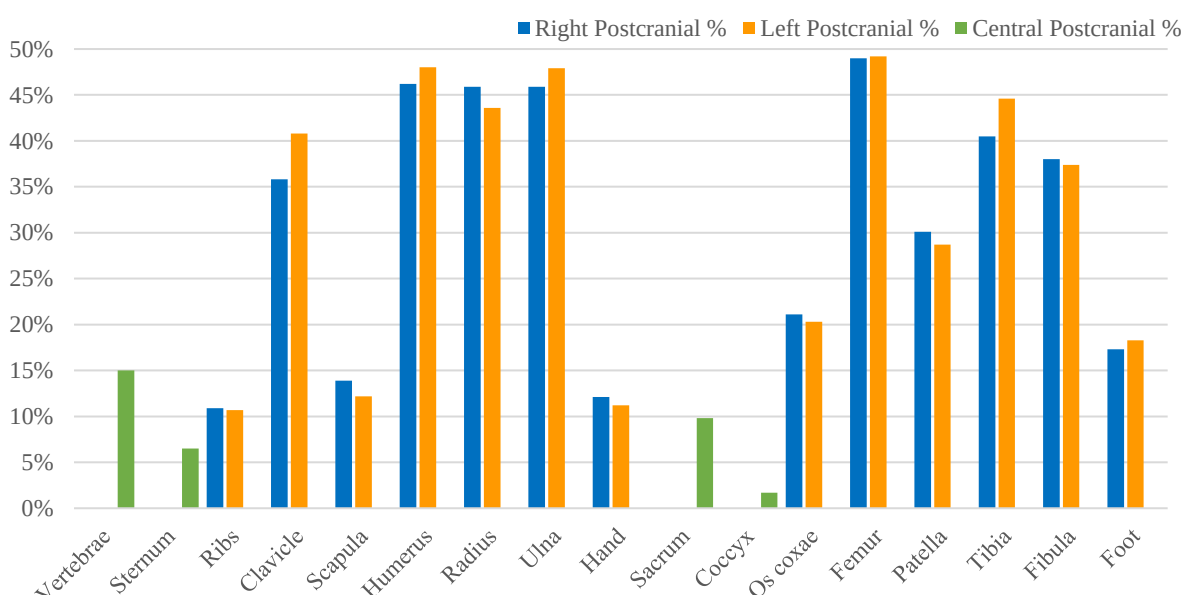


Figure 6.17. Completeness of postcranial elements in Jōmon sample ($n = 302$).

In contrast to the general Jōmon sample, the mandible (right 48%, left 49%) was the most complete element among the individuals from Kitamura and Yashiro, and the zygomatic (right 22%, left 18%) the least (Fig. 6.18). The right side of the frontal, parietal, occipital, and zygomatic bones were more complete, while for the temporal, nasal, maxillary, and mandibular bones, the left side was more complete; these differences were not substantial. Compared to the general Jōmon sample, the completeness of cranial bones from Kitamura and Yashiro was lower (18~49%). If a true prevalence approach were adopted, 67~88% (using a completeness cut off of 70%) of the cranial elements would be excluded from analysis; thus exemplifying the inappropriateness of this method in this study. In the

postcranial sample, the completeness of the left and right side of elements was relatively similar (Fig. 6.19). The right side was generally more complete than the left, apart from the ribs, humerus, radius, and os coxae. The right femur (44%) was the most complete bone, followed by the left femur (36%) and the right tibia (35%). The sternum (4%) was the least complete element, but in contrast to the general Jōmon sample, all postcranial elements were present, to some extent, for the Kitamura and Yashiro sample.

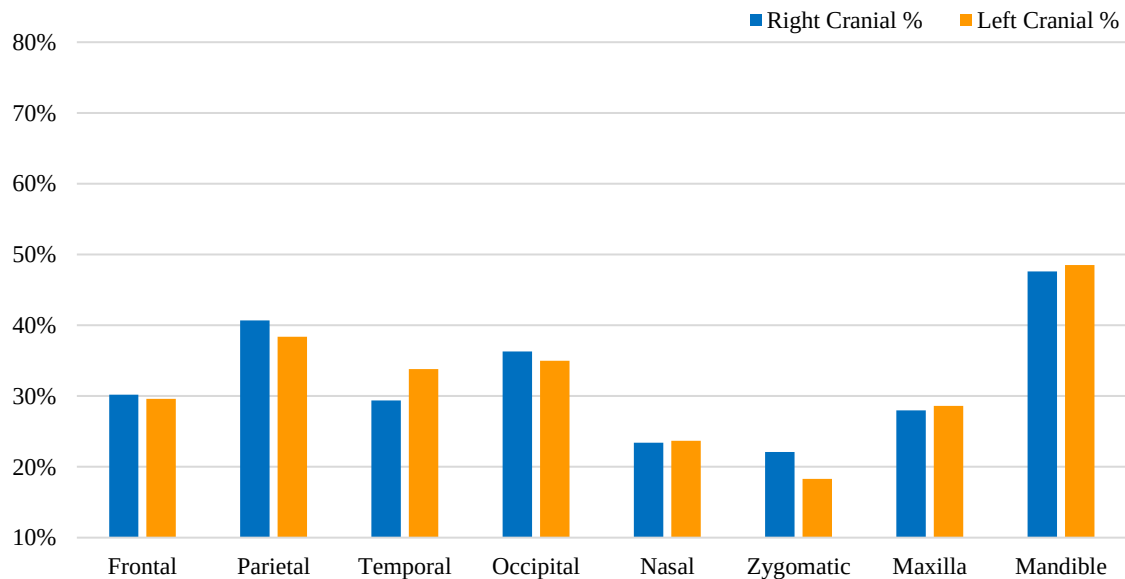


Figure 6.18. Completeness of cranial elements in Kitamura and Yashiro sample (Nagano) ($n = 145$).

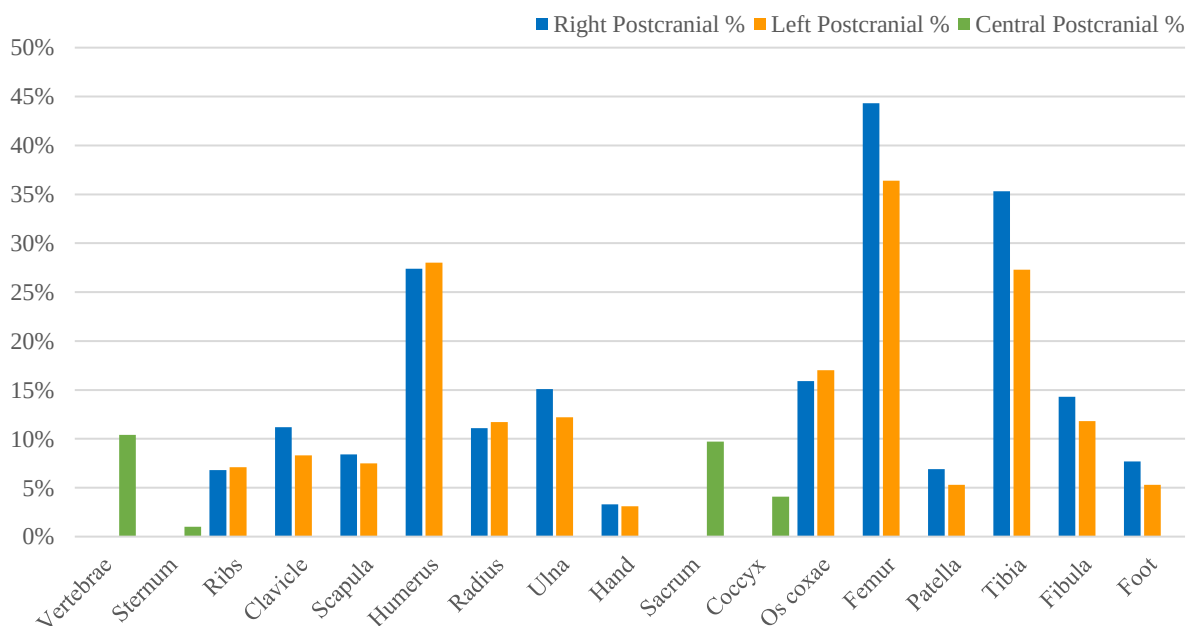


Figure 6.19. Completeness of postcranial elements in Kitamura and Yashiro sample (Nagano) ($n = 129$).

Statistical Analysis

All statistical summaries were produced using MS Excel, drawing on data extracted from the spreadsheets. To test the statistical significance of differences in violent trauma between subperiods, geographical regions, trauma timings, age groups, sexes, and anatomical regions, results were summarised in contingency tables to perform Z-tests, McNemar tests, and Chi-squared (χ^2) tests (for samples greater than 20). Statistical significance was evaluated using a two-tail probability cut off of less than $\alpha = 0.05$ for proportions satisfying a standard binomial requirement of at least five observations of interest out of at least ten total observations. For 2x2 contingency tables with small expected cell frequencies (<5), Fisher's Exact Probability Test (FEPT) was employed. A binomial hypothesis test was used to test for whether two categories were equally likely to have been observed. Significance tests were conducted in *VassarStats* (<http://vassarstats.net>).

Problems with Methods

Assessing the completeness of each bone in a human skeleton and identifying violent trauma are somewhat subjective forms of analysis, since they are dependent on researchers' training, experience, and expertise. To minimise the risk of error, where any doubt was present a second opinion was sought from an expert in the field.

To assign bones to individuals where multiple sets of remains were contained within a single box was challenging. Sometimes the box labels did not distinguish between them. Separate ID numbers were given to each (incomplete) skeleton, except where only a single duplicate bone was found, or the extra bones were too poorly preserved to record in any detail. Such cases were noted on the spreadsheets. Moreover, some skeletons had been examined multiple times by different researchers, resulting in separate data for the same individual. As far as possible this data was consolidated, but where differences were observed, this study relied on the current condition of the bones. As mentioned above, 44 skeletons were excluded from analysis because the remains were either insufficiently preserved and/or complete.

Collective burials impose an additional burden when trying to identify which individual(s) suffered violent trauma. Though not especially common in the Jōmon record, at least 21 examples have been found at eight sites (Early to Final periods), and appear to have been a special type of burial practice. With the exception of the inland cemetery site of Kitamura (Nagano), they are found predominantly at coastal shell midden sites in the southern part of

Kantō (Yamada 2013). A collective burial containing at least five individuals removed intact from the Kitamura site was examined, but had to be excluded from statistical analysis since its style of preservation precluded proper examination. In contrast, skeletons originally discovered in a collective burial at Kosaku (Late Jōmon, Chiba) were stored individually, which facilitated examination and enabled inclusion in the dataset.

Limitations of Study

Significant limitations accompany the study of human remains. Analysis is restricted to individuals who were buried (intentionally or naturally), subject to good preservation conditions, and excavated sometime later (Pardoe 2014). Therefore, the archaeological record in general, and studies of skeletal material in particular, are biased and only represent a keyhole through which to observe the events of the past. Violence leaves scars, but they are not always visible on skeletal remains, adding yet another layer of obfuscation.

Sample Representativeness

One of the main limitations is the geographic unrepresentativeness of the study sample. As frequently mentioned, acidic soils result in the vast majority of Jōmon skeletons being found at coastal shell midden sites. Although it was possible to collect data from a few inland sites such as Kitamura, most of the skeletal data used unavoidably derives from coastal sites.

Similarly, there was a disproportionate number of skeletons examined from Jōmon subperiods and sites in eastern as opposed to western Japan. Skeletal collections at Japanese institutes are dominated by those from the Middle, and particularly the Late and Final Jōmon. The Jōmon era generally saw much greater populations in eastern rather than western regions; the population density ratio was often as high as 10:1 according to Kawahata (2009). Accessibility to food sources is thought to be largely responsible; the most important, such as large nut tree species (walnuts, chestnuts, and Japanese horse chestnuts) and salmon and trout, being more plentiful in the east (Kawahata 2009:16). Statistical analyses helped to ameliorate these problems by taking into account the different sample sizes used in comparative analyses.

Dating Skeletal Remains

Many Jōmon sites were inhabited across multiple subperiods, and determining to which one a skeleton belonged is often problematic. This is especially troublesome when examining Final

Jōmon remains in Kyūshū, because of the potential confusion with Initial Yayoi skeletons (see above).⁸⁰ The majority of Jōmon skeletons lack absolute dates, although in recent years more have been directly dated by radiocarbon (e.g., Hokkaidō University), and projects are under way to address this issue more widely. Available site reports and relevant academic papers were consulted; in particular, subperiods used in Jōmon violence studies by Yamada (2006), Suzuki (1999), Uchino (2013), and Nakao et al. (2016) were followed. Until it has become standard practice in Japan to date Jōmon skeletal remains using absolute rather than relative dating methods, reliance on pottery typology will continue.

Underestimating the Extent of Violence-related Trauma

Bioarchaeological studies inevitably underestimate the number of violent trauma cases in ancient societies. Bone remodelling can completely erase any trace of antemortem trauma by the time the person died, especially if it occurred during childhood. This is particularly true of injuries to the postcrania, which often heal quickly in the young, and hence may disguise high rates of violence (Roberts 2000; Standen & Arriaza 2000; Ortner 2003). Here, this problem is confined to the ulnae, as other postcranial fractures were not recorded, although it could also apply to healed projectile injuries. Furthermore, trauma may be limited to soft tissues, meaning that some injuries will not be observable on the skeleton (Roberts 2000:337; Roberts & Manchester 2010:85-86; Kimmerle 2014:965-66; Larsen 2015:115). This is particularly difficult with arrowhead injuries (e.g., Milner 2005; Smith et al. 2007). Moreover, facial bones are frequently damaged during excavation or shattered by soil pressure, and without complete reconstruction, it is probable that craniofacial fractures may be missed during analysis (Boylston 2000:366). Lastly, the issue of the poor preservation of osseous remains in Japan is again relevant, since it decreases the probability of identifying skeletal trauma.

Sample Size

A combination of factors contributed to the relatively small sample size, especially of postcranial remains, for the osteological component of this study. For example, organising archaeological field trips to Japan, and recording numerous data points for each skeleton was time consuming. This problem was addressed by supplementing the Jōmon cranial sample with primary data collected by other researchers, and the postcranial sample with data

⁸⁰ In this study, only six individuals have been dated to the Final Jōmon period in Kyūshū (Goryō shell midden).

gathered from the osteological collection records of Hokkaidō University and The University (of Tōkyō) Museum.

Study Replicability

Replicating the results of this study should be relatively easy. Since the preservation condition of old bones change over time, skeletal remains were meticulously recorded and all injuries photographed. A standard method for assessing skeletal injuries was followed. In addition, each case of Jōmon trauma discovered or re-examined was given a p-score (low, medium, or high) to signify the likelihood that the injury was caused by violence, and hence to determine its significance for this study.

In order to obtain an accurate assessment of violence in a hunter-gatherer society, it is vital to examine human remains rather than simply relying on previously published sources, which may have overlooked important evidence. Despite the problems and limitations listed above, the methods employed in this study—the physical examination of skeletal remains, and in particular the assessment of the completeness of individual elements—have uncovered newly identified evidence of violent trauma. These findings will help to deepen our understanding of violence in the Jōmon period. Results from the skeletal examination are explored in Chapter 7.

7. Jōmon Skeletal Analysis:

Results

This chapter presents a detailed analysis of violence-related trauma identified on a sample of 1208 skeletons excavated from one hundred Jōmon period sites (predominantly in eastern Japan). Due to poor preservation, data collected from skeletal remains found at Kitamura and Yashiro (Nagano), and stored in the Nagano Prefectural Museum of History (NPMH), are discussed separately from the main Jōmon study sample (see Chapter 6). Excluding the 166 individuals from the NPMH, a total of 1042 individuals (864 crania and 302 postcrania) formed the basis of the statistical analysis.

After calculating the quantity and total prevalence of violent injuries (cranial and postcranial), the trauma results have been analysed according to: spatiotemporal prevalence; timing; number of injuries; age group; sex; type; skeletal element, and side most affected. The newly identified evidence of violent trauma has been combined with critically assessed previously reported cases (see Table 5.2) to enable crude prevalence (MNI) to be more comprehensive. However, the statistical validity of this approach is debateable. Since early studies of Jōmon trauma focused on a handful of cases rather than adopting a population-based approach (see Chapter 5), inevitably their addition raises the prevalence of violence because only skeletons exhibiting trauma are added to the sample. To avoid duplication, only the previously reported cases which were not physically inspected for this study have been included in the revised calculations. Nevertheless, the osteological examination has produced a higher estimate of the prevalence of violence in Jōmon Japan than any previous study.

In the single instance where an Old adult male (Ubayama, Late Jōmon) sustained both antemortem and perimortem trauma, these injuries were counted separately since they represent two distinct incidents of violence, but not as two people when calculating the total number of individuals affected.⁸¹ The symbol * is used to indicate where this single skeleton was counted twice in a table or figure. Z-tests were performed to test the statistical

⁸¹ The skeleton had sustained three cranial injuries: a small, healed depressed fracture to the left parietal, and two unhealed oval-shaped perforations, one on the left parietal and the other on the left frontal bone.

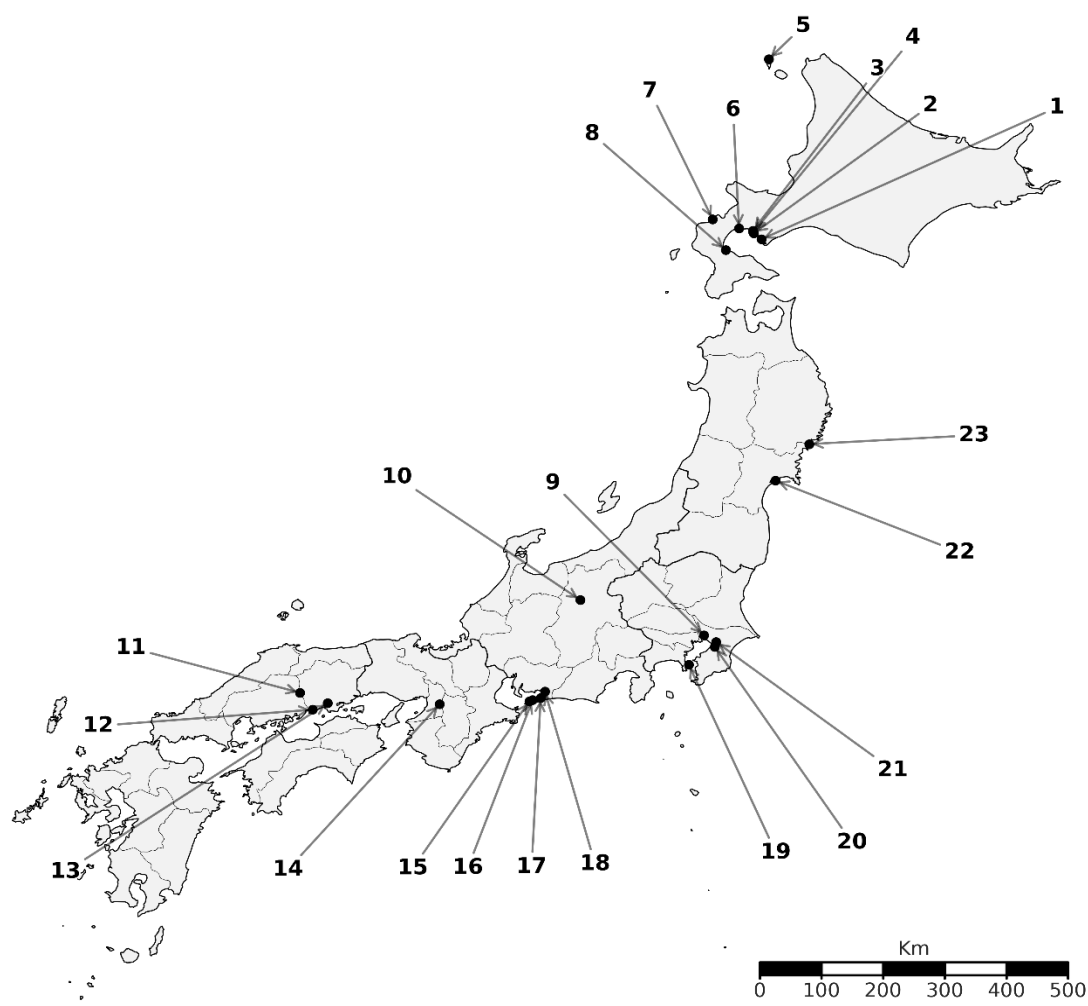
significance of differences, unless otherwise stated. The McNemar, Fisher Exact Probability (FEPT), and Chi-squared (χ^2) tests were also used where appropriate.

Quantity of Cases and Total Prevalence

Violent trauma was identified on 43 skeletons—forty crania and three postcrania of separate individuals—at 22 Jōmon sites (see Table 7.1 and Fig. 7.1). Among those exhibiting trauma, 32 crania were newly identified cases, while two postcrania were pointed out by collection curators as unpublished trauma cases. The other eight cranial and one postcranial cases had been reported previously, but since re-examination added new data they have been included in the results. Hokkaidō had the highest number of individuals with skeletal trauma, followed by Chūbu and Kantō, but this was not unexpected given that these three regions had more skeletons available to examine.

Table 7.1. Violence-Related Trauma Identified on Skeletal Remains from the Jōmon Period

Region	Site	Subperiod	Cranial	Postcranial	Individuals
Hokkaidō	Funadomari	Late	1	0	15
	Kitakogane	Early	3	0	
	Koboro cave	Epi	1	1	
	Kotan-Onsen	Late	1	0	
	Minami-Usu 6	Epi	1	0	
	Sakaeiso Iwakage	Final	1	0	
	Takasago	Final	1	0	
	Usu-Moshiri	Epi	3	2	
Tōhoku	Nakazawahama	Final	4	0	5
	Satohama	Final	1	0	
Kantō	Kasori-Minami	Late	1	0	7
	Kōsaka	Late?	1	0	
	Tenaga	Late	1	0	
	Ubayama	Middle & Late	4	0	
Chūbu	Hobi	Final	5	0	11
	Ikawazu	Final	1	0	
	Inariyama	Final	2	0	
	Yoshigo	Final	3	0	
Kansai	Kō	Early	1	0	1
Chūgoku	Hashima	Early?	1	0	4
	Toyamatsu Dōmen Cave	Late	1	0	
	Tsukumo	Final	2	0	
Total	22		40	3	43



- | | | | |
|------------------|--------------------------|------------------|----------------------|
| 1. Kitakogane SM | 7. Sakaeiso Iwakage | 13. Hashima SM | 19. Kōsaka SM |
| 2. Minami-Usu 6 | 8. Kotan-Onsen | 14. Kō | 20. Tenaga SM |
| 3. Takasago SM | 9. Ubayama SM | 15. Hobī SM | 21. Kasori-Minami SM |
| 4. Usu-Moshiri | 10. Kitamura | 16. Ikawazu SM | 22. Satohama SM |
| 5. Funadomari | 11. Toyamatsu Dōmen cave | 17. Yoshigo SM | 23. Nakazawahama SM |
| 6. Koboro cave | 12. Tsukumo SM | 18. Inariyama SM | |

Figure 7.1. Distribution of Jōmon sites where skeletal trauma was identified (SM: shell midden).

The overall crude prevalence of violent skeletal trauma for the 1042 Jōmon individuals in this study sample was MNI 4.1%. Using the ENI method reduced the number of ‘individuals’ to 719 and increased the prevalence to 6.0%.⁸² Separating the violent trauma identified on cranial and postcranial remains produced the following results. The crude prevalence of trauma found on the 864 Jōmon skulls was MNI 4.6% (Table 7.2). When the completeness of craniofacial elements was taken into account, the ENI prevalence increased to 6.7%.

⁸² 719 was produced by avoiding double counting the skull and postcranial remains from the same skeleton.

Table 7.2. Prevalence of Jōmon Cranial Trauma

	Total	Antemortem*	Perimortem*
Individuals with trauma	40	26	15
Representation of the major cranial vault elements	69.3%		
Effective Number of Individuals (ENI)	599		
Minimum Number of Individuals (MNI)	864		
ENI prevalence	6.7%	4.3%	2.5%
MNI prevalence	4.6%	3.0%	1.7%

To determine the prevalence of cranial trauma specifically among the adolescents and adults, data from infants and children were excluded from Table 7.3 (cf. Nakao et al. 2016). As a result, prevalence of antemortem (healed) and perimortem (unhealed) trauma increased by approximately 0.2%, while the total ENI and MNI prevalence values both rose by 0.4% (compare with Table 7.2). No violent trauma was identified on the bones of infants or children. It is possible that injuries were missed during examination due to the fragile and fragmented nature of their skeletal remains, or any injuries could have healed completely.

Table 7.3. Prevalence of Jōmon Cranial Trauma Excluding Infant/Child Category

	Total	Antemortem*	Perimortem*
Individuals with trauma	40	26	15
Representation of the major cranial vault elements	70.3%		
Effective Number of Individuals (ENI)	563		
Minimum Number of Individuals (MNI)	801		
ENI prevalence	7.1%	4.6%	2.7%
MNI prevalence	5.0%	3.2%	1.9%

The postcranial sample size (302) was considerably smaller than the cranial, and no additional violence-related injuries were logged in the skeletal records of Tōkyō and Hokkaidō Universities (see Chapter 6). Calculation of the total MNI prevalence of postcranial injuries revealed a relatively low figure of just 1.0% (ENI 2.5%) (Table 7.4). The ENI prevalence for perimortem trauma was similar for cranial and postcranial remains, however, which suggests that while rare, fatal injuries were equally likely to afflict the head or body.

Table 7.4. Prevalence of Jōmon Postcranial Trauma

	Total	Antemortem	Perimortem
Individuals with trauma	3	0	3
Representation of the major cranial vault elements	39.9%		
Effective Number of Individuals (ENI)	120		
Minimum Number of Individuals (MNI)	302		
ENI prevalence	2.5%	0.0%	2.5%
MNI prevalence	1.0%	0.0%	1.0%

The addition of two previously reported cases of cranial trauma (one antemortem and one perimortem) produced an MNI prevalence of 4.85%, while the prevalence of postcranial trauma increased to 3.86% with the addition of nine cases (six antemortem and three perimortem). Combining the eleven previously reported cases with the 43 identified in this study (including a re-examination of some previously reported cases) increased the overall crude trauma prevalence from 4.1% ($n = 1042$) to 5.1% ($n = 1053$).⁸³ The validity of this figure is debateable, however, since in the previously reported cases the total number of Jōmon skeletons examined is unknown, and consequently only those exhibiting trauma have been added to the sample. This problem can never be fully resolved, although re-examining all of the skeletal remains collected from each site may improve accuracy.

Spatiotemporal Analysis

The Jōmon culture endured for over 12,000 years across the diverse environments of the Japanese archipelago, during which the occurrence of violence fluctuated spatiotemporally. In order to quantify the extent of the dynamic shifts in violence, the prevalence of trauma was determined for each subperiod (Table 7.5).⁸⁴ The Early (ENI 14.3%), Final (ENI 7.2%), and Epi-Jōmon (ENI 22.2%) saw the highest prevalence. This suggests that following the decrease in violence after the Early period, it increased again from the Late period onwards.

Separating episodes of violence according to outcome revealed an overall downward trend in antemortem trauma after peaking in the Early phase (ENI 11.4%), when it was almost four times as frequent as perimortem trauma (ENI 2.9%) (Fig. 7.2). In contrast, there was an

⁸³ A total of 1053 was calculated by adding the eleven cases of previously reported trauma (excluding duplicates) to the 1042 individuals examined for this study. This value does not equal the combined total of crania and postcrania as some individuals were represented by both parts of the skeleton.

⁸⁴ Note that in Table 7.5, Table 7.6, and Table 7.7, total trauma prevalence was calculated based on the number of individuals exhibiting skeletal trauma (43), rather than the number of incidents causing violent trauma (44).

upward trend in perimortem trauma, culminating in the Epi-Jōmon period (ENI 16.7%).⁸⁵ No perimortem injuries were identified on Middle Jōmon skeletons, while evidence of violent trauma was absent on those from the Initial, Early-Middle, Middle-Late, Late-Final, and broad Jōmon period categories in this sample (though note that all of the latter group have low sample numbers).

