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Change in the prehistoric use of arboreal resources in Japan: From their sophisticated management in the Jomon period to their intensive use in the Yayoi to Kofun periods

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ABSTRACT

In Japan, plant remains excavated from lowland sites have been studied extensively in the past thirty years. These studies revealed that people managed and used plant resources, especially arboreal ones, around settlements since the early Jomon period starting at ca. 7000 cal BP. In eastern Japan, this management of arboreal resources was recognized as intensive management and use of *Castanea crenata* (chestnut) and *Toxicodendron vernicifluum* (lacquer tree) resources around settlements. In the succeeding Yayoi and Kofun periods, use of arboreal resources drastically changed to intensive use of oak and conifer species and an apparent lack of resources management. This change seems to have been caused by the introduction of metal tools and agriculture, but the implication of such technical advancement on the management and use of arboreal resources has not been evaluated critically. By reviewing the studies of plant remains carried out in central to northeastern Japan, the cause of the drastic change in the management and use of arboreal resources in prehistoric Japan is discussed.

1. Introduction

In the normally forested Japanese archipelago, use of arboreal resources changed through prehistoric and historic periods with the advancement of felling and processing techniques (Suzuki, 2002). In Japan, use of arboreal resources became apparent in the late Glacial period corresponding to the beginning of the Jomon period, when people began to settle, using pottery and polished stone tools and making pit dwellings (Imamura, 1996; Habu, 2004). Although thought to have lived as hunter–gatherers during the Jomon period, extensive studies on plant remains carried out in the past thirty years revealed that Jomon people definitely managed and used plant resources around settlements and cultivated native and introduced cultigens at least since the early Jomon period starting at ca. 7300 cal BP (Noshiro and Sasaki, 2013, 2014). In eastern Japan, these management and use of plant resources are recognized as intensive management and use of arboreal resources of *Castanea crenata* (chestnut) and *Toxicodendron vernicifluum* (lacquer tree) around settlements. In the succeeding Yayoi and Kofun periods from ca. 2400 cal BP to ca. 600 AD, however, use of arboreal resources changed drastically with the introduction of agriculture and metal tools from China and Korea, and people began to use oaks and conifers for tools and construction (Fig. 1A; Ito and Yamada, 2012). Surprisingly, in central to northeastern Japan, *Castanea crenata* cherished during the Jomon period was almost neglected through the Yayoi and Kofun periods and came to be used again only in the following historical periods, Nara and Heian. The wood of *Castanea crenata* has straight grain, is durable against fungi and waterlogged conditions, and has been valued for building foundations or railroad sleepers even in the modern period (Forest Bureau Ministry of Agriculture and Commerce, 1912; Hirai, 1996). Thus, the value of *Castanea crenata* wood was completely neglected through the Yayoi and Kofun periods.

To find out why evaluation of arboreal resources changed with the introduction of Yayoi cultural systems, the use and management of arboreal resources will be compared first between the Jomon and the Yayoi and Kofun periods by reviewing studies on plant remains from central to northeastern Japan carried out in the past thirty years. Then, the following four hypotheses will be tested to explain the reason for the change in evaluation of arboreal resources. 1) Availability of arboreal resources changed from the Jomon to the Yayoi and Kofun periods. 2) Change in felling tools from stone axes to iron axes induced reevaluation of arboreal resources.

