PALEOETHNOBOTANY OF THE KAMEDA PENINSULA JOMON

by

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For my parents

GARY WILLIAM CRAWFORD. Paleoethnobotany of the Kameda Peninsula Jomon (Under the direction of RICHARD A. YARNELL.)

Archaeological data pertaining to the plant utilization by the Jomon of Kameda Peninsula of southwestern Hokkaido in northern Japan are reported and interpreted. The adaptations of the Initial through Middle Jomon populations are examined from the perspective of plant and human inter-relationships. Reasons for the adaptive success of the Ento tradition in Hokkaido and Tohoku are explored.

Plant remains were retrieved from six archaeological components: the Sumiyoshi-cho phase at the Nakano B site; the Todokawa subphase at the Yagi site and locality 4 of the Hakodate Airport site; the Saibesawa II and III subphases at the Hamanasuno site; and the Saibesawa VII, Daigi VIIIb, and Nodappu II subphases at the Usujiri B site. The sites represent a time period from ca. 6000 B.C. to 2000 B.C.

Most of the plant remains were collected by a froth flotation apparatus. Two other recovery methods were used. Comparability of the results obtained by the different methods was tested. Results show that relative quantities of types of remains recovered by the different methods are comparable. The froth flotation apparatus was more efficient and allowed large soil samples to be systematically processed. This facilitated the collection of good contextual data. The other methods, because of their inefficiency, precluded obtaining multiple large samples necessary for statistically reliable contextual interpretations.

The identifiable plant remains were mainly small, carbonized seeds. Some nutshell was found. The nearly 4000 seeds recovered represent an estimated 180 plant taxa. Strong evidence for utilization was found for only 15 taxa, one of which was Japanese walnut. The remaining 14 taxa comprise about 60% of the total seeds: probably barnyard grass, four kinds of knotweed, dock, chenopod, amur corktree, blackberry, elderberry, grape, matatabi, udo, and sumac.

The principal utilized plant parts during the Early through Middle Jomon seems to have been the seeds and greens of herbaceous annual weeds and the fleshy fruits of weedy shrubs and vines. During the preceding Initial Jomon period Japanese walnut was apparently an important plant food. Negligible amounts of nutshell were recovered from the later sites. A subsistence change after the Initial Jomon is evident.

Data from eastern North America representing prehistoric sites where varying degrees of plant husbandry was practiced are compared to the ecological data from Kameda Peninsula. The evidence indicates that by the Early Jomon the harvesting of annual and perennial weeds made productive by the maintenance of localized dis-climax communities was an important facet of subsistence. The system was apparently amplified through time. There is no evidence that highland beech forests were exploited for plant food. Instead plants were probably gathered in and near the Jomon communities on the terraces. Some plants may have been collected from the river valleys. These patterns are expected to apply more generally to the Jomon of northern Japan excluding north-eastern Hokkaido.

The new data confirm most of the interpretations from a previous investigation at the Hamanasuno site. Buckwheat husbandry was not

confirmed. Evidence for the possible domestication of Echinochloa type grass (barnyard grass) is evaluated. Two hypotheses are presented: 1) harvesting of wild plants alone comprised the Jomon plant food subsistence activities; and 2) plant husbandry and harvesting of wild plants were important subsistence pursuits. Neither hypothesis can be strongly supported at the present time.

TABLE OF CONTENTS

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LIST OF TABLES

LIST OF FIGURES

Figure

LIST OF PLATES

CHAPTER I

INTRODUCTION

The purposes of this investigation are: 1) to collect, report, and interpret archaeological data on plant utilization by Jomon populations in southwestern Hokkaido; 2) to examine the adaptations of the Initial through Middle Jomon in the same area, a period from 6000 B.C. to 2000 B.C., in the context of human and plant inter-relationships 3) to test problems derived from a study of plant remains collected from the Hamanasuno site in 1974 (Crawford 1976; Crawford et al. 1976); and 4) to make inferences about the success of the Jomon adaptation in northeastern Japan in general.

The data on which this study is based are plant remains recovered systematically by flotation from five sites: Hakodate Airport (Nakano b and Locality 4), Yagi, Hamanasuno, and Usujiri B. A major part of the investigation was the subsequent analysis of these plant remains. The plant remains are interpreted as far as is possible with the currently available archaeological data from these sites. Initially I had hoped to incorporate data on stone tools from the 1974 Hamanasuno excavation now being studied by William Hurley and his associates at the University of Toronto. These data are not yet available.

As a long term ceramic tradition with complex regional and temporal variation, the Jomon has important comparative implications for western anthropologists. The virtual lack of communication of Japanese archaeological data outside of Japan has made these data unavailable. With my ecological orientation at least one avenue of communication is opening. Western archaeologists have noted the distinctive orientation of Japanese archaeological concepts that have developed largely out of isolation from western intellectual circles (Bleed 1973; Ikawa-Smith 1976; Pearson 1976). Japanese archaeology tends to be concerned with national history and can be considered to be normative in the terms of Binford (1965) and Struever (1971). Archaeology is not a social science in Japan. The priorities of Japanese archaeologists are different than ours, and thus information which is crucial to many western archaeologists is not collected. Subsistence ecological data is a key example. The ecological approach in archaeology is an aspect of ecological anthropology as defined by Rappaport (1971), Anderson (1974), and Vayda and McCay (1975). The observation that certain features of culture, such as technology and subsistence, are involved in the utilization of the environment in culturally prescribed ways (Steward, 1955) is particularly suited to archaeology. These features are not static but part of an adaptive process. By concerning ourselves with adaptation we hope to explain cultural variation in time and space. In addition, ecological anthropology emphasizes the interaction of people with their environment (e.g. Anderson 1974). Plants are particularly sensitive indicators of human-environmental relationships. Dimbleby (1978) has pointed out the value of interpreting plant remains with particular regard to the effects of people on the landscape such as forest clearance, increasing the productivity of shrubs in disclimax plant communities, and changing soil conditions involving land use and misuse. In effect we are not looking at climate change but at a "change in microclimate" (ibid.:150). Moreover, plant food resources are extremely important to many hunting and gathering populations (Lee 1968). Thus this palaeoethnobotanical study can contribute both to Japanese archaeology by applying a new perspective and to western archaeology and anthropology by contributing substantive comparative information in a familiar context.

The analysis of plant remains from each site is treated separately in Chapters IV, V, and VI. Since similar plant remains are reported from each site, information on the plants identified in the samples is accorded a single chapter (II). Interpretations of ecology and subsistence are presented in Chapter VII.

Physical Setting

The Hakodate Airport, Yagi, Hamanasuno, and Usujiri B sites are situated on the Oshima Peninsula of southwestern Hokkaido (Figure 1). These sites are components of archaeological phases which are in general limited in distribution to the peninsula (Figure 2). Only in later phases does the distribution expand significantly north and east of this area. Cultural affinities are with northern Honshu throughout the time period in question. Since one of the purposes of this study is to examine Jomon adaptations, the physiography and vegetation of southwestern Hokkaido are considered in detail in this section.

The northern limit of the Oshima Peninsula is a geological fault called the Kuromatsunai Line or Kuromatsunai Depression. This line extends from the town of Suttsu on the Sea of Japan coast through Kuromatsunai to Oshamambe on the shore of Uchiura Bay (Figure 1). North of this line is a volcanic region which separates the Oshima

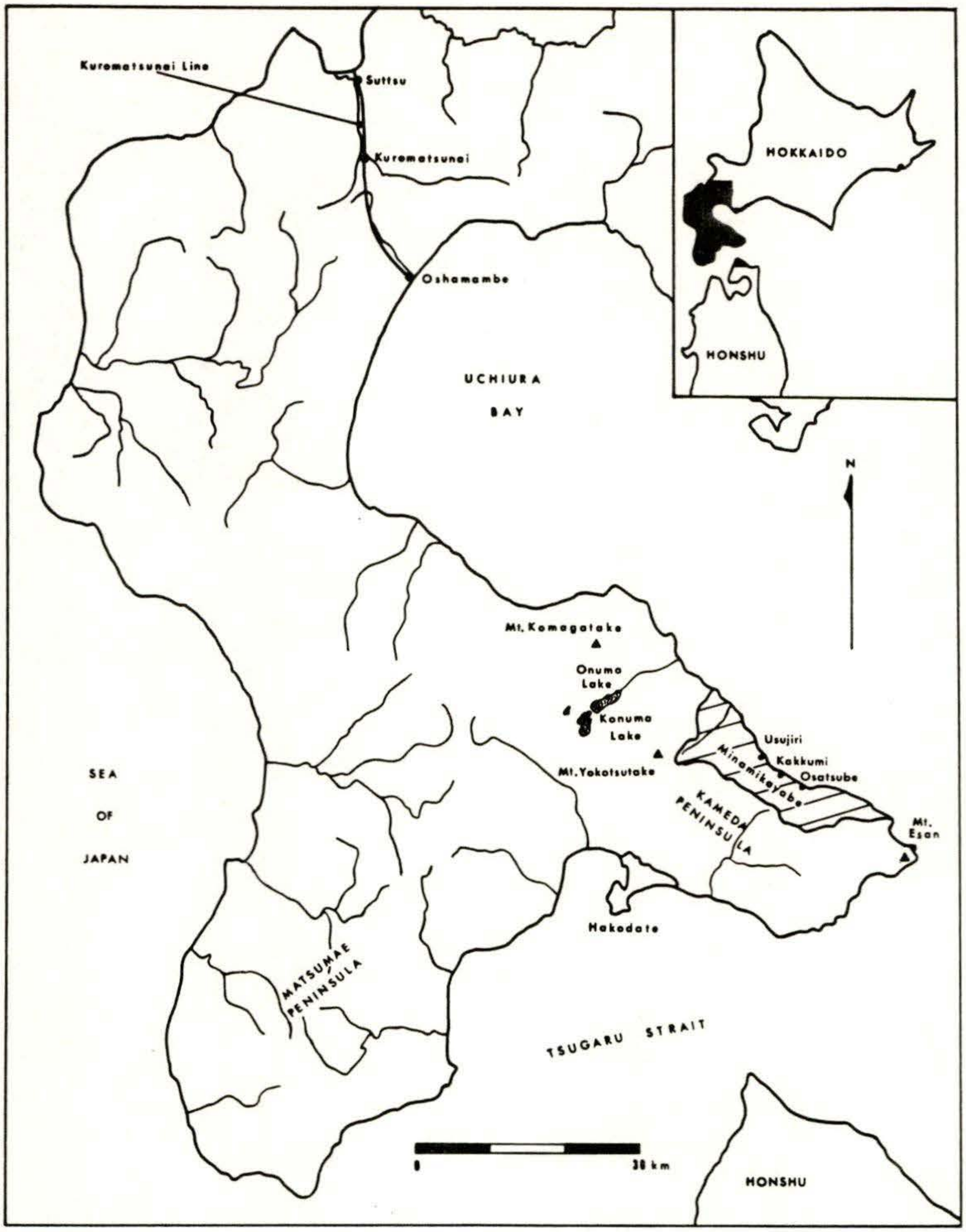


FIGURE 1
Oshima Peninsula

Peninsula from the largest flat lowland area in Hokkaido--the Ishikari Plain. Most of the peninsula is andesitic highland with soils characterized as medium textured lithosols (Bushnell and Ritchie 1951). The mountains are well drained with many stream valleys which provide sites for modern transportation routes and settlements. The higher areas are relatively inaccessible and predominantly forest covered. In contrast, most modern settlements are concentrated along the coast. The Sea of Japan coast is fairly rugged with little or no coastal plain development. Narrow alluvial lowlands extending inland more or less perpendicular to the coast are the rule. Important archaeological sites such as Katsuyamadate and Jubeizawa are situated on one such riverine lowland (Figure 2). Along the western shore of Uchiura Bay are narrow coastal lowlands where some salt marshes have developed. To the east and south, coastal terraces have developed under the influence of tectonic uplift. The eastern-most portion of the Oshima Peninsula, called the Kameda Peninsula, is of volcanic origin. Mt. Komagatake and Mt. Esan are the largest volcanoes in this region. The Yagi, Hamanasuno, and Usujiri B sites are situated on the north coast of Kameda Peninsula facing the Pacific Ocean, while the two Hakodate Airport sites face the Tsugaru Strait on the western edge of the peninsula.

All of the Oshima Peninsula is within the Temperate Forest Zone of Japan (Owhi 1965), also called the Temperate Mixed Forest Zone (Trewartha 1965) and the Cool-Temperate Forest Zone (Maekawa 1974). This zone is limited, in general, to areas where the mean annual temperature is between about 43° and 55°F (Trewartha 1965). Beech

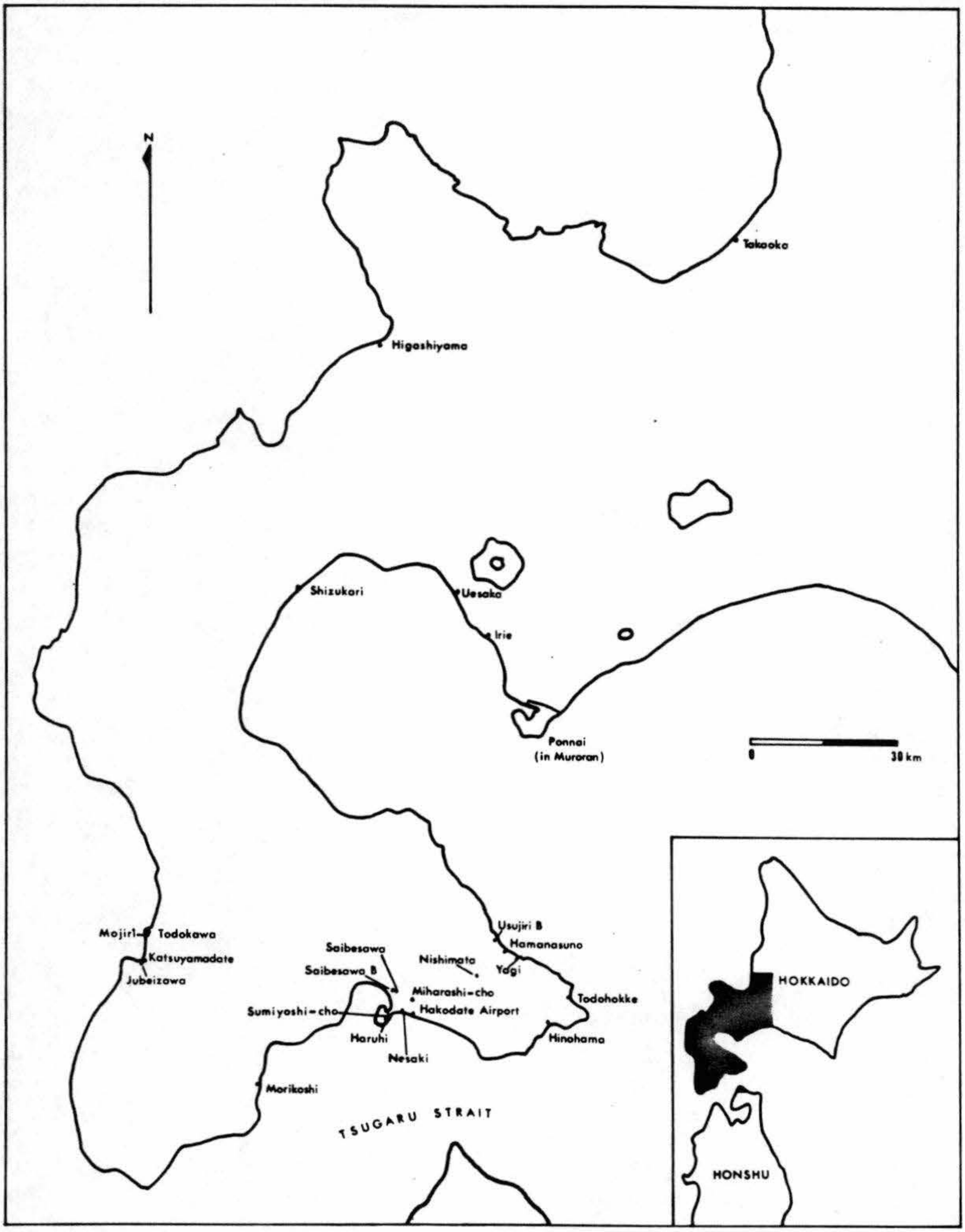


FIGURE 2

Locations of Some Hokkaido Initial, Early, and Middle Jomon Sites

(Fagus crenta Bl.) is the principal tree in this zone which is dominated by angiosperms. Although this beech forest is extensive in Japan it is absent in continental eastern Asia (Tatewaki 1958). Beech forests are found from sea level to the tree line in the Oshima Peninsula, where the climax vegetation is usually a beech-bamboo grass (Sasa Makino et Shibata) association. Beech is also occasionally associated with maple (Acer japonicum Thunb. or A. tschonskii Maxim.) in the shrub layer (Tatewaki 1958:397). These are not the only forest types found in this area. Sawagurumi-buckeye (Pterocarya rhoifolia Sieb. et Zucc.-Aesculus turbinata Bl.) forests are common on rich valley soils (ibid.: 399). Tatewaki recognizes three main sawagurumi-buckeye associations: fern, tall herbs, and sasa. Since present-day settlements favor these valleys most of the sawagurumi-buckeye forests have been seriously disrupted. Fortunately, relatively undisturbed examples near Hakodate have been studied (Tatewaki et al. 1961). Three other less common forest communities are found in the valleys: Sawagurumi-katsura (Cercidiphyllum japonicum Sieb. et Zucc.), sawagurumi, and buckeye.

The Kuromatsunai Line, as well as geologically separating the Oshima Peninsula from the rest of Hokkaido, also separates the two areas floristically. This line is the northern-most limit of the temperate beech forest (Tatewaki 1958; Shidei 1974). Beech, sawagurumi, grape, (e.g. Vitis flexulosa Thunb.) and asunaru (Thujopsis dolobrata Sieb. et Zucc.), for example, do not grow north or east of this line (Tatewaki 1958). According to Shidei (1974:97) the "cold winter temperatures to the north of the Kuromatsunai Line prevent the establishment of beech forests." Similarly, certain plants do not grow south and west of this line. Spruce, a principal element of the Hokkaido Boreal forest, does not grow naturally in the Oshima Peninsula or other parts of southern Japan. North and east of the Kuromatsunai Line, in the transition zone between the cool temperate and boreal forests, the main deciduous tree species are two types of oak (Quercus crispula Bl. and Q. dentata Thunb.), two species of elm (Ulmus davidiana Pland. and U. laciniata Mayr.), basswood (Tilia maximowicziana Shiras.), maple (Acer mono Maxim.) and harigiri (Kalopanax septemlobus Koidz.) (ibid.). This ecological contrast between northeastern and southwestern Hokkaido is likely a variable which may help to explain the prehistoric cultural contrasts between the two areas.

Throughout Japan temperature is considered to be the main factor influencing vegetation zone distributions (Shidei 1974:20). Factors effecting temperature on the Oshima Peninsula are diverse. A warm branch of the Kuroshio (Tsushima) Current moves northward along the Sea of Japan coast of Hokkaido and eastward through the Tsugaru Strait. The cold Oyashio Current moves southward along the east coast of Hokkaido. During the winter, cold winds blowing from mainland Asia are warmed in passing over the sea of Japan and pick up moisture which is deposited as snow on the Japanese islands. Snow cover, another important factor effecting the vegetation, is deepest on the Japan Sea side of Honshu, averaging as much as 150 cm annually (Trewartha 1965:57). Oshima Peninsula snow cover is not quite as deep averaging between 50 and 100 cm. Kameda Peninsula, located on the Pacific Coast, receives a snow cover more similar in depth to the west coast of Honshu than the east coast. Shidei (1974) reports that the upper limits of the forest zones tend to be at lower altitudes towards the Japan Sea coast and that the plant communities differ particularly among undergrowth tree species and shrubs.

Minamikayabe and Hakodate are within the Pacific Seaboard climate type which Murokata (1975) characterizes as having mild weather with a summer rainy season (tsuyu). In many respects the climate is similar to the Sea of Japan side of northern Honshu but the effects of the winter monsoon (Okada 1931) on Kameda are moderated somewhat by its Pacific facing position.

The Yagi, Hamanasuno, and Usujiri B sites are all within the town of Minamikayabe (Figure 3). The sites are on the coast and a variety of topographic features with associated vegetation are within a few kilometers of each. The Kameda Mountains which parallel the coast divide the Kameda Peninsula into two drainage systems. One drains to the northeast into the Pacific Ocean, the other to the southwest into the Tsugaru Strait. The rivers in Minamikayabe are relatively short; the longest (Isotani River) originates about 10 km from the coast. On the whole, river valleys are "v"-shaped with little or no flood plain development. The rivers flowing into the Tsugaru Strait, on the other hand, tend to be longer, slower, and wider with narrow flood plains (e.g. the Shiodomari and Matsukura Rivers). The Kakkumi Pass, which is the main access route between Hakodate and Minamikayabe, follows two such river valleys; those of the Kakkumi and Hiyamizu River (Figure 3).

Modern population distribution reflects the local topography. Minamikayabe is an approximately 35 km long settlement along the coast with almost no occupation inland. The southern slope of the Kameda

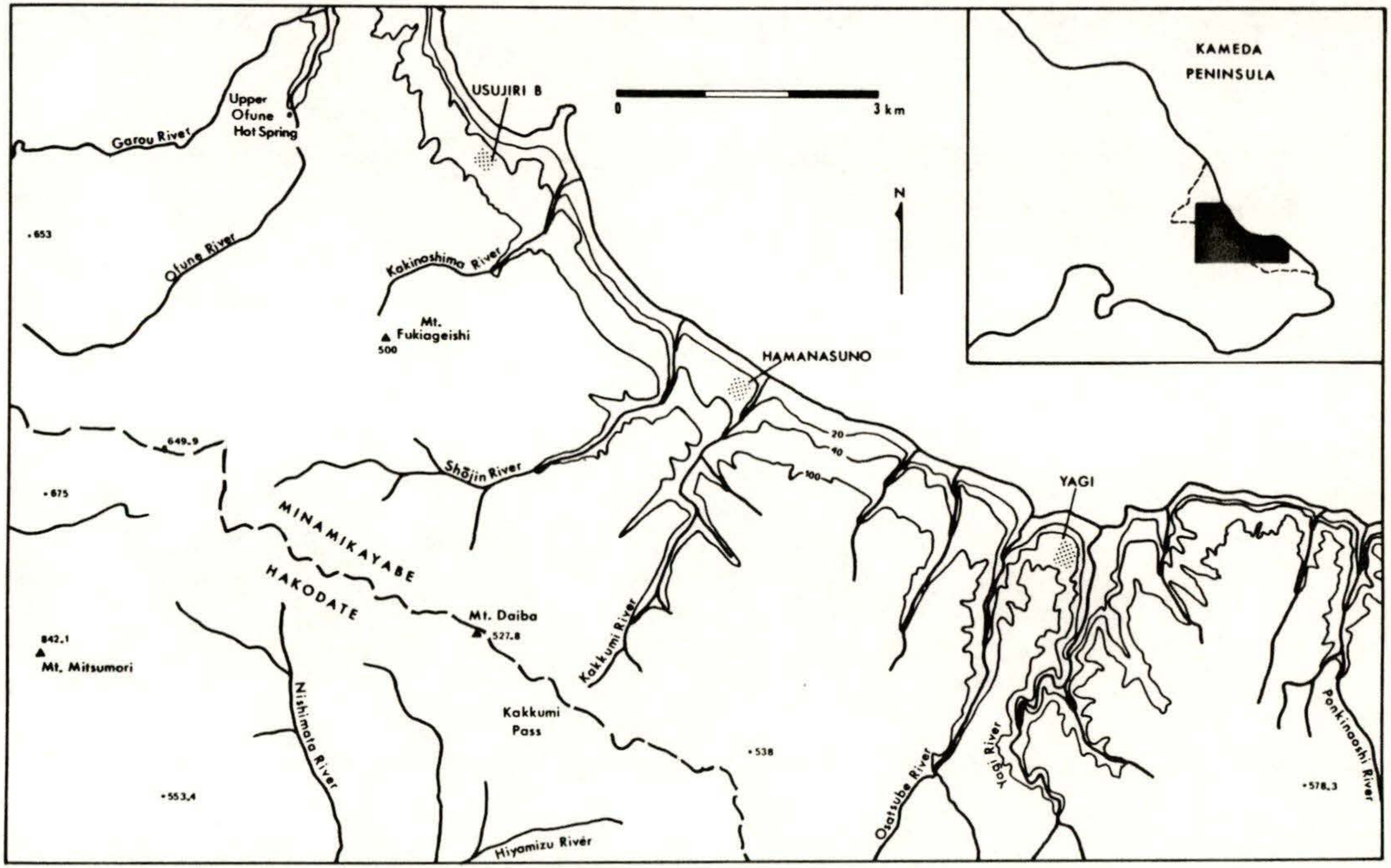


FIGURE 3

Location of the Yagi,
Hamanasuno, and Usujiri B Sites

Mountains is occupied as far as 10 km inland and 140 m above sea level. The distribution of known Jomon sites is similar. Sites have been found as far as 8 km from the Minamikayabe coast at 100 m above sea level on the south face of the divide (e.g. the Nishimata site). In Minamikayabe sites are restricted to the coast (Chio 1972).

Along the Pacific coast from Osatsube to the western edge of Minamikayabe is a broad terrace ranging from 20 to 60 meters above sea level (Figure 3). The formation of this terrace has been described by Yoshida (1971). The terrace soils are classified as black ando (Bushnell and Ritchie 1951) but the classification probably more aptly applies to the hilly country backing the terrace. The terrace is covered in deep soils of volcanic origin. In the Hamanasuno area where the Kakkumi River (Figure 2) disects the terrace, Yoshida (1971) reports three terrace levels. The 21 to 28 meter, or upper, terrace on which Hamanasuno is located is Pleistocene in age. The coastline is rough with near vertical cliffs rising from the Pacific Ocean about 15 km east of Osatsube. A volcano, Mt. Esan, forms the eastern end of Kameda Peninsula (Figure 3). To the northwest Uchiura Bay borders directly on the north slope of Mt. Komagatake, another volcano. Broad coastal terraces again appear west of Komagatake and extend about 35 km to the northwest. The physiological region within which Minamikayabe and the Yagi, Hamanasuno, and Usujiri B sites are situated is bounded on the northwest and southeast by rocky, steeply sloping coastline and on the south by a mountain ridge.

The ecology of Kameda Peninsula can be understood in terms of the climatic features and physical structures outlined. In general the vegetation is typical of that described for the Oshima Peninsula. For the most part, the mountains bordering Minamikayabe are forested. The settled coastal terrace is used for gardening of potatoes, soy beans, squash, and other vegetables and has been extensively deforested. Fields comprise less than 10% of the town area (Minamikayabe Town, 1976). In addition about 10% of the town area is planted in relatively homogeneous stands of sugi (Cryptomeria japonica D. Don.) or larch (Larix leptoloepis Gord.). The remaining area is mostly secondary forest. Primary beech forest has been almost completely removed. The ecological disruption evident today in Minamikayabe was intensified when the first Japanese settlers arrived early in the 17th century. Oshima had become dotted with settlements as early as the 13th century (Harrison 1953:4-5) but the extent of forest clearance at that time was probably fairly localized. Extensive forest clearance likely did not begin until the 1900s. In much of Japan beech wood became important for the construction of aircraft during the Second World War. This led to destructive clear cutting of the beech forests (Shidei 1974:98). Although I have no data for the Kameda area, extensive deforestation likely occurred there too.

Remnants of the local beech forest still exist but only at higher altitudes in Minamikayabe. Murokata (1975:10-18) reports three beech communities: one at 450 m above sea level near the Ōfune Pass (Appendix 1A), one near the source of the Ōfune River at 400 m, and another near the source of the Kinaoshi River (near the source of the Ponkinaoshi River in Figure 3) between 300 and 500 m (Appendix 1A). The first location has the greatest number of tree species (23) of the Beech communities but is composed mainly of beech and maple (Acer mono Maxim.). The number of herbaceous plant taxa is small (17). In general these beech communities do not exemplify the vegetation of either the mountains or lowlands of the area. For example, birch (Betula ermanii Cham.) woods grow on a narrow ridge on the northwestern slope of Mt. Daiba (Figure 3) about 500 m above sea level (ibid.). Chishimazasa (Sasa kurilensis Makino et Shibata) forms a dense undergrowth. Murokata observes that systematic changes in the vegetation occur with descending altitude:

> The number of tree species increases with the descent from the mountain ridge. Forests composed of two types of birches, alder, beech, oak, elm, katsura, two types of maple, basswood, koshi-abura, ash, amur corktree, etc. develop. In addition types of understory trees, shrubs, and vines increase in number. Forest classes diverge. Furthermore chishimazasa becomes sparce and instead kumaizasa is found. Herbaceous plants such as Blechnum niponicum, o-uren-shida, kuruma lily, ō-uba lily, and a few other lilies become abundant (Murokata 1975:10).

The changes recorded by Murokata reflect decreased successional stages at lower altitudes. Most of the land between the terrace edge and the mountains is either secondary forest, sugi or larch plantations, or farmland. Even as far inland as the Nishimata site (Figure 2), the area is almost entirely secondary forest (Matsushita 1974: Figure 4). Murokata (1975) has examined four locations with secondary forest growth: mountain paths, the upper Ōfune hot spring, the riverside 1.5 km upstream from the upper Ōfune hot spring, and the Isotani valley. The data from three of these areas (all but the Isotani valley) are listed in Appendix Ib. As with the species lists for the beech communities, Murokata often seems to include taxa from several habitats. The riverside vegetation upstream from the Ōfune hot spring illustrates the differentiation of communities from the mesic habitats close to the river to the drier habitats at the mountain foot. Another example is in the Nishimata site area where alder and <u>Carpinus</u> communities are associated with areas adjacent to the Nishimata River. Notable in the list of plants in Appendix Ib is the strong representation of the weedy families of grasses (Gramineae), knotweeds (Polygonaceae), composits (Compositae), umbels (Umbdliferae), and legumes (Leguminosae).

Vegetation History

The vegetation history of Oshima Peninsula has not been adequately documented. Sufficient data from Honshu allow inferences to be made about southwestern Hokkaido. Basic references in English are Tsukada (1966), Tsukada and Stuiver (1961), Pearson (1977), and Yasuda (1978). Recently Tsukada (1974) and Yasuda (1975; 1978) have summarized what they interpret as five pollen zones: L, RI, RII, RIII, and RIIIb. The RII zone dates from about 9500 BP. to 4500 BP. and therefore dates to the time in question for this investigation. This zone represents the hypsithermal interval in Japan when temperatures are thought to have been 2°C. warmer than at present (Tsukada and Stuiver 1967). Oak and beech were dominant at this time (ibid.). The percentage of beech pollen increases relative to oak during the RII period suggesting a cooling trend. Elm, basswood, and buckeye were also common. During the RII period was the Jomon transgression when sea levels were a maximum of 5 meters above the present level (Kotani 1968:152). These zones are used to refer to pollen assemblages recovered at the Hakodate Airport Site (Chio 1977). At the Nakano B locality the RII zone is reportedly dated to between 8000 and 3500 BP. (ibid.:1262). The arboreal pollen from this period is dominated by buckeye (50-55%), followed by oak (20%) and pine (10%) with lesser amounts of beech, alder, birch, and willow. Walnut pollen is reported (0.5%) only from this zone (ibid.:1263). This pollen assemblage, in my opinion, may be more representative of local mesic vegetation than the regional vegetation at the time.

Archaeology

The Jomon Tradition was a major prehistoric manifestation lasting about eight millenia in the Japanese island system. The degree of isolation of this system is still open to question (Pearson 1976). The Initial Jomon immediately postdates the paleolithic of Hokkaido but follows a short Incipient Jomon period in Honshu and Kyushu (Chard 1974). Throughout the Jomon period southwestern Japan and northeastern Japan are characterized by different patterns. Chard (1974:119) suggests that these patterns be called co-traditions. The area of the study, Oshima Peninsula, is part of the area occupied by the northeastern co-tradition. The divisioning of the Jomon into Initial, Early, Middle, Late, and Final periods or stages is applied throughout the islands (see Kidder 1968). Following the Final Jomon in most of Japan outside of Hokkaido is the Yayoi Period which began about 300 B.C. in northern Kyushu. The Yayoi marks the beginnings of intensive wet rice agriculture in Japan. In Hokkaido, however, the Final Jomon is not followed by the Yayoi but by the Zoku Jomon, or Continuing Jomon, Period (see Kidder 1968; Chard 1974), which lasted from about the time of Christ to perhaps A.D. 800. The Yayoi ended about A.D. 300 in Honshu and Kyushu and was followed by the Kofun period, during which the first Japanese states evolved. The end of the Kofun period in the 7th century A.D. is the beginning of the historic period in Japan. In Hokkaido, the historic period was not until considerably later, perhaps in the 13th century, when the Japanese (wajin) began to settle there. The Zoku Jomon was followed by an archaeological complex known as the Satsumon culture which ended about A.D. 1200. The Satsumon is generally thought to be ancestral to the Ainu (Ohyi 1970; Chard 1974). The archaeology of Hokkaido becomes quite complex during the first millenium A.D. and the issues will not be sorted out here. One important point is that it is erroneous to equate the Ainu with the Jomon; continuing from the Jomon to the Ainu is open to question. In the following discussion the southwestern Hokkaido Initial through Middle Jomon periods is summarized. The summary is not meant to be exhaustive, rather it generally places the sites in question in proper chronological and spatial context.

The four sites for this study are Initial (Nakano B), Early (Hakodate Airport Locality 4, Yagi, and Hamanasuno), and Middle Jomon (Usujiri B). Richard Morlan cautions that the fivefold division of the Jomon "cannot be applied to Hokkaido without making certain alterations or qualifications" (1966:44). Pottery assemblages or shiki-doki, in Hokkaido are assigned to a particular period (jidai) on the basis of traits shared with pottery assemblages on Honshu. Since culture history and chronology are the overriding goals of Japanese archaeology, periodization in this manner is of some utility. Many archaeologists in Hokkaido, though, are concerned less with the absolute nature of these periods than with distinguishing what may be considered to be archaeological phases. Peter Bleed, who has extensive reviewed the shiki-doki concept, points out that the shiki "play the same role as 'phases' in North American archaeology" (1973:15). A particular shiki may be assigned to different periods depending upon the researcher. For example, Yoshizaki (1965:31) gives the Todohokke shiki a transitional status between Initial and Early Jomon, whereas Takahashi and Ogasawara (1976) classify it as Early Jomon (Table 1). In the following discussion, emphasis will be placed on the shiki-doki exemplified at each site, since this kind of classification more specifically relates to form and content of site artifact assemblages. Period assignments for the Hakodate Airport, Yagi, Hamanasuno, and Usujiri B sites are agreed upon by Hokkaido archaeologists and will be used in the following discussion in their temporal sense--not as stages.

The Nakano B locality of the Hakodate Airport site belongs to the Sumiyoshi-cho phase. Pottery from this phase is the earliest known in Hokkaido and is not found in the northeastern part of the island (Yoshizaki 1965). It represents the beginning of the Initial Jomon period (Table 1). First defined for the Sumiyoshi-cho site in Hakodate, variations have been found at the Tonoma site and the Nesaki sites (Figure 2). Ceramics belonging to this phase are shellmarked and have pointed bases. Nine radiocarbon dates have been reported from Nakano B (Chio 1977) and all are beyond the present range of the MASCA correction factor (see Hurley et al. 1977):

N2517	7280 ± 170 BP(5330 B.C.)
N2511	7510 ± 245 BP(5560 B.C.)
N2515	7520 ± 150 BP(5570 B.C.)
N2514	7690 ± 125 BP(5740 B.C.)

Table 1. Initial Through Middle Jomon Chronology in Southwestern Hokkaido (based on Takahashi and Ogasawara, 1976; Morlan, 1966)

Approximate Dating	Jomon Period	Phase	Subphase	Sites
2000 B.C.		Yoichi	Nodappu II (central Hokkaido)	Usujiri B
		?	Rengadai	
		?	Shizukari	
		Daigi	Daigi VIIIb	Usujiri B
		Ento-Joso	Miharashi-cho	
			Saibesawa VIIb	Usujiri B
			Saibesawa VIIa	
			Saibesawa VI	
			Saibesawa Vb	
			Saibesawa Va	
			Kabui a	
3000 B.C.	Middle		Kabui b	
	Early	Ento-Kaso	Saibesawa III	Hamanasuno
			Saibesawa II	Hamanasuno
			Todokawa b	
			Todokawa a	Hakodate Airport Locality 4 and Yagi
			Hamanasuno	
		Ishikawa-no		
		Kasuga-cho		
5000 B.C.	Early	Todohokke		
	Initial	Vesaka		
		Yanagawa-cho		
		Oma C		
		Arutori		
		Kojohama		
		Sumiyoshi-cho	Nesaki	Yagi (?)
		Yoichi	Nodappu I (central Hokkaido)	
4000-6000 B.C.		Sumiyoshi-cho	Sumyoshi-cho I	Nakano B
			Sumioshi-cho II	

N2516	7750 ± 120 BP	(5800 B.C.)
N2510	7850 ± 90 BP	(5900 B.C.)
N2513	7910 ± 80 BP	(5960 B.C.)
N2512	10,300 ± 160 BP	(8350 B.C.)

The 5960 B.C. and 5740 B.C. dates are from the structure from which plant remains are reported (House 11).

Contemporaneous with Initial Jomon phases in the Oshima Peninsula are phases unique to eastern Hokkaido (e.g. Higashikushiro). At this time the southwestern Hokkaido Jomon and the northeastern Hokkaido Jomon were developing separately; the southwestern Hokkaido phases were more closely related to the northern Honshu Initial Jomon. Yoshizaki suggests that this separation was not always the case, evidenced by flat-based, cord-marked pottery found in both areas in the late Initial Jomon (Yoshizaki 1965:38).

The other sites mostly belong to the temporally and geographically extensive Ento group. Ento pottery (literally "cylindrical" pottery) existed until the end of the Middle Jomon and consists of two phases: the Ento-Kaso (Lower Ento) and the Ento-Joso (Upper Ento). Ento-Kaso pottery is Early Jomon and Ento-Joso is Middle Jomon. Yoshizaki (1965:41) notes that "when the Ento-Kaso phase began to flourish in northern Tohoku, southwestern Hokkaido became part of the northern Tohoku cultural sphere." Southwestern Hokkaido Ento pottery is somewhat different than that of Tohoku where it was initially defined (see Kidder 1968:50). In the Oshima Peninsula the Ento-Kaso and Joso phases are represented by thirteen of what I shall call "subphases" (Table 1). The Ento subphases from which extensive plant remains are reported in this investigation are: Saibesawa II and III at the

Hamanasuno site and Saibesawa VII at Usujiri B. Two phases post-dating the Ento-Joso have also been sampled at Usujiri B: Daigi VIIIb and Nodappu II. A few plant remains are reported from the Todokawa phase at Locality 4 of Hakodate Airport and the Yagi site. Todokawa and Saibesawa II and III are subphases of Ento-Kaso. Yoshizaki believes they are equivalent to Ento-Kaso a-b, c, and d, respectively (1965:42). Other Saibesawa II sites include Saibesawa and Jubeisawa (Morlan 1966) (Figure 2). Saibesawa III sites are found not only in southern Oshima but in areas further north than Saibesawa II sites; one is as far north as Muroran (the Ponnai site; Figure 2) (Yoshizaki 1965). Other Saibesawa III sites include the Saibesawa, Hinohama, Mojiri, Irie, Shizukari, Higashiyama, and Katsuyamadate sites) (Figure 2). A wide range of radiocarbon dates has been reported from southwestern Hokkaido Early Jomon sites (5680 $\pm$ 380 BP to 3800 $\pm$ 140 BP) (Hurley et al. 1976: 118 and 139). For the moment testing of the Ento-Kaso sequence by chronometric techniques has not been carried out.

The Yagi site currently presents a confused situation. Test excavations at Yagi indicated an occupation of the earliest part of the Ento-Kaso phase: the Todokawa subphase (Chio 1972). Our excavations at Yagi in 1978 found the remains of one Todokawa subphase house but radiocarbon dates from two other pit structures with unclear ceramic associations cluster around 2500 B.C. (Hurley and Yoshizaki 1979).

The contrasts and similarities among the stone tool assemblages found in the Kameda Peninsula are not accessible to me at the present time. Some information is available, but the data have not yet been thoroughly assessed by the archaeologists themselves. The stone tools from House 11 at Nakano B (from which flotation samples were taken) were numerous; about 630 tools were recovered. Over half of them were stone weights (large notched pebbles used as netsinkers). The other tools were scrapers, polished stones, large bifacial points, tanged scrapers, arrow points, ground stone axes, pecked stones, hammerstones and a few each of drills, cores, whetstones (to-ishi), and ishizara (metates) (Yoshino 1977).

