Chapter 1
Historical Perspectives on the Relationships between Humanity and Nature in Japan

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1.1 Introduction

The Japanese Archipelago extends over 3 000 km from north to south, and includes subarctic, cool temperate, warm temperate and subtropical climatic zones. These various climatic zones were present even during the dramatic environmental changes of the past 1 00 000 years (e.g., Tsukada 1967). The Japanese Archipelago has been densely populated since the Neolithic Age, and most of the natural environment has been strongly influenced by human activities (Koyama and Sugito 1984). The life patterns of humans have, in turn, been shaped by their use of biological resources in the shape of the fauna and flora they encountered. Moreover, although the Japanese biota is derived from life forms which migrated from the continental mainland when sea-levels were lower, the biodiversity has been augmented by human beings, who have introduced species at various times.

There is still a rich biotic life in the Japanese Archipelago, in spite of intensive intervention by humans in the natural environment, including, for example, an abundance of indigenous species of angiosperm and freshwater fish. This abundance has led to the assumption that human–nature relations in pre-modern Japan were governed by some kind of traditional wisdom that prevented people from exhausting biological resources, or that moderate human activity preserved the abundance of biological resources in Japan.

The question of exactly how stable the coexistence between nature and humans was in the past has not been resolved. How ought one to describe the human–environmental history of Japan? Has there not been, in the Japanese Archipelago, a history of exhausted biological resources and of extinction? If early peoples possessed the wisdom and will to use biological resources in a sustainable way, how commonly were these virtues exercised? Further, if there were cases in which humans exhausted certain biological resources, did any major social changes follow as a result?

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Although each of these questions has been examined within one historical period or region, or from one disciplinary perspective, no trans-disciplinary examination has been attempted over an area that would represent the whole Japanese Archipelago, or over a time span that encompasses the whole period from the earliest human habitation of Japan to modern times. The objective of this chapter is to review the human role in the vegetation changes witnessed in the Japanese Archipelago since the Neolithic, and to locate the refugia of plants and animals that inhabited the primeval forests.

1.1.1 Human Activities and Vegetation in Pre-History

During the Late Glacial Maximum (LGM, ca. 20 000–12 000 year BP), a period which was much cooler and drier than the present, the vegetation of Japan would have been unrecognizable to a contemporary observer. The climax vegetation of the southwestern area of Japan is now evergreen broad-leaved forest dominated by evergreen oaks (*Quercus* spp.) and the Lauraceae, but during the LGM, evergreen broad-leaved forest was restricted to the narrow coastal area of southernmost Kyushu, Shikoku and Honshu Islands. Instead, deciduous broad-leaved forest prevailed in southwestern Japan, consisting of beech (*Fagus crenata*), oak (*Quercus crispula*), hornbeam (*Carpinus* spp.), maple (*Acer* spp.) other deciduous species, and five-needled pine (*Pinus koraiensis*) (Tsukada 1967). The northeastern part of Japan, where deciduous broad-leaved forest dominated by *F. crenata* and *Q. crispula* is now found, was covered in coniferous forest, mainly consisting of spruce (*Picea* spp.) and fir (*Abies* spp.) (Kamei et al. 1981).

How has the vegetation in the Japanese Archipelago changed since the LGM? Pollen analyses have indicated that broad-leaved evergreen forests formed across the southwestern part of Japan in the early Jomon period (ca. 5300–3500 BC) (Yasuda and Miyoshi 1998), while Japanese cedar (*Cryptomeria japonica*) dominated the wide, flat lowlands along the Sea of Japan. As the climate subsequently warmed, broad-leaved evergreen tree species and *C. japonica* gradually expanded from their earlier warmer, wetter refugia in the LGM. On the other hand, the northeastern part of Japan began to be covered by deciduous forests consisting of *Fagus*, *Acer*, *Carpinus* and related species (Yasuda and Miyoshi 1998).

There have been many arguments on the subject of the human impact on these early forests. The population density in the early Jomon period was estimated as 1.0 per km^2 in northeast Japan, and 0.5 per km^2 in the southwest (Koyama and Sugito 1984). From the early Jomon, people depended heavily on the seeds of deciduous oak (*Quercus* subgen. *Lepidobalanas*) and chestnut (*Castanea creanata*) as staple foods. Pollen analyses and artifacts excavated from the Sannai-maruyama site (northern Honshu), a Jomon village continually inhabited from ca. 5100 to 3750 year BP, indicate that the *C. crenata* forest appeared after ca. 5650 year BP, and expanded with the appearance of the village. The pure stand, which cannot exist without human intervention, was formed in ca. 4850 year BP and maintained for several hundred years

(Yoshikawa et al. 2006). Signs of horse chestnut (*Aesculus trubunata*) usage also began to appear at the end of the middle Jomon period, when there was also a decrease in the area of the *C. crenata* stand (Yoshikawa et al. 2006). Such evidence shows that Jomon people modified the forest according to their needs.

