



# Henceforth fishermen and hunters are to be restrained: towards a political ecology of animal usage in premodern Japan

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## Abstract

Domestic animal usage remains a key problem in understanding Japan's premodern economy. Assumptions that religious and other cultural proscriptions limited the use of domesticated animals, and the consumption of meat in particular, from Late Antiquity until Westernisation in the nineteenth century remain widespread. However, the zooarchaeological record from historic Japan is patchy and the scholarly literature often uncritically reproduces state-centred ideas about agriculture and the economy. In this essay we critically review the ways in which historical and zooarchaeological studies of animal usage in premodern Japan have been impacted by broader cultural discourses. We examine animal usage from the Bronze Age to the eve of modernisation, broadly 1000 BC to AD 1850, in terms of a tension or dialectic between promotion and restriction by the state and other authorities. While the utilisation of animals for warfare and official transport was more closely controlled, other uses reflected a complex and often international political ecology that requires further analysis by zooarchaeologists.

**Keywords** Japan · Zooarchaeology · Domestic animals · State legibility · Buddhism · Social discrimination

## 1 Introduction

The promise of zooarchaeology in understanding animal usage in premodern Japan was set out three decades ago in a short paper by Uchiyama (1992). In his discussion of the San'ei-chō 三栄町 site in early modern Edo 江戸 (Tokyo), Uchiyama noted the ability of archaeology to study animal usage not mentioned in historical records. He also emphasised the importance of the political context of animal usage, suggesting a relationship between limits on meat-eating and the suppression of Christianity in the early seventeenth century. The past thirty years have seen a growing zooarchaeological record and many studies on the history of animal usage in Japan (e.g., Nishimoto

2008a; Nakazawa 2009). Yet in many ways the *problématique* identified by Uchiyama has not been resolved. We still lack a basic model of the position of domestic animals in premodern Japan. Nevertheless, two broad assumptions continue to shape writings on this topic: first, that while pigs and chickens were introduced into the archipelago in the Bronze Age Yayoi 弥生 period (1000 BC – AD 250), they never really 'took off' in the Japanese context; and second, that while horses and cattle were added from the fifth century AD, religious and other cultural proscriptions limited the consumption of meat until Westernisation in the nineteenth century. While premodern China is also frequently depicted as a 'vegetarian' civilisation (Cartier 1993), the Japanese literature emphasises that the consumption and culture of domesticated animals was much less deep-rooted in Japan than on the Asian mainland. This is a theme commonly taken up in post-war cultural nationalist writings (e.g., Watanabe 1989), but many archaeologists have also emphasised this conclusion. In recent decades archaeological publications have been integrated into claims about the superiority and sustainability of the 'traditional' Japanese economy, which supposedly avoided upland deforestation due to its low reliance on domesticated animals (see Hudson et al. 2022).

The understanding that agricultural societies diversify and change over time as they adapt to local conditions has been resisted in archaeological and historical research in

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Japan. Across Eurasia, Neolithic and Bronze Age farming systems employed diverse crops, animals, cultivation technologies and patterns of social mobility to expand into new ecological zones (Cubas et al. 2020; Ethier et al. 2017; Ivanova et al. 2018; Shennan 2018; Spriggs 2007). The Bronze Age saw an increase in the long-distance exchange (or ‘globalisation’) of food crops (Jones et al. 2011; Liu and Jones 2014; Liu et al. 2019; Spengler 2019), increasing the resilience of farming systems. As medieval empires expanded, new crops, animals and food technologies were shared even further (Watson 1983; Chaudhuri 1990; Spengler et al. 2021a; Pelloli *in press*). Growing urbanisation had been associated with commercial crops since the Bronze Age (Sherratt 1999; Lucas and Fuller 2020), but the Middle Ages saw a further expansion of such trade. In complete contrast with such research, instead of an adaptive system with the potential to increase or reduce its socio-ecological resilience, agropastoralism in the Japanese archipelago is usually seen as a fixed arrangement which remained essentially unchanged over the premodern period and which can be explained by, or reduced to, culturalist assumptions about Japanese society and identity. Such views are maintained despite considerable historical evidence for market exchange in premodern Japan. As discussed in Hudson et al. (2022), these ideas have even influenced environmental *policy* in Japan.

Toyohiro Nishimoto 西本豊弘, one of Japan’s most senior zooarchaeologists, argues that traditional Japanese views of the natural world were only changed by the sudden introduction of Western, Christian values in the nineteenth century. Those values, Nishimoto insists, made nature into an ‘enemy’ to be ‘conquered’: ‘Western values, which consider the wild as something completely evil to be eliminated, were greatly different from those of Japan’s Buddhist values and the Japanese view of nature, animals and plants’ (Nishimoto 2008b: 4). Japan’s earlier encounter with Christianity in the late sixteenth to early seventeenth centuries had led to various social and economic changes, but did not result in major changes to ‘Japanese values’ (Nishimoto (2008c: 81). These claims about the Japanese being ‘close to nature’ draw on a large literature which cannot be rehearsed here. What is important to note, however, is the role of political assertions that, unlike China and the West, the Japanese formed a ‘natural’ community under the emperor (Thomas 2001; Hudson 2021a). If the late nineteenth century arrival of industrialisation and ‘Christian values’ marked the decline of Japan’s authentic relationship with nature, it is thus necessary to construct ‘traditional’ Japanese foodways as originating from before that decline. Hence, a large literature claims that it was *isolation* from the outside world during the Tokugawa period that generated traditional food in Japan (Ishige 2000, 2001).

## 1.1 Animals, food, and Japanese civilisation theory

Over human history, the food we eat has been influenced by many cultural and social factors and zooarchaeology has recently begun to consider such issues in a rigorous fashion (e.g., Driver 2004; Erynck 2004; Pigièrre et al. 2004). History and archaeology in East Asia are afflicted by a Confucian emphasis on grain agriculture. In Japan, this means rice. Almost all studies of the Yayoi define it as the era when wet-rice farming reached the Japanese Islands, an approach shared by both Japanese and non-Japanese scholars. Alluvial rice remains a powerful metonym of Japan, but rice was important above all for its role in premodern state finance. Scholars of early Japan who emphasise rice are seeing food *like a state*, to borrow James Scott’s (1998) germane phrase. A substantial critical literature emphasises the subsistence diversity found in premodern Japan, yet often assumes that fishing, hunting and non-rice cultivating communities were *dependent on* and socially *inferior to* rice farmers (Hudson 2021b). Within Japanese historiography the reluctance to acknowledge the occupational specialisation of fishing and similar groups in antiquity stems also from the Marxist view of an Asiatic mode of production under which the Kinai capital zone extracted wealth from economically self-sufficient rural communities (cf. Goodwin 2006). In such research, the peasant village is the unchanging norm; anyone engaging in other economic activities necessarily represents a deviation from that norm. Premodern Japanese ideas about social deviancy are discussed below, but here we assume that farming systems articulated with herding, fishing, hunting, trading and raiding groups in historically complex and contingent ways (cf. Amino 2012; Ling et al. 2018; Spengler et al. 2021b).

Views of agriculture and food in premodern Japan have been affected and to a significant extent determined by the Chinese experience. China was a locus of moral authority through Confucianism, as well as Buddhism introduced via China and Korea. While it is frequently claimed that Shintō was also a key factor in generating ideology about animals in Japan—and that was certainly true in later times—there is no evidence that the roots of such Shintōist thinking pre-date the arrival of Buddhist, Confucian and Taoist notions in the archipelago. Historians of China have argued that domestic animals played a minor role in that country, in part due to demographic pressure since farmers cleared and cultivated all the land that was easily available, leaving little or no room for animals to graze (Cartier 1993; Elvin 2004). From the late nineteenth century, however, many Japanese scholars became keen to emphasise the *divergence* of Japan’s historical experience from that of China and the rest of mainland Eurasia.

**Table 1** Cultural traits associated with the minimal role of domesticated animals in premodern Japan according to Makoto Sahara

Cultural traits associated with raising domesticated animals	Presence/absence in Japanese history
Castration of horses and other animals	Castration of horses first introduced in 1725
Improvement of breeds	Only began in the eighteenth to nineteenth centuries
Killing of excess animals in the autumn	Unknown in premodern Japan
Dietary culture, including consumption of blood and internal organs, cooking in stews, use of strong spices	Japanese cuisine emphasises the use of ‘fresh material in order not to lose the unspoiled food flavor’
Castration of men as eunuchs or for entertainment ( <i>castrati</i> )	Unknown in Japan
Keeping of slaves	Slavery present but the ‘quality and quantity of “Japanese slaves” did not compare with those among pe[o]ples who maintained domesticated animals.’
Sacrifice of domesticated animals	‘In Japan, under the influence of [the] Chinese, peasants did sacrifice of animals in [the] 8-ninth century in prayers for rain. However, such practice was unheard [of] among the Japanese ruling class.’

Source: Based on Sahara (1983)

This desire has been expressed in various ways (Tanaka 1993), but one has been to imagine Japan as a country characterised by low use of domesticated animals even when compared with China. An early debate was over the origins of a caste of skinners and tanners known in modern Japan as *burakumin*.<sup>1</sup> Writers such as the journalist Aizan Yamaji 山路愛山 (1864–1917) and the folklorist Kunio Yanagita 柳田國男 (1875–1962) argued that *burakumin* were non-Japanese people with nomadic pastoralist roots. The underlying assumption was that people who worked in trades associated with the slaughter of animals were fundamentally different from the Japanese race. This position was criticised by the historian Sadakichi Kita 喜田貞吉 (1871–1939) who proposed that the *burakumin* were not an alien race, but had become ostracised due to their failure to assimilate to the agricultural norm of Japanese culture (Oguma 2002: 97, 99–100).

By the early post war era, animals had become a common way of discussing differences between Japan and the rest of the world. In a book based on lectures given in 1965 and translated into English a decade later, cultural anthropologist Eiichirō Ishida 石田英一郎 (1974: 132) argued that ‘livestock as an element in the traditional life of the Japanese is conspicuously lacking’. In his influential re-evaluation of Yayoi culture, archaeologist Makoto Sahara 佐原真 (1975) similarly concluded that the lack of livestock raising established a basic parameter for the premodern economy, a point he developed in many later publications. Such claims are also common in populist writings (e.g., Umehara 1999; Yasuda 2006, 2013), but Sahara provided perhaps the most systematic treatment of the argument in a series of publications in both English and Japanese (Sahara 1983, 1992, 1993, 1999; Egami and Sahara 1990) (Table 1).

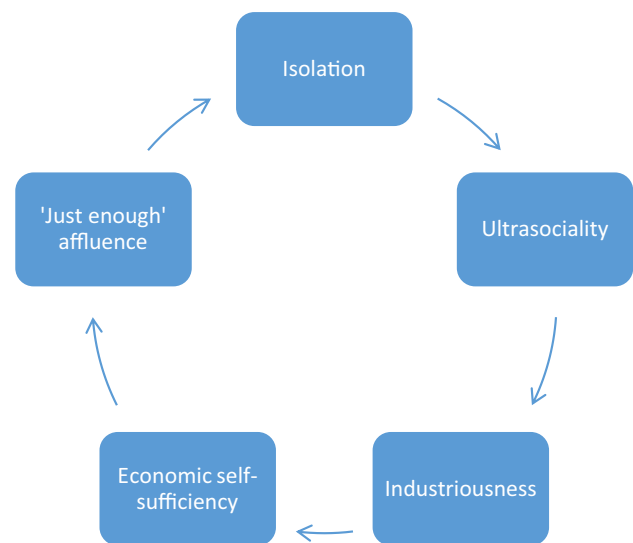
<sup>1</sup> The term *burakumin* (部落民, literally ‘village people’) began to be used from around 1900 (Kobayakawa 2021). As discussed in Section 2.4, these people were earlier known by other terms.