Table 7.5. Jōmon Skeletal Remains: Subperiod and Trauma Timing

Subperiod	Total Skeletons <i>n</i> ENI (MNI)	Antemortem Trauma <i>n</i> *	Perimortem Trauma <i>n</i> *	Trauma Prevalence ENI (MNI)
Initial	0 (3)	0	0	0.0% (0.0%)
Early	35 (52)	4	1	14.3% (9.6%)
Early-Middle	7 (9)	0	0	0.0% (0.0%)
Middle	57 (82)	1	0	1.8% (1.2%)
Middle-Late	9 (19)	0	0	0.0% (0.0%)
Late	291 (402)	6	4	3.1% (2.2%)
Late-Final	2 (3)	0	0	0.0% (0.0%)
Final	279 (414)	13	7	7.2% (4.8%)
Epi	36 (53)	2	6	22.2% (15.1%)
Jōmon	3 (5)	0	0	0.0% (0.0%)
Total	719 (1042)	26	18	6.0% (4.1%)

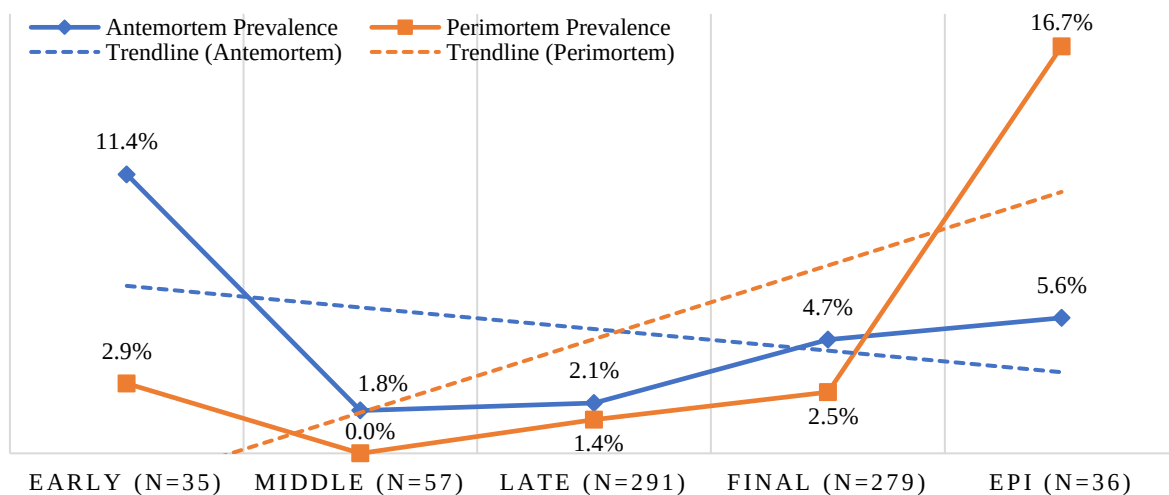


Figure 7.2. Prevalence of skeletal trauma (ENI) by Jōmon subperiod and trauma timing (*n* = 719).*

⁸⁵ If the Epi-Jōmon results were excluded—as some scholars prefer to do—it would reduce the overall Jōmon trauma prevalence from ENI 6.0% to 5.1% (MNI 4.1% to 3.5%). Similarly, while both antemortem and perimortem trauma would maintain an inverse relationship, their trendlines would become less pronounced (see Figure 7.2). While the omission of Epi-Jōmon data sometimes appears arbitrary, it is probably influenced by the coexistence of the Epi-Jōmon with the agricultural Yayoi and Kofun periods on the other main Japanese islands. However, for this study such a limitation would make Jōmon comparisons with the Mesolithic Europeans and Californians more difficult, as they also had contact with agriculturalists.

Changing socio-environmental conditions may have led to more violence among the Jōmon people inhabiting particular geographic regions. The prevalence of individuals exhibiting antemortem trauma was highest in Kansai (ENI 10.0%) and Tōhoku (ENI 7.9%), although the former is based on a small sample of just ten individuals (Table 7.6). Inhabitants of Hokkaidō clearly suffered the most perimortem trauma (ENI 6.0%), as well as the most total trauma (ENI 12.9%); more than double the average prevalence for Japan. Perhaps this reflects the fact that the Jōmon period lasted longer in Hokkaidō than in any other region. However, when the size of the various regions are taken into account, Kantō experienced the highest density of trauma (per square kilometre), followed by Hokkaidō and Chūbu. No trauma was identified on skeletons from Kyūshū examined in this study. An attempt was made to combine the subperiod and regional data to see in which subperiod violent incidents were most common in different areas. However, since skeletons exhibiting trauma from more than one time period only survived in the regions of Hokkaidō, Chūgoku, and Kantō, the sample size was too small to produce meaningful results.

Table 7.6. Prevalence of Skeletal Trauma ENI & (MNI): Region and Trauma Timing

Region	Total Skeletons <i>n</i>	Antemortem*	Perimortem*	Total Prevalence
Kansai	10 (13)	10.0% (7.7%)	0.0% (0.0%)	10.0% (7.7%)
Kyūshū	24 (41)	0.0% (0.0%)	0.0% (0.0%)	0.0% (0.0%)
Tōhoku	63 (82)	7.9% (6.1%)	0.0% (0.0%)	7.9% (6.1%)
Chūgoku	95 (145)	2.1% (1.4%)	2.1% (1.4%)	4.2% (2.8%)
Hokkaidō	116 (174)	6.9% (4.6%)	6.0% (4.0%)	12.9% (8.6%)
Chūbu	168 (262)	3.0% (1.9%)	3.6% (2.3%)	6.5% (4.2%)
Kantō	243 (325)	2.1% (1.5%)	1.2% (0.9%)	2.9% (2.2%)
Total	719 (1042)	3.6% (2.5%)	2.5% (1.7%)	6.0% (4.1%)

Trauma prevalence was also calculated for the 22 Jōmon sites (excluding the Nagano sample) (Table 7.7). A single case of violent trauma was found at thirteen sites, while the other nine had two or more. Healed trauma was most frequently found at Kitakogane (Hokkaidō) (ENI 30%) and Nakazawahama (Iwate) (ENI 25%), while unhealed trauma was most common at Usu-Moshiri (Hokkaidō) (ENI 25%). Dismissing those where the total number of skeletons examined was less than ten, these were also the top three sites for total trauma prevalence.⁸⁶

⁸⁶ In bioarchaeological studies, sites where fewer than ten skeletons were examined are often excluded because they can distort the prevalence figures (as seen at the bottom of Table 7.7) (Nakagawa & Nakao 2017a:94).

A higher number of skeletons being found at a site did not necessarily correlate with more cases of violent trauma being identified. For example, only three of the 97 skulls from Yoshigo shell midden exhibited injuries, equating to an ENI prevalence of 4.8% (MNI 3.1%), while at Minami-Usu 6, Sakaeiso Iwakage, and Satohama, the single skull available for analysis was found to have an injury. The resulting 100% is clearly unrealistic as an estimate of trauma prevalence, but these figures are included so that Table 7.7 offers a more accurate representation of Jōmon violence. Nevertheless, among the inhabitants of the 22 Jōmon sites, approximately one in ten (ENI 10%) (or one in fourteen, MNI 7.1%) suffered some form of skeletal injury resulting from violence during their lifetime.

Table 7.7. Prevalence of Skeletal Trauma ENI (MNI) at Jōmon Sites

‘Warm spot’ Site		Total Skeletons <i>n</i>	Antemortem Trauma <i>n</i> *	Perimortem Trauma <i>n</i> *	Trauma Prevalence
	Tsukumo	49 (67)	2	0	4.1% (3.0%)
1	Ubayama	97 (124)	4	1	4.1% (3.2%)
2	Yoshigo	62 (97)	1	2	4.8% (3.1%)
1	Kasori-Minami	21 (18)	0	1	4.8% (5.6%)
1	Tenaga	16 (25)	1	0	6.3% (4.0%)
2	Hobi	71 (113)	2	3	7.0% (4.4%)
2	Inariyama	23 (37)	1	1	8.7% (5.4%)
	Kō	10 (13)	1	0	10.0% (7.7%)
	Funadomari	9 (11)	1	0	11.1% (9.1%)
2	Ikawazu	7 (8)	1	0	14.3% (12.5%)
	Takasago	7 (8)	1	0	14.3% (12.5%)
	Kotan-Onsen	5 (10)	1	0	20.0% (10.0%)
	Nakazawahama	16 (23)	4	0	25.0% (17.4%)
	Kitakogane	10 (14)	3	0	30.0% (21.4%)
	Toyamatsu Dōmen Cave	3 (6)	0	1	33.3% (16.7%)
	Hashima	3 (5)	0	1	33.3% (20.0%)
3	Usu-Moshiri	12 (18)	2	3	41.0% (27.8%)
	Kōsaka	2 (2)	0	1	50.0% (50.0%)
3	Koboro cave	3 (5)	0	2	60.1% (40.0%)
3	Minami-Usu 6	1 (1)	0	1	100.0% (100.0%)
	Sakaeiso Iwakage	1 (1)	0	1	100.0% (100.0%)
	Satohama	1 (1)	1	0	100.0% (100.0%) ⁸⁷
Total		430 (607)	26	18	10.0% (7.1%)

Note: total percentages include the Ubayama male as a single trauma case (see above).

⁸⁷ Total ENI prevalence value for Satohama is 113.2% because the calculation is using one full trauma divided by 0.9 effective individuals. This value has been capped at 100%. If the trauma count is higher than the ENI value (due to a relatively low completeness score from poor skeletal preservation), then the ENI prevalence will be more than 100%. The ENI method corrects upwards for the fact that the less of a skeleton present, the less likely you are to find injuries.

As an experiment, this thesis distinguished between three types of spatiotemporal anomaly: ‘hotspots’, ‘warm spots’, and ‘cold spots’. The first represents the common understanding of ‘hotspot’, that is, a single site containing a concentration of violently injured skeletons (here a minimum of five) from a relatively short time frame (e.g., massacres, battles). Identifying ‘hotspots’ of violence in the spatiotemporal distribution of Jōmon sites is challenging due to the lack of precisely (radiocarbon) dated skeletal remains, but the concept is at least acknowledged (Nakao et al. 2016). Less well known is the idea of ‘warm spots’, which here signify localities where violence occurred (perhaps repeatedly) over a relatively long period of time, and often incorporate ‘hotspots’. The parameters used to define these are admittedly somewhat arbitrary: sites are clustered within about 20 kilometres of each other (representing approximately 1~2 days travel over good terrain); substantially overlap in time period, and in combination contain ten or more skeletons of which at least five exhibit violent trauma. In contrast, ‘cold spots’ are used to indicate areas of long-term nonviolence; a potentially useful tool given that archaeological evidence of nonviolence is often debateable and unverifiable. Here ‘cold spots’ will be defined as a mirror image of ‘hot/warm spots’, that is single sites (or clusters) where ten or more skeletons dating from the same subperiod have been found, with no evidence of skeletal trauma within 20 kilometres.

Despite the relatively sparse distribution of Jōmon sites, two of the sites, namely Hobi (ENI 7.0%, MNI 4.4%) and Usu-Moshiri (ENI 41.0%, MNI 27.8%), constitute potential ‘hotspots’. Three plausible ‘warm spot’ clusters also emerged from Figure 7.3—two of them centred around the ‘hotspots’—and all located around natural bays. Dating to the Middle-Late and Late periods, the first group consists of Ubayama, Kasori-Minami, and Tenaga shell middens, situated on present-day Tōkyō Bay (Chiba) (ENI 4.5%, MNI 3.6%), and the only one not to contain a ‘hotspot’. The second is the Final Jōmon sites of Inariyama, Yoshigo, Ikawazu, and Hobi shell middens around Mikawa Bay on the Atsumi Peninsula (Aichi) (ENI 6.7%, MNI 4.3%). The prevalence of trauma at this cluster increases to MNI 5.4% when three previously reported trauma cases at sites in this cluster are included. The third ‘warm spot’ incorporates the Epi-Jōmon sites of Koboro cave, Usu-Moshiri, and Minami-Usu 6 situated around Uchiura Bay (Hokkaidō) (ENI 50%, MNI 33.3%). It is the only cluster to exceed the average trauma prevalence across the 22 sites, albeit based on a very small sample (see Table 7.7). This produces an overall prevalence at the ‘warm spots’ of MNI 5.61%, or MNI 6.24% if the previously reported cases are included. More data, especially greater temporal resolution, is clearly required to determine the level of violence experienced at these potential ‘hot/warm

spots'. Nevertheless, while intergroup conflict at these potential 'warm spots' cannot be ruled out, given the number of injured individuals found at each site, the distance between sites, and the timescales involved, a more plausible scenario may be that the violence was on an interpersonal or intragroup level.

Turning to the 'cold spots', of the 1042 skeletons (MNI) from the 98 study sites (excluding the Nagano sample), only 435 (MNI 41.7%) were located at the 76 sites (78%) where no violent trauma was identified. Of the 24 sites that fit the 'ten or more skeletons' criteria, only eleven (46%) lacked violence, which together contained just 253 skeletons (30.7%).

However, five of these sites had to be excluded due to the proximity of adjacent sites with violence or unconfirmed cases of skeletal trauma. On the other hand, two additional 'cold spot' clusters (incorporating four sites) were identified. This produced a total of eight 'cold spots', where 170 individuals (170/1042 or MNI 16.3%) may never have directly experienced physical violence (see Table 7.8). Using the ENI method, this drops to just three 'cold spots', all from the Late or Final periods.⁸⁸ Yet, it is likely that additional 'cold spots' would be identified if the dating of skeletal remains was more accurate, allowing sites with violence (especially those spanning multiple periods) to be subdivided into violent and nonviolent phases.

Table 7.8. Jōmon Sites of Nonviolence (SM: shell midden)

'Cold spot'	Site	Period	Total Skeletons <i>n</i> ENI (MNI)
1	Bibi 4	Middle	0 (2)
2	Wakazono SM	Late	2 (3)
1	Misawa 1	Middle	2 (8)
2	Shimokusuda SM	Middle-Late	3 (9)
3	Abashiri cave	Early	6 (11)
4	Mitsuya	Late	6 (13)
5	Ōta	Middle	9 (22)
6	Yoyama	Late	14 (28)
7	Gionbara	Late-Final	17 (26)
8	Sanganji	Late-Final	37 (48)
Total	Sites = 10		96 (170)

⁸⁸ The MNI results were used for 'cold spots' so that they were comparable with Mesolithic Europe and prehistoric California (see Chapter 8).

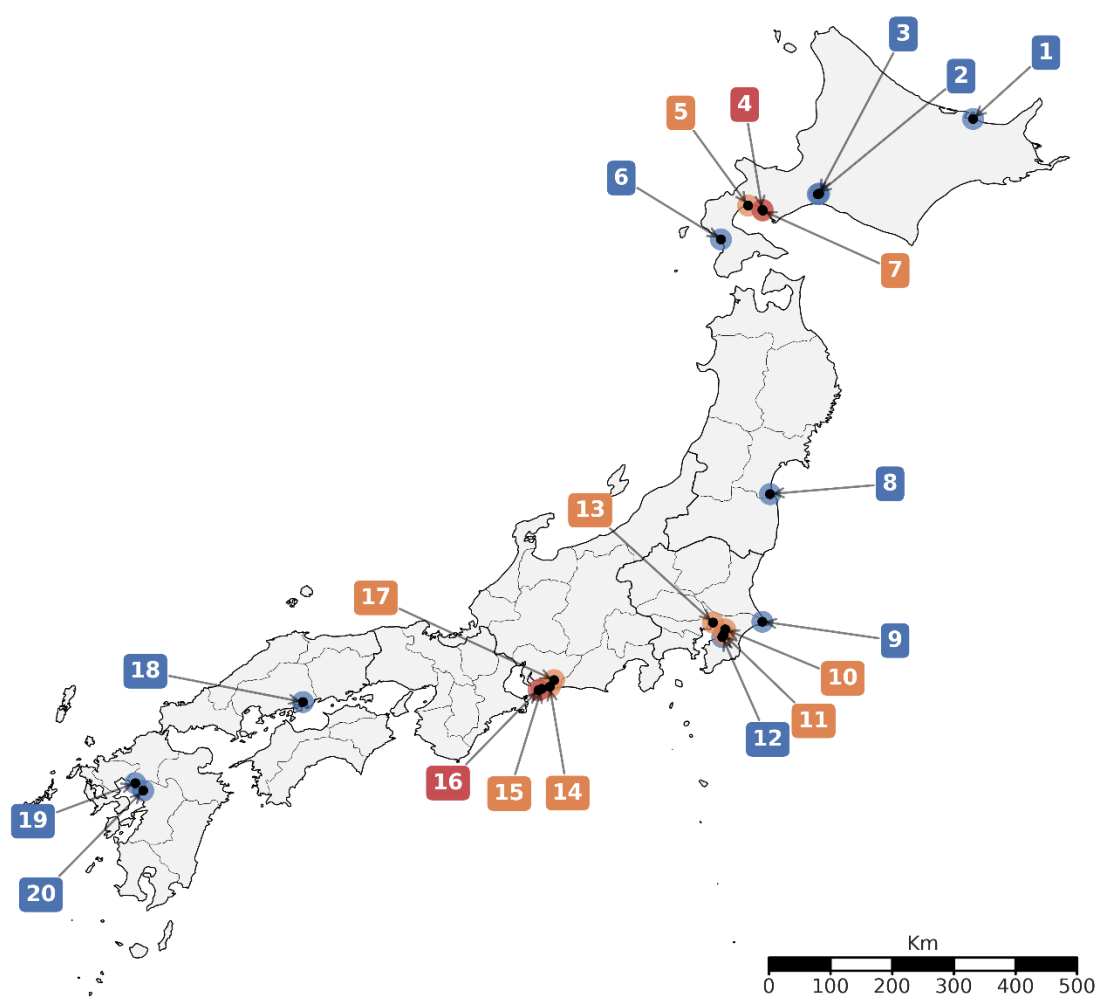


Figure 7.3. Distribution of Jōmon 'hot (red), warm (orange), and cold (blue) spots' (SM: shell midden).

The location of the potential 'hot/warm spots'—as well as most Jōmon study sites where skeletal trauma was found—may point to a higher incidence of violence among coastal compared to inland dwellers. Division of the one hundred study sites (including the Nagano sample) based on their geographic location revealed that episodes of violence were almost three times as common among individuals living at coastal settlements (ENI 6.2%) than those inland (ENI 2.2%) (Table 7.9). Separately, the prevalence of injuries to the cranial and postcranial bones was more than double on the coast, with no examples of the latter being

discovered inland. Statistical analysis indicated that differences in trauma prevalence between inhabitants of coastal and inland sites were significant for individuals when using the MNI results ($p = 0.025 \chi^2$ test), but not for the ENI results (individuals $p = 0.10$ FEPT). This perhaps reflects the fact that the ENI method takes into account the preservation condition and completeness of skeletal remains, thus resulting in smaller sample sizes than the MNI method and an accentuated coastal bias.⁸⁹ The fact that differing sample sizes necessitate the use of different statistical tests further complicates the picture. Nevertheless, violent incidents appear to have been more prevalent among inhabitants of Jōmon coastal sites, lending some support to Hudson's (2017) argument for the distant relationship between mountain societies and violence. Adding the eleven previously reported cases (ten coastal, one inland) further supported this finding (MNI $p = 0.016 \chi^2$ test). However, it is notable that all of the 'cold spot' sites were also located near the coast. This suggests that rather than coastal locations being a magnet for violence, they are simply where most Jōmon skeletal remains have survived.

While beyond the scope of this thesis, further research to identify the defining features of these 'hot/warm/cold spots' would be necessary to explain their anomalous character. This would require access to detailed comparative data on subcultures in the relevant regions and subperiods, to discover any specific factors (such as climatic and sociocultural changes) associated with the prevalence of violence. For instance, the 'hotspot' at Hobi might conceivably be linked to its high population density.

Table 7.9. Skeletal Trauma Prevalence ENI (MNI): Coastal versus Inland Jōmon Sites⁹⁰

	Coastal Sites			Inland Sites		
	<i>n</i>	Trauma	Prevalence	<i>n</i>	Trauma	Prevalence
Crania	554 (792)	39	7.0% (4.9%)	97 (217)	3	3.1% (1.4%)
Postcrania	120 (302)	3	2.5% (1.0%)	37 (129)	0	0.0% (0.0%)
Individuals	674 (970)	42	6.2% (4.3%)	134 (238)	3	2.2% (1.3%)

⁸⁹ The coastal bias in the Jōmon period results from elevated calcium levels in shell middens, which offers better preservation conditions than the usual highly acidic soils. This is significant because the better a skeleton's state of preservation and completeness, the easier it is to identify trauma. Although ENI reduced sample sizes for both coastal (30.5%) and inland (43.7%) sites, poorer preservation at the latter meant that more individuals were removed, while the number of individuals exhibiting trauma stayed the same (at a ratio of 14:1 coastal-inland). Hence, while ENI trauma prevalence increased for both, the rate of increase was higher for inland sites, thereby reducing the gap between coastal and inland leading to a less statistically significant result. This highlights the sensitivity of statistical significance tests to the scale of skeletal preservation and completeness when calculating the prevalence of violent trauma in a society.

⁹⁰ All study sites and analysed skeletons were used in the calculations of Table 7.9, including those from the Nagano sample.

Trauma Timing and Number of Injuries

There were 41 separate violent incidents involving Jōmon skulls in this study sample, of which 26 (63.4%) resulted in antemortem injuries and 15 (36.6%) in perimortem injuries, the difference being statistically significant ($p = 0.015$). Three quarters of these incidents (75.6%) caused a single injury, with antemortem (23) outweighing perimortem trauma (8) (Fig. 7.4). This indicates that the relatively few Jōmon people who were subjected to serious violence (sufficient to result in cranial damage), only experienced it once in their lifetime, and more often than not they survived. However, ten incidents (24.4%) resulted in multiple injuries (70% perimortem); specifically eight displaying two injuries, and solitary examples of three and seven injuries. The last, from Hobi, was clearly a case of excessive violence or ‘overkill’ indicating a strong dislike (Kjellström 2014). Thus, there is a potentially positive correlation between the number of injuries a person sustained on their head and whether those injuries were lethal (perimortem). This may indicate a lack of ritualised violence or other type of non-lethal violent activity affecting the cranium in Jōmon society. In recurrent ritualised violence where the aim is commonly to wound rather than kill an opponent, one would expect to see a higher number of individuals with multiple antemortem trauma. Although logical, this observation is based on a small sample and thus cannot be considered robust. Note that the trauma sustained by the Ubayama male counted as two separate incidents; one antemortem and two perimortem injuries. This is perhaps evidence of repeat victimisation, examples of which have not been reported among the previously discovered cases of Jōmon skeletal trauma discussed by Yamada (2006), Suzuki (1999), Uchino (2013), or Nakao et al. (2016).

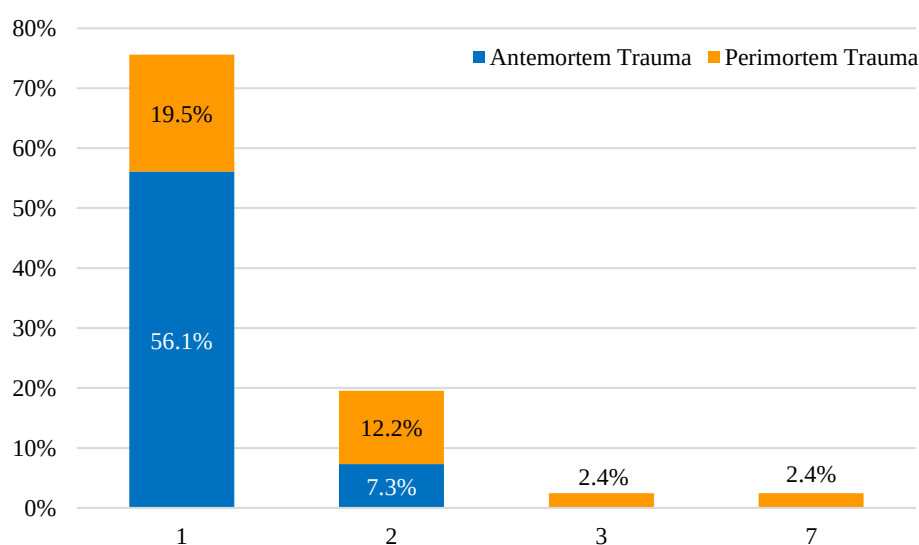


Figure 7.4. Timing of trauma and frequency of violent incidents which resulted in one or more cranial injuries ($n = 41$).*

More skulls had healed rather than unhealed trauma, perhaps indicating that in Jōmon society a single injury to the head was intended to wound rather than kill the victim, or implying a high degree of resilience. The same cannot be said of the postcranial trauma in this sample. With no evidence of healing, all postcranial injuries occurred during the perimortem interval, and most likely contributed to these individuals' deaths. Whether they constituted the death blow is unknowable, but knowing which bones were affected and the severity of the injury (e.g., if the arrowhead pierced any major arteries or organs) might help with the diagnosis. Two of the three victims exhibited single embedded arrowheads, while the other displayed two. The greater the number of injuries, the less likely they are to have been accidental.

With the addition of the previously reported cases of violence, the number of incidents causing antemortem cranial injuries (27) was nearly 70% larger than those for perimortem (16) ($p = 0.02$). For postcranial injuries, there was an equal number of antemortem (6) and perimortem (6) episodes ($p = 1$). This equates to total antemortem incidents outweighing perimortem by a ratio of 3:2, a difference that is statistically significant ($p = 0.04$).

Combining the newly discovered with the previously reported cases seems to confirm the intuitive view that the more injuries a person sustained the higher the chance of those injuries being lethal. While the proportion of individuals who suffered two or more perimortem injuries to their cranium increased from 17.5% to 19%, those who sustained two or more antemortem injuries decreased slightly (7.5% to 7.14%) because the number of incidents remained unchanged. Nonetheless, a single (more often healed) wound to the head appears to have been the most common Jōmon injury. Merging the three new cases of postcranial trauma with the nine previously reported produced a ratio of 11:1 in favour of single injuries. However, the percentage of individuals who died from a single injury was 45.5% for the postcrania, but only 25% for the crania. In other words, single postcranial projectile injuries were nearly twice as lethal as blunt force cranial ones.

Prevalence by Age Group and Sex

Analysing the timing of cranial trauma by age group revealed that Old adults exhibited the highest prevalence of both antemortem (8.4%) and perimortem (6.7%) injuries; approximately double the average (Table 7.10). This may suggest that antemortem injuries were cumulative (with the exception of the relatively few Young-Middle adults) (Fig. 7.5). The number of perimortem trauma victims declined after the Young adult category, before

increasing sharply in the Middle-Old age group and peaking among Old adults. Excluding the Young-Middle adult and Middle-Old adult groups, individuals from the other adult categories suffered more antemortem than perimortem trauma; the latter being lowest in the Middle adult group before rising progressively amongst the elderly. Excluding the Infant/Child and Adolescent categories, the only statistically significant difference was between the Middle adult (0.8%) and Old adult (6.7%) categories for perimortem and total trauma ($p = 0.04$ and 0.02 respectively, FEPT). This implies that elderly Jōmon people suffered significantly more lethal injuries than middle-aged adults. However, it would be difficult to conclude that one age group was targeted over any other.