From Locality 4, some 20 tool types have been reported: projectile points, bifaces, drills, tanged scrapers, other scrapers, cores, stone weights, polished stones, hammerstones, stone saws, ishizara, sekikan (a kind of mano), blades, pendants and a few others (Chio 1977). Although most of these classes are similar to those reported from Nakano B, both qualitative and quantitative differences exist. Although I cannot presently define those differences, one observation is that ishizara proliferate after the Initial Jomon and the sekikan are not reported from Nakano B. Yoshizaki believes that the stone tool assemblage and technology of the Initial Jomon is significantly different from that of subsequent periods (personal communication).

By the late Early Jomon, a wider range of tools seems to have been in use. The data from Hamanasuno are being analyzed by William Hurley and his associates at the University of Toronto. So far they have isolated over 40 kinds of tools; the assemblage has greater qualitative similarities to the Todokawa assemblage than the Initial Jomon assemblage.

At the Usujiri B site three late Middle Jomon subphases have been found. Although not yet systematically analyzed, the ceramics are tentatively assigned to the Saibesawa VII subphase of Ento-Joso, and the Daigi VIIIb and Nodappu II phases. Saibesawa VI and VII sites are common in the Oshima Peninsula but occur farther north than any of the preceding phases (e.g. the Takaoka site in Ishikari) (Yoshizaki 1965). Other Saibesawa VII sites are Jubeisawa, Ponnai (Yoshizaki 1965), and Saibesawa B (Takahashi and Morita 1967) (Figure 2). Daigi VIIIb is a tentative classification and its existence in Hokkaido presents a problem. Daigi VIIIb sherds were found in association with Saibesawa VII pottery at the Saibesawa site (Yoshizaki 1965:48). Formerly, Daigi VIIIb pottery was known only from Tohoku (northern Honshu). Usujiri B, to my knowledge, is the first site in Hokkaido at which Daigi VIIIb structures have been located. Bleed (1973:38-39) has reviewed the Daigi VIIb phase of Tohoku and notes that, even in Tohoku, assemblages from this phase are poorly known. It is a widespread complex "distributed over all of Tohoku with heaviest concentration along the Pacific coast" (ibid.:39). At Usujiri B, Daigi VIIIb is later than the Saibesawa phase but probably not much later. The Nodappu II phase is later than both the Saibesawa VII and Daigi VIIIb complexes (Table 1). At the Nishimata site the Nodappu II occupation has been radiocarbon dated (seven dates) from 4790 ± 100 BP (2840 B.C.; MASCA 3690 B.C.) to 3880 ± 100 BP (1930 B.C.; MASCA 2440 B.C.). Four dates cluster around 2000 B.C. (MASCA 2400 B.C.).

The Yagi, Hamanasuno, and Usujiri B sites are not the only evidence of prehistoric occupation of Minamikayabe. A survey of the town found 24 sites (Chio 1972). The earliest occupation is evidenced by Initial Jomon shell-marked pottery found in the test pits at Yagi (ibid.:5). Similar sherds were found in our 1978 Yagi excavation. The latest prehistoric period occupations are evidenced by Zoku Jomon (Esan shiki) pottery at the Birodomari site along with what appears to be the remains of an Ainu chashi (fortification) (ibid.:11 and 13). An apparent Ainu burial is also reported from the Usujiri B site (Ogasawara 1978). Through the Early, Middle, and Late Jomon an increase in the number of occupations is evident. The two Early Jomon sites (Yagi and Hamanasuno) partially overlap in time. Seven sites are Middle Jomon while perhaps nine are Late Jomon. Only five Final Jomon sites are reported and the following Zoku Jomon period is represented by a few pieces of pottery. The meaning of these data are unclear, since the shiki are reported for only a few of the sites. Where the shiki are reported, chronological overlapping of occupations is clear (e.g. Yagi and Hamanasuno; Usujiri B and Shojin River). Increasing occupation intensity of the area within the boundaries of Minamikayabe is likely the case, at least through the Late Jomon period. All of the sites reported by Chio (1972) are limited to areas adjacent to the coast. None have been found inland. Only two of the sites, the Late Jomon Kinaoshi site and the Final Jomon Kakkumi A site, are situated in areas lower than 20 m above sea level, below the terrace.

Subsistence

Jomon subsistence in both northeastern and southwestern Japan is thought to have been based on hunting and gathering (gathering here referring also to fishing and shell fish collection). Over the eight millenia of the Jomon period there are hints that populations emphasized different kinds of resources at different times throughout Japan. For example, the Late Jomon of northeastern Honshu is thought to have been an effective maritime adaptation (Kider 1968; Chard 1974:131). Large shell middens are conspicuous at this time. In southwestern Hokkaido, however, such a generalization is not appropriate. Of the 103 sites listed for the Hakodate area only five are shell middens; three are Middle Jomon and two are Late Jomon (Chio 1977). No shell middens are known in Minamikayabe for this period. Along with these temporal subsistence variations, spatial variations too are known. Regional archaeological differences roughly correspond to environmental zones and "it is likely that they reflect ecological adjustments emphasizing exploitation of differing economic resources" (Chard 1974:111). Chard also notes that we do not know how to interpret the significance of regionalism during the Jomon (ibid:142). The relative adaptive success and variations of the Jomon cannot be explained without detailed examination of subsistence. Reference to plant food subsistence in the Japanese literature on Jomon archaeology are numerous but few are systematic studies. In Japan outside of Hokkaido, subsistence studies have focussed on the existence or non-existence of agriculture in the Jomon period. First, agriculture in the Chubu District during the Middle Jomon has been proposed (Fujimori, 1965). At this time, the well-documented Katsusaka phase developed on the Pacific facing slope of the mountains in the Chubu District (see Bleed 1973; Chard 1974). This phase is typified by elaborate remains from a large number of sites. The complexly designed pottery has a sculptural attitude with applique and, occasionally, zoomorphic and anthropomorphic motifs combined with a general disregard for card-marking (Kidder 1968:91). This unusual development during the Jomon led some scholars to hypothesize that it was based on a dramatic subsistence change--the origin of agriculture in Japan. Fujimori based his argument on a number of characteristics of the Katsusaka phase such as the functional differentiation of pottery, the proliferation of digging tools and ishizara (metates), and the discovery of a number of carbonized "cakes" presumably made from cultigen plants (Fujimori 1965). Recently, these ideas have been challenged by Tsunoda and Watanabe (1976). Results of their excavation at the Kuwagaishimo site in Kyoto show that native plants of the Shōyojurintai (Broad-leaf Evergreen Forest Zone) were likely utilized in the context of hansaibai (half-cultivation) which was part of the early stage of the Shōyojurin culture as hypothesis by Kamiyama (1961), Nakao (1966), Sasai (1971), and Ueyama et al. (1976). Tsunoda and Watanabe (1976) also observe that Late and Final Jomon populations relied heavily upon acorns and tochinoki (a Japanese buckeye). A leaching technology which allowed for a more effective exploitation of these nuts is thought to have developed in the northeast and diffused southward (ibid.). The ishizara are part of this leaching technology. (In my opinion the plant remains from Kuwagaishimo do not support this interpretation). Plant husbandry probably existed in the Final Jomon as evidenced, for example, by rice and barley remains recovered in flotation samples from the Uenoharu site in Kyushu (Kotani 1972). In addition gourd (hyōtan) remains are reported from the Early Jomon Torihama shellmound in Fukui prefecture (Morikawa 1976).

Research on prehistoric plant utilization in Hokkaido has long been neglected but research is progressing. Cultigen remains from several Satsumon period sites indicates that plant husbandry was a subsistence activity at that time. Hayashi (1975) contends that the Ainu were involved in plant husbandry prior to the time when the Japanese initiated a policy encouraging them to take up agriculture. Hitoshi Wotanabe (1972:131) outlines the ambiguity of the evidence for Ainu agriculture prior to 1700 A.D. The only other subsistence related study in Hokkaido is my own (Crawford 1976; Crawford et al. 1976). In 1974 plant remains were recovered by flotation from an Ento-Kaso c-d (Saibesawa II-III) component of the Hamanasuno site. Subsequent analysis showed the presence of more than 18 species of plants in differing abundance at the Hamanasuno site. Thirty-seven percent of the total number of seeds are from herbaceous weeds while the remainder are mainly from other types of plants common to disturbed areas of one sort or another. One cultigen seed, buckwheat (*Fagopyrum esculentum* Moench.), was identified in a sample from the fill near the floor of a pit house. Several seeds of the tribe Paniceae (millet) were recovered but no evidence suggested that they were cultigens. Nut remains are virtually absent from the samples (one fragment was found). The large number of *ishizara* (metates or grinding stones), the importance of weed seeds (and probably greens too), and the buckwheat seed strongly suggested that plant husbandry was carried out at Hamanasuno in Early Jomon times. In addition I hypothesized that the Early Jomon of southwestern Hokkaido mainly utilized plants growing in the immediate vicinity of their settlements, that Early Jomon coastal occupations and their immediate environs were disrupted by human activity to an extent that plant productivity was high, and that the Jomon of this area was not simply an adaptation to temperate forests and littoral resources.

Beyond these data little is known about the palaeoethnobotany of Hokkaido. Only general information is available on total subsistence pursuits. Animal remains are reported from time to time (e.g. the remains cited in Morlan 1966) but are not included in systematic ecological context. Bones from three of the sites in the present investigations have been reported. Animal remains (259 calcined bone fragments) from Hamanasuno include one earless seal (subfamily Phosinae) bone, three northern fur seal specimens (Callorhinus ursinus), a large seal or sea lion specimen (family Delphinidae), a hoofed mammal bone (order Artiodactyla), a hare bone (Lepus timidus), and one specimen of cormorant (Phalacrocorax sp.). In total, 72 specimens were mammalian, 3 were avian, and 13 were fish.

From the early Early Jomon Todokawa subphase occupation at Locality 4 of Hakodate Airport, 42 bones or bone fragments have been reported (Miya 1977). Thirty-one are sea mammal bones: sea lion, seal, porpoise, and unknown sea mammal. Eleven are unidentified land mammal bones. Each of these classes was identified at Hamanasuno (Savage 1975). Animal remains from House 11 at Nakano B, an Initial Jomon occupation at Hakodate Airport, contrast with the Early Jomon samples. The remains from Nakano B include sea urchin (bafun-uni), a shark tooth (nezumi-zame), 20 bones of a type of sardine (iwashi), and five dace (ugui) bones. Five fragments were not identifiable.

Some relationship probably exists between the change in stone tool assemblage after the Initial Jomon and the different animal remains evidenced at the Initial and Early Jomon sites. The palaeoethnobotanical data presented in this dissertation point to a change in plant utilization after the Initial Jomon. In combination with the animal remains, a reorientation of overall subsistence pursuits is suggested during or after the Initial Jomon.

The Jomon sequence and areal distribution in the Oshima Peninsula probably reflects gross adaptive patterns from the perspective of plant and human inter-relationships. The general Ento cultural continuity suggests that a relatively stable, long-lasting system of plant and human relationships similar to that at Hamanasuno with spatial and temporal variations of an unspecified range related to settlement pattern, seasonalty, and cultural affiliations (at least at the abstract level of shiki-doki) existed at least throughout the Early and Middle Jomon. A pattern of increased sedentism from Initial Jomon onward (Hurley 1977) may mean that ecological disturbance was also increasing and evidence of this should be detectable in the plant remains.

CHAPTER II

PLANT REMAINS IDENTIFICATIONS AND ECOLOGICAL DATA

This chapter is concerned with the identification and description of the plant remains, excluding wood charcoal, recovered from the Kameda Peninsula sites. Ecological data for each taxa of plants is also presented. The specific archaeological contexts in which the plant remains were found are described in separate chapters. The remains are grouped according to whether the seeds or fleshy fruits were probably the primary plant parts utilized ("grain seeds" and "fleshy fruit seeds") or whether or not they were utilized for other purposes ("other seeds"). Many of the plants may also have been exploited as greens; this is pointed out for the appropriate taxa. Furthermore, two classes of unidentified seeds are distinguished: unknown and unidentifiable. The order of the descriptions is the same as the order presented in the Tables and Figures throughout this report.

The scientific nomenclature follows Jisaburo Ohwi (1965). English common names are used in the text and tables to denote plant taxa which are also common in North America or which have familiar English common names. In cases when familiar English names do not exist, the Japanese common name is used.

The level of confidence of each identification is denoted by the adjectives "questionable," "possible," and "probable." No modifier means that the identification is positive. A questionable identification is one that is the most uncertain. This designation is applied when characters necessary for a good identification are not present. A possible identification is more confident than a questionable one and denotes a best guess. A probable identification is nearly certain but confirmation has not been secured. In any case, justification is presented for the level of each identification. Uncertain identifications are often arrived at through a combination of morphological characteristics and the known geographical range of a taxa. More extensive reference material should allow confirmation or negation of the classifications.

Identification of the plant remains were assisted by the following texts: Kasahara (1974), Kuwabara (1974; 1975), Martin and Barkley (1961), Montgomery (1977), Musil (1963), and Nagata (1972).

Sasa

Stem fragments of sasa, a grass in the tribe Bambuseae, were found in many flotation samples. Two species grow in Minamikayabe today: Sasa kurilensis Makino et Shibata (chishimazasa) and S. palmatus Nakai (kumaizasa) (Murokata 1975). Chishimazasa is a high mountain species (Owhi 1965). Murokata (1965) reports that chishimazasa is replaced by kumaizasa at lower altitudes in Minamikayabe. Sasa grows abundantly both in the beech forests and in secondary forests but is far more abundant in the latter.

Nuts

Many nut producing trees grow in the investigation area. These include walnut, chestnut, buckeye, oaks, and beech. Only two types of nut have been found carbonized in the samples. These are:

Chestnut

A few small, probably immature, chestnuts (Castanea crenata Sieb. et Zucc.; kuri) were found at the Usujiri B site. Southwestern Hokkaido is the northern limit of the tree. Chestnut is not common in Minamikayabe today although a chestnut grove was found on the terrace above the Shojin River near Hamanasuno. Owhi (1965) reports that chestnut grows in foothills. Archaeological chestnut has been recovered from the Seizan site near Hakodate. The nuts are available in the fall.

Japanese Walnut

The tough, carbonized nutshell of walnut (Juglans ailanthifolia Carr.; onigurumi) has been recovered, but not abundantly. Walnut was found at the Saibesawa site (Early and Middle Jomon) and a single walnut is reported from the Haruhi Site in Hakodate (cited in Watanabe 1975:16). Walnuts ripen in the fall.

Grain Seeds

Echinochloa Type

A majority of the grass seeds is probably barnyard grass (Echinochloa crusgalli Beauv.). E. crusgalli is the only species of Echinochloa that grows in Japan. Ohwi (1965) reports four varieties, three of which grow in wet or lowland habitats and mainly as rice paddy weeds. The only upland variety is E. crusgalli Beauv. var. praticola Ohwi; hime-inubie). It is a weed in Minamikayabe today (Murokata 1975) and is common throughout Japan (Ohwi 1965). None of the other varieties is found in Minamikayabe.

The carbonized seeds are all naked (only the caryopses are present) and with only a few exceptions the embryos are not intact (Plate 1). The caryopses from Hamanasuno average 1.5 mm long and 1.2 mm broad. Those from Usujiri B average 1.7 mm long and 1.3 mm broad. Barnyard grass seeds shrink about 10% when they are carbonized. Eighteen caryopses were carbonized and their average dimensions were reduced from just over 1.9 mm by 1.5 mm to 1.8 mm by 1.4 mm. The actual seed size of the archaeological specimens is probably closer to 1.6 mm by 1.3 mm for the Hamanasuno sample and 1.8 mm by 1.4 mm for the Usujiri B sample.

Figure 4 diagrams the uncorrected size distribution of the caryopses from Hamanasuno and Usujiri B. The product of the length times the breadth of the seeds was used as an index of overall seed size. The range of the seed size falls within the range reported by Gould et al. (1972). The size distribution is not that of an homogeneous population however. Two and possibly three modes are present: one in the 1.7 to 1.8 class in the Hamanasuno sample, one in the 2.1 to 2.2 class for the Daigi VIIIb sample and perhaps another in the 2.7 to 2.8 class. Together with the increase in mean seed size between the Hamanasuno and Usujiri B samples this seed size distribution indicates that a significant increase in seed size (about 20%) occurred over the at least one millenium separating the two occupations.

Increase in seed size is a characteristic of many cultigens (for a discussion see Schwanitz 1967:14-24). Weeds among cultigens often undergo morphological changes, including increased seed size (ibid.:122). For example, Echinochloa crusgalli Beauv. var. oryzicola Ohwi is a variety of barnyard grass that has undergone considerable evolution

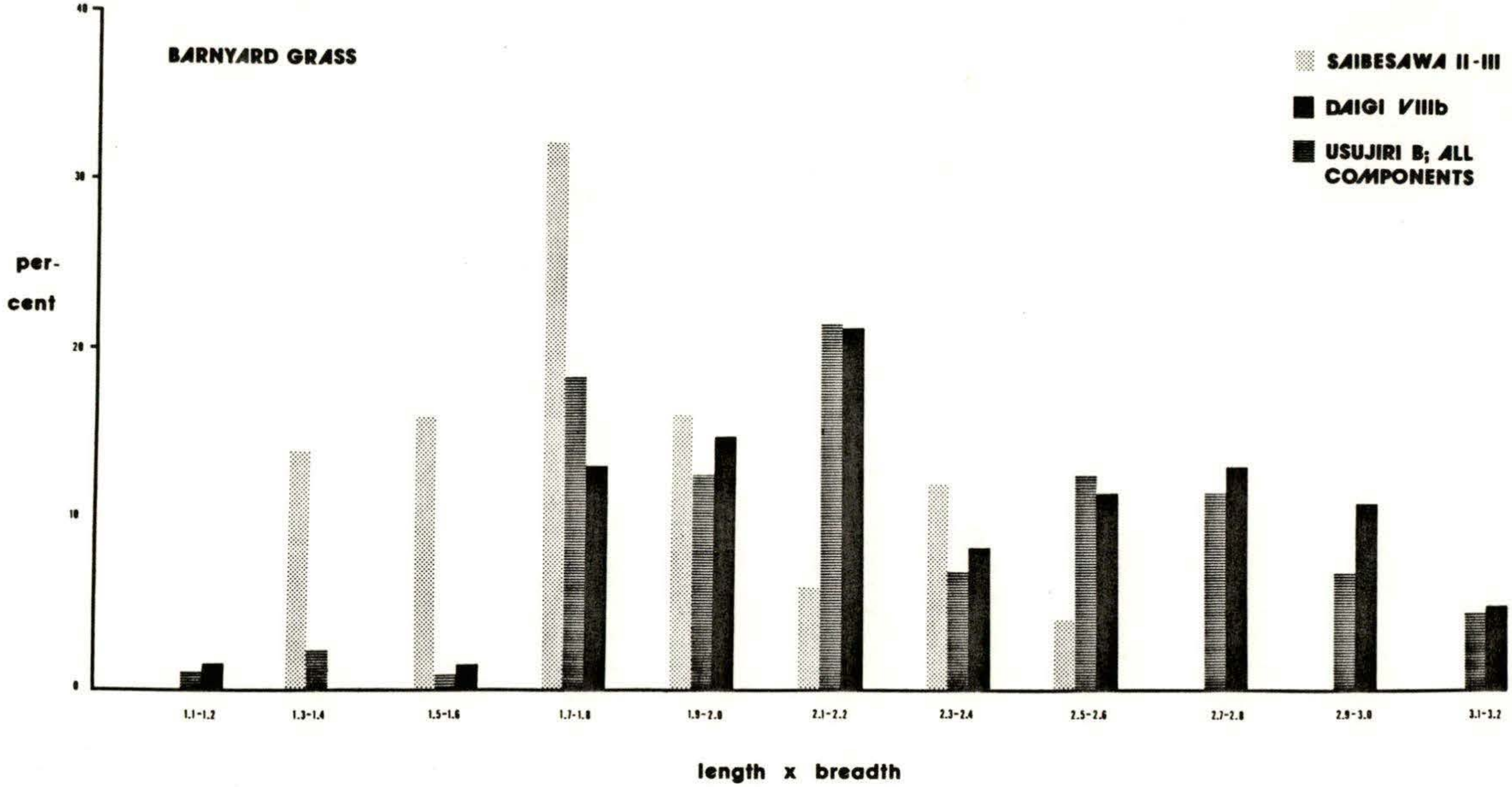


FIGURE 4

Frequency Distribution of Barnyard Grass
(<u>Echinochloa</u> <u>crusgalli</u> Beauv.) Caryopses Size (lenght X breadth)

as a result of its association with wet rice (Yabuno 1966). I doubt that the seed size increase noted in the Hokkaido sample is a result of an adaptation to another crop plant. Instead, the seed size increase is evidence of artificial selection, possibly involving polyploidy. Archaeological documentation of such changes in seed size is rare. Seed size increase of two cultigens, sumpweed and sunflower, over several millenia in eastern North America has been documented by Richard Yarnell (1972; 1979).

Today perhaps two species of Echinochloa are cultigens: E. frumentacea and E. utilis (Yabuno 1966). The latter species is grown mainly in eastern Asia and apparently evolved form E. crusgalli (ibid.:319). The Jomon data may represent an independent domestication of barnyard grass but several reservations about this interpretation must be considered. First of all, the seeds may represent two genera since carbonized seeds of plants in the millet tribe are difficult to distinguish (e.g. Setaria and Echinochloa). Nevertheless if the seeds are from one species (even if their identification as Echinochloa is incorrect) the seed size increase of nearly 20% is a significant change. Second, the quantity of archaeological seeds is not consistent with the quantities that would be expected were this plant husbanded prehistorically. Further archaeological evidence bearing on this problem is discussed in Chapter VII.

Other Grasses

Grass seeds (family Gramineae) are represented by an estimated minimum of 18 types: 14 from Hamanasuno and 4 from Usujiri B. No single type in this group is particularly abundant. Some may be identifiable, but most are not. One type found clustered in the hearth of House 60 at Hamanasuno measures 1.0 to 1.1 mm long and 0.6 to 0.7 mm broad. Their morphology suggests that this species is a member of the tribe Paniceae. Similar seeds were found in House 30A at Hamanasuno. Another type is flattened and measures 1.9 by 0.8 by 0.5 mm. The embryo is about one third the length of the caryopsis. A few morphologically similar but smaller examples have been found in other samples. Two other notable grass seed types are present. Two specimens are possibly Panicum L. (kibi zoku). One (Hamanasuno, House 71, Pit 4) measures 1.3 by 0.7 mm. The other (Hamanasuno, House 78, floor) is 2.1 by 1.2 mm. A probable Setaria Beauv. seed (enokoro-gusa zoku) which measures 1.0 by 0.7 mm was found in the floor sample from House 62 at Hamanasuno.

The 18 types of other grasses probably do not represent plant food remains. These grasses may have been used as construction materials, however.

Knotweeds

Five types of knotweed (family Polygonaceae, genus Polygonum L.; tade zoku) have been isolated. Species identifications are suggested for each type but the extreme interspecific variability and species polymorphism of this genus makes positive identifications difficult. For this reason several types of knotweeds are reported. A type may be a species, or several types may be a single species. Knotweeds can also be eaten as greens.

HNS type. This type is named after the Hamanasuno site (HNS) at which it was first found. It is the most abundant single type of knotweed in the 1974 flotation samples from Hamanasuno. A sample of 20 seeds range from 2.1 to 2.8 mm in length (average:2.5 mm). HNS Type seeds are oval in cross-section and contracted at the ends (spindle-shaped) (Plate 2). The tips of many of the seeds are faintly trigonous. Kasahara (1974:332) reports that seeds of Polygonum cuspidatum Sieb. et Zucc. (itadori) range from 2.0 to 2.5 mm in length and can be either trigonous or spindle-shaped. The only other knotweed seed which is morphologically similar to the HNS Type seeds is that of P. sachalinense Fr. Schmidt (ō-itadori). Modern specimens of ō-itadori seeds are about 3.9 mm long and are all trigonous. HNS seeds are possibly itadori.

Type A. Type A knotweed seeds (Plate 2) are similar in size and shape to HNS Type knotweed seeds. Type A seeds are trigonous in cross-section, however, and are slightly longer than the HNS Type seeds. A sample of 20 seeds has a range of 2.4 to 3.1 mm in length (average:2.8 mm). Most of the Type A seeds are probably P. sachalinense Fr. Schmidt. (ō-itadori). Since the size range overlaps that of itadori seeds and the seed shapes of both species are similar, both species may be represented. For this reason the two types are listed adjacent to one another in the tables and figures listing the seed data.

Ō-itadori is an herbaceous plant sometimes growing up to three meters tall. According to Ohwi (1965), it grows along ravines and streams in mountains. It is common today, though, in waste ground, along roads and paths and at forest edges (Murokata 1975) and grows profusely in old fields. The seeds are available beginning in October.

Ōinutade. Ōinutade seeds (P. lapathifolium L.; also called sanae-tade) are flattened, lenticular (Plate 3), and range from 1.8 to 2.3 mm long (average:2.1 mm). According to Ohwi (1965), it is common in sunny grassy places and waste ground in lowlands. Ōinutade is relatively common in the Nishimata site area (Mitsuno 1974). Archaeological ōinutade seeds have been reported from two sites in Japan, in addition to the sites in this study: the Uenoharu site in Kyushu (Kotani 1972) and from the Seizan site in Hokkaido (Crawford 1976). Jane Renfrew (1973:183) reports that seeds of this plant are known from sites in many parts of Europe.

Type B. Type B seeds (Plate 3) are lenticular with the embryo situated along one edge. The pericarp is smooth. Of the knotweeds presently growing in Japan, P. foliosum H. Lindb. (yanagi-nukabo) and P. persicaria L. (harutade) have seeds similar to Type B seeds. Yanagitade seeds are about 1.5 mm long according to Ohwi (1965). Harutade seeds are slightly larger with a range from 1.8 to 2.2 mm long and 1.6 to 1.8 mm wide (Kasahara 1974). A sample of 32 carbonized seeds range from 1.5 to 2.2 mm long (average:1.9 mm) and from 1.0 to 1.7 mm wide (average:1.4 mm). No reference material is available for either species, so a positive identification cannot be made. The seeds, however, are probably harutade. Harutade, common in Japan, is an annual that grows in waste ground.

Type C. Type C knotweed seeds are probably P. longisetum de Bruyn (inutade). The carbonized specimens are 1.3 to 2.3 mm long (average: 1.6 mm) and are trigonous with rounded vertices. Inutade is an annual favoring grassy, sunny places in lowlands (Ohwi 1965). I have found it growing in the vicinity of the Hamanasuno site and Mitsuno (1974) reports that it is common in the Nishimata site area.

Polygonum sp. Many of the carbonized knotweed seeds are represented by fragments which are not further classifiable. These are listed in the tables and figures as "*P*. sp." A type of knotweed found only at Usujiri B (2 seeds) is included in this category. The seeds are about 1.3 mm long and trigonous with indented faces which gives the seeds a cross-section which is three-lobed in appearance.

Dock

Dock (Rumex, L.; gishi-gishi zoku) is also a member of the family Polygonaceae. A sample of 18 carbonized seeds from several different contexts range from 1.8 to 2.4 mm long and are acutely trigonous (Plate 4). Seeds of dock are similar to knotweed seeds but can be distinguished from the latter on the basis of the embryo location and other subtle morphological characteristics. Identification to species seems to be possible although interspecies differences are small in some cases. Six species grow in Hokkaido today: *R. acetosella* L. (*hime-suiba*), *R. acetosa* L. (*suiba*), *R. longifolius* DC (*no-daiō*), *R. japonicus* Houtt. (*gishi-gishi*), *R. crispus* (*nagaba-gishi-gishi*), and *R. obtusifolius* L. (*ezo-no-gishi-gishi*). Seeds of *R. acetosella* and *R. longifolius* are quite different from the archaeological seeds. *R. crispus* is supposed to be a recent introduction from Europe and western Asia (Owhi 1965; Kasahara 1974). The archaeological seeds are probably either *suiba*, *gishi-gishi*, or *ezo-no-gishi-gishi*; all of which grow in Minamikayabe today (Murokata 1975). Modern seeds of *suiba* are smaller (1.5 to 2.0 mm) than the carbonized seeds while seeds of the other two species are about 2.5 mm long.

Chenopod

Chenopod (*Chenopodium* L.; *akaza zoku*) is a member of the family Chenopodiaceae. Only three seeds were recovered from Hamanasuno in

1974 (Crawford, 1976) but the sample was increased considerably in this study. One seed tentatively classified as Amaranthus L. (Crawford 1976) falls within the range of variation evident for the sample of chenopod seeds now available. The carbonized seeds (Plate 4) range from 1.0 to 2.0 mm in diameter. Four species grow in Hokkaido today: C. album L. (shiro-akaza), C. ficifolium Smith (ko-akaza), C. glaucum L. (urajiro-akaza), and C. hybridum L. (usuba-akaza). Urajiro-akaza seeds are too small (0.8 mm) and usuba-akaza seeds are too large (2.0 mm) to be the species represented by the archaeological specimens. The seeds are probably either shiro-akaza or ko-akaza. The only other record for carbonized chenopod seeds from Jomon sites are from the Seizan site (Crawford 1976). Shiro-akaza is common in the Nishimata site area (Mitsuno 1974) while both shiro-akaza and ko-akaza grow today in Minamikayabe (Murokata 1975). Both species grow in highly disturbed soil.

Fleshy Fruit Seeds

Udo

Udo (Aralia cordata Thunb.) is one of two species of Aralia (the other is A. elata Seem.; tara-no-ki) which grows in Hokkaido. Murokata (1975) reports that both species are found in Minamikayabe. Seeds of the two species can be distinguished from one another: tara-no-ki seeds are striated, udo seeds are relatively smooth (Plate 5). Udo is a perennial herb which grows up to two meters tall in the Minamikayabe area. It prefers openings in woods and disturbed soil. The shoots of the plant are often eaten by the Japanese today. The fruits are available in the fall.

Amur Corktree

Carbonized seeds (Plate 6) and berry flesh of the amur corktree (Phellodendron amurense Rupr.; karafuto-kihada), in the family Rutaceae, are presented in this study. An Ainu individual has reported to me that the Ainu commonly use the berries for medicinal purposes. Watanabe (1972) reports that the Ainu also utilized the berries for food. The amur corktree is a deciduous tree usually found in the woods in mountains (Ohwi, 1965). Murokata (1975) reports that it is more common at lower altitudes in Minamikayabe and was found in one of his study areas (the mountain ridge near the Ofune pass). One botanist has informed me that amur corktree is also common in river valleys at low altitudes in Hokkaido. The fruits ripen in September and October.

Blackberry

Blackberry (Rubus L.; ki-ichigo zoku) is a genus comprised of some 37 species in Japan. R. parviflorus L. (nawa-shiro-ichigo) is the most common species in Hokkaido. Murokata (1975) reports six species growing in Minamikayabe: R. wrightii A. Gray (kuma-ichigo), R. mesogaeus Michx. (kuro-ichigo), R. parviflorus L., R. phoenicolasius Maxim. (ebigara-ichigo), R. pseudo-japonicus Koidz. (himegoyo-ichigo), and R. strigosus Michx. (urajiro-ezo-ichigo). These species grow in openings in woods and other disturbed habitats.

Elderberry

Elderberry (Sambucus L.; niwatoko zoku) is represented by only one species in Hokkaido: S. sieboldiana Bl. var miquella (ezo-niwatoko). The only other species of elderberry in Japan, S. chinensis Lindl., has a more southerly distribution. Seeds of the two species are similar.

Murokata (1975) lists ezo-niwatoko as a component of the Hinamikayabe coastal vegetation (Appendix 1C). It is common in clearings and along paths and roadsides in Minamikayabe. Elderberry fruits are available from late summer through early fall.

Grape

Two species of grape (Vitis L.; budō zoku) grow in southwestern Hokkaido, according to Ohwi (1965); V. coignetiae Pulliat. (yama-budō) and V. thunbergii Sieb. et Zucc. (ebizuru). Murokata (1975) reports that a third species, V. flexuosa Thunb. (sankaku-zuru) grows in Minamikayabe and he does not report ebizuru. Yama-budō seeds are about five mm in length. Ebizuru seeds are smaller, measuring about 3.5 mm long. No sankaku-zuru seeds were available for examination. The carbonized seeds range from 3.5 to 4.7 mm long but most of them are larger than 3.9 mm and all are morphologically quite similar. Therefore none of the grape seeds seem to be ebizuru. Ampelopsis Michx. (no-budō zoku) seeds are similar to grape seeds but are distinguishable in this case. Grape is common in openings in woods. Watanabe (1972:39) reports that yama-budō berries were eaten by the Ainu. The fruits are available in the fall.

Matatabi

The name "matatabi" here refers to the genus Actinidia Lindl. of the family Actinidiaceae or Dilleniaceae. A species, A. polygama Maxim., is also known as matatabi. A. polygama and A. arguta Planch (sarunashi) var. platyphylla Nakai (kokuwa), according to Ohwi (1965), are the only species that grow in southwestern Hokkaido among the five species of

Actinidia that grow in Japan. Murokata (1975) also reports A. komikta Maxim. (miyama-matatabi) which Ohwi (1965) reports only from north and central Hokkaido. No reference material for A. komikta is presently available. The carbonized seeds (Plate 5) do not resemble the seeds of A. polygama and compare well with seeds of A. arguta. Matatabi commonly grows in openings in woods. Murokata (1975) reports that sarunashi and miyama-matatabi are part of the coastal vegetation (Appendix 1C). Matatabi grows abundantly around the Usujiri B site. The fruits ripen in October.

Other Seeds

Sumac

Three species of sumac (Rhus L.; urushi zoku) grow in Hokkaido: R. ambigua Lavall. (tsuta-urushi), R. javanica L. (nurude), and R. trichocarpa Miq. (yama-urushi). All three are reported growing in Minamikayabe (Murokata 1975). Twenty-five carbonized seeds from Hamanasuno and Usujiri B (Plate 7) range from 2.8 to 4.1 mm long (average: 3.3 mm). Yama-urushi and tsuta-urushi seeds are fairly large (4.0 to 4.8 mm). Nurude seeds range from 3.0 to 3.2 mm long. More than one species may be represented although clusters of sumac seeds probably are single types and considerable size variation was noted among the specimens in a single cluster.

The three species are common in dry habitats. Contact dermititis can be received from tsuta-urushi which is a woody vine. The other two species are small trees and are found in the hills and mountains according to Ohwi (1965). More specifically, they are common in areas which were disturbed many years previously and which have since been left relatively undisturbed. Such areas are found today on the terrace, road embankments, and sometimes on the steep slopes of river-sides.

Cleavers

The seeds of cleavers (Galium L.; yae-mugura zoku) are not positively identified; however, the identification is a probable one. Cleavers seeds are spherical or flattened spheres. Flotation samples from the Hokkaido sites all contain a variety of spherical objects which may be fungus sporangia and are not seeds. Close examination allows separation of spherical seeds from the other objects. The spherical seeds are probably cleavers, although a few may not be seeds. Ohwi (1965) reports 19 species from Japan ranging from grassy mountain slopes and disturbed soil to riversides in lowlands. Murokata (1975) has found five species of cleavers in Minamikayabe. No reports on the possible uses of cleavers in Hokkaido have been found yet. Many of the species have prickly fruits which easily adhere to clothing, hair, etc. The seeds may thus be fortuitous inclusions in the archaeological samples.

Dogwood

Two types of dogwood (Cornus L.; mizu-ki zoku) seeds have been recovered (Plate 8). One type is ridged and measures 3.6 by 4.0 mm. The other is smooth except for four grooves which are 90 degrees apart. The seeds should be further identifiable but comparative seeds are not presently available. Based on the seed descriptions provided by Ohwi (1965) possible identifications are: C. brachypoda C.A. Mey. (kumano-mizu-ki), C. canadense L. (gozem-tachibana), and C. suecicia L. (ezogozen-tachibana). The latter species is rare and its distribution is apparently limited to eastern Hokkaido. Of the three species, gozen-tachibana is the only species which Murokata (1975) lists growing in Minamikayabe. The fruits are ripe in the fall. The utilization of this plant by the Jomon peoples of the Kameda Peninsula is doubtful. Dogwood seeds have been receovered from the Kuwagaishimo site in Honshu, but they were not carbonized (Nishida 1976).

Ostrya

The carbonized seeds (Plate 9) of asada (Ostrya japonica Sarg.) are as long as 4.5 mm. Modern seeds measure 5-6 mm, but these are not from Hokkaido. The size difference may be due to carbonization.

Other Seeds

A small percentage of the total number of seeds in this study belong to four taxa which were probably not utilized or were unimportant to the populations of the area: Cyperaceae (katsuri-gusa ka), Compositae (kiku-ka), Solanaceae (nasu ka), and umbelliferae (seri-ka).

The Cyperaceae (sedge) seeds are possibly Fimbristylus subbispicata Nees et Meyen. (yamai) and Scirpus L. (hotaru-i zoku). Both plants prefer wet ground. Only one Compositae achene was found. It is 2.3 mm long. Members of this family grow today most commonly in old fields, clearings in woods, and at forest edges in Minamikayabe. Plants of the family Solanaceae (nightshade) include six genera in Japan: Lycium L., Scopalia Jacq., Physalis L., Physalliastrum Makino, Tubocapsicum Makino, and Solanum L. The carbonized nightshade seed is 1.3 mm long.

A single, probable Umbelliferae (umbel family) seed was recovered. Thirty-one genera are reported in Japan, 21 of which grow in Minamikayabe

(Murokata 1975). Umbels are common in disturbed soil, in clearings, and at forest edges.

Legumes (family Leguminosae; mame-ka) are represented by a few cotyledons (partial seeds). This is an extensive family whose fruits and/or seeds are generally edible.

Unknown Seeds

The unknown seeds are identifiable but not yet classified. The total sample of unknown seeds are comprised of an estimated 141 taxa. Most of the taxa are exemplified by only single specimens. A few occur in several samples. These are illustrated in Plate 10. One unknown seed is possibly Sorbus L. (nana-kamado zoku).

CHAPTER III

METHODOLOGY

The attainment of the goals of this study were predicated on the collection of plant remains from the five sites in question. The sites were not chosen by using any special sampling logic. Virtually all archaeology in southwestern Hokkaido is salvage work so I had no choice but to work at sites which were being excavated while I was in Japan. The Yagi site is an exception. The Yagi project, begun in 1977, is research oriented. Fortunately, salvage archaeology is extensive in the study area and sites representing a four millenia time-span were sampled for plant remains. The fact that the extent of any single excavation is quite big, permitting the large-volume sampling of a wide variety of contexts, was a tremendous advantage in this kind of investigation.

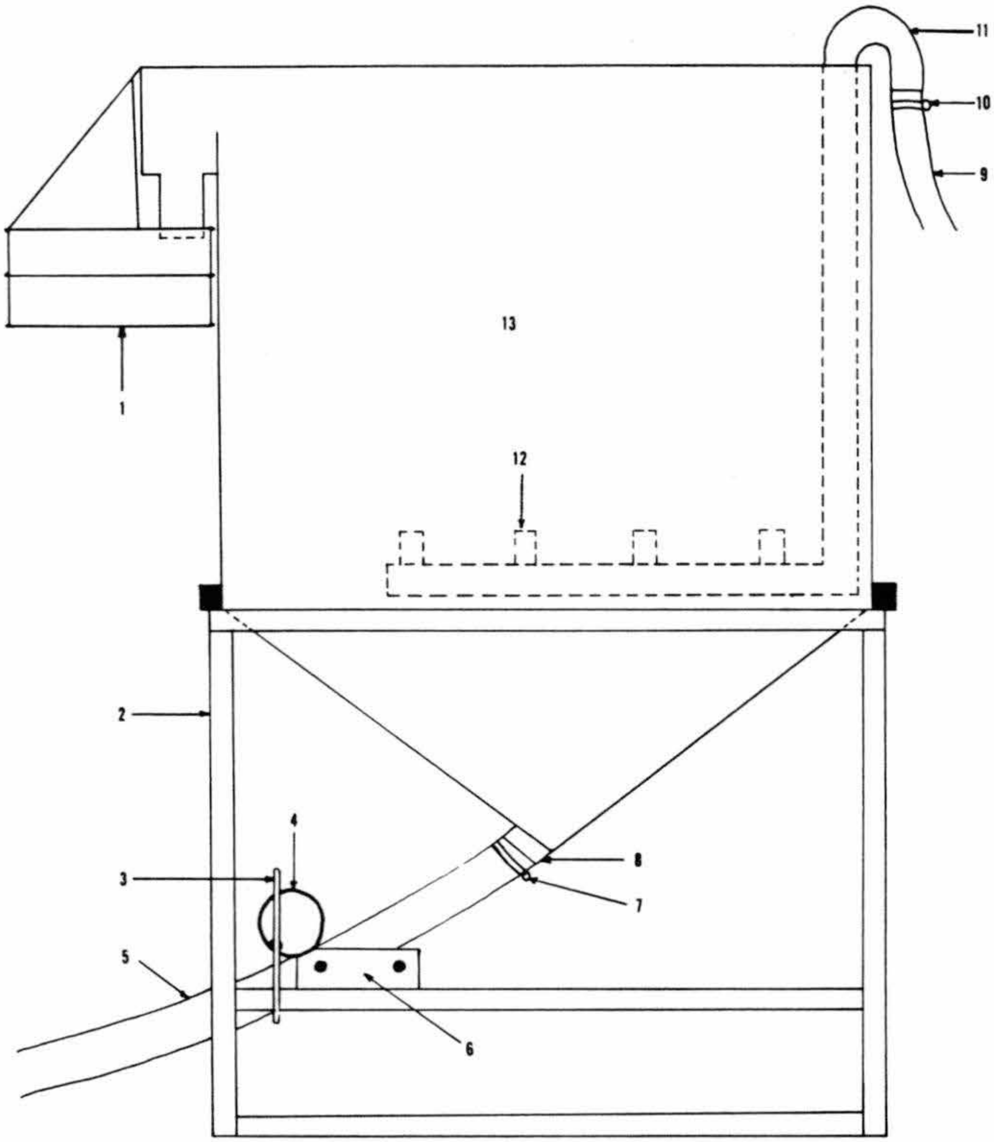
The plant remains were recovered using the flotation or water separation method popularized by Stuart Struever (1968). Archaeological plant remains samples are critically biased if they are not systematically sampled (see Struever, 1968; Jarmen et al. 1972). Where systematic recovery of plant remains has been instituted, our preconceptions of prehistoric plant utilization and concomitant implications on local subsistence adaptations have often been dramatically altered. For example, Chester Gorman has documented the wide range of plants used by early post-paleolithic peoples in Thailand (1969). In eastern North America, our conception of Late Archaic and Early Woodland subsistence has changed. Recent work has shown the existence of a non-pottery associated plant husbandry sequence (Yarnell 1974) and a separate origin of agriculture in the area has been disconfirmed (Chomko and Crawford 1978). Watson (1976) has summarized recent contributions flotation studies have made to Middle Eastern archaeology. In Japan, Kotani (1972) and I (Crawford 1976; Crawford et al. 1976) have already demonstrated the importance of flotation to Jomon studies.