While Sahara lends great significance to animal castration, zooarchaeological analysis of this custom is difficult (Binois-Roman 2016; Nistelberger et al. 2019: 120) and further research would be needed to determine its presence or absence in ancient Japan. Slavery was common in ancient and medieval Japan (Nelson 2004; de Sousa 2019) and, as far as we are aware, the claim that societies with domesticated animals had more slaves than those without has no empirical basis. Sahara’s dismissal of the role of slavery is intriguing because of his controversial suggestion that the hunter-gatherers of the Jōmon period might have already possessed slaves (Sahara 1985). Although cattle sacrifice was to some extent influenced by Chinese customs (Sekiyama 2016: 156), animal sacrifice in general appears to have been a common practice in ancient Japan, often associated with prayers for rain. Sahara’s comments about Japanese cuisine emphasising the use of ‘fresh’ ingredients are mirrored in many writings (e.g., Ishige 2001), yet the claim essentially refers to food cultures developed under modern conditions. Sahara criticises proposals such as that found in Wilson (1984: 61) that pottery was invented to boil tendons and other tough meat for consumption, arguing that in Japan pottery was used to process plant foods (Egami and Sahara 1990: 182–183). Recent analyses have, however, demonstrated that Neolithic Jōmon 縄文pots were widely utilised to process aquatic resources (Craig et al. 2013), meaning that fish and shellfish were not primarily being consumed in a ‘fresh’ state.

Sahara’s influential proposals about Japan’s rejection of domesticated animals and their (in his view) associated cultural traits shows how ideas about food in Japanese archaeology are often influenced by a broad suite of cultural preconceptions. Imamura (1987) is unusual in attempting an explanation based on geography not culture. According to Imamura, Japan’s limited grasslands provided insufficient grazing for domesticated animals; as the human population increased in the medieval and early modern eras, the horse ranches (*maki* 牧) of Late Antiquity were reduced in number and concentrated in scarcely-populated areas of the Tohoku

region (Imamura 1987: 118). Most other scholars, by contrast, explain domesticated animal use in premodern Japan through cultural or religious factors. As mentioned, Nishimoto (2008b: 3–4) argues that traditional Japanese views of the natural world were only changed by the introduction of Christian values with industrialisation. As a result, understandings of the role of animals have become integrated into a broader narrative about identity which insists that Japan's premodern economy was essentially isolated and therefore 'self-sufficient' from the Yayoi onwards, removing the need for significant exchange with the non-Japanese world. If Japan is seen as a geographically 'isolated' group of islands, a key issue is the extent to which it managed to develop economic stability or even affluence. If premodern Japan was economically 'backward', why did it become the first country in Asia to embrace modernity and industrialism? A common answer to this conundrum has been that isolation and the ensuing ecological limits *pre-adapted* the Japanese to hard work; through industriousness they managed to develop a 'just enough' type of affluence. While this claim has primarily been made with respect to the early modern Tokugawa 徳川 period (1600–1868), it has also influenced understandings of the initial adoption of cereal farming in the Bronze Age. Akazawa (1982, 1986: 86) argued that the hunter-gatherer Jōmon people of western Japan gained a 'high degree of botanical experience', meaning that 'Agriculture could be smoothly incorporated into their procurement system because the cultivation of rice did not conflict with the already established seasonal procurement round.' The same point is made by Mizoguchi (2019: 102) who writes that since rice and millets are grown over the summer and harvested in early autumn, they could be fitted into the 'spatio-temporal organisation of [Jōmon] social life with *minimal disturbance*.' Imamura (1996: 460) offers the more general conclusion that 'the habits of hard work required to carry out wet-rice cultivation were already well developed among the Late Jomon population.'

As noted, such ideas have been especially associated with the Tokugawa period. If Japan industrialised rapidly after two hundred years of isolation during the Tokugawa era, then, the argument goes, Japan's modernity clearly took a different route than that of Europe. Masahide Bitō 尾藤正英 proposed that the Tokugawa represented Japan's indigenous modernity, which was followed by Western modernity after 1868 (Gluck 1998: 275). In 1976, Akira Hayami 速水融 proposed the key lay in Japan's *industriousness* (Hayami 2015: 96). For Kawakatsu (2006), Japan's 'self-sufficiency' takes on moralistic and nationalist overtones which resonate closely with a large nativist literature on Japanese exceptionalism (Hudson 2021a). A review of that literature lies beyond the scope of the present essay, yet a number of central topics emerge in both mainstream and more marginal writings (Fig. 1). In the mainstream historical literature, the



**Fig. 1** Common approaches to explaining Japan's premodern economy

links between the boxes in Fig. 1 are usually implied rather than analysed; more nationalist writings accept the causal links much more easily.

Historians have critiqued the degree to which even Tokugawa Japan was isolated (Toby 1984), yet the essential 'seclusion' of the country is still taken as a given by many writers, as is a type of communal 'ultasociality' centred ultimately on the emperor. The following quote by Nishimoto (2008c: 81) shows how Japan's isolation is often imagined in a reductionist fashion:

At the end of the Middle Ages, the Southern Barbarians arrived [in Japan], bringing Christianity and it can be considered that they introduced a Christian view of animals for a short period. ... Information from overseas had also entered through the medieval tally and private trade systems, but that new information was based on the Oriental values which, since the Yayoi period, had [reached Japan] via the people of China and the Korean Peninsula. The new [European] arrivals did not substantially change those existing values. However, the view of animals held by the Southern Barbarians must have seemed strange.

By contrast, one such 'Southern Barbarian', Jesuit João Rodrigues, who was in Japan 1577–1610, recounted how hens, pigs and cattle kept at port cities to feed the Portuguese led to the wider consumption of these animals by the Japanese: 'Not only the merchants who come from various places to trade with [the Portuguese], but also many others now eat these things. Even nobles and others do so under the excuse of regarding it as medicine and something new' (Cooper 2001: 110). In the late sixteenth century, wealthy

Japanese went shopping in Nagasaki for exotic goods and were exposed to new foods there (Hesselink 2015).

After less than a century, the Tokugawa ‘closed country’ policy led to economic stasis (Totman 1993), requiring ever-increasing inputs of labour to stand still. For Totman (1993: 262), Hayami’s ‘industrious revolution’ was a type of ‘self-exploitation, meaning, in the main, fuller exploitation of those below by those above.’ A similar system developed in late imperial China, placing ‘an all-but intolerable workload on working people’ (Elvin 2004: xviii). Rice farming was highly productive (Fuller and Qin 2009) but could be a victim of its own success. If in early modern Europe the average seed-to-yield ratio of wheat rarely exceeded 1:5, in late imperial Jiaying 嘉興, the comparable ratio for unhusked rice to husked rice was—in good years for better-off farmers—as high as 1:36 (Elvin 2004: 208). However, this very high productivity required two things: very hard work by the peasants and an absence of disruption from war or natural disaster. When the latter calamities occurred, they ‘put the lives of an exceptionally large number of people at risk’ (Elvin 2004: 209).

For some Japanese writers, industriousness is inherent in the Japanese national character. Hayami himself is careful to avoid such reductionist explanations; nevertheless, he insists that ‘the fact that the Japanese were industrious for centuries cannot be denied’ (Hayami 2015: 95). The dangers anticipated by Hayami here are demonstrated by one environmental archaeologist who claims that ‘The rice-cultivating fishing people [of Japan] find joy in transfusing the energy of their bodies into the steep barren wasteland, and transforming it into fertile terraced rice paddies’ (Yasuda 2006: 109). While Yasuda is an extreme example, the basic conceit that Japanese society favoured the sacrifice of communal industriousness is pervasive. Such ideas are found in moralistic farm manuals of the early nineteenth century (Murayama 2016: 27–28). By 1987, even the director of a farmer’s union was warning that, ‘The principles developed in rice cultivation are the glue of Japanese society. They pervade our social structure, our culture, and our moral code’ (Vlastos 1998: 79). Thus, ‘self-sufficiency’ becomes not just—or even mainly—economic, but rather *cultural*, reflecting Japan’s inherent ability to realise itself without outside control. The economic realities are unimportant since ‘virtues like sincerity, effort and spirit of sacrifice mean more than tremendous efficiency’ (Watanabe 1989: 36). The final stage in Fig. 1 is the affluence which derives from self-sufficiency. That affluence may have been limited but—to borrow the title of Brown (2009)—it was ‘just enough’. For the Tokugawa period, this has become a major area of research with studies claiming a high comparative standard of living in early modern Japan based on a range of material indicators (e.g., Hanley 1997; Macfarlane 2003; Kitō 2012).

The ideas behind the cycle in Fig. 1 were popularised in Jared Diamond’s book *Collapse*. Although he omits footnotes, his list of further readings suggests that Diamond relied heavily on the work of historian Conrad Totman. However, Diamond’s reading of Tokugawa environmental history is far more positive than Totman’s. In addition to high rainfall and soil fertility (cf. Rollet and Diamond 2004), Diamond (2005: 304–306) suggests three factors which encouraged ecological and economic stability in early modern Japan: (1) the number of horses and oxen was ‘allowed to decrease in response to deforestation and loss of forest fodder’; (2) the use of seafood to relieve ‘pressure on forests as sources of protein and fertilizer’; and (3) political stability deriving from the Tokugawa ‘peace dividend’ (sensu Walthall 2012).

The first point has been discussed by Hayami (2015: 98–99) who found a two-thirds decrease in oxen and horse numbers in the Owari domain 尾張藩 around Nagoya, from over 12,000 in the 1670s to only 4200 in 1820.<sup>2</sup> Over the same period, the population of the domain increased from 265,522 to 331,678. Hayami (2015: 99) concludes that ‘Human power replaced livestock power’. It is unclear to what extent this decrease in draught animals was found in other regions. Nevertheless, Hayami argues that changing patterns of animal use were based on economic rationality. As the area of cultivated land grew at the expense of forests, feeding horses and oxen became increasingly expensive in lowland areas. In places which relied on ceramic production, by contrast, livestock remained a cost-effective means of transporting materials (Hayami 2015: 101). The substitution of ‘horse power’ by ‘manpower’ provides a classic example of Hayami’s concept of industriousness (Murayama 2016: 28).

Diamond’s second explanation derives from Totman’s (1993: 272–274) discussion of Tokugawa fisheries. Totman notes the increased specialisation of Japan’s fisheries at this time, yet also emphasises that a significant proportion of the catch was used to make fertiliser. The latter fisheries were not necessarily sustainable since even small fish unsuitable for human consumption could be used. Fish for fertiliser was caught off Hokkaido or the Tohoku and then transported over long-distances to other areas of Japan. Totman (1986: 465–466) explains the extra labour (aka industriousness) involved:

... fish caught off Tōhoku were being brought to shore, unloaded, dried, baled, reloaded aboard coasting vessels, shipped south to Chōshi [Chiba], transferred to river boats, hauled up the Tone [river] to its south fork,

<sup>2</sup> Hayami (2015: 99) gives a figure of 12,986 in his Table 6.1 but 12,337 in the text.

sent down to Edo, punted over to riverbank warehouses, unloaded and stored, sold, reloaded on boats to go out into the Tama region, punted down the coast and upstream, unloaded, hauled overland to villages, and finally carried out to the fields and applied.

Until the eighteenth century, peasants had achieved the same end by simply walking into nearby hills, collecting leaves and other ‘green manure’ and mulching it into their fields. More broadly, it remains a moot question to what extent seafood contributed to the diet of ordinary Japanese during the Tokugawa period, although the shogun and other elites were certainly major seafood consumers (Hudson 2022; Ōguchi 2021).

Though not mentioned by Diamond or historians such as Cullen (2003: 2), who also proposes that ‘Japan was self-sufficient in food [because] there was no international trade in food in east Asia and no ready supply to turn to in the event of need’, a significant international trade in food *did* exist in early modern East Asia. Dried sea cucumber (*trepang* or *bêche-de-mer*), abalone, shark fins and kelp (*konbu* 昆布) from Hokkaido were carried via Nagasaki to Qing China (Peng 2019). The sea cucumber trade seems to have expanded in the early seventeenth century (Macknight 2013; Schwerdtner Máñez and Ferse 2010) and grew quickly to encompass a huge area from Hokkaido to northern Australia (Bowdler 2002), even to Fiji by the 1820s (Schlesinger 2017: 52). The international trade in these marine products was driven by growing market demand under the Qing (Schwerdtner Máñez and Ferse 2010; Schlesinger 2017). Another traded food mentioned by Rodrigues was salted birds imported to Japan from Korea (Cooper 2001: 263). Cranes, swans and ducks were frequently eaten in elite banquets in the early modern period.