Table 7.10. Prevalence of Jōmon Cranial Trauma ENI & (MNI): Age Group and Trauma Timing

Age Group	Crania <i>n</i>	Antemortem*	Perimortem*	Total Trauma
Infant/Child	35 (63)	0.0% (0.0%)	0.0% (0.0%)	0.0% (0.0%)
Adolescent	25 (37)	0.0% (0.0%)	0.0% (0.0%)	0.0% (0.0%)
Young adult	178 (244)	3.9% (2.9%)	2.8% (2.0%)	6.7% (4.9%)
Young-Middle adult	37 (48)	0.0% (0.0%)	2.7% (2.1%)	2.7% (2.1%)
Middle adult	123 (166)	4.1% (3.0%)	0.8% (0.6%)	4.9% (3.6%)
Middle-Old adult	63 (81)	4.8% (3.7%)	4.8% (3.7%)	9.6% (7.4%)
Old adult	60 (85)	8.4% (5.9%)	6.7% (4.7%)	13.3% (9.4%)
Adult	79 (140)	7.6% (4.3%)	1.3% (0.7%)	8.9% (5.0%)
Total	599 (864)	4.3% (3.0%)	2.5% (1.7%)	6.7% (4.6%)

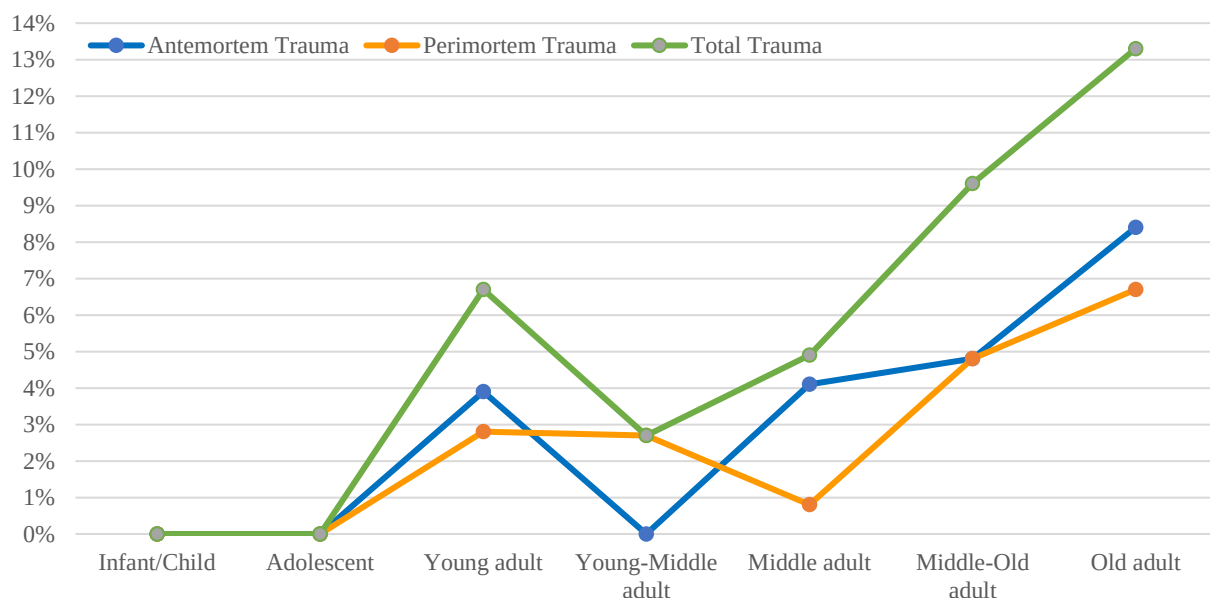


Figure 7.5. Prevalence of cranial trauma (ENI) by age group and timing of trauma (excluding the general 'Adult' category) ($n = 520$).*

In calculating the ENI prevalence of cranial trauma by sex, differences between males and females were found to be more pronounced when sorting by antemortem, where males predominated, than perimortem, where the positions were reversed (Table 7.11); although in neither case was the difference significant (antemortem $p = 0.16$; perimortem $p = 0.36$). The difference in terms of total cranial trauma prevalence was also not significant ($p = 0.69$), since the ratio between male and female cranial trauma was roughly in balance (5:4). This suggests that Jōmon males and females were approximately equally likely to sustain violent injuries on their heads. Total trauma prevalence for indeterminates (ENI 13.5%) was greater than for males ($p = 0.19$ FEPT) or females ($p = 0.16$ FEPT). However, indeterminates refer to individuals whose sex could not be determined. Therefore, if their data were divided in the same ratio as the overall female-male cranial distribution (49% versus 51%), then the most likely total cranial trauma prevalence for this study sample would be ENI 6.7% (MNI 4.7%) for females and ENI 7.5% (MNI 5.3%) for males. When looking at the differences between antemortem and perimortem within a single sex, the statistical test proved ‘insignificant’ for females ($p = 1$ McNemar Test) because the two proportions were equal, but significant for males ($p = 0.03$ McNemar Test) where the ratio was 3:1 in favour of antemortem. This implies that males were either more resilient and thus better able to survive major cranial trauma, or they more frequently engaged in non-lethal (to humans) violent activity such as hunting, although the scarcity of multiple antemortem injuries undermines the latter theory (see above).

Table 7.11. Prevalence of Jōmon Cranial Trauma ENI & (MNI): Sex and Trauma Timing

Sex	Crania <i>n</i>	Antemortem*	Perimortem*	Total Trauma
Infant/Child	35 (63)	0.0% (0.0%)	0.0% (0.0%)	0.0% (0.0%)
Indeterminate	37 (98)	8.1% (3.1%)	5.4% (2.0%)	13.5% (5.1%)
Female	258 (345)	3.1% (2.3%)	3.1% (2.3%)	6.2% (4.6%)
Male	269 (358)	5.6% (4.2%)	1.9% (1.4%)	7.1% (5.3%)
Total	599 (864)	4.3% (3.0%)	2.5% (1.7%)	6.7% (4.6%)
Total (excl. children)	564 (801)	4.6% (3.2%)	2.7% (1.9%)	7.1% (5.0%)

All postcranial injuries were found on male skeletons: two Adults and one Middle adult (with two injuries). Postcranial trauma prevalence was not analysed by age group due to the small sample size (see Table 7.4 for overall prevalence), and was insignificant between the sexes ($p = 0.25$ FEPT). Since 91 of the 302 postcranial skeletons (ENI = 46) examined belonged to adult males, MNI prevalence equates to 3.3% of male individuals (ENI 6.5%). However, this

percentage is not representative of the actual prevalence of postcranial violent trauma in the Jōmon period.

To determine which age group and sex experienced the highest prevalence of physical violence in this study sample, cranial and postcranial trauma cases have been combined (in Table 7.12). Overall, the male-female difference (ENI) was not prominent ($p = 0.43$), yet males (51.2%) were rather more likely to sustain trauma than females (37.2%) (and much more likely than indeterminates (11.6%)). Furthermore, the prevalence of trauma amongst males (ENI 7.0%) was roughly a third higher than that for females (ENI 5.4%) (and almost 60% higher than indeterminates, ENI 4.6%). As previously, if indeterminates' data were divided in the same ratio as the overall female-male skeletal distribution (48.4% versus 51.6%), then the most likely total skeletal trauma prevalence for this study sample would be ENI 5.7% (MNI 3.9%) for females and ENI 7.1% (MNI 5.1%) for males.

Table 7.12. Prevalence of Jōmon Skeletal Trauma ENI (MNI): Age Group and Sex

Age Group	Male <i>n</i>	Female <i>n</i>	Indet. <i>n</i>	Male	Female	Indet.
Infant/Child	0 (0)	0 (0)	49 (94)	0.0% (0.0%)	0.0% (0.0%)	0.0% (0.0%)
Adolescent	4 (5)	20 (27)	2 (10)	0.0% (0.0%)	0.0% (0.0%)	0.0% (0.0%)
Young adult	105 (122)	92 (115)	10 (23)	2.9% (2.5%)	8.7% (7.0%)	10.0% (4.3%)
Young-Middle adult	24 (26)	16 (17)	5 (6)	4.2% (3.8%)	0.0% (0.0%)	0.0% (0.0%)
Middle adult	74 (85)	61 (78)	7 (14)	8.1% (7.1%)	1.6% (1.3%)	0.0% (0.0%)
Middle-Old adult	42 (47)	27 (31)	1 (4)	4.8% (4.3%)	11.1% (9.7%)	100% (25.0%)
Old adult	28 (35)	38 (48)	3 (7)	14.3% (11.4%)	10.5% (8.3%)	0.0% (0.0%)
Adult	38 (68)	40 (65)	32 (115)	15.8% (8.8%)	0.0% (0.0%)	9.4% (2.6%)
Total	315 (388)	294 (381)	109 (273)	7.0% (5.7%)	5.4% (4.2%)	4.6% (1.8%)

Indet. = Indeterminate

The results when further analysed by age group were more varied, however. Male trauma prevalence among Young-Middle, Middle, Old, and Adult categories was much higher than female (or indeterminate). On the other hand, Young adult females experienced skeletal trauma three times more often than Young adult males, and at more than double the frequency amongst Middle-Old adults. This contrasts with the strong propensity to suffer violence-related trauma seen amongst young males in most societies (Fibiger et al. 2013). Yet, of all the age groups and sexes, the only statistically significant result was in the miscellaneous Adult category, where no female trauma was identified ($p = 0.01$ FEPT). No violent injuries were found on skeletal remains of Infants/Children or Adolescents. These

groups were all relatively underrepresented, but this may indicate that the young were not often the target of violence in Jōmon society.⁹¹

When the combination of new and previously reported trauma cases are distinguished by sex (Table 7.13), the prevalence of cranial trauma between males (5.6%) and females (4.9%) was found to be similar ($p = 0.70$). However, almost three times as many Jōmon males (9.3%) suffered postcranial trauma as females (3.4%), particularly from projectiles, although given the small numbers involved this fails to attain statistical significance ($p = 0.14$). The overall MNI prevalence of violent skeletal trauma was higher for males (7.3%) than females (5.2%) ($p = 0.22$) suggesting that one sex was somewhat more likely to suffer trauma than the other. Note that there were also five skeletons of indeterminate sex with newly discovered cranial injuries. When the indeterminates' data (excluding infants and children) were divided in the same ratio as the female-male skeletal distribution (49.4% versus 50.6%), it produced an overall violent trauma prevalence of 4.7% for females and 6.5% for males for the combined Jōmon sample used in this study.

Table 7.13. Prevalence of Jōmon Trauma (MNI) by Sex: New and Previously Reported Cases Combined

	Previously Reported		Newly Identified		Total Trauma		Total Individuals		MNI Prevalence	
	M	F	M	F	M	F	M	F	M	F
Crania	1	1	19	16	20	17	359	346	5.6%	4.9%
Postcrania	6	3	3	0	9	3	97	87	9.3%	3.4%
Total	7	4	22	16	29	20	395	385	7.3%	5.2%

Trauma Types

A total of 57 separate injuries were physically identified on the forty skulls exhibiting trauma. Unlike the analysis of individuals, dividing the discrete cranial injuries into antemortem (29) and perimortem (28) produced an almost even split, suggesting that approximately 50% of blows to the head were survived. Representing 93% of skull injuries, blunt force depressed fractures and perforations were the most common types of violent trauma seen in this Jōmon sample. In contrast, chop marks (sharp force) and puncture marks (puncture/projectile) were comparatively rare (Fig. 7.6). No verified injuries from projectiles were found on the

⁹¹ Based on evidence suggesting periods of male predominance in the Jōmon population, Sahara (1992) believed there was a possibility that the Jōmon people practiced infanticide.

craniofacial remains. The sum of all trauma types equals 100%, but some individuals exhibited multiple injuries. For example, a young-middle aged adult male from Koboro cave (Epi-Jōmon, Hokkaidō) sustained both blunt force and sharp force injuries to his cranium. Incorporating three additional injuries from the two previously reported cranial trauma cases had inverse effects; reducing the incidence of depressed fractures while increasing the perforations, with both now constituting 46.7% ($n = 60$).

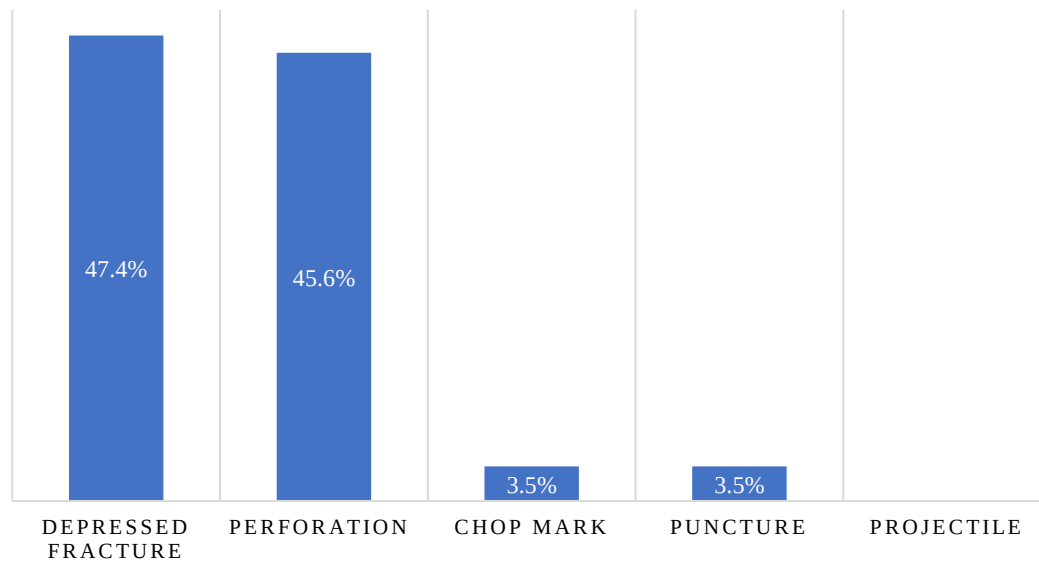


Figure 7.6. Frequency of trauma types on Jōmon cranial remains ($n = 57$).

Four unambiguous injuries were identified on the postcranial remains of three individuals; all caused by projectiles. Fragments of arrowheads made from a dark glassy stone (most likely obsidian) were discovered still embedded in the bones. An additional nine cases (seven projectile and two parry fractures) with single injuries were identified from the published literature. This remains too small a sample to examine meaningfully, but it is not surprising that in hunter-gatherer cultures humans are occasionally shot with bows and arrows, especially in the postcranial skeleton. Unless all cases were accidental, this evidence supports the hypothesis (outlined in Chapter 4) that the Jōmon people repurposed their hunting tools as weapons.

Skeletal Elements and the Side Most Affected

The largest of the cranial elements, the parietals, sustained the highest proportion of trauma in this sample of Jōmon skulls (66.7%). The frontal bone came a close second; the temporal and occipital bones received significantly fewer injuries. Yet, averaging the left and right sides, the temporal (60.9%) and occipital (66.5%) bones were proportionally less complete than the

frontal (68.8%) and parietals (72.7%). Evidence of additional injuries has likely disappeared; hence the true ratio may have differed from that observed in this study. Excluding three mandibular injuries, no trauma was identified on facial bones; although their survival in the archaeological record is patchy (zygomatic 46.9% and maxilla 37.9% complete).

Turning to the lethality of injuries, the proportion of antemortem trauma was greater on the parietals and mandible, while perimortem trauma was higher on the frontal and temporal bones, and the occipital suffered from both equally (Fig. 7.7). With the addition of the two previously reported cases (one antemortem frontal and two perimortem parietal injuries), the small differences between the quantity of antemortem and perimortem injuries on the frontal (6:8, $p = 0.57$) and parietal bones (21:19, $p = 0.70$) narrowed further. Hence, a blow to the front or side of the head was equally likely to have been either non-lethal or lethal.

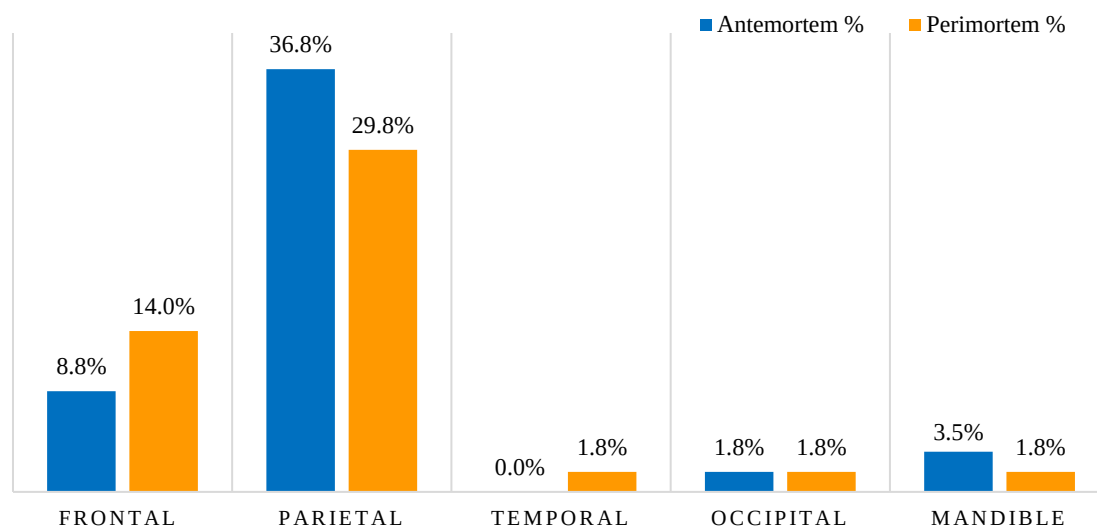


Figure 7.7. The proportion of antemortem and perimortem trauma on Jōmon skeletal elements ($n = 57$).

With the exception of the frontal bone, the left side of cranial elements never exceeded the proportion of injuries to the right side (Fig. 7.8). A difference is seen between the frontal and parietal halves of the cranium. The ratio of antemortem injuries for the frontal were 3:2 (left: right), and for the parietal 3:4 (left: right), while for perimortem injuries they were equal for the frontal and nearly 1:2 (left: right) on the parietal. Statistically speaking, neither healed nor unhealed trauma was more likely to have occurred on the right or left sides of these two cranial elements (frontal left $p = 1$ and right $p = 0.65$; parietal left $p = 0.57$ and right $p = 1$). Nevertheless, concentrations of healed and unhealed trauma were found on the rear, top, and sides of the cranium, indicating blows from multiple directions.

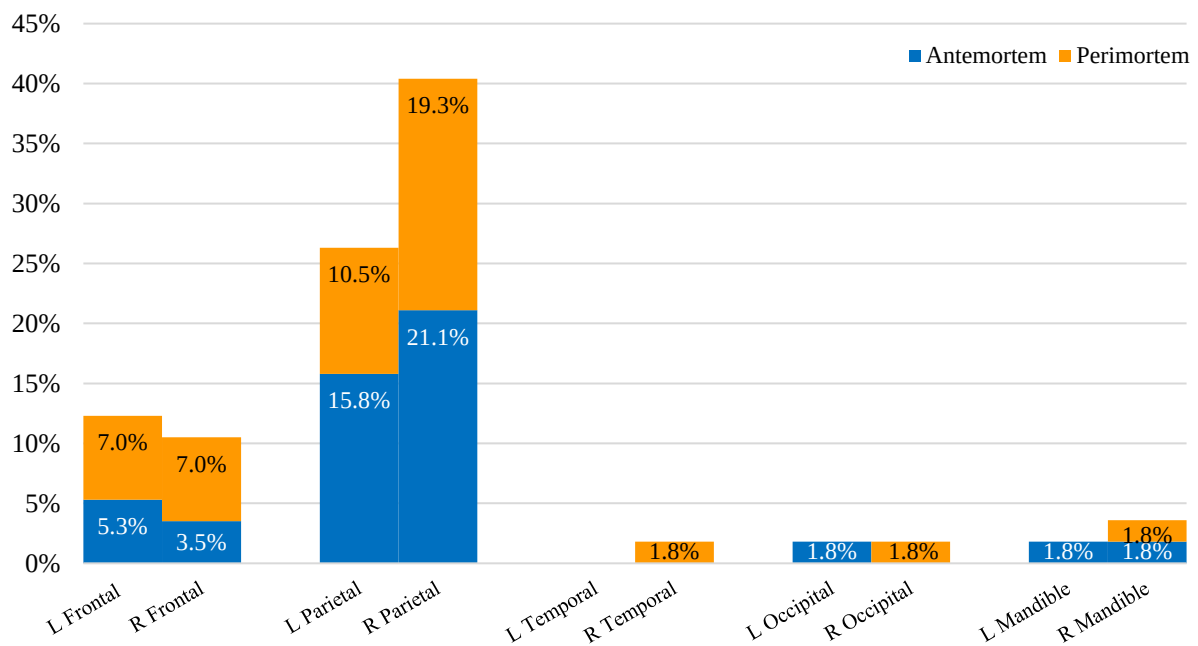


Figure 7.8. Skeletal elements and side of the body affected by violent trauma ($n = 57$).

Visual representation of the more precise locations of distinct cranial trauma illustrates a fairly random distribution of healed and unhealed injuries around the cranium (Fig. 7.9). The lack of a clear side preference would be expected with long-range projectiles, such as sling shots or thrown stones (cf. Schulting & Wysocki 2005). At first glance, the apparent absence of a discernible pattern seems to indicate that it is not possible to determine whether wounds to particular areas more often resulted in lethal or non-lethal outcomes. Yet, closer inspection reveals concentrations of healed trauma on the posterior parietals, and unhealed trauma near the temporal lines on the frontal and parietals, where the bone is thinner. Moreover, injuries to the top of the head along the sagittal suture are predominantly healed.

Fifteen individuals (37.5% of those exhibiting cranial trauma) suffered injuries to the back of the head, specifically on the posterior parietals and occipital bone, which suggests that they were attacked from behind. Assuming that the majority of Jōmon people were right-handed, a greater proportion of injuries to the right side might be expected in rear attacks. However, there was almost an equal proportion of wounds on the left (47%) and right (53%) rear cranium. This might imply a near parity between left- and right-handed Jōmon assailants attacking from the rear, or more likely, the right-handed assailants were attacking both from the rear and the left side of the victim. Llaurens et al. (2008) seem to suggest that being left-handed might have offered prehistoric people a fighting advantage (as it does modern athletes). Alternatively, it could indicate the use of projectiles, although no obvious projectile

injuries were found on the crania in this sample, and only two puncture marks (on the same individual). Nevertheless, injuries found on the posterior cranium suggest ambush rather than face-to-face combat or an accident, although more than half (63%) of the wounds were non-lethal.

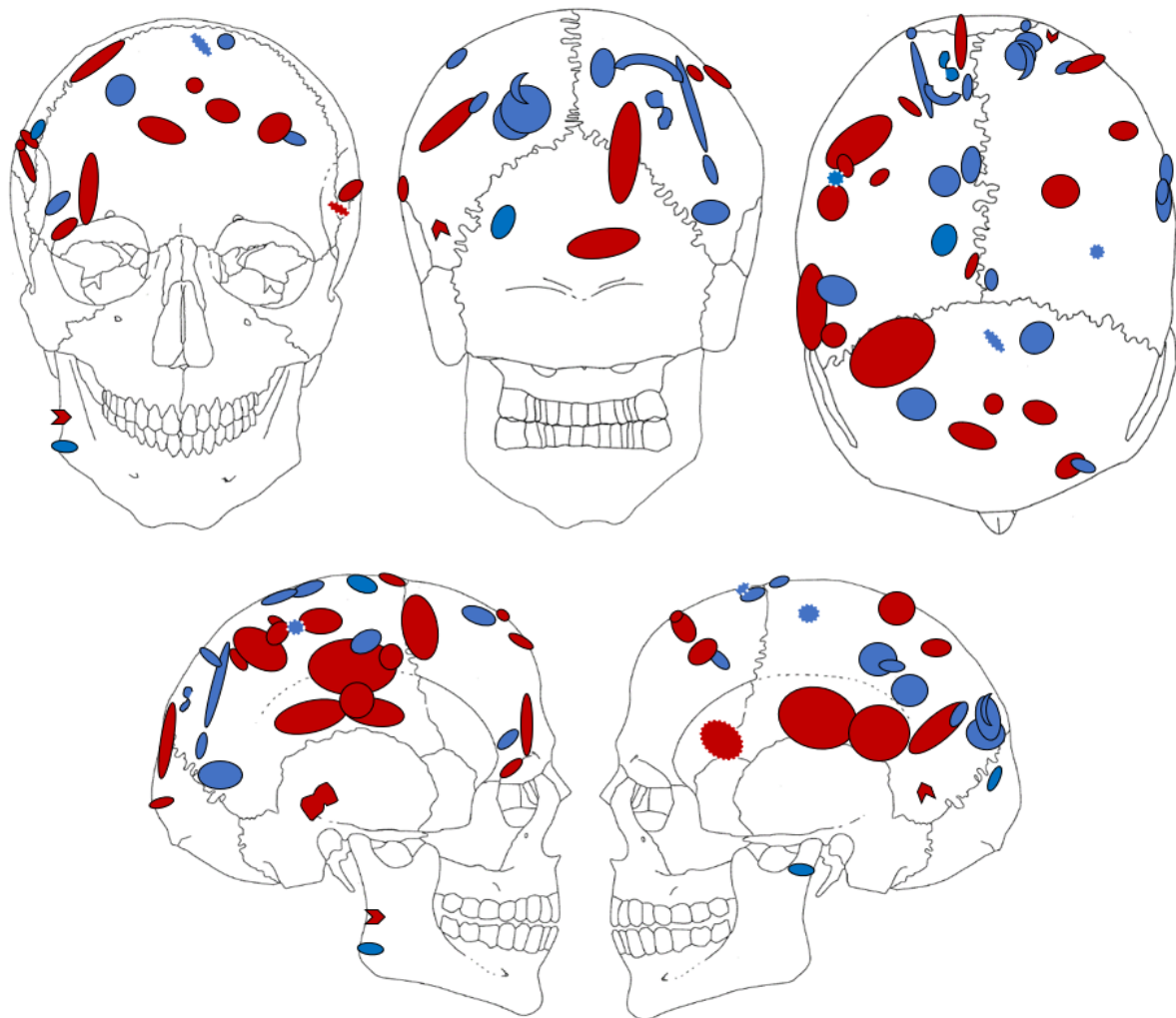


Figure 7.9. Location of antemortem (blue) and perimortem (red) violent trauma on Jōmon skulls (diagrams from Buikstra & Ubelaker 1994).⁹²

Several potential scenarios may explain the concentration of healed trauma along the sagittal suture. Examples include being attacked from above during an ambush, being in a non-standing position at the time of attack, or being thrown head-first against an object with

⁹² Note that sizes of trauma markings are not to scale. Dashed lines surrounding a marking indicates uncertain injury location. In some cases, postmortem damage to the trauma area obscured the injury dimensions, thus the size of markings were estimated based on available information. The number of markings do not equal the number of cranial injuries identified in this study (57), as the same injury is marked from multiple perspectives.

enough force to cause blunt force depressed fractures. It is notable that the majority of individuals with healed injuries to the top of the head were Adult males (compare Fig. 7.9 and Fig. 7.11), which perhaps suggests evidence of violent attack. More difficult to deduce is the direction of attack and potential cause of the cluster of unhealed trauma close to the temporal lines. Trauma to this part of the skull could have come from almost any direction, depending on variables such as the distance between the assailant and the victim, the assailant's height and arm length, as well as the size and type of weapon.

Analysing the location of violent trauma based on skeletal elements and the victims' sex revealed (unsurprisingly) that the parietals exhibited the highest proportion of injuries for both males (64.5%) and females (55.6%) (Fig. 7.11). Male trauma was concentrated on the parietal and frontal bones whereas the locations of female trauma were slightly more dispersed across the skull, with the biggest differences seen on the frontal and mandibular bones. Results from indeterminate sex were excluded from Figure 7.10 because all eight injuries were identified on the parietals, and as there were fewer indeterminate individuals exhibiting trauma, the difference in proportion of injuries would be exaggerated. Yet, if the eight injuries were divided in the same ratio as the overall MNI female-male cranial distribution (49% versus 50%), then the proportion of parietal injuries would increase to 63.5% for females and 68.6% for males in this sample. Additionally, if the previously reported cranial trauma cases were also included then the proportions for the frontal bone would decrease to 30.5% for males and 12.5% for females, while the parietal proportion would decrease to 66.7% for males but would increase to 66.6% for females.

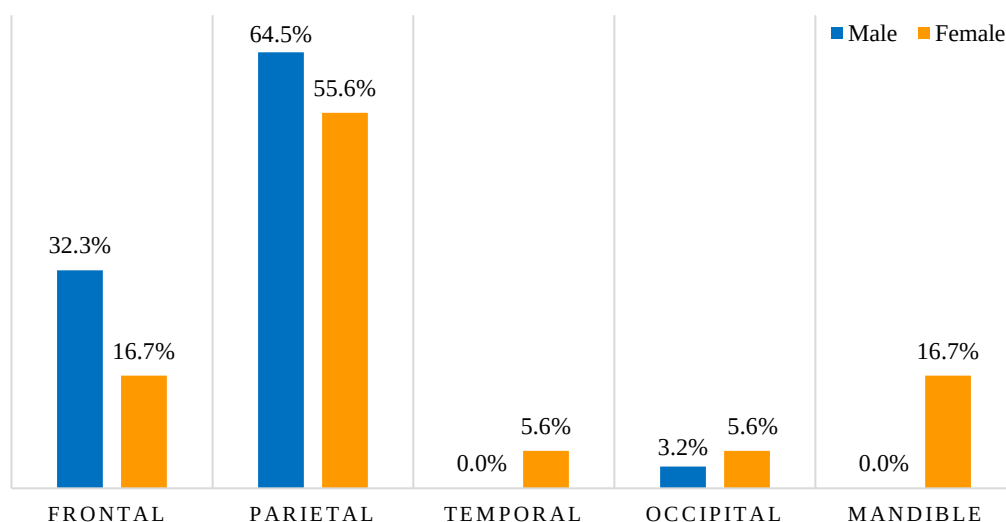


Figure 7.10. Proportion of violent injuries to the bones of the skull grouped by sex ($n = 49$).