New crops introduced in the Yayoi period (ca. 1500–900 BC), including rice from southern China, dramatically changed the previous patterns of vegetation and human–forest relations. Forested land was cleared to make way for rice cultivation. In the early Yayoi period, rice was cultivated from Kyushu to Kanto, and prevailed throughout Honshu Island in the middle Yayoi period. Iron tools appear to have been introduced to Japan along with rice cultivation, and were quickly adapted for felling timber. The composition of the forest changed as a result. From the Kinki district to Chubu during the Yayoi-Kofun period (ca. 900 BC–AD 600), the most commonly used wood was that of *Chryptomeria japonica.* People utilized *C. japonica* for various tools and construction. Many forests previously buried by flood or tephra have been excavated in the wet lowlands along the Sea of Japan where natural stands of *C. japonica* cannot be found today. Ancient people seem to have exhausted *C. japonica* trees in such regions.

1.2 Forests in Historical Period

Reconstructing the history of Japanese vegetation from ancient to pre-modern periods relies on combined analyses of pollen, wooden tools and constructions, and historical documents and images. The following discussion is focused on the Kinki district, where such materials are abundant.

The Kinki district was the site of several ancient capitals. By AD 600 the people of Japan were using woodland much more intensively than they did a millennium earlier. Villagers needed cleared land for tilling, and the ruling elite required huge quantities of timber for the construction of monumental buildings such as palaces, temples and government offices (Totman 1989). Massive pillars of hinoki (*Chamaecyparis obtuse*) and Japanese umbrella pine (*Sciadopitys vercillata*) were excavated in Heijo Palace (the Nara period, AD 710–784) and Heian Palace (the Heian period, AD 794–1185/1192), although no natural stands of *C. obtuse* or *S. vercillata* are currently found nearby. At the end of the Heian period, relatively convenient stands of large trees were exhausted, and large timbers were often reused in new constructions.

One of most important woods in early Japan was *Sciadopitys vercillata*. Many coffins excavated in the Kinki district during the Kofun period (ca. AD 0–600) were made of *S. vercillata*. One of the oldest written histories, the "Nihon-shoki," described *S. vercillata* as the most suitable wood for coffins. A third of the pillars in Heijo Palace were made of *S. vercillata*, and a significant ratio of pollen fossils from that time are of *S. vercillata*. However, nowadays stands of *S. vercillata* are found only on very steep mountain ridges in areas remote from Nara city. Earlier people exhausted stands of *S. vercillata* that were located near the plateau.

Ancient urban areas also consumed large amounts of firewood. Evergreen broad-leaved forests in the urban areas of the Kinki district provided the fuel needed to work iron, fire pottery and make salt, and were replaced by pine forests dominated by *Pinus densiflora*. Less impacted forests still remained in mountainous areas in these periods.

In the seventh century, after adopting a Chinese system of governance, the Japanese government claimed ownership of all lands. In practice, many forests remained available for use. In the latter half of the seventh century, however, lords and temples again claimed exclusive land ownership, and governments of this period repeatedly issued decrees forbidding the private use of forests.

A manor system prevailed in the Kinki district in the eighth and ninth centuries, and private use of demesne lands was promoted, in spite of the principle of government land ownership. The manor system initially arose as the government bestowed the responsibility for land management on lords and temples, and compensated them for their expenses in doing so. Later, the lords and temples were allowed to tax certain uses of their demesne land. In the medieval manor system, the lords and temples acquired both judicial authority and military power over the land and people in their demesne lands. Historical documents recount a number of land-based social conflicts in this era, including a famous example of the unauthorized use of private lands in Katsuragawa beside Lake Biwa during the thirteenth and fourteenth centuries. The landowner was a temple called Myo-oh-in. The temple desired to preserve their forest as a sanctuary for meditation and other religious austerities, but villagers nearby claimed the right to harvest trees for firewood and charcoal production.

1.3 Forest Commodities and the Appearance of Grass-Covered Mountains

The typical rural landscapes depicted in Ukiyoe, the Japanese woodblocks of the Edo period, consisted of a combination of pine forests and grass-covered mountains. A pictorial map of Kyoto published in 1884 showed a wide range of surrounding mountains in the north covered by grass and shrubs with few trees, and indicated that pine stands and bamboo thickets occurred only around shrines and temples (Ogura 1992). Older pictorial maps of Kyoto also indicated that no broad-leaved forests existed in the Kyoto Basin after the seventeenth century.

Many photographs from the Meiji, Taisho and early Showa eras (1880s–1940s) confirm that bare mountains prevailed in the southwestern part of Japan. The first topographical maps produced by the government in 1880–1886 also show that grass-covered mountains, which was wasteland, and pine stands occupied wide areas in Japan. When and why were such a wide range of grass-covered mountains established?