The third factor proposed by Diamond, the so-called ‘peace dividend’ of the Tokugawa, is the most controversial. It would be obtuse and indeed immoral to suggest that peace was not good for farming. Yet consider the following comments by Diamond (2005: 305):

... the Tokugawa shoguns, having imposed peace and eliminated rival armies at home, correctly anticipated that they were at little risk of a revolt at home or an invasion from overseas. They expected their own Tokugawa family to remain in control of Japan... . Hence peace, political stability, and well-justified confidence in their own future encouraged Tokugawa shoguns to invest in and to plan for the long-term future ...

Today, exactly the same comments could be made about any autocratic regime and little is really explained here. Diamond overestimates the power of the Tokugawa shoguns who attempted to maintain their rule through strict social and economic controls, or what Sivaramakrishnan (2005:

321) terms ‘repressive peace’. The decentralised feudalism of the Tokugawa encouraged domain lords to exploit new regional products to avoid bankruptcy (Morris-Suzuki 1998: 45–46). Tokugawa ‘farmers were praised only to the extent they were law-abiding, diligent in their labor, and dutiful in paying taxes’ (Vlastos 1998: 81). Diamond (2005: 305) insists that ‘Living in a stable society without input of foreign ideas, Japan’s elite and peasants alike expected the future to be like the present, and future problems to have to be solved with present resources.’ This formulation not only romanticises shogunal rule but ignores the considerable role of introduced crops such as sweet potato and sugar cane, as well as the ‘foreign ideas’ contained in agronomic manuals (cf. Totman 1993: 264, 312; von Verschuer 2016).

## 1.2 Domesticated animals in premodern Japan: overview

Four domesticated animals were brought to Japan in the Yayoi and Kofun古墳 (AD 250–700) periods: pigs, chickens, cattle and horses. Suids had already been partially managed during the Jōmon, being translocated to islands outside their natural area of distribution, including the Izu islands, Sadō, and Hokkaido (Katō 1981; Watanobe et al. 2001; Hongo 2017). In such cases it is unclear whether they were kept penned or released to be hunted later (Sahara 1992: 45; Hongo et al. 2007: 128–129). In the Ryukyu Islands, wild boar are commonly found at Upper Palaeolithic and later sites on islands which are not thought to have been connected to the mainland. The possibility that these boar were also transported by humans as early as 30,000 years ago seems plausible (Fujita et al. 2014; Kawamura et al. 2016). Genetic analyses suggesting some domesticated pigs were introduced to the Ryukyus in the Jōmon period (Takahashi et al. 2012) require further confirmation. Domesticated pigs were brought to mainland Japan in the Yayoi, presumably from Korea (Nishimoto 1991; Morii et al. 2002; Robbeets et al. 2021).

Domesticated chickens also seem to have been introduced in the Yayoi, though the zooarchaeological record suggests their use as food was restricted until the late medieval era (Sahara 1992: 46, 1999; Niimi 2008; Hudson 2019). Chickens were related to religious and rebirth symbolism, something which would be more evident from the Kofun period onwards when *haniwa* 埴輪 clay figurines depict these birds and lacquered wooden roosters have been excavated from the moat of the Makimuku Ishizuka 纏向石塚 tomb mound (Ishino 1992: 198). Buddhist taboos regarding the consumption of eggs are displayed in the eighth-century *Nihon Ryōiki* 日本靈異記 (II: 10), which reports a curse on a man who used to eat eggs regularly (Watson 2013: 82–83). How widespread such ideas became, however, is difficult to judge.

Horses reached Japan at the end of the fourth century AD and cattle were probably introduced at around the same time (Robbeets

**Table 2** Some archaeological finds of goats from Okinawa Island

Site name	Coordinates	Date	NISP	Reference <sup>1</sup>
Shuri castle (2005)	26.1200, 127.4300	1600–1879	12	<i>Shurijō ato</i> (OPAC 2005)
Wakita kiln	26.2124, 127.6803	1600–1879	6	<i>Wakita furukama ato I</i> (OPBE 1993)
Nakandakariyama cemetery	26.12, 127.43	1500–1800	20	<i>Nakandakariyama no furubakagun</i> (OPAC 2005)
Sunabe saakubaru	26.3376, 127.7493	Modern?	8	<i>Chatan cho Sunabe saakubaru iseki</i> (OPBE 1987)
Nakagusuku udun	26.2208, 127.7180	Meiji	110	<i>Nakagusuku udun ato</i> (OPAC 2012)
Kaganjibaru (feature SD1-3)	26.1980, 127.6386	Early modern	2	<i>Kaganjibaru iseki</i> (OPAC 2021)
Shuri castle (2004)	26.2040, 127.7149	Early modern-modern	99	<i>Shurijō ato</i> (OPAC 2004)
Shuri castle (2007)	26.2040, 127.7149	Early modern-modern	3	<i>Shurijō ato</i> (OPAC 2007)
Shuri castle (2008)	26.2169, 127.7168	Early modern-modern	3	<i>Shurijō ato</i> (OPAC 2008)
Uchaya udun ato	26.1223, 127.43.22	Early modern-modern	4	<i>Uchaya udun ato</i> (OPAC 2003)

Source: Though not a complete list, the table represents preliminary results from a search for *yagi* (goat) on the Nara National Research Institute for Cultural Properties site reports repository (<https://sitereports.nabunken.go.jp/ja>). <sup>1</sup>OPAC: Okinawa Prefecture Archaeology Centre; OPBE: Okinawa Prefecture Board of Education

et al. 2021). This late introduction of horses goes against the earlier literature which often mentions horse finds from Neolithic and Bronze Age sites in Japan (e.g., Hesselink 1991: 28); such finds are not directly dated and can be assumed to be contamination from later layers. From the fifth century onwards, remains of horses and cattle appear in significant quantities, often in association with Sueki 須恵器 and other Korean pottery (Sekiyama 2016: 142), connecting immigrants from the peninsula with the introduction of horse breeding (Como 2007: 400). Horses were widely used in warfare from the Kofun period onwards. As in China (Bray 2019: 121), the state managed pastures for horses and, to a lesser extent, cattle. Kyushu and the eastern provinces became major pasture areas for horses, though smaller ranches were found in all regions, even close to the capital (Amino 2012: 110–111). Cattle pastures were also established in Naniwa 難波 from the sixth century (Sekiyama 2016: 151). According to the *Nihon sandai jitsuroku* 日本三代実録, by the ninth century thousands of horses were brought to Honshu from Kyushu each year (Hotate 2006: 181). Strontium isotope analysis has found that horses excavated from the Fujiwara palace site (694–710) originated in the interior of eastern Japan (Gakuhari 2018).

Sheep reached northern China by the fifth millennium BC (Dodson et al. 2014) but only arrived in Japan much later. In his 1601 *Historia de las misiones*, Luis de Guzmán mentioned that the Japanese raised sheep but the evidence for this is weak. Goats were known in Okinawa and Nagasaki in the Middle Ages (Thiede 1998; Table 2). In a letter dated 1584 or '85, Andres de Aguirre describes the first contact between Portugal and Okinawa; according to this letter, the Okinawans 'had pigs, goats, bulls and wild boars, and ate much fish and fruit' (Kreiner 1996: 21). In Fushimi in August 1613, Englishman John Saris bought 'hens and pheasants of the best for iii pence a peece, pigges verie fatt and large xii pence a peece, a fatt hogge v shillings, a good beefe, such as our welch runts, at xvi shillings. A Goate iii shillings, Rice a half pennie a pounce' (Saris 1941: 181). In the seventeenth century, the Japanese traded goatskins to Korea

(Lach and van Kley 1993: 1829, 1787). It is not known whether goats were introduced to Japan from Korea or from Southeast Asia. Carl Peter Thunberg (1743–1828), described how 'every year' the Dutch brought livestock including 'calves, oxen, hogs, goats, sheep and deer' to Nagasaki from Batavia for their provisions (Screech 2005: 86). They were raised on the island of Dejima and it is unclear to what extent they escaped beyond.

## 2 Animal usage and the state in premodern Japan: promotion and limitation

We divide animal usage in premodern Japan, defined as from the Bronze Age until the end of the early modern era, roughly 1000 BC to AD 1850, into two broad types. The first comprises uses actively promoted by the state, such as transport, warfare and agricultural labour. The second contains uses that were limited or controlled in some way by the state or other authorities. These categories are obviously not mutually exclusive, yet provide a convenient way to organise the discussion below, not least because they have implications for how archaeologists approach the topic. Writings that claim 'Animal husbandry has never been important in Japan' (Berglund 2008: 56) focus on a narrow range of uses such as meat or dairy while paying little or no attention to animals employed in warfare or transport.

### 2.1 State promotion of animal usage

Transport involving horses provides the first clear example of this category. In the eighth century, the Nara court built a series of highways to link the capital with the provinces. Post stations for horses were positioned at intervals of 30 *ri* (ca. 16 km); stables at these stations housed between five and twenty horses depending on the importance of the highway (Takeda 2006). Historian Sachiko Takeda 武田佐知子 argues that although transport by sea was almost always more convenient, the

Ritsuryō 律令 state attempted to encourage the use of land highways as a way to express its power and sophistication. This was especially the case for foreign envoys who were made to travel by land from Dazaifu 太宰府 in Kyushu to the capital instead of proceeding by boat up the Seto Inland Sea. In contrast to Tang China, which provided the model for the Ritsuryō legal system, the Nara court prohibited the transport of tax items by cart or boat. Taxpayers had to bring the goods to the capital themselves, sometimes paying for porters to carry them by hand or by horse, but thereby avoiding the involvement of cart-handlers who had a special position in ancient society (Takeda 2006: 161–162). This system did not last very long and sea transport again took over as the more practical alternative. In 807, numbers of horses along the highways were reduced by one fifth due to the increased use of maritime transport (Hotate 2006: 173). Later, in the early modern period, an elaborate system of roads and post stations once again supported the state. In 1600, Tokugawa Ieyasu 徳川家康 decreed that post stations on the Tōkaidō between Edo and Kyoto should keep 36 horses per station. Similar measures were instituted on other highways shortly thereafter (Vaporis 1986: 378). At the Oiwake 追分宿 station in Nagano, the number of horses used in official traffic increased from 4335 in 1702 to 18,197 in 1830 (Vaporis 1986: 395). These figures show that huge number of horses were involved in official transport arrangements in premodern Japan.

Warfare was another area where the state and aristocracy made extensive use of animals. In the early eighth century, the preface to the *Kojiki* 古事記 extolled the empress Genmei 元明 (r. 707–715) whose ‘virtue extends to the limit of the horses’ hoof-prints’ (Philippi 1968: 42). By the fifth century, stirrups, saddles, iron armour for horses, and other trappings of mounted warfare were already present in Japan (Kidder 1985). Archaeologically, many horse trappings have been found in burials so it can be assumed that their actual use dates back earlier than the tombs themselves. The horse dominated warfare in Japan until the appearance of peasant infantry using pikes (*yari* 槍) in the fourteenth century (Farris 1995: 15). Firearms then transformed Japanese warfare in the late sixteenth century. The comment by Vries and Vries (2020: 58) that, compared to Europe in the same period, ‘The importance of horses for Japan’s military under Tokugawa rule was low’ makes little sense because the Tokugawa was a period with few military conflicts.

In early China, there is documentary evidence that huge numbers of animals and birds were hunted to provide hides, tendons, bone and horns for military purposes (Elvin 2004: 32) and the same was certainly true of Japan. Animal bones were used to make arrowheads, especially in earlier periods. In Okinawa, arrowheads made from dugong bones have even been discovered from medieval castle sites (Sahara 1999: 201). Eagle feathers imported from Hokkaido were used to fletch arrows (Walker 2001). Leather was another crucial resource used to make bowstrings and other items.

Documents discussed by Nagahara (1979: 399–400) show how leather-workers were provided land and protection by warlords of the Warring States era (1467–1615) in order to secure a supply of military goods. In the early modern period, commoners were forbidden to wear leather-soled sandals (Shively 1964: 154), presumably to maintain leather stocks for military and other official uses.