The specific positions of individual cranial injuries are illustrated in Figure 7.11 (see 92). For males, injuries to the anterior cranium outweighed those on the posterior at a ratio of 4:3, and injuries on the right side (19) exceeded those on the left (12), suggesting more frontal and right side attacks. For females, however, attacks came from multiple directions with a similar number of anterior (7) and posterior (5) injuries and an equal distribution on the left (9) and right sides (9). In contrast, for individuals of indeterminate sex, most attacks occurred from behind the victim. Many of the clusters of antemortem and perimortem trauma discernible on certain areas of the skull in Figure 7.9 seem to be split between the sexes, making identification of trauma patterns challenging. Thus, sex does not seem to be an accurate predictor of either the location or the lethality of cranial trauma in this Jōmon sample.

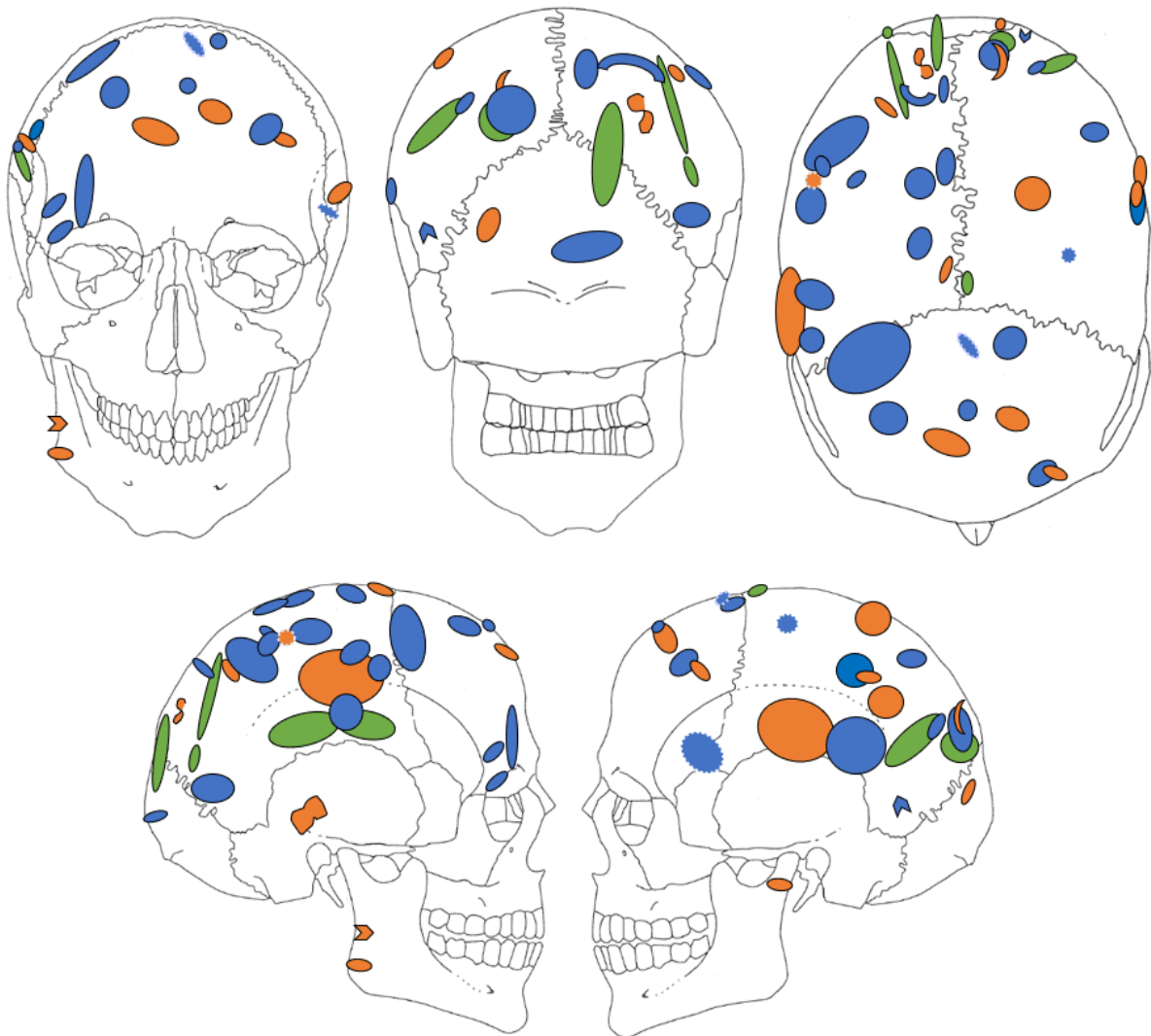


Figure 7.11. Location of violent trauma on male (blue), female (orange), and indeterminate (green) Jōmon skulls (diagrams from Buikstra & Ubelaker 1994).

Four broken arrowheads were discovered embedded in separate postcranial bones of the three male victims: one had penetrated a left rib, while the other three were embedded in the right side of a lumbar vertebra (L1), an ilium, and a femoral head. The injuries to the rib and ilium were found on a Middle adult male skeleton from Koboro cave (Hokkaidō), and the vertebra and femur injuries on separate Adult male skeletons from Usu-Moshiri (Hokkaidō).⁹³ Despite a higher frequency of injuries to the right side, sample numbers are insufficient for any meaningful statistical analysis to be conducted. The location of the lodged arrowhead in the lateral vertebral body indicates that the victim from Usu-Moshiri had been shot from behind on the right side. The arrow entered at a slight downwards angle, suggesting that the attacker was positioned above the victim. The position of the obsidian arrowhead, which had pierced the right femoral head near the neck, reveals that the second Usu-Moshiri victim had been attacked from the right lateral side. The Koboro male with two projectile injuries had been shot from both the front and back. The former pierced the left eighth rib near the angle through to the inferior lateral side, while the latter entered the right lateral ilium, but did not penetrate to the medial side.

When the nine previously reported cases of postcranial trauma are added, there were a total of thirteen separate injuries, located on: a lumbar and thoracic vertebrae; a rib; a humerus; three ulnae; three ilia, and two femurs. Projectiles caused eleven of the thirteen injuries; ten arrowheads (eight remained embedded), and one embedded spearhead.⁹⁴ The right side of the postcranial elements was subjected to 82% of the projectile trauma and the left side 18%. While the injury locations reveal that being shot from behind was most common, they are likely to be randomly distributed as it is difficult to determine precisely where a projectile will hit a (moving) target. Uchino (2013) points out that if a projectile had become embedded so deeply in a bone that it is not easily removable, then it is likely that the arrow/spear was shot/thrown from relatively close range (although this would depend on the strength of the bow/spear-thrower). On the basis that one shoots an arrow after taking aim, the chance of a stray arrow hitting a person, for example while hunting, is probably quite low (Uchino 2013:466). Moreover, given that there was a threefold difference in projectile trauma between males (9) and females (3), this perhaps suggests the possibility of intergroup conflict.

⁹³ Matsumura (1989) and Uchino (2013) mention one of the latter cases.

⁹⁴ The last two were parry fractures.

Data Collection Results from Nagano

Due to very poor preservation of the bones, data collected during the examination of 166 individuals from the Kitamura (160) and Yashiro (6) sites (Nagano) has not been included in the overall analysis of Jōmon violence. Nevertheless, the analytical results are worth discussing separately, particularly those of Kitamura, which represents a rare example of an inland Jōmon site with numerous excavated human skeletons (Shigehara 1994). Skeletal remains, especially from the Middle, Late, and Final Jōmon periods, are more commonly found in shell middens on coastal regions, so Kitamura serves as a useful comparator for these littoral sites.

Trauma Cases

Sediment and adhesive substances covered the majority of the Kitamura and Yashiro remains, making it difficult to determine age, sex, and completeness, and to identify any trauma. Most of the Kitamura skulls had also been crushed and deformed under the pressure of around five metres of soil (Shigehara 1994). Nevertheless, at least two violent injuries were identified on the 145 partially represented skulls: an antemortem depressed circular fracture on the frontal bone of an Adult male (Fig. 7.12-A), and a small perimortem puncture mark on the occipital bone of an Adult female (Fig. 7.12-B). Sediment obscured the internal cranial surface of the former, but rounded margins and healed cortical bone which slopes inward with smooth edges were visible externally. In the latter case, patination and internal bevelling were evident on one side of the puncture mark, and two fractures (transverse and oblique) radiate across the fragile sediment-encrusted external surface. Judging from the rhomboid or squarish-shape (also known as a squircle), this injury could have been caused by a bone arrowhead or an arrow shaft. No evidence of violent trauma was found on the cranial remains from Yashiro, which were in an even worse condition than those from Kitamura.

Despite the recovery of a large number of skulls, especially from Kitamura (140), the prevalence of cranial trauma appears to have been rather low at these two inland sites (ENI 4%, MNI 1.4%) (Table 7.14). Overall deformity, fragmentation, and poor preservation, as well as sediment and adhesives obscuring bone surfaces, are likely to have contributed to this low value, and it is possible that additional trauma cases were missed as a result.

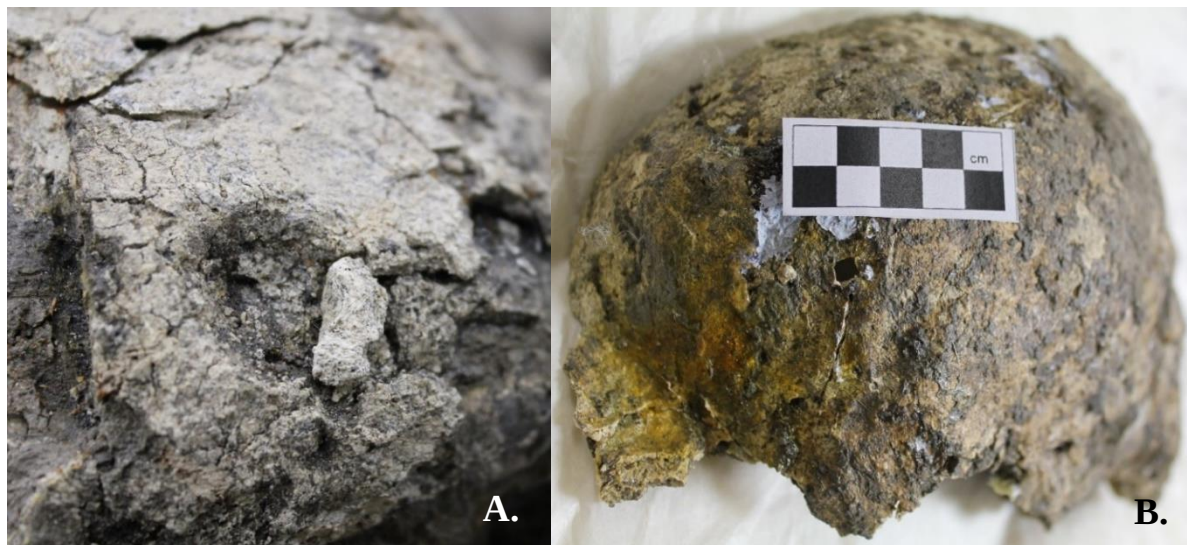


Figure 7.12. Cases of violence-related skeletal trauma at Kitamura (Nagano). A. A healed circular depressed fracture on right frontal bone near coronal suture (20.9 mm x 17.7 mm, depth approx. 3.8 mm), Adult male. B. A rhomboid-shaped puncture mark on left occipital bone (3.6 mm x 4.7 mm), Adult female. Photographed by IR Braddick.

Table 7.14. Prevalence of Jōmon Cranial Trauma at Kitamura and Yashiro (Nagano)

	Total	Antemortem	Perimortem
Individuals with trauma	2	1	1
Representation of the major cranial vault elements	35.0%		
Effective Number of Individuals (ENI)	51		
Minimum Number of Individuals (MNI)	145		
ENI prevalence	4.0%	2.0%	2.0%
MNI prevalence	1.4%	0.7%	0.7%

No definitive cases of violent trauma were identified on the 129 postcranial skeletons from Kitamura and Yashiro. Thus, the prevalence of total skeletal trauma for the Nagano sample was ENI 2.3% (MNI 1.2%) (Table 7.15). Compared to the trauma prevalence seen at coastal sites in this study (see Table 7.9), the frequency was lower at the inland Kitamura site.

Table 7.15. Prevalence of Jōmon Skeletal Trauma ENI (MNI) at Kitamura and Yashiro (Nagano)

Site	Total Skeletons <i>n</i>	Antemortem Trauma <i>n</i>	Perimortem Trauma <i>n</i>	Total Trauma Prevalence
Kitamura	86 (160)	1	1	2.3% (1.3%)
Yashiro	2 (6)	0	0	0.0% (0.0%)
Total	88 (166)	1	1	2.3% (1.2%)

Potential Trauma Cases

In addition to the skeletal trauma cases mentioned above, several potential cases were also found. For example, an unhealed small oval depression with a sharp upper margin on the frontal bone of an Old adult male could be a blunt force injury (Fig. 7.13-A). However, since the depth of the depression is less than one millimetre it is not considered a traumatic injury, and is more likely to be from taphonomic processes. Further postmortem damage, in the form of scratches and dents, were also discernible on the cranial vault of this individual. For the postcranial skeleton, conspicuous, deep parallel incisions (approximately seven or eight ranging in length between 2.4 millimetres to 6.3 millimetres) on the right radius of an Old adult from Kitamura may be a potential perimortem injury (Fig. 7.13-B). The lack of evidence of healing around the cut marks suggest that a sharp implement was used to conduct postmortem processing, although the location of the cuts are oddly placed for such a procedure. Findings of disarticulated human remains with cut marks along the shaft are rare in the Jōmon period.⁹⁵ Alternatively, depending on the patination, animal claws, tooth marks, or excavation damage could have produced these incisions postmortem. Adhering sediment and poor preservation precluded examination of the internal surfaces of the cuts that could distinguish the three potential causes. Since this trauma probably occurred after the individual's death, it is not considered to be violence-related, and thus was not included in the overall prevalence of violence in the Nagano sample.

Some cranial and postcranial bones exhibit what appear to be deep chop marks (linear defects) on their external surfaces (see Fig. 7.13-C~F). Based on the general lack of patination (due to the subsequent exfoliation of much of the cranial surface) and no evidence of healing in each case, these marks have been determined as postmortem damage, perhaps from an excavation shovel. The small depression on Figure 7.13-F could conceivably be violence-related, but preservation conditions at Kitamura are such that it is not possible to classify these marks (and depressions) as injuries resulting from violence.

⁹⁵ For example, incisions have been found on human femurs excavated at Nakazawahama shell midden (Iwate) and at Itoku (Kōchi) (Suzuki 1944; Matsui 2003; Nakahashi 2003), although those identified on the Itoku femur are now considered to have been caused by animal scavenging (Hudson et al. 2021).



Figure 7.13. Potential violent trauma on skeletal remains from Kitamura (Nagano). A. Oval depression on frontal bone (8.5 mm x 6.2 mm, depth approx. 0.6 mm), Old adult male. B. Deep cut marks (or scavenger marks) on right proximal radius (posterior aspect), Old adult. C. Right parietal bone (near coronal suture), Young adult female (length 31.8 mm, depth 1.7 mm). D. Posterior left parietal bone, Adult female (46.3 mm x 5~8 mm). E. Lateral condyle of right distal femur (posterior aspect), Young adult male. F. Posterior left parietal bone (45.6 mm x 12 mm) and small round depression (7.6 mm x 6.7 mm) located diagonally right of the chop mark, Old adult female. Photographed by IR Braddick.

Concluding Thoughts

This chapter reported the results of the osteological examination of violence-related trauma on 1208 skeletons excavated from one hundred Jōmon sites across the Japanese archipelago. Excluding the 166 poorly preserved skeletons from the Nagano sample (discussed separately), 43 out of 1042 individuals exhibited violent injuries—forty on their skulls and three on their postcrania—at 22 sites. Of these, 32 were newly identified cases.

Evidence of 41 distinct violent episodes was found impacting skulls, but attacks on the head were significantly more likely to result in non-lethal (63% antemortem) than lethal (37% perimortem) injuries, with one individual experiencing repeated victimisation having sustained both. In three quarters of these incidents the victim escaped with a single injury, which subsequently healed in 74% of cases, while ten individuals sustained multiple injuries which proved fatal in 70% of cases. One individual suffered a particularly violent death from at least seven injuries to his frontal and parietal bones. There were 57 separate cranial injuries, the majority found on the parietals, with blunt force depressed fractures and perforations the most common types of trauma seen. Projectiles, specifically arrowheads, were responsible for all of the postcranial injuries, and caused perimortem trauma after they became embedded in four separate bones. There was no obvious pattern of trauma on either cranial or postcranial remains, indicating attacks from multiple directions, and the victim's sex does not appear to have been a compelling factor in either the location or the lethality of injuries. Incidents of trauma were more prevalent amongst males and older adults, but not strikingly so, and no violent injuries were found on the bones of infants or children.

Spatiotemporal analysis revealed that violent trauma occurred most frequently in the Early, Final, and Epi-Jōmon periods, and was most prevalent on skeletons from the Hokkaidō region. Inhabitants of coastal sites suffered almost three times as much skeletal trauma as those living inland, with three potential violent 'warm spot' clusters identified around coastal bays, although the eight possible 'cold spots' were also located near the coast. Combining the cranial and postcranial results produced an overall Jōmon skeletal trauma prevalence of ENI 6.0% (MNI 4.1%).

Having considered the data in multiple ways, perhaps the findings of this chapter are best understood in contrast to those of the previous major studies discussed in Chapter 5. Several notable differences are revealed, most importantly, this study found a significantly higher

prevalence of violence-related skeletal trauma (MNI 4.13%) through physical examination of Jōmon remains; more than four times greater than the MNI 0.89% calculated by Nakao et al. (2016) ($p < 0.002$). Moreover, there was a much higher proportion of both cranial and antemortem trauma, whereas postcranial and perimortem injuries predominate in most existing studies. The ranking of regions also highlights another distinctive feature of this study. In Suzuki (1999), Uchino (2013), and Nakao et al. (2016), Chūbu, Kyūshū, and Kantō/Tōhoku recorded the highest quantity of violent incidents. However, in this study Hokkaidō topped the list, Chūbu, Kantō, and Tōhoku retained their unenviable status, and Kyūshū fell to last place; even when verified cases from published sources were included. In terms of trauma prevalence (MNI), Kansai, Kyūshū, and Chūbu were highest in Nakao et al.'s study, while in this chapter the top three (in order) were Hokkaidō (excluded by Nakao et al.), Kansai, and Tōhoku.⁹⁶ The temporal pattern shows a similar overall trend with a steady increase in the number of trauma cases from the Initial through to the Final Jōmon period, before a dramatic fall in the Epi-Jōmon phase, but this is the first study to identify a Middle Jōmon dip (both in count and prevalence). In contrast, Nakao et al.'s study saw trauma prevalence peak in the Middle phase, with the drop in violence instead occurring in the subsequent Late Jōmon phase. In all studies where data was available (this one included), more males suffered violent trauma than females, but here this disparity narrowed dramatically. Nevertheless, the possibility that these differences reflect sampling biases—or simply insufficient data—more than substantial variations in violent trauma cases cannot be discounted entirely.

The prevalence of violence in a society is a matter of degree rather than absolutes. The results presented in this chapter doubtless underestimate the frequency with which violent incidents occurred in Jōmon communities, yet they reveal that it was significantly more prevalent than previously thought. Although two plausible violent ‘hotspots’ and three potential ‘warm spot’ clusters were identified, no direct or indirect evidence of large-scale intergroup fighting was uncovered in this study. Whether or not the prevalence of violence in Jōmon Japan was especially high (or low) requires a comparison with a number of other prehistoric hunter-gatherer societies. This will be the focus of the next chapter.

⁹⁶ If the previously reported verified trauma cases are added, Tōhoku and Kansai's positions are reversed.

8. Violence in Jōmon Society: A Comparative Perspective

The relative pacifism or belligerence of a society can only be understood within a comparative framework. Since no society has succeeded in completely eliminating violence, comparative analysis becomes a matter of ranking and degree. Methods of comparison vary according to the level of analysis adopted and the questions posed. The purpose of this chapter is to determine whether the Jōmon people were relatively peaceful, whether they experienced intergroup conflict like other hunter-gatherers, and if not, how the differing patterns of violence might be explained. To do this requires a multi-layered biocultural comparative analysis incorporating general prevalence, spatiotemporal prevalence, and direct (skeletal) and indirect (non-skeletal) evidence. Calculating the overall prevalence of violent skeletal trauma on a population basis helps to locate a society on a ‘violence spectrum’ (by determining whether the quantum of violence was high or low), but inevitably this broad-brush quantitative method sacrifices detail. Secondly, spatiotemporal analysis not only shows general trends in the prevalence and distribution of violence, but may also reveal ‘hotspots’ where intense violent incidents might have occurred, ‘warm spots’ where conflict recurred over a long time period, or ‘cold spots’ of nonviolence. Finally, a more nuanced, qualitative analysis incorporating both direct and indirect evidence is necessary to identify the types and levels of violence experienced in a society, while a synoptic perspective embracing both cultural and environmental contexts hints at potential determinants shaping regional variations. Given the incomplete nature of the archaeological record, not every marker of violence searched for will be identifiable, but the more that are unearthed the greater the degree of confidence in the existence of organised intergroup conflict or warfare in a society.

Making meaningful comparisons is rarely straightforward, since no two societies develop in precisely the same way or at the same pace. Although violence in prehistoric times was not uncommon, finding appropriate comparators is challenging, especially for the rather unusual Jōmon. Hence, this chapter begins by acknowledging that in comparative studies of hunter-gatherer violence, the Jōmon have long been neglected. Japanese archaeologists’ recent efforts to rectify this situation by contrasting violence in Jōmon Japan and Mesolithic Europe

will be critiqued on the basis of the findings presented in Chapter 7. Using the extremely diverse cultures of Mesolithic Europe as a comparator is impractical in biocultural terms, and hence as an alternative, California (central and southern) will be utilised as the main comparative case study in this thesis.⁹⁷

The Jōmon in absentia

In comparative studies, emphasis is usually placed on the overall prevalence of violence in a number of distinct regions, rather than on a thorough investigation of violent injuries found at a handful of sites or on individual skeletons. Some scholars, such as Samuel Bowles and Steven Pinker, have attempted to produce wide-ranging comparative studies incorporating data from multiple historic societies (see Chapter 3). At the global scale, Bowles (2009) calculated the average rate of ‘adult mortality due to warfare’ for fifteen archaeological hunter-gatherer societies at between twelve to fourteen per cent, while Pinker (2011), after adding a further six locations, estimated ‘the percentage of deaths in warfare’ at fourteen per cent. In addition to some of their data being drawn from rather antiquated sources (the earliest dating to 1955), both tended to overlook the East Asian dimension, instead concentrating on North America, Europe, and parts of Africa.

Setting aside the numerous problems with Bowles’ and Pinker’s data (which have been addressed in other studies such as Ferguson 2013, see Chapter 3), it is nevertheless interesting to contrast their findings with the Jōmon results. Bowles (2009) limited his analysis to adults, and sites where a minimum of ten skeletons were excavated; believing that otherwise they would distort the prevalence figures. Based on the data presented in Chapter 7, the prevalence of violent death (perimortem trauma) amongst the Jōmon people was 1.73% (2.09% if previously reported violent trauma cases are included, see Chapter 5), although as will be discussed below these deaths are unlikely to have resulted from warfare.⁹⁸ Excluding infants and children (but including adolescents), prevalence increased to 1.90% (from 100 to 98 sites), whereas excluding sites with less than ten skeletons reduced the prevalence to 1.34% (24 sites), while in combination the resulting prevalence was 1.53% (21 sites). This last figure is significantly lower than the hunter-gatherer ‘average’ that they posited; indeed, it

⁹⁷ Other potential comparators were considered, for example, the sedentary hunter-gatherer-fishers of the Northwest Coast of America and those in Northeastern Patagonia (Argentina). Although occasional reference is made to these peoples here, California and Mesolithic Europe were selected due to the availability of essential data on violence, and better geographic and climatic alignment.

⁹⁸ Without access to the European and Californian skeletal material, data from these regions cannot be converted into ENI. Hence, for comparative purposes, all figures used in this chapter refer to MNI.

would place the Jōmon at the bottom of both Bowles' and Pinker's tables (excluding Gobero in Niger, whose adult population allegedly experienced no lethal violence for 7800 years) (see Table 8.1).

It is a relatively simple matter to compile prevalence data where other archaeologists and anthropologists have employed compatible methods to produce comparable results, but finding valid comparators for the Jōmon is more complicated. Hence, as described previously, for a long time Japanese archaeologists contrasted evidence of violence among the Jōmon hunter-gatherers almost exclusively with that of the Yayoi agriculturalists. It is only very recently that they have started to consider the Jōmon (and Yayoi) violence in a more global context.

Table 8.1. Warfare Mortality Rates of Hunter-Gatherer Adults

No.	Location	Period	Adult Mortality Rate
1	South Dakota	AD 1325	60%
2	Nubia (Site 117)	12000 BC - 10000 BC	40.7%
3	Sarai Nahar Rai, India	2140 BC - 850 BC	30%
4	British Columbia (30 sites)	3500 BC - AD 1674	23%
5	Voloshkoe, Ukraine	7500 BC	22%
6	Vasilyevka III, Ukraine	9000 BC	21%
7	Illinois	AD 1300	16.3%
8	Northeast Plains	AD 1485	15%
9	Vedbaek, Denmark	4100 BC	13.6%
10	Bogebakken, Denmark	4300 BC - 3800 BC	12%
11	Ile Teviec, France	4600 BC	12%
12	Brittany, France	6000 BC	8%
13	Central California	1400 BC - AD 235	8%
14	Skateholm, Sweden	4100 BC	7%
15	Southern California (28 sites)	3500 BC - AD 1380	6%
16	Kentucky	2750 BC	5.6%
17	Central California	1500 BC - AD 1500	5%
18	Calumnata, Algeria	6300 BC - 5300 BC	4%
19	Central California (2 sites)	AD 240 - AD 1770	4%
20	Nubia (near Site 117)	12000 BC - 10000 BC	3%
	Japan (21 Jōmon sites)	13000 BC - AD 700	1.53%
21	Gobero, Niger	14000 BC - 6200 BC	0%

Modified from Bowles 2009 and Pinker 2011.

Jōmon Japan and Mesolithic Europe

Nakagawa and Nakao (2017a, b) and Nakagawa et al. (2017) broadened the discussion on violence in Japanese archaeology by acknowledging the need to compare Jōmon (and Yayoi) skeletal trauma with available data from other societies; they chose to contrast it with evidence from the European Mesolithic. This is a significant and welcome contribution, however, their studies are worthy of further investigation from three different directions: data selection; methods, and choice of comparator.

Nakagawa and Nakao's (2017a, b) studies are constrained by their data selection. For example, they relied on Nakao et al.'s (2016) paper to calculate the prevalence of violent Jōmon skeletal injuries. It is unnecessary to reiterate the various problems with this earlier study (see Chapter 5), but the issues here are not confined to the Jōmon data. Given the language barriers and lack of physical access, reliance on secondary sources for Mesolithic Europe is unavoidable. However, some of those utilised to construct the dataset do not directly address the question of violence. O'Shea and Zvelebil's (1984) study of 170 skeletons excavated at the Oleneostrovski mogilnik site is one such example. Reliant on even older Russian research from the 1930s, the authors did not identify any violent trauma, perhaps because their study focused on mortuary practices rather than searching for evidence of violence. Hence, data from this site has been excluded from this thesis.