During the four field seasons spent in Hokkaido collecting plant remains, I have employed three flotation methods. The first is what I call the bucket method. A collection of plant remains from Hamanasuno retrieved by this method has already been reported (Crawford 1976 a; Crawford et al. 1976). As Patty Jo Watson notes (1976), one of the first published accounts of a flotation apparatus was the bucket method useb by Hans Helbaek to float deposits from the Deh Luran Plain (Helbaek 1969). In my opinion, the use of this method is still warranted. To begin, a bucket is filled 1/3 to 1/2 full with soil (preferably a bucket calibrated in liters), the volume of soil is recorded. Then water is slowly added until the bucket is filled to within a few inches of the rim. While the water is added, the soil is gently stirred by hand to make sure the soil is completely wetted and that the archaeological remains have been released from the soil. The water and debris floating on the water surface and suspended in the water are poured through a fine screen (preferably the mesh size should be 0.7 mm^2 or smaller). Care must be exercised in order to prevent pouring any of the sediment into the screen. This procedure can be repeated on the same soil sample until it seems relatively clean. The light fraction is trapped in this screen and set aside to slowly dry. The soil remaining in the bucket can either be immediately discarded or further processed by, for example, wet-screening.

In 1976, I decided to use a modification of the garbage-can technique described by Watson (1976:80). A galvanized bucket with a 1.6 mm^2 metal screen replacing its bottom was inserted inside a plastic garbage-can filled with water. Metal brackets welded onto the side of the bucket supported it in the top of the garbage-can. I must emphasize that the soil was poured slowly to allow it to be thoroughly wetted. If the soil is not wetted completely small carbonized remains which would otherwise become suspended in the water will be carried through the screen to the bottom of the garbage-can. Screening in the bucket was facilitated by agitating the soil by hand and gently breaking any clumps of dirt. While the soil was stirred the light fraction was collected in a hand-held strainer. I made my own strainer out of 0.5 mm^2 mesh bought in a local hardware store. This light fraction was placed into a paper towel and set aside to dry. When the material lying on the screen in the bucket (the heavy fraction) is relatively free from soil, leaving only items such as stone flakes, bone, etc. the process is complete. When I used this method, I usually worked with an assistant.

In 1976 a maximum of about 50 liters of soil per day was processed by the garbage-can method. This is similar to the rate reported by Struever (1968) for the Apple Creek samples (70 liters per day). The concentration of remains at Hamanasuno and Nakano B probably represent actual differences in the concentrations of carbonized remains in the archaeological soils. The soil samples from Hamanasuno were drier than those from Nakano B when I floated them. As a result the heavy fractions from Hamanasuno were relatively sterile. About 35% of the carbonized remains reported from Nakano B were extracted from the heavy fractions.

The results obtained using the bucket and garbage-can methods indicated that identifiable plant remains are in very low concentrations in all of the archaeological contexts sampled (generally less than 1 gm per liter of soil; seeds are less than 1 per liter). It was clear that if the subsistence hypotheses were to be adequately tested a much more effective flotation method had to be used; one that would allow processing of larger soil samples in a reasonable amount of time. It appeared that perhaps 10 times the quantity of soil collected in 1974 from Hamanasuno would be necessary (Crawford 1976). Both Limp (1974) and Patty Jo Watson (1976) have made similar suggestions. Mechanized methods are known to give adequate processing rates (Watson 1976). With this logistics problem in mind, a froth flotation apparatus (Plate 11 and Figure 5) was purchased by William Hurley and is on loan in Japan from Erindale College of the University of Toronto. The froth flotation machine not only allows a greater quantity of soil to be processed per day but, in principle, retrieves seeds denser than water. Furthermore, problems of chemical additives to increase the density of the separation medium are eliminated (Jarman, Legge, and Charles 1972:39). The developers of this apparatus summarize the flotation principle as follows:



1	Course and fine sieves	7	Screw clip
2	Stand for tank	8	Discharge spout for mud
3	Valve handle	9	Rubber air hose
4	Valve	10	Screw clip
5	Discharge hose	11	Metal air delivery tube
6	Valve fastening bolts	12	Porous cone
		13	Flotation Tank

FIGURE 5

Froth Flotation Apparatus

"In froth flotation additions known as 'collectors' made to a suspension of the mixed solids in water selectively coat the surfaces of the required particles, so that they become more water repellent and air avid than the particles with which they are mixed, i.e. hydrophobic and aerophilic. The suspension is searched by rising air bubbles and the formation of a short-lived froth at the surface is facilitated by making additions of a frothing agent . . . which lowers the air/water surface tension so that bubbles may approach each other without coalescing. When suitably coated particles meet an air bubble they attach to it and are lifted into the surface froth for removal" (Jarman, Legge, and Charles 1972:40).

For the duration of the Kameda Peninsula study, the froth flotation apparatus was installed near the multi-purpose shed used by the archaeologists excavating Hamanasuno. Archaeological soil, collected in large, plastic garbage-bags was brought to the area and stored under a large plastic sheet. During the day the bags were opened to allow the soil to dry. Before the earth could be subjected to flotation, it had to be put through a 2.5 mm^2 mesh screen. This removed any obvious artifacts, stones or other items which might otherwise have damaged the delicate porous brass bubblers (Figure 5). The weight of the soil was recorded and the soil was placed into plastic containers (obtained from a bakery) to dry further and await processing. When the soil was dried considerably but still damp, it was ready for flotation. Flotation of wet soils, fresh from the excavation yielded the poorest results. Completely dry soils, on the other hand, tended to retain carbonized material if there was some clay present in the soil. Somewhat damp soil broke apart easily, and I expect seeds were damaged less by not drying them completely before immersing them in water. In an experiment carried out at Tel Gezer in Palestine (Jarman, Legge, and Charles 1972:45) on a sample of 500 carbonized seeds, a series of three wettings and dryings proved sufficient to destroy the whole sample.

Processing a sample essentially followed the steps outlined by Jarman et al. (1972), although I made a few modifications to fit the Hokkaido soils. The steps were as follows:

1. The flotation tank (Plate 12 and Figure 5) was filled with water to within about 5 cm of the lip.

2. The motor driving the air pump was started and the bubbler head was placed in the water (Plate 13). The frothing agent (Polpropelene glycol) was added (about 20 cc) and about 5 cc of collector (Kerosene) was subsequently added.

3. The soil was gently shovelled from the plastic boxes into two graduated buckets. The two buckets, filled to the top, comprised one flotation run of 16 liters of soil. A careful record of the total volume of a soil sample could then be made. The soil was then poured into the center of the froth bed, care being taken to make sure that the soil was properly wetted. I found that placing my hand just above the water surface and dropping the soil first onto my fingers then onto the froth bed gave sufficient control of the dropping soil. The water level in the flotation tank was such that when the second bucket of soil was added, the water surface rose to just below the tank lip.

4. A short period of time (about one minute) was allowed before collecting the froth and its contents in order to insure flotation of as much residue as possible. I found it necessary to break up some of the soil by hand in the cell at this time. If a second person was available to assist, he or she would run water into the tank to raise the water level above the lip at this time, otherwise the level was raised after the soil was mixed. The bubbler was removed just before

the froth overflowed into the trough and subsequently into the collection screens (Plate 14).

5. The overflow of the cell had to be assisted by hand. I used a hand strainer (the same one that I used in the garbage-can method) to push the froth toward the lip. Any material clinging to the strainer could be easily washed off with a spray bottle. The strainer was then used to collect any floating debris after most of the froth had washed into the trough and the cell was finished overflowing.

6. After each cycle the mud was discharged from the cell. The valve at the bottom of the cell (Plate 15 and Figure 5) allows the removal of a given volume of soil with the loss of only half its volume in water (Jarman et al. 1972:44). At this time the soil could be wet screened to collect a heavy fraction if desired. The soil, in this case, can be discharged into a garbage-can which can have a screen-bottom bucket placed inside it to allow the soil to be washed in a manner identical to that of the garbage-can method. Considering the large quantities of soil that can be processed, a screen of larger surface area placed inside a larger collecting basin would be more efficient for processing the heavy fraction (the illustration in Jarman et al. (1972:45 and 47) shows such a set-up). For the most part, time and labor constraints allowed me to subsample the heavy fractions of only a few samples. Analysis of heavy fractions from the 1976 garbage-can processed samples and samples from the froth apparatus showed that the likelihood of finding relevant heavy fraction remains was low at Hamanasuno, Usujiri B, and Yagi. The mud discharged from the cell into the garbage-can often contained carbonized remains which floated

on the surface of the water above the mud. This was collected in the hand strainer. Only one seed was ever recovered from this discharge. Evidently most of the seeds were collected in the froth (or destroyed by the procedure).

7. When the collection screens were filled to capacity with light fraction, they were cleaned in order to avoid overflow. Otherwise the screens were cleaned after a complete soil sample was processed. The light fraction was emptied onto a dampened paper towel placed upon a piece of newspaper which, in turn, was contained in a small plastic basket. A spray bottle proved useful in washing all of the light fractions out of the screens. The paper towel was then folded over the remains and allowed to slowly dry.

Preliminary laboratory and field tests of the machine by its developers were promising. Jarman et al. (1972:41) report that under laboratory conditions complete collection of carbonized seeds in a soil sample is obtained. In the field, some data exist which indicate that the froth machine can be much more effective than water immersion methods. One study is reported in which 58% of the seeds that were collected by the froth apparatus sank in a water immersion process (ibid.). Data recovered by this new method, then, might yield results incomparable to previously processed samples from Hamanasuno and Nakano B. To measure the comparability of the three methods, several samples from Hamanasuno and Usujiri B were divided into three parts, each to be processed by a different flotation method. Ideally, each soil sample should have been divided into three parts of equal size. The demands of time and money made it impractical to float large quantities of soil by the bucket and garbage-can methods (since fairly large samples need to be taken to retrieve large quantities of seeds). It would have taken far too long to have processed adequately sized samples. Furthermore it was necessary to examine how comparable the large samples processed in the froth machine were to the consistently small samples processed by the other two methods.

Four samples, two from Usujiri B, and two from Hamanasuno were processed to test the comparability of results obtained from the three flotation methods. The experimental results are summarized in Tables 2 and 3. The flotation sample contents are presented in a somewhat condensed form. The samples from Usujiri B, House 20, level 3 were the most productive of the four samples. Together these samples contained 479 seeds and nearly 56 gm of wood charcoal. The other three samples were far less productive and probably contain statistically inadequate data.

The main contrast among the samples from Usujiri B, House 20, is in the density of the light fraction which is composed entirely of carbonized plant remains. The two portions processed by the bucket and garbage-can methods (immersion methods) have about 6 to 8 times the concentration of wood charcoal than the two samples floated by the froth apparatus. Seed densities, in contrast, are more similar, averaging about three seeds per liter. This suggests that the flotation process acts independently on wood charcoal and seeds and that in the froth flotation apparatus there is a greater loss of wood charcoal but not seeds. This pattern is the same as that for the sample from Hamanasuno, House 74, level X4. The considerable variance in the other

TABLE 2 Flotation Method Comparison for Usujiri B, House 20, level X3: Light Fraction and Seed Densities; and Seed Types as Percentage of Total Number of Carbonized Seeds

					Grain Seeds							Fleshy Fruit Seeds					Other Seeds			
						Greens														
						Knotweeds														
Flotation Method	Total Sample Weight (gm)	Total Sample Density (gm per liter soil)	Seed Density (no. per liter)	Total No. Seeds	*Echinochloa* Type Grass	HNS Type	Type A	*P.* sp.	Sorrel	Chenopod	*Udo*	Amur Cork-tree	Blackberry	Elderberry	Grape	*Matatabi*	Sumac	*Ostrya*	Unknown	Unidentifiable
Froth	7.43	0.2	2.8	104	9.6	23.1	-	6.7	2.9	-	1.0(?)	1.0	1.0(?)	-	-	1.0	4.8	-	7.7	41.3
Froth	20.09	0.2	3.0	273	30.0	13.9	-	25.3	0.4	0.4	1.5	1.5	-	0.4	0.4	1.5	3.7	0.7	2.2	18.3
Bucket	12.25	1.1	7.1	71	28.2	14.1	2.6	19.2	-	1.3	1.3	-	-	-	-	2.6	5.1	-	2.6	14.1
Garbage-can	16.36	1.5	2.6	29	24.1	34.5	-	6.9	-	-	-	-	-	-	-	-	6.9	-	6.9	20.7
TOTAL	56.13	0.4	3.2	477	25.4	17.4	a	19.5	0.8	0.4	1.2	1.0	0.2(?)	0.2	0.2	1.4	4.3	0.4	3.7	22.7

a: < 0.1%

TABLE 3 Flotation Method Comparison for Usujiri B and Hamanasuno: Light Fraction and Seed Densities; and Seed Types as Percentage of Total Number of Carbonized Seeds

					Grain Seeds														
							Greens					Fleshy Fruit Seeds					Other Seeds		
					Grasses		Knotweeds												
	Total Sample Weight (gm)	Total Sample Density (gm per liter soil)	Seed Density (no. per liter)	Total No. Seeds	Echinochloa Type	Other	HNS Type	Ōinu-tade	Type B	P. sp.	Udo	Amur Cork-tree	Blackberry	Elderberry	Grape	Matatabi	Sumac	Unknown	Unidentifiable
USUJIRI B House 21, X1																			
Froth	5.66	0.1	0.3	15	6.7	-	-	-	-	26.7	6.7	6.7	-	-	-	-	-	20.0	33.3
Bucket	0.37	a	1.0	11	9.0	-	-	-	9.1	9.1	-	-	-	-	-	-	-	-	72.7
Garbage-can	0.20	a	1.0	8	-	-	-	12.5	-	-	12.5	12.5	-	-	-	-	-	-	62.5
Total	6.23	0.1	0.5	34	5.9	-	-	2.9	2.9	2.9	5.9	5.9	-	-	-	-	-	8.8	52.9
HAMANASUNO House 71, X1																			
Froth	19.27	0.4	0.6	30	-	3.3	6.6	-	-	6.6	-	3.3	-	3.3	3.3	-	13.3	3.3	56.7
Bucket	0.40	a	0.1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0
Garbage-can	1.25	0.1	0.3	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0
Total	20.92	0.2	0.4	37	-	2.7	-	-	-	-	-	-	-	-	-	-	-	-	64.9
HAMANSUNO House 74, X4																			
Froth	22.5	0.3	0.3	34	-	29.4	-	-	-	-	2.9	-	8.8	2.9	-	2.9	8.8	2.9	41.2
Bucket	10.33	0.7	0.2	3	-	-	-	-	-	33.3	-	-	-	33.3	-	-	-	-	33.3
Garbage-can	6.66	0.6	0.5	6	-	-	-	-	-	-	-	-	-	-	-	-	16.7	-	83.3
Total	34.39	0.4	0.4	43	-	19.5	-	-	-	2.4	2.4	-	7.3	4.9	-	2.4	9.8	2.4	48.8

*: Less than 0.05 gm

a: Less than 0.1 gm per liter

two samples (Table 3) may be an artifact of low debris concentration or other archaeological factors which were not controlled for.

All four samples show a remarkably consistent recovery of seed types irrespective of the method used to collect them. Looking at the percent composition of the total number of seeds recovered by each method from Usujiri B, House 20, level X3, grain seeds are dominant. Grain seeds comprise a lower percentage of the seeds in the first froth sample than in the second (42% vs. 71%) indicating that all other factors being equal, there is an actual difference in the archaeological soil contents. This interpretation is supported by the observation that the other three samples have 65% to 74% grain seeds with knotweed seeds comprising roughly 40% of the total number of seeds, followed by grasses at between 24% and 30%. The main contrast between the froth samples and the other samples seems to be a factor of sample size. Seeds which are rare in the large froth floated samples such as elderberry, grape, and blackberry, do not show up in the small non-froth samples. Another contrast, of yet unknown significance, is the variability of the unidentifiable seed percentages. These seeds have their identifying characteristics obscured. Few of the unidentifiable seeds seem to be freshly broken or otherwise distorted, indicating that the different flotation methods do not differentially damage seeds. Seed densities are comparatively low in the other samples, with most seed types represented by only one seed each per sample portion.

In summary, only one of the samples taken for flotation method comparison contained enough information to make a reliable evaluation. The three methods do not appear to differentially select for seeds or types of seeds. This is contrary to the results anticipated by Jarman et al. (1972). The immersion methods seem to be effective in collecting subsistence information relevant to this study. My purpose was not to determine the absolute effectiveness of each method but to evaluate their comparability. For the purposes of this study they will be considered to be directly comparable. Wood charcoal collection may have been biased; it may be under-represented in the froth samples. This would be expected since the soils were screened, prior to froth flotation, to remove small compacted soil clods which probably contained some wood charcoal.

The principal advantage of the froth apparatus was its increased efficiency over the immersion methods. Jarman et al. (1972:45) report that 1000 to 2000 liters of soil from Nahal Oren in Palestine could be processed in a day "under optimum working conditions." The flotation rate in Japan was considerably lower. The maximum quantity of soil that we processed in a day was 374 liters from a single pit. On most good days, about 130 to 150 liters, and occasionally 200 liters were processed. This rate was still two to three times that of the immersion techniques. A number of factors influenced this rate: the number of people processing the samples (usually only one or two), the number of samples floated (one large sample can be floated faster than several smaller ones which require a greater cumulative clean-up time), and the soil which often tended to clump in the flotation cell and made discharge from the cell time-consuming. Furthermore, flotation was carried out concurrently with the excavation on a daily basis. Not only did I have to operate the machine myself, but I had to supervise soil sampling and often collect samples.

Laboratory Analysis

Analysis of the flotation samples followed a standardized procedure which closely follows the one outlined by Richard Yarnell (1974: 113-114). A sample is weighed and then passed through a series of 10 geological sieves of the following mesh sizes: 6.35, 4.00, 2.83, 2.00, 1.41, 1.00, 0.71, 0.42, and 0.21 mm. Each of the 11 fractions into which a sample is divided is weighed. The first sample weight and the fraction weights are not used in the final tabulations of the sample composition but are used as a check against which subsequent weighings are made. The fractions above the 2.38 mm screen are separated entirely into their constituent components which may number as many as nine: wood charcoal, nutshell, amur corktree berry remains, sasa stem fragments, unidentified plant remains, bone, stone flakes, mineral (mainly pumice), and uncarbonized organic material. Each of these components is weighed. Mineral and uncarbonized organic material are not included in the final results. Each of the other components is reported as a percentage of the total component weight.

Below the 2.38 mm screen only carbonized seeds are removed. The seeds are weighed together as a component. After the seeds have been removed, the fractions from the 2.00, 1.41, and 1.00 mm screens are combined and weighed together. The fractions with particles smaller than 1.00 mm are examined but their weights are not included in the final calculations and tabulations. The expected weight of each component that would be found in the entire sample down to the 1.00 mm screen is then calculated based on the assumption that the ratios of each component weight above the 2.38 mm screen to the total weight of the sample above 2.38 mm is the same as the ratio of the total component weight to the total sample weight.

Seeds are usually found in the fractions between the 2.38 and 1.00 mm screens and their weight is usually quite small. The seed weights are not included in the calculations but are tabulated in the final report of the flotation sample contents. For the sites where large quantities of seeds were recovered, the seeds are reported as a percentage of the total number of seeds per sample, otherwise only the number of seeds is recorded. Nevertheless, the raw data are reported in the appendices to this study.

CHAPTER IV

HAKODATE AIRPORT SITE AND YAGI SITE PLANT REMAINS

The earliest phases sampled in this investigation come from two localities of the Hakodate Airport site (Nakano B and Locality 4) and the Yagi site. A third locality, Nakano A, of the Hakodate Airport site was not sampled. Nakano B is a Sumiyoshi-cho phase occupation (see Table 1). Locality 4 and Yagi are both Todokawa phase sites. Not a large quantity of plant remains was recovered from any of these sites compared to what was retrieved from Hamanasuno and Usujiri B. Therefore, the range of variation of plant remains from these early phases has not been adequately explored. The Hamanasuno and Usujiri B sample variation, however, provides an adequate range to allow an evaluation of the significance of the plant remains from Hakodate Airport and Yagi.

Nakano B and Locality 4

Figure 6 shows the location of Nakano B (中野B) and Locality 4. The land on which both sites are located is not well drained. The Uba River (乳母川) drains a narrow marsh which separates Locality 4 from the Nakano site. Within three km of the sites are two rivers, the Matsukura (松倉川) and the Shiodomari (汐泊川) Rivers, which connect the coast with the interior of Kameda Peninsula.

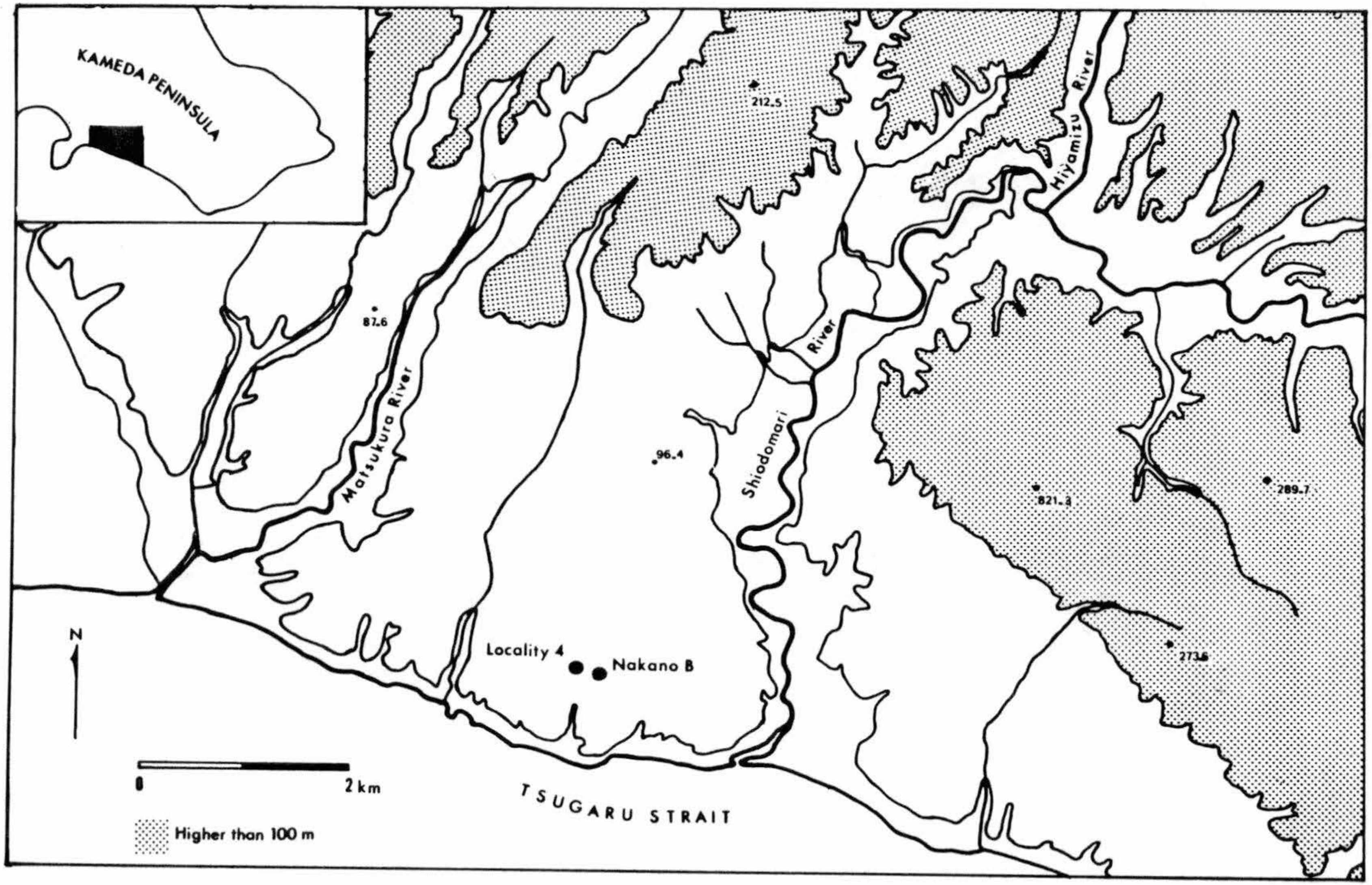


FIGURE 6

Location of the Nakano B Site
and Locality 4 of the Hakodate Airport Site

Both rivers have relatively wide flood plains. Most of the land around the sites as far as the 100 m contour line is under cultivation or is grassland. The only wooded areas are adjacent to the rivers and in the hills and mountains. Pollen from the occupation levels suggest a prehistoric vegetation of buckeye, oak, and pine (Chio 1977). Pollen from herbaceous plants in the families Umbelliferae and Compositae indicate the existence of unforested land.

Nakano B

Twenty-one houses were found at Nakano B but only one house was sampled for plant remains. The soil samples are from Grid 3 (Figure 7), House 11 (Figure 8) and were collected in 1975 by Eisuke Yokoyama, the excavation director that year. Flotation was not carried out until the following year. The samples had been sealed in plastic bags and were still damp after being stored for a year. The soil was not dried to the same extent as the soils flotated in 1977 and 1978. A total of 125 liters of soil were processed from four levels: 1, 2, 3, and IIIb (Figure 8). Level 2 was divided into two portions; one called "level 2", the other called "lower level 2." Although I do not have specific information on the meaning of this distinction, I expect that "lower level 2" is the portion of level 2 immediately overlying level 3. "Level 2" is either general level 2 fill or the portion of level 2 adjacent to level 1. Level 3 is floor fill.

All of the samples from House 11 were processed by the garbage-can technique. Unlike the samples from Hamanasuno, Usujiri B, and Yagi the heavy fractions were found to have a significant proportion of pottery sherds, stone flakes, small bone, and carbonized plant remains. All of the sample listed in Table 4 were recovered from the heavy fractions

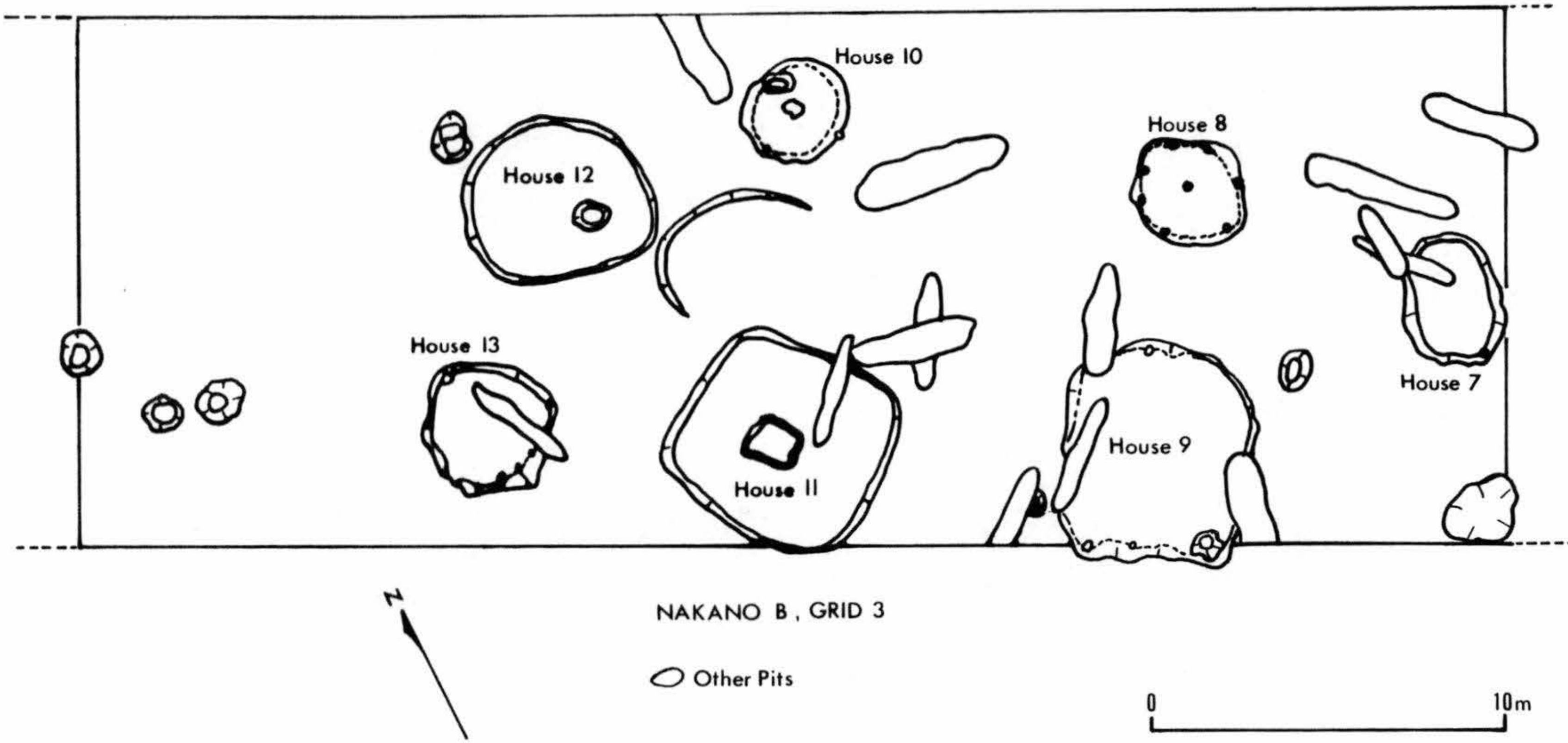
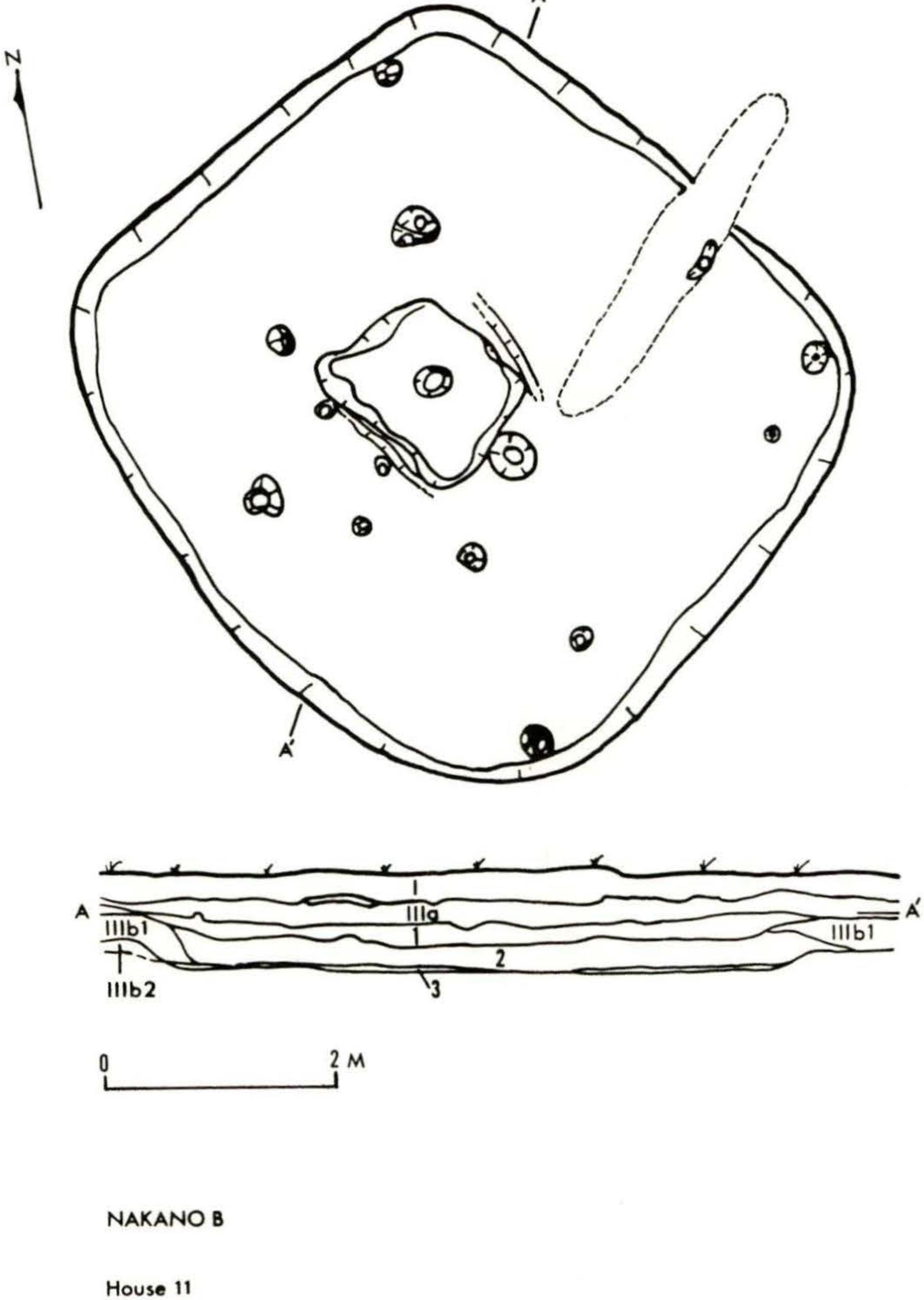


FIGURE 7

Nakano B Site, Grid 3
(adapted from Chio 1977)



NAKANO B

House 11

FIGURE 8

Nakano B Site, House 11
(adapted from Chio 1977)

TABLE 4 Nakano B, House 11, Flotation Samples: Contents as Percentage of Total Sample Weight and Light Fraction and Seed Densities

Level	Total Sample Weight (gm)	Pottery	Stone Flakes	Small Bone	Carbonized Plant Remains	Densities: Light Fraction (gm/liter)	Densities: Seeds (no./liter)
1	40.48	21.5	55.4	a	23.1	0.3	b
2	362.09	61.9	28.3	a	9.8	1.2	0.4
2 (lower)	32.16	33.5	46.5	-	20.0	0.2	0.1
3	244.86	45.5	43.4	-	11.1	0.9	0.8
IIIb2	49.15	87.7	6.9	a	4.4	0.4	b
Total	728.74	54.7	34.2	a	11.1	0.6	0.3

a: Less than 1%

b: Less than 0.1 seeds/liter

except for some of the carbonized plant remains. About 62% of the plant remains is from the light fraction. Since none of the components except for the carbonized material were found in the light fractions from any of the other sites, the carbonized plant remains are summarized separately in Table 5 for comparative purposes.

The carbonized items are comprised of wood charcoal, Japanese walnut shell, carbonized amur corktree berry flesh, unidentified plant remains and 38 carbonized seeds. The seeds are comprised of only seven taxa, three of which are unknown. Fleshy fruit is the most abundant class of plant food represented and almost all of the seeds in this class are amur corktree. The single knotweed seed is the same as Type B seeds recovered from the other sites. Two of the unknown seeds are the same type are not present in the samples from the other sites.

A few patterns in the vertical distributions of plant remains are evident. Levels 2 and 3 have relatively high concentrations of plant remains, while levels 1 and lower 2 have considerably lower concentrations. Seeds show the same pattern: higher densities in levels 2 and 3 than in levels 1 and lower level 2. The distinction between the contents of level 2 and lower level 2 apparently confirms the distinction made in the field but the basis for the difference is unknown to me. No explanation for any of these patterns can be offered at the present time.

Locality 4

Twenty-six flotation samples, only a few liters each in volume, were processed from Locality 4. Seventeen of these samples were from House 1. The remainder were from Houses 10, 15, 46, 47, and 52. The

TABLE 5 Nakano B, House 11, Flotation Samples: Carbonized Plant Remains Components as Percentage of Total Weight of Carbonized Plant Remains and Number of Carbonized Seeds

Total Weight (gm) of Carbonized Plant Remains	Wood Charcoal	Juglans Nutshell	Amur Corktree Fruit Remains	Unidentified Plant Remains	Seeds	Amur Corktree	Dogwood	Elderberry	Type B Knotweed	Unknown	Unidentifiable	Total No. Seeds
9.36	85.3	14.7	-	a	a	1	-	-	-	-	-	1
35.54	75.6	24.1	0.3	a	a	8	-	-	1	2	-	11
6.45	35.0	65.0	a(?)	-	a	1	1	-	-	-	-	2
27.12	75.3	24.1	a	a	a	20	-	1	-	2	1	24
2.14	100.0	a	-	-	-	-	-	-	-	-	-	-
80.61	74.0	25.7	0.3	a	a	30	1	1	1	4	1	38

a: Less than 1%

*: Less than 0.05 gm

carbonized remains totalled 26.32 gm; 98.6% of this was wood charcoal. Walnut shell comprised the remaining 1.4%. The nutshell was all from Pit 2 in House 1. One knotweed seed, from House 1 Pit 3, was the only identifiable seed among the four seeds that were found.

The flotation samples from Locality 4 were probably too small to have produced many plant remains but the drop in percentage of walnut shell compared to Nakano B is probably significant. Interestingly, out of the 10 tools found on the floor of House 1, seven were ishizara (metates). This is a considerably greater proportion than were found in House 11 at Nakano B. This is consistent with the hypothesis (Crawford et al. 1976) that the grinding stones were used for a purpose other than nut processing.

Yagi Site

The Yagi (八木) site is situated on the coastal terrace between the Yagi and Osatsube (尾札部) Rivers (Figure 3). It is in the Yagi River Danchi of the Osatsube community in Minamikayabe at longitude 140°14' E. and latitude 41°53' N. The Yagi River has the broadest valley bottom of any of the rivers between Usujiri and Osatsube. This broad lowland extends only about 1.5 to 2 km inland however. The course of the Yagi River is about 8 km long; its source is at about 400 m above sea level. The Osatsube River, less than a kilometer from the Yagi River at the Yagi Site, is slightly smaller and faster flowing, originating about 5 km inland. The whole area of the terrace where the site is situated (Figure 9) is under cultivation. Only the terrace slope and the hills backing the site vicinity are not cultivated; these areas are covered by secondary forest.