The use of animals in agricultural labour can be considered as a further category encouraged by the state. Though aimed at the promotion of agricultural production, it was left to the farmers themselves to raise the livestock. In the Tokugawa period there were even regulations against peasants riding horses or cattle in some areas (Shively 1964: 154). Historians have been divided over the extent to which animals were used to pull ploughs in early Japan. Von Verschuer (2016: 72–74) discusses the relevant literature, concluding that ‘livestock rearing and implements such as the plough and harrow did not really evolve during the late medieval period and that their role was restricted to large estates.’ Draught animals were, says von Verschuer, too expensive to feed for the average peasant. Vries and Vries (2020: 57) also play down the role of these animals in Japan, claiming that ‘By the end of the eighteenth century, plough animals were all but non-existent.’ Yet these same authors mention an estimated one million cattle and 1.2 million horses in Japan (excluding Hokkaido and the Ryukyus) in 1870 (Vries and Vries 2020: 57).<sup>3</sup> These numbers may have been lower than for comparable territories in Europe, but are not insignificant. As draught animals, it is often stated that horses were more common in eastern Honshu, southern Shikoku and southern Kyushu; cattle, by contrast, dominated the area from north Kyushu along the Inland Sea to the Kinai (Kōno 2009; Hayami 2015: 98). While this pattern was found in the late nineteenth century, there were changes over time. In Late Antiquity, many cattle were raised in eastern Japan, perhaps for the production of cheese (*so* 蘇; see below) and hides (Saeki 1967; Uetsuki 2018).

Some historical records document numbers of cattle and horses kept in villages or regions. The impression given by such records is often one of significant numbers. During the Jurchen raids on northern Kyushu in 1019 known as the ‘Tōi invasion’ 刀伊の入寇, nearly 400 cattle and horses were butchered for food by the attackers (Batten 2006: 100). Table 3 lists the number of horses in villages in Oyama 小山 town near Mount Fuji prior to and five years after the 1707 Hōei 宝永 eruption of the volcano. Numbers decreased significantly as damage from the eruption forced many families to move away and sell their livestock, but prior to 1707 each household had owned at least one horse. Most other

<sup>3</sup> Although their book has a long bibliography, citations are not given for most of the statistics in the book.



**Table 3** Numbers of horses recorded prior to after the 1707 Hōei eruption of Mount Fuji in villages in the Oyama area

Village name	No. horses prior to eruption	Population prior to eruption ( <i>horses/ individuals</i> )	No. households prior to eruption ( <i>horses/ households</i> )	No. of horses in 1712	Population in 1712 ( <i>horses/ individuals</i> )	No. households in 1712 ( <i>horses/ households</i> )
Yosawa	104	429 (0.24)	74 (1.4)	13	153 (0.08)	44 (0.29)
Tana-gashira	40	155 (0.25)	25 (1.6)	7	75 (0.09)	13 (0.54)
Atano Shinden	20	118 (0.17)	13 (1.54)	2	65 (0.03)	9 (0.22)
Omika	62	241 (0.26)	39 (1.59)	4	111 (0.03)	20 (0.2)
Ueno	65	250 (0.26)	46 (1.41)	10	161 (0.06)	34 (0.29)
Ueno Shinden	9	33 (0.27)	5 (1.8)	0	22 (0)	3 (0)
Naka-hinata	50	198 (0.25)	22 (2.27)	3	50 (0.06)	14 (0.21)
TOTAL	350	1424 (0.25)	224 (1.56)	39	637 (0.06)	137 (0.28)

Source: Nagahara (2015: 104–105)

Tokugawa villages discussed by Murayama (2016: 40) had a smaller number, but the pre-eruption Oyama figures for horse ownership are comparable to or even higher than those from a sixteenth-century community in Sweden (Bäckström et al. 2018: 2087).

## 2.2 State limitations and animals as food

At the beginning of this section it should be emphasised that state limitations on animal usage in premodern Japan were themselves quite limited. From time to time, government decrees regarding consumption or hunting were announced. Various religious ideas were also present and could influence ways of thinking and behaviour. Yet comparable limitations were also present in Europe. It is not clear that premodern dietary restrictions in Japan were stricter than those in Europe; such a claim would require further research.

A 675 decree issued by the emperor Tenmu 天武 is frequently cited in the literature:

Henceforth the fishermen and hunters are to be restrained from making pitfalls or using spear-traps and such like contrivances. Moreover, from the 1st day of the 4th month until the 13th day of the 9th month, let no one set fish traps, closing the space. Further, let no one eat the flesh of kine [cattle], horses, dogs, monkeys, or barn-door fowls [chickens]. This prohibition does not extend to other kinds of meat (Aston 1972: II, 328–329).

The significance of this decree is sometimes exaggerated; Hudson (2021a) discusses the inaccurate claims made in this respect by archaeologist Yoshinori Yasuda 安田喜憲. Imamura (1987) notes that Tenmu's prohibition excludes deer and (wild) pigs, the most common sources of meat in Japan at the time. Uzawa (2008: 166) notes that the time of the year specified in the decree covers the rice harvest; the seasonal limits to hunting and fishing can be seen as

attempts to restrict access to food products not controlled by the state. The state wanted cereals—and peasants who grew those cereals and made their produce accessible. Animals, by contrast, could provide mobile and 'dangerous' sources of social power outside the state. Decrees such as that issued by Tenmu had existed in China much earlier. In the late first millennium BC, prohibitions were made in the last month of spring for 'nets for snaring animals and birds, and those mounted on long handles for birds, the concealment shelters for those shooting game, and the toxins used to poison animals'. Elvin (2004: 30) remarks that these tools were to be kept out of use in late spring but could still be employed later in the year.

It was during the Tokugawa period that the strictest sumptuary regulations were established in premodern Japan (Shively 1964). A mourning edict issued in 1688 stipulated 150 days defilement for contact with the meat or corpses of cattle or horses, as compared to 70 days for pigs, dogs, deer and wild boar, a difference likely reflecting the role of the former animals in agricultural labour (Shimizu 2010: 93). Some of the strictest regulations regarding animals were the 'Laws of Compassion' issued by the fifth Tokugawa shogun, Tsunayoshi 綱吉 (r. 1680–1709). Though popularly known as the 'Dog Shogun', Tsunayoshi's laws were primarily aimed at the protection of draft animals and provisions were made for shooting boar, deer and other agricultural pests. However, the laws seem to have had the effect of reducing meat consumption until around the 1730s (Shimizu 2010: 97–99).

The fundamental question of the extent to which both domesticated and wild animals were consumed in premodern Japan is surprisingly hard to answer. While documentary records often deal with various proscriptions related to animals, or else with aristocratic banquets (Cadwallader and Justice 2010; Kinski 2010; Rath 2010; von Verschuer 2017; Ōguchi 2021), it can be assumed that peasants in rural areas regularly hunted and consumed meat, though it is hard to

gauge the overall dietary contribution. Information about meat markets or shops in Edo comes primarily from travel accounts and the number of these places increased in the late Tokugawa period. For the most part, however, it was meat from wild animals that was sold and consumed (Shimizu 2010).

While humans in the Japanese archipelago made extensive use of suids during the Neolithic and Bronze Age, from around the middle of the first millennium AD the consumption of pork appears to have declined. This is usually explained as part of a cultural aversion to killing and eating animals following the introduction of Buddhism in the sixth century. However, this same period seems to have seen greater use of forests to raise pigs. The *Shoku Nihongi* 続日本紀 records that in 732, peasants in the Kinai region let loose forty pigs into the mountains. Zooarchaeological studies also support greater introgression between pigs and wild boar populations in Late Antiquity (Anezaki 2007). In China, pigs were usually raised on household waste in villages and other settlements; in Europe, by contrast, the pannage system let pigs loose into forests where they fed on acorns and other nuts (Shaw 1940; Parsons 1962; Koenig 2021). With the exception of Okinawa, Japan seems to have followed the pannage system (Sand 2022).

From the early modern period, pigs became more widely consumed in Japan, especially in urban centres such as Edo. Sites with significant numbers of *Sus* bones (both wild and domesticated) include the Satsuma domain residence in Edo, Osaka castle, Hakata, and Dejima harbour in Nagasaki (Maruyama 2018). Evidence from mtDNA reveals that new breeds of pigs were introduced from Southeast Asia during the Tokugawa period (Anezaki et al. 2018). Both archaeological and historical evidence show that shops selling meat grew in popularity at this time. As well as domesticated pigs, many wild animals were caught and eaten, including boar, deer, bear and raccoon dogs (Uchiyama 1992; Watanabe 2009). The causes of this increase in meat-eating are unclear, but likely reflect a combination of factors such as conspicuous consumption by townspeople, the overall status of Japan's economy, and the declining power of the Tokugawa shogunate.

As discussed above, cattle and horses were widely raised for use in farming, transport and warfare in premodern Japan. It is unclear to what extent these animals were consumed when dead. There was certainly a resistance against the regular utilisation of these animals for food, though this could be politicised. In a 1586 letter reflecting his concerns over Jesuit power in Japan, warlord Toyotomi Hideyoshi 豊臣秀吉 requested the Portuguese to hunt wild animals instead of consuming cattle and horses that were necessary for agriculture and transport (de Sousa 2019: 63). The extent to which the Portuguese, especially priests, ate horse meat is moot, considering that it was banned or at least discouraged

by the Catholic church.<sup>4</sup> The Jesuit response to Hideyoshi was guarded, stressing that this was a matter for Christian believers to decide themselves. The missionaries replied that 'Europeans did not follow the custom of eating the meat of such game animals, noting that even Japanese customarily ate horse meat' (Shimizu 2010: 95). The claim that Europeans did not eat wild game was clearly false, yet an appropriately strategic response to Hideyoshi.

In many parts of Eurasia, secondary products sensu Sherratt (1981) were an important means to expand the area of agricultural settlement through adapting to new environmental conditions (Ethier et al. 2017; Ivanova et al. 2018; Wilkin et al. 2020). In premodern Japan, while the exploitation of animals for their 'primary' products of meat and hides was common, secondary products were less widely used, though a type of cheese known as *so* was made from cow's milk in the Nara and Heian periods. This was consumed by the emperor and aristocracy, which offered it in court ceremonies, as evidenced by wooden plates used for this purpose in the remains of the imperial palace of Heijō-kyō 平城京 in Nara (Kaya 2014: 83). The extent to which such products spread to other classes is difficult to judge, but they could be paid as taxes to the court, resulting in specific regulations to control milk production (Watanabe 2005: 3–4). The importance of dairy products entailed the creation of a system of rotation for the supply of *so* to the Imperial court in 650. *So* was not the only dairy item consumed at the time: the variety of dairy products listed in the *Ishinpō* 医心方 medical treatise of 934 shows the popularity of these animal by-products, at least among the upper class (Kaya 2014: 84).<sup>5</sup> As a consequence of the importance of cattle-derived products, a specific order was issued in 713 for the appointment of fifty families of cattle ranchers destined to enhance dairy production (*Shoku Nihongi* VI, 713, translated by Snellen 1937). Based on the *Engishiki*, it has been calculated that around 1500 cows were bred for *so* production in Japan in the tenth century (Ishige 2001: 61).

### 2.3 Industrial uses of animals: a contested category

The most contested category of animal usage in premodern Japan relates to the production of animal hides, furs, bones, horns, antler, sinews and so forth. This production always

<sup>4</sup> Consumption of horse meat was banned by Pope Gregory III in the eighth century. In Spain, foals were sometimes eaten under the name 'red deer', while horsemeat could be used to feed sailors (Leteux 2012: 7–8).