Prevalence of Violence

In attempting to answer the fundamental question of whether or not the Jōmon people engaged in warfare, Nakagawa and Nakao (2017a) adopted a methodology similar to Bowles and Pinker, that is, a large-scale, spatiotemporal study derived from the secondary literature. By narrowing their focus to Europe, the authors were able to incorporate data from a larger number of sites (210), and distinguish between the total number of skeletons excavated (2055) and those exhibiting violent injuries (80). Using this comparison, Nakagawa and Nakao asserted that warfare among the Jōmon was non-existent, or at least exceedingly rare. This assessment was based on their revised calculation of the prevalence of violent skeletal injuries, as well as the absence of geographical and chronological clusters of sites with skeletal injuries. They found a statistically significant difference between injury prevalence in Mesolithic Europe (3.89%) and Jōmon Japan (0.89%) ($p < 0.0001$), but only a relatively weak significance with the Yayoi (3.03%, $p < 0.0892$). Nakagawa and Nakao (2017a:112)

interpreted this to mean that there was a much higher likelihood of ‘wars’ having occurred in the European Mesolithic than in the Jōmon era, and somewhat higher than in the Yayoi period. Yet, when the Jōmon figures from Chapter 7 are used, the difference in the overall prevalence of violence for Mesolithic Europe (4.24%)⁹⁹ and Jōmon Japan (4.13-5.13%)¹⁰⁰ becomes statistically insignificant ($p = 0.88-0.27$), and even more so when limiting the focus to sites with violence (7.4% and 7.1% respectively) ($p = 0.81$).

Nakagawa and Nakao explicitly sought to contrast their Jōmon findings with the hunter-gatherer results of Bowles (2009) and Pinker (2011). When Nakagawa and Nakao excluded children and the (age) unknown individuals, the prevalence of Jōmon violent trauma more than doubled (from 0.89% at 242 sites to 1.81% at 156 sites).¹⁰¹ In contrast, calculated separately, their results would only have increased marginally if they had merely discounted sites with less than ten skeletons: Jōmon from 0.89% (242 sites) to 0.92% (56 sites) and Mesolithic Europe from 3.89% (210 sites) to 4.16% (36 sites). Using Bowles’ method (i.e. both of these criteria), Nakagawa and Nakao produced a prevalence of 1.81%, but inexplicably did not use this percentage in their comparison with Mesolithic Europe, perhaps because they did not have access to the necessary age data for Europe.

Applying Bowles’ parameters to the data presented in Chapter 7 strengthens the argument that there was no ‘warfare’ in Jōmon Japan. Excluding infants and children (but including adolescents), prevalence increased from 4.13% to 4.54%, whereas excluding sites with less than ten skeletons reduced the prevalence to 4.00% (from 100 to 24 sites), while in combination the resulting prevalence was 4.46% (from 100 to 21 sites).¹⁰² In other words, the first of Bowles’ parameters had a much greater impact on prevalence calculations than the second, whether applied to the Chapter 7 data or the data presented by Nakagawa and Nakao. Since infants and children in both Jōmon samples did not exhibit any violent injuries on their skeletons, they are not likely to have been victims of organised intergroup violence. Furthermore, if warfare was present then applying the second parameter should have led to a

⁹⁹ This prevalence figure excludes data from the Oleneostrovski mogilnik site.

¹⁰⁰ Unlike Nakagawa and Nakao (2017a, b) and Nakagawa et al. (2017), data from Hokkaidō and the Epi-Jōmon period are included here for comparative purposes, since Mesolithic Europeans (and Californians) would also have had some contact with agriculturalists at various times.

¹⁰¹ Counting sites that span two Jōmon subperiods as two separate sites.

¹⁰² Three sites (Abashiri cave, Kotan Onsen, and Mitsuya) with ten or more skeletons were excluded when they fell below the ten skeleton threshold after skeletons of infants and children were eliminated.

large increase in the prevalence, but as it did not, this result indicates that violence was fairly evenly distributed across sites in Jōmon Japan.

Despite recognising the existence of warfare in Mesolithic Europe and its likely absence in Jōmon Japan, Nakagawa and Nakao (2017a:115) concluded that juxtaposing the European and Japanese data (including the Yayoi) ‘reveals that Japan's prehistoric periods are not so special.’ This thesis reaches a similar conclusion, albeit arriving at this appreciation from the opposite direction. Whereas Nakagawa and Nakao scaled down the pervasiveness of warfare in Mesolithic Europe, this study found a higher occurrence of violence in the Jōmon period (4.13%, or 5.13% if the previously reported cases are included) to narrow the gap, placing Japan slightly above the European average (see Table 8.3).

Spatiotemporal Analysis

Analysing the Mesolithic European prevalence data chronologically (Table 8.2) and geographically (Table 8.3), Nakagawa and Nakao (2017a) found that given the variations, even in Mesolithic Europe ‘wars’ did not occur frequently; a sentiment shared by some specialists of the period (e.g., Roksandic et al. 2006). Most regions of Europe appear to have been largely unaffected by violence, with just seven ‘countries’ accounting for 87.5% (70/80) of injured skeletons in the Mesolithic period.¹⁰³ Moreover, with the exception of the well-known ‘massacre’ site of Ofnet cave (Germany) (Cunliffe 2006), no single site contained more than a handful of injured skeletons. Sorting their data according to modern day national boundaries is at best a very imprecise approximation of Mesolithic cultural groupings, while using millennial increments is purely arbitrary and unrelated to cultural shifts. Admittedly, re-examining the data according to individual Mesolithic cultures and culturally significant turning points would be very challenging, and is beyond the scope of this study.

Nakagawa and Nakao (2017a, b) examined the spatiotemporal arrangement of the Mesolithic sites spanning the period from 10,000-3000 BC, providing continental maps distinguishing those with skeletal trauma. They did not identify any clusters of violence—although they did concede the possibility—nor did they specify the number and proximity of ‘hotspots’ required for localised ‘warfare’ to become generalised. However, by applying the same ‘hot/warm spot’ criteria described in Chapter 7 to Nakagawa and Nakao’s European data, it is

¹⁰³ This may be partly explained by the varying preservation conditions and patchiness of Mesolithic archaeological research.

possible to produce a shortlist of six potential locales, stretching over 3600 kilometres from the banks of the Tagus River (Portugal) to the Dnieper River (Ukraine) (Table 8.4). Only two ‘hotspots’ and one ‘warm spot’ had a trauma prevalence exceeding that of the Mesolithic European average for sites with violence (7.4%).

Table 8.2. Chronological Division of Prevalence of Violent Skeletal Injury in Mesolithic Europe

Period	Excavated Skeletons <i>n</i>	Injured Skeletons <i>n</i>	Injury Prevalence
Pre 10,000 BC	94	12	12.77%
10,000-9000 BC	59	0	0.00%
9000-8000 BC	358	3	0.84%
8000-7000 BC	562	35	6.23%
7000-6000 BC	208	9	4.33%
6000-5000 BC	412	17	4.13%
5000-4000 BC	131	4	3.05%
4000-3000 BC	26	0	0.00%
Total	1950	80	4.10%

Modified from Nakagawa & Nakao 2017a. Note: 170 skeletons from Oleneostrovski mogilnik were excluded; as well as 35 (by Nakagawa & Nakao) due to issues with dating.

Table 8.3. Geographical Division of Prevalence of Violent Skeletal Injury in Mesolithic Europe and Jōmon Japan

Country	Skeletons <i>n</i>	Injured Skeletons <i>n</i>	Injury Prevalence
Switzerland	1	1	100.00%
Germany	51	17	33.33%
Italy	3	1	33.33%
Ukraine	82	12	14.63%
Latvia	51	6	11.76%
Greece	21	2	9.52%
Denmark	82	6	7.32%
Sweden	65	3	4.62%
France	167	7	4.19%
Japan (from Ch. 7)	1042~1053	43~54	4.13~5.13%
Portugal	396	12	3.03%
Spain	57	1	1.75%
Serbia-Romania	605	10	1.65%
England	102	1	0.98%
Japan (Nakagawa & Nakao)	2576	23	0.89%
Netherlands	124	1	0.81%
Belgium	60	0	0.00%
Ireland	15	0	0.00%
Luxembourg	2	0	0.00%
Norway	1	0	0.00%
Total (exc. Japan)	1885	80	4.24%

Modified from Nakagawa & Nakao 2017a. Note: 170 skeletons from Oleneostrovski mogilnik were excluded.

When the most likely ‘hot/warm spot’ candidates in Mesolithic Europe are contrasted with those in Jōmon Japan (see Chapter 7), the number of individual sites (Europe 12, Japan 10) were found to be very similar, though not the total sample sizes (Europe 923, Japan 449). Moreover, it is worth noting that both sets of sites averaged a similar timespan (1200 years), and the trauma prevalence in the former (6.18%) was almost identical to that experienced in the latter (6.24%). Even if the criteria are relaxed, for instance to include potential ‘hot/warm spots’ with three or more injured individuals, the ratio remains similar (Europe 7.20%: Japan 6.50%), implying that this does not undermine the result. Nevertheless, differing cultures of violence could still mean that one region experienced ‘warfare’ while the other did not.

Table 8.4. Potential ‘Hot/Warm Spots’ of Violence in Mesolithic Europe

‘Hot/ warm spot’	Site	State	Period	Total Skeletons	Injured Individuals	Trauma Prevalence
Dnieper Rapids	Voloshkoe	Ukraine	10080-9980 BC	82	12	14.63%
	Vasilyevka I					
	Vasilyevka III					
Iron Gates 1	Lepenski Vir Vlasac	Serbia- Romania	8900-5500 BC?	390	5	1.28%
Ofnet	Ofnet cave	Germany	7560-7360 BC	38	17	44.74%
Iron Gates 2	Schela Cladovei	Serbia- Romania	7545-7307 BC	100	5	5.0%
Zvejnieki	Zvejnieki	Latvia	7310-5300 BC?	51	6	11.76%
Ribatejo	Cova da Onça	Portugal	6430-5340 BC	262	12	4.58%
	Cabeco da Amoreira					
	Cabeco da Arruda					
	Moita do Sebastião					
Total	in clusters: 12			923	57	6.18%
Total	with violence: 29			1081	80	7.40%

Note: basic data drawn from Nakagawa & Nakao 2017a.

Nonviolence in Mesolithic Europe presents an analogous picture to Jōmon Japan. Of the 1885 skeletons from the 209 study sites included in Nakao and Nakagawa (2017a) (excluding Oleneostrovski mogilnik), 804 (42.7%) were located at the 180 sites (86%) where no violent trauma was identified. Of the 35 sites that fit the ‘ten or more skeletons’ criteria, 18 sites (51.4%) lacked violence, which together contained 412 skeletons (28.1%). This represents almost the same proportion calculated for the Jōmon: 42.7% versus 41.7% for total skeletons without violent trauma, or 28.1% versus 30.7% for sites with ‘ten or more skeletons’, respectively (see Chapter 7). Applying the same criteria used in Chapter 7 produced a total of

15 ‘cold spots’, where 316 individuals (316/1885, 16.76%) may never have experienced violent trauma (Table 8.5). Although this represents nearly double the number of ‘cold spots’ identified for Jōmon Japan, the proportion of nonviolence at ‘cold spots’ is remarkably similar (Mesolithic Europe 16.76%, Japan 16.3%, $p = 0.75$), suggesting an almost equal likelihood of living a relatively peaceful life in these societies.

Table 8.5. Potential Mesolithic European Sites of Nonviolence

‘Cold spot’	Site	State	Period	Total Skeletons <i>n</i>
1	Paças de São Bento	Portugal	5090-4830 BC	15
2	Vale de Romeiras	Portugal	5440-5180BC	26
3	Cabeço do Pez	Portugal	5690-5520 BC	32
4	Arapouco	Portugal	5970-5730 BC	32
5	Cabeço das Amoreiras	Portugal	6200-6030 BC	21
6	El Collado	Spain	8460-8070 BC	15
7	Hajdučka Vodenica	Serbia-Romania	7200-6200 BC?	46
8	Cuzoul de Gramat	France	6450-4450 BC	10
9	Vergne	France	8470-8220 BC	10
10	Margaux Autours	Belgium	9150-7990 BC	20
11	Bois Laiterie Claminforge	Belgium	9120-8340 BC	11
12	Malonne Burin	Belgium	9120-8350 BC	10
13	Potter's Cave Ogofye Ychen Caldey Island Daylight Rock	England	7620-5590 BC	10
14	Swifterbant S2 Swifterbant S22/23	Netherlands	4520-3970 BC	48
15	Urk-E4	Netherlands	6220-6030 BC	10
Total	22			316

Modified from Nakagawa & Nakao 2017a.

An Alternative Approach

For Nakagawa and Nakao (2017a, b), it is clear that the prevalence of violence-related skeletal trauma is the primary indicator of the existence or absence of ‘warfare’ in a society, with spatiotemporal factors serving as a supplementary and incremental measure of the pervasiveness of violent conflict. Yet, whether such methods are sufficient to support their

conclusions is debatable. Taken separately, counting the proportion of injured skeletons or identifying concentrations of violent incidents is only sufficient to approximately gauge the level of violence in a society. Even in combination, a moderate prevalence of violence and a sporadic distribution of clusters may not indicate a pattern of organised intergroup conflict, especially, as is often the case, skeletal remains have not been precisely dated. Resolving this issue requires an understanding of the cultural context, which in turn involves a more in-depth analysis of both direct (skeletal) and indirect (non-skeletal) archaeological evidence. A complete picture of the role that violence played in a prehistoric hunter-gatherer society is unattainable. Yet, if a society devoted resources to creating, for example, specialised weapons and defensive systems, alongside experiencing a high prevalence of violence and a large number of ‘hot/warm spots’, then it seems reasonable to conclude that warfare was present.

No less important is the issue of whether Mesolithic Europe is the best comparator for Jōmon Japan. Without offering much in the way of justification, Nakagawa and Nakao’s position is apparently that both were predominantly engaged in hunting and gathering with emerging sedentism, and represent overlapping time periods. The authors might have added other similarities such as the use of daily tools as weapons, the lack of defensive structures, the development of food storage technologies, and a similar climatic range. However, there are also significant differences. For instance, the gradual emergence of social hierarchy in Mesolithic Europe most likely predated that in Japan. The Jōmon period endured for much longer than the Mesolithic era: approximately 12~14 millennia versus 7~10 millennia (although the skeletal records appear to cover a similar timespan, around 7~9 millennia), depending on which part of Europe is being considered. The geographic areas are also a rather poor match since Mesolithic Europe was at least fifteen times larger than Japan, and although population figures are unreliable, population densities in the latter were probably higher (between 0.005-0.5 people/km² in Mesolithic Europe versus 0.07-0.89 in Jōmon Japan) (Mithen 1994:119; Kawahata 2009). The coexistence across Mesolithic Europe of a wide variety of distinct cultures sharing certain characteristics further complicates the picture, especially as the Neolithic era arrived at different times. Most notably, for the purposes of this study, the prevalence of violent skeletal injuries ranges from 0~100% (or 0~33.33% if countries with less than ten skeletons are excluded) (see Table 8.3), further emphasising the differences. An alternative comparator such as the hunter-gatherers of California is worthwhile, especially since the addition of a third case study should produce a more robust analysis.

Jōmon Japan and Prehistoric California

Contrasting the hunter-gatherers of Japan with those of California is not particularly innovative. Since at least the late 1970s, Japanese and American archaeologists have offered tentative comparisons between the Jōmon and indigenous peoples of California (Koyama & Thomas 1981).¹⁰⁴ This was not surprising given the numerous points of similarity that existed between these two societies, and yet there does not appear to have been any systematic comparison of their respective experiences of violence.

The hunter-gatherer period in what is now the ‘Golden State of California’ outlived that in Japan by many centuries, however, they are a closer fit than Mesolithic Europe since each endured for over 12 millennia (Arnold et al. 2004). Nevertheless, despite preservation conditions varying widely, the span of the surviving skeletal record for all three is not dissimilar: very approximately 84 centuries for Jōmon (not including the Incipient phase); 82 centuries for Mesolithic Europe, and 79 centuries for California. Geographically speaking, whereas Mesolithic Europe straddled a continent, the Japanese archipelago (377,972 km²) and the region of California (423,970 km²) represent much smaller and roughly equivalent areas. Furthermore, due to their parallel latitudes—which affects the amount of sunlight available over the year—the two peoples inhabited analogous physical environments and topographies, including ‘a great altitudinal range, mature and widespread forests, and abundant freshwater flowing towards extended and highly indented coastlines.’ (Koyama & Thomas 1981:1) They generally enjoyed a temperate climate, with the exception of south-eastern California which comprises mostly desert, and Hokkaidō and the Ryūkyū Islands which lie in the subarctic and subtropical zones, respectively.

In many respects, the Jōmon (prior to the arrival of the Yayoi) and indigenous Californians (prior to the arrival of Europeans) lived similar lifestyles. Though the latter were perhaps more culturally diverse than the former, they had comparable subsistence systems supporting increasingly sedentary populations. This involved variable but intensive use of arboreal resources inland, and a high degree of reliance on rich marine resources along the coasts. For example, acorns, salmon, game, and shellfish featured as staple foods in both regions (Baumhoff 1963; Koyama & Thomas 1981; Walker & DeNiro 1986; Yoneda et al. 2002a, b,

¹⁰⁴ The primary aim of the 1979 ‘Affluent Foragers’ symposium held at the National Museum of Ethnology in Osaka was to compare the foraging economies of prehistoric Japan and California (Koyama & Uchiyama 2006:1).

2004; Newsome et al. 2004; Koyama & Uchiyama 2006; Metheny & Beaudry 2015). Moreover, while the two societies had limited contact with farming communities, the usually abundant natural food resources and the practice of some forms of horticulture (e.g., seed collection, arboriculture, and perhaps irrigation) obviated the need to adopt full-scale agriculture (Habu 2004; Kitagawa & Yasuda 2004; Bellwood 2005:40; Bettinger 2005:320). Long-distance exchange networks and food storage were also important to the development of Jōmon and Californian societies. In short, while remaining primarily hunter-gatherers (Purdy 2013:65), both societies depended upon natural resources which could be stored. This enabled a greater degree of sedentism and larger populations to emerge.

Despite witnessing dramatic fluctuations over time, the Jōmon and Californians were able to support relatively high population densities for hunter-gatherer societies, although the latter were significantly higher (Sahara 1992:214). The Californians clearly surpassed the Jōmon peak (0.89 people/km²), with densities in central California ranging from 2.32-3.86 people/km², and insular southern California realizing one of the highest densities among ancient hunter-gatherers anywhere (6.33 people/km²) (Bartelink et al. 2013; Schwitalla et al. 2014a). This perhaps encouraged the development of social complexity, the establishment of group territories, and a more hierarchical society. While there is clear evidence of chiefdoms emerging in some indigenous Californian groups, often with ranked lineages and the accumulation of prestige goods (Lambert & Walker 1991; Lambert 1997; Bellwood 2005:34), this is more contentious in Jōmon Japan where the evidence is ambiguous.

In 1990, cultural anthropologist Watanabe Hitoshi posited the idea of Jōmon Japan being a stratified society, with elites possessing luxury artefacts. It shared features with other North Pacific coastal societies, which distinguishes them from the hierarchies seen in complex agricultural societies. North Pacific stratification was said to be based on special technology and rituals associated with big game hunting (Pearson 2007). Similarly, Takahashi (2001) compared the Jōmon to indigenous North American tribes and agreed that social hierarchy emerged by the end of the Jōmon era (see Chapter 3). However, in addition to the production of prestige goods, Takahashi based his conclusion on a wider range of evidence, including large construction projects and the uneven distribution of grave goods. Yet, more recently, Habu (2004:197) questioned the validity of this proposed North Pacific parallel, stating that ‘Among the elements that characterise social stratification among hunter-gatherer groups on

the Northwest Coast of North America and in California, some elements, such as warfare and differentiation by house size, are missing in the Jōmon data.’

Violence in Hunter-Gatherer California

Based on ethnographic and ethnohistoric accounts, native Californians had a reputation for limited interpersonal violence and sporadic warfare, whereas more recent archaeological evidence reveals that prehistoric violence was relatively common (Eerkens et al. 2014b:297). Indeed, the quantity of violence found in California was in some part responsible for driving the paradigm shift away from the romanticised portrayal of hunter-gatherers as living lives of peaceful coexistence.

After three decades of relative neglect, following the seminal work of Walker (1989) on coastal southern California, the 1990s saw renewed academic interest in violence among hunter-gatherer groups in California. In the early 2000s, this research was extended to central California, including multiple investigations of dismemberment and trophy-taking. Scholars such as Lambert (1994, 1997), Andrushko et al. (2005, 2010), Bartelink et al. (2013), and Schwitalla et al. (2014a, 2014b) have uncovered a plethora of unambiguous skeletal evidence of violence. This paradigm shift has resulted in a bifurcation of perceptions regarding the pervasiveness of violence in Jōmon Japan and prehistoric California (Habu 2004; Nakao et al. 2016). However, quantifying the relative prevalence of violence in these two societies remains challenging because few academic papers systematically examine whole populations. The tenacity of A.W. Schwitalla in collating data on nearly 20,000 burials (spanning almost 5000 years) to produce the Central California Bioarchaeological Database (CCBD) has proved invaluable. No such database exists for southern California, but the publications of Walker and Lambert have facilitated this comparative analysis. Yet, it is further complicated by the fact that the chronological divisions used for the two parts of California do not align (Table 8.6). Historical sources suggest that the indigenous desert peoples living on the eastern California periphery exhibited very warlike behaviour, but little archaeological evidence survives from this highly mobile people to substantiate these claims (Lambert 2002:219).

Table 8.6. Chronology of Prehistoric California

Central California			Southern California		
Period	Phase	Date	Period	Phase	Date
			Early-Early	EX	6000–4500 BC
				EY _a	4500–3500 BC
Early	E	3050–500 BC	Late-Early	EY _b	3500–2400 BC
				EZ	2400–1400 BC
Early-Middle	EM Transition	500–210 BC	Early-Middle	M1	1400–800 BC
	EM	210 BC–AD 420		M2a	800–200 BC
				M2b	200 BC–AD 300
Middle	Intermediate M	AD 420–445	Late-Middle	M3	AD 300–700
	Unnamed M	AD 445–575		M4	AD 700–900
	Terminal M	AD 575–735			
Late-Middle	LM	AD 735–1010		M5a	AD 900–1000
				M5b	AD 1000–1050
Middle-Late	ML Transition	AD 1010–1210		M5c	AD 1050–1150
Late	L1A	AD 1210–1265	Late	L1a	AD 1150–1250
	L1B	AD 1265–1390		L1b	AD 1250–1400
	L1C	AD 1390–1510		L1c	AD 1400–1500
	L2A	AD 1510–1700		L2a	AD 1500–1650
	L2B	AD 1700–1720		L2b	AD 1650–1782
Historic	H	AD 1720–1899		L3	AD 1782–1804

Modified from Lambert 1994; Schwitalla 2013.

Prevalence of Violence

The CCBd (2012 version) contains data on 329 archaeological sites covering the period 3050 BC–AD 1899, and stretching from Monterey county in the south to Shasta county in the north. It incorporates information on 16,820 individuals, including three different types of violent trauma (blunt force, sharp force, and trophy-taking/dismemberment) divided by sex (male, female, indeterminate). However, access to this data is restricted.¹⁰⁵ Almost half of the sites (163) contained skeletal remains exhibiting violent trauma, with an overall prevalence for violence in central California of 4.94% (831/16820), or 4.41% (742/16820) if trophy-taking/dismemberment cases are excluded. The latter are problematic because while usually presenting as perimortem trauma, trophy-taking/dismemberment is predominantly a secondary form of violence that rarely occurs in the heat of battle. Furthermore, it is nearly

¹⁰⁵ Note that the CCBd is a meta-database compiled from ‘published and unpublished archaeological site reports, osteological appendices, burial records, and NAGPRA [Native American Graves Protection and Repatriation Act] inventories housed at regional repositories’. The full version of the CCBd includes ‘information on the individual age, sex, mortuary characteristics, pathological conditions, missing and detached body parts, modified human bone, antemortem and perimortem traumatic injuries, degree and type of taphonomic disturbances, and temporal phase assignments based on chronological markers.’ (Schwitalla et al. 2014a:70)

always accompanied by blunt and/or sharp force/projectile injuries, accentuating the risk of double counting.

For southern California, the most detailed sources cover just 30 sites, all centred on the Santa Barbara Channel area: the mainland coast, and the northern Channel Islands (Santa Cruz, Santa Rose, and San Miguel) (Walker 1989; Lambert & Walker 1991; Lambert 1994, 1997). The studies incorporate information on 1744 skeletons, most of which have been radiocarbon dated, but on the other hand, the sites span a much longer time frame (6000 BC–AD 1804). Partial data is provided on age, sex, era, types of injuries (e.g., cranial vault fractures, projectile injuries, and forearm parry fractures), and the timing of trauma (antemortem versus perimortem). At 11.24% (196/1744), the overall prevalence of violence in southern California is significantly higher than in the central region ($p < 0.0002$), although this result may be distorted by the exclusion of inland areas.¹⁰⁶

Although far from complete, if these samples are taken as representative of hunter-gatherer violence in California, then the overall prevalence is 5.05% (or 5.53% if cases of trophy-taking/dismemberment are included).¹⁰⁷ It is worth noting, however, that while covering the most populous regions, 26 of 58 modern day Californian counties are not included in either survey. Nevertheless, this result is remarkably similar to the 4.13–5.13% prevalence calculated for the Jōmon sample in Chapter 7 ($p = 0.18$ – 0.91), and only slightly higher than the Mesolithic European prevalence of 4.24% ($p = 0.12$); both statistically insignificant differences. This appears to indicate that the frequency of violence recorded in hunter-gatherer societies in California, Japan, and Europe varied somewhat, with the Jōmon occupying an overlapping position, although all existed within a fairly narrow band. However, if this prevalence is recalculated on a per century basis to take into account the length of their respective skeletal records, the intensity of violence for Japan (0.049%) and Europe (0.052%) are somewhat lower than for California (0.064%, or 0.070% including trophy-taking/dismemberment). The central California figure (0.089%, or 0.1% including trophy-taking/dismemberment) is lower than that for southern California (0.144%), indicating that the latter is the outlier.

¹⁰⁶ This figure is based on the assumption that blunt force and sharp force/projectile trauma did not occur on the same skeletons.

¹⁰⁷ Note that this calculation is based on direct evidence from the CCBd, rather than the slightly different published calculations used in Schwitalla et al. (2014a), which produces a figure of 4.97% (or 5.44% if cases of trophy-taking/dismemberment are included).

Spatiotemporal Analysis

Applying the same ‘hot/warm/cold spot’ criteria used in Chapter 7 to the Californian data produced striking differences with the Jōmon. The data for central California was derived from the abbreviated version of the CCBD appended in Schwitalla et al. (2014a) and supplemented by Schwitalla (2013), and the southern California data from Walker (1989) and Lambert (1994).

Large-scale massacres are known to have occurred in parts of North America, but as yet have not been identified in California (Lambert 2002:229). While no massacre sites have been confirmed, at least 45 potential ‘hot or warm spots’ can be identified from the CCBD (Table 8.7).¹⁰⁸ This far exceeds the numbers posited for Mesolithic Europe (6) and Jōmon Japan (3), implying a higher level of violence. ‘Warm spot’ clusters were found across every chronological phase and in most ethnographic territories; being especially common in those of the Costanoan and Plains Miwok peoples where violence may have been endemic.¹⁰⁹ The trauma prevalence for the central California ‘warm spot’ clusters was 5.89%; slightly lower than the intensities in Jōmon Japan (6.24%) and Mesolithic Europe (6.18%). Thus, the main difference between ‘warm spots’ in central California on the one hand and Jōmon Japan and Mesolithic Europe on the other appears not to be prevalence, but rather their quantity and pervasiveness.

Central California presented the opposite challenge to Jōmon Japan; whereas the latter had such a paucity of skeletons with trauma in close geographic proximity that it was difficult to identify any plausible ‘hot or warm spots’, in the former there was an embarrassment of riches. Often spanning long time periods, some central Californian sites potentially fell within multiple clusters. In such cases, the following additional principle was applied: include as many injured skeletons as possible in appropriate ‘warm spot’ clusters, while minimizing their chronological and geographic ranges, rather than maximizing the prevalence rate.

¹⁰⁸ Ethnographic territories were preferred to modern counties in Table 8.7 because they were contemporary with at least part of the hunter-gatherer period in central California.

¹⁰⁹ To be endemic, violence need only be found regularly, not continuously, amongst a particular people or in a certain area.