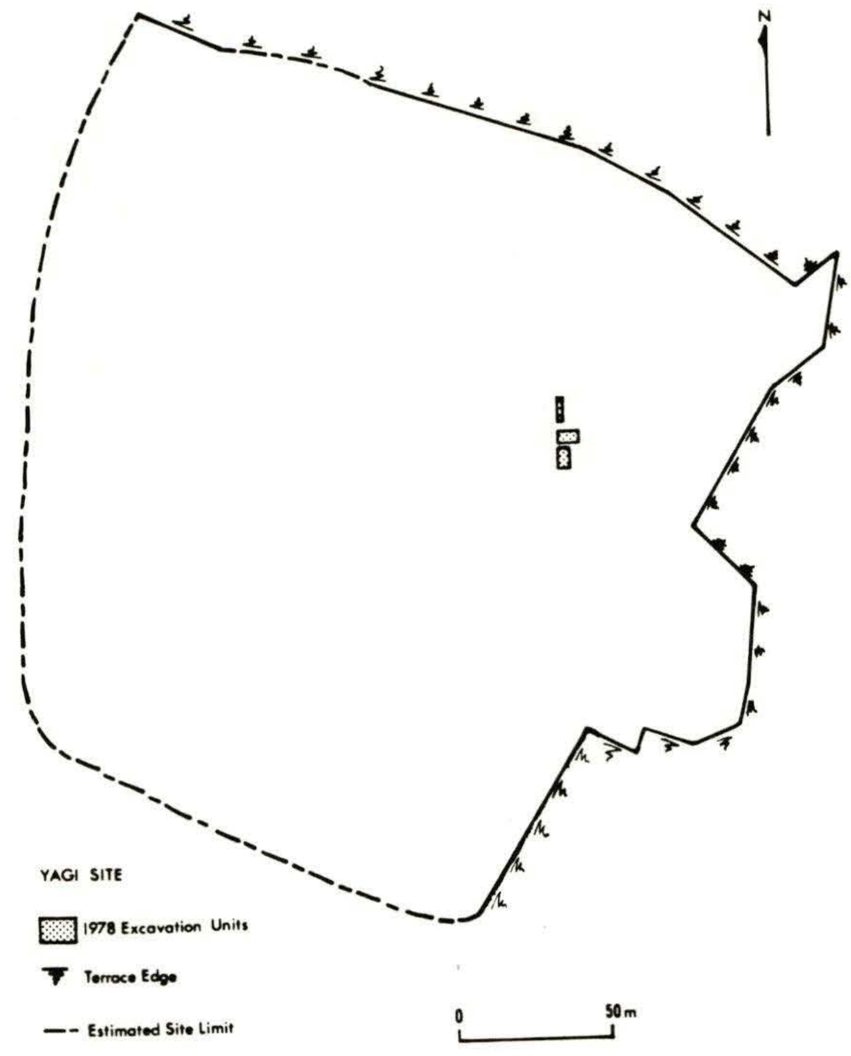


FIGURE 9
Yagi Site

The samples reported here were collected as an integral part of the Yagi project directed by William Hurley, Peter Bleed, and Masakazu Yoshizaki. As such, they are a preliminary examination, the results of which will provide feedback into future sampling at the site. Furthermore, substantive data of relevance to understanding Jomon adaptations in the study area have been recovered. The samples are from three pit houses. The House 1a sample is from house fill encountered in a test pit excavated in 1977. Samples from Houses 1 and 2 were taken in 1978. The houses are not like those found at other sites in the area but no conclusions have been reached yet on the nature of these structures.

Initially, the site was excavated in arbitrary levels. Level 2 is probably general midden overlying the site. Levels 4 and 5 in squares where houses were encountered are house fill; level 5 is the deepest of those arbitrary levels which were sampled. After defining the houses, the feature fill and floor samples were distinguished on the basis of horizontal provenience. The grid key is illustrated in Figure 10.

A total of 609 liters of soil from Yagi were floated. About 72% of this total is from House 2 (Figure 10). The remainder is from four other samples. Almost all of the light fraction is wood charcoal (Figure 11). Some sasa, unidentified plant remains, and seeds were also retrieved.

Carbonized remains (wood charcoal) are concentrated mainly in the floor of House 2. Two of the samples from the house depression fill contained wood charcoal densities within the range of the floor fill samples (samples from N79E98 and N76E98). The other four samples

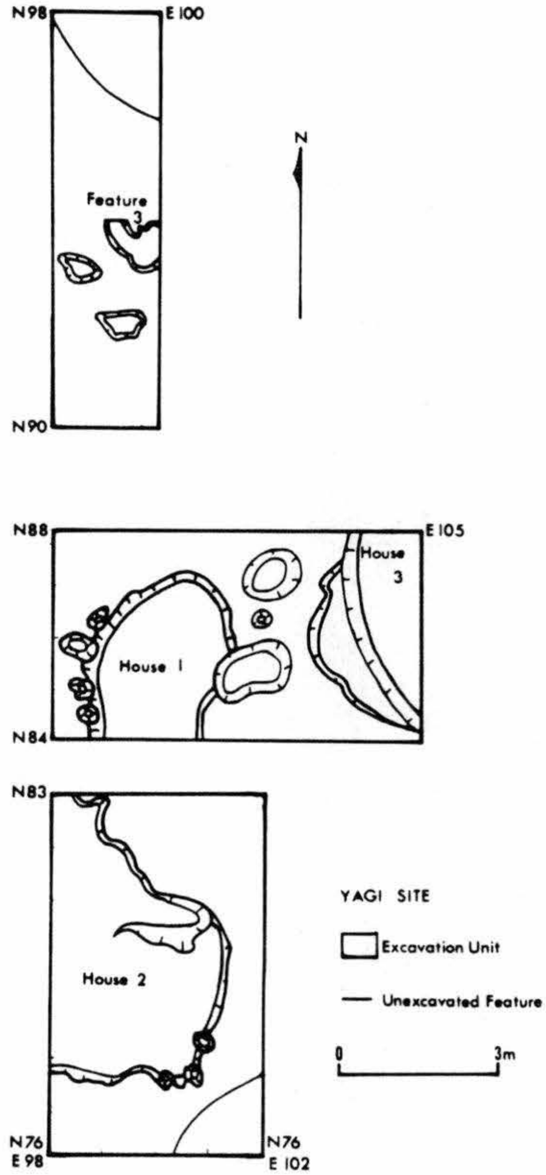


FIGURE 10
Yagi Site Features

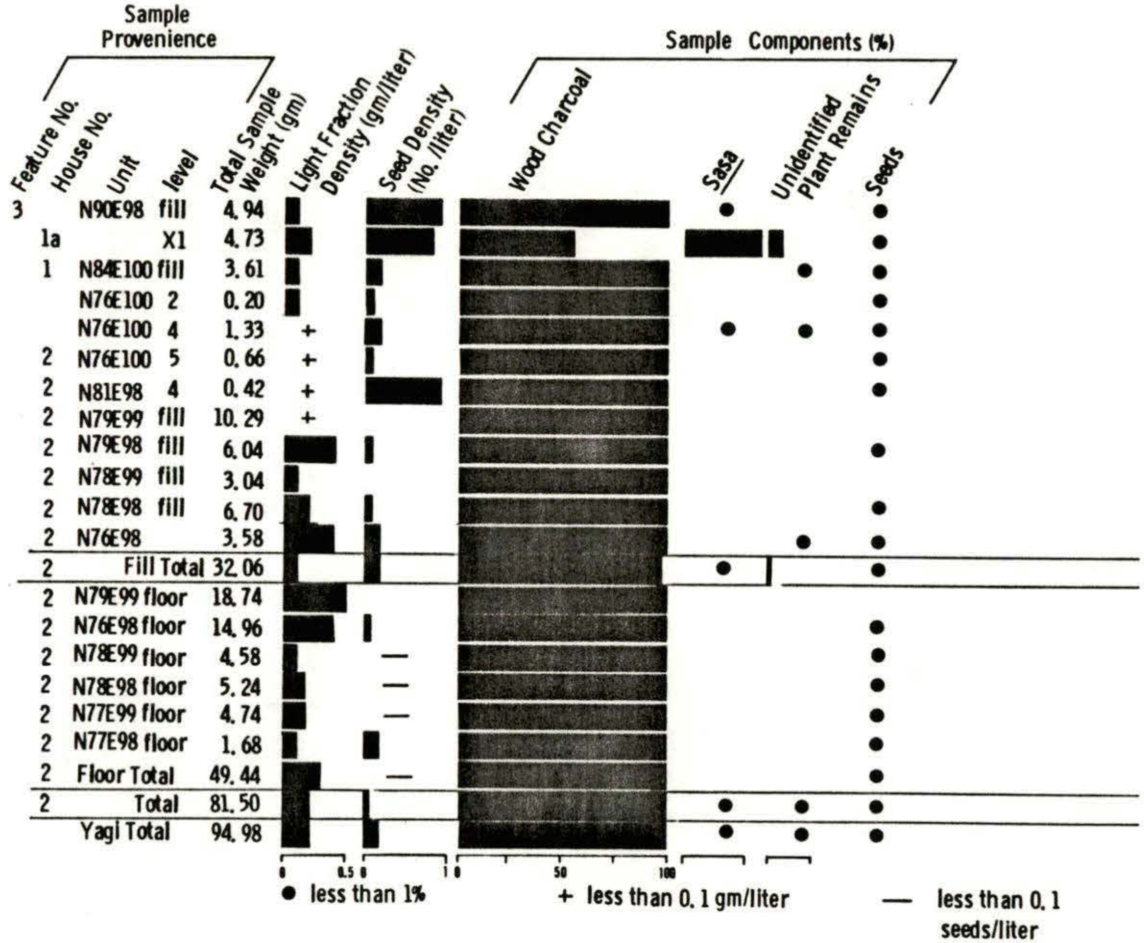


FIGURE 11

Yagi Site Flotation Samples: Light Fraction and Seed Densities; and Sample Components as Percentage of Total Sample Weight contained uniformly low concentrations of wood charcoal. Conversely, though, House 2 has a low seed density overall. The fill of feature 3 and House 1a, level 1 have a much higher seed density than any of the other samples except for the House 2, level 4, N81E98 sample. One important observation is that samples high in wood charcoal concentration contain low seed densities; the samples high in seed densities were quite low in wood charcoal concentrations. Future soil sampling at Yagi must consider this pattern (although the small sample size from Yagi may not be representative of the overall pattern). The floor fill from House 2 is higher in wood charcoal density than the overlying depression fill. This is expected since the distribution of wood charcoal in the fill was one of several factors which allowed us to distinguish the two deposits. Most of the seeds from House 2 come from the house depression fill.

The seed data are summarized in Table 6. Unidentifiable seeds account for 58% of the seeds from Yagi. Unknown seeds comprise 9.6% of the total and represent eight taxa. One of these is probably a seed of a plant in the Umbelliferae family (from House 1a); another is possibly <u>Fimbristylus</u> sp. (House 2, N76E100, level 4). The remaining seeds have been classified and belong to nine taxa including three species of knotweed. Thus 17 taxa are represented in the Yagi seed assemblage.

The grain seeds and greens category dominates the classified seeds (22% of the total). Most of these are knotweed seeds: mainly HNS type. Fleshy fruit seeds (7%) are represented mainly by elderberry.

Although the radiocarbon dates on House 2 cluster in the third millenium B.C. (Middle Jomon period), the major occupation at Yagi

TABLE 6 Yagi Site Flotation Samples: Number of Carbonized Seeds

						Grain Seeds and Greens					Fleshy Fruit Seeds			Other Seeds			
						Knotweeds											
Feature No.	House No.	Unit	Level	Total Seed Weight (gm)	Total No. Seeds	HNS Type	Type B	Type C	P. sp.	Dock	Amur Cork-tree	Elderberry	Grape	Sumac	Cleavers	Unknown	Unidentifiable
3	-	N90E98	fill	*	49	6	-	1	6	2	-	-	-	1	-	6	27
	1a	-	X1	*	24	-	1	-	-	-	-	-	3	-	-	2	18
	1	N84E100	fill	*	11	2	-	-	3	-	-	1	-	-	-	-	5
	-	N76E100	2	*	4	-	-	-	-	-	-	-	-	1	-	2	1
	2	N76E100	4	*	15	-	-	-	-	-	-	5	-	1(?)	-	2	7
	2	N76E100	5	*	2	-	-	-	1(?)	-	-	-	-	-	-	-	1
	2	N81E98	4	*	16	4	-	-	4	-	-	-	-	-	-	-	8
	2	N79E99	fill	*	nil	-	-	-	-	-	-	-	-	-	-	-	-
	2	N79E98	fill	*	1	-	-	-	-	-	-	-	-	-	1(?)	-	-
	2	N78E99	fill	*	nil	-	-	-	-	-	-	-	-	-	-	-	-
	2	N78E98	fill	*	3	-	-	-	1	-	-	-	-	-	-	-	2
	2	N76E98	fill	*	2	-	-	-	-	-	-	-	-	-	-	-	2
House 2, fill: Total				*	39	4	-	-	6	-	-	5	-	1(?)	1(?)	2	20
	2	N79E99	floor	*	nil	-	-	-	-	-	-	-	-	-	-	-	-
	2	N76E98	floor	*	2	-	-	-	-	-	-	-	-	-	-	-	2
	2	N78E99	floor	*	1	-	-	-	-	-	-	-	-	-	-	-	1
	2	N78E98	floor	*	1	-	-	-	-	-	-	-	-	-	-	-	1
	2	N77E99	floor	*	1	-	-	-	-	-	1	-	-	-	-	-	-
	2	N77E98	floor	*	3	-	-	-	-	-	-	-	-	-	-	-	3
House 2, floor: Total				*	8	-	-	-	-	-	1	-	-	-	-	-	7
House 2: Total				*	47	4	-	-	6	-	1	5	-	1(?)	1(?)	2	27
Yagi: Total				*	135	12	1	1	15	2	1	6	3	3	1(?)	12	78

*: Less than 0.05 gm

is early Jomon. The working hypothesis for the time being is that the radiocarbon dates are problematical and not relevant to our understanding of the local chronology. The assemblage of plant remains from Yagi does bear more similarity to that documented for the Early Jomon in the area (see Chapter V). Likely the Yagi plant remains are representative of the Todokawa phase.

CHAPTER V

HAMANASUNO SITE PLANT REMAINS

Hamanasuno (ハマナス野) is an Early Jomon site in the Hamanasuno *Danchi* of Kakkumi, in the coastal town of Minamikayabe (Figure 2) at latitude 41°54' and longitude 140°58'. The edge of the terrace here is 20 m above sea level and slopes gently to a maximum of 40 m in the immediate site area. Mt. Daiba, just to the west of the Kakkumi Pass and only 4 km from Hamanasuno, rises to 528 m above sea level. The Hamanasuno area terrace backed by the ridge of low mountains is bounded to the northwest by the Shojin River (精進川) and to the east by the Kakkumi River (川汲川) The area bounded by the two rivers, the mountains, and Uchiura Bay is a little more than one square kilometer. I have previously suggested that this area was the focus of the Hamanasuno occupants' plant collecting activities (Crawford 1976; Crawford et al. 1976).

The source of the Kakkumi River is 4 km from the coast at 300 m above sea level and that of the Shojin River is 5 km from the coast at 400 m. Both rivers have steep-sided valley walls and flow rapidly along their courses. The valley floors flatten out slightly 2 km from the coast and in this area the vegetation is similar to the *Aesculus-Cercidiphyllum* forests described by Tatewaki et al. (1958).

Since the first excavation at Hamanasuno in 1973, a total area of about 5300 square meters have been opened, not including the 1978 investigations (Figure 12). Within that area some 47 pit houses have been discovered. In addition, numerous pits which seem to be too small for dwellings, some of which contained deep post holes, have been found. To date, plant remains have been collected from 18 of the structures found at Hamanasuno, including one found in 1978.

The Hamanasuno occupation, for the most part, belongs to the late Early Jomon Ento-Kaso phase. At least four subphases are represented: Todokawa (Ento-Kaso a), Saibesawa II (Ento-Kaso b), Ento-Kaso c-d, and Saibesawa III (Ento-Kaso d) (Takahashi and Ogasawara 1976). The pottery has not been systematically analyzed yet but some tentative associational interpretations can be made. All of the structures sampled for plant remains are late Early Jomon Ento-Kaso c-d or Saibesawa III. Several types of pit house belonging to these subphases are recognized. One, the Hinohama type, is characteristically elliptical, the long axis averaging 6 m. A one meter wide bench around the perimeter of the house pit makes the house interior rectangular with rounded corners or pentagonal (Takahashi and Ogasawara 1976:90). Houses 27, 29, 31, 63, and 71 are tentatively classified as Hinohama structures. This type of structure continues into the Middle Jomon, the period for which Hinohama type houses were first defined. Another type of house, found after Takahashi and Ogasawara published their paper in which they summarize the Early Jomon house types, is much larger than the Hinohama type, averaging about 10 m in diameter. The floors are often two meters below the surface. The structures are tentatively assigned to the final Early Jomon period and are known from no other site. Houses 60, 61, 62, 70, 72, and 73 are examples of this large type of pit house.

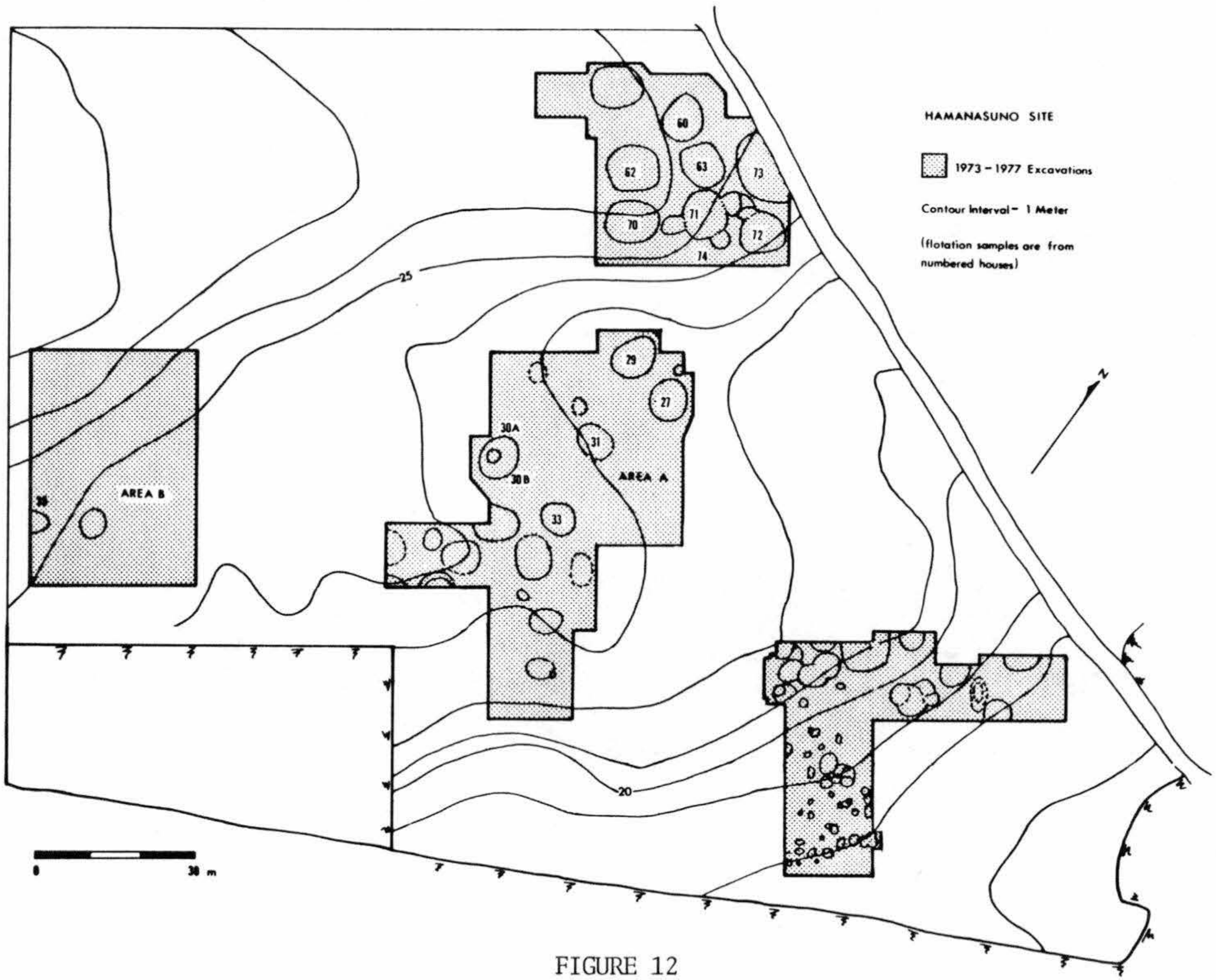


FIGURE 12
Hamanasuno Site

Several Early Jomon pit houses are oval but have no benches such as House 308 and House 33 or, like House 35, are rectangular, about 7 m long, with rounded corners and a stone bordered hearth. House 35 is probably contemporaneous with the Hinohama type structures (Takahashi and Ogasawara 1976:90).

This useful pottery and house type chronology is confused somewhat by the chronmetric dates from the site. Hurley et al. (1976) have reported six radiocarbon and five thermoluminescence dates all associated with the late Early Jomon occupation. Based on these data, the Hamanasuno occupation is tentatively thought to range from 5000 to 3000 B.C. and may have existed throughout that 2000 year span (Hurley et al. 1976).

Plant Remains Analysis

In this section, all of the plant remains collected to date are discussed. Flotation samples from Areas A and B have already been reported (Crawford 1976; Crawford et al. 1976). Refinements in the analysis procedure necessitated reexamination of the data collected in 1974. In addition, ten other archaeological structures were sampled in 1976, 1977, and 1978.

Three flotation methods were used at Hamanasuno: the bucket, garbage-can, and froth techniques. All of the 1974 samples were processed by the bucket method. In 1976 the soil was floated using the garbage-can method; this included most of the House 60 samples. Most of the samples collected in 1977 and 1978 were froth floated although occasionally the other two techniques were utilized.

The plant remains are discussed by numerical order of houses. The data do not warrant grouping according to house type. No significant associations with particular types of houses can be distinguished.

Reports which summarize the results of each field session have been published (Ogasawara 1975, 1976, 1977, 1978). Pertinent details in the following discussion are taken from these reports. Since the reports are not readily accessible to most readers, they will be cited again only when the source of information is ambiguous.

Areas A and B

Flotation sample contents from 8 houses in Area A and from one pit in Area B are summarized in Table 7. From the 500 liters of soil processed from these contexts 220 gm of light fraction were recovered. Most of this is wood charcoal although small amounts of stone flakes, bone, sasa, plant food, and unidentified plant remains were found. These data, reported initially in Crawford (1976) are reported in a slightly revised from here. The revisions are based on my recent reanalysis of the carbonized seeds, which was necessary because I have recently made identifications of some of the unidentified seeds, my knotweed and grass seed classification has been revised, and a few additional seeds were found in some samples. The 1974 data are now more comparable with the newly collected information.

The overall data from the 1974 excavation and the more recently collected data (Table 8) are quite similar. The proportion of unknown seeds in the 1974 data is down to 5.6% from 9% after the reanalysis. This is somewhat lower than the 9% figure for the new data. The two collections contain the same proportion of grain seeds (slightly less

TABLE 7 Hamanasuno Site, 1974 Flotation Samples: Carbonized Seeds as Percentage of Total Number of Carbonized Seeds

			Grain Seeds																							
						Greens							Fleshy Fruit Seeds													
				Grass		Knotweed																				
House No.	Total Seed Weight (gm)	Total No. Seeds	Buckwheat	*Echinochloa* Type	Other	HNS Type	Type A	*Ōinu-tade*	Type B	Type C	*P.* sp.	Chenopod	*Udo*	Amur Cork-tree	Blackberry	Elderberry	Grape	*Matatabi*	Cleavers	Legume	*Ostrya*	Sumac	*Fimbristylus*	Rush	Unknown	Unidentifiable
8	*	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
27	*	25	1	1	-	-	-	-	2	-	2	-	-	-	-	2	-	-	1(?)	2(?)	-	2	-	-	1	11
29	*	39	-	-	3	2	-	-	2	-	-	4	-	-	-	5	-	-	-	-	-	-	-	-	-	23
30A	*	49	-	13	24	-	-	1	2	1	-	1	-	-	-	-	-	-	-	-	-	1	-	-	4	2
30B	*	105	-	7	2	35	3	-	2	3	6	-	1	-	1	1	-	-	-	-	-	-	-	-	3	41
31	*	24	-	4	-	-	-	-	3	1	1	-	-	-	2	-	-	1	-	-	1	-	1	1	3	6
32	*	9	-	-	-	-	-	-	1	-	-	-	-	-	1	1	-	-	-	-	-	1	-	-	2	3
33	*	4	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2	1
Miscellaneous	*	91	-	5	4	2	-	-	2	-	3	2	-	2	-	-	1	-	1	-	-	3	5	-	6	55
Total	*	373	1	30	33	39	3	1	14	5	12	7	1	2	4	10	1	1	2	2(?)	1	7	6	1	21	144

*: Less than 0.05 gm

TABLE 8 Hamanasuno Site Flotation Samples (1976-1977): Carbonized Seeds as Percentage of Total Number of Carbonized Seeds

			Grain Seeds										Fleshy Fruit Seeds					Other Seeds						
					Greens																			
			Grasses		Knotweeds																			
House	Total Seed Weight (gm)	Total No. Seeds	Echino-chloa Type	Other	HNS Type	Type A	Ōinu-tade	Type B	Type C	P. sp.	Dock	Cheno-pod	Udo	Amur Cork-tree	Black-berry	Elder-berry	Mata-tabi	Cleavers	Com-posit	Ostrya	Sumac	Sola-naceae	Un-known	Uniden-tifiable
60	*	121	0.8	8.3	-	1.7	9.1	20.7	-	5.8	-	-	0.8	1.7	0.8	5.8	0.8	-	-	-	6.6	0.8	15.7	19.8
61	*	45	-	-	6.6	2.2	-	4.4	-	4.4	2.2	-	4.4	-	-	-	-	-	-	-	4.4	-	13.3	57.8
62	*	160	0.6	1.9	10.0	2.5	1.3	1.3	-	8.1	1.3	2.5	1.9	0.6	-	4.4	0.6	0.6(?)	-	-	1.9	-	9.4	51.3
63	*	50	-	8.9	4.4	-	-	4.4	2.2	4.4	-	-	17.8	-	2.2(?)	-	2.2	-	-	-	2.2	-	17.8	37.8
70	*	344	1.5	0.6	16.6	4.1	0.6	1.2	1.5	4.7	-	3.8	0.6	0.6	1.5	3.5	1.5	0.6(?)	0.3	0.3	5.8	-	4.7	46.5
71	*	313	0.3	1.3	20.8	2.6	1.0	4.5	0.6	7.7	-	-	0.6	0.3	0.3	2.9	0.3	-	-	0.3	2.2	-	10.2	43.4
72	*	250	55.2	0.8	3.2	-	0.8	-	2.0	-	1.2	-	0.8	1.2	0.4	4.4	-	0.4	-	-	1.6	-	4.0	22.4
73	*	73	-	2.7	15.1	2.7	-	1.4	-	-	1.4	-	-	-	1.4	20.5	-	-	-	-	1.4	1.4	12.3	39.7
74	*	145	-	6.9	0.7	-	-	1.4	-	2.8	0.7	-	2.8	1.4	2.8	1.4	2.8	-	-	-	35.2	-	4.8	36.6
Total	*	1491	10.0	2.3	11.2	2.0	1.4	3.4	1.0	4.6	0.4	1.2	1.6	0.8	1.0	4.2	0.8	0.3	+	+	6.3	+	8.7	38.4

*: Less than 0.05 gm

+: Less than 0.1%

than 40%) and similar percentages of unidentified seeds (44% from 1974, 47% from the more recent samples). Knotweeds dominate both seed collections but they are only slightly more common than grasses in the 1974 samples and nearly double the percentage of grasses found in the new samples. Fleshy fruit seeds and sumac are more abundant in the new flotation series than in the 1974 series. Thus, although the 1974 sample is considerably smaller than the new sample, the 1974 data fit well within the range of variation observed for the new samples.

House 35. Fifteen small flotation samples from House 35 in Area B (Figure 12) were processed by the excavation supervisor. The samples were from 13 Pits and levels X1 and X3. Only 10 seeds were recovered in the total of 22.73 gm of carbonized remains from the house (mostly wood charcoal with a few unidentifiable fragments). Half of the seeds were unidentifiable. Two HNS type knotweed seeds and one unknown seed were found in Pit 9. A single unidentifiable grass seed was recovered from Pit 4 and a possible knotweed seed was found in a hearth sample. The contents of the House 35 samples were not unusual, although they were too small to allow substantial interpretations.

House 60

House 60 is a large and deep pit house 9.7 m by 7.7 m (Figure 13). An entrance is evident at the southwest corner of the structure. Not far from this entrance is a hearth. Near the entrance-way is a projection from the house pit wall in the form of a "fan-shaped bench" (Ogasawara 1977:4). Artifact distributions on the house floor correspond with a two part division of the structure along a northwest-

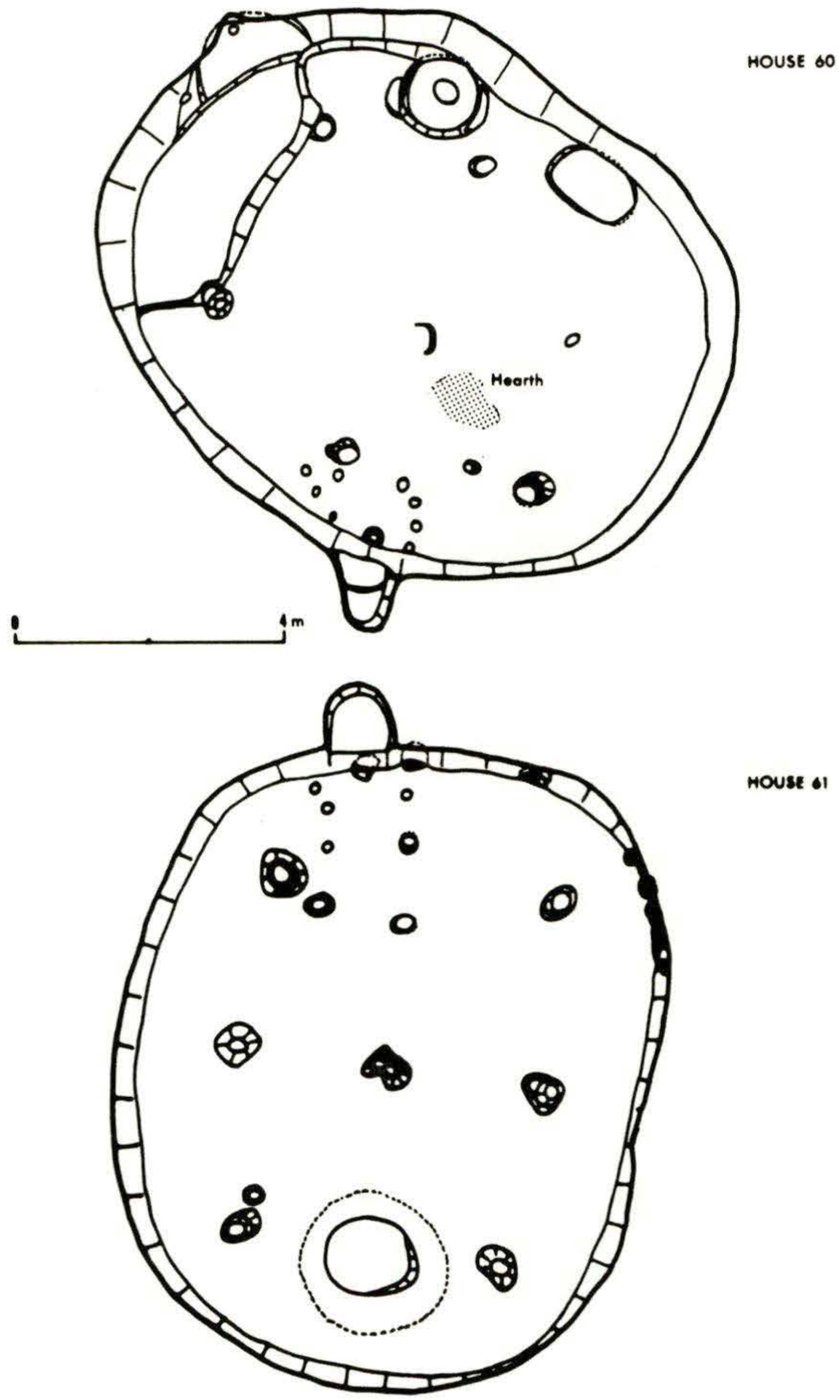


FIGURE 13
Hamanasuno Site, Houses 60 and 61

southeast line. Toward the entrance ishizara (grinding stones), suri-ishi (mano-like tool), and small stone flakes were clustered. Flake tools were generally found in the opposite floor area.

Seven flotation samples amounting to 220 liters of soil were collected from House 60. While I was at the site, work concentrated on the house fill, so a complete vertical series of flotation samples was taken from near the center of the house. The samples labelled "floor" and "lower" are from levels not yet accurately defined. During the excavation of House 60, labels were assigned to apparent levels. The floor sample turned out to be too far above the floor to be considered floor fill. The "lower" sample was taken from below the initial floor sample and is probably more representative of floor fill. All of the samples were the same volume except for the hearth sample (11 liters). The garbage-can method was used to float levels III, and the floor. The hearth and "lower" samples were collected after I left Hamanasuno in 1976 and were floated the following year with the froth apparatus.

Wood charcoal and sasa are the most abundant light fraction components by weight (Figure 14). Less than 0.5% by weight is seeds and unidentified plant remains. Some of the unidentified plant remains in level X3 may be nutshell. The hearth contained the highest concentration of wood charcoal and seeds in House 60. Flotation of the other sampled contexts produced relatively low quantities of plant remains. Level III, X2, and the floor have higher light fraction densities than intervening levels X1, and X3 (1.0 to 2.1 gm per liter versus 0.3 and 0.5 gm per liter respectively).

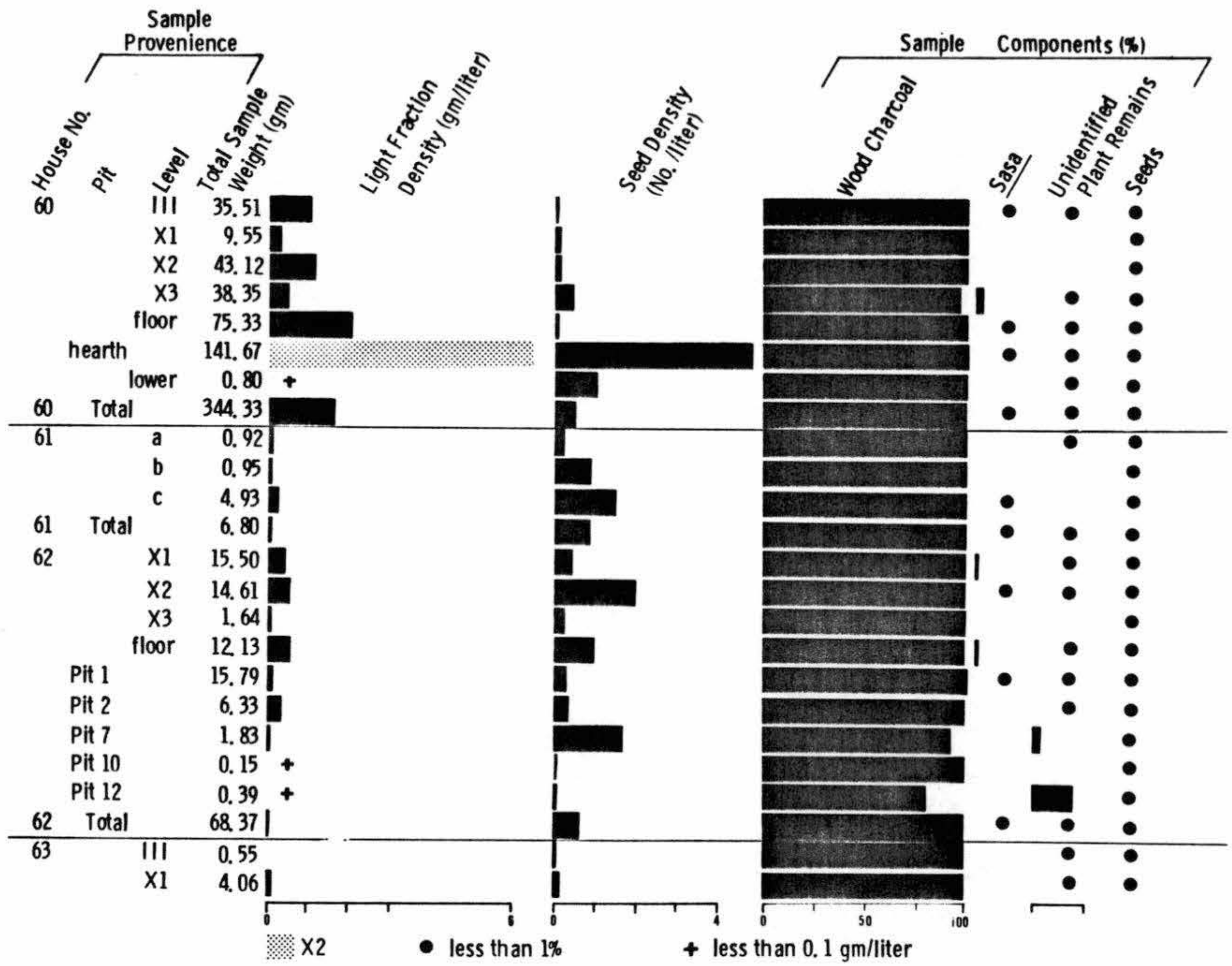


FIGURE 14

Hamanasuno Site Flotation Samples: Light Fraction and Seed Densities; and Sample Components as Percentage of Total Sample Weight

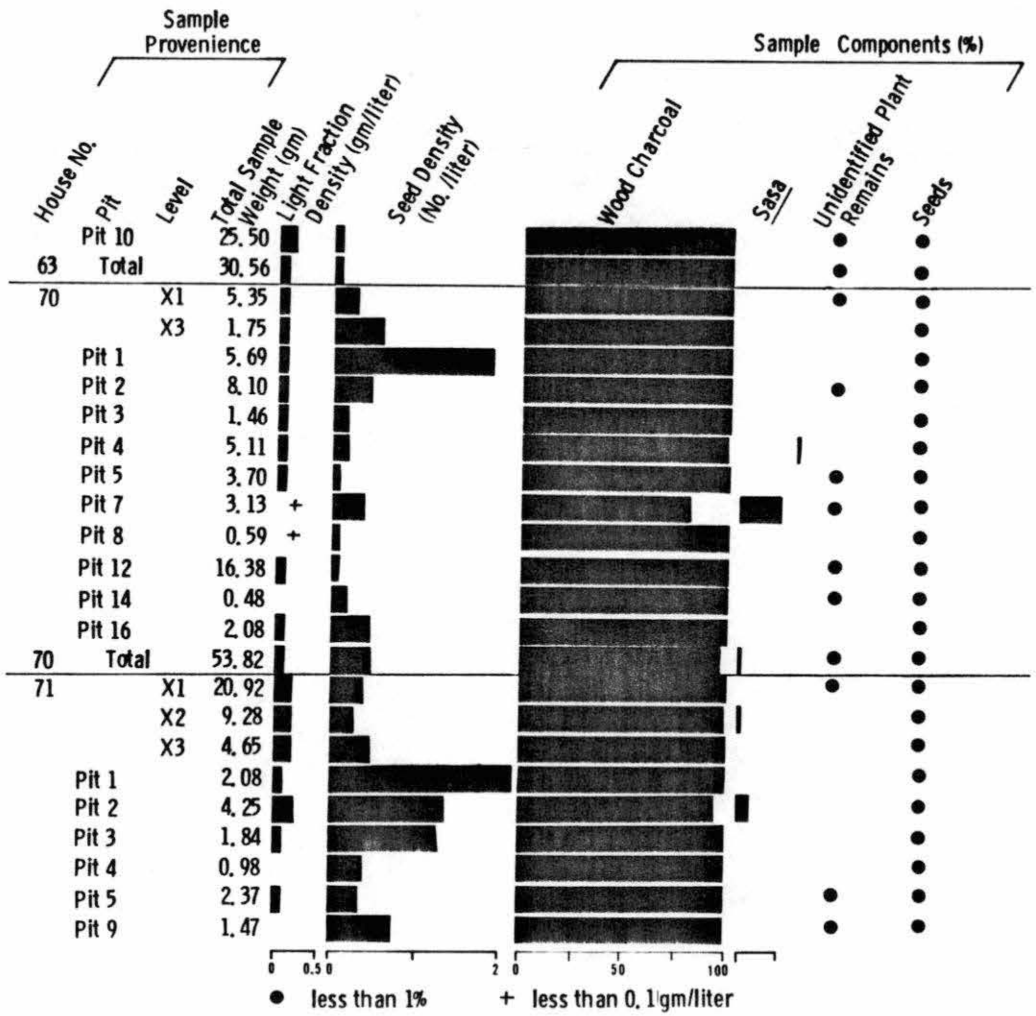


FIGURE 14 (continued)

Hamanasuno Site Flotation Samples: Light Fraction and Seed Densities; ans Sample Components as Percentage of Total Sample Weight

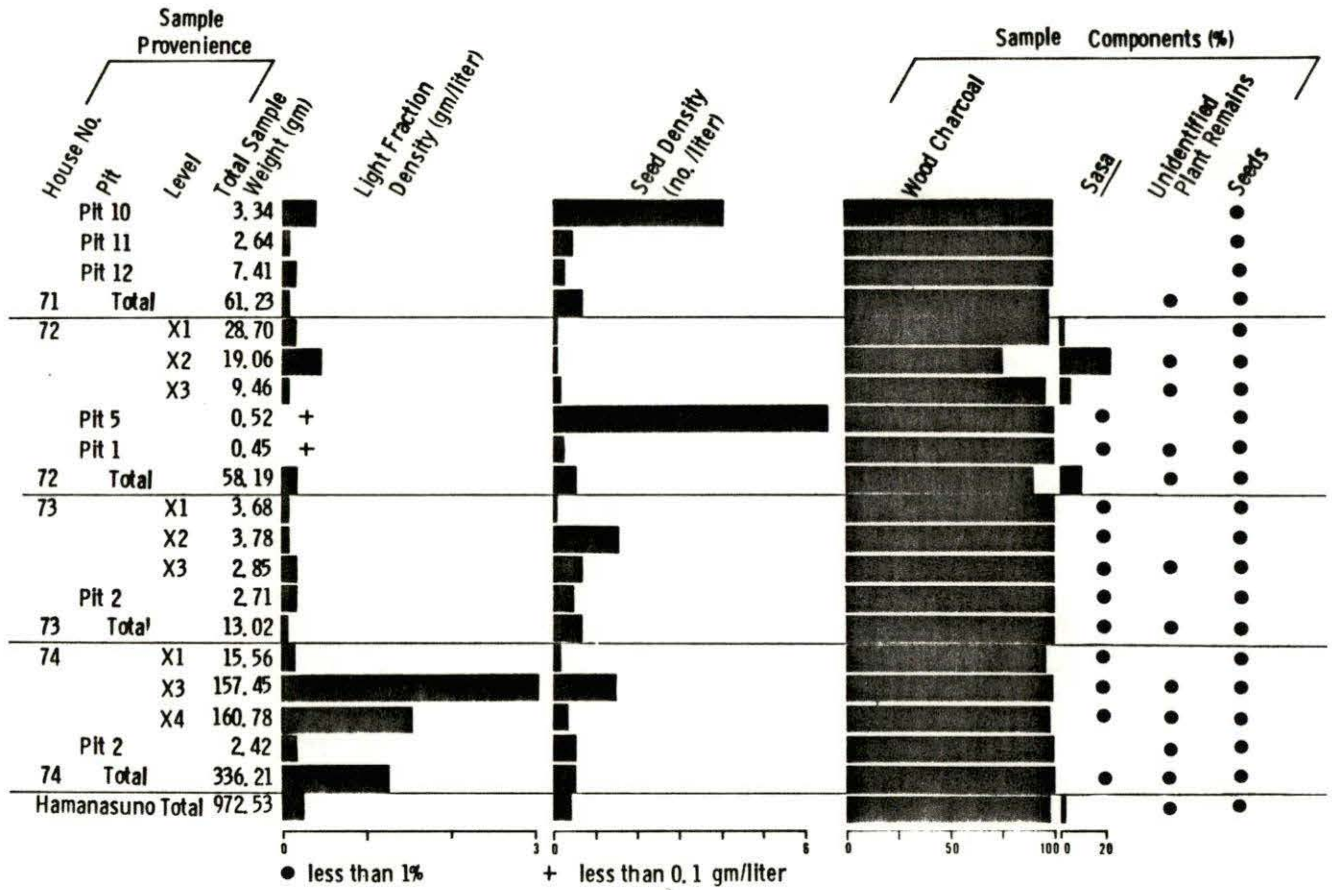


FIGURE 14 (continued)

Hamanasuno Site Flotation Samples: Light Fraction and Seed Densities; and Sample Components as Percentage of Total Sample Weight

Eighty percent of the seed sample is identifiable (Table 8). Twenty-two types of seeds have been isolated; nine of these are unknown. The 11 grass seeds belong to three taxa; the one single grass seed in level X3 is not further identifiable, while the cluster of nine grass seeds in the hearth is a single type.