The oldest pictorial maps of Kyoto, the Grand Views of Kyoto Capital (Rakuchu-rakugai-zu), were created in the 1520s–1530s. They show the mountains

surrounding Kyoto covered by grass and shrubs with few trees, as they were also depicted in the Edo period (Ogura 1992). Pollen analyses undertaken in Mizuro-ga-ike in the northern part of Kyoto established that evergreen oak (*Quercus* subgen. *Cyclobalanopsis*) began to decrease and two-needled pine (*Pinus* subgen. *Diploxylon*) to increase in the seventh century. The same analysis showed that the number of evergreen oaks decreased greatly in the eleventh century, and two-needled pine became dominant in the seventeenth century (N. Sakaki et al. personal communication).

Mountains and hills near villages were important sources of timber, firewood, and grass for fodder and manure. An archeological excavation also proved that in the sixth and seventh centuries several kilns for pottery and roof tiles were located nearby, and old documents survive showing that people in Mizuro-ga-ike village bought the right to harvest grass on Mt. Kibune, which was situated ca. 7 km north of the village. There are a number of pictures from the Edo period showing agricultural workers ploughing twigs and grass into paddy fields as manure. Tokoro (1980) estimated that more than 500 kg of grass is necessary to manure 1 acre of paddy field, and 10–12 acres of grass-covered mountain are needed in order to harvest 500 kg of grass. Tokoro (1980) also estimated that an average farming household needed 135–200 kg of firewood, which is equivalent to 2.5–4.5 acres of woody mountain. Maintaining grass-covered mountains requires regular burning in the early spring. Local governments in the Edo period often issued decrees warning about bush fires and the need to check the spread of fire.

An important aspect of Japanese grassland landscapes is the lack of pasture. From ancient times, governments and some lords kept herds of horses for military use, but there was no widespread grazing of cattle, sheep or goats, and none of the associated landscapes. Farmers kept only a few horses and oxen for ploughing. Very few people had the habit of eating the meat of domestic animals until the modern period, although many people did consume bush meat, such as sika deer (*Cervus nippon*), Japanese hare (*Lepus brachyurus*), wild boar (*Sus scrofa*), Eurasian badger (*Meles meles*), Japanese serow (*Capricornis crispus*), Asian black bear (*Ursus thibetanus*) and Japanese giant flying squirrels (*Petaurista leucogenys*), and they hunted and ate wild birds such as green pheasant (*Phasianus versicolor*), copper pheasant (*Syrmaticus soemmerringii*), Japanese quail (*Coturnix japonica*), several duck species (*Anas* spp.), goose (*Anser* spp.), swan (*Cygnus* spp.) and passerines.

Timber plantations in Japan, consisting mainly of conifers, *Cryptomeria japonica* and *Chamaecyparis obtuse*, were mainly formed after World War II. The cultivation of broad-leaved tree plantations for firewood and charcoal began much earlier, but only a very few coppiced stands of kunugi (*Quercus actissima*) for charcoal production are still maintained, e.g., those in Nose, Osaka Prefecture, and in Motegi, Tochigi Prefecture. Intensive plantations of *Q. actissima* are estimated to have been started in the sixteenth and seventeenth centuries. People harvested the sprouting stems at an interval of 8–10 years as wood for charcoal production. The stands were complete monocultures of *Q. actissima*, and seedlings of *Q. actissima* began to be distributed as a saleable commodity no later than the seventeenth century. People planted seedlings of *Q. actissima* even in the terraced fields,

because they regarded it as a crop. A population genetic analysis of *Q. actissima* proved that the genetic diversity of the Japanese populations is very low, and strongly suggested that people introduced *Q. actissima* to Japan from the Korean Peninsula (Y. Tsumura et al. personal communication).

Charcoal making was almost abandoned after the energy revolution of the 1960s, but the woods of *Q. actissima* are still used for oak mushroom (*Lentinula edodes*) culture. Oak mushroom culture began in the 1660s, but the modern style of culture was established in 1943 by Dr. Kisaku Mori.

Until the Meiji period, mountains and hills were managed as commons. In many regions, local rules were established to guide the harvest of grasses and wood. For example, in some cases only a fixed number of people from each family were allowed to harvest manure or firewood during a fixed period of the year. In some regions, only bush knives, not hatchets or saws, were allowed for harvesting firewood. Nevertheless, many forests were over-used in the Edo and Meiji periods, and as a consequence, the newly bare mountains were susceptible to soil erosion. Early industrialization in those periods increased demands for firewood, so that people over-harvested wood from the commons as a saleable commodity. In forests where commons borders were not clear, competition among neighboring communities to harvest wood also accelerated over-use (Chiba 1991).