<sup>5</sup> For instance, the text specifies to 'Make *raku* (a kind of curdling, maybe yoghurt) with milk, make *so* with *raku*, and make *daigo* with *so*' (Kaya 2014: 83). The exact composition of *daigo* is unknown but, as the term continued to be used in the sense of 'the best part', it is likely that it was related to milk skin (Watanabe 2005: 4).

comprised an essential part of the economy, yet historical analysis is complicated by issues related to the status of people involved in these trades. The roots of prejudice against these trades are much debated, but such discrimination continues to be a problem in contemporary Japan.<sup>6</sup>

Wool from sheep and goats was not utilised in premodern Japan. Recent research has shown that genetic changes associated with the development of sheep wool led to the appearance of woollen textiles around 2000 BC, with wool becoming widespread in Europe by 1600 BC (Kristiansen and Sørensen 2020: 317). However, there is no evidence for wool in premodern Japan, except for a few imported items in the Shōsōin 正倉院 imperial treasure house. The majority of the populace continued to use plant fibres such as hemp, ramie and straw, while silk was the textile of choice for East Asian elites. The political ecology of wool was complex and the absence of woollen textile production in premodern Japan cannot be explained by reductionist appeals to ‘civilisational’ principles as suggested by Yasuda (2013). Large flocks and more land were needed for wool production, which had particular labour demands. For Scandinavia, it has been calculated that 1 ha of land would have been required for 300–400 kg of flax or 1–2 kg of wool (Bender Jørgensen 2012). However, flax needed much more time to process, estimated at 58 workdays for 2 kg as compared to 15–20 days for the same amount of wool (Kristiansen and Sørensen 2020: 320). In Europe, woollen textiles also had an aesthetic side as their different properties of shape and (dyed) colour generated a distinct vocabulary of identity (Sørensen 1997). Takeda (1984, 2006) has discussed the politics of dress in Japan in Late Antiquity. Unlike in Tang China—where dress was used to mark ethnicity—Takeda argues that while a formal dress code was used in official contexts, the majority of the populace retained a diversity of clothing styles.

The absence of wool means that all animal clothing products in Japan would have been primary, obtained after the death and butchering of the animal concerned (including silk worms). The tanning of deer and other hides would have been an everyday activity during the Neolithic and Bronze Ages. From the late first millennium AD, however, there seems to be increased participation by specialist craft workers, sometimes involving people or techniques from the Korean peninsula. The *Nihon shoki* (XV, 29, translated by Aston 1972: I, 397) records the presentation to the court of two tanners from Koguryō 高句麗 in 488. These craftsmen were responsible for the introduction of a tanning technique

that required the extraction of horse and oxen brains (Matsui 2016: 132), a method which was probably the cause of the hole in a horse skull found at the Morinomiya 森の宮 site (Osaka) (Sekiyama 2016: 148). People involved in the tannery were called ‘artisans from Paekche’ or ‘people from Koguryō’, names which clearly point to the peninsular origin of these communities (Matsui 2016: 132). However, it cannot have been the case that all tanning in ancient Japan was done by immigrants and caution is required when interpreting these texts given the later association of such trades with ritual pollution and therefore with ‘outsiders’. The existence of local markets for animal hides is shown by regulations in the Ritsuryō code which specified the removal of skin, brains, antlers and gallbladders from government cattle and horses that died. If the animals died away from the relevant office, their skin and meat was to be sold at the nearest market, the profits being delivered to the local office as tribute (Matsui 2016: 131).

The mountainous interior of Japan is still home to large numbers of wild animals such as sika deer, wild boar and macaque monkeys. As agricultural pests, the default assumption must be that these animals were hunted throughout Japanese history. Animal furs and hides were also important commodities in the premodern East Asian economy and were widely traded (Shepherd 1993; Schlesinger 2017). By at least the medieval period, Japan began to import animal hides, especially deer, from Taiwan and Southeast Asia. In the seventeenth century, over 100,000 deerskins were exported from Taiwan to Japan in some years (Liu 1998). Four possibilities, not mutually exclusive, present themselves as an explanation for the large-scale importation of animal hides into Japan. The first is over-hunting. The second is that elites increasingly controlled access to forests and hunting. The third possibility relates to structural problems in the industries concerned. The fourth is that the association of hide processing with ritual pollution encouraged ‘outsourcing’ of supply. Over-hunting must be considered as a possibility; indeed, the demand for deerskins quickly led to a decline in deer numbers in Taiwan (Elvin 2004: 33). Processing animal hides and manufacturing objects from antler and horn was labour-intensive and tanning could be highly polluting of the natural environment. In England, medieval tanning was moved out of London and other urban centres to provincial towns where the environmental impacts were less concentrated (Yeomans 2007). In England, the early modern period also saw increased use of ivory and horn imported from India and Africa, while antler more or less dropped out of use as a raw material (Yeomans 2007: 110). Japanese authorities attempted to curtail the use of some imported materials. For example, Tokugawa-period regulations stipulated that combs should be made of wood or whalebone; thirty days confinement was established as punishment for using tortoise shell combs in 1756 (Shively 1964: 154). The possible role of ritual pollution is discussed below,

<sup>6</sup> Indeed, the issue goes beyond Japan, as shown by a recent publication by an American scholar who presents a highly discriminatory view of these people as ‘a heavily criminal extortion machine’. For a series of responses to this article, see Neary and Saito (2021).

although it should be emphasised that we are unaware of any evidence that this was directly connected to the import of animal products from overseas. Even if deerskins were imported from Taiwan, European reports from the seventeenth century suggest that they underwent further ‘tanning’ and processing in Japan, activities which were carried out by outcastes (Höllmann 1991: 271).

## 2.4 Animals as source of social power

The Japanese literature places considerable emphasis on limits to the use or consumption of animals, but those limits are usually seen as inherent to Japanese culture, or what Ikegami (1995: 8) terms ‘ethnomentality’, rather than based on class. This differs from Europe where there is a large literature about differential social access to animals (e.g., Pluskowski 2007, 2010; Grau-Solostea 2017). Premodern Japan saw a range of attempts by state authorities to limit animal usage—both wild and domesticated—in order to control or constrain peasants within its territories. Such policies could also be designed to limit the over-exploitation of natural resources, although it is impossible to determine on what basis the concept of over-exploitation was evaluated. These decrees were usually expressed through moralistic imperatives. As well as the Confucian emphasis on grain agriculture, it is widely assumed that Buddhism encouraged resistance to the taking of life and thus the consumption of meat.

Many aspects of food production in premodern Japan became associated with taboos and discrimination. As well as domesticated animals, pollution was connected to numerous things and activities including birth, death, menstruation, disease, fire, crime, riverbanks, moving large boulders and trees, and digging wells. Archaeological evidence suggests this discrimination dates back at least to Late Antiquity, though the way deviancy was understood changed over time (Amino 2012; Groemer 2001; Matsui 2016; Nagahara 1979; Sekiyama 2016). Rodrigues noted that the Japanese ‘regard a man who slaughters an animal reared in his house as cruel and unclean’ (Cooper 2001: 263), but provided no details of such people as a class of workers.<sup>7</sup> Discrimination against people whose families were previously associated with leather-working and animal butchery remains strong in some areas even today (DeVos and Wagatsuma 1973; Neary 1997; Amos et al. 2021).

If discriminated communities were more common in western than in eastern Japan (Amino 2012: 214–216), it was the imperial capital of Kyoto that was especially associated with fear of ritual pollution. Ikegami (1995: 57) understands this ‘cultural obsession with notions of purification and pollution’ as ‘the result of an agrarian lifestyle with a set of agricultural values that included not killing any creature

that had blood.’ However, this explanation seems improbable, perhaps reflecting the normative expectation that the emperor should be the guardian of ‘traditional’ values. Ideas connecting agriculture and ritual pollution were likely transmitted from the imperial court down to the peasantry rather than the other way round. Ikegami (1995: 58–61) goes on to summarise historical research linking the medieval rise of the samurai with non-agricultural groups in eastern Japan who frequently engaged in hunting animals. This also reflects a romanticised view of the past since it prioritises agriculture at the expense of other modes of production. Yet Ikegami’s analysis points to a basic contrast in Japanese history between ideologies of pollution, associated especially with the imperial court in Kyoto and which worked to limit the slaughter and consumption of animals, and a militaristic/hunting style which engaged in hunting wildlife for training and social display. The tension between these two positions is what gives premodern Japan its distinctive features regarding animal usage.

People discriminated against by the state in premodern Japan were called by various names, such as *mizunomi* 水飲み (‘water drinkers’), *atama-furi* 頭振り (‘head shakers’), *muen* 無縁 (‘unconnected’), *eta* 穢多 (‘greatly polluted’), *hinin* 非人 (‘non-humans’), and *kawata*.<sup>8</sup> In recent centuries, these people were subjected to a ‘dehumanizing rhetoric of pollution’ (Amos et al. 2021: 6); in the ancient and medieval periods their social position was more complex (Amino 2012). *Hinin* was originally a Buddhist term for a fearsome deity and was also used by monks to symbolise their withdrawal from society (Goodwin 2017). While Toshio Kuroda 黒田俊雄 argued that *hinin* had a ‘status outside the status system’, Amino emphasised the economic skills and functions of these people in medieval society. At first, the Yamato court excluded the whole idea of people existing outside of agricultural production: ‘there was no tolerance for the existence of those who had fled their communities. For that reason, exclusionary discrimination was neither possible ... nor demonstrable, as far as we can tell from surviving records’ (Amino 2012: 173). Within the Ritsuryō system there were nevertheless five categories of ‘base’ people distinguished from commoners and officials. Four of these were slaves, with the fifth category being people who guarded imperial tombs (Amino 2012: 173–174). As the Ritsuryō system of centralised government broke down, more people were included in the deviant category, though the reasons are debated.

According to Sahara (1993), discrimination against people who worked with dead animals derived from the fact that premodern Japanese were unfamiliar with such animals.

<sup>7</sup> Rodrigues went on to note that ‘they do not show this compassion toward human beings, because they kill them with greater ease and enjoyment than they would an animal’ (Cooper 2001: 263).

<sup>8</sup> *Kawata* could be written 皮田 meaning ‘hide field’, but other characters were also used, including 川田 (‘river field’).

Sekiyama (2016: 141) finds this argument unconvincing on the bases that Japan was not the only country to lack systematic animal husbandry and that there was a significant time lag between the introduction of cattle and horses and the rise of institutional discrimination against people who worked with those animals. The role of pollution and discrimination in premodern Japan is a complex topic but here we wish to emphasise two aspects relevant to our present discussion. The first is the elaborate social responses to ‘pollution’ found in early Japan, the second the role of the state in using discrimination to attempt to maintain or increase its power.

The so-called ‘cattle-herding children’ (*ushikai-warawa*) provide a useful example of the first point. These people had the children’s suffix *maru* 丸 appended to their names and in picture scrolls such as the *Ban Dainagon ekotoba* 伴大納言絵詞 they are depicted with long hair bound in a pony tail rather than with the usual topknot. Cormorant fishers also let their hair grow free, suggesting they were included in the same social category. Amino (2012: 194) notes that cattle are shown as wild, unruly beasts in these scrolls, suggesting the medieval view that ‘people who dealt with such animals were seen as having special powers unavailable to common people.’ This understanding changed by the Tokugawa period, but in Late Antiquity and the Middle Ages cattle and horses were regarded as animals with special powers which required special handling. Evidence suggests that butchers and tanners coexisted in cities with no particular exclusion for a long time (Sekiyama 2016: 158). During the tenth century, the state banned cattle and horses sacrifices in Kyoto, probably as a way to purify the capital by excluding pollution in order to avoid epidemics (Sekiyama 2016: 157). For this reason, tanning areas were segregated and the related workers began to be stigmatised after a gap of nearly four centuries following the introduction of horses and cattle to Japan (Matsui 2016: 133).

The second point relates to the way the state developed discriminatory practices against a range of groups whom it regarded as deviant. States strive to make production *legible*; wealth which was ‘illegible, concealable, and fugitive’ was distrusted and stigmatised (Scott 2017: 131). Scott notes that official Chinese distrust of the merchant class provides a classic example, and the same can be said for merchants in Tokugawa Japan. From the state’s perspective, ‘deviancy’ was a broad category of people who engaged in non-rice subsistence and who had fluid economic and residential relationships. Thus, the non-rice was inscribed into Japanese history as deviancy. In Japan, such people included day labourers in the capital, ‘rogue monks and butchers’ (*Engi-shiki*), and retainers and slaves who hunted with falcons or fished in the mountains. Legislation in 844 complained of ‘gangs of hunters’ polluting the river near Kamo shrine 賀茂神社 in Kyoto by butchering their meat (Hotate 2006: 190). In assigning visible features of ‘deviancy’ to such people,

the state could make their existence less concealable and fugitive.