Grain seeds comprise the majority of the seeds (46%). Most of these are from knotweeds which can also be used as greens. Two types of knotweed predominate: ōinutade and Type b. These two taxa are found only in the hearth and "lower" samples. Concentrations there are good evidence of utilization. Fleshy fruit seeds are 10% of the total. Most of these are elderberry. Sumac is present in a significant number (7%). All of the seed types except sumac are concentrated in the lower levels of the house fill and the hearth.

House 61

House 61 is a large structure (10.8 m by 8.2 m) similar in outline to House 60 (Figure 13). It differs from House 60 in having no projecting fan-shaped bench at one end of the house, and has a flask-shaped pit (フラスコ状土坑) near the edge of the house pit opposite the entrance. An area in the center of the floor with several overlapping small pits (掘り込む) contained a concentration of volcanic tuff and charcoal. As in House 60, stone tools such as sekikan (a kind of mano) and ishizara are scattered near the entrance portion of the house floor. Few tools were found elsewhere on the floor.

Only three samples totalling 50 liters from a vertical column in the house fill were collected. The supervising archaeologist assigned tentative level designations to the samples and these are retained here (levels a, b, and c). How they relate to the levels is not known at the present time.

The light fraction composition is almost entirely wood charcoal (Figure 14). Similar to House 60 most of the plant remains are concentrated in the deepest level (c). Very few seeds were recovered (45) due mainly to the small soil volume collected (the seed density is above average for the site). A high proportion of these (70%) are not identified. The remaining 30% is mostly knotweeds (Table 8). Including the three knotweed taxa identified in these samples, a total of only six taxa are represented in House 61. An additional six unknown taxa represented by one seed each are present, bringing the number of plant taxa recovered from House 61 to 12.

House 62

House 62 is 10.0 m by 8.4 m and is similar to Houses 60 and 61 in overall shape (Figure 15). The floor is about 1.8 m below the surface. Four main post holes were recognized. The hearth is a shallow depression in the center of the house floor. Between the hearth and the western wall of the house pit was a shallow oval pit. Both the oval pit (Pit 1) and the hearth (Pit 2) were sampled. Fill from two of the main post holes (Pits 7 and 12) and fill from on other post hold (Pit 10) were floated. Four samples of house fill, including the floor, were taken (Figure 14 and Table 8). The soil volume processed from this structure totalled 260 liters.

All but 1% of the light fraction by weight is wood charcoal. The remainder is sasa stem fragments and unidentifiable plant remains.

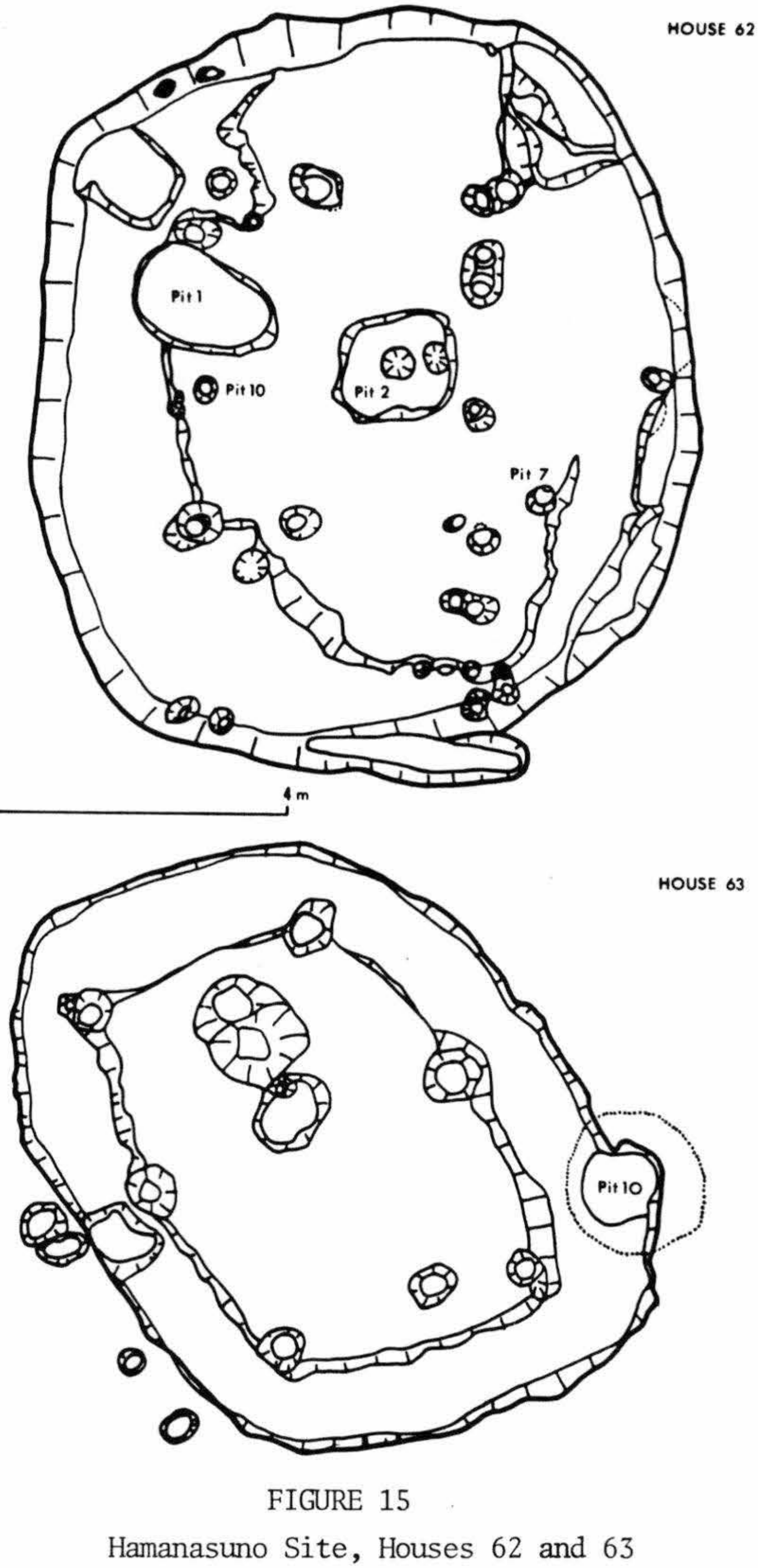


FIGURE 15
Hamanasuno Site, Houses 62 and 63

Most of the *sasa* is in the house fill samples. Only a trace of *sasa* was found in one pit (Pit 1). The density of plant remains is not very high in this house (0.1 gm per liter); house fill levels contain higher concentrations of wood charcoal than pits in general. Seeds are concentrated in levels X2, floor and pit 7. Most of the seeds in level X2 are unidentifiable.

At least 18 taxa of seeds are in the House 62 samples. Fifteen of these, including four kinds of grasses and four kinds of knotweeds, are classified. The grass seed from the floor sample is a small (1.0 mm long) Paniceae seed and differs from the *Echinochloa* type seeds in outline and embryo shape. The Pit 1 and Pit 12 specimens are apparently not Milliaceae seeds and are different from each other. Most of the knotweed seeds are HNS type (Table 8). Conspicuous in the sample from this house are four chenopod seeds which are found again only in House 70. The 15 unknown seeds represent 11 types; three specimens may be grass seeds. The grass, knotweed, and chenopod seeds comprise, along with a seed of sorrel, 30% of the total number of seeds; not too far below average for Hamanasuno. A relatively high proportion of the seeds from House 62 are not identified (61%).

The hearth and oval pit samples contain no plant remains which distinguish their contents from other samples. Plant remains concentrations including seeds are not particularly high. The contents seem to be most similar to the house fill and floor samples. The only post hole with unusual seed content is Pit 7, one of the holes for a main post. It contained a concentration of knotweed seeds (37% of the seeds from Pit 7).

House 63

House 63 (Figure 15) was partially excavated in 1976 and almost completed by the time I arrived in 1977. As a result few samples were taken from this structure. House 63 is classified by Ogasawara as a Hinohama type house. The continuous bench forms a pentagonal outline while the outside form of the structure is a square with rounded corners. One post stood in each of the five corners of the bench with an additional post in the center of one side. A pit is centrally located in the eastern side of the structure. One unusual feature was a 1.8 m deep flask-shaped pit in the western corner. Whether or not it was functionally associated with the house is open to question. At the same level as the house floor, traces of burning and a piece of burned timber were noted in the pit. As much of the pit contents as possible were floated (374 1). The other two flotation samples were small ones from levels III and XI (26 and 45 liters respectively).

Little was recovered from the house fill samples (Figure 14). Only two of the nine seeds from the fill are identified. Pit 10 contained nearly the same density of remains as the other samples, but since the sample was large, a more statistically valuable sample of seeds was obtained. Grain seeds (both grasses and knotweeds) are present in about the same proportion as fleshy fruit seeds (22% and 24% respectively). The Pit 10 sample is similar to other pits including post holes. This sample was floated without proper drying so plant remains may be underrepresented.

The seeds from House 63 represent 17 taxa, nine of which are unknown. One of the unknowns (level III) is a type tentatively identified in the 1974 samples as Fimbristylus sp. (Crawford 1976).

House 70

The largest volume of soil floated from any one house at Hamanasuno was collected from House 70 (713 liters). The structure is another one of the large, oval pit houses and it measures 10.2 m by 8.5 m (Figure 16 and Plate 16). Around the wall of the house pit is a one meter wide bench, continuous except for a break in the southwest corner. In this corner above the bench is a narrow step-like projection. In the center of the house floor is a pit (Pit 12) which is interpreted to be the hearth. Six main support posts in two rows of three were found. Some of these are double, perhaps representing repair posts. The hearth and all of the main posts were sampled. In addition, about 100 liters of house fill (levels X1 and X3) were collected from above the center of the house floor.

Wood charcoal comprises nearly all of the light fractions from this structure. The density of wood charcoal is uniformly low in all samples (Figure 14). Some sasa, confined to the post hole samples and a few unidentified remains, are present. Some of the unidentifiable remains in the Pit 12 sample may be tuber remains.

Forty-two percent of the 344 seeds from House 70 are grain seeds and 7% are fleshy fruit seeds. Fifty percent of the seeds are not identified. Most of the grain seeds are knotweeds (39% of the total; 83% of the grain seeds) and are mainly one type: HNS knotweed. Chenopod is most abundant in this structure (it was found only in this house and in House 62). The two chenopod seeds in Pit 16 are popped; the endosperm has burst open the seeds. The single "other grass" seed in Pit 16 is similar to the group of grass seeds in the Usujiri B

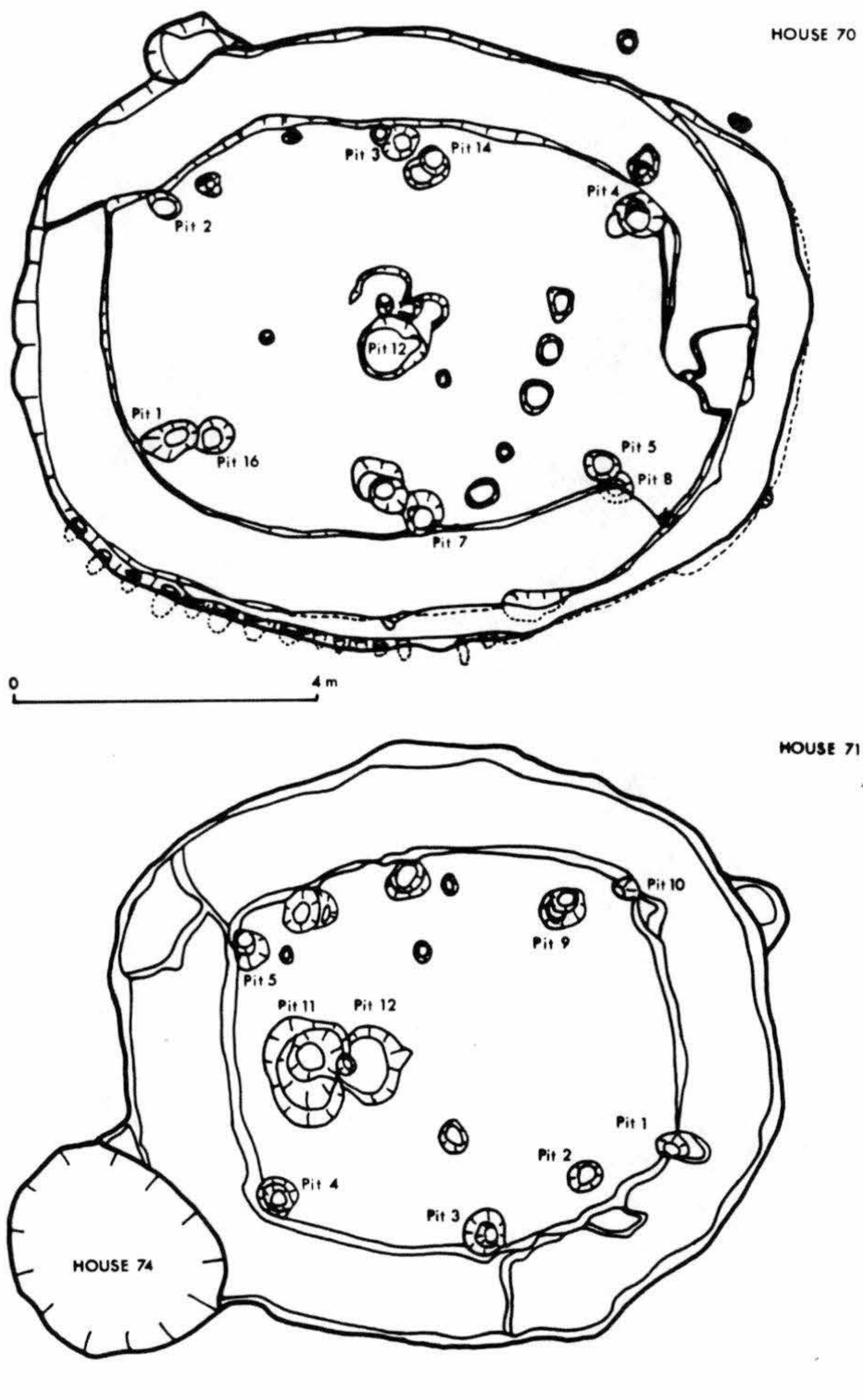


FIGURE 16
Hamanasuno Site, Houses 70, 71, and 74

site sample. Overall, 17 taxa of seeds have been classified, including two kinds of grass and five kinds of knotweed. Including 17 unknown types, 34 taxa of plants are probably represented in House 70.

Only one sample (Pit 1) had an unusually high concentration of seeds for this house. A cluster of knotweed and unidentifiable seeds are responsible for this statistic. The house fill and Pit 12 (hearth) sample seem to be distinguished from the other samples (all post hole fill) by a consistently low variety of seed taxa.

House 71

House 71, a Hinohama type structure, is 8.6 m by 8.0 m (Figure 16 and Plate 17). As in House 63, there is a continuous bench, but it is stepped up in the western part of the structure. A hearth is centrally located near the eastern wall. Soil samples totalling 430 liters were collected from seven post holes, the two pits (Pits 11 and 12) forming the hearth area, and levels X1, X2, and X3 of the house fill.

All of the samples were below average in plant remains concentrations. Two clusters of sasa were found: one in Pit 2, the other in level X2. Seeds, on the other hand, have densities varying from sample to sample. The highest concentration of seeds are in Pits, 1, 2, 3, 9. and 10; all post holes in the northern part of the house. The remaining pits, including the hearth area, are uniformly low in seed concentration (Figure 14). Pits 4, 5, 11, and 12 contain mainly just a few knotweed seeds. Grape and amur corktree seeds are only in the house fill. House fill and the hearth area had the highest proportion of unidentifiable seeds of the House 71 samples (53% to 75%).

A minimum of 39 taxa of seeds are represented in House 71. Twenty-four of these are unknown types, one of which is a possible _Fimbristylus_ seed and another is a possible _Ostrya_ seed.

Nearly 54% of the seeds have not been identified. Grain seeds, dominated by knotweeds (96% of the grain seeds) comprise 39% of the total House 71 seed sample. About 5% is fleshy fruit seeds (mostly elderberry). The knotweeds are almost all HNS type (55% of the knotweeds). Twelve percent of the knotweeds are Type b, represented mainly by a cluster in Pit 3.

House 72

House 72 is another large (9.6 m by 8.5 m) oval pit house (Figure 18 and Plate 18). Two benches parallel the northeast-southwest long axis of the structure. Three shallow pits in the center of the floor may be the hearth. The six main post holes are arranged in two rows of three. Three of the post holes, Pits 1, 3, and 5, and levels X1, X2, and X3 of the house fill were sampled. The combined soil volume from these contexts is 401 liters.

The light fraction density is slightly below average. The composition of this fraction is unusual in being 9% _sasa_ stem fragments. These fragments were found in each sample but were cost abundant in level X2.

Seed density is high in Pit 5 (Figure 14) due to a cluster of 138 Type 1 grass seeds. Only one other grass seed was found in the pit. The proportion of seeds found in this house (63%) is much higher than in the other Hamanasuno houses due to the cluster of _Echinochloa_ type seeds. Still the proportion of flesh fruit seeds is not unusual at 8%.

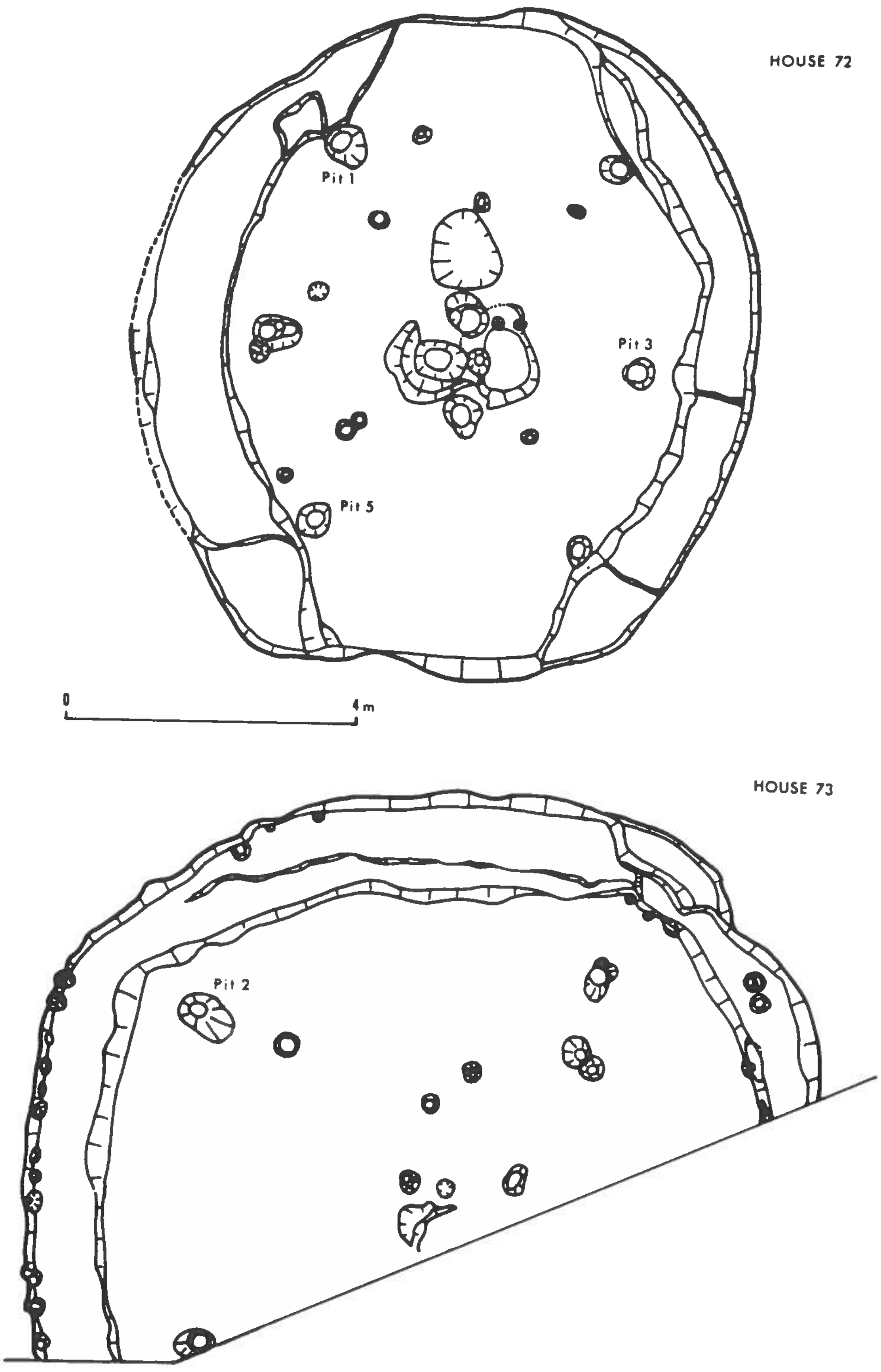


FIGURE 17
Hamanasuno Site, Houses 72 and 73

Twenty taxa of seeds have been isolated in the House 72 samples. Eight of these are not yet identified. One unknown type in Pit 5 may be a grass seed and another in level X3 may be a Sorbus seed.

House 73

House 73 was not completely excavated, but it is probably about 11 m long (Figure 18 and Plate 19). A one meter wide bench is evident around the house pit wall. Three post holes were found, one of which (Pit 2) was sampled. Three 27 liter flotation samples were floated from house fill near the north end of the house pit.

The samples are almost entirely composed of wood charcoal, but a few sasa stem fragments and some unidentifiable remains were recovered. All of the samples except for level X2 contained few identifiable seeds. Elderberry and HNS type knotweed seeds are the most abundant. Grain seeds and fleshy fruit seeds are present in about the same proportions (23% and 22% respectively).

Sixteen types of seed are present including seven which have not yet been identified.

House 74

House 74 is a small, nearly circular structure about 3 m in diameter and probably was not a dwelling (Figure 17 and Plates 20 and 21). It overlaps and dates some time later than House 71. The fill of House 74 contained a number of nearly complete Saibesawa III type pots and a high concentration of flakes and stone tools. Four large post holes were evident in the house floor. Three levels of the pit fill and one post hole were sampled for a total of 261 liters of soil.

Levels X3 and X4 are dense in wood charcoal, accounting for most of the nearly 333 gm of it recovered from House 74 (Figure 14). Seed density is near average, but the composition of the seed sample is quantitatively quite different than the other house samples. Grain seeds and fleshy fruit seeds are 13% and 11% of the seed sample, but 35% is sumac, mostly from level X3 (Table 8). Likely the fill of this structure resulted from events different from that resulting in the fill of the other structures. Not only do the plant remains reflect this but the concentration and condition of the artifacts in this structure is unusual. At the present time, no explanation can be offered for the unique fill of this pit.

Fifteen taxa of plants including five unknown types and two types of grass are represented in the four House 74 samples.

Middle Jomon Component

The Middle Jomon component at Hamanasuno is so far exemplified by only House 78 (Plate 22). House 78 has tentatively been assigned to the final Middle Jomon, the same period as represented at Usujiri B. One soil sample (142 liters) was collected from the house floor.

Wood charcoal density is high (1.4 gm per liter) in this sample. Seed density, in contrast, is well below average for Hamanasuno. Since 61% of the 31 seeds have not been identified, the seed sample is not likely to be representative of the Middle Jomon component. Including six unknown types, 15 taxa of plants are present. Identified seeds include HNS Type and Type b Knotweeds, chenopod, _matatabi_, _udo_, elderberry, sumac and _Ostrya_. The single grass seed is a large

(2.1 mm long) Paniceae seed but is not quite the same as the Echinochloa Type. House 78 is the only context at Hamanasuno in which dogwood is represented.

Plant Remains Distributions

The data collected in 1974 suggested plant remains distribution patterns which provided useful feedback into later sampling strategies. None of the patterns were related conclusively to the natural and/or culturally influenced depositional history of Hamanasuno. Furthermore, seed taxa did not have recognizably regular archaeological associations; individual sample volumes were deemed inadequate for such pattern recognition. The following observations were noted however:

1. The highest concentrations of plant remains were in levels X3 and X4 of house fill and from pit samples. Together these sample concentrations averaged 0.5 gm per 1 liter of soil.

2. Seeds were found to be most dense in levels III, X2, and X3.

3. Levels III and X1 contained the highest porportions of unidentifiable seeds (64% and 66% respectively).

4. Pits (mostly post holes) and house floors, although low in overall seed density, had the highest proportion of identifiable seeds, (65% and 75% respectively). Pits also had the greatest variety of seed taxa.

5. No direct relationship between the quantity of wood charcoal and the quantity of seeds seemed to exist (Crawford 1976:35, 38 and 60).

Confirmation of these observations in their entirety was not achieved. The recent level X2 and X3 samples have higher than average seed densities (0.8 and 0.6 seeds per liter) but are significantly lower than the Area A levels X2 and X3 seed densities (1.4 and 3.1 seeds per liter respectively). Post holes contain the highest density of seeds (averaging 1.1 seeds per liter) among the new samples, the converse of my expectations. Again, level III and house fill levels generally have a much greater proportion of unidentifiable seeds than floors or pits. Considerable variation among the samples exists, though.

The increased soil sample volume facilitated by the froth apparatus resulted in seed collections that now allow tentative plant taxa distribution observations. The distributional contrasts are between house fill (not including floors), and the pit and the floor samples. Since 46% of the soil (26 samples) is from house fill and the remaining 54% from pits (33 samples), sampling bias between the two types of archaeological contexts is probably small. Grain seeds are associated mainly but not exclusively, with pits and hearths. Echinochloa type grass seeds were recovered from a hearth (1 seed) and from post holes (145 seeds). The one large cluster of Echinochloa type grass seeds is from a post hole (House 72, Pit 5). A few other grass seeds occur in fill samples, but they too seem to be confined mainly to pit samples. Only eight Echinochloa type grass seeds come from house fill and they are all from Area A. HNS type knotweed seeds are similarly distributed. In the new samples, nearly 80% of the HNS knotweed seeds are in samples other than the "X" levels. This includes clusters in House 70, Pits 1 and 2 and House 71, Pits 1 and 10. Ōinutade and Type b knotweed seeds, the other two most common knotweeds, are also rare in "X" levels. Only two of the 20 ōinutade seeds are from "X" levels. One cluster, in the House 60 hearth, is present. Three clusters of Type b knotweed seeds, one in the House 60 hearth, one in the "lower" level of House 60, and one in House 71, Pit 3 further exemplify the distributional limits of the knotweed seeds. Finally, a cluster of 9 chenopod seeds from House 70, Pit 1 (associated with an HNS type knotweed cluster) is further evidence that grains are predominantly associated with hearths, floors, and pits.

Fleshy fruit seeds are distributed more evenly throughout the various archaeological contexts sampled at Hamanasuno. Sumac seeds seem to be mainly in "X" levels although they also occur in other contexts, but not abundantly.

The apparent distributions of grain seeds and fleshy fruit seeds attests to the not unexpected differential processes leading to the preservation of the two groups of seeds. Grain seeds are often toasted or parched both for eating and storage. Throughout the occupation of a structure, some of these seeds might accidentally accumulate in hearths and on floors, and sift down into post holes. The distinction between fill and pit contents suggests that the two contexts developed independently of each other; the pit contents and floor fill to some extent reflecting house occupation debris, while the fill represents debris deposited after the house was abandoned. The high proportion of identifiable seeds found both in the 1974 and recently sampled post holes suggests that seeds were deposited in the post holes before they were exposed to erosional factors for too long. I must stress, though, that these thoughts are quite speculative at the moment.

CHAPTER VI

USUJIRI B SITE PLANT REMAINS

Usujiri B (臼尻B) is a late Middle Jomon site in the western Minamikayabe community of Usujiri, in the Asunaru Danchi, at 140°57' E and 41°56' N. Like the other archaeological sites in Minamikayabe, Usujiri B lies on a broad terrace overlooking Uchiura Bay (Figure 2). The excavated portion of the site is on the edge of the terrace about 30 meters above sea level. The present community of Usujiri is at the base of the terrace.

The closest river is the Kakinoshima River (垣ノ島川), 1 km to the southeast of the site (Figure 2). The Kakinoshima River is a relatively short (3 km), fast stream; but for nearly 1 km it cuts through the terrace where the river bed slopes more gently to the ocean. The river banks form a steep-sided "v" shaped valley throughout most of the river course but become less inclined where it cuts through the terrace. The source of the Kakinoshima River is only 2.5 km to the south of Usujiri B, near Fukiageishi (Figure 2), which is about 500 meters above sea level, so within 2 km the river drops nearly 400 meters. The character of the local vegetation changes in association with this topography and the terrace soils. Although no information is available on the vegetatation of the Kakinoshima River, the Upper and Lower Ōfune Hot Springs (Figure 3) have been studied by Murokata

(1975) (Appendix 1B). These hot springs are on the Ōfune River (大船川) which comes within 2 km of Usujiri B. Access to this river is inhabited by a 300 meter high ridge. The Ōfune River is much longer than the Kakinoshima River and has a more gradual descent to the ocean (it drops 400 m in just over 6 km). Compared to the Kakinoshima River, the valley floor is broader, sometimes 200 m across.

Three pottery assemblages have been recognized at Usujiri B: Saibesawa VII, Daigi VIIIb, and Nodappu II. Although analysis of the pottery has not been completed, the three groups are known to represent the end of the Middle Jomon in Hokkaido and immediately precede the Late Jomon (Takahashi and Ogasawara 1976; Yoshizaki 1965).

The Usujiri B excavation (Plate 23) from which the flotation samples were collected was conducted from the end of September through November of 1977. Flotation was carried out through October. Two structures had been excavated in 1976, but only one sample from each was saved for flotation the following year. An extensive area was excavated in 1978 but no flotation samples were taken. One house (House 10) found in 1977, was not excavated until 1978. Sizeable flotation samples were retrieved from this structure to complete the sampling of the area opened in 1977.

The 1977 excavation was an area slightly smaller than 16 m by 48 m and totalled some 575 m^2 (Figure 18). In this area, 26 structures (mostly pit houses) and 7 burials were found. The upper levels (house fill) of the houses in the southwestern portion of the site had been removed when the land was levelled for the purpose of constructing

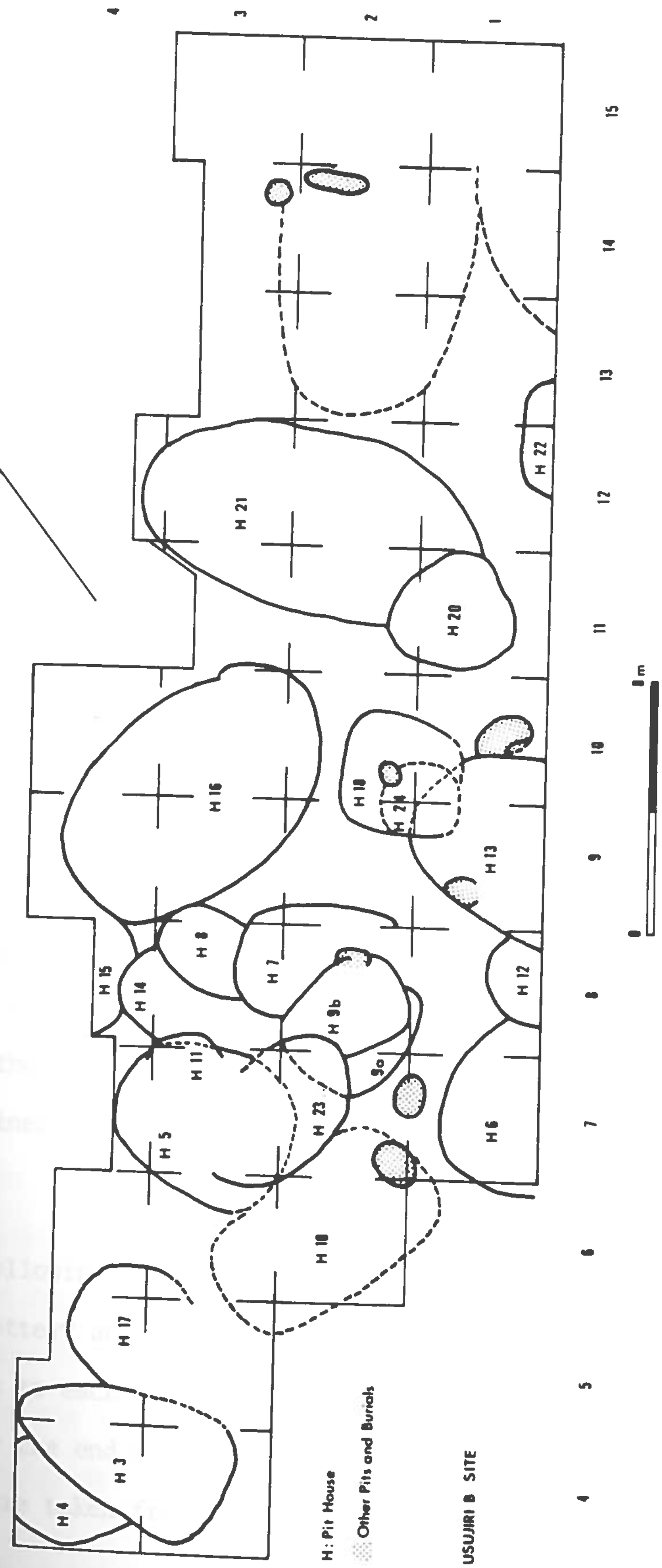


FIGURE 18
Usujiri B Site

gardens, leaving only the house floors and associated pits. Structures 6, 12, 13, 16, 18, 20, 21, and 22 were less disturbed; much of the original house pits remained intact.

The site disturbance and complexity directly influenced the soil sampling procedure. Only floors and pits (including post holes) could be sampled from the disturbed houses. Since the extent of contamination of the structure floors was uncertain in many of them, only feature contents were eventually sampled (except for House 9b). Furthermore, the houses with Nodappu II pottery associations (Houses 3 and 17) were nearly completely destroyed, while only two houses with Daigi pottery (Houses 18 and 20) were relatively intact. Thus, not only was soil sampling greatly reduced in the southwestern section of the excavation which contained the remains of 13 structures but the Nodappu II and Daigi VIIIb components were not sampled as intensively as originally planned. The complexity of the excavation problems in grid units 7 and 8 (Figure 18) forced the digging to progress slowly and samples large enough for my purposes could not be handled efficiently. As a result of these practical considerations, sampling priorities emphasized the northern area of the excavation and houses which were clearly delineated--mainly Saibesawa VII houses.

Saibesawa VII Houses

The following is a description of the structures which contained Saibesawa pottery and associated plant remains. Interpretations which are specific to each house are made. A comparative discussion is reserved for the end of this chapter. The archaeological details of the houses are taken from the preliminary excavation report (Ogasawara

1977). Observations relevant to the soil samples were also made by me and are included in the following discussion when warranted.

House 6

House 6 was only partially excavated, but the general outline of the structure compares well with the other large oval houses found at Usujiri B (Figure 20). A whale vertebrae was found on the floor of this house.

One 58 liter sample, taken from just above the house floor, was floated from this structure. The soil had little clay content and floated easily. Few carbonized remains resulted (Figure 19), but seeds were present in good quantity (Table 9). Nearly half of the seeds from this sample were unidentifiable. Sumac is the most common (three seeds) of the six identified taxa. An additional five unknown taxa bring to a total 11 taxa of plants represented at this house.

House 10

The archaeologists at Usujiri B believe that House 10 was destroyed by fire. Carbonized remains of wooden posts were outlined just above the floor (Plate 25). The floor itself showed traces of burning. Soil samples were collected in anticipation that a broader spectrum of plant remains would be recovered here than from other houses which did not show obvious signs of burning. Soil samples amounting to 330 liters were removed from four pits, three of which are post holes. The data are summarized in Figure 19 and Table 9.