1.4 Logging and the Wilderness in the Deep Mountains

In spite of such intensive intervention by humans, some primeval forests remained in Japan, and several large mammals, including bears and wolves, survived until recent times. How was this possible?

The Warring States Period (the Sengoku Jidai, 1943–1573) was a time of social upheaval, political intrigue and almost constant military conflict. Huge military forts were repeatedly constructed and destroyed. Many military lords recognized the forests that provided good timber for such constructions as important resources, and controlled them with strict rules and surveillance.

Hideyoshi Toyotomi (1536–1598) dominated the whole of mainland Japan by 1592. He was the first person in Japanese history who was able to demand and receive massive contributions of timber from all parts of the Japanese Archipelago (Totman 1989). His decade-long reign consumed huge volumes of timber. He built and repaired a number of monumental buildings, including Osaka Castle, Fushimi Castle, Kyoto Palace and Hokoji Temple (to house a giant 160-foot Buddha image). Timber poured into the Kinki region from throughout the archipelago, most notably from Kumano in Kii, Hida, Mino, and Suruga to the east, and from deep within the mountains of Shikoku and Kyushu. His government also assumed control of several important timber-producing forests, such as Kiso, Hida, Yoshino and others.

Tokogawa Ieyasu succeeded Hideyoshi, and improved transportation, the single most costly element in acquiring timber. Loggers were evidently cutting far enough into the mountains to make improved transportation worth the effort (Totman 1989).

In order to secure their supply of timber, Tokogawa Shogun and other lords adopted strict forest policies: they assumed direct control of important forests and issued prohibitions on the harvesting of timber in general. They also protected the forests in order to ensure the sources of water supplies. Tokugawa Shogun and several other great lords were fond of falconry. They designated several important habitats for the breeding of the Northern goshawk (*Accipiter gentils*) and Eurasian sparrowhawk (*Accipiter nisus*) as "Osutakayama (hawk-nested mountains)," and prohibited their use by local people.

Although forest resources have been used intensively for centuries, some areas of the Japanese Archipelago's steep topography have remained largely inaccessible. In the Edo period, it is likely that there were areas deep in the mountains which feudal lords could not control effectively. Certain people surreptitiously utilized such areas in deep mountains, including bear hunters and wood turners.

Bear-hunting groups, called "matagi," appear in Edo period local government documents of the Tohoku district. The local government ordered them to provide the gallbladders of Asian black bears, which were considered to be precious medicines, to the central government. Bear hunters were mainly farmers who went hunting only in the winter season. The local government controlled the number of guns and obliged the matagi to donate the gallbladders and furs of harvested bears, but could not check the hunters' activities in the mountains directly. After the Meiji era, bear hunters moved through the archipelago to hunt Asian black bears and Japanese serows. Animal fur was quite a common commodity, because the Japanese military needed a lot of furs for winter fighting against China and Russia at that period.

As for wood turners, or "kijiya," they used large trees of *Zelkova serrata*, *Kalopanax pictus* and *Aesculus trubunata* to make bowls and trays. Once they had exhausted the large trees, they moved to find other places to work. In the Edo period, when travel was severely regulated by local governments, they secured special permission allowing them to enter the higher parts of every mountain all over the Japanese Archipelago. Actually they moved from central Honshu to Akita in the north and to Miyazaki in the south looking for suitable wood. Several documents survive describing conflicts between local people and wood turners for the utilization of wood. However, until the large-scale forest road network was built after World War II, there were huge areas of physically inaccessible places in the deep mountains of the Japanese Archipelago, and apart from bear hunters and wood turners, very few people entered such areas.

1.5 Conclusion

There is a history more than 10000 years of intensive human intervention in the forests of the Japanese Archipelago. The knowledge and skills that humans have developed concerning individual species can be considered to contain both the idea that biological resources should be used in sustainable ways, and the desire to harvest without fear of exhausting the resources. Although ethnological research

into Japanese human–environmental history has highlighted such phenomena as public management of lands and resources and environmental preservation through restricted harvest, the cultural and intellectual roots of this philosophy of preservation are still unclear, and have not been convincingly traced to a particular social period or order.

Throughout the period of human habitation, the Japanese Archipelago has been blessed with a relatively warm climate and abundant rainfall, and consequently with abundant biological resources. As a result, the characteristics of the natural environment and human subsistence activities within the Japanese Archipelago varied greatly, as did the relationships between nature and human activities. Under the influence of climatic change and human activities, the distributions of individual species of plants and animals in the Japanese Archipelago and its surrounding landmasses have been constantly changing. Populations have repeatedly divided, expanded, diminished and divided in response to changes in the availability of suitable habitat. Where suitable habitat was unavailable, species became extinct. Until quite recently, there were a surprising number of physically remote and largely inaccessible places in the deep mountains of the Japanese Archipelago. Where they exist today, such places still provide refugia for plant and mammal species which inhabited the primeval forests.

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