### 3 Discussion: how unique were patterns of animal use in Japan?

The Japanese literature often contrasts a carnivorous Europe with a Japan that only ate plants and seafood. Such idealistic images ignore archaeological and historical research emphasising the complex diversity of foodways in Europe. This bias in the literature has prevented us both from understanding the role of animals in premodern Japan, and also from developing comparative approaches with the European sequence. In medieval Europe, meat was not only a luxury, it was also a strategic resource, a means through which religious groups attempted to distance themselves from aristocratic profligacy (Seetah 2007: 25). If wild animals were frequently hunted and eaten in Japan, how did that consumption differ from Europe? In both Japan and Europe (Thomas 2007), hunting could be a highly symbolic and ritualised activity for the aristocracy. In medieval Iberia, ‘High status social groups consumed wild mammals and birds more often [than peasants], and had access to a wider range of species’ (Grau-Sologestoa 2017: 192). Albalá (2007: 32) explains that ‘In the late Middle Ages wild foods were among the most esteemed items on banquet menus, primarily game and wildfowl but also fish, wild fruits, and vegetables.’ While further quantification is required, the same trend seems to have existed in Japan where, as in Europe, the medieval and early modern periods saw a shift toward increased use of domesticated over wild resources as the landscape became more controlled, yet, at the same time, wild resources were extolled in aristocratic consumption.

As in China (Cartier 1993), draught animals were of great importance in premodern Japan. Horses and cattle were employed for riding and to pull ploughs and carts. The use of animals in agricultural labour reflected a continuum of ecological and economic factors, in particular the delicate balance between fodder and traction (Hoffmann 2014: 124; Bray 2019: 124). In Europe, it was understood that horses were more expensive to feed than oxen, a point made in Walter of Henley’s *Husbandry* written in the late thirteenth century (Langdon 1982). In the 1930s, it was claimed that China had a higher ratio of draught animals to land than countries with less developed agriculture such as Italy (Cartier 1993: 8). Military uses of horses in Japan were certainly highly developed: one can hardly imagine the samurai without horses.

If various taboos surrounded animals and those who worked with them in Japan, comparable ideas could be found elsewhere. In early modern Europe, dishonourable trades included skinner and executioners, grave-diggers, latrine

cleaners, plague workers and prostitutes (Roberts 2009). Discrimination against tanners in Europe was partly a result of the environmental pollution connected with such work. In England the movement of tanners into provincial towns led to an improvement in their social status, with tanners even becoming mayors of Leicester and St Albans in the sixteenth century, though these men were probably traders rather than artisans (Yeomans 2007: 100). In Japan, the list of trades associated with discrimination was longer than in Europe and even included fisher folk (Hudson 2021b, 2022). Social taboos and discrimination could work to increase agricultural production by smaller family units. Controlling the size of farms was a way for the state to control the populace, a policy that invariably made it harder to raise animals. In northern China, from the mid-Tang onwards the authorities ‘clamped down on large estates that could afford teams of draught animals and mixed farming’ (Bray 2019: 122). This impacted gender and social relations: as Totman (1993: 248) explains, ‘A tiller could exercise more careful husbandry on [smaller farm] units while more intensively exploiting family labor—wife, children, unwed siblings, and elderly parents—because of their sense of engagement and dependence.’ Comparative research on social taboos and animal usage in Japan, Europe and elsewhere would be a fertile topic for the future.

The sparse zooarchaeological record for medieval and early modern Japan makes it difficult to generate quantitative data for the patterns of animal usage proposed above. Historical records provide some relevant indications, yet texts come with their own problems and, as emphasised by Uchiyama (1992), further zooarchaeological research is needed. Of course, Japan is not the only region in East and Southeast Asia where the relevant zooarchaeological records are patchy (cf. Piper 2017; Amano et al. 2021). On the Korean peninsula, we have very little information about domesticated animals before the first millennium AD, yet all the domesticated animals found in ancient Japan were likely introduced via Korea and the relationship between animal usage on the peninsula and in the Japanese archipelago is a key topic for the future.

## 4 Conclusions

The patterns of premodern animal usage discussed above were found all across Eurasia, though in varying degrees and combinations over time and place. The consumption of domesticated animals varied enormously depending on location, class and time. As a highly productive crop, wet rice was favoured by the Japanese state not just because of the final, state-accessible product, but also because it needed enormous inputs of labour tied to a particular landscape. In other words, ‘because wet rice fosters concentrated,

labor-intensive production, it requires a density of population that is, itself, a key resource for state-making’ (Scott 2009: 41). Given the geography of the Japanese archipelago, however, there was always a tension between limited areas of alluvial rice and the alternative economic practices encouraged by the mountains and seas. Many studies conclude or imply that rice was the main source of wealth for the premodern Japanese state within the framework of what D’Altroy and Earle (1985) call *staple finance*. But *wealth finance* from metals and mining, timber, marine products, furs and textiles, and other products was also crucial. Frequent violence and warfare in Japan made wealth finance a flexible source of economic power. This balance changed during the Tokugawa when ‘boosting agricultural productivity became the chief way for [regional lords] to enhance their incomes’ (Walthall 2012: 392), leading to a doubling of arable land between 1600 and 1720 (Brown 2015: 101). The seventeenth century also saw increased engineering of Japan’s ‘ecological inheritance’ (*sensu* Ellis 2015) through land reclamation and irrigation projects. By 1700, however, the limits to such growth had been reached (Totman 1993: 235). State policies aimed at separating rice farmers from other members of society played a significant role in limiting the adaptive diversity of agropastoralism in Japan. Although the state attempted to construct an ecological inheritance centred around wet-rice farming, the premodern economy maintained resilience through food globalisation and flexible articulation with non-rice subsistence practices. From the eighteenth century, that resilience began to break down under the rigid socio-ecological governance of the Tokugawa regime.

While a range of economic and cultural factors certainly influenced animal usage in premodern Japan, we conclude that those factors themselves were not especially distinctive to Japanese history. It is true that dairy products only seem to have been produced in Japan for a few centuries in Late Antiquity and were perhaps mainly limited to the aristocracy. Yet, of the many countries where dairy products were traditionally rarely consumed (Simoons 1970), cheese (*so*) production in ancient Japan was quite significant. Zooarchaeological research in Europe and elsewhere has shown that diets and food customs varied depending on class and other factors, but the pervasive assumption of Japanese cultural homogeneity has encouraged scholars to play down such differences. Writing about the Tokugawa period, for example, Nishimoto (2008c: 85) concludes that, ‘Although superficial differences can be seen between the rulers and commoners, the case of children keeping tortoises as pets shows that a distinctive Japanese view of animals, strongly influenced by Buddhism, formed the undercurrent [to the period].’ Here, Nishimoto refers to the humorous mid-nineteenth century *Bakumatsu fūzoku zukan* (幕末風俗図鑑, often translated as ‘Genre scenes

of the last days of the Tokugawa regime') but does not explain why the illustration of a child with a tortoise on a lead is connected with Buddhism or a 'Japanese view of animals', or why this depiction invalidates class criticisms of animal use. Previous archaeological research on animals in premodern Japan has often revolved around simplistic questions such as whether or not 'the Japanese' ate meat, or how Japanese views of nature were supposedly replaced by Western/Christian values in the nineteenth century. Against the background of such superficial framing, more interesting issues have been ignored. For instance, how did patterns of animal hunting, rearing and consumption change over time? What was the relationship between animals and economic or proto-industrial development? In Europe, we know that the relationship between hunting and social class changed significantly over the medieval period (e.g., Valenti and Salvadori 2007), but how was that same relationship perceived in Japan? The Japanese literature sometimes hints at these issues but rarely considers them in a systematic way.

In focusing on the role of the state in animal usage, we do not assume that the state was always able to impose its will; regulations regarding animals were socially negotiated. In this respect we differ from authors such as Berglund (2008: 62) who explains Japan's landscape history in terms of the impact of strong rulers—as contrasted with Scandinavia where the rule of the state, church and nobles was supposedly weaker. We argue that there is a need to supplement religious or culturalist views of nature in Japan to focus more on the role of human labour in the production and consumption of animals. Claims that premodern Japanese avoided consuming certain types of animals raises the question of how cultures organise their view of the natural world. What does it mean that, according to João Rodrigues in the late sixteenth century, the Japanese ate wild boar but not pigs (Cooper 2001: 263)? This is not a question that can be answered only by recourse to Buddhist or other religious discourse. Instead, there is a need to consider the broader political ecology of resource use in premodern Japan. Zooarchaeology has great potential to contribute to this debate, but a more flexible approach to the topic will be required.

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## References

- Akazawa, T. 1982. Cultural change in prehistoric Japan: receptivity to rice agriculture in the Japanese archipelago. In *Advances in World Archaeology*, eds. F. Wendorf, and A.F. Close, Vol. 1, 151–211. New York: Academic Press.
- Akazawa, T. 1986. Regional variation in procurement systems of Jomon hunter-gatherers. In *Prehistoric Hunter-Gatherers in Japan: New Research Methods*, ed. T. Akazawa and C.M. Aikens, 73–89. University of Tokyo Press.
- Albala, K. 2007. *The Banquet: Dining in the Great Courts of Late Renaissance Europe*. Champaign: University of Illinois Press.
- Amano, N., G. Bankoff, D.M. Findley, G. Barretto-Tesoro, and P. Roberts. 2021. Archaeological and historical insights into the ecological impacts of pre-colonial and colonial introductions into the Philippine archipelago. *Holocene* 31: 313–330.
- Amino, Y. 2012. *Rethinking Japanese History*. Ann Arbor: Center for Japanese Studies, University of Michigan.
- Amos, T., M. Ehlers, A. McKnight, D. Ambras, and I. Neary. 2021. Doing violence to buraku history: J. Mark Ramseyer's dangerous inventions. *The Asia-Pacific Journal/Japan Focus* 19 (9): e5597.
- Anezaki, T. 2007. Pig exploitation in the Southern Kanto region, Japan. *International Journal of Osteoarchaeology* 17: 299–308.
- Anezaki, T., 姉崎智子, T. Watanabe 渡部琢磨, Y. Yamane 山根洋子, and N. Ishiguro 石黒直隆. 2018. Satsuma Kagoshima han Shimazuke yashiki ato daini iseki shutsudo inoshishi tōkotsu no keitaiteki kaiseki to ko mtDNA bunseki 薩摩鹿児島藩島津家屋敷跡第2遺跡出土イノシシ頭骨の形態的解析と古mtDNA分析. *Dōbutsu Kōkogaku* 35: 1–11.
- Aston, W.G. 1972. *Nihongi: Chronicles of Japan From the Earliest Times to AD 697*. Rutland: Tuttle.
- Bäckström, Y., J. Mispelaere, A. Ingvarsson, M. Fjellström, and K. Britton. 2018. Integrating isotopes and documentary evidence: Dietary patterns in a late medieval and early modern mining community, Sweden. *Archaeological and Anthropological Sciences* 10: 2075–2094.
- Batten, B.L. 2006. *Gateway to Japan: Hakata in War and Peace, 500–1300*. University of Hawai'i Press.
- Bender Jørgensen, L. 2012. The introduction of sails to Scandinavia: raw materials, labour and land. In *N-TAG Ten: Proceedings of the 10th Nordic TAG Conference at Stiklestad, Norway 2009*, ed. R. Berge, M. Jasinski, and K. Sognnes, 173–181. Oxford: BAR International Series 2399.