Most of the light fractions from House 10 are composed of wood charcoal. Sasa, amur corktree berry fragments, some nut remains, seeds,

TABLE 9 Usujiri B Side, Saibesawa VII Component, Flotation Samples: Carbonized Seeds as Percentage of Total Number of Carbonized Seeds

				Grain Seeds: Grasses		Grain Seeds / Greens: Knotweeds					Greens		Fleshy Fruit Seeds						Other Seeds					
House	Level or Pit No.	Total Seed Weight (gm)	Total No. Seeds	Echinochloa Type	Other	HNS Type	Ōinutade	Type B	Type C	P. sp.	Dock	Chenopod	Udo	Amur Cork-tree	Blackberry	Elderberry	Grape	Matatabi	Cleavers	Dogwood	Sumac	Ostrya	Unknown	Unidentifiable
6		*	30	-	-	-	-	-	-	3.3	-	-	-	6.7	-	3.3	-	6.7	-	-	10.0	-	16.7	46.7
10	1 Upper	*	50	14.0	-	6.0	-	-	-	-	4.0	8.0	-	2.0	2.0	-	-	2.0	-	4.0	12.0	-	14.0	32.0
	Lower	0.06	36	22.2	-	2.8	-	-	-	13.9	-	-	-	2.7	-	2.7	2.7	-	-	1.7	8.3	-	8.3	33.3
	Amalgamated	0.21	259	8.9	8.1	0.4	1.2	1.5	-	5.8	0.4	11.2	1.5	2.7	-	1.2	0.8	2.3	0.7	1.2	8.1	-	3.9	40.1
	Total	0.27	375	11.0	6.1	1.4	8.7	1.2	-	5.8	0.9	9.6	1.2	2.6	0.3	1.2	0.9	2.0	0.6	1.7	8.7	-	5.8	38.3
	2	*	17	-	17.6	-	-	-	-	5.9	-	5.9	-	41.2	-	-	-	-	-	-	-	-	-	29.4
	3	*	14	-	14.3	-	-	-	-	7.1	-	-	7.1	21.4	-	-	-	-	-	-	-	-	-	50.0
	4	*	35	-	-	-	-	-	2.9	2.9	8.6	5.7	-	17.1	2.9	-	-	5.7	-	-	2.9	-	-	51.4
10 Total		*	411	9.2	6.3	1.2	0.7	1.0	+	5.6	1.5	8.8	1.2	6.1	0.5	1.0	0.7	2.2	+	1.5	7.5	-	4.9	39.4
16	X1	*	9	-	-	-	-	-	-	11.1	-	11.1(?)	-	-	-	-	-	-	-	-	11.1	-	-	66.7
	X2	*	13	-	15.4	-	-	-	7.7	-	7.7	7.7	-	-	-	-	-	7.7	7.7	-	7.7(?)	-	7.7	30.8
	X3	*	15	13.3(?)	-	-	-	-	-	6.7	6.7	-	-	6.7	-	-	-	-	-	-	-	6.7	6.7	53.3
16 Total		*	37	5.4	5.4	-	-	-	2.7	5.4	5.4	5.4	-	2.7	-	-	-	2.7	2.7	-	5.4	2.7	5.4	48.6
21	X1	*	34	5.9	-	-	2.9	2.9	-	14.7	-	-	5.9	5.9	-	-	-	-	-	-	-	-	8.8	52.9
	X2	*	11	-	-	27.2	-	-	-	18.0	9.0	-	-	-	-	-	-	-	-	-	9.0	-	-	36.4
	X3	*	150	-	0.7	2.0	6.7	26.7	-	1.3	1.3	8.7	8.0	-	-	-	-	1.3	-	-	8.7	1.3	7.3	26.0
	floor	0.21	274	-	3.3	-	-	1.8	-	22.3	20.1	17.2	0.7	0.4	-	0.7	-	0.4	0.7(?)	-	3.3	0.4	0.4	28.5
	Pit 1	0.17	185	2.7	1.1	-	0.5	0.5	-	-	-	60.5	-	-	-	-	-	0.5	-	-	20.5	-	2.2	11.4
	Pit 2	0.05	79	-	20.3	-	1.3	-	-	6.3	-	2.5	6.3	-	-	1.3	2.5	3.8	-	-	7.6	1.3	7.6	39.2
21 Total		0.43	733	1.0	3.8	0.8	1.6	6.3	-	10.5	7.9	23.7	2.9	0.4	-	0.4	0.3	1.0	0.3	-	9.1	0.5	3.4	26.1
TOTAL		0.70	1211	3.9	4.8	0.9	1.2	4.1	0.2	8.5	5.5	17.5	2.1	2.6	0.2	0.7	0.4	1.6	0.4	0.5	8.5	0.4	4.3	31.8

*: Less than 0.05 gm

+: Less than 0.1%

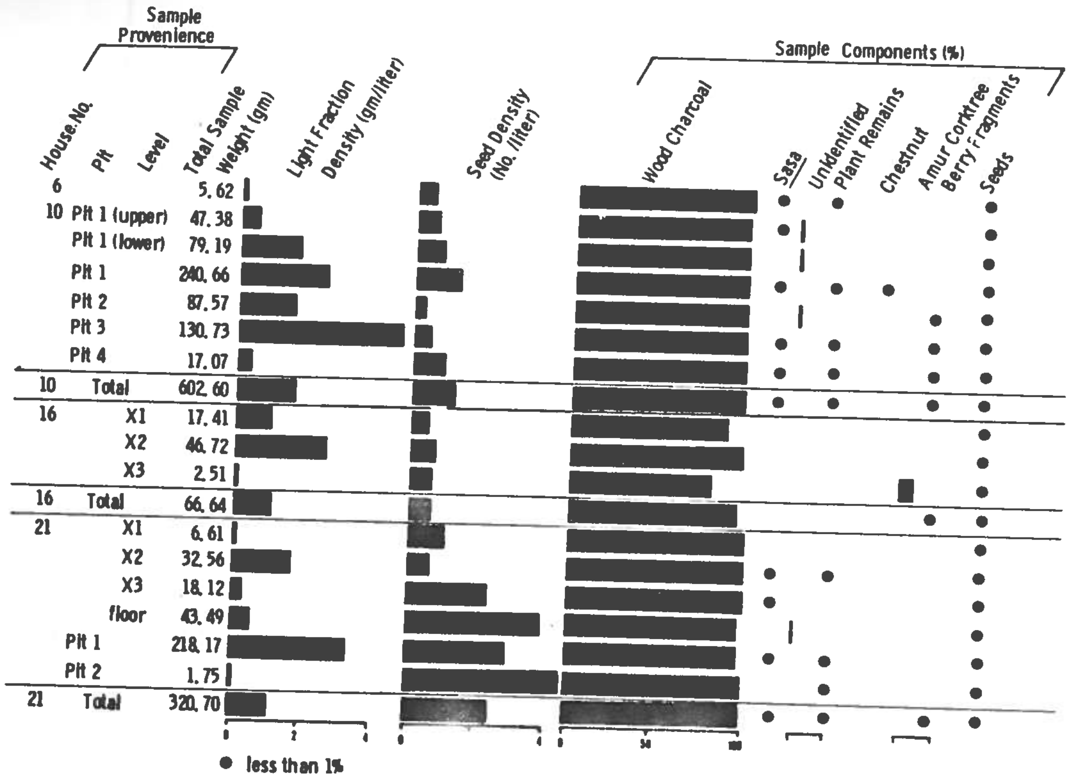


FIGURE 19

Usujiri B Site, Saibesawa VII Component Flotation Samples:
Light Fraction and Seed Density; and Sample Components as Percentage of Total Sample Weight

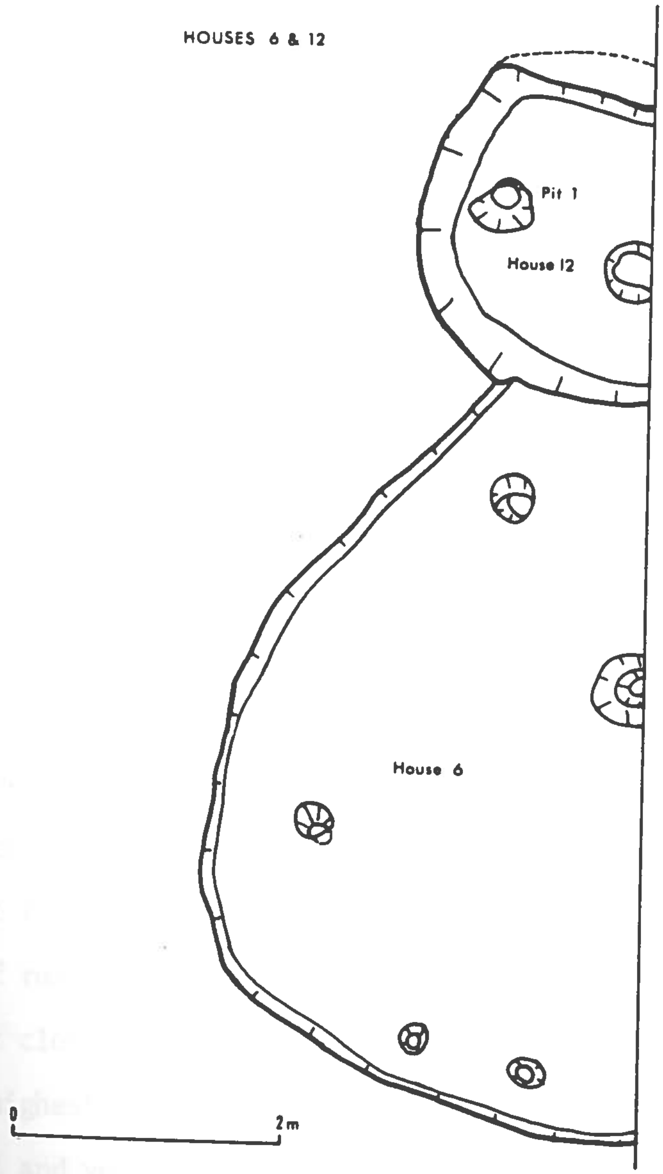


FIGURE 20
Usujiri B Site, Houses 6 and 12

and unidentified plant fragments comprise about 0.5% of the House 10 samples by weight.

Thirty-five kinds of seeds have been isolated in the House 10 samples, including 17 unknown types. Only 5% of the 411 seeds from this structure are unknown, however. Grass seeds (mainly Echinochloa type, knotweeds, chenopod, and sumac are the most common taxa represented. Grain seeds (seeds of herbaceous plants some of which are also used for their greens) comprise about 34% of the total number of seeds. Fleshy fruit seeds are nearly 12% of the total while 40% cannot be identified.

Pit 1 was a 2 meter deep flask-shaped pit (Plate 25). Two human skeletons were recovered from the pit bottom. Only the fill from the upper portion of the pit to a depth of about 1 meter below the house floor was sampled. The pit was first divided in half. The eastern half was removed to a depth of about 1 meter and the contents were floated as one sample. The western portion was divided into an upper and a lower portion based on observed stratigraphy. The density of the light fraction (mainly wood charcoal) was lower in the upper portion of the pit (Figure 19). The amalgamated pit sample, however, has a density of remains which is higher than either the upper or lower levels but close to the density of the lower sample. Seed densities, too, are highest in the amalgamated sample. This suggests that both horizontal and vertical distributional differences exist in Pit 1. The carbonized seeds recovered from each of the three Pit 1 portions are qualitatively and quantitatively similar (Table 9). The amalgamated sample has the greatest variety of seeds but the additional taxa are represented by only a few specimens each. The high variety of seed types in this portion of Pit 1 is probably a factor of the relatively large soil volume floated from it. Unidentified seeds (unknown and unidentifiable seeds) are between 40% and 46% of the total. Grain seeds, which average 37% of the total number of seeds, dominate the samples followed by sumac (9%) and then by fleshy fruit seeds (8%). Grasses are more common than knotweeds in each portion of Pit 1. Sorrel, chenopod, matatabi, and blackberry are limited to the upper level of the pit. Sorrel and chenopod, together comprising 12% of the upper sample (6 seeds) and the amalgamated Pit 1 sample (30 seeds), form a significant proportion of the seeds in the upper level. The lower level has the least variety of plant taxa. Grape is the only taxon in the lower sample not present in the upper sample but only one seed was found. The seed content of Pit 1, in general, is remarkably homogeneous which suggests that refuse accumulation there was consistent over an undeterminable period of time. The variation in light fraction density among the samples and the distribution of chenopod and sorrel in the pit suggests some variation in the pit fill.

Pits 2, 3, and 4 are all post holes. The sample contents are similar. Plant taxa are represented by one or a few specimens only, except for amur corktree seeds. Amur corktree seeds are common in each of the pits. The density of wood charcoal is lower in Pit 4 than in the other post holes. The Pit 4 sample included a broad area around the dense charcoal containing post mold thus probably accounting for the relatively low charcoal density. Pits 2 and 3 post molds were almost the same size as their respective post holes.

The post hole contents are quantitatively different than the Pit 1 sample. The sample sizes from the post holes are too small relative to Pit 1 to suggest qualitative differences. The principal differences are: 1) grain seeds are scarce in the post holes, 2) sumac and dogwood are nearly absent from the post holes but are common in Pit 1, and 3) fleshy fruit seeds are more common the post holes.

Light fraction (wood charcoal) density (1.7 gm per liter) is higher in House 10 than in the other structures sampled. This is not surprising if House 10 actually was destroyed by fire. The density of seeds, however, is similar to the Ento-Joso House 21 seed density (Figure 19) which suggests that the seed content of the soil in House 10 is not directly related to the possible fire which terminated its occupation. Conversely, though, there is no evidence to suggest that House 21 did not burn.

House 16

House 16 is oval-shaped and 9.5 m in its longest dimension (Figure 21 and Plate 27). At the west end of the house was a flask-shaped pit. The pit was excavated after my departure so it was not sampled. Three samples of house fill totalling 61 liters were taken, one each from levels X1, X2, and X3. Flotation sample contents are summarized in Figure 19 and Table 9.

Seed densities for the levels are almost the same (about 0.6 per liter of soil) but total light fraction densities are variable. Light fraction density in level X2 is very high while level X3 is low. A considerable amount of unidentifiable plant remains were in the level X1 sample. The remains have the appearance of carbonized fruit flesh, but they are not amur corktree berry. Fragments of amur corktree berry were found in level X3, but only one seed of this tree was recovered

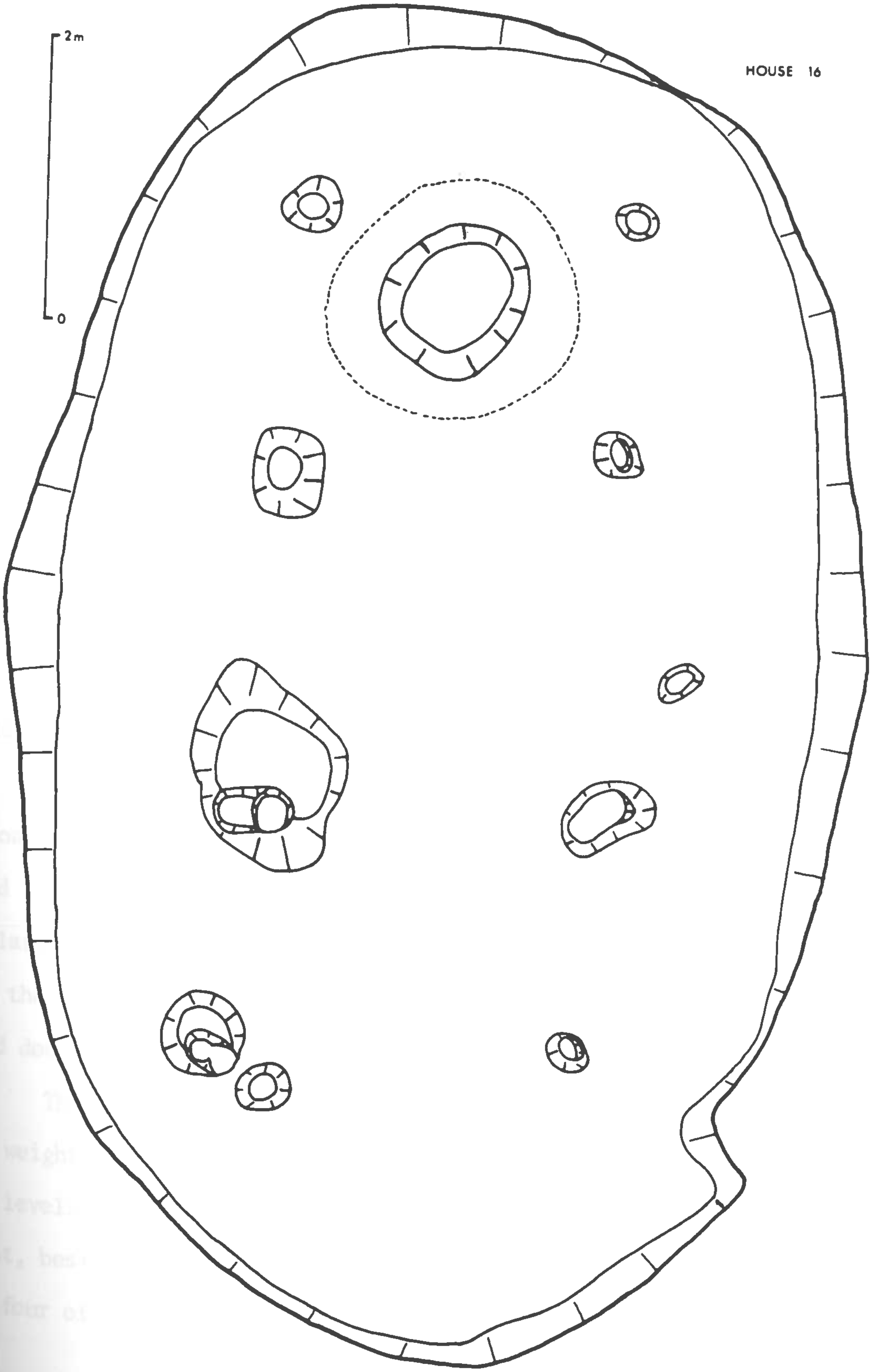


FIGURE 21
Usujiri B Site, House 16

from the same sample. The remaining identified seeds are represented by only one or two seeds. No particular plant group is emphasized.

House 21

House 21 which is an oval pit 10 m long, is the largest pit house found in the 1977 excavations (Figure 22 and Plates 27 and 28). Approximately 10 post holes in two rows of five holes each were found but not sampled. Three large pits, of which two are deep and flask-shaped, were uncovered in the northwestern half of the house. One of the flask-shaped pits (Pit 1) and the shallow pit (Pit 2) at the extreme northwestern end of the structure were sampled. Pit 1 consisted of an upper portion dense in carbonized material and pottery (Plate 26) and a lower, more sterile portion. The soil samples are from the upper part of Pit 1. This is the only structure at Usujiri b from which samples from house fill (levels X1, X2, and X3), floor, and pits were all collected.

Eight samples from House 21 totalling about 305 liters were floated. The flotation sample contents are summarized in Figure 19 and Table 9. On the whole, the plant remains concentrations were relatively high. In particular, the seed density (2.4 seeds per liter) is the second highest for all the structures sampled at Usujiri B and double the concentration in the presumably fired House 10.

The light fraction is almost entirely composed of wood charcoal by weight. Small quantities of Sasa stem fragments were identified in levels X2, and X3, and in Pit 1, while the only significant component, besides seeds, is some unidentifiable fragments of plant remains in four of the samples. Wood charcoal (light fraction) was most

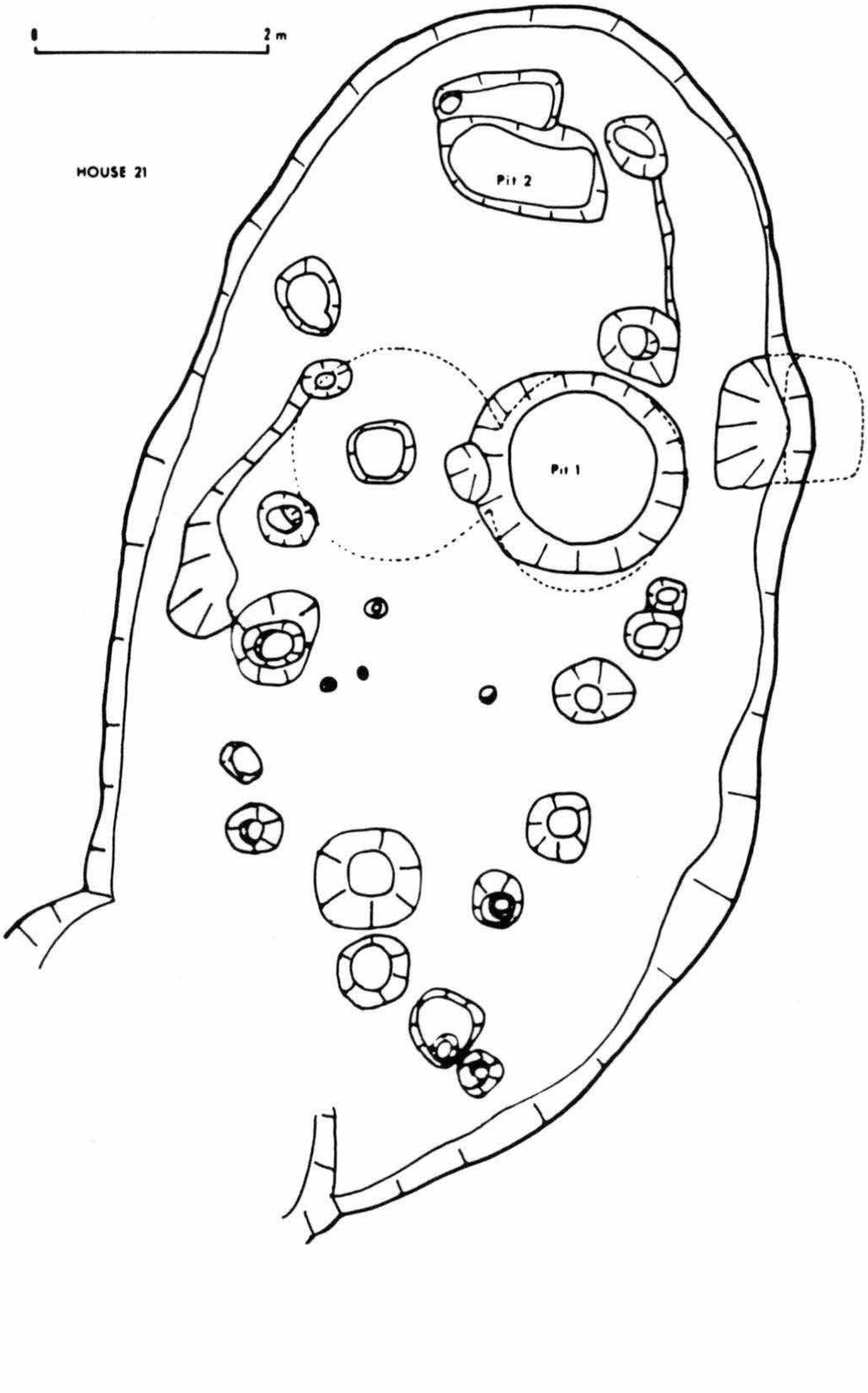


FIGURE 22
Usujiri B Site, House 21

concentrated in level X2 and Pit 1 and very sparse in level X1 and Pit 2. No pattern of wood charcoal distribution is obvious.

Seed concentrations contrast with those of wood charcoal. Densities are highest in level X3, floor and pit samples and low in levels X1 and X2 (Figure 19). One result is that few seeds (45) were recovered from levels X1 and X2 compared with the other House 21 samples (688). Level X1 and X2 data may therefore be unreliable. One implication of the wood charcoal and seed concentration data is that the two classes of plant remains are independent of each other in this structure. The relationship between wood charcoal and seeds is discussed later in this paper.

Sixteen taxa of seeds have been classified in the House 21 samples, including four kinds of knotweed (Polygonum) and at least two groups of grasses. In addition, at least 23 types of unknown seeds are present, but they comprise only 3.4% of the total House 21 seeds. Thus a minimum of 39 plant taxa are represented by the House 21 seed collection. The most common taxa are chenopod (24%) and knotweeds (19%). Although most of the knotweeds are not further classifiable, two clusters are present: one of the HNS type knotweed seeds in level X2 and one cluster of Type 5 seeds in level X3. Herbaceous weeds represented by the group labelled "Grain Seeds" in Table 9, which also includes the aforementioned knotweeds and chenopod, are the dominant plant group in this house (56% of the total). Fleshy fruit seeds are as abundant as grass seeds (5%). Sumac is the third most common single taxon (9%).

Seed distribution patterns are evident. Knotweeds occur in every context sampled in House 21. Taxa that occur in all but one context are: grasses (not in level X2), and sumac (not in level X1). Chenopod and sorrel occur in few samples but are abundant in several samples each (Table 9). Elderberry, grape, amur corktree, Ostrya, and cleavers, on the the other hand, are rare and occur in only a few samples each. Furthermore contents of the floor sample which was taken from immediately above Pit 1, and the Pit 1 contents are not similar. Pit 1 and Pit 2 sample contents are also dissimilar.

Daigi Houses

Only two houses with Daigi VIIIb pottery associations were sampled: House 18 and House 20. I am not certain that House 18 can be assigned to this Daigi classification. The other Daigi component houses include structures in the archaeologically complex area in grids 7 and 8 which was not sampled.

House 18

House 18 is a relatively small (4.4 by 3.6 meters) structure in the form of a square with rounded corners. It overlaps Houses 13 and 24 (Figure 18). The former is more recent than House 18 while the latter, a Saibesawa VII house, was constructed earlier than House 18. A rectangular, stone-lined hearth is situated in the southeastern portion of the structure.

Two flotation samples, one from level X3 and one from the hearth were processed. From the 117 liters of soil comprising the two samples 34 gm of light fraction (almost entirely wood charcoal) were collected (Figure 23 and Table 10). The wood charcoal is, not surprisingly, considerably more dense in the hearth than in level X3.

TABLE 10 Usujiri B Site, Daigi VIIIb Component Flotation Samples: Carbonized Seeds as Percentage of Total Number of Carbonized Seeds

				Grain Seeds									Fleshy Fruit Seeds					Other Seeds			
						Greens															
				Grasses		Knotweeds															
House	Context	Total Seed Weight (gm)	Total No. Seeds	Echinochloa Type	Other	HNS Type	Type A	Type B	P. sp.	Dock	Chenopod	Udo	Amur Cork-tree	Blackberry	Elderberry	Grape	Matatabi	Sumac	Ostrya	Unknown	Unidentifiable
18	level X3	*	138	0.7	5.1(?)	3.6	-	0.7	2.9	-	57.2	0.7	0.7	-	-	-	0.7	3.6	-	4.3	19.6
	hearth	*	10	-	-	-	-	-	10.0	-	20.0	-	-	-	-	-	10.0	-	-	-	60.0
18	Total	*	148	0.7	4.7(?)	3.4	-	0.7	3.4	-	54.7	0.7	0.7	-	-	-	1.4	3.4	-	4.1	22.3
20	X3	0.26	477	25.4	-	17.4	0.4	-	19.5	0.8	+	1.3	1.0	+(?)	+	+	1.5	4.4	+	3.8	23.1
Total		0.26	625	19.5	1.1	14.1	+	+	15.7	0.6	13.3	1.1	1.0	+	+	+	1.4	4.2	+	4.0	22.9

*: Less than 0.05 gm

+: Less than 0.5%

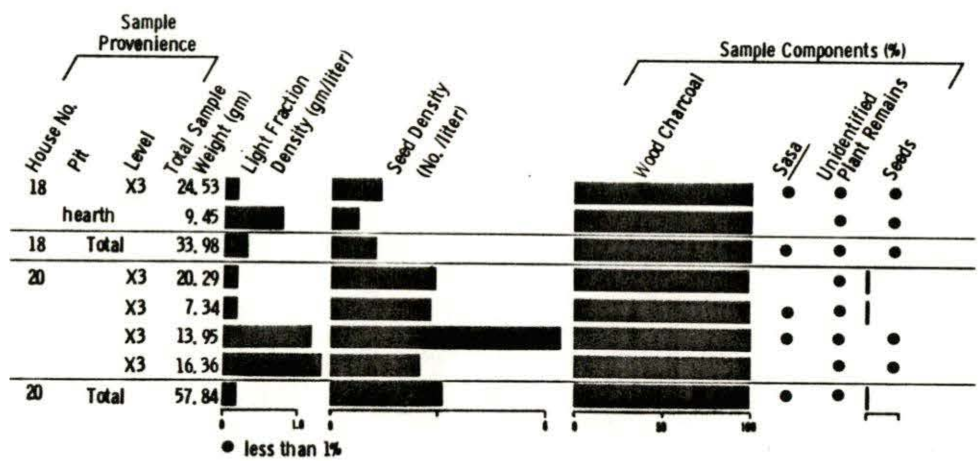


FIGURE 23

Usujiri B Site, Daigi VIIIb Component, Flotation Samples:
Light Fraction and Seed Densities;
and Sample Components as Percentage of Total Sample Weight

The 149 seeds from House 18 are comprised of a minimum of 17 taxa, 7 of which are unknown types. At least three species of knotweed and two species of grass have been isolated. About 22% of the seeds are not identifiable. Very few identifiable seeds were found in the hearth sample whose seed density is at the lower range of the Usujiri B densities. The level X3 samples, although only of average density (1.4 seeds per liter), contained 145 seeds. A high proportion of the seeds (73%) are grain seeds. Fleshy fruit seeds represented only by matatabi, udo and amur corktree are rare. Seven of the unknown seeds may be a species of grass. If this is the case, the grains represent nearly 80% of the total number of House 18 seeds.

House 20

House 20 is a small, oval house pit nearly 4 meters in its longest dimension. It intrudes into the souteastern end of the chronologically earlier House 21 (Figure 18). A stone-bordered, rectangular hearth is situated in House 20. About 150 liters of soil were taken from between the hearth and the southeastern border of the structure and from about 20 cm above the floor to a few cm above the floor surface. The contents of this sample are summarized in Figure 23 and Table 10. The sample was floated in four parts by three different flotation methods (see Chapter III). The four portions are discussed as a single sample in this section.

The flotation sample contents are nearly all wood charcoal (99.5%). The remaining 0.5% is mainly carbonized seeds. A very small quantity of sasa and unidentifiable remains is present. Although the charcoal density is below the site average, the seed concentration (3.2 per liter) is the highest for all the houses sampled and is exceeded only by the House 21, Pit 2 sample (4.4 per liter).

At least 31 plant taxa are represented. Fourteen of these have been classified, while the remaining 17 types which comprise only 4% of the total are unknown. The classified seeds are dominated by grass and knotweed seeds (63%). Together, grain seeds make up 64% of the total, sorrel and chenopod are represented by only six specimens. The grass seeds are all the Echinochloa type while nearly half of the knotweed seeds are the HNS type. The percentage of fleshy fruit seeds is low and again similar in percentage to sumac (4.4%). A comparatively low proportion (23%) of the seeds are unidentifiable. Many of the unidentifiable seeds appear to be similar to the grass seeds but can not be confidently classified.

Nodappu II and Unspecified Assemblages

Seven soil samples were collected from archaeological associations unknown to me at the present time. Including the single sample from the Nodappu II structure, the total light fraction from these contexts comprise only 3% of the site total. The seeds from the eight samples are only 4% of the total from the site. All of the soil samples were small except for a 40 liter sample from the floor of House 12. The contents of these eight samples are listed in Figure 24 and Table 11.

The sample from the Nodappu II component is from House 3, Pit 1 (a hearth). Light fraction and seed densities are below average. Only three plant taxa are represented. Nothing of significance can be reported.

TABLE 11 Usujiri B Site, Nodappu II Component and Unspecified Assemblages: Carbonized Seeds as Percentage of Total Number of Carbonized Seeds

				Grain Seeds					Fleshy Fruit Seeds			Other Seeds			
					Greens										
					Knotweeds										
House	Context	Total Seed Weight (gm)	Total No. Seeds	Echinochloa Type	HNS Type	P. sp.	Dock	Chenopod	Amur Cork-tree	Elderberry	Matatabi	Ostrya	Plantain (?)	Unknown	Unidentifiable
Nodappu Component															
3	Pit 1	*	7	14.3	-	-	14.3	28.6	-	-	-	-	-	-	42.9
Unspecified Assemblage															
1	hearth	*	3	-	-	-	-	-	-	33.3	-	-	33.3	-	33.3
2	inside pot	*	1	-	-	-	-	100.0	-	-	-	-	-	-	-
12	floor	*	7	42.9	14.3	-	-	-	-	28.6	-	-	-	14.3	-
	Pit 1	*	17	23.5	-	-	-	5.9	-	5.9	-	5.9	-	17.6	41.2
12	Total	*	24	29.2	4.2	-	-	4.2	-	12.5	-	4.2	-	16.7	29.2
Burial:															
	Upper	*	4	-	-	-	-	-	-	-	-	-	-	50.0	50.0
	Lower	*	37	5.4	-	2.7	-	-	67.6	-	2.7	-	-	2.7	18.9
Total		*	76	13.2	1.3	1.3	1.3	5.3	32.9	5.3	1.3	1.3	1.3	9.2	26.3

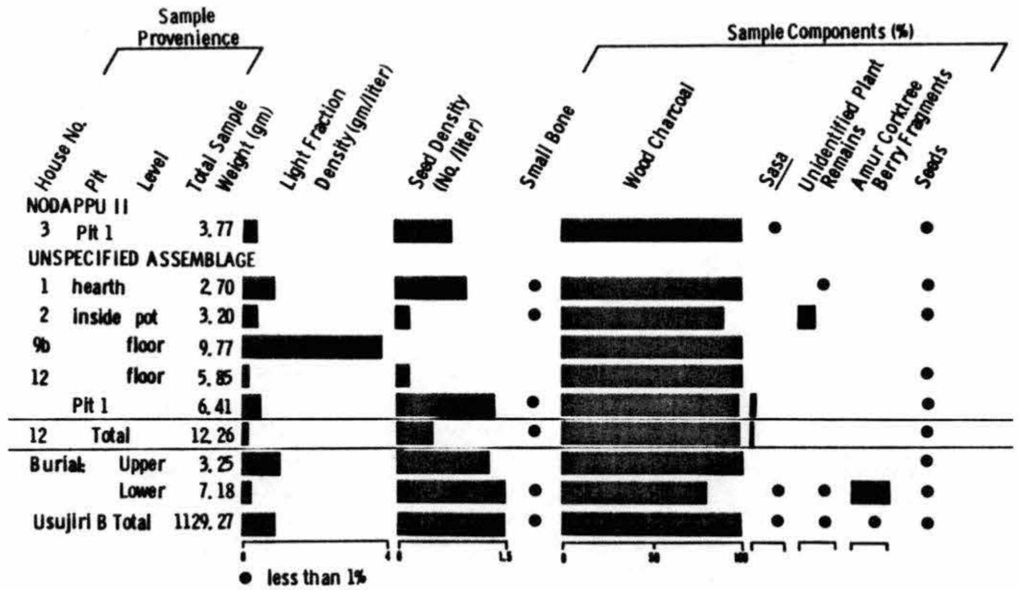


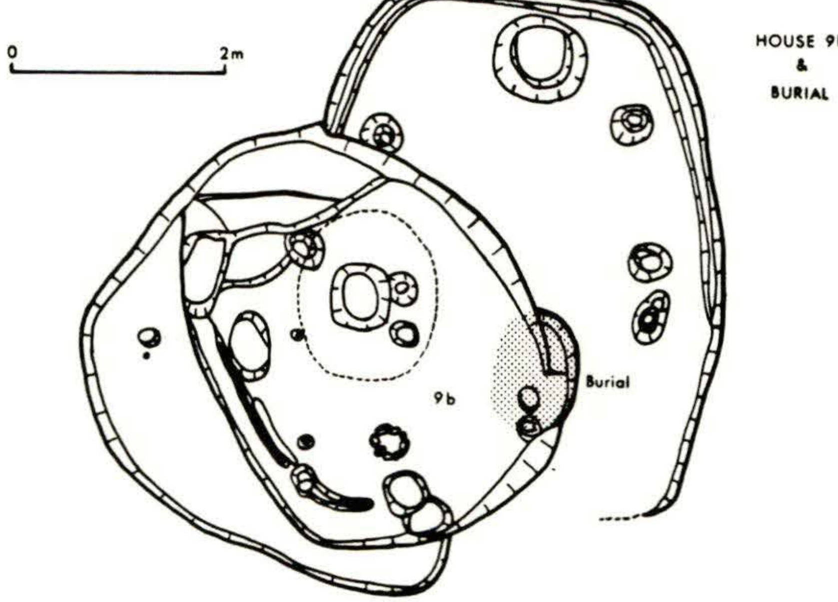
FIGURE 24

Usujiri B Site, Nodappu II Component and Unspecified Assemblages, Flotation Samples: Light Fraction and Seed Densities; and Sample Components as Percentage of Total Sample Weight

The other miscellaneous samples produced similar results except for the ones from House 12 and the burial (Plate 30). House 12 is a small structure which intersects House 6 and it was not totally excavated. Two samples were taken: one from the floor and one from a post hole. The density of both light fraction and seeds are much higher in the post hole sample. In addition, the sasa in House 12 is restricted to the post hole (1.6% of the light fraction). Qualitatively, though, the seed composition of both samples is similar, although 46% of the total seed sample is unidentifiable. About 29% of the seeds are grass which comprises most of the dominant grain seed group (38% of the total). Only one type of unknown seed is present.

The burial apparently belongs to the late Middle Jomon occupation of Usujiri B. It intersects both House 7 and House 9 (Figure 18). The burial pit was overlain by a stone formation (Plate 29) on which there had been a fire. Two samples were collected: one from above the stones and one from the pit fill below the stones.

The light fraction density reflects the characteristics of the two deposits. The upper sample has a higher density of wood charcoal. Nothing else but a few unidentifiable seeds were found above the stones. Below the stones, however, is a very low light fraction concentration. A cluster of amur corktree berry fragments and seeds representing an estimated seven berries (the largest cluster of corktree remains at the site) were found (Figure 24). Seeds of only four other taxa were present in a small number. Possibly the corktree berries had been purposely placed in the burial pit. The fire above the stones, then, may have caused incomplete combustion of the plant material contained in the soil below the stones.



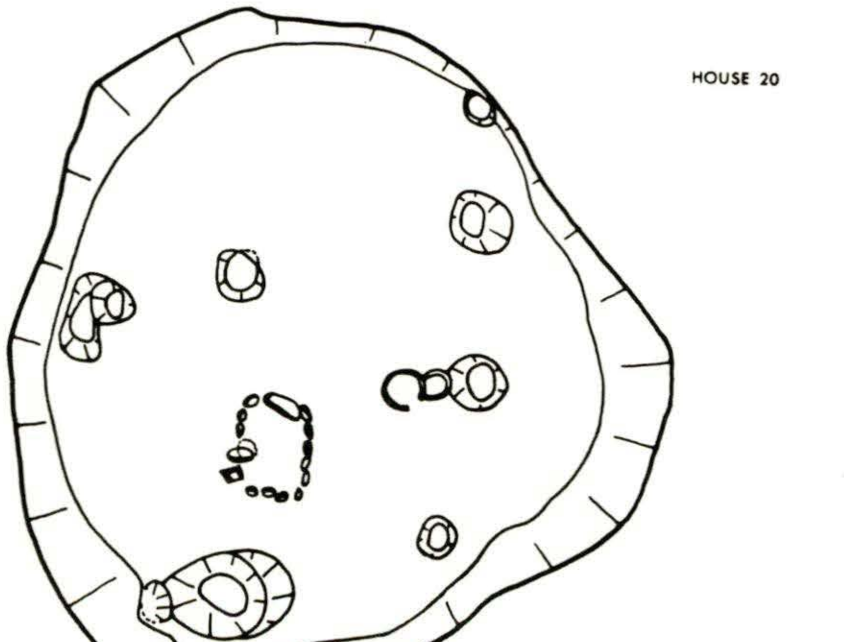


FIGURE 25
Usujiri B Site, Houses 9b and 20, and Burial

Plant Remains Distributions

Unlike Hamanasuno, house fill at Usujiri B could not be extensively sampled. Thirteen samples totalling 41% of the soil floated from Usujiri B was from "X" levels (house fill), but only from four structures. In Houses 18 and 20, the sampled house fill is from level X3 only. Fifteen percent of the soil volume is from three house floor samples. The remaining 44% of the soil is from flask-shaped pits, post holes, and a burial. The latter three contexts are better represented since a greater variety of samples was taken from them. Distinctions between house fill and other contexts cannot be adequately explored at Usujiri B to see if the pattern observed in the Hamanasuno data is paralleled here. There may well be a distinction between levels X1 and X2 on the one hand and X3, floor, and pit samples on the other hand. Level X3, in contrast to level X3 at Hamanasuno, is dense in grain seeds and contains some fleshy fruit seeds. Although the archaeologists at Usujiri B and Hamanasuno suspect that the "X" levels at both sites reflect similar depositional events, I doubt that direct comparisons are instructive at the present time.

Distinct presence/absence patterns of seed distributions do not seem to exist at Usujiri B. Quantitative contrasts are apparent, however. The meaning of these contrasts is not readily apparent, but I think it is important to point them out. Two knotweeds (ōinutade and Type b), sorrel, and chenopod seeds are found mainly in House 21. Clusters of chenopod seeds is associated with a cluster of chenopod seeds. Another association seems to be between the ōinutade and Type b knotweed seeds. This is especially apparent in House 21, level X3 where both types are clustered. These taxa (the two knotweeds, sorrel, and chenopod) are confined mainly to pit and floor samples. The cluster of 79 chenopod seeds in House 18, level X3 was found just above the floor. The contexts in which these four taxa are dominant are Saibesawa houses (except for House 18).

A relatively high percentage of the Echinochloa type grass seeds (68% of the Echinochloa type seeds) are found in House 20, a Daigi structure. A cluster of 38 Echinochloa type seeds (21%) is from the Saibesawa House 10. Other grasses, although comprising only 3.4% of the total Usujiri B seed sample, are mainly in the Saibesawa houses; a cluster in house 10, Pit 1 and a group in House 21.

Knotweed seeds in general are present in all contexts but cluster in House 21 and 20. In House 20, level X3, HNS type knotweed seeds are associated with a cluster of Echinochloa type grass seeds.

Amur corktree seeds and berry remains are found predominantly in the House 10 pits and the one burial which was sampled. House 10 was apparently destroyed by fire. I have suggested that the carbonized berry remains in the burial resulted from a fire built on top of the stones sealing the burial pit. Amur corktree berries may be under-represented in other contexts where carbonized remains may be present due to more regularly occurring events. No other plant remains show this contrast.

Sumac seeds are present in similar proportions in each component of the site and occur in a variety of contexts, unlike their predominance in house fill levels at Hamanasuno.

As at Hamanasuno, wood charcoal concentrations are not directly related to seed densities.