Table 8.7. Spatiotemporal Distribution of Skeletons with Violent Injuries in Central California

Ethnographic Territory Site(s)		Dates	Skeletons Total Injured		Prevalence
Bay Miwok	CCO-18, 548	>1500-500 BC	592	15	2.53%
	CCO-138, 139, 141, 147, 538	210 BC-AD 1720	584	21	3.60%
	CCO-647	AD 1210-1390	91	6	6.59%
Coast Miwok	MRN-5, 39, 254	AD 970-1660	80	6	7.50%
Costanoan	ALA-343, 453, 509, 514	>1500 BC-AD 1390	375	31	8.27%
	ALA-307, 309, SFR-4	>1500 BC-AD 1510	433	33	7.62%
	ALA-413, 483, 555, 613	>1500 BC-AD 1880	860	48	5.58%
	CCO-474	>1500 BC-AD 735	115	11	9.57%
	SCL-478	500-210 BC	105	21	20.00%
	SCL-68, 194, 732	500 BC-AD 735	191	15	7.85%
	ALA-12, 13	210 BC-AD 1210	111	10	9.01%
	CCO-151, 269, 295, 300, 600, 601	210 BC-AD 1700	297	9	3.03%
	ALA-328, 329, 330, 424	210 BC-AD 1720	1101	36	3.27%
	SCL-137, 674	210 BC-AD 1720	53	14	26.42%
	SCL-6, 128, 302	AD 445-1265	254	10	3.94%
	CCO-15, 235	AD 575-1390	55	12	21.82%
	SCL-690	AD 1010-1210	141	5	3.55%
	ALA-42, 46, 554	AD 1010-1265	563	25	4.44%
	ALA-342, SCL-30, 38	AD 1010-1720	315	30	9.52%
	SCL-294	AD 1210-1720	93	8	8.60%
Hill Nomlaki	GLE-10, TEH-10	AD 1010-1880	553	23	4.16%
Konkow/ River Nomlaki	BUT-233, GLE-101	>1500 BC-AD 1210	35	5	14.29%
Konkow/ River Patwin	BUT-84, 90, COL-2	AD 1010-1880	267	22	8.24%
Nisenan	SUT-24, YUB-14	210 BC-AD 1265	62	8	12.90%
Nisenan/ Plains Miwok	SAC-99, 109, 113	AD 420-1010	132	8	6.06%
Northern Sierra Miwok	CAL-14/405	AD 1010-1265	10	6	60.00%
Northern Valley Yokuts	SJO-91	500 BC-AD 735	405	20	4.94%
	SJO-17, 154	210 BC-AD 1390	284	5	1.76%
	MER-215	AD 1010-1510	25	9	36.00%
Plains Miwok	SJO-56, 68, 142	>1500 BC-AD 420	359	14	3.90%
	SAC-73, 107	>1500 BC-AD 1880	324	14	4.32%
	SAC-60, 66, 67	210 BC-AD 1720	293	12	4.10%
	SAC-6, 122, 127, 267	AD 420-1880	359	13	3.62%
	SAC-117, 145, 151	AD 575-1750	162	9	5.56%
	SAC-56, 85	AD 1390-1880	69	6	8.70%
Plains Miwok/ Nisenan	SAC-157, 200	500 BC-AD 575	32	11	34.38%
Plains Miwok/ Nisenan/ River Patwin	SAC-16, 29, 117	AD 445-1880	418	19	4.55%
Plains Miwok/ R. Patwin	SAC-42, 43, YOL-27	500 BC-AD 1515	176	16	9.09%
River Patwin	YOL-13	AD 1010-1210	124	9	7.26%
Southern Patwin	SOL-270, 255, 364	210 BC-AD 1210	471	19	4.03%
	SOL-357	AD 600-1000	324	6	1.85%
Southern Sierra Miwok	MAD-107, 115, 117, 133, 159	210 BC-AD 1880	252	33	13.10%
	MAD-171, 179	210 BC-AD 1880	136	7	5.15%

Wintu	SHA-143	AD 1390-1880	147	31	21.09%
Yana	BUT-288, 294	>1500 BC-AD 1700	30	7	23.33%
Total	111		11858	698	5.89%

Note: these ethnographic territories may not have existed during the relevant timespans listed. Injured skeletons at sites not meeting the ‘hot or warm spot’ criteria have not been included in this table.

The Santa Barbara Channel area is notorious for the longevity and intensity of its violent conflict (Walker 1989). Hence, it has long been the focus of archaeological investigation in southern California. Despite incomplete and somewhat confusing data, ten potential (and another four marginal) clusters can be identified in the area (Table 8.8).¹¹⁰ This also exceeds the numbers suggested for Mesolithic Europe (6) and Jōmon Japan (3), although less than a quarter of those for central California (45). Santa Cruz Island apparently endured a high prevalence of violence for over six millennia, from the earliest dated skeletons (4500 BC) to almost the end of the hunter-gatherer period (AD 1650) (Lambert 1994). Such longevity indicates that violence was endemic on this island. However, in at least one other area (Santa Barbara), every phase within the Late-Middle period (AD 300-1150) produced a violence ‘warm spot’.

Although gaps in the data make it impossible to calculate accurately the trauma prevalence for the southern California ‘warm spots’, a very rough approximation of 14.64% still represents the occurrence of violence at much higher intensities than in central California (5.89%), Mesolithic Europe (6.18%), or Jōmon Japan (6.24%). If the four marginal clusters are added to the ten potential ‘warm spots’, then the prevalence of violence across the southern Californian clusters remains much the highest at 11.95%.

¹¹⁰ Unlike in central California, the southern Californian data on the total injured skeletons provided in Lambert (1994) is not organised by site. Marginal ‘warm spot’ clusters result where insufficient skeletons can be assigned to a specific cluster, either because of location or dating issues.

Table 8.8. Spatiotemporal Distribution of Skeletons with Violent Injuries in Southern California

Period		Santa Barbara	Rincon Creek	San Luis Obispo	Ventura	Santa Cruz Is.	Santa Rosa Is.	San Miguel Is.
Early-Early	Total Skeletons	7	0	0	0	47	67	0
	Injured Skeletons	0	0	0	0	4	7	0
	Prevalence	0%	0%	0%	0	8.51%	10.45%	0
Late-Early	Total Skeletons	86	65	0	0	127	5	0
	Injured Skeletons	3-6?	2-5?	0	0	15-26?	2	0
	Prevalence	3.49-6.98%?	3.08-7.69%?	0	0	11.81-20.47?	40%	0
Early-Middle	Total Skeletons	293	6	0	0	67	148	0
	Injured Skeletons	4-10?	0	0	0	7	29	0
	Prevalence	1.37%-3.41%	0.00%	0.00%	0	10.45%	18.92%	0
Late-Middle	Total Skeletons	172	0	0	92	140	0	0
	Injured Skeletons	23-40?	0	0	9-26?	25	0	0
	Prevalence	13.37-23.26%?	0	0	9.78-28.26%?	17.86%	0	0
Late	Total Skeletons	219	0	17	0	155-276?	111-124?	41
	Injured Skeletons	10	0	0	0	15-46?	21-22?	10
	Prevalence	5.13%	0.00%	0.00%	0	9.68-16.67%?	17.74-18.92%?	24.39%

Note: the dark grey sections indicate potential clusters of violence, while the pale grey represent marginal clusters. Santa Barbara does not include all of the sites listed in Santa Barbara County in Lambert (1994). Figures in *italics* show the addition of sites from Walker (1989) that were excluded by Lambert (1994) due to the lack of site numbers. An additional six subadults (under 18) with healed or healed? cranial vault fractures were excluded from this table because Lambert did not specify to which site or time period they belong.

‘Hotspots’ represent a subset of ‘warm spot’ clusters. For example, six of the sites included in the list of potential clusters for Mesolithic Europe (Moita do Sebastião, Ofnet, Schela Cladovei, Vasilyevka III, Voloshkoe, and Zvejnieki) met the ‘hotspot’ criteria, whereas only two did so for Jōmon Japan (Hobi and Usu-Moshiri, see Chapter 7). These sites spanned an average period of 536 years (see Table 8.4) and 725 years (see Appendix 1 and Table 2.1), respectively. However, no less than 48 of the 163 individual sites in central California where skeletal trauma was found were technically ‘hotspots’, albeit they spanned an average of 1288 years. In southern California, at least ten sites were singularly violent and spanned an average of approximately 500 years. Thus, for ‘hotspots’ the trauma prevalence changes somewhat, increasing to 6.66% (618/9286 skeletons) for central California, 15.75% (120/762 skeletons) for southern California, 8.33% for Jōmon Japan (11/132 skeletons), and 13.06% for Mesolithic Europe (44/337 skeletons). Perhaps such ‘hotspots’ could be indicative of intra- or inter-group violence.

Taken together with the high overall trauma prevalence (11.24%), the spatiotemporal analysis confirms prehistoric southern California's status as an outlier in this comparative study. In other words, the southern Californian 'hotspots' appear to be much hotter, and the 'warm spots' much warmer. The higher the prevalence of violence and the larger the number of 'hot/warm spots' in a region, the greater the confidence that large-scale intergroup conflict occurred in that society.

When examining central California through a nonviolence lens, it again presents a contrast to Jōmon Japan. Of the 16859 skeletons from 313 sites in the CCB, just 2849 (16.9%) were located at the 150 sites (47.9%) where no violent trauma was identified.¹¹¹ A mere 67 of these sites (33.5%) fit the 'ten or more skeletons' criteria, which together contained 2550 skeletons (2550/16323, 15.6%). This represents approximately half of the proportion calculated for the Jōmon: 16.9% versus 41.7% for total skeletons without violence, or 15.6% versus 30.7% for sites with ten or more skeletons, respectively (see Chapter 7). Applying the same criteria used in Chapter 7 produced a total of 27 'cold spots' where 1064 individuals (1064/16859, 6.3%) likely did not experience violent trauma (Table 8.9). This is a statistically significant difference (central California 6.3%, Japan 16.3%, $p < 0.0002$), and confirms that a greater proportion of Jōmon people were unlikely to have experienced skeletal violence than central Californians.¹¹² In contrast to Jōmon Japan—where 'hot/warm/cold spots' were all located on the coast—in central California they were almost evenly balanced between coastal and inland sites ('warm spots' 22:23; 'cold spots' 14:13). However, most of the inland 'warm spots' were situated in valleys (16:7), whereas the majority of the inland 'cold spots' were in the mountains (3:10). These findings appear to contradict the widely held view that mountainous societies are more violent (Hudson 2017).

¹¹¹ The figures used here were derived from a recalculation of the publicly available version of the CCB from Schwitalla et al. (2014a) supplemented with data from Schwitalla (2013).

¹¹² With the possible exception of San Luis Obispo (Walker 1989), southern California could not be included in the 'cold spot' analysis due to the unavailability of specific site data.

Table 8.9. Central Californian Sites of Nonviolence

Ethnographic Territory	Site(s)	Dates	Total Skeletons <i>n</i>
Central Sierra Miwok	TUO-314	AD 1010-1210	14
Coast Miwok	MRN-152, 168	>1500 BC-AD 735	12
	MRN-27, 76	500 BC-AD 735	68
	SON-299	500-210 BC	44
Costanoan	CCO-222, 309, 431	>1500-210 BC	46
	CCO-30	AD 1390-1510	18
	MNT-229, 234	>1500 BC-AD 1010	22
	SCL-366, 775	>1500-500 BC	34
	SCR-44	210 BC-AD 1390	44
	SMA-125	AD 1010-1510	45
	SMA-22, 100, 110, 147	AD 575-1265	19
	SMA-335	210 BC-AD 1010	12
Hill Patwin	YOL-69	AD 1700-1880	151
Nisenan	SAC-485	210 BC-AD 420	15
Northern Sierra Miwok	CAL-279, 280	210 BC-AD 1880	12
	CAL-629/630	>1500 BC-AD 1880	199
	AMA-91, CAL-217	AD 1510-1720	15
	CAL-237	>1500 BC-AD 1720	63
	CAL-99	210 BC-AD 735	17
	AMA-56, CAL-185	210 BC-AD 1010	30
Northern Valley Yokuts	FRE-128, 129	AD 1510-1880	15
	MER-3, 56	AD 1010-1880	56
Salinan	MNT-281, 282	210 BC-AD 420	14
Southern Patwin	SOL-236	AD 1210-1510	13
	SOL-356	AD 1510-1700	18
Wintu	SHA-20	AD 1700-1880	38
Yana	TEH-1, 193, 328	AD 1700-1880	34
Total	44		1064

Types of Violence

Having established the overall similarity in the spatiotemporal prevalence of violence and differences in the quantity and pervasiveness of ‘hot/warm/cold spots’, it is necessary to examine the types of violent skeletal trauma suffered: blunt force; sharp force/projectile, and trophy-taking/dismemberment.¹¹³ This will help to highlight variations in the patterns of violence by sex, age, and trauma position on the skeleton, as well as assist in determining the level of violence experienced in these societies.

Comparing the prevalence of trauma types in Jōmon Japan and prehistoric California reveals significant differences between the incidence of blunt ($p = 0.0006$) and sharp force/projectile trauma ($p = 0.002$). The difference between central and southern California was even more pronounced for blunt force ($p < 0.0002$), but insignificant for sharp force/projectile trauma ($p = 0.19$). It appears that the prevalence of blunt force trauma was higher among the Jōmon compared to the native Californians, whereas the opposite was true for sharp force/projectile trauma (Table 8.10). Nevertheless, in southern California the blunt force trauma ratio was more than double that in Japan, perhaps due to ritual fighting with clubs in the former, as described by Walker (1989).

Table 8.10. Blunt Force and Sharp Force/Projectile Trauma in Jōmon Japan and Prehistoric California

	Blunt Force Trauma			Sharp Force/Projectile Trauma		
	Total Skeletons <i>n</i>	Injured Skeletons <i>n</i>	Prevalence	Total Skeletons <i>n</i>	Injured Skeletons <i>n</i>	Prevalence
Jōmon	1053	40	3.80%	1053	13	1.23%
California	18564	405	2.18%	18564	526	2.83%
Central	16820	274	1.63%	16280	468	2.78%
Southern	1744	131	7.51%	1744	58	3.33%

Note: sharp force trauma for California includes incisions, but is excluded from the Jōmon data (see Chapter 6). The Jōmon data includes previously reported cases of trauma, and one individual, who exhibited both blunt force and sharp force/projectile injuries, has been counted twice (see Chapter 7).

¹¹³ Parry fractures are excluded since they are not discussed by Schwitalla et al. (2014a, 2014b) or listed separately in the CCBD, and although included in Lambert (1994), she identified few examples (2.29%, 8/350).

Blunt Force Trauma

Evidence of blunt force trauma is easier to overlook than sharp force/projectile trauma, but careful examination of human skeletal remains (particularly the skull) minimises this problem. With the CCBD being such an extensive database, Schwitalla et al. (2014a) reduced the sample size to 6202 by excluding subadults and individuals missing any of the five major skull elements (frontal, parietals, occipital, maxilla, and mandible).¹¹⁴ This inevitably increases the prevalence of blunt force trauma in central California; from 1.6% (274/16820 burials) to 4.3% (264/6202 adults). Nevertheless, there was considerable variation across central California, with people in the Central Valley region (5.6%, 132/2349) clearly experiencing the most trauma, followed by those in the San Francisco Bay area (3.8%, 130/3456), and Sierra Nevada (0.5%, 2/397) (Schwitalla et al. 2014a:76).

Applying Schwitalla et al.'s criteria, Pilloud et al. (2014) identified a total of 337 blunt force craniofacial injuries, with perimortem (26.1%, 88/337) being much lower than antemortem (73.9%, 249/337); representing a three in four chance of surviving such an encounter. The most common injuries were antemortem depressed fractures of the parietal (29.1%) and frontal (22.6%) bones; the former found more frequently on females and the latter on males (Fig. 8.1). This might imply that males were slightly more likely to engage in face-to-face combat than females (Pilloud et al. 2014:267-69). Overall, a significantly higher percentage of males (5.5%, 141/2557) exhibited craniofacial injuries than females (4%, 103/2580) ($p = 0.01$), or indeterminates (1.9%, 20/1065) ($p < 0.0002$). This was true of every region, and with the exception of the Early-Middle and Protohistoric/Historic periods when more males suffered trauma, the sexes were broadly similar over time (Schwitalla et al. 2014a). Being cumulative, antemortem trauma cases increased with age in this sample, but for males most injuries were acquired during young adulthood, while for females the number of incidents continued to rise as they aged (Pilloud et al. 2014:269-70). In contrast, perimortem trauma was generally more common among males than females in all age groups, but after adolescence, decreased in both sexes with increasing age (Pilloud et al. 2014:262-68). In other words, lethal injuries were more frequently suffered at younger ages in males and females, but individuals usually survived craniofacial trauma in central California.

¹¹⁴ Schwitalla et al.'s refinement (using the true prevalence method) was not employed in Table 8.10 because it could not be applied retroactively to the Jōmon or southern Californian data.



Figure 8.1. Antemortem depressed blunt force trauma to the frontal bone of an individual from CA-SCL-478 site, central California (Schwitalla et al. 2014a:74).

Unlike in central California, blunt force was the most frequent trauma type seen in the south (Table 8.10), with a significantly higher prevalence than the former ($p < 0.0002$). The overwhelming majority was antemortem depressed cranial injuries rather than perimortem, and appear intentional. Walker's (1989) ground-breaking study revealed 122 of 744 crania (16.4%) with antemortem ('non-lethal') depressed fractures in the Santa Barbara Channel area. Later, Lambert (1994, 1997)—who incorporated most of Walker's findings in her own study—identified slightly more antemortem ('healed/healed?') cases (17%, 128 of 753 crania), alongside '2 or 3' crania exhibiting perimortem depressed fractures (17.4%, 131/753 in total).¹¹⁵ Yet, they differed markedly regarding the geographical distribution of the injured individuals. For Walker, such injuries were much more common among northern Channel islanders (18.6%, 111/598) than mainlanders (7.53%, 11/146), whereas Lambert (1994, 1997) found that the antemortem prevalence was roughly equal for islanders (18.5%, 84/454) and mainlanders (18.1%, 38/210). While Walker's figures included children and Lambert's did not, this cannot entirely account for the difference. Lambert (1994) identified 168 antemortem (98.8% or 98.2%) and '2 or 3' perimortem fractures (1.18% or 1.75%) on 138 crania exhibiting blunt force trauma, indicating that nearly all individuals in the sample survived.

In contrast to central California, Walker found that within the Channel population, frontal bone injuries (55.1%) outweighed those on the parietals (43.2%); a finding largely confirmed

¹¹⁵ Lambert (1994) identified 138/753 crania with violent fractures (18.3% of the total cranial sample), of which 128 had 'healed' or 'healed?' and 10 had 'perimortem' (7/10 exhibited sharp force/projectile trauma only).

by Lambert (front 54.2% and side—forward $\frac{3}{4}$ of the parietals—31.5%). However, when divided by sex, the pattern more closely resembles that further north (male front 63.8%, side 27.7%; female front 37.3%, side 40.7%); again suggesting a male predilection for face-to-face confrontations and perhaps a female preference for flight over fight (Lambert 1994:116-19). Akin to central California, males in southern California also exhibited significantly higher frequencies of blunt force craniofacial trauma than females, although the difference between the sexes was more pronounced in the south (Lambert: male 25.2%, 82/325; female 14.4%, 42/292, $p = 0.0008$). Unusually, both Walker (1989:316-19) and Lambert (1994:112) found that healed cranial injuries were most common in young (12.1% or 17.3%) and middle-aged (21.5% or 23.5%) adults. Although Walker's results may be partially explained by sample bias, the same cannot be said of Lambert.

A comparison of Pilloud et al. (2014) with Walker (1989) and Lamberts' (1994, 1997) data indicates that blunt force cranial injuries in central California were larger and deeper than those in southern California, but also less common. This suggests that central California experienced a different style of combat; larger weapons being deployed with greater intent to inflict grievous harm, and hence less likely to have been ritualised conflict, as inferred for the south (Pilloud et al. 2014:268-69). Perhaps this intent is also reflected in the higher rates of trophy-taking and dismemberment observed in the archaeological and ethnographic records of central California (see below).

Occasional upsurges in violence are evident across central California, especially during the Medieval Climatic Anomaly (MCA) (AD 800-1350) in the Sierra Nevada, when extreme drought appears to have caused a surge in competition for limited resources, although the peak came in the Protohistoric/Historic period (Pilloud et al. 2014:269-70; Schwitalla et al. 2014a). Pilloud et al. therefore concluded that rates of interpersonal violence in central California were linked to resource availability (and later the arrival of Europeans). However, there is no apparent agreement on when violence peaked in southern California: Walker (1989) states that it was during the Early-Middle period (at least on the Channel Islands); Lambert (1997) during the Late-Middle period; Arnold et al. (2004) during the Middle-Late Transition, while Gamble (2005) appears to agree with all three. Yet, Walker argued similarly that the high frequency of healed cranial trauma on the northern Channel Islands was a consequence of limited natural resources being outstripped by rapid population growth; only partly ameliorated by ritual fighting with clubs or similar weapons as a non-lethal means of

conflict resolution. Lambert (1997:78) also saw a correlation between the prevalence of violent conflict in the Santa Barbara Channel area and times of severe drought.

Like southern California, for Jōmon Japan blunt force trauma prevalence outweighed that of sharp force/projectile; being found on 4.62% (40/866) of skulls analysed in this thesis (including the two previously reported cases), or 4.98% (40/803) when infants and children are excluded.¹¹⁶ However, the prevalence of blunt force trauma was significantly lower than in southern California (4.98%:17.4%, $p < 0.0002$), though similar to that in central California (4.98%:4.26%, $p = 0.34$). A total of 57 blunt force craniofacial injuries were identified on the Jōmon skulls, with slightly more antemortem (52.6%) than perimortem (47.4%). As in central California, the most common Jōmon injuries were antemortem fractures to the parietal bones (36.8%), although perimortem parietal fractures (26.3%) came second.¹¹⁷ When divided by sex, the former was most frequently found on males; however, it was the latter on females. Overall, a higher percentage of Jōmon males (5.57%, 20/359) exhibited this type of trauma than females (4.62%, 16/346), or indeterminates (5.1%, 5/98), which is akin to California, but the difference between the sexes was notably narrower. Given the small sample size and difficulty in assigning several individuals to a specific age group, it is perhaps not surprising that there was no discernible pattern in antemortem or perimortem cranial trauma cases with increasing age. Twice as many females as males suffered lethal injuries, but nevertheless, as in California, Jōmon individuals usually survived blunt force craniofacial trauma. However, most significantly, blunt force injuries to the Jōmon were much more likely to result in death in comparison to Californians (47.4%:17.9%, $p < 0.0002$, central and southern Californian injury figures combined), or even central Californians (47.4%:26.1%, $p = 0.0011$). In other words, people were usually able to survive a blunt force trauma attack in either Jōmon Japan or California, but the Jōmon were more likely to die from that injury than Californians.

Sharp Force/Projectile Trauma

Sharp force/projectile trauma on skeletal remains is indicated by incisions, chop marks, puncture wounds, and embedded projectile points. It was the most prevalent form of violence found in central California (see Table 8.10 and Fig. 8.2). Schwitalla et al. (2014a) drastically

¹¹⁶ In Chapter 7, this data was organised according to standard Japanese archaeological practise, but in order to be compatible with the Californian data, here the Jōmon data has been recalculated according to American practice. Note also that a young-middle aged adult male from Koboro cave was counted twice because he exhibited both blunt force and sharp force/projectile trauma on his cranium.

¹¹⁷ Note that the old adult male from Ubayama site was counted twice because he exhibited both antemortem and perimortem blunt force cranial trauma.

pared their sample size from the CCBBD again by rejecting skeletons that were less than 70% complete (including the skull, long bones, manubrium, ribs, vertebral column, and pelvic girdle, these being regarded as the elements most commonly targeted). This inevitably increased the prevalence of sharp force/projectile trauma in central California; from 2.78% (468/16820 burials) to 7.4% (462/6278 burials). The geographical distribution of such trauma in central California differed markedly from the blunt force trauma pattern, with the Sierra Nevada region showing the highest (10.8%, 45/417), followed by the Central Valley (9.6%, 203/2125), and San Francisco Bay (5.7%, 214/3736) (Schwitalla et al. 2014a:78). Overall, males (10%, 233/2298) exhibited a significantly higher frequency of sharp force/projectile trauma than females (4.5%, 108/2374) ($p < 0.0002$), or indeterminates (2.4%, 18/739) ($p < 0.0002$). Since this was true of every region and time period, these figures suggest that males were more frequently engaged in raiding and warfare in this society than females. However, as Larsen (2015:143) points out, females were not only victims of violence but also sometimes participants in combat. Young adulthood (18-35) was the most dangerous age for males, whereas for females it was adolescence (12-18); sharp force/projectile trauma slowly declining in both sexes thereafter (Schwitalla et al. 2014a:77). Schwitalla et al. (2014a) do not analyse their data according to lethality. However, within Allen et al.'s (2016) subsample of the CCBBD (3939~3947 burials dating from the Late-Middle to Late Prehistoric periods), 94.4% (286/303) of sharp force/projectile (and 23.5%, 36/153 of blunt force) cases were identified as definitely perimortem, confirming the much greater lethality of the former trauma type.

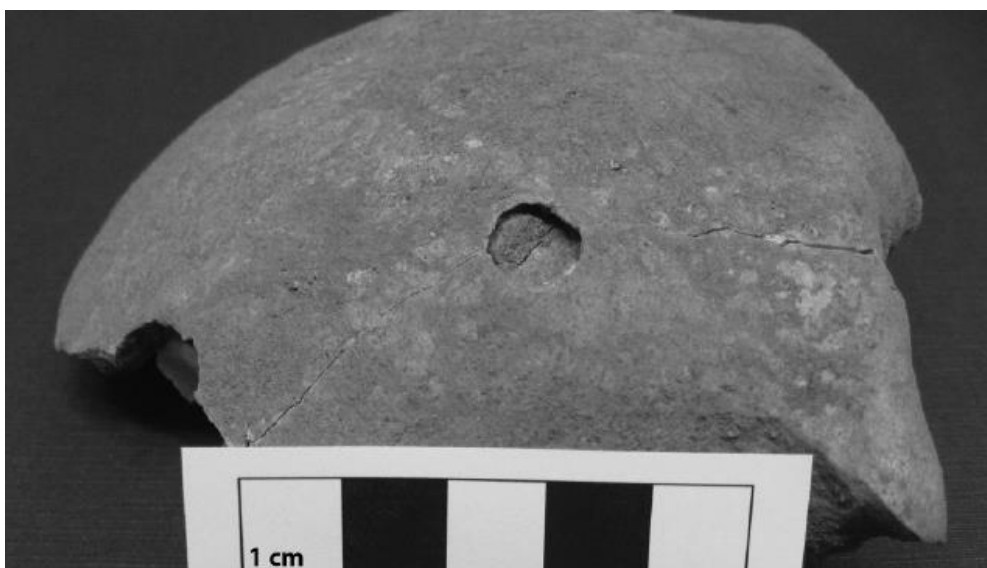


Figure 8.2. Two perimortem depressed stab wounds to the right frontal bone of an adult male from the Sacramento Valley, central California (Schwitalla 2013:70).

Schwitalla et al. (2014a) posited two periods of elevated violence. The first came during the Early-Middle period when trophy-taking/dismemberment peaked along with increased sharp force trauma, possibly as a result of the migration of ethnolinguistic groups into central California at this time. This was followed by an increase in sharp force/projectile trauma during the Middle-Late Transition, which accompanied the arrival of bow and arrow technology around AD 1000-1200, but is said to have been a response to the droughts of the MCA causing resource scarcity (Kennett et al. 2013:127; Schwitalla et al. 2014a:81; Allen et al. 2016:12124). Such violence continued to increase until it peaked again in the Protohistoric/Historic period, with high levels of blunt force craniofacial and projectile trauma attributed to the ripple effects triggered by European arrival in southwestern North America (Schwitalla et al. 2014a:81). However, when recalculated on an annualised basis, Schwitalla et al.'s data reveals a constant but variable increase in the prevalence of sharp force/projectile trauma over time.¹¹⁸

Compared to central California, sharp force/projectile trauma was more prevalent in the south, although not sufficiently so to be statistically significant ($p = 0.19$) (Table 8.10). Lambert (1994, 1997) identified 118 projectile wounds on 58 skeletons, representing 3.33% of the total sample of 1744 individuals. The prevalence increases to 4.99% (58/1163) if children less than ten years old are excluded (to make it more comparable with Schwitalla et al.'s central California figure). When contrasting the geographical distribution of the entire Santa Barbara Channel area sample, mainlanders exhibited a much higher rate overall (4.1%, 36/877) than islanders (2.54%, 22/867); a rather less balanced outcome than for blunt force trauma.¹¹⁹ Overall, males (9.63%, 42/436) exhibited a significantly higher frequency of sharp force/projectile trauma than females (3.67%, 14/381) ($p = 0.0008$), and this bias held true for every time period in southern California. Young adulthood (15-25.9 years) was again the most dangerous age for males (13/71, 18.3%), but for females it was middle age (>30 years, 3/28, 10.7%), before declining sharply for both sexes after the age of forty. Lambert speculates that this society conferred some degree of protection on young children (<10 years, 0/242) and the elderly (>40 years, 3/215, 1.4%). At least 72% (42/58) of individuals with sharp force/projectile trauma died from their wounds, with young adult males the most susceptible, followed by mature males (26-40 years) (Lambert 1997:95). This is consistent

¹¹⁸ Whereas calculating the prevalence by chronological periods produced Schwitalla et al.'s stepped curve, recalculating it on an annualised basis—useful when periods are of such unequal length (179~2550 years)—revealed an exponential rise in the average prevalence.