- Berglund, B.E. 2008. Satoyama, traditional farming landscape in Japan, compared to Scandinavia. *Japan Review* 20: 53–68.
- Binois-Roman, A. 2016. To cut a long tail short: The tail-docking and gelding of lambs in western Europe. *Argos* 54: 132–139.
- Bowdler, S. 2002. Hunters and traders in northern Australia. In *Forager-traders in South and Southeast Asia: Long Term Histories*, ed. K.D. Morrison and L.L. Junker, 167–184. Cambridge University Press.
- Bray, F. 2019. Where did the animals go? Presence and absence of livestock in Chinese agricultural treatises. In *Animals Through Chinese History: Earliest Times to 1911*, ed. R. Sterckx, M. Siebert, and D. Schäfer, 118–138. Cambridge University Press.
- Brown, A. 2009. *Just Enough: Lessons in Green Living From Traditional Japan*. Tokyo: Kodansha International.
- Brown, P.C. 2015. Floods, drainage, and river projects in early modern Japan: Civil engineering and the foundations of resilience. In *Environment and Society in the Japanese Islands: From Prehistory to the Present*, ed. B.L. Batten and P.C. Brown, 96–113. Corvallis: Oregon State University Press.
- Cadwallader, G.S., and J.R. Justice. 2010. Stones for the belly: kai-seki cuisine for tea during the early Edo period. In *Japanese Foodways, Past and Present*, ed. E.C. Rath and S. Assmann, 68–91. University of Illinois Press.
- Cartier, M. 1993. La marginalisation des animaux en Chine. *Anthropozoologica* 18: 7–15.
- Chaudhuri, K.N. 1990. *Asia Before Europe: Economy and Civilisation of the Indian Ocean from the Rise of Islam to 1750*. Cambridge University Press.
- Como, M. 2007. Horses, dragons and disease in Nara Japan. *Japanese Journal of Religious Studies* 34 (2): 393–415.
- Cooper, M., ed. 2001. *João Rodrigues's Account of Sixteenth-Century Japan*. London: Hakluyt Society.
- Craig, Oliver, H. Saul, A. Lucquin, Y. Nishida, K. Taché, L. Clarke, A. Thompson, D. Altoft, J. Uchiyama, M. Ajimoto, K. Gibbs, S. Isaksson, C. Heron, and P. Jordan. 2013. Earliest evidence for the use of pottery. *Nature* 496: 351–354.
- Cubas, M., et al. 2020. Latitudinal gradient in dairy production with the introduction of farming in Atlantic Europe. *Nature Communications* 11: e2036.
- Cullen, L.M. 2003. *A History of Japan, 1582–1941: Internal and External Worlds*. Cambridge University Press.
- D'Altroy, T., and T. Earle. 1985. Staple finance, wealth finance, and storage in the Inka political economy. *Current Anthropology* 26: 187–206.
- de Sousa, L. 2019. *The Portuguese Slave Trade in Early Modern Japan: Merchants, Jesuits and Japanese, Chinese, and Korean Slaves*. Leiden: Brill.
- DeVos, G., and H. Wagatsuma. 1973. *Japan's Invisible Race*, 2nd ed. University of California Press.
- Diamond, J. 2005. *Collapse: How Societies Choose to Fail or Survive*. London: Allen Lane.
- Dodson, J., E. Dodson, R. Banati, X. Li, P. Atahan, S. Hu, R.J. Middleton, X. Zhou, and S. Nan. 2014. Oldest directly dated remains of sheep in China. *Scientific Reports* 4: e7170.
- Driver, J.C. 2004. Food, status and formation processes: a case study from medieval England. In *Behaviour Behind Bones: The Zooarchaeology of Ritual, Religion, Status and Identity*, (244–251), ed. S. Jones O'Day, W. Van Neer, and A. Ervynck, Oxford: Oxbow.
- Egami, Namio 江上波夫 and Makoto Sahara 佐原眞. 1990. *Kibamin-zoku wa kita!? Konai?! 騎馬民族は来た!? 来ない?!* (Did the Horsesiders Come to Japan or Not?). Tokyo: Shogakukan.
- Ellis, E.C. 2015. Ecology in an anthropogenic biosphere. *Ecological Monographs* 85 (3): 287–331.
- Elvin, Mark. 2004. *The Retreat of the Elephants: An Environmental History of China*. Yale University Press.
- Ervynck, A. 2004. *Orant, pignant, laborant*. The diet of the three orders in the feudal society of medieval north-western Europe. In *Behaviour Behind Bones: The Zooarchaeology of Ritual, Religion, Status and Identity*, eds. S. Jones O'Day, W. Van Neer, and A. Ervynck, 215–223. Oxford: Oxbow.
- Ethier, J., E. Bánffy, J. Vuković, K. Leshtakov, K. Bacvarov, M. Roffet-Salque, R.P. Evershed, and M. Ivanova. 2017. Earliest expansion of animal husbandry beyond the Mediterranean zone in the sixth millennium BC. *Scientific Reports* 7: e7146.
- Farris, W.W. 1995. *Heavenly Warriors: The Evolution of Japan's Military, 500-1300*. Revised paperback edition. Cambridge, MA: Council on East Asian Studies, Harvard University.
- Fujita, M., S. Yamasaki, H. Sugawara, and M. Eda. 2014. Body size reduction in wild boar (*Sus scrofa*) from the late Pleistocene Maehira fissure site in Okinawa-jima Island, Japan, with relevance to human arrival. *Quaternary International* 339–340: 289–299.
- Fuller, D.Q., and L. Qin. 2009. Water management and labour in the origins and dispersal of Asian rice. *World Archaeology* 41 (1): 88–111.
- Gakuhari, Takashi 覚張隆史. 2018. Kachiku no dōitai bunseki 家畜の同位体分析. *Kikan Kōkōgaku* 144: 51–55.
- Gluck, C. 1998. The invention of Edo. In *Mirror of Modernity: Invented Traditions of Modern Japan*, ed. S. Vlastos, 262–284. University of California Press.
- Goodwin, J.R. 2006. Introduction. In *Capital and Countryside in Japan, 300–1180: Japanese Historians Interpreted in English*, ed. J.R. Piggott, 166–169. Ithaca: East Asia Program, Cornell University.
- Goodwin, J.R. 2017. Outcasts and marginals in medieval Japan. In *Routledge Handbook of Premodern Japanese History*, ed. K.F. Friday, 296–309. Routledge.
- Grau-Sologestoa, I. 2017. Socio-economic status and religious identity in medieval Iberia: The zooarchaeological evidence. *Environmental Archaeology* 22: 189–199.
- Groemer, G. 2001. The creation of the Edo outcaste order. *Journal of Japanese Studies* 27: 263–293.
- Hanley, S.B. 1997. *Everyday Things in Premodern Japan: The Hidden Legacy of Material Culture*. Berkeley: University of California Press.
- Hayami, A. 2015. *Japan's Industrious Revolution: Economic and Social Transformations in the Early Modern Period*. Springer.
- Hesselink, Reinier H. 1991. The introduction of the art of mounted archery into Japan. *Transactions of the Asiatic Society of Japan* 6: 27–47.
- Hesselink, R.H. 2015. I go shopping in Christian Nagasaki: Entries from the diary of a Mito samurai, Ōwada Shigekiyo (1593). *Bulletin of Portuguese/Japanese Studies* 2: 27–45.
- Hoffmann, R.C. 2014. *An Environmental History of Medieval Europe*. Cambridge University Press.
- Höllmann, T.O. 1991. *Formosa and the trade in venison and deer skins*. In *Emporia, Commodities and Entrepreneurs in Asian Maritime Trade, c. 1400–1750*, ed. R. Ptak and D. Rothermund, 263–290. Stuttgart: Franz Steiner Verlag.
- Hongo, H. 2017. Introduction of domestic animals to the Japanese archipelago. In *The Oxford Handbook of Zooarchaeology*, ed. U. Albarella, et al., 333–351. Oxford University Press.
- Hongo, H., et al. 2007. Hunting or management? The status of *Sus* in the Jomon period in Japan. In *Pigs and Humans: 10,000 years of interaction*, ed. U. Albarella, et al., 110–130. Oxford.
- Hotate, M. 2006. Traffic between capital and countryside in *ritsuryō* Japan. In *Capital and Countryside in Japan, 300–1180: Japanese Historians Interpreted in English*, ed. J.R. Piggott, 169–208. Ithaca: East Asia Program, Cornell University.



- Hudson, M.J. 2019. Towards a prehistory of the Great Divergence: The Bronze Age roots of Japan's premodern economy. *Documenta Praehistorica* 46: 30–43.
- Hudson, M.J. 2021a. *Conjuring Up Prehistory: Landscape and the Archaic in Japanese Nationalism*. Oxford: Archaeopress.
- Hudson, M.J. 2021. Dragon divers and clamorous fishermen: Bronzisation and transcultural marine spaces in the Japanese archipelago. In *Globalization and Transculturality from Antiquity to the Pre-modern World*, ed. S. Autiero and M. Cobb, 103–119. Routledge.
- Hudson, M.J. 2022. Globalization and the historical evolution of Japanese fisheries. In *Maritime Prehistory of Northeast Asia*, ed. J. Cassidy, I. Ponkratova, and B. Fitzhugh, 97–122. Springer.
- Hudson, M.J., et al. 2022. Global processes of anthropogenesis characterise the early Anthropocene in the Japanese Islands. *Humanities & Social Sciences Communications* 9: e84.
- Ikegami, E. 1995. *The Taming of the Samurai: Honorific Individualism and the Making of Modern Japan*. Harvard University Press.
- Imamura, Keiji 今村啓爾. 1987. Shujin no keifu 狩人の系譜 (The roots of Japan's hunters). In *Nihon no kodai 10: sanjin no seigyō: 日本の古代10: 山人の生業* (Ancient Japan 10: Mountain People and Subsistence), ed. Ōbayashi Taryō, 73–118. Tokyo: Chūō kōronsha.
- Imamura, K. 1996. Jomon and Yayoi: The transition to agriculture in Japanese prehistory. In *The Origins and Spread of Agriculture and Pastoralism in Eurasia*, ed. David R. Harris, 442–464. London: UCL Press.
- Ishida, E. 1974. *Japanese Culture: A Study of Origins and Characteristics*. University of Tokyo Press and University Press of Hawai'i.
- Ishige, N. 2000. Japan. In *The Cambridge World History of Food*, eds. K.F. Kiple and K.C. Ornelas, Vol. 2, 1175–1183. Cambridge: Cambridge University Press.
- Ishige, N. 2001. *The History and Culture of Japanese Food*. London: Kegan Paul.
- Ishino, H. 1992. Rites and rituals of the Kofun period. *Japanese Journal of Religious Studies* 19 (2–3): 191–216.
- Ivanova, M., B. De Cupere, J. Ethier, and E. Marinova. 2018. Pioneer farming in southeast Europe during the early sixth millennium BC: Climate-related adaptations in the exploitation of plants and animals. *PLoS ONE* 13: e0197225.
- Jones, M.K., H.V. Hunt, E. Lightfoot, D. Lister, X. Liu, and G. Motuzaitė-Matuzevičiūtė. 2011. Food globalization in prehistory. *World Archaeology* 43: 665–675.
- Katō, Shinpei 加藤晋平. 1981. Jōmon, Yayoi bunka ni okeru inoshishi shiyō: sono keifu ni tsuite 縄文・弥生文化におけるイノシシ飼養: その系譜について (Raising of wild boar in the Jōmon and Yayoi cultures and its roots). In *Nihon to higashi Ajia no bunka kōryū no kisokuteki kenkyū* 日本と東アジアの文化交流の基礎的研究 (Basic Research on Cultural Exchange between Japan and East Asia), pp. 39–52.
- Kaya, H. 2014. Historical development of cheese manufacturing in Japan. *Bulletin of the IDF* 472: 83–88.
- Kawakatsu, H. 2006. Towards a civilization based on beauty, from civilizations based on truth and goodness. In *Cultural Diversity and Transversal Values: East-West Dialogue on Spiritual and Secular Dynamics*, ed. UNESCO, 84–89. Paris: UNESCO.
- Kawamura, A., C.-H. Chang, and Y. Kawamura. 2016. Middle Pleistocene to Holocene mammal faunas of the Ryukyu Islands and Taiwan: An updated review incorporating results of recent research. *Quaternary International* 397: 117–135.
- Kidder, J.E. 1985. The archaeology of the early horse-riders in Japan. *Transactions of the Asiatic Society of Japan, Third Series* 20: 89–123.
- Kinski, M. 2010. 'How to eat the ten thousand things': table manners in the Edo period. In *Japanese Foodways, Past and Present*, ed. E.C. Rath and S. Assmann, 42–67. University of Illinois Press.
- Kitō, Hiroshi 鬼頭宏. 2012. *Kankyō senshinkoku Edo* 環境先進国江戸 (The Environmentally Advanced Country of the Edo Period). Tokyo: Yoshikawa kōbunkan.
- Kobayakawa, A. 2021. Japan's modernization and discrimination: What are Buraku and Burakumin? *Critical Sociology* 47: 111–132.
- Koenig, Walter D. 2021. A brief history of masting research. *Philosophical Transactions of the Royal Society B* 376: e20200423.
- Kōno, Michiaki 河野通明. 2009. Nōkō to gyūba 農耕と牛馬, in K. Nakazawa (ed.), *Hito to dōbutsu no Nihonshi, 2: rekishi no naka no dōbutsutachi* 人と動物の日本史2: 歴史の中の動物たち: 96–126. Tokyo: Yoshikawa kōbunkan.
- Kreiner, J. 1996. Notes on the history of European-Ryūkyūan contacts. In *Sources of Ryūkyūan History and Culture in European Collections*, ed. J. Kreiner, 15–41. Munich: iudicium.
- Kristiansen, K., and M.L.S. Sørensen. 2020. Wool in the Bronze Age: concluding reflections. In *The Textile Revolution in Bronze Age Europe: Production, Specialisation, Consumption*, ed. S. Sabatini and S. Bergerbrant, 317–332. Cambridge University Press.
- Lach, D.F., and E.J. van Kley. 1993. *Asia in the Making of Europe. Volume III: A Century of Advance, Book Four: East Asia*. University of Chicago Press.
- Langdon, J. 1982. The economics of horses and oxen in medieval England. *The Agricultural History Review* 30: 31–40.
- Leteux, S. 2012. Is hippophagy a taboo in constant evolution? *Menu: Journal of Food and Hospitality Research* 1: 47–54.
- Ling, J., T. Earle, and K. Kristiansen. 2018. Maritime mode of production: Raiding and trading in seafaring chiefdoms. *Current Anthropology* 59 (5): 488–524.
- Liu, T.-J. 1998. Han migration and the settlement of Taiwan: the onset of environmental change. In *Sediments of Time: Environment and Society in Chinese History (165–199)*, ed. M. Elvin and T.-J. Liu. Cambridge University Press.
- Liu, X., and M.K. Jones. 2014. Food globalisation in prehistory: Top down or bottom up? *Antiquity* 88: 956–963.
- Liu, X., P.J. Jones, G.M. Matuzevičiūtė, H.V. Hunt, D.L. Lister, T. An, N. Przelomska, C.J. Kneale, Z. Zhao, and M.K. Jones. 2019. From ecological opportunism to multi-cropping: Mapping food globalisation in prehistory. *Quaternary Science Reviews* 206: 21–28.
- Lucas, L., and D.Q. Fuller. 2020. Against the grain: Long-term patterns in agricultural production in prehistoric Cyprus. *Journal of World Prehistory* 33: 233–266.
- Macfarlane, A. 2003. *The Savage Wars of Peace: England, Japan and the Malthusian Trap*. Basingstoke: Palgrave Macmillan.
- Macknight, C. 2013. Studying trepangers. In *Macassan History and Heritage: Journeys, Encounters and Influences*, ed. M. Clark and S.K. May, 19–39. Canberra: ANU Press.
- Maruyama, M. 丸山真史. 2018. Chū, Kinsei no inoshishi, buta riyō 中・近世のイノシシ・ブタ利用. *Kikan Kōkōgaku* 144: 56–58.
- Matsui, A. 2016. The use of livestock carcasses in Japanese history: an archaeological perspective. In *Coexistence and Cultural Transmission in East Asia*, ed. N. Matsumoto, H. Bessho, and M. Tomii, 127–139. Routledge.
- Mizoguchi, K. 2019. Re-thinking the origin of agriculture through the 'beginnings' in the Japanese archipelago. *Japanese Journal of Archaeology* 6: 95–107.
- Morii, Y., et al. 2002. Ancient DNA reveals genetic lineage of Sus scrofa among archaeological sites in Japan. *Anthropological Science* 110 (3): 313–328.
- Morris-Suzuki, T. 1998. *Re-Inventing Japan: Time, Space, Nation*. Armonk: M.E. Sharpe.
- Murayama, S. 2016. Livestock and the 'industrious revolution' in Tokugawa Japan (1603–1868). In *Local Realities and Environmental Changes in the History of East Asia*, ed. T.-J. Liu, 27–48. Routledge.