CHAPTER VII

INTERPRETATIONS AND CONCLUSIONS

Plant remains from archaeological sites have both ecological and subsistence relevance. Both are significant to understanding human adaptations. The ecological significance of botanical data outlined by Dimbleby (1978), concentrates on the human impact on the natural environment; people almost always affect the local ecology. This investigation examines local ecological changes and the reciprocal relationships between the Initial to Middle Jomon populations in the study area and the ecology. Plant exploitation patterns must be considered on three levels: 1) the types of utilized plants; 2) how the plants were utilized (for food or other purpose); and 3) the proportions in which they were utilized.

The differential preservation of plant parts is acknowledged as an extremely significant factor in interpreting plant exploitation patterns (Munson et al. 1971; Renfrew 1973; Dennel 1976; Dimbleby 1978). Utilized plant parts include very dense inedible nutshell and large pits of fruits; dense parts, such as grains which are ingested, and non-dense plant foods, such as greens, tubers, and pulpy fruits (Munson et al. 1971:426-427). The last group is usually not represented archaeologically at open sites and even when such remains are recovered, their identifications are extremely difficult. Food grains which are ingested in their entirety would be generally under-represented. Dense inedible parts are sometimes found in paleofeces or intestinal contents of dessicated bodies (Yarnell 1974), but they usually were not eaten; perhaps they were even used as fuel. Munson et al. (1971) point out that inter-class comparisons of plant food proportions are difficult to assess. Estimates of proportions of plant foods used within a class are easier to make.

Contextual data can be of vital importance in interpreting plant utilization patterns. Dennel suggests that most plant remains result from everyday activities not conflagrations (1976). The evidence from Usujiri B, House 10 supports this interpretation. Furthermore "the composition of a particular sample of carbonized plant remains is likely to have resulted from specific human activities during the preparation and consumption of a plant food" (Dennel 1976:232). Just what these activities were is difficult to determine. Since all of the remains reported by most investigators are carbonized, we are examining remains which were carbonized as a result of some preparation technique, such as parching, or which were fortuitously burned (in a low oxygen atmosphere). Likely, plant remains found abundantly (in clusters and/or in many samples) represent utilized plants. In this investigation, I am assuming that changes in proportions of types of plant remains through time are evidence of changes in plant utilization patterns. Conversely, patterns which vary little through time represent consistent utilization patterns.

The first analysis of plant remains from Hamanasuno suggested that weeds, comprised of knotweeds and grasses, were a relatively important plant food; fleshy fruits were also in evidence, but their dietary significance was difficult to estimate (Crawford 1976; Crawford et al. 1976). The possibility that plant husbandry played a role in both the Jomon subsistence and the ecological disruptions that were conducive to weed growth was raised (ibid.). If plant husbandry was not practiced, the environment was still suitable for the annual, herbaceous weeds which were utilized. Evidence for nuts as food was virtually absent. Testing of these observations depended on comparing the first collection of plant remains with subsequent collections and recovering samples which would provide better contextual information. Replication of these patterns, both qualitatively and quantitatively, would support the argument for which plants were utilized. Contrasts would suggest either changes through time (perhaps including changes in scheduling) or would point to idiosyncracies which might disconfirm suspected plant use patterns.

The quantification of remains suggests which plants can be ruled out as having been utilized. The collection of nearly 4000 seeds from the Kameda Peninsula sites probably represent nearly 180 plant taxa. Only 15 of these taxa occur regularly and sometimes in varying abundance at each of the sites. The 15 consistently occurring taxa make up about 60% of all of the seeds. The other 165 taxa made up less than 10% of the total. A reasonable interpretation is that the 165 taxa of seeds and/or fruits (including the 18 types of other grass seeds) are incidental inclusions in the samples, even though most of these are not yet identified. Although not of direct relevance to subsistence or plant utilization in general, these plants have ecological significance. The other grasses, for example, may have been collected

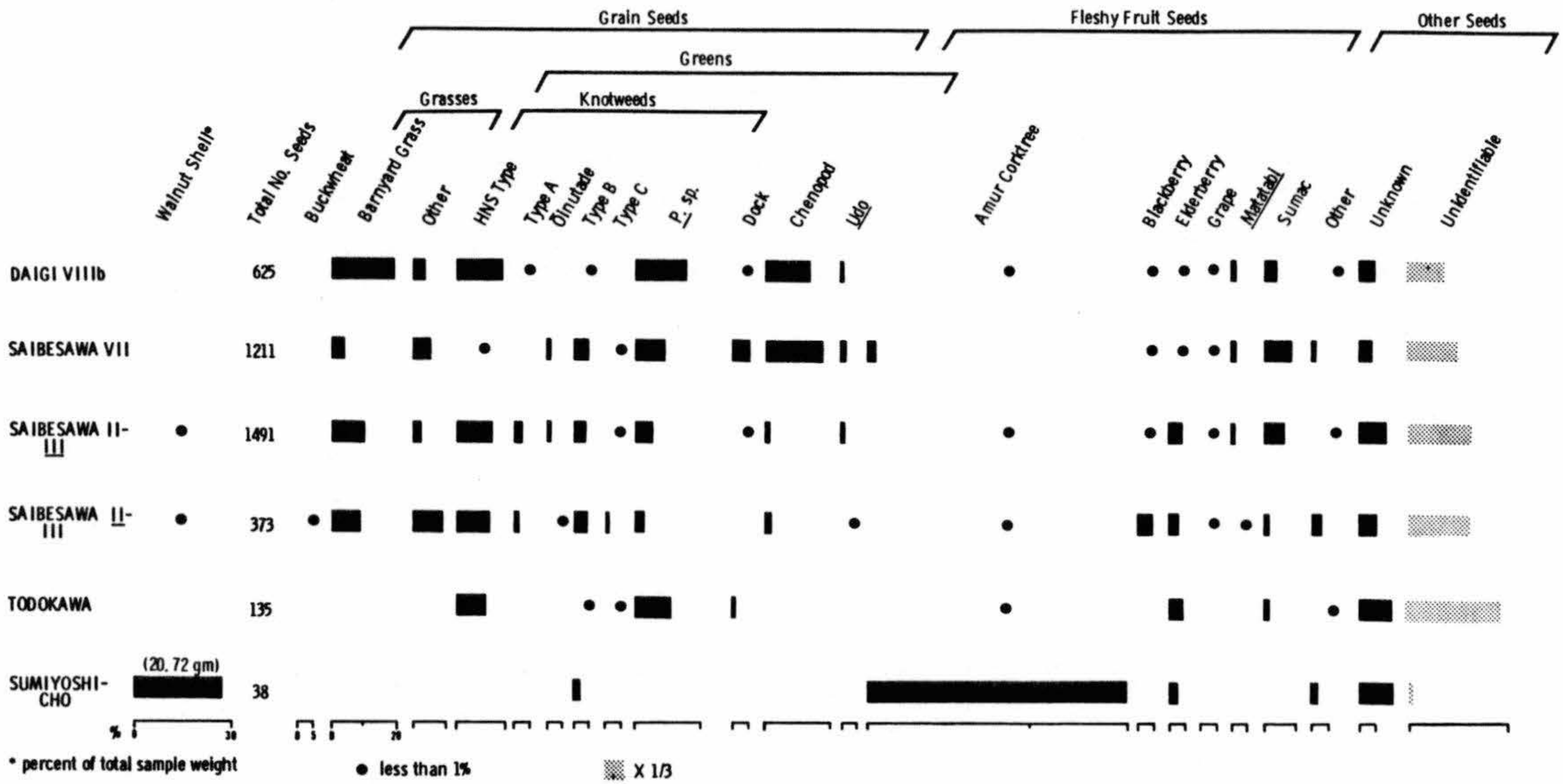


FIGURE 26

Summary of Seed Types as Percentage of Total Number of Seeds and Nuts as Percentage of Total Sample Weight

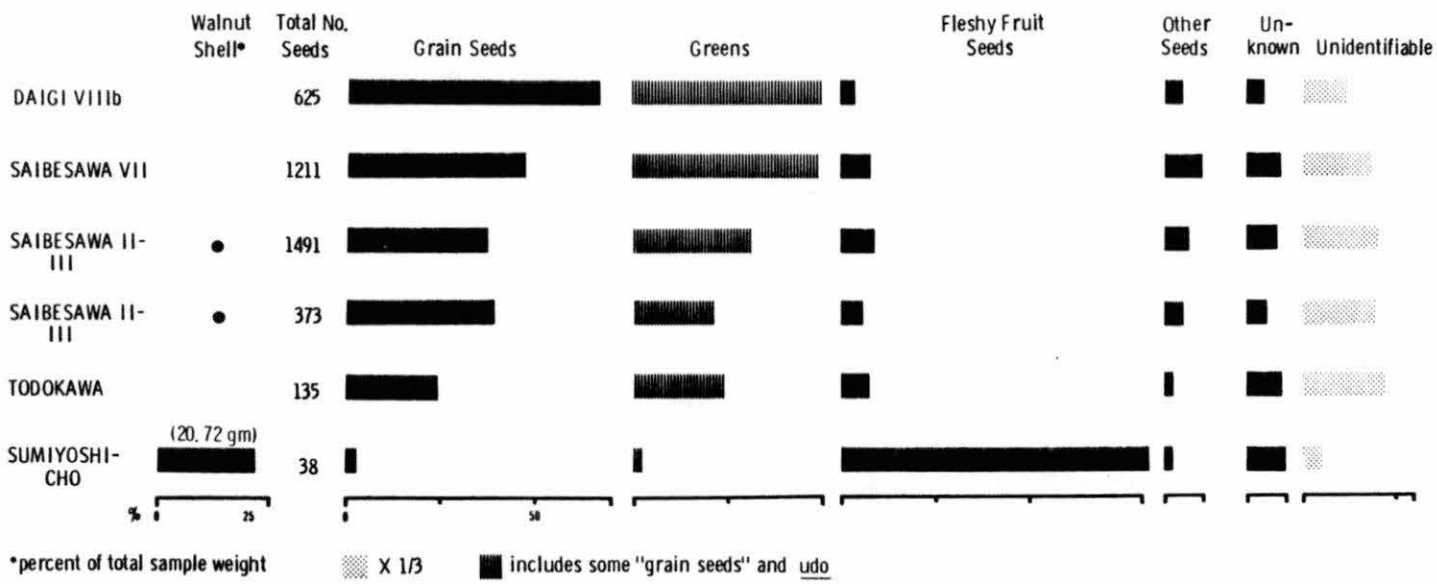


FIGURE 27

Summary of Seed Classes as Percentage of Total Number of Seeds and Nuts as Percentage of Total Sample Weight unintentionally along with other plants or fruits which were growing in the same location as the plants which were purposefully gathered. Furthermore the presence of some of the other identified taxa--dogwood, cleavers, Cyperaceae, Compositae, Solanaceae, Umbelliferae, and Leguminoseae--probably cannot be considered as evidence of their utilization. None of these plants are statistically well-represented, nor do many of them have documented uses. The remaining taxa which comprise the majority of seeds from the study area are of greater concern to understanding local Jomon subsistence patterns and ecological relationships.

Figure 26 summarizes the quantities of each type of seed recovered from the Kameda Peninsula sites. Most of the identified plant types probably represent utilized taxa. Figure 27 illustrated the patterns of the various classes of plant remains. The general classes show consistent patterns through the Ento and Daigi VIIIb phases. The components of the classes are qualitatively identical. The plant exploitation patterns on these grounds seem to have been rather consistent through these phases. To further check the status of utilization of these plants, evidence relating to each taxon will be considered.

At Hamanasuno, seeds in the grains category were usually confined to house floors, hearths and pits. Fleshy fruit seeds had a more dispersed distribution; no particular contexts were likely to yield more evidence of fleshy fruits than others. One fleshy fruit, that of the amur corktree, did have an unusual distribution at Usujiri B. The carbonized flesh was common in two contexts (House 10 and the burial) which were apparently burned over. Grain seeds at Usujiri B were also confined to deeper levels in the site, but because of sampling problems the resolution of a pattern similar to that observed at Hamanasuno was hindered. The distribution of these remains likely reflects patterns in processing of the different classes of plant remains and thus supports the conclusion that they were utilized.

Barnyard grass seeds at both Hamanasuno and Usujiri B occur more abundantly in deeper levels: hearths and post holes at Hamanasuno and in pits and in level X3 at Usujiri B. Clusters of these seeds were found, indicating that large numbers of this grass seed were carbonized together and deposited frequently. This fact in combination with this taxon's known food potential is evidence that it was a food resource, at least from the end of the Early Jomon.

The HNS type knotweed which is probably itadori (Polygonum cuspidatum) shows a situation parallel to the barnyard grass but its utilization dates at least to the beginning of the early Jomon ca. 5000 to 4500 B.C. Ōinutade seeds occur in a few clusters and are found archaeologically not only in Kameda Peninsula but in other parts of Japan, indicating that ōinutade was utilized over a broad geographical range. Type B knotweed (P. persicaria?) appears as early as the Initial Jomon Sumiyoshi-cho Phase, although only as a single seed. Their consistent occurrence, clustering, and occasional popping indicates that the seeds were likely a food at the later occupations. Both ōinutade and P. persicaria seeds are known to have been ingested in quantity by prehistoric peoples in other parts of the Old World (Renfrew 1973). These two types of seeds are often associated together in clusters at Hamanasuno. They may have been collected together. Type C knotweeds appear not to have been utilized.

Dock seeds are abundant at the end of the Middle Jomon and occur in several large clusters in the Saibesawa VII component. Their smaller representation in the Daigi component may be a factor of the lack of variation in the samples from that component. Indeed, the abundance of dock seeds when they do occur is not congruent with what one would expect had they not been utilized. It is occasionally reported from elsewhere archaeologically, and Jane Renfrew (1973:185) has remarked that at least one species (Rumex crispus) should be found more often at archaeological sites. Possibly some seeds identified as knotweed are actually dock. Their utilization seems to have begun during the Middle Jomon, although utilization may have begun as early as the Todokawa subphase.

Chenopod seeds have a similar temporal and spatial distribution as dock seeds. A large cluster of dock seeds is associated with a large cluster of chenopod seeds at Usujiri B. The few seeds reported in 1976 from Hamanasuno (Crawford 1976; Crawford et al. 1976) indicated their economic unimportance. The new data point to the utilization of chenopod by the end of the Middle Jomon. Not only does chenopod become abundant but large clusters of seeds, many of which are popped, in a variety of contexts were found. Chenopod was likely a food plant.

The fleshy fruit group in general no doubt represents a class of plant food. Fleshy fruit with small seeds (blackberry, elderberry, matatabi, and udo) may be under-represented because the seeds were probably eaten along with the fruit flesh. Matatabi fruits have far more seeds than any of the fleshy fruits reported here and so this plant, represented by a higher proportion of seeds than elderberry, blackberry, and grape may have been no more important than them. Amur corktree berries are likely an important component of this group. Both fruit flesh and seeds were recovered, often clustered, from each site in a variety of contexts. Their distribution at Usujiri B in the fired contests is evidence that they were even more important than the other samples indicate.

Sumac presents somewhat of a dilemma. Its abundance from the Todokawa subphase through the end of the Middle Jomon, the clusters of seeds and distinct distribution patterns (House fill at Hamanasuno and particularly abundant in House 74, pits, floors, and level X3 at Usujiri B) evidences the utilization of sumac. The distribution pattern of sumac seeds, which does not completely parallel that of the other plant remains, many of which were probably utilized for food, suggests that sumac was used for some other purpose. In southern Japan today, one species of sumac is grown for its wax, while another is grown for its use in laquer production. No documentation for the use of sumac in Hokkaido by the Ainu or present inhabitants is known. Sumac was used by some native peoples in North America to make a kind of drink (Yarnell 1965).

None of the plants with remains recovered from the Kameda sites are components of the mature beech forests which were probably extensive prehistorically. The plants are either weedy, herbaceous annuals (the grain seed category) or weedy perennials (blackberry, grape, dogwood, matatabi, udo). Amur corktree, dogwood and Ostrya do not fruit productively in climax forest communities and their presence in the samples also supports the contention that beech communities and climax forests were not exploited for plant foods. Based on the data that Murokata (1975) presents on the present vegetation of Minamikayabe, this would exclude most or all of the highlands.

The types of communities exploited from the beginning of the Early Jomon to the end of the Middle Jomon were similar, so the remains from these periods will be discussed together. The great abundance of grasses, knotweeds, dock, and chenopod incicates that highly disturbed soil with abundant light was an important ecological component of the area. Since many of the plants identified in the samples are annuals, these areas must have been maintained annually as well as over at least two millenia. This kind of habitat can often occur on floodplains where annual flooding maintains a young successional stage. Such habitats are not developed to any extent in the study area. Instead, areas on the terrace within the villages and perhaps immediately outside the communities provided ideal habitats for the annual weeds. Murokata (1975) reports such plants from forest edges, roadsides and similar habitats in the area today. The perennial weeds are consistent with habitats which have been cleared of climax vegetation but left alone for at least several seasons. Examples of such areas would include forest edges, clearings in forests, areas where human occupations (e.g. pit houses) had been discontinued and where limited vegetational succession was permitted, and river banks. Such perennial weeds are common today on the terrace in the Hamanasuno site vicinity (Crawford 1976) and the Usujiri B area.

That such communities were an important component of Jomon subsistence in the study area is both an example of, and is supported by, the understanding that human adaptation involves reciprocity with the natural environment with which they are systemically related. In turn, maintenance of cultures involves adaptation to those modifications. In Kameda Peninsula, some, if not all, of the changes observed between the Initial and Early Jomon, and the maintenance of a fairly stable pattern during the Early through Middle Jomon, can be hypothetically interpreted in terms of reciprocal relationships. Climatic changes may have been a factor involved in the apparent subsistence change after the Initial Jomon, but this has not been documented. Ecological disruption of the site areas was favorable to the growth and maintenance of certain weeds. Colonization of such habitats probably began with the initiation of Jomon settlements that were more stable than the preceding pre-pottery occupations (none of which, to my knowledge, are known from the study area). The productivity of these plant communities increased as settlements became more permanent and grew in size (Hurley 1977). Concomitantly, these plants began to be utilized. The Early Jomon subsistence adaptation here involved capitalizing on local environmental changes that were occurring unintentionally as a result of their particular adaptation.

The amplification of the relationship between the environment and culture through time in the Kameda Peninsula is evident. The importance of weeds, assuming that they were exploited according to their availability, increased (Figures 26 and 27). Dock and chenopod became more extensively utilized by the end of the Middle Jomon, indicative concurrently of greater soil disturbance at that time. Furthermore, the increased percentages of sumac and _matatabi_ over time (Figure 26) indicates the increased extent of forest edges, forest clearings, and waste ground which had been left long enough for these perennial weeds to reach maturity. The continuing presence of blackberry, elderberry, grape, and dogwood is consistent with this hypothesis. The increased percentage of amur corktree in the middle Jomon suggests that the production of this fruit was increasing also. Thus this relationship between plants and people was of adaptive significance accounting, at least in part, for the success of the Jomon in the area.

If some of these plants were also exploited from the river valleys where some of the archaeologically documented plants grow today (chestnut, amur corktree, sumac, some of the knotweeds, etc.), the maximum extent of the zone from which plants were collected probably approxiimates a boundary between the 40 and 100 meter contour lines in Figure 3. The zone may have extended down the terrace slope but does not seem to have included any of the beach area which may have been inundated by the ocean during the marine transgression. For Hamanasuno, this area may have included parts of the Shojin and Kakkumi River valleys and for the Yagi, the Osatsube and Yagi River valleys. The location of the Usujiri B site some distance from any large river suggests that habitats associated with rivers were not of primary importance during the Middle Jomon. Areas closer to the site may well have been adequately productive in plant food. This area of plant exploitation is no more than 15% of the 160 km^2 area of the town of Minamikayabe. For each site, the area exploited may have covered considerably less area than this.

According to Hitoshi Watanabe (1972:40-41), the Ainu of the Tokachi area of Hokkaido (in northeastern Hokkaido) collected most of their plants from the terrace on which the village stood and its adjoining river bank. The Ainu that Watanabe studied apparently were not the kind of harvesters that the Early and Middle Jomon peoples were, although Ainu ethnobotany is not well reported. This would support the view that the Jomon plant collecting territories in Minamikayabe did not have to be extensive in area and could have been close to the villages.

Comparison of the Japanese plant remains with well-documented assemblages from other parts of the world should allow an evaluation of at least the relative organization (complexity) of the Kameda Jomon subsistence. An abundance of plant remains from sites occupied by peoples engaged primarily in hunting and gathering and to some extent food production have been reported from many parts of North America and Europe. Plant remains from sites occupied by hunter-gatherers are best documented in eastern North America from Archaic Period sites in the Illinois Valley (Asch, Ford, and Asch 1972; Asch and Asch 1979), central Kentucky (Crawford 1978), Tennessee (e.g. McCollough and Faulkner 1973; Chapman 1973 and 1975; Chapman and Shea 1977), and in eastern Illinois (Winters and Yarnell, n.d.). Evidence from food producer sites includes Early through Late Woodland Mississipian period sites. The data I have access to from Europe are from Neolithic sites. The Archaic Period sites provide an excellent contrast with the Japanese data. The principal plant food in eastern North America at this time was nuts, but evidence of other utilized plants is accumulating. Plant husbandry had begun by at least the Late Archaic (Yarnell 1976; Chomko and Crawford 1978) but cultigens contributed little to the total diet. For central Kentucky, the Late Archaic data is contrasted with data from an occupation at Salts Cave which partly overlapped in time with the shellmounds. At Salts Cave, plant husbandry was an important subsistence activity (Yarnell 1975). The people at the two shellmounds, Carlston Annis and Bowles, depended on nuts as a main plant food, but fleshy fruits seem also to have been of some importance. Seeds of herbaceous, annual weeds were less than 15% of the total from Carlston Annis and less than 5% at Bowles. At Salts Cave nuts were still utilized, but herbaceous weed seeds and cultigen grains contributed significantly to the Salts Cavers' diet (Yarnell 1974). Yarnell attributes the proliferation of herbaceous weeds to forest clearance for cultivation (ibid.:118). The proportion of plant food components in the flotation samples is quite similar to the composition of paleofeces from Salts Cave and strongly supports the validity of inferring plant food composition from flotation samples.

From sites dating to the first millenium B.C. in eastern North America, seeds from herbaceous weeds used for both their seeds and greens from Scovill (Munson et al. 1971), where squash and gourd were grown, are dominated by nuts, but chenopod and knotweed seeds were so abundant that they may have been husbanded. In fact Asch and Asch (1979) suggest that Chenopodium bushianum, Polygonum erectum, and Phalaris caroliniana may have been cultivated since their wild abundance was not great enough to permit harvest collection. Along with the advent of plant husbandry in the lower Illinois valley, nuts decline in importance and the percentage of starchy seeds increases over time (ibid.). Starchy seeds of herbaceous weeds dominate the seed samples reported from the Middle Woodland Owl Hollow phase in Tennessee (Crites 1978). Even at Mississippian sites which were occupied by people who had maize agriculture,nuts continued to be utilized. A good example is the collection of plant remains reported from the Gypsy Joint site (Smith and Wetterstrom 1978). Over 1550 gm of nutshell, compared to about 40 gm of maize was recovered. Seeds from weeds such as knotweed and chenopod were extremely abundant.

Most of the plant remains from occupations of both hunters and gatherers and food producers consist of a significant quantity of nuts. Even Late Woodland and Mississippian people, who grew a variety of productive cultigens, ate nuts. Nuts are reported from a variety of Neolithic sites in Europe (see Renfrew 1973:154-160), but they apparently do not occur abundantly. Thus the presence of nut remains at archaeological sites do not necessarily reflect other plant utilization patterns. The absence of nuts, in this context, is therefore significant. In Kameda Peninsula, Japanese walnut comprised 25% of the remains from Nakano B (Figures 26 and 27) during the Sumiyoshi-cho phase. By the time of the Todokawa subphase (ca. fifth millenium B.C.), nuts were relatively unimportant. Nuts are consistently poorly represented through the end of the Middle Jomon period, which was the latest period investigated. Seeds of herbaceous weeds and perennial weeds become emphasized instead, in a manner not unlike the way they appear with the advent of food production and increased site disturbance over time in eastern North America. Apparently a change in subsistence occurred sometime between the Sumiyoshi-cho phase and the Todokawa phase.

Two types of stone tools, the ishizara (metates) and sekikan (a kind of mano) are conspicuous in their absence from the Initial Jomon Nakano A and B sites. The two ishizara at Nakano B were from House 11--the structure from which plant remains were collected. No sekikan were found at Nakano B. Only one ishizara and one sekikan were found at Nakano A. In contrast, 183 ishizara were reported from the 48 pit houses excavated at the Early Jomon Locality 4 of Hakodate Airport. At the Early Jomon Hamanasuno site, 170 ishizara were recovered from the nine houses excavated in 1974. The sekikan similarly become abundant after the Initial Jomon. The proliferation of these tools after the Initial Jomon, parallels the suggested subsistence developments at that time. The grain seeds, which apparently dominated the plant food of the Early and Middle Jomon populations of Kameda Peninsula,were probably the materials which were being ground.

The ecological contrast between the south and north sides of the Kameda Mountains was described in Chapter I. Initial Jomon sites are relatively common in the Hakodate area, south of the Kameda Divide. About 15 sites from this period are reported by Chio (1977). Occupation of Minamikayabe by Initial Jomon people is thus far evidenced by only a few pottery sherds at the Yagi site. Possibly this new subsistence orientation facilitated the occupation of the Oshima coast.

The remaining plant remains (mainly carbonized seeds) can be evaluated in light of the other plant remains collections from North America and Europe. The Early and Middle Jomon plant utilization patterns are quite different from the Late Archaic pattern. The situation is justifiably not analagous on other grounds--settlement stability, pottery manufacture, and probably social organization. Closer parallels exist with the food producers and harvesters--the emphasis on weeds for their seeds and greens, and the ecological disruption that the plant remains indicate. The situation is ambiguous in Japan because no obvious cultigen has been identified in the samples. Certainly buckwheat husbandry has not been confirmed by this investigation. The unique yet ambiguous nature of the Kameda Peninsula plant remains from food producing populations on the other hand suggests that two alternative hypotheses about plant utilization and Jomon adaptations in southwestern Hokkaido can be productively explored:

1. Harvesting Hypothesis. The Kameda Peninsula populations subsisted by harvesting productive wild plants (as well as animals).

2. Plant Husbandry Hypothesis. To some degree plant husbandry was practiced and it originated sometime after the Sumiyoshi-cho phase.

A tenable hypothesis must be consistent in particular with 1) the successful adaptation of the Jomon people in the study area and the apparent adaptive change in the time between the Initial and Early Jomon; 2) the apparent year-round settlement stability; 3) the ecological disruption and its amplification through time; and 4) the assemblage of utilized plants.

The harvesting hypothesis would require that ecological disruption which began during the Initial Jomon developed as a result of clearing land for settlements, construction, firewood collection, and perhaps some burning. Food from the weedy annuals and perennials was sufficiently productive in combination with fishing and hunting to encourage a deemphasis on nut collection. Starchy tubers may have been collected, as suggested by the analysis of the plant remains clearance. The weedy annuals were colonizers of, among other places, gardens and were productive enough to be harvested as well. The contrast between the Sumiyoshi-cho phase and the subsequent Jomon phases was a general evolutionary change (as defined by Sahlins and Service 1960).

Further testing of these hypotheses is not possible with the present information. Future research must provide the necessary data. This will entail determining whether or not a cultigen was grown; whether the increase in the Echinochloa type grass seed can be replicated at other sites, and whether the pattern continues during later periods. The productivity of barnyard grass, knotweeds, dock, and chenopod in the area should be checked. The regional pollen sequence should indicate the extent of ecological disruption through time. Contrasts with pollen from the site should help put the site vegetation in a regional context. Technological adaptations, especially stone tool technology, need to be explored in detail over the range of time periods involved, perhaps with particular emphasis on comparing the Initial and later Jomon periods. Flotation samples from more Initial Jomon sites are needed to characterize the range of variation of plant utilization at that time. Comparison of flotation samples from sites dating to the first millenium A.D., when plant husbandry is known to have existed during the Satsumon phase, with Jomon sites will allow an evaluation of whether or not Satsumon subsistence patterns were similar to preceding subsistence patterns.

Whatever the case, the results of this investigation demonstrate that the subsistence ecology of the Kameda Peninsula Jomon does not fit collected in 1974 (Crawford 1976; Crawford et al. 1976). Archaeological evidence for this kind of plant food is virtually irretrievable from open sites. The increase in size of the grass seeds by the end of the Middle Jomon may be a response to local ecological conditions, and they may not have been cultigen seeds.

The plant husbandry hypothesis would require that management of plant production was a subsistence activity and that at least one cultigen was grown. Buckwheat (Fagopyrum exculentum) is a possibility, but the presence of the plant in the Jomon period of southwestern Hokkaido has not been confirmed. Barnyard grass is a more likely possibility for the reasons outlined in Chapter II. Doubt of the cultigen status of this plant remains, however; the identification is not certain and the abundance of the grass seeds is similar to the other weeds which probably were not tended. The archaeological contexts provide ambiguous evidence. Echinochloa type grass occurs in five of the six samples from the Daigi VIIIb component and is extremely abundant in three of them; it occurs in all of the 26 remaining Usujiri B samples and is the most abundant taxon in six of those samples. Echinochloa type grass makes its appearance at the end of the Early Jomon at Hamanasuno, although future research may show that it was present prehistorically at Yagi as well. If the husbandry hypothesis is correct, the increased ecological disruption through time in combination with the increased proportion of grass seeds in the Daigi VIIIb component implies that plant husbandry was growing in importance by the end of the Middle Jomon. Thus the increased harvest potential of the area was partly a result of ecological management (including cultivation) and plant husbandry was another factor in the forest the patterns suggested for the Jomon in general. Both hypotheses imply that the reliance on nuts for food evidenced in other parts of Japan (Watanabe 1965; Koyama 1976) cannot be extended to include southwestern Hokkaido. Furthermore, the plant husbandry hypothesis, if correct, would support the arguments that food production was part of Jomon subsistence throughout Japan south of Oshima Peninsula. The recent work by Turner (1979) and Morikawa (1976) are fully consistent with this interpretation. The plant husbandry hypothesis suggested by others has certainly not been disconfirmed by this investigation.

A whole aspect of subsistence is ignored, when, as in nearly all previous subsistence investigations in Japan, flotation is not employed. I suggest that the ecological relationships between Jomon people and their natural environment as interpreted for Kameda Peninsula has broader application to other areas in Japan. The Kameda Peninsula Jomon is part of a larger system encompassing northern Honshu and therefore implies that similar plant utilization and ecological patterns obtained at least throughout the temporal and spatial range of the Ento-Joso phases. The Daigi VIIIb phase subsistence pattern in southwestern Hokkaido, presumably intrusive from outside the southern range of Ento pottery, did not differ qualitatively to a great extent from that of the Ento. The variations of the subsistence patterns within northern Japan need to be documented in order to comprehend the full implications of the findings for the Initial through Middle Jomon in Kamade Peninsula.

PLATES

PLATE 1 Echinochloa Type Seeds (Barnyard Grass)

PLATE 2 HNS Type Knotweed Seeds (top)
and Type A Knotweed Seeds (bottom)

PLATE 3 Ōinutade Seeds (top) and Type B Knotweed Seeds (bottom)

PLATE 4 Dock Seeds (top) and Chenopod Seeds (bottom)

PLATE 5 (a) Matatabi Seeds and (b) Udo Seeds

PLATE 6 Amur Corktree

PLATE 7 Sumac Seeds

PLATE 8 Dogwood Seeds

PLATE 9 *Ostrya* Seeds

PLATE 10 Selected Unknown Seeds

PLATE 11 Froth Flotation Apparatus

PLATE 12 Flotation Tank

PLATE 13 Bubbler Head with Porous Metal
Cones Being Inserted into Flotation Tank

PLATE 14 Coarse and Fine Screens with Light Fraction

PLATE 15 Discharge Valve Assembly

PLATE 16 Hamanasuno Site, House 70

PLATE 17 Hamanasuno Site, House 71

PLATE 18 Hamanasuno Site, House 72

PLATE 19 Hamanasuno Site, House 73

PLATE 20 Hamanasuno Site, House 74

PLATE 21 Hamanasuno Site, House 74

PLATE 22 Hamanasuno Site, House 78

PLATE 23 Usujiri B Site, 1977 Excavation;
View to the North

PLATE 24 Usujiri B Site, House 10

PLATE 25 Usujiri B Site, House 10

PLATE 26 Usujiri B Site, House 16 (foreground)

PLATE 27 Usujiri B Site, House 21

PLATE 28 Usujiri B Site, House 21, Pits 1 and 2

PLATE 29 Usujiri B Site, Burial

APPENDIX 1

The following is taken directly from Murokata (1975). The scientific nomenclature used by Murokata is not the same as that used by Ohwi (1965). For the sake of consistency and simplicity I have used the nomenclature already adhered to in this dissertation, that of Ohwi. The main difference is a reduction in the number of plant families. The plants are listed in the same order as they appear in Murokata (1975) with a few exceptions. Since the order is taxonomical and not ecological, minor changes from the original order reflect the slight nomenclatural differences between Ohwi and Murokata.

A. Beech Forests

1) Mountain Ridge Near the Ōfune Pass

Scientific Name	Japanese Name
(a) Canopy	
Taxaceae	
Taxus cuspidata Sieb. et Zucc.	ichi
Salicaceae	
Populus maximowiczii Henry	doro-no-ki
Juglandaceae	
Pterocaya rhoifolia Sieb. et Zucc.	sawagurumi
Betulaceae	
Alnus maximowiczii Call.	miyama-han-no-ki
A. japonicum Sieb. et Zucc.	yama-han-no-ki
Betula maximowiczii Call.	udai-kanba

Scientific Name	Japanese Name
Fagaceae	
Fagus crenata Blume.	buna
Quercus mongolica Fiach. var. grosseseratta Rend. et Wils.	mizunara
Ulmaceae	
Ulmus laciniata Mayr.	o-hyonire
Cercidiphyllaceae	
Cercidiphyllum japonicum Sieb. et Zucc.	katsura
Magnoliaceae	
Magnolia obovata Thunb.	hō-no-ki
Rosaceae	
Prunus furuseana Ohwi	uwamizu-zakura
P. padus L.	ezo-no-uwamizuzakura
P. maximowiczii Rupr.	miyamazakura
Rutaceae	
Phellodendron amurense Rupr.	karafuto-kihada
Simaroubaceae	
Picrasma quassiodes Benn. var. glabrescens Pamp.	nigaki
Aceraceae	
Acer japonicum Thunb.	ha-uchiwa-kaede
A. mono Maxim. form. heterophyllum Nakai	itaya-kaede
A. palmatum Thunb. subsp. matsumurae Koidz.	yama-momiji
Tiliaceae	
Tilia japonica Simonkai.	tsuna-no-ki

Scientific Name	Japanese Name
Araliaceae	
Kalopanax pictus Nakai	harigiri
Oleaceae	
Fraxinus lanuginosa Koidz. var. serrata Hara	aodamo
Styricaceae	
Styrax obassia Sieb. et Zucc.	haku-unboku etc.
(b) Understory	
Salicaceae	
Salix sachalinensis Fr. Schm.	karafuto-yanagi
S. bakko Kimura	bakko-yanagi
S. vulpina Anders.	kitsune-yanagi
Toisusu urbaniana Kimura	oba-yanagi
Betulaceae	
Alnus pendula Matsum.	hime-yashabushi
Carpinus laxiflora Bl.	aka-shide
Carpinus cordata Blume.	sawa-tsuba
C. laxiflora Bl.	aka-shide
Leguminosae	
Maakia amurensis Rupr. et Maxim	inu-enju
Anacardeaceae	
Rhus trichocarpa Miq.	yama-urushi
R. javanica L.	nurude
(?)	
(?)	shiribachi

Scientific Name	Japanese Name
Araliaceae	
Aralia elata Seem.	tara-no-ki
Caprifoliaceae	
Vibirnum dilatatum Thunb. var. hispidum Nakai	arage-gamazumi
V. furcatum Bl.	o-kame-no-ki
(c) Shrubs	
Cephelotaxaceae	
Cephelotaxus harringtonia K. Koch. var. nana Rehd.	hai-inugaya
Salicaceae	
Salix integra Thunb.	inukori-yanagi
Lauraceae	
Lindera umbellata Thunb. var. membranaceae	oba-kuromoji
Saxifragaceae	
Hydrangea paniculata Sieb.	nori-utsugi
Rosaceae	
Rubus wrightii A. Gray	kuma-ichigo
R. mesogaeus Focke.	kuro-ichigo
R. strigosus Michx. (?)	urajiri-ichigo
Euphorbiaceae	
Daphniphyllum macropodum Miq. var. humile	ezo-yuzuriha
Buxaceae	
Pachysandra terminalis Sieb. et Zucc.	fukki-so

Scientific Name	Japanese Name
Celastraceae	
Euonymus alatus Sieb. form. ciliato-dentatus Hiyama	koma-yumi
Magnoliaceae	
Illicium religiosum Sieb. et Zucc. (?)	hai-shikimi
(?)	karasu-shikimi
Aucuba japonica Thunb. var. borealis	hime-aoki
Ericaceae	
Rhododendron albrechti Maxim.	murasaki-yashio-tsutsuju
R. kaempferi Planch. form. latifolium Hara	ezoyama-tsutsuju
Caprifoliaceae	
Weigela hortensis K. Koch	tani-utsugi
Sambucus racemosa L. var. miquelii Nakai	ezo-niwatoko etc.

(d) Vines

Scientific Name	Japanese Name
Magnoliaceae	
Schisandra chinensis H. Baill.	chosen-gomishi
Saxifragaceae	
Hydrangea petiolaris Sieb. et Zucc. var. cordifolia Nakai	shiru-ajisai
Schizophragma hydrangeoides Sieb. et Zucc.	iwa-garami
Anacardeaceae	
Rhus ambigua Lavall. et Dipp.	tsuta-urushi
(?)	
(?)	tsuru-una-modoki

Scientific Name	Japanese Name
Vitaceae	
Vitis coignetiae Pulliat.	yama-budo
Actinidiaceae	
Actinidia arguta Planch.	sarunashi
A. kolomikta Maxim.	miyama-matatabi
(e) Herbaceous Plants	
Blechnaceae	
Blechnum niponicum Makino	shishi-gashira
(?)	
(?)	o-uren-shida
Aspleniaceae	
Asplenum scolopendrium L.	kotani-watari
Gramineae	
Sasa Kurilensis Makino et Shibata	chishima zasa
S. senanensis Rehd.	kumaizasa
Liliaceae	
Disparum smilacinum A. Gray	chigo-yuri
Lilium medeoloides A. Gray	kuruma-yuri
Paris tetraphylla A. Gray	tsukubane-so
Rosaceae	
Filipendula kamtschatica Maxim.	nishi-motsu
Aruncus dioicus Fern. var. kamtschaticus Hara	yama-buki-shoma
Umbelliferae	
Angelica ursina Maxim.	ezo-nyu
A. edulis Miyabe	yama-nyu

Scientific Name	Japanese Name
Araliaceae	
Aralia cordata Thunb.	hama-udo
Gentianaceae	
Tripterospermum japonicum Maxim.	tsuru-rindo
Compositae	
Cacalia auriculata DC. var. kamtschatica Matsum.	mini-komori
C. hastatata L. var. orientalis Ohwi	yobusu-ma-so
Miricacalia makineana Kitam.	momigi-gasa etc.

2) Source of the Kinaoshi River

(a) Canopy

Taxaceae	
Taxus cuspidata Sieb. et Zucc.	ichi
Salicaceae	
Salix sachalinensis Fr. Schm.	karafuto-yanagi
Betulaceae	
Carpinus cordata Bl.	sawa-shiba
Alnus pendula Matsum.	hinayatsu-yabushi
Fagaceae	
Fagus crenata Blume	buna
Quercus mongolica Fiach. var. grosseserrata Rend. et Wils.	mizunara
Ulmaceae	
Ulmus laciniata Mayr.	ohyonire

Scientific Name	Japanese Name
Cercidiphyllaceae	
Cercidiphyllum japonicum Sieb. et Zucc.	*Katsura*
Magnoliaceae	
Magnolia obovata Thunb.	*hō-no-ki*
Rosaceae	
Sorbus commixta Hedl.	*nana-kamado*
Prunus padus L.	*ezo-no-uwamizu-zakura*
P. sargentii Rehd. var. *yama-sakura* Ohwi	*ezo-yama-zakura*
P. maximowiczii Rupr.	*miyama-zakura*
Picrasma quasiodes Benn.	*nigaki*
Aceraceae	
Acer mono Maxim. form. *hetero-phyllum* Nakai	*itaya-kaede*
A. japonicum Thunb.	*ha-uchiwa-kaede*
Araliaceae	
Kalopanax pictus Nakai	*harigiri*
Akanthopanax sciadophylloides Fr. et Sav.	*koshi-abura*
Cornaceae	
Cornus controversa Hemsl.	*mizu-ki*
Styricaceae	
Styrax obassia Sieb. et Zucc.	*haku-unboku*
Oleaceae	
Fraxinus lanuginosa Koidz var. *serrata* Hara.	*aodama* etc.