¹¹⁹ Lambert (1994) does not provide a table detailing the geographic distribution of individuals by age.

with the view that younger males engaged more frequently in lethal raiding and feuding than others in this society.

Similar to the central Californian record, a significant increase in sharp force/projectile trauma rates in southern California between ca. AD 300 and 1500 has been identified from human remains and mortuary contexts (Lambert & Walker 1991:970; Eerkens et al. 2014b:297). This overlaps with the severe drought conditions of the MCA (AD 300-1150), which according to Lambert (1994) was associated with both resource scarcity in the Late-Middle period and the introduction of the bow and arrow around AD 580. Brill (2014:327) went further in arguing that the environmental pressures which caused violence to escalate led to an investment in increasingly sophisticated tool/weapon forms in this region, including the adoption of the bow and arrow. In other words, the rise in violent conflict was the prime motivator driving the improvement in weapons technology. Unlike in central California, however, there was a decline in violence here during the Late period when environmental productivity improved, helping to stabilise the region's political economy (Lambert & Walker 1991:970; Arnold et al. 2004:18; Brill 2014:330). Like many anthropologists, Lambert and Walker (1991:970) believe that 'conflict is a prime mover that drives societies toward greater political complexity.' Hence they conclude that the chiefdoms of the Santa Barbara Channel area emerged in large part as a result of this violence and warfare.

Evidence of sharp force/projectile trauma was rarely found on either crania or postcrania in the Jōmon sample (even when previously reported cases were included), with a prevalence of 1.23% (13/1053), or 1.36% (13/959) excluding infants and children. However, the prevalence of sharp force/projectile trauma was significantly lower than in both southern (4.99%, $p < 0.0002$) and central California (7.4%, $p < 0.0002$). A total of just fifteen separate injuries were identified (antemortem 26.7%, perimortem 73.3%). Overall, males (0.95%, 10/1053) exhibited a much higher frequency of this type of trauma than females (0.28%, 3/1053); an even more pronounced imbalance than in central or southern California, but again the small sample size meant that there was no apparent age profile. The greater lethality of sharp force/projectile trauma seen in California is confirmed by the Jōmon sample, with at least 69% (9/13) of individuals dying from their wounds; approximately double the percentage of blunt force trauma (35%, 14/40). Nevertheless, in contrast to blunt force trauma fatalities, Jōmon people were slightly less likely to die from projectile wounds than Californians, especially those in the south.

Trophy-taking/Dismemberment

Dismembering and taking specific human body parts either as mementos or as trophies is a practice found in many past (and some present) societies around the world, including prehistoric North America. It is generally interpreted as evidence of intergroup violence and warfare (Bowles 2009:1296; Lahr et al. 2016:396). Although often confused with excarnation or other ritual mortuary processing, trophy-taking “is suggested when skeletal elements are repeatedly missing from burials, and cut marks consistent with dismemberment are present on adjacent bones.” (Andrushko et al. 2005:375) The head, or some part thereof (especially the scalp), was most commonly targeted, but any body part could be removed from victims of violence. Evidence for trophy-taking/dismemberment practices in Jōmon Japan remains controversial (see Chapter 5), and while no examples have been identified in southern California, it was relatively commonplace in central California (Lambert 2007; Andrushko et al. 2010).¹²⁰

Within the CCBBD, trophy-taking/dismemberment represents 0.7% (87/12603) of the total skeletons analysed by Schwitalla et al. (2014a, 2014b), or 10.7% of the 813 individuals exhibiting one of the three forms of violence documented in the database (Fig. 8.3-A). The practice reached its zenith in the Early-Middle Transition period (500-210 BC), perhaps due to conflict with ethnolinguistic groups that migrated into central California during this time (Andrushko et al. 2010:83; Schwitalla et al. 2014a:74). In the San Francisco Bay area, this is exemplified by strong evidence of forearm trophy-taking and subsequent bone modification practice at site CA-SCL-674, where 6.25% (14/224) of adults in primary burials were missing forearms (Andrushko et al. 2005) (Fig. 8.3-B). Most of them also had perimortem cut/chop marks on their distal humeri.

¹²⁰ Based on linguistic, ethnographic, and archaeological evidence, Lambert (2007:79, 84) claims that Penutian-speaking peoples brought trophy-taking to California approximately 4000~6000 years ago.

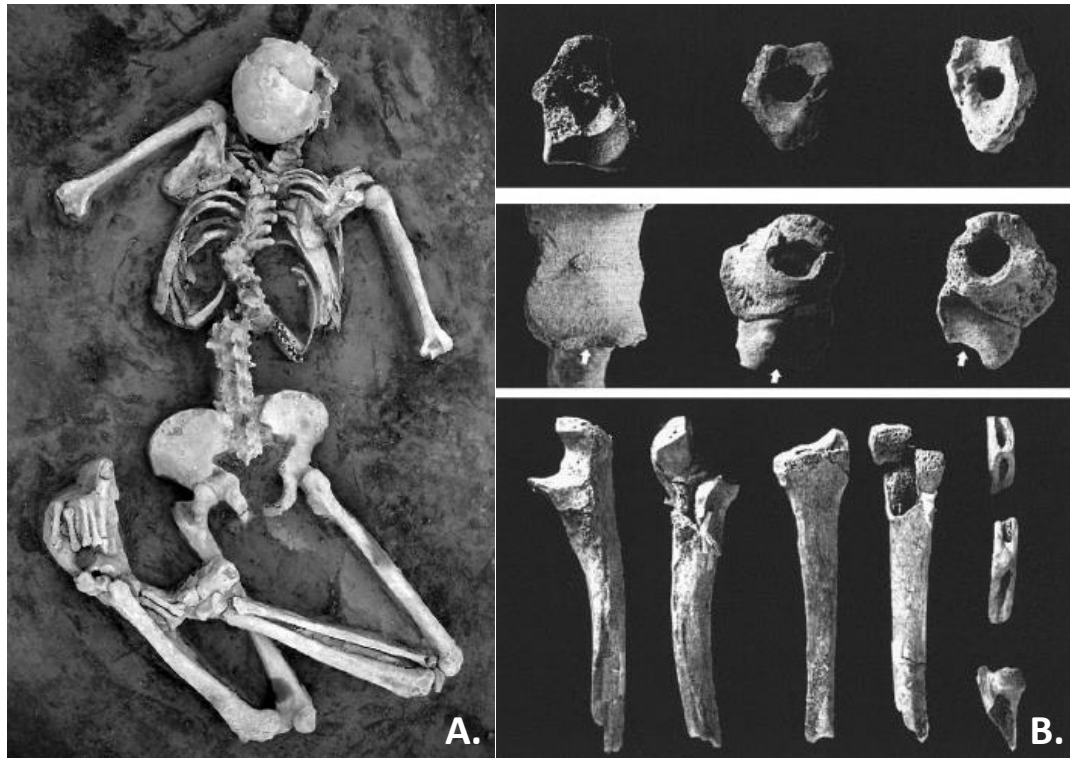


Figure 8.3. A. Skeleton exhibiting forearm trophy-taking from CA-SCL-478 site, central California (Schwitalla et al. 2014a:72). B. Drilled and polished forearm bones for display and ritual use from the CA-SCI-674 site, central California (radii: top row, bottom right; ulnae: middle row, bottom left) (Andrushko et al. 2005:377).

Patterns of intergroup violence between Native American populations can be discerned by studying these ritual practices, which served to increase the status and power of the trophy-taker (Andrushko et al. 2005). It appears that the vast majority of trophy-victims shared certain distinguishing features often associated with warfare. They were young to middle-aged adult males (a “draft-age” demographic), frequently found buried haphazardly in mass graves with similar victims, and displayed numerous blunt and sharp force trauma, including cranial and postcranial fractures and embedded projectile points (Andrushko et al. 2010:93). Andrushko et al. (2010) attribute the prevalence of these practices to social geography: the close proximity of culturally diverse (and hence hostile) tribes in central California, unlike in the south.

Mass Graves and Stable Isotope Analysis

In addition to large-scale, population-based studies of violence in prehistoric California, some scholars, such as Eerkens et al. (2014a, 2014b, 2016), have used stable isotope analysis to re-examine skeletons from mass graves, in order to reconstruct the victims’ life histories and the circumstances surrounding their deaths. Since the revival of archaeological interest in the

study of violence in the 1990s, examining physical injuries on human skeletal remains has been the dominant method of determining patterns of violence among prehistoric hunter-gatherer societies in California. However, in recent years stable isotope analysis has begun to play a more prominent role by helping to distinguish between (isotopic) ‘local’ and ‘non-local’ victims of violence, and thereby establish whether the violence occurred intra- or inter-group (Eerkens et al. 2014a, 2014b).

Eerkens et al. used stable carbon, nitrogen, oxygen, and strontium isotopes to re-examine prehistoric hunter-gatherer skeletons from three mass burial sites in coastal central California (CA-YOL-117, CA-SCL-38, and CA-ALA-554), as well as genetic (mtDNA) testing at the last. Dating from the Late-Middle and Late Prehistoric periods, similar isotopic data from all three sites suggest that the relatively healthy male victims had migrated from more densely populated inland areas, such as the Sacramento-San Joaquin Valley (Eerkens et al. 2014a:479, 2014b:307-08). Exhibiting a variety of perimortem trauma (blunt and sharp-force/projectile wounds), the migrants (‘non-locals’) had clearly been treated as outsiders, implying inter- rather than intra-group violence as the probable cause of death (Eerkens et al. 2014a, 2016). In contrast to McCorkle’s (1978) ethnographic account, with the benefit of genetic testing, the authors hypothesised that conflict in prehistoric California involved groups of (maternally) unrelated or distantly related men. Furthermore, Eerkens et al. (2016) theorised that territorial expansion due to high population densities and competition over resources (especially during times of drought) were the leading causes of violence and warfare in prehistoric central California. Yet, as Eerkens et al.’s analysis is restricted to mass burials, it may not be generalisable.

Since mass graves are rare in the Santa Barbara Channel area, it appears that archaeologists are yet to conduct similar isotopic analyses on the southern Californian skeletal sample (Lambert 2002). Nevertheless, Lambert (1994) noted that the provenance of the stone used in projectile points found embedded in some victims of violence in the Santa Barbara Channel area was restricted. Together with the fact that victims’ graves were usually located far from major cultural (linguistic) boundaries, these findings suggested violent conflicts in southern California generally involved affiliated groups rather than strangers. This indicates another difference in the pattern of conflict between central and southern California. Unlike in California, stable isotope analysis is yet to be systematically applied to the study of Jōmon violence.

Indirect Evidence of Violence

Weapons

Indirect evidence of violence in prehistoric California is somewhat ambiguous. While lacking defensive structures common in other parts of North America (e.g., the Northwest Coast), California did witness the introduction of sophisticated projectile points apparently designed to kill humans (Lambert 2002; Bettinger 2013). Although estimates vary, the bow and arrow replaced the throwing stick (atlatl) and dart around AD 500; its introduction revealed by the marked shift from large (Vandenberg Contracting-stemmed points) to small (Malaga Cove points) projectiles in archaeological assemblages and skeletal contexts (Lambert 1994; Glassow et al. 2007; Snow 2015).¹²¹ For Lambert (2002:218), this development ‘changed how war was conducted’ in California. Brill (2014) agreed, arguing that a greater investment in weapons technology had led to the emergence of arrowheads designed specifically for warfare, since they featured extreme barbs which made them virtually impossible to remove. Given that this innovation coincided with the MCA, he saw the rise in violence as the only logical response to widespread resource stress, which again declined when environmental productivity later improved, as evidenced by a decrease in embedded points (Brill 2014:314, 328-30).

Kennett et al. (2013) saw the introduction of the bow and arrow (AD 650-900) to the Santa Barbara Channel area as a force multiplier, but they believed that the increase in interpersonal violence probably predated its arrival. They agreed with earlier studies that the highly unstable environment (AD 600-1100) was the root cause of mounting socio-political instability and violence. When periodic droughts (recorded in tree rings) and a warming Pacific Ocean caused both terrestrial and marine productivity to decline, the growing population exceeded the local carrying capacity, as revealed by health stress and disease indicators on skeletons (Lambert 1994, 1997). This stimulated intragroup social coercion (‘law enforcement’) in an effort to bring violence under control which, when combined with the arrival of the bow and arrow, promoted sedentism, population aggregation, and economic intensification (fisheries) (Lambert & Walker 1991). It ultimately led to the emergence of intergroup conflict (as evidenced by the increase in projectile injuries to women and adolescents) and social hierarchy (chiefdoms, AD 900-1300), since such politically

¹²¹ Apparently, ‘the bow and arrow would have been superior in warfare to the throwing stick and dart’ (Glassow et al. 2007:307).

centralised structures were better at compelling the cooperation required to prevail in warfare (Arnold 1992; Kennett et al. 2013; Snow 2015).

In contrast, Bettinger (2013) argued that in central California, where the bow and arrow arrived from the east much later (AD 1000-1200), it did not lead to increased social coercion as they lacked sufficient social organisation to effectively employ the new weapon technology. Schwitalla et al. (2014a) disagreed, however, since they discerned a continuous increase in arrow-related violence from its introduction onwards. In short, the arrival of the bow and arrow exacerbated an already unstable situation in California caused by the breaching of the Malthusian ceiling, and via various mechanisms, facilitated growing intergroup violence.

The origin of bow and arrow technology in Japan likely coincided with the start of the Jōmon period, and was used primarily for hunting (see Chapter 4). It is difficult to assess its impact on the prevalence of violence, since no skeletons survive from the Incipient Jōmon phase. Arrowhead numbers fluctuated spatiotemporally, but in eastern Japan they increased considerably during the Late Jōmon and peaked in the Final. There is no consensus among archaeologists to explain this phenomenon (see Chapter 4), but applying the Californian argument, one possibility might be that it was related to a deteriorating climate which led to shifts in subsistence patterns and an increase in violence. Yet, a dearth of projectile trauma evidence makes it impossible to determine the validity of this argument. Furthermore, unlike in California where arrowheads designed for warfare emerged, Jōmon stone arrowheads did not make such a technological leap until the Yayoi period, when new and more deadly types were introduced and employed as a human-killing weapon. Thus, while it has been argued that the introduction of the bow and arrow in central and southern California was linked to an increase in violence (Larsen 2015:174), there is insufficient evidence to repeat this claim for Jōmon Japan.

In addition to the bow and arrow (some being obsidian-tipped or poisoned with rattlesnake venom), the native Californians also used spears, daggers, clubs, and slings as offensive weapons. Defensive weapons included elk hide ‘armour’ and shields and wooden rod ‘armour’ vests (Pritzker 2000). As noted above (see Chapter 4), Jōmon society apparently lacked such defensive equipment, but since this would have been fashioned from perishable materials, the likelihood of its survival and subsequent recovery is small.

Defensive Structures and Settlement Locations and Patterns

It appears that the native Californians were selective in their importation of military technology. Having eventually adopted the bow and arrow—a highly portable weapons system—they seemingly chose not to build defensive works, even in times of war (Lambert 2002:217). Admittedly, given the sometimes ephemeral nature of such structures, they are often unidentifiable in the archaeological record. Yet, defensive architecture is rarely mentioned even in the ethnographic and historic accounts discussing warfare in the region (Kroeber 1976). Nevertheless, there is some evidence of villages being constructed on headlands and clifftops in the northern Channel Islands, which, according to Kennett et al. (2013:129), is suggestive of strategic intent. Lambert (2002) proposed that mobility may have offered an alternative defensive strategy; however, as she later conceded, populations and settlements grew too large to relocate easily.

Structures built in and around settlements specifically for defensive purposes also appear to be absent in the Jōmon record. Features such as the ditched enclosure at Shizukawa and the six-pillar wooden structure at Sannai Maruyama could be interpreted as a moat and watchtower, respectively, but no evidence of violence has been discovered at either site, and the archaeological remains suggest ceremonial uses (see Chapter 4). The Jōmon people often chose to locate their settlements on slightly elevated ground, such as tablelands and hillsides. However, in contrast to the Santa Barbara Channel Islanders, this decision is thought to have been a response to local environmental conditions (e.g., proximity to water sources, andosols, and eco-junctions) rather than defensive intentions. Changes in Jōmon settlement patterns have been linked to shifts in subsistence practices resulting from the overexploitation of resources, environmental degradation, and ultimately, climatic changes (see Chapter 4). In contrast to southern California, where an increase in violence led to the agglomeration of settlements, in some parts of Japan a decentralisation strategy seems to have been adopted, perhaps suggesting that people respond to increased violence according to its nature and their cultural norms. The prevalence of violence was lowest during the Middle Jōmon period (1.2%), when the climate was relatively warm and stable, and large nucleated settlements emerged. It increased in the Late (2.2%) and Final (4.8%) phases when the climate deteriorated and settlements shrank, decreased in number, and became more dispersed.¹²²

¹²² When previously reported trauma cases are included, the prevalence of violence increases (because this data only contains injured skeletons) and the distribution shifts somewhat. Nevertheless, prevalence remained

Iconography

Despite the occasionally high prevalence of violence-related injuries in the skeletal record, and the well-documented adoption of the bow and arrow as a lethal weapon, it appears that the emergence of intergroup conflict did not have a significant influence on prehistoric iconography in California. The native Californians enjoyed a rich artistic culture; decorating their pottery, baskets, and rocks with colourful images of humans, animals, and abstract geometric patterns (see Penney 2004). Yet, iconographic scenes of violence are rare in California, and those that do exist are ambiguous. For example, a petroglyph panel (CA-INY-1375) found at Sheep Canyon (Coso Range, eastern California) appears to depict two groups of opposing anthropomorphic bowmen shooting arrows at each other (Yohe et al. 1986). However, since arrows are not shown protruding from any of the twelve figures, this implies a lack of casualties. At least three plausible interpretations have been offered: a hunting scene; a ritual dance line or vision quest, or a small battle scene (whether real or mythical) (Yohe et al. 1986:136). The last seems most likely given the horizontally pecked lines representing arrows in flight, and the absence of animals.

The Jōmon people also used their pottery vessels and pebbles as a canvas on which to depict a range of daily activities, such as hunting and childbirth, that were important to their survival. Unlike in California, however, no images of violent incidents between humans have been discovered from the Jōmon period (see Chapter 4).

Comparing Patterns and Levels of Violence

Many characteristics seem to be shared by the Jōmon and Californian hunter-gatherers, superficially or otherwise, but there are also important differences between their patterns of violence. If focusing on the overall prevalence, these societies appear remarkably similar; indeed the difference between central and southern California is much greater (4.94%:11.24%, $p < 0.0002$) than that between California and Jōmon Japan (5.05%:5.13%, $p = 0.91$). Both of these societies may have been somewhat more violent than ‘Mesolithic Europe’ taken as a whole, in contradiction to Nakagawa and Nakao’s (2017a, b) findings, yet this need not imply a higher level of violence.

relatively low during the Middle Jōmon period (4.7%), reached its lowest point in the Late phase (2.2%), before increasing in the Final (6.4%).

Adding the spatiotemporal dimension reveals a stark contrast between Jōmon Japan and Mesolithic Europe on the one hand and southern California on the other, with the latter outweighing the former in both the quantity and intensity of potential violent ‘hot/warm spots’. Central California represents the two extremes: the most extensive network of ‘warm spot’ clusters, together with the lowest intensity of violence. Thus, when the Californian data are merged, the quantity of clusters exceeds Japan and Europe combined by a ratio of over 6:1, while the intensity at the potential ‘warm spot’ clusters becomes 6.77%; higher than for either Jōmon Japan or Mesolithic Europe. This indicates a propensity to upsurges of violent conflict in California, which implies a divergence in the level of violence experienced in these societies. However, incorporating the direct and indirect evidence into the basic prevalence model confirms that while the Californians almost certainly engaged in warfare, the Jōmon almost certainly did not.

The bioarchaeological record in prehistoric California suggests that fighting was a familiar part of life. Violence was especially common among young to middle-aged adult males (<40 years of age), who exhibited the highest rates of skeletal trauma in both central and southern California. This was probably because they typically engaged in more violent acts, such as going on raids, partaking in ritual fighting and trophy-taking, and participating in feuding or warfare (Walker 1989; Lambert 1994, 1997; Andrushko et al. 2005; Eerkens et al. 2014a; Pilloud et al. 2014; Schwitalla et al. 2014a). This bias is also commonly observed in other pre-industrial societies, such as Mesolithic Denmark (Thorpe 2000:11), but Jōmon Japan did not fit this pattern. There, old adult males (50+ years) had the highest prevalence of violence-related skeletal trauma. More generally, middle-aged and old adults were the age groups most likely to have suffered violent injuries, and most strikingly, this even holds true when (cumulative) antemortem trauma is excluded (Table 7.10). Moreover, amongst young adults (<35 years), females were roughly three times more likely to suffer trauma than males. Overall, males experienced more violence than females in Jōmon Japan, as in California, however the differential was significantly greater in the latter region. Given the relatively minor statistical differences in trauma prevalence among both the sexes and age groups, this may indicate that when violence occurred in the Jōmon period, it was most probably small-scale, sporadic episodes of interpersonal or intragroup clashes rather than large-scale, organised intergroup conflict or warfare.

This interpretation is reinforced by the finding that the overall prevalence of sharp-force/projectile trauma in the Jōmon sample was substantially lower than in central or southern California, although admittedly the male predominance was more pronounced in Japan than California. That Californian society saw the emergence of arrowheads arguably designed specifically for warfare, whereas the Jōmon did not, adds further weight to this argument. There were no obvious obstacles blocking the latter from developing more efficient weapons if the need had arisen, since the Jōmon people certainly possessed the necessary materials and techniques. Furthermore, though the Jōmon were slightly less likely to die from sharp force/projectile wounds than the Californians, they were significantly more likely to die from blunt force wounds.¹²³ While the Jōmon fashioned ‘ceremonial’ implements (such as *sekibō*)¹²⁴ which might have functioned as clubs, there is no obvious pattern to the blunt force cranial trauma in the sample, nor clear evidence of trophy-taking/dismemberment. In short, the Jōmon exhibited little apparent interest in ritualised violence, whether lethal or not. This is in contrast to both the central Californians, for whom intergroup ritualised violence revolved around trophy-taking/dismemberment, and the southern Californians, who bludgeoned each other with clubs apparently as a means of resolving conflict. The latter was the preponderant source of healed blunt force trauma to the frontal bone (especially on males).¹²⁵ Finally, the absence of recognisable defensive weapons and structures, alongside the paucity of images of fighting, suggests that intergroup conflict and warfare was probably absent in Jōmon Japan, and although it did exist in California it was not rife.¹²⁶

Based on the best available evidence, the discordant nature of these findings prompts some informed speculation about factors which might help to explain the variations in the Jōmon and Californian patterns and levels of violence. These distinctions cannot be explained at the level of interpersonal violence as it is commonplace in all societies. The personal motives for such violence (e.g., revenge, jealousy) are shared across geographical, chronological, and cultural boundaries, and are in any case inaccessible in the archaeological record. At the intra-/inter-group level of violence, ethnographic researchers have identified various

¹²³ This holds true whether calculated by the number of injuries or the number of skeletons with trauma.

¹²⁴ Coincidentally, the Californians also produced phallic-shaped stone implements. These are thought to have served ritual purposes, but their association with objects linked to warfare (e.g., trophy skulls and projectile points) in some burials might suggest a connection to ritual killings and warfare (Van & Wiberg 2011).

¹²⁵ A similar theory has been advanced to explain the depressed cranial fractures found on ‘Tilbury man’ from Late Mesolithic Britain (Schulting 2013:25-26).

¹²⁶ With the possible exceptions of Santa Cruz Island and the San Francisco Bay area and hinterland, where such violence may have been endemic.

scenarios such as raiding, ambushing, trespassing, poaching, and disputes over access to resources in multiple societies (McCorkle 1978; Pritzker 2000; Eerkens et al. 2014a, 2014b, 2016; Pilloud et al. 2014). Their application may appear limited to specific incidents, yet at a certain level of abstraction, many also represent universal social characteristics. They are difficult to assess in archaeological contexts, where the available evidence often renders intra-/inter-group violence indistinguishable (although, if available, stable isotope analysis would assist, see above) (Allen et al. 2016:12121). This leaves comparative analysis at a population level to investigate why warfare may have been experienced in one region and not another.

If what distinguishes the Jōmon from the Californians is not the absence of violence but rather the absence of warfare, then cross-examining the explanations for violence in California using the evidence from Jōmon Japan may help to identify some key variables that led to this outcome. Lambert (2002:218) identified three intervening variables—population size and density, resource availability, and socio-political structure—to explain levels of violence in prehistoric North America. This study suggests that population mobility, resource distribution, as well as social inequality and organisational complexity should be added to this list, with climate lurking in the background as an independent variable.

Since it is difficult to unravel prehistoric chains of causation, when attempting to explain trends in the prevalence of violence, archaeologists generally prefer to speak of correlation. Many researchers have asserted that rises in prehistoric violence are ultimately linked to climate instability (e.g., Ember & Ember 1992; Otterbein 2004; Brill 2014; Schwitalla et al. 2014a). As Keeley (1996:140) claimed, ‘it is becoming increasingly certain that many prehistoric cases of intensive warfare in various regions correspond with hard times created by ecological and climatic changes.’ Schwitalla et al. (2014a) state that resource stress due to drought (associated with the MCA) and social stress (from high population densities) were partly responsible for violent upsurges in central California.¹²⁷ Similar arguments have been made for southern California, as well as for other hunter-gatherer societies such as the indigenous peoples of Australia (Lambert & Walker 1991; Lambert 1994; McDonald et al. 2007; Brill 2014; Pardoe 2014). Elsewhere, this connection has been challenged; for example, Gordón and Bosio (2012) argued that the MCA did not lead to increased hunter-

¹²⁷ Admittedly, Schwitalla et al. (2014a) also cite the arrival of migrants, European colonisers, and new weapons such as the bow and arrow as causal factors.

gatherer violence in northeastern Patagonia (Argentina), although its impact may have differed between hemispheres.¹²⁸ Moreover, Nakao et al. (2020) concluded recently that climate change did not promote conflict during the Jōmon era, as they perceived a decline in the prevalence of mortality attributable to violence in the Late Jōmon.

It is true, as Gamble (2005:102) asserted, that ‘We lack the chronological resolution in the archaeological record necessary to link cultural change directly to past climatic events.’ But contrary to Nakao et al.’s (2020) findings, when recalculated on an annualised basis, the data presented in Chapter 7 supports a basic correlation between the increasing prevalence of violence in Jōmon Japan and the deteriorating climatic conditions. Perhaps the divergence in the level of violence between prehistoric California and Japan may be explained by the differing nature of the climate change that they experienced. The former was associated with a dramatic temperature increase which not only exacerbated resource scarcities on land, but also produced warmer oceans that drove fish into deeper waters.¹²⁹ In the latter, the neoglaciation which began at the end of the Middle Jōmon generally reduced the range and availability of plant foods and resulted in a shrinking population. Yet, the slowly cooling climate left the Jōmon people with more time to adapt to the changing conditions. Certainly, the relationship between violence and climate change is never straightforward, and regional variations undoubtedly existed.¹³⁰ Furthermore, climate instability is not the only driver of increased violence cited by scholars.

Allen et al. (2016) adopted a statistical approach to test hypotheses regarding two of the main causative factors for human violence, namely, resource scarcity and socio-political complexity. Having examined patterns of lethal trauma on central Californian craniofacial remains, they found that sharp force injuries were the consequence of competition over resources, whereas blunt force trauma did not correlate with either. In other words, while socio-political complexity may be a sufficient motivation for violence, their study did not support the theory that hunter-gatherers with more complex (hierarchical) political structures were further predisposed to violence. This conclusion appears to undermine Fry’s (2012:880)

¹²⁸ In northeastern Patagonia (Argentina), despite demographic nucleation, experts suggest that migration, group fission and fusion, and exchange networks for goods, people, and information, might have helped to dissipate social tensions (Gordón & Bosio 2012:646).