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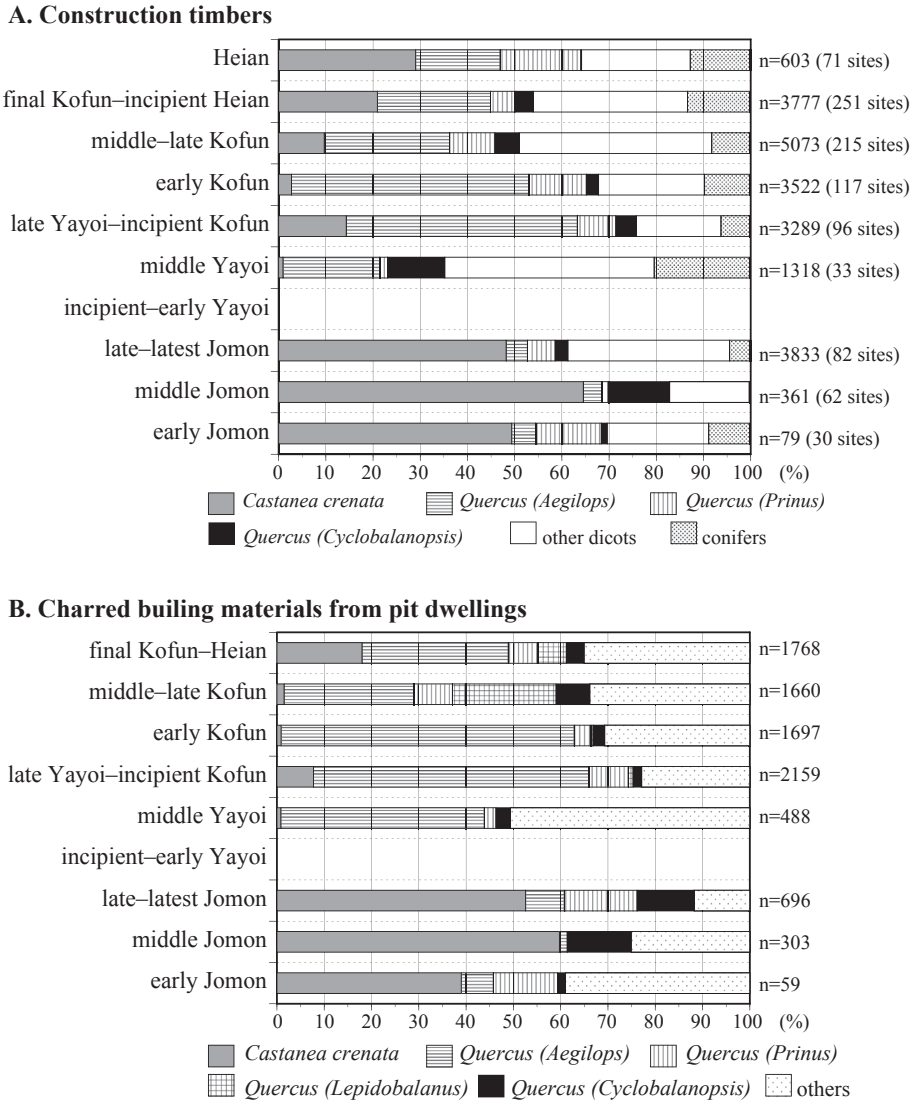

Fig. 1. Taxonomic composition of lowland construction timbers (A) and charred building materials from pit dwellings (B) in the Kanto district, central Japan (A: compiled from Ito and Yamada, 2012; B: compiled from Ohtani, 2012). *Castanea crenata* accounted for 50–65% during the Jomon period, but declined to less than 15% during the Yayoi and Kofun periods, and increased to 20–30% in the historic Nara and Heian periods. Instead of *Castanea crenata*, use of *Quercus* (*Aegilops*) increased during the Yayoi and Kofun periods.

3) Wood properties required for wooden constructions and tools dictated the change in the selection of material trees. 4) Introduction of the Yayoi culture with agriculture induced different evaluation of arboreal resources.

Because most Jomon sites that yielded plant remains exist in the Kanto and Tohoku districts of central to northeastern Japan and because most Yayoi to Kofun sites that yielded plant remains exist in western to central Japan, plant remains only from the Kanto and adjacent districts will be treated in this review. Management and use of arboreal resources of the Jomon period will be reviewed briefly, because they were recently reviewed by Noshiro and Sasaki (2013, 2014). Here, use of arboreal resources during the Yayoi to Kofun periods in central to northeastern Japan will be reviewed based on the archaeological reports of the following sites: Nakazaike-minami (Sendai City Board of Education, 1996) and Takada B sites (Sendai City Board of Education, 2000) in the Tohoku district, Kawada-jouri (Archaeological Research Center of Nagano Prefecture, 2000) and Ishikawa-jouri sites (Archaeological Research Center of Nagano Prefecture, 1997) in the Chubu district, and Shinbo (Gunma Archaeological Research Foundation, 1986), Koshikida (Saitama Cultural Deposits Research Corporation, 1991), Sorimachi (Saitama Cultural Deposits Research Corporation, 2009, 2010, 2011a, 2011b), Gosho-shitanda (unpublished), Kouseki (Chosei-gun-shi Archaeology Center, 1993), Tokoshiro (Kimitsu-gun-shi Archaeology Center, 1996), Kawaraguchi-bouju (Kanagawa Archaeology Foundation, 2014, 2015), and Ikego sites (Kanagawa Archaeology Foundation, 1996, 1997a, 1997b, 1999a, 1999b, 1999c) in the Kanto plain. Periodical divisions and their calendar years of the Jomon, Yayoi, and Kofun periods follow Taniguchi (2001), Kudo (2012), and Fujio (2014).

In this paper, Fagaceous taxa that were most used in these periods are abbreviated as follows. In Japan, *Quercus* subgen. *Cyclobalanopsis* includes eight species of evergreen oaks, such as *Q. gilva*, *Q. acuta*, and *Q. myrsinifolia*, and will be shown as *Quercus* (*Cyclobalanopsis*). *Quercus* subgen. *Lepidobalanus* includes two sections of deciduous oaks, *Aegilops* and *Prinus*, and will be shown as *Quercus* (*Lepidobalanus*). *Quercus* subgen. *Lepidobalanus* sect. *Aegilops* include two species of deciduous oaks, *Q. acutissima* and