Scientific Name	Japanese Name
(b) Shrubs	
Cephelotaxaceae	
Cephelotaxus harringtonia K. Koch. var. nana Rehd.	hai-inugaya
Salicaceae	
Salix bakko kimura	bakko-yanagi
Saxifragaceae	
Hydrangea paniculata Sieb.	mori-utsugi
Magnoliaceae	
Illicium religiosum Sieb. et Zucc. (?)	hai-shikimi
Thymelaeaceae	
Daphne miyabeana Makino	karasu-shikimi
Aquifoliaceae	
Ilex crenata Thunb. var. paludosa Hara	hai-inutsuge
Araliaceae	
Oplopanax japonicus Nakai	hari-buki
Cornaceae	
Helwingia japonica F.G. Dietr.	hana-ikada
Ericaceae	
Enkianthus campanulatus Nichols	sarasa-dō-dan
Leucothoe grayana Maxim. var. grayana	hiroha-hana-hiri-no-ki
Vaccinium smallii A. Gray	ōbasu-no-ki
V. japonicum Miq.	aku-shiba
V. oldhamii Miq.	natsu-haze

Scientific Name	Japanese Name
Tripetaleia paniculata Sieb. et Zucc.	ho-tsutsuji
T. bracteata Maxim.	miyama-ho-tsutsuji
Tripetaleia sp. (?)	ezoyama-ho-tsutsuji
Menziesia pentandra Maxim.	koyō-raku-hotsutsuji
Rhododendron brachycarpum D. Don. var. roseum Koidz.	shiro-bana-shakunage
Verbenaceae	
Callicarpa japonica Thunb.	murasaki-shikibu
Caprifoliaceae	
Vibirnum furcatum Blume	o-kame-no-ki
V. wrightii Miq.	miyama-gamazumi etc.

(c) Herbaceous Plants

Selaginellaceae	
Selaginella sp.	ezo-no-hikage-no-kazura
Lycopodiaceae	
Lycopodium chinense Christ.	hime-sugiran
Ophioglossaceae	
Botrychium ternatum Sw.	ezo-fuyu-no-hanawarabi
Blechnaceae	
Struthiopteris niponica Nakai	shishi-gatsura
Aspidiaceae	
Cornopteris opaca Tagawa	shike-chishida
Dryopteris crassirhizoma Nakai	oshida
D. sabaei C. Chr.	miyama-ita-chishida
Millium effusum L.	ibuki-nukabo

Scientific Name	Japanese Name
Liliaceae	
Allium victorialis L. var. *platyphyllum* Makino	*gyoja-nin-niku*
Lilium medeoloides A. Gray	*kuruma-yuri*
Paris tetraphylla A. Gray	*tsukubane-sō*
Streptopus amplexifolius DC. var. *papillatus* Ohwi	*ōba-takeshima-ran*
Smilacina japonica A. Gray	*yuki-zasa*
Maianthemum dilatatum A. Nels. et Macbr.	*maizuru-so*
Orchidaceae	
Goodyera repens L.	*hime-miyama-uzura*
Cypripedium japonicum Thunb. (?)	*kuma-ga-insō*
Platanthera tipuloides Lindl.	*hosoba-no-kiso-chidori*
Cephalanthera longibracteata Bl.	*sasaba-gin-ran*
Epipactus papillosa Fr. et Sav.	*ezo-suzu-ran*
Saxifragaceae	
Saxifraga fortunei Hook. f. var. *incisolobata* Nakai	*daimon-jisō*
S. fusca Maxim. var. *kikubuki* Ohwi	*kuro-kumo-sō*
(?)	
(?)	*kosu-nabi*
Gentianaceae	
Tripterospermum japonicum Maxim.	*shiru-rindō*
Pterygocalyx volubilis Maxim.	*hosoba-shiru-rindō*

Scientific Name	Japanese Name
Asclepiadaceae	
Cynanchum caudatum Maxim.	ikema
Labiateae	
Mentha sachalinensis Kudo.	ezo-hakka
Rubiaceae	
Mitchella undulata Sieb. et Zucc.	shiru-aridotsu
Scrophulariaceae	
Melampyrum laxum Miq. var. nikkoense	miyama-mamako-na
Rubiaceae	
Galium Kamtschaticum Steller ex Roem. et Schult.	ōba-no-yotsuba-mugura
Compositae	
Artemisia keiskeana Miq.	inu-yomogi
A. glehni Fr. Schm.	ezo-gomana
Eupatorium chinense L. subsp. sachalinense	yotsuba-hyodori
Carpesium triste Maxim.	miyama-yabu-tabako
Cacalia hastata L. var. orientalis Ohwi	yobu-zuma-sō etc.

B. Hill Vegetation

1) Forest Edge Along Mountain Paths Near Kakkumi and Ōfune

(a) Canopy

Taxaceae	
Taxus cuspidata Sieb. et Zucc.	ichi
Salicaceae	
Salix sachalinense Fr. Schm.	karafuto-yanagi

S. bakko kimura	bakko-yanagi
Populus maximowiczii Henry	doro-no-ki
Betulaceae	
Betula platyphylla Sukatchev. var. *japonica* Hara	shira-kanba
B. maximowicziana Regel.	udai-kanba
Alnus hirsuta Turcz. var. *sibirica* C.K. Schn.	yama-han-no-ki
Fagaceae	
Quercus mongolica Fiach. var. *grosseserrata* Rend. et Wils.	mizunara
Fagus crenata Blume	buna
Cercidiphyllaceae	
Cercidiphyllum japonicum Sieb. et Zucc.	katsura
Rosaceae	
Prunus sargentii Rehd. var. *yamasakura* Ohwi	ezo-yama-zakura
Leguminosae	
Maakia amurensis Rupr. et Maxim.	inu-enju
Aceraceae	
Acer mono Maxim. form. *heterophyllum* Nakai	itaya-kaede
A. palmatum Thunb. subsp. *matsumurae* Koidz.	yama-momiji
A. japonicum Thunb.	ha-uchiwa-kaede
Hippocastanaceae	
Aesculus turbinata Bl.	tochinoki
Tiliaceae	
Tilia japonica Simonkai	shina-no-ki

Scientific Name	Japanese Name
Oleaceae	
Fraxinus lanuginosa Koidz. var. *serrata* Hara	aodama
Styraceae	
Styrax obassia Sieb. et Zucc.	haku-unboku etc.

(b) Shrubs

Scientific Name	Japanese Name
Liliaceae	
Smilax china L.	saru-tori-ibara
Salicaceae	
Salix integra Thunb.	inukori-yanagi
Lauraceae	
Lindera umbellata Thunb. var. *membranaceae*	ōba-kuro-moji
Saxifragaceae	
Hydrangea paniculata Sieb.	nori-utsugi
Rosaceae	
Rosa polyantha Sieb. et Zucc.	noibara
Rubus wrightii A. Gray	kuma-ichigo
R. parviflorus L.	nawa-shiro-ichigo
R. phoenicolasius Maxim.	ebigara-ichigo
Staphyleaceae	
Staphylea bumalda D.C.	mitsuba-utsugi
Celastraceae	
Celastrus orbiculatus Thunb.	tsuru-ume-modaki
Euonymus oxyphyllus Miq.	tsuri-bana

Scientific Name	Japanese Name
E. sieboldianus Blume. var. *yedoensis* Hara	*ōbama-yumi*
E. alatus Sieb. form. *ciliato-dentatus* Hiyama	*koma-yumi*
Stachyuraceae	
Stachyurus praecox Sieb. et Zucc.	*kibushi*
Araliaceae	
Aralia elata Seem.	*tara-no-ki*
Ericaceae	
Rhododendron albrechti Maxim.	*murasaki-yashio-tsutsuji*
R. Kaempferi Planch. form. *latifolium* Hara	*ezo-yama-tsutsuji*
Enkianthus campanulatus Nichols	*sarasado-udan*
Menziesia pendantra Maxim.	*koyō-raku-tsutsuji*
Caprifoliaceae	
Sambucus racemosa L. var. *miquelli*	*ezō-niwatoko*
Vibirnum furcatum Blume.	*ō-kame-no-ki*
V. dilitatum Thunb. var. *hispidum* Nakai	*arage-gamazumi* etc.

(e) Herbaceous Plants

Scientific Name	Japanese Name
Gramineae	
Anthoxanthum odoratum L.	*haru-gaya*
Holcus lanatus L.	*shirake-gaya*
Dactylis glomerata L.	*kamo-gaya*
Phleum pratense L.	*ō-awa-gaeri*
Glyceria acutiflora Torr.	*mutsu-ore-gusa*

Scientific Name	Japanese Name
Poa acroleuca Steud.	mizo-ichiga-tsunagi
P. pratensis L.	nagaha-gusa
P. annua L.	suzume-no-katabira
Phragmites communis Trin.	kita-yoshi
Arundinella hirta Tanaka	toda-shiba
Cyperaceae	
Scirpus wichuria Boeckl.	ezo-abura-gaya
Carex incisa Bott.	kawa-rasuge
Polygonaceae	
Polygonum sachalinense F. Schmidt	ō-itadori
P. nepatense Meissn.	tani-soba
Rumex acetosa L.	suiba
R. acetosella L.	hime-suiba
Saxifragaceae	
Astilbe thunbergii Miq. var. congesta Boiss.	toriashi-shōma
Rosateae	
Aruncus dioicus Fernald	yamabeki-shōma
Filipendula kamtschatica Maxim. (?)	oni-shimitsuke
Agrimonia pilosa Ledeb.	kin-mizu-hiki
Leguminosae	
Trifolium repens L.	shiro-tsume-kusa
Desmodium oxyphyllum D.C.	musubito-hagi
Vicia unijuga Al. Braun.	futaba-hagi
V. cracca L.	kusa-fuji

Scientific Name	Japanese Name
(?)	
(?)	*fūronu*
Geraniaceae	
Geranium yesoense Fr. and Sav.	*ezofūro*
(?)	
(?)	
Umbelliferae	
Angellica edulis Miyabe ex. Yabe	*ama-nyū*
A. ursina Maxim.	*ezo-nyū*
Heracleum lanatum Mich.	*hana-udo*
Araliaceae	
Aralia cordata Thunb.	*udo*
(?)	
(?)	
Plantaginaceae	
Plantago asiatica L.	*ōbako*
P. lanceolata L.	*hera-ōbako*
Compositae	
Eupatorium lindleyanum DC.	*sawa-hyodori*
E. chinense L. subsp. *sachalinense*	*yotsuba-hyodori*
Senecio cannabifolius Less.	*hangon-sō*
Picris hieraciodes L.	*kō-zorina*
Aster scabra Thunb.	*shirayama-giku*
A. ghehni Fr. Schm.	*ezo-gomana*

Scientific Name	Japanese Name
Artemisia vulgaris L. var. kamtschotica Bess.	ezo-yomogi
A. keiskeana Miq.	inu-yomogi
A. japonica Tunb.	otoko-yomogi
Ixeris dentata Nakai	nigana
Hypochoeris radicata L.	butana
Lactuca raddeana Maxim. var. elata kitam.	yama-nigana
Erigeron annus Pers.	hime-jiyōn
E. canadensis L.	hime-mukashi-yomogi
Taraxacum hondoense Nakai	ezo-tanpopo
T. officinale Weder.	seiyō-tanpopo
C. aomorense Nakai	ōno-azami
Cephalonoplos setosum kitam.	ezo-no-kitsue-azami etc.

2) Secondary Forest Near the Ōfune River Source

(a) Canopy

Taxaceae	
Taxus cuspidata Sieb. et Zucc.	ichi
Salicaceae	
Salix bakko kimura	bakko-yanagi
Betulaceae	
Oshya japonica Sarg.	asada
Carpinus cordata Bl.	sawa-shiba
C. laxiflora Bl.	aka-shide
Fagaceae	
Fagus crenata Blume	buna
Quercus mongolica Fiach. var. grosseserrata Rend. et Wils.	mizunara

Scientific Name	Japanese Name
Ulmaceae	
Ulmus davidiana Planch. var. japonica	haru-nire
U. laciniata Mayr.	ohyō-nire
Moraceae	
Morus bombycis Koidz.	kuwa
Magnoliaceae	
Magnolia obovata Thunb.	ho-no-ki
M. kobus DC.	kitako-bushi
Lauraceae	
Lindera umbellata Thunb. var. membranaceae	ō-bakuromoji
Saxifragaceae	
Hydrangea serrata Seringe.	ezo-ajisai
H. petiolaris Sieb. et Zucc.	tsuru-ajisai
Schizophragma hydrangeoides Sieb. et Zucc.	iwagarami
Rosaceae	
Prunus ssiori Fr. Schm.	shiuri-zakura
P. furuseana Ohwi	uwamizu-zakura
Sorbus commixta Hedl.	nana-kamado
S. alnifolia C. Koch.	azuki-nashi
Pourthiaea villoso. Decne.	kamatsuka
Simaroubaceae	
Picrasma quasiodes Benn.	nigaki
(?)	
(?)	futsu-kinu

Scientific Name	Japanese Name
Anacardiaceae	
Rhus ambigua Lavall. ex. Dipp.	tsuta-urushi
Aceraceae	
Acer mono Maxim. form. *heterophyllum* Nakai	itaya-kaede
A. palmatum Thunb. subsp. *matsumurae* Koidz.	yama-momiji
A. japonicum Thunb.	ha-uchiwa-kaede
Celastraceae	
Celastrus orbiculata Thunb.	tsuru-umemodaki
Euonymus oxyphyllus Miq.	tsuri-bana
Hippocastanaceae	
Aesculus turbinata Bl.	tochinoki
Vitaceae	
Vitis coignetiae Pulliat.	yama-budō
Actinidiaceae	
Actinidia arguta Planch. ex. Miq.	sarunashi
A. kolomikta Maxim.	miyama-matatabi
Alangiaceae	
Alangium platanifolium	uri-no-ki
(?)	
(?)	sen
Ericaceae	
Rhododendron albrechti Maxim.	ezo-yama-tsutsuji
Vaccinium oldhamii Miq.	natsu-haze

Scientific Name	Japanese Name
Styraceae	
Styrax obassia Sieb. et Zucc.	*haku-unboku*
Oleaceae	
Fraxinus lanuginosa Koidz. var. *serrata* Hara	*koba-no-toneriko*
Caprifoliaceae	
Vibirnum furcatum Blume	*ō-kame-no-ki*
V. dilatatum Thunb. var. *hispidum* Nakai	*arage-gamazumi* etc.

(b) Herbaceous Plants

Scientific Name	Japanese Name
(?)	
(?)	*kusa-sotetsu*
Aspidaceae	
Dryopteris crassirhizoma Nakai	*oshida*
Athyrium felix-femina Roth var. *longipes* Hara	*ezome-shida*
Polystichum tripteron Presl.	*jumonji-shida*
Cyperaceae	
Carex siderostita Hance.	*taganenu*
Araceae	
Arisaema peninsulae Nakai	*kōrai-tennanshō*
(?)	
(?)	*hirohāyuki-zasa*
Liliaceae	
Smilax higoensis Miq. var. *maximowiczii* Kitagawa	*shiode*

Scientific Name	Japanese Name
Convalariaceae	
Maianthemum dilatatum Nels. et Macbr. var. nipponicum Hiyama	maizurunu
Liriope minor Makino	enrei-sō
Polygonatum lasianthum Maxim.	miyama-naruko-yuri
P. maximowiczii Fr. Schm.	ō-amadokoro
Paris tetraphylla A. Gray	tsukubane-sō
Disporum smilacinum A. Gray	chigo-yuri
Allium victorialis L. var. platyphyllum Makino	gyōja-nin-niku
Lillium medeoloides A. Gray	kuruma-yuri
Chloranthus japonicus Sieb.	hitori-shizuka
C. serratus Roem. et Schult.	futari-shizuka
Urticaceae	
Boehmeria tricuspis Makino	aka-sō
Laporta macrostachya Ohwi	miyama-irakusa
L. bulbifera Wedd.	makago-irakusa
Aristolochiaceae	
Asarum heterotropoides F. Schmidt.	oku-ezo-saishin
Polygonaceae	
Rumex acetosa L.	suiba
Polygonum pubescens Hara. var. acuminata Hara.	bontoku-tade
P. longisetum kitagawa	inu-tade
P. hydropiper L.	yanagi-tade
P. filiforme Thunb.	mizuhiki

Scientific Name	Japanese Name
Caryophyllaceae	
Cerastium caespitosum Galib. var. ianthes Hara	mimi-na-gusa
Ranunculaceae	
Aconitum yezoense Nakai	ezo-tori-kabuto
Glaucidium palmatum Sieb. et Zucc.	shirane-aoi
Berberidaceae	
Caulophyllum robustum Maxim.	ruiyō-botan
Epimedium koreanum Nakai	shiro-bana-ikari-sō
Saxifragaceae	
Astilbe thunbergii Miq.	tori-ashi-shōma
Rosaceae	
Aruncus dioicus Fernald	yamabeki-shōma
Filipendula kamtschatica Maxim.	onishimotsuke
Agrimonia pilosa Ledeb.	kin-mizuhiki
Leguminosae	
Trifolium repens L.	shiro-tsume-kusa
Glycine soja Sieb. et Zucc.	tsuru-mame
Desmodium oxyphyllum DC.	nusubito-hagi
Geraniaceae	
Geranium thunbergii Sieb. et Zucc.	Furo-sō
Balsaminaceae	
Impatiens noli-tangere L.	kitsuri-fune
Violaceae	
Viola vaginata Maxim.	sumire-saishin

Scientific Name	Japanese Name
Araliaceae	
Panax japonicus C.A. Meg.	tochiba-nigin shiyaku
Umbelliferae	
Meracleum moellendorffii Hance.	hana-udo
Angelica ursina Maxim.	ezo-nyū
A. edulis Miyabe ex. Yabe	ama-nyū
(?)	
(?)	kosunabi
Asclepiadaceae	
Cynanchum caudatum Maxim.	ikema
Labiatae	
Plectranthus japonicus Koidz.	hiki-okoshi
Prunella vulgaris L.	utsubo-gusa
Phrymaceae	
Phryma leptostachya L. var. asiata Hara	hae-doku-sō
Plantaginaceae	
Plantago asiatica L.	ō-bako
Rubiaceae	
Galium spurium L. var. echonospermon Hayek	yaemugura
Compositae	
Erigeron annuus Pers.	himejo-on
Artemesia vulgaris L. var. kamtschatica Bess.	ezo-yomogi
Cirsium sp. (?)	benkei-azami etc.

Scientific Name	Japanese Name

3) 1.5 Km. Upstream from the Daisen Hot Spring

(a) Trees

Near the River Bank

Salix integra Thunb.	inu-kori-yanagi
S. bakko kimura	bakko-yanagi
S. miyabeana Seemen.	ezo-no-kawa-yanagi
S. sachalinensis F. Schmidt	karafuto-yanagi
Maakia amurensis Rupr. et Maxim.	inu-enju
Fraxinus mandshurica Rupr. var. japonica Maxim.	yachi-damo

Farther from the River Bank

Carpinus cordata Bl.	sawa-shiba
C. laxiflora Bl.	aka-shide
Morus bombycis Koidz.	kuwa
Prunus grayana Maxim.	yama-zakura
P. jamasakura Sieb. ex. Koidz.	uwa-mizu-zakura
Acer mono Maxim. from hetero-phyllum Nakai	itayakaede
Euonymus oxyphyllus Miq.	tsuribana
Taxus cuspidata Sieb. et Zucc.	ichi
Quercus mongolica Fiach.	mizunara
Fagus crenata Bl.	buna
Ulmus davidiana Planch. var. japonica Nakai	haru-nire
U. laciniata Mayr.	ohyō-nire
Sorbus alnifolia C. Koch.	azuki-nashi
Acer japonicum Thunb.	ha-uchiwa-kaede

Scientific Name	Japanese Name
A. palmatum Thunb. subsp. *matsumurae* Koidz.	*yama-momiji*
(b) Shrubs	
Cephalotaxus harringtonia K. Koch. var. *nana* Rehd.	*hai-inugaya*
Rosa multiflora Thunb.	*noibara*
R. parviflorus L.	*nawa-shiro-ichigo*
R. wrightii A. Gray	*kuma-ichigo*
R. phoenicolasius Maxim.	*ezo-yara-ichigo*
Rhododendron kaempferi Planch. form. *latifolium* Hara	*ezoyama-tsutsuji*
Vaccinium oldhamii Miq.	*natsu-haze*
Vibirnum furcatum Bl.	*ōkame-no-ki*
V. dilatatum Thunb. var. *hispidum* Nakai	*arage-gamazumi*
Weigela hortensis K. Koch. form. *albiflora* Rehd.	*tani-utsugi*
Sambucus racemosa L. var. *miquelii* Nakai	*ezo-niwatoko*
(?)	*kanboku*
(c) Herbaceous plants	
Damp habitats	
Carex dispalata Boott	*kasa-suge*
C. incisa Boott	*kawa-rasuge*
Phragmites communis Trin.	*kitayoshi*
Scirpus wichurai Boeck. form. *borealis* Ohwi	*ezo-obura-gaya*
Polygonum thunbergii H. Gross.	*mizo-soba*
Saxifraga fortunei Hook. f. var. *incisolobata* Nakai	*dai-monji-sō*

Scientific Name	Japanese Name
S. fusca Maxim. var. kikubuki Ohwi	kuro-kumo-sō
Oenanthe javonica DC.	seri
Sium suave Walt. var. nipponicum (Maxim.) Hara	mumazeri
Mimulus sessilifolius Maxim.	ō-bami-zozuki
(?)	ezo-buki
Cirsium yezoense Makino	sawa-azami
Wooded areas	
Milium effusum L.	ibuki nukabo
Maianthemum dilatatum A. Nels. et Macbr.	maizuru-sō
Tricyrtis affinis Makino	yamaji-no-hototogisu
Allium victorialis L. var. platyphyllum Makino	gyōja-ninniku
Viola verecunda A. Gray	tsubo-sumire
Galium kamtschaticum Steller ex. Roem. et Schult.	ōba-no-yotsuba-magura
Forest edge	
Polygonum hydropiper L.	yanagi-tade
Rumex acetosella L.	hime-suiba
Polygonum sachalinense F. Schmidt.	o-itadori
(?)	akino-unagi-zuru
(?)	nagabagi-shigishi
Boehmeria tricuspis Makino	aka-so
Trifolium repens L.	shiro-tsume-gusa
Trifolium sp. (?)	ushi-bogusa
Aralia cordata Thunb.	udo

Scientific Name	Japanese Name
Artemisia vulgaris L. var. kamtschatica	ezo-yomogi
A. keiskeana Miq.	inu-yomogi
Aster ageratoides Turez. var. ovatus	nokon-giku
Picris hieraciodes L. subsp. japonica krylv.	kō-zorina

C. Coastal Vegetation

(a) Canopy, Understory, and Shrubs

Taxaceae	
Taxus cuspidata Sieb. et Zucc.	ichi
Salicaceae	
Salix sachalinensis Fr. Schmidt	karafuto-yanagi
S. integra Thunb.	inukori-yanagi
Betulaceae	
Alnus maximowiczii Call.	miyama-han-no-ki
Fagaceae	
Quercus mongolica Fiach. var. grosseserrata Rend. et Wils.	mizunara
Q. dentata Thunb.	kashiwa
Moraceae	
Morus bombycis Koidz.	kuwa
Rosaceae	
Sorbus alnifolia C. Koch	azuki-nashi
S. commixta Hedl.	nana-kamado
Prunus furuseana Ohwi	uwa-mizu-zakura
Pourthiaea villosa Decne.	kamatsuka

Scientific Name	Japanese Name
Aceraceae	
Acer mono Maxim. form. *heterophyllum* Nakai	*itaya-kaede*
A. japonicum Thunb.	*ha-uchiwa-kaede*
Hippocastanaceae	
Aesculus turbinata Bl.	*tochinoki*
(?)	
(?)	*sen*
Cupressaceae	
Juniperus sp.	*miyama-haibyakushin*
J. conferata Parl.	*hai-nezu*
Araliaceae	
Aralia elata Seem.	*tara-no-ki*
Caprifoliaceae	
Sambucus racemosa L. var. *miquelii* Nakai	*niwatoko*
Weigela hortensis K. Koch.	*tani-utsugi*
Saxifragaceae	
Schizophragma hydrangeoides Sieb. et Zucc.	*iwa-garami*
Hydrangea paniculata Sieb.	*nori-utsugi*
H. petiolaris Sieb. et Zucc.	*tsuru-ajisai*
Fabaceae	
Pueraria lobata Ohwi	*kuzu*
Actinidiaceae	
Actinidia arguta Planch.	*sarunashi*
A. kolomikta Maxim.	*miyama-matatabi*

Scientific Name	Japanese Name
Anacardiaceae	
Rhus ambigua Lavall.	*tsuta-urushi*
(?)	
(?)	*oni-shiru-una-modoki* etc.

The most common of the plants listed is *itaya-kaede* (*Acer mono*)

(b) Herbaceous Plants

Scientific Name	Japanese Name
Aspidiaceae	
Cyrtomium falcatum Presl.	*oni-yabu-sotetsu*
Polypodiaceae	
Lepisorus thunbergianus Ching.	*nokishi-nobu*
Gramineae	
Miscanthus sinensis Anders. var. *purpurascens* Nakai	*murasaki-susuki*
(?)	
(?)	*ezo-zukashuri*
Urticaceae	
Boehmeria tricuspis Makino	*aka-sō*
Laportea bulbifera Wedd.	*mukago-irakusa*
Polygonaceae	
Polygonum sachalinense F. Schmidt.	*ō-itadori*
(?)	
(?)	
Ranunculaceae	
Thalictrum minus L. var. *hypoleucum* Miq.	*aki-karamatsu*

Scientific Name	Japanese Name
Aconitum yezoense Nakai	*ezo-tori-kabudo*
Rosaceae	
Filipendula kamtschatica Maxim.	*oni-shimo-shike*
Fabaceae	
Vicia japonica A. Gray	*hirohakusa-fuji*
Umbelliferae	
Angelica edulis Miyabe ex. Yabe	*ama-nyū*
Bupleurum longeradiatum Turcz. form. *elatius* Koso-polj.	*otaru-saiko*
Scrophulariaceae	
Scrophularia grayana Maxim. ex. Komar	*ezo-hina-no-usutsubo*
Isodon inflexus Kudo	*yama-hakka*
Plantaginaceae	
Plantago major L. var. *japonica* Miyabe	*tō-ōba-ko*
Cucurbitaceae	
Schizopepon bryoniaefolius Maxim.	*miyama-niga-uri*
Compositae	
Artemisia vulgaris L. var. *kamtschatica* Bess.	*ezo-yomogi*
A. laciniata Willd.	*shi-kotan-yomogi*
Solidago virga-aurea L. subsp. *asiatica* Kitam.	*aki-nok-rinsō*
Cirsium aomorense Nakai	*ō-no-azami*
Senecio cannibifolius Less.	*Hangon-sō*

Scientific Name	Japanese Name
Anaphalis margaritaceae Benth. et. Hook. f. var. angustior Nakai	yama-hahako
Saussurea riederii Herd. form. elongata Ohwi	ezo-to-hiren
Lactuca raddeana Maxim. var. elata kitam.	nigana
Sonchus brachyotis DC.	hachijo-una
Eupatroium lindleyanum DC.	sawa-hiyodori

(c) Damp Habitats

Scientific Name	Japanese Name
Cyperaceae	
Carex podogyna Franch. et Sav.	tanu-kiran
Juncus leschenaultii J. Gay.	kō-gaizeki-shō
J. fauriensis Buchen.	hoso-banokō-gaisekishō
Liliaceae	
Hosta rectifolia Nakai	tachigibōshi
Polygonaceae	
Polygonum thunbergii H. Gross.	mizo-soba
Crassulaceae	
Sedum verticillatum L.	mitsuba-benkeisō
Saxifragaceae	
Saxifraga fortunei Hook. f. var. incisolobata Nakai	daimon-jisō
S. fusca Maxim. var. kikubuki Ohwi	kuro-kumo-sō
Balsaminaceae	
Impatiens noli-tangere L.	ki-tsuri-fune
I. textori Miq.	tsuri-fune-sō

Scientific Name	Japanese Name
Lythraceae	
Lythrum salicaria L.	*ezo-miso-hagi* etc.

APPENDIX 2

Hamanasuno Flotation Samples: Number of Carbonized Seeds

			Grain Seeds											Fleshy Fruit Seeds					Other Seeds						
					Greens																				
			Grasses		Knotweeds																				
House	Context	Total No. Seeds	Echinochloa Type	Other	HNS Type	Type A	Ōinu-tade	Type B	Type C	P. sp.	Dock	Chenopod	Udo	Amur Cork-tree	Blackberry	Elderberry	Grape	Matatabi	Sumac	Cleavers	Ostrya	Composit	Solanaceae	Unknown	Unidentifiable
60	III	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1(?)	-	-	-	-	-	3
	X1	8	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	5	-	-	-	-	-	2
	X2	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	1	2	2
	X3	16	-	1	-	1	-	-	-	2	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4
	floor	5	-	-	-	1	-	-	-	1(?)	-	-	1	1	-	-	-	-	-	-	-	-	-	-	1(?)
	hearth	53	1	9	-	-	10	10	-	3	-	-	-	1	-	3	-	1	-	-	-	-	-	11	4
	"lower"	28	-	-	-	-	1	15	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2	9
60	Total	121	1	10	-	2	11	25	-	7	-	-	1	2	1	7	-	1	8	-	-	-	1	19	24
61	a	3	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
	b	17	-	-	3	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13
	c	25	-	-	-	1	-	-	-	2	1	-	2	-	-	-	-	-	1	-	-	-	-	6	12
61	Total	45	-	-	3	1	-	2	-	2	1	-	2	-	-	-	-	-	2	-	-	-	-	6	26
62	X1	21	-	-	1	-	-	-	-	1	-	-	1	-	-	-	-	-	-	1	-	-	-	1	16
	X2	49	-	-	3	-	-	-	-	3	-	-	1	1	-	1	-	1	1	-	-	-	-	3	35
	X3	8	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	6
	floor	19	-	1	3	1	-	-	-	1	1	3	-	-	-	-	-	-	1	-	-	-	-	1	7
	Pit 1	25	-	1	4	-	-	-	-	1	-	1	1	-	-	3	-	-	1	-	-	-	-	4	9
	Pit 2	6	-	-	1	-	1	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2
	Pit 7	28	1	-	4	3	1	2	-	4	-	-	-	-	-	1	-	-	-	-	-	-	-	6	6
	Pit 10	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	Pit 12	3	-	1	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	Total	160	1	3	16	4	2	2	-	13	2	4	3	1	-	7	-	1	3	1	-	-	-	15	82
63	III	5	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2
	X1	4(?)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4(?)
	Pit 10	41	-	4	2	-	-	2	1	-	-	-	8	-	1(?)	-	-	1	1	-	-	-	-	8	13
63	Total	50	-	5	3	-	-	2	1	-	-	-	8	-	1(?)	-	-	1	1	-	-	-	-	9	19

APPENDIX 2
(continued)

			Grain Seeds: Grasses		Grain Seeds / Greens: Knotweeds						Greens			Fleshy Fruit Seeds					Other Seeds						
House	Context	Total No. Seeds	Echinochloa Type	Other	HNS Type	Type A	Ōinutade	Type B	Type C	P. sp.	Dock	Chenopod	Udo	Amur Cork-tree	Blackberry	Elderberry	Grape	Matatabi	Sumac	Cleavers	Ostrya	Composit	Solanaceae	Unknown	Unidentifiable
70	X1	41	-	-	5	-	-	-	-	-	-	-	-	-	-	1	-	1	11	-	-	-	-	5	18
	X3	21	-	-	3	-	-	-	1	1	-	1	-	-	-	2	-	-	3	-	-	-	-	1	9
	Pit 1	143	-	-	28	13	1	2	3	5	-	9	-	1	2	1	-	-	-	-	-	1	-	3	74
	2	41	-	-	15	-	-	-	-	-	-	-	1	-	1	5	-	-	3	-	-	-	-	1	15
	3	4	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	3
	4	19	-	-	2	-	1	-	-	1	-	-	1(?)	-	-	-	-	4	2	1(?)	-	-	-	3	4
	5	3	-	1(?)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1(?)	-	-	-	-	1
	7	30	-	-	2	1	-	2	1	7	-	-	-	-	-	2	-	-	1(?)	-	-	-	-	-	14
	8	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2
	12	16	1(?)	-	2	-	-	-	-	1	-	1	-	-	-	1	-	-	-	-	-	-	-	2	8
	14	5	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	3
	16	19	4	1	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-	1	-	-	1	9
70	Total	345	5	2	57	14	2	4	5	16	-	13	2	2	5	12	-	5	20	2(?)	1	1	-	17	160
71	X1	38	1	-	2	-	-	-	-	2	-	-	-	1	-	1	1	-	4	-	-	-	-	2	24
	X2	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	3	12
	X3	14	-	-	3	-	-	1	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	8
	Pit 1	58	-	-	27	3	1	2	-	2	-	-	-	-	1	2	-	-	2	-	-	-	-	1	17
	2	24	-	-	2	2	-	-	-	5	-	-	-	-	-	1(?)	-	-	-	-	-	-	-	4	10
	3	52	-	1(?)	1	-	1	11	-	4	-	-	-	-	-	2	-	-	1	-	-	-	-	10	21
	4	12	-	1	1	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	5	3
	5	10	-	-	2	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
	9	25	-	-	9	2	1	-	-	-	-	-	1(?)	-	-	1	-	-	-	-	-	-	-	-	11
	10	37	-	2	16	1	-	-	-	5	-	-	-	-	-	1	-	-	-	-	1	-	-	-	11
	11	21	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	7	11
	12	6	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
71	Total	313	1	4	65	8	3	14	2	24	-	-	2	1	1	9	2	1	7	-	1	-	-	32	136

APPENDIX 2
(continued)

			Grain Seeds: Grasses		Grain Seeds / Greens: Knotweeds						Grain Seeds / Greens		Greens / Fleshy Fruit Seeds	Fleshy Fruit Seeds					Other Seeds						
House	Context	Total No. Seeds	Echinochloa Type	Other	HNS Type	Type A	Ōinutade	Type B	Type C	P. sp.	Dock	Cheno pod	Udo	Amur Cork-tree	Blackberry	Elderberry	Grape	Matatabi	Sumac	Cleavers	Ostrya	Composit	Solanaceae	Unknown	Unidentifiable
72	X1	15	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	2	11
	X2	2	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-
	X3	26	-	-	2	-	2	-	3	-	3	-	1	1	-	6	-	-	-	1	-	-	-	5	2
	Pit 1	197	138	1	6	-	-	-	2	-	-	-	-	-	1	-	-	4	3	-	-	-	-	3	39
	Pit 5	10	1	-	-	-	-	-	-	-	-	-	-	2	-	2	-	-	1	-	-	-	-	-	4
72	Total	250	139	1	8	-	2	-	5	-	3	-	2	3	1	11	-	4	4	1	-	-	-	10	56
73	X1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
	X2	42	-	-	8	2	-	1	-	-	-	-	-	-	-	9	-	-	1	-	-	-	-	2	19
	X3	20	-	-	3	-	-	-	-	-	1	-	-	-	1	6	-	-	-	-	-	-	1	3	5
	Pit 2	9	-	2(?)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	3
73	Total	73	-	2(?)	11	2	-	1	-	-	1	-	-	-	1	15	-	-	1	-	-	-	1	9	29
74	X1	16	-	2(?)	1	-	-	-	-	1	-	-	1	1	-	-	-	-	-	-	-	-	-	-	10
	X3	82	-	-	-	-	-	2	-	1	1	-	1	-	-	-	-	3	47	-	-	-	-	6	21
	X4	43	-	10	-	-	-	-	-	1	-	-	1	-	3	2	-	1	4	-	-	-	-	1	20
	Pit 2	4	-	-	-	-	-	-	-	1	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-
74	Total	145	-	12	1	-	-	2	-	4	1	-	4	2	4	2	-	4	51	-	-	-	-	7	51
TOTAL		1502	147	39	164	31	20	52	13	66	8	17	24	12	14	63	2	17	97	4	2	1	2	124	583

APPENDIX 3

Usujiri B Site Flotation Samples: Number of Carbonized Seeds

				Grain Seeds											Fleshy Fruit Seeds					Other Seeds						
						Greens																				
				Grasses		Knotweeds																				
House	Context	Total Seed Weight (gm)	Total No. Seeds	Echinochloa Type	Other	INS Type	Type A	Ōinutade	Type B	Type C	P. sp.	Dock	Chenopod	Udo	Amur Cork-tree	Blackberry	Elderberry	Grape	Matatabi	Cleavers	Dogwood	Sumac	Ostrya	Plantain	Unknown	Unidentifiable
SATBESAKA Component																										
6	floor	*	30	-	2	-	-	-	-	-	1	-	-	-	2	-	1	-	2	-	-	3	-	-	5	14
10	Pit 1 (upper)	*	50	7	-	3	-	-	-	-	-	2	4	-	1	1	1	-	-	-	2	6	-	-	7	16
	Pit 1 (lower)	0.06	36	8	-	1	-	-	-	-	5	-	-	-	1	-	1	1	-	-	1	3	-	-	3	12
	Pit 1	0.21	259	23	21	1	-	3	4	-	15	1	29	4	7	-	3	2	6	2	3	21	-	-	10	104
	Pit 2	*	17	-	3	-	-	-	-	-	1	-	1	-	7	-	-	-	-	-	-	-	-	-	-	5
	Pit 3	*	14	-	2	-	-	-	-	-	1	-	-	1	3	-	-	-	-	-	-	-	-	-	-	7
	Pit 4	*	35	-	-	-	-	-	-	1	1	3	2	-	6	1	-	-	2	-	-	1	-	-	-	18
10 Total		0.27	411	38	26	5	-	3	4	1	24	6	36	5	25	2	5	3	8	2	6	31	-	-	20	162
16	X1	*	9	-	-	-	-	-	-	-	1	-	1(?)	-	-	-	-	-	-	-	-	1	-	-	-	6
	X2	*	13	-	2	-	-	-	-	1	-	1	1	-	-	-	-	-	1	1	-	1(?)	-	-	1	4
	X3	*	15	2	-	-	-	-	-	-	1	1	-	-	1	-	-	-	-	-	-	-	1	-	1	8
16 Total		*	37	2	2	-	-	-	-	1	2	2	2	-	1	-	-	-	1	1	-	2	1	-	2	18
21	X1	*	34	2	-	-	-	1	1	-	5	-	-	2	2	-	-	-	-	-	-	-	-	-	3	18
	X2	*	11	-	-	3	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-	4
	X3	*	150	-	1(?)	3	-	10	40	-	2	2	13	12	-	-	-	-	2	-	-	13	2	-	11	39
	floor	0.21	241	3	7	2	-	2	4	-	2	77	47	2	1	-	2	-	1	2(?)	-	9	1	-	1	78
	Pit 1	0.17	185	5	2	-	-	1	1	-	-	-	112	-	-	-	-	-	1	-	-	38	-	-	4	21
	Pit 2	0.05	79	-	16(?)	-	-	1	-	-	5	-	2(?)	5	-	-	1	2	3	-	-	6	1	-	6	31
21 Total		0.43	700	10	26	8	-	15	46	-	16	80	174	21	3	-	3	2	7	2	-	67	4	-	25	191

APPENDIX 3 (continued)

				Grain Seeds										Fleshy Fruit Seeds						Other Seeds						
				Grasses		Greens																				
						Knotweeds																				
House	Context	Total Seed Weight (gm)	Total No. Seeds	Echinochloa Type	Other	INS Type	Type A	Ōinutade	Type B	Type C	P. sp.	Dock	Chenopod	Udo	Amur Cork-tree	Blackberry	Elderberry	Grape	Matatabi	Cleavers	Dogwood	Sumac	Ostrya	Plantain	Unknown	Unidentifiable
DAIGI VIIIb Component																										
18	X3	*	138	1	7(?)	5	-	-	1	-	4	-	79	1	1	-	-	-	1	-	-	5	-	-	6	27
	hearth	*	10	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-	1	-	-	-	-	-	-	6
20	X3	0.26	477	121	-	83	2	-	-	-	93	4	2	6	5	1	1	1	7	-	-	21	2	-	18	110
Daigi VIII b Total		0.26	625	122	7(?)	88	2	-	1	-	98	4	83	7	6	1	1	1	9	-	-	26	2	-	24	143
NODAPPU II Component																										
3	Pit 1	*	7	1	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	3
Unspecified Assemblage																										
1		*	3	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1(?)	-	1
2		*	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
12	floor	*	7	3	-	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	1	-
	Pit 1	*	17	4	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	1	-	3	7
12 Total		*	24	7	-	1	-	-	-	-	-		1	-	-	-	3	-	-	-	-	-	1	-	4	7
Burial:																										
	Upper	*	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
	Lower	*	37	2	-	-	-	-	-	-	1	-	-	-	25	-	-	-	1(?)	-	-	-	-	-	1	7
TOTAL		0.96	1879	182	63	102	2	18	51	2	141	93	299	33	62	3	14	6	28	5	6	129	8	1(?)	83	548

*: Less than 0.05 gm

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