¹²⁹ Even in modern times, higher ambient temperatures have been associated with higher levels of aggression and rates of intentional homicide (Cohn 1990; Field 1992; Gates et al. 2019; Xu et al. 2020).

¹³⁰ For example, food surpluses might lead to rapid population growth and a strengthened sense of territoriality, but may prove short-lived, leaving the community vulnerable to even relatively minor fluctuations in climate and resulting in conflict over resources as they exceed the local carrying capacity.

earlier ‘robust anthropological finding’ which asserts that ‘complexity of social organisation correlates positively with warfare.’ On this point, the Jōmon evidence is rather inconclusive.

In the Middle Jōmon, a more organised and cooperative social structure appears to have emerged. Organisational complexity in settlement and subsistence—as exemplified by communal and ritual buildings, elaborate pottery, and storage pits—apparently reached a peak, coinciding with a relative dearth of violence. The erection by locals of substantial communal buildings at the heart of settlements, for example at Fudodo and Mizukamidani (Middle Jōmon, Toyama), and other collaborative works such as delineated graveyards and rubbish pits, perhaps helped to strengthen solidarity and mitigate intragroup violence (Aikens & Higuchi 1982:185; Steinhaus & Kaner 2016:24). This tendency was reinforced by a wider web of cooperative relations based on task distribution, long-distance exchange networks, food storage, craft specialization, and the resulting interdependence. Similarly, as the MCA subsided and climatic conditions improved in southern California, trading networks expanded and social systems became more sophisticated, so violence declined; implying that these developments helped to mitigate disputes and suppress feuding (Lambert 2002:218-19; Arnold et al. 2004).

It is important not to conflate organisational complexity in subsistence and settlement (horizontal) with socio-political complexity or inequality (vertical). Despite its elaborate material culture and wide-ranging exchange systems, the Middle Jōmon showed no overt social inequalities (Barnes 2015:155). The period of depopulation across the Late and Final Jōmon generally resulted in reduced organisational complexity as trade and craft specialization declined, which was probably linked to social dislocation (Baumhoff 1981:86). While communities in California (and the Northwest Coast of North America) developed simultaneously along both axes, these two phenomena apparently evolved an inverse relationship in the Late and Final Jōmon (Habu 2004). This coincided with a steady increase in the overall prevalence of violence, but while the Jōmon may have had skilled hunters, ‘shamans’, and community leaders, the political infrastructure (chiefdoms) required to engage in organised intergroup conflict and warfare apparently never emerged. Nevertheless, the relationship between violence and social complexity is also complicated. As mortuary analysis has revealed, a degree of social inequality existed in Late and Final Jōmon ‘in certain regions and at certain times’ (Steinhaus & Kaner 2016:28). However, it would be difficult to argue that this inequality was a direct consequence of the increase in prevalence of violence,

whereas in southern California, a period of intense violence resulted in rapid political centralisation (chiefdoms) within some ethnographic territories and not others (Arnold et al. 2004).

Social bonds between villages were maintained during the Late and Final Jōmon through the shared construction and management of large monuments in significant locations, especially since the biggest may have taken centuries to complete (e.g., Ōyu stone circle) (Okamura & Takada 2013:78). It has even been suggested by Kobayashi (2010) that the essence of Jōmon philosophy was not to complete these ceremonial structures, but rather to use such projects to sustain cooperation between groups. An increase in the number of stone circles and ritual objects (such as *dogū*) perhaps suggests that the Jōmon turned to ceremonies and rituals to help dissipate social stress, thereby minimising intergroup violence. However, if such measures were successfully able to prevent warfare from emerging in the Jōmon era, then why were similar practices less effective in California? Prehistoric large stone circles called ‘medicine wheels’ were also constructed by native North Americans on the Plains to fulfill ceremonial and other functions. Admittedly, none have yet been discovered in California, where the people instead built various large mounds (made from shell, earth, or sand) and concentric or semi-concentric shell rings in their landscapes (Brumley 1998:508-10; Lightfoot & Luby 2012). However, since these apparently date from the earliest period to historical times, their construction cannot be considered a direct response to varying degrees of social stress.

Population mobility and density may offer an alternative intervening variable which could have affected the prevalence and level of violence in a prehistoric society. Among Jōmon and Californian hunter-gatherer groups, the development of sedentism led to population growth, and probably a degree of territoriality, when climatic conditions were relatively favourable. This process has been linked to rising violence by some archaeologists (Kobayashi 2003; Uchino 2013). The high trauma prevalence found in the Early Jōmon phase (9.6%) might support this view, but the absence of skeletons excavated from the earlier Incipient Jōmon and their scarcity in the Initial phase makes it difficult to verify. This argument is challenged by sedentism and population density peaking in the Middle Jōmon, when violence was relatively low. Conversely, migration by ethnolinguistic groups into central California during the Early-Middle Transition period (long before the MCA) is associated with a peak in trophy-taking/dismemberment and increasing sharp-force trauma (Andrushko et al. 2010;

Schwitalla et al. 2014a). The subsequent climate crises saw a temporary reversal of the earlier trends towards full sedentism, as groups relocated from inland to coastal areas in Japan and central California (Arnold et al. 2004). These processes released centrifugal forces in (eastern) Japan, where Jōmon populations tended to disperse into smaller, more self-sufficient villages (Kobayashi 2010; Nakao et al. 2020). Native Californians, on the other hand, seemingly preferred to congregate in nucleated settlements, although in southern California the situation differed somewhat, since the already large and dense populations inhibited mass migration. It saw a rise in interpersonal and intragroup violence (attributed to resource scarcity and social stress) which led to the emergence of intragroup social coercion and eventually a more hierarchical society. This strategy probably helped to maintain group unity by redirecting violent impulses against neighbouring groups. In contrast, residual communities in Japan were probably too small for sophisticated hierarchies to emerge and too few and far between to engage in large-scale organised intergroup conflict. Thus, perhaps it is less a matter of the Jōmon lacking the will to fight wars, and more a lack of capacity.

These differing responses to the resource predicament may also have reflected differences in the topographies of Japan and California. Both are mountainous with long coastlines, but whereas the former is difficult to traverse by land (see Chapter 2), the latter is dominated by the large flat Central Valley (Sacramento-San Joaquin) which covers an area of 47,000 square kilometres. Hence, the Californians may have moved to more defensible areas (e.g., coastal mountains) and aggregated settlements to enhance security.

While an increase in violence seems to have accompanied each of these waves of migration, the relationship between population change and violence is not a simple one. Migration in the Late Jōmon coincided with a virtual halving of population densities in eastern Japan, and a doubling in the west (albeit from a much lower base, see Fig. 2.3), although the majority of the sites with violence are located to the east.¹³¹ Moreover, group fusion and fission was a cyclical phenomenon in Japan (and probably elsewhere), and difficult to link accurately to changes in the prevalence or level of violence. Finally, regardless of how well organised both societies were, neither could resist the ‘invasion’ of colonialists and agriculturalists, which caused populations to collapse, the displacement and debasement of cultures, and violence to surge (especially in California).

¹³¹ This may simply reflect the bias in availability of Jōmon skeletons to examine.

Concluding Thoughts

Comparative studies generally involve contrasting similarities and differences between societies, but the emphasis is usually on identifying and quantifying the discrepancies. However, the former often appear to outweigh the latter when comparing violence in prehistoric California and Jōmon Japan. With virtually every plausible determinant of the level of violence appearing to be shared, at least to some degree, it has proven challenging to establish which of these are consequential. Furthermore, it seems that no one variable—climate, topography, population, resources, or socio-political structure—can account for the different outcomes; why large-scale organised intergroup violence probably occurred in California (and Mesolithic Europe), but likely not in Jōmon Japan. As Schwitalla et al. (2014a:81) have noted, there is no ‘single over-arching factor that explains patterned violence in prehistoric California.’ This conclusion is no less valid for Jōmon Japan, since each society was shaped by a combination of variables that interacted to create a unique pattern of violence. This process is further complicated by the spatiotemporal variation that existed within each society. Levels of violence are not fixed nor mutually exclusive, and, as Jones and Schwitalla (2008:41) observed, in central California patterns of violence (and health problems) ‘have been found to be more complicated and regionally varied than previously thought’. This comment may apply equally well to Jōmon Japan, where regional divisions were noticeable, and variations between eras pronounced. Moreover, the lack of reliable population figures and imprecise dating of most skeletons makes it impossible to tease out chains of causation, or reach any definitive conclusions about the consequences of violence.

The relatively small number of Jōmon skeletons exhibiting violence-related trauma is evident, especially when compared to the large number unearthed from California (and to a lesser extent Mesolithic Europe), but the overall prevalence of violence within these societies was remarkably similar. Yet, this quantitative similarity masks a qualitative difference, since prevalence estimates the overall amount of violence in a society, but merely hints at the level of violence. Thus, relative prevalence figures alone are insufficient to distinguish between patterns of violence. After recalculating prevalence on a per century basis, a large gap emerged between Jōmon Japan and Mesolithic Europe on the one hand and California on the other. However, using spatiotemporal analysis presented a somewhat contradictory picture: the intensity of violence across potential ‘warm spot’ clusters remained similar (with southern California still an outlier), but the quantity and pervasiveness of clusters implied that

California was more likely to have experienced a higher level of violence. Sites in Jōmon Japan or Mesolithic Europe were also twice as likely to form ‘cold spots’ as those in central California. Hence, it was only when the direct (skeletal) and indirect (non-skeletal) evidence was incorporated into the biocultural analysis that a clearer answer to the warfare question emerged. This revealed that while warfare was infrequent in central California (and Mesolithic Europe) and fairly commonplace in southern California (and even endemic in some locales), it was most likely not a feature of life in Jōmon Japan.

Making meaningful comparisons between violence in Japan and other prehistoric hunter-gatherer societies is a difficult but necessary undertaking if attempting to understand whether or not the Jōmon experience of violence was exceptional. Some pioneering research has been conducted recently, but the difficulties associated with relying on other archaeologists’ findings are multiplied in a comparative context, where standards of assessment of skeletal trauma and analytical techniques often vary. Moreover, as the number of comparators grows, so the potential problems increase exponentially. This may help to explain why existing international comparative studies of violence largely confine their analyses to overall prevalence. It also raises the awkward question of whether the findings outlined in this chapter are substantial or superficial, meaningful or methodological. As yet, no definitive answer can be offered, although if the methods employed in this thesis were applied to the skeletons from Mesolithic Europe and California, then the numbers might be expected to change, as they did with the Jōmon.

9. Concluding Thoughts

The importance of studying violence in archaeology lies in the fact that it is a key social indicator, whether as an agent or adjunct of change. Yet, since violence cannot be understood in isolation, scrutinising societies through this lens offers a somewhat myopic perspective. This trap was avoided in this thesis by combining multiple modes of analysis in a biocultural framework; a process resembling Japanese *ukiyo-e*, where an image gains definition with every woodblock that is printed. General prevalence supplies a frame of reference or background texture, while spatiotemporal analysis offers focal points by grouping objects in the foreground. Direct and indirect evidence of violence fills in vital details by contributing shading and depth of field, whereas the socio-environmental context conveys out-of-frame information that helps the observer to interpret the image. No less important are the areas left blank (‘negative space’) which enhance the viewers’ appreciation of the picture, and in this perhaps overextended metaphor represent nonviolence. The challenge for archaeologists, however, is that evidence of nonviolence (and some violence) is often elusive; hence the necessity to examine them in tandem. Indeed, the prevalence of violence can only be calculated on a population scale if skeletons without violent trauma are also counted. Moreover, while it may be a truism to state that the absence of evidence is not evidence of absence, in this case the discovery of numerous skeletons without violent trauma may be regarded as representing nonviolence. In other words, an important distinction needs to be drawn between finding skeletons without violent trauma and finding no (preserved) skeletons at all. Ultimately, a biocultural approach offers a more detailed reconstruction of prehistoric patterns of (non)violence, although given the incomplete nature of the archaeological record and current technological limitations, conclusions necessarily remain limited and tentative.

Violence distorts our understandings of the past. While an individual violent act can define a life, it requires a lifetime free of violence to constitute a peaceful existence. Spatiotemporal analysis may magnify this bias; a single violent incident nullifies a ‘cold spot’, whereas it only requires a handful of injured skeletons to produce a ‘hot or warm spot’. How much violence must occur during a person’s lifetime for their society to be defined as ‘violent’? Humans have always displayed a fluid, often unstable mixture of violent and nonviolent

behaviour, influenced by a combination of genetic predisposition and social context in equal measure. Thus, the level of (non)violence in prehistoric hunter-gatherer societies exists on a spectrum, but to determine this with any degree of accuracy would necessitate a systematic assessment of the prevalence, duration, pervasiveness, intensity, organisation, and types of violence experienced. This task is hampered by the archaeologist's toolkit lacking a comprehensive rubric of violence, that is, shared definitions of what constitutes evidence of interpersonal, intra- and inter-group violence, and warfare. Higher levels of violence may leave deeper, more varied scars and have a more profound impact on society, but still remain difficult to distinguish in the archaeological record. They may be indicative of a more dynamic society, while lower levels of violence suggest stability, or more negatively, stagnancy. The more sudden and/or fundamental the changes, the more likely they are to result in intergroup violence and warfare, whereas if changes are incremental or superficial, humans can adapt with relatively little violence. Producing a Pantone chart of violence is beyond the scope of this thesis, but it has perhaps made a practical contribution by applying these measures of violence to Jōmon Japan.

This study has sought to estimate the prevalence and levels of violence in prehistoric Jōmon Japan. The prevailing Japanese assessment that the Jōmon maintained a predominantly peaceful existence for over 12,000 years is contradicted by an influential view in world archaeology which sees violence as commonplace in all ancient hunter-gatherer societies. This thesis does not endorse either position. It does not subscribe to a uniform or linear view of (pre)history, since (with the exception of the interpersonal) levels of violence in hunter-gatherer cultures were neither pervasive, constant, nor mutually exclusive.

While the actual prevalence of violence in Jōmon society will never be known, the physical re-examination of skeletal remains has revealed that the Jōmon people suffered significantly more violent trauma than previously identified by Japanese scholars. Yet, although violence levels varied over time, and three plausible 'warm spot' clusters were identified, there is no definitive evidence—direct or indirect—to suggest that the Jōmon people engaged in large-scale organised intergroup conflict. In short, although the overall level of violence was likely not confined to the interpersonal, it almost certainly did not extend to 'warfare' in any meaningful sense.

The direct and indirect evidence from the archaeological record initially appeared to present starkly contrasting images of the patterns and levels of violence experienced by the Jōmon

people. Settlement locations and patterns, the absence of specialised weaponry and defensive structures, as well as the lack of unambiguous iconographic representations of conflict or warrior graves all pointed to an era of peaceful coexistence, or at most interpersonal violence. Yet, the trauma 'written in bone' told a rather different story. This thesis has highlighted the need, whenever possible, to physically (re-)examine skeletons, and partly compensated for the effect of Japan's highly acidic soils on skeletal preservation and completeness by employing the ENI (and MNI) method to produce a more accurate estimate of the prevalence of violence. Although this figure undoubtedly remains an underestimate, this study nevertheless found that violent incidents were much more common than previously reported.

However, the direct-indirect disconnect may be smaller than at first thought. Blunt force trauma was by far the most prevalent injury type identified on Jōmon skeletons, and incidents resulting in healed trauma outweighed unhealed significantly. Males sustained only slightly more trauma than females, and old adults were more likely to have suffered (antemortem and perimortem) trauma than young adults. This evidence all seems to imply a lack of large-scale organised intergroup violence in Jōmon society. In contrast, it is no longer disputed that the Jōmon people repurposed their everyday tools as weapons when necessary, especially bows and arrows and stone axes, and since most tools become weapons with malicious intent, *sekibō* and other club-like implements could perhaps also be added to this list. Moreover, some Jōmon structures, such as the moat at Shizukawa or the large six-pillar wooden structure at Sannai Maruyama, may have served defensive as well as other functions, but no definite fortifications have been identified at Jōmon sites. In short, the archaeological evidence points to levels of violence in Jōmon Japan converging at a point somewhere beyond the interpersonal but below warfare.

Each society has a unique pattern of violence, but establishing whether the Jōmon people were especially violent or relatively peaceful necessitates widening the focus to incorporate other prehistoric hunter-gatherer cultures. Although inherently problematic, this approach is more valid than comparing them to the agriculturalist Yayoi as these two societies were at different stages of development. The ideal comparator for the Jōmon—socially, culturally, and environmentally—may not exist, but this study found that prehistoric California offered certain advantages over Mesolithic Europe. Overall, the prevalence of violent trauma in all three regions hovered around 4~5%, yet when recalculated on a per century basis to take into account the relative longevity of each society, California emerged as rather more violent than either Jōmon Japan or Mesolithic Europe. Similarly, while the intensity of 'warm spot'

clusters was roughly comparable (except for southern California), their number and pervasiveness was significantly higher in California than Japan, and vice versa for ‘cold spots’. Clear evidence of trophy-taking and ritualised violence have also been unearthed in central and southern California respectively, but not in Japan. In addition, sharp force/projectile trauma were more prevalent in California, whereas blunt force trauma was more dominant in Japan. Unlike in Jōmon society, young to middle-aged Californian males exhibited the most trauma, and some were in possession of specialised arrowheads with which to fight. In sum, direct and indirect evidence revealed that warfare was capricious in central California (and Mesolithic Europe), all too familiar in southern California, but implausible in Jōmon Japan, where violence appears to have been opportunistic rather than organised.

The variables which produced such diverse outcomes are difficult to isolate, since most of the plausible determinants were shared, at least to some degree, between Jōmon Japan and prehistoric California. The fallibility of population estimates and the imprecision of skeletal dating make it impossible to identify clear causes or reach any definitive conclusions about the effects of violence on these societies. No single factor can explain the disparate and fluctuating patterns of violence, but a combination of climate, topography, population, resources, and socio-political structure goes some way towards solving this riddle.

A thesis of this length cannot hope to address all of the unresolved issues surrounding the study of violence in Jōmon Japan. Therefore, it may be worthwhile here to offer a few brief suggestions for future research priorities. Scholars should concentrate on the systematic recording of violent trauma (especially when re-examining old skeletal collections) to determine its extent in Jōmon society more accurately. After performing triage on existing skeletal collections, non-invasive three-dimensional scanning techniques (e.g., photogrammetry) should be employed to preserve digitally as much information as possible before the skeletons disintegrate further. Significant progress would also result from the construction of a comprehensive bioarchaeological database of excavated Jōmon skeletons (akin to the CCBD), which would potentially strengthen collaboration domestically and internationally, thereby enabling additional comparative studies to be undertaken. Ideally, this would include a (virtual 3D) reference collection of Jōmon skeletons exhibiting violent injuries. Similarly, the task of comparing violence would be greatly simplified if reference frameworks were developed to produce standard indicators for interpreting levels of violence

on a population basis. Finally, using stable isotope analysis to examine victims of violence at ‘hotspots’ could also add new layers to our understanding of Jōmon violence.

Violence damages everything it touches, leaving scars on both the living and the dead, the tangible and the intangible. Archaeological evidence of violence may be confined to the deceased and the material, but as scars fade, so archaeologists are constantly engaged in a race against time. Given Japan’s highly acidic soils, Jōmon archaeologists have to run even faster.

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Appendix

Appendix 1. Study Sample (MNI)

Site Name	Japanese	Prefecture	Jōmon Subperiod	Skeletons		Curation
				Examined	Violent Trauma	
Abashiri	網走遺跡	Hokkaidō	Epi	1		HU
Abashiri cave	網走洞窟	Hokkaidō	Early	11		HU
Abashiri Keimusho-ura	網走刑務所ウラ	Hokkaidō	Epi	1		SMU
Abuta	虻田遺跡	Hokkaidō	Final	2		HU
Adaka SM	阿高貝塚	Kumamoto	Middle-Late	4		KU
Aradate	荒立遺跡	Kanagawa	Middle	1		UMUT
Arayashiki SM	荒屋敷貝塚	Chiba	Middle	1		UMUT
Bibi 4	美々4 遺跡	Hokkaidō	Middle	2		SMU
Bōzuyama	坊主山遺跡	Hokkaidō	Epi	2		SMU
Chatsu 4	茶津 4 洞穴遺跡	Hokkaidō	Epi	1		SMU
Chidorikubo SM	千鳥窪/	Tōkyō	Middle	4		UMUT
	千鳥久保貝塚					
Daimon SM	台門貝塚	Chiba	Late	1		UMUT
Einomaru SM	永犬丸貝塚	Fukuoka	Late	3		Kyūshū U
	絵鞆貝塚/					
Etomo SM	エトモ	Hokkaidō	Epi	1		HU
Fukuda SM	福田貝塚	Ibaraki	Late	2		UMUT
Funadomari	船泊遺跡	Hokkaidō	Late	11	1	SMU
Fuyuki SM	冬木貝塚	Ibaraki	Late	7		UMUT
Gionbara SM	祇園原貝塚	Chiba	Late-Final	26		SMUSM
Goryō SM	御領貝塚	Kumamoto	Final	6		Kyūshū U
Hamanaka	浜中遺跡	Hokkaidō	Epi	1		HU
Hanawa SM	花輪貝塚	Chiba	Late	1		SMU
Hashidate	橋立遺跡	Saitama	Jōmon	1		UMUT
Hashima SM	羽島貝塚	Okayama	Early?	5	1	UMUT
Higashi-Kushiro SM	東釧路貝塚	Hokkaidō	Initial	3		SMU
Hiroo	広尾遺跡	Hokkaidō	Epi	2		SMU
Hobi SM	保美貝塚	Aichi	Final	113	5	UMUT
Ikawazu SM	伊川津貝塚	Aichi	Final	8	1	UMUT
Inariyama SM	稲荷山貝塚	Aichi	Final	37	2	KU
Irie SM	入江貝塚	Hokkaidō	Early-Late	12		SMU
Kanezaki (Kōjō) SM	鐘崎(上八)貝塚	Fukuoka	Late	4		Kyūshū U
Karasuhorikomi SM	烏堀込貝塚	Chiba	Middle	1		SMUSM
Kasori SM	加曽利貝塚	Chiba	Late	4		UMUT

Kasori-kita SM	加曾利北貝塚	Chiba	Middle-Late	9		UMUT
Kasori-minami SM	加曾利南貝塚	Chiba	Late	18	1	UMUT
Kawaji SM	川地貝塚	Aichi	Late	4		KU
Kitakogane SM	北黄金貝塚	Hokkaidō	Early	14	3	DCIFC/ SMU
Kitamura	北村遺跡	Nagano	Late	160	2	NPMH
Kitsuki SM	本月(古月)貝塚	Fukuoka	Late	1		Kyūshū U
Kō	国府遺跡	Ōsaka	Early	13	1	UMUT
Koboro cave	小幌洞窟遺跡	Hokkaidō	Epi	5	2	HU
Kokura/Ogura?	小倉遺跡	Fukuoka	Jōmon	1		UMUT
Kokuzō SM	虚空蔵貝塚	Chiba	Middle	1		SMUSM
Kōsaka SM	高坂貝塚	Kanagawa	Late?	2	1	UMUT
Kosaku SM	古作貝塚	Chiba	Late	24		SMUSM /UMUT
Kotan-Onsen	コタン温泉遺跡	Hokkaidō	Early-Late	10	1	SMU
Kuroya SM	黒谷貝塚	Saitama	Early	5		UMUT
Kusakariba SM	草刈場貝塚	Chiba	Late?	7		UMUT
Kushnkotan	クシュンコタン 遺跡	Hokkaidō	Epi	1		SMU
Mae SM	前貝塚	Chiba	Middle-Late	1		UMUT
Midorimachi	緑町遺跡	Hokkaidō	Late-Final	2		SMU
Minami-Usu 6	南有珠 6 遺跡	Hokkaidō	Epi	1	1	SMU
Minami-Usu 7	南有珠 7 遺跡	Hokkaidō	Epi	3		DCIFC
Misawa 1	美沢 1 遺跡	Hokkaidō	Middle	8		SMU
Mitsuya	三ッ谷遺跡	Hokkaidō	Late?	13		HU
Mitsuzawa SM	三ッ沢貝塚	Kanagawa	Late	4		UMUT
Moriya-Kaigan	守谷海岸	Chiba	Late?	1		UMUT
Moyoro	モヨロ貝塚	Hokkaidō	Middle	1		HU
Nakazawahama SM	中沢浜貝塚	Iwate	Final	23	4	UMUT
Narumi SM	鳴海貝塚	Aichi	Final?	2		UMUT
Numazu SM	沼津貝塚	Miyagi	Late-Final	1		UMUT
Ōhora SM	大洞貝塚	Iwate	Final	6		UMUT
Okadaira SM	陸平貝塚	Ibaraki	Middle	1		UMUT
Okazaki SM	岡崎貝塚	Aichi	Jōmon	1		UMUT
Onkoromanai	オンコロマナイ 遺跡	Hokkaidō	Epi	3		SMU
Oshironai	尾白内遺跡	Hokkaidō	Epi	5		HU
Oshonnai	オションナイ 遺跡	Hokkaidō	Epi	1		SMU
Ōta SM	太田貝塚	Hiroshima	Middle	22		KU
Ponnai/ Motowanishi SM	ポンナイ/ 本輪西貝塚	Hokkaidō	Early-Middle?	9		HU/ UMUT

Rebunge	礼文華遺跡	Hokkaidō	Epi	2		SMU
Rokutsū SM	六通貝塚	Chiba	Late	6		SMU
Saihiro SM	西広貝塚	Chiba	Late	19		SMUSM
Sakaeiso Iwakage	栄磯岩陰遺跡	Hokkaidō	Final	1	1	SMU
Sakai	境遺跡	Miyagi	Jōmon	1		UMUT
Sanganji SM	三貫地貝塚	Fukushima	Late-Final	48		UMUT
Sarugami Iwakage	猿神岩陰遺跡	Hiroshima	Final	3		Kyūshū U
Satohama SM	里浜貝塚	Miyagi	Final	1	1	UMUT
Shimo Numabe SM	下沼部貝塚	Tōkyō	Late	1		UMUT
Shimokusuda SM	下楠田貝塚	Fukuoka	Middle-Late	9		Kyūshū U
Shimotai	下平遺跡	Aomori	Late	1		SMUSM
Takasago SM	高砂貝塚	Hokkaidō	Final	8	1	SMU
Tenaga SM	手永貝塚	Chiba	Late	25	1	SMUSM
Tenneru	天寧遺跡	Hokkaidō	Epi	1		SMU
Toyamatsu Domen cave	豊松堂面洞窟遺跡	Hiroshima	Late	6	1	Kyūshū U
Tsubue (Funamoto) SM	粒江(船元)貝塚	Okayama	Middle	2		UMUT
Tsukimino	月見野遺跡	Aomori	Late	1		SMUSM
Tsukumo SM	津雲貝塚	Okayama	Final	67	2	KU/ UMUT
Ubayama SM	姥山貝塚	Chiba	Middle-Late	124	4	UMUT
Uennaipo	ウエンナイポ遺跡	Hokkaidō	Epi	4		HU
Urausu SM	浦臼貝塚	Hokkaidō	Jōmon	1		SMU
Usujiri B	臼尻 B 遺跡	Hokkaidō	Middle	2		SMU
Usu-Moshiri	有珠モシリ遺跡	Hokkaidō	Epi	18	5	DCIFC/ UMUT
Wakazono SM	若園貝塚	Kumamoto	Late	3		Kyūshū U
Wanishi	輪西遺跡	Hokkaidō	Middle-Late?, Epi	6		HU
Washibetsu	鷺別遺跡	Hokkaidō	Middle	2		HU
Yamaga SM	山鹿貝塚	Fukuoka	Late	10		Kyūshū U
Yashiro	屋代遺跡	Nagano	Middle	6		NPMH
Yoichi/Ōyachi SM	余市貝塚/ 大谷地貝塚	Hokkaidō	Late	3		HU
Yosekura Iwakage	寄倉岩陰	Hiroshima	Late	40		UMUT
Yoshigo/Yasaki SM	吉胡/矢崎貝塚	Aichi	Final	97	3	KU
Yoyama SM	余山貝塚	Chiba	Late	28		UMUT