- Nagahara, K. 1979. The medieval origins of the *eta-hinin*. *Journal of Japanese Studies* 5: 385–403.
- Nagahara, Keiji 永原慶二. 2015. *Fujisan Hōei daibakuhatsu* 富士山宝永大爆発. Tokyo: Yoshikawa kōbunkan.
- Nakazawa, Katsuaki 中澤克昭. (Ed.). 2009. *Hito to dōbutsu no Nihonshi, 2: rekishi no naka no dōbutsutachi* 人と動物の日本史2: 歴史の中の動物たち. Tokyo: Yoshikawa kōbunkan.
- Neary, I. 1997. Burakumin in contemporary Japan. In *Japan's Minorities: The Illusion of Homogeneity*, ed. M. Weiner, 50–78. Routledge.
- Neary, I., and N. Saito. 2021. Japan's Burakumin (outcastes) reconsidered: a special issue refuting Ramseyer's interpretation. *Asia-Pacific Journal/Japan Focus* 19(9): e5591.
- Nelson, Thomas. 2004. Slavery in medieval Japan. *Monumenta Nipponica* 59: 463–492.
- Niimi, Michiko 新美倫子. 2008. Tori to Nihonjin 鳥と日本人 (Birds and the Japanese). In *Hito to dōbutsu no Nihonshi 1: dōbutsu no kōkogaku* (People and animals in Japanese history 1: The archaeology of animals), ed. T. Nishimoto, 226–252. Tokyo: Yoshikawa kōbunkan.
- Nishimoto, Toyohiro 西本豊弘. 1991. Yayoi jidai no buta ni tsuite 弥生時代のブタについて. *Bulletin of the National Museum of Japanese History* 36: 175–189.
- Nishimoto, Toyohiro 西本豊弘. (Ed.) 2008a. *Hito to dōbutsu no Nihonshi 1: dōbutsu no kōkogaku* 人と動物の日本史1: 動物の考古学 (People and animals in Japanese history 1: The archaeology of animals). Tokyo: Yoshikawa kōbunkan.
- Nishimoto, Toyohiro 西本豊弘. 2008b. Nihonjin to dōbutsukan 日本人と動物観 (The Japanese and views of animals). In *Hito to dōbutsu no Nihonshi 1: dōbutsu no kōkogaku*, ed. T. Nishimoto, 1–8. Tokyo: Yoshikawa kōbunkan.
- Nishimoto, Toyohiro 西本豊弘. 2008c. Dōbutsukan no hensen 動物観の変遷 (Changing views of animals). In *Hito to dōbutsu no Nihonshi 1: dōbutsu no kōkogaku*, ed. T. Nishimoto, 61–85. Tokyo: Yoshikawa kōbunkan.
- Nistelberger, H.M., et al. 2019. Sexing Viking Age horses from burial and non-burial sites in Iceland using ancient DNA. *Journal of Archaeological Science* 101: 115–122.
- Ōguchi, Y. 2021. Edo castle as a consumer: Procuring fish for the shogun's table. *Monumenta Nipponica* 76: 291–328.
- Oguma, E. 2002. *A Genealogy of 'Japanese' Self-Images*. Melbourne: Trans Pacific Press.
- Parsons, J.J. 1962. The acorn-hog economy of the oak woodlands of southwestern Spain. *Geographical Review* 52: 211–235.
- Pelloli, C. 2023. Rice: from medicine to food in Roman and medieval Italy. In *Agropastoralism and Languages Across Eurasia: Expansion, Exchange and Environment*, ed. M. Hudson, and M. Robbeets, pp. 141–152. Oxford: BAR International Series.
- Peng, H. 2019. *Trade Relations Between Qing China and Tokugawa Japan, 1685–1859*. Springer.
- Philippi, D.L. 1968. *Kojiki*. University of Tokyo Press.
- Pigière, F., I. Boone, M. Udrescu, W. Van Neer, and S. Vanpoucke. 2004. Status as reflected in food refuse of late medieval noble and urban households at Namur (Belgium). In *Behaviour Behind Bones: The Zooarchaeology of Ritual, Religion, Status and Identity*, ed. S. Jones O'Day, W. Van Neer, and A. Ervynck, 233–243. Oxford: Oxbow.
- Piper, P.J. 2017. The origins and arrival of the earliest domestic animals in mainland and island Southeast Asia: A developing story of complexity. In *New Perspectives in Southeast Asia and Pacific Prehistory (Terra Australis 45)*, ed. P.J. Piper, H. Matsumura, and D. Bulbeck, 251–271. Canberra: ANU Press.
- Pluskowski, A. 2007. Communicating through skin and bone: Appropriating animal bodies in medieval western European seigneurial culture. In *Breaking and Shaping Beastly Bodies: Animals as Material Culture in the Middle Ages*, ed. A. Pluskowski, 32–51. Oxford: Oxbow.
- Pluskowski, A. 2010. The zooarchaeology of medieval 'Christianism': Ideology, the treatment of animals and the making of medieval Europe. *World Archaeology* 42: 201–214.
- Rath, E.C. 2010. *Honzen dining: the poetry of formal meals in late medieval and early modern Japan*. In *Japanese Foodways, Past and Present*, ed. E.C. Rath and S. Assmann, 19–41. University of Illinois Press.
- Robbeets, M., ..., M. Hudson, and N. Chao. 2021. Triangulation supports agricultural spread of Transeurasian languages. *Nature* 599: 616–621.
- Roberts, P. 2009. Marginals and deviants. In *The European World 1500–1800: An Introduction to Early Modern History*, ed. B. Kümin, 64–73. Routledge.
- Rollet, B., and J. Diamond. 2004. Environmental predictors of pre-European deforestation on Pacific islands. *Nature* 431: 443–446.
- Saeki, A. 佐伯有清. 1967. *Ushi to kodajin no seikatsu* ウシと古代人の生活. Tokyo: Shibundō.
- Sahara, Makoto 佐原眞. 1975. Nōkō no kaishi to kaikyū shakai no keisei 農耕の開始と階級社会の形成, in *Iwanami Kōza Nihon Rekishi*, 岩波講座日本歴史 Vol. 1: 113–182. Tokyo: Iwanami.
- Sahara, M. 1983. Jomon and Yayoi cultures in world prehistory and patterns of animal usage in early Japan: a test of the horse rider theory. Paper presented at the XIth International Congress of Anthropological and Ethnological Sciences, Vancouver, August 1983. Unpublished manuscript in Haddon Library, Cambridge.
- Sahara, M. 1985. Dorei o motsu shokuryō saishūmin. *Rekishi Kōron* 11:47.
- Sahara, M. 1992. Rice cultivation and the Japanese. *Acta Asiatica* 63: 40–63.
- Sahara, Makoto. 1993. *Kiba minzoku wa konakatta* 騎馬民族は来なかった (The Horseriders Didn't Come to Japan). Tokyo: NHK.
- Sahara, M. 1999. Yayoi culture in the context of world history. In *Japanese as a Member of the Asian and Pacific Populations*, ed. Kazuro Hanihara, 197–203. Kyoto: International Research Center for Japanese Studies.
- Sand, J. 2022. People, animals, and island encounters: A pig's history of the Pacific. *Journal of Global History* 17: 355–373.
- Saris, J. 1941. *The First Voyage of the English to Japan*. Tokyo: The Toyo Bunko.
- Schlesinger, J. 2017. *A World Trimmed With Fur: Wild Things, Pristine Places, and the Natural Fringes of Qing Rule*. Stanford University Press.
- Schwerdtner Mániez, K., and C.A.S. Ferse. 2010. The history of Makasan trepang fishing and trade. *PLoS ONE* 5 (6): e11346.
- Scott, J.C. 1998. *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*. Yale University Press.
- Scott, J.C. 2009. *The Art of Not Being Governed: An Anarchist History of Upland Southeast Asia*. Yale University Press.
- Scott, J.C. 2017. *Against the Grain: A Deep History of the Earliest States*. Yale University Press.
- Screech, T. 2005. *Japan Extolled and Decried: Carl Peter Thunberg and the Shogun's Realm, 1775–1796*. London: Routledge.
- Seetah, K. 2007. The Middle Ages on the block: Animals, guilds and meat in the medieval period. In *Breaking and Shaping Beastly Bodies: Animals as Material Culture in the Middle Ages*, ed. A. Pluskowski, 18–31. Oxford: Oxbow.
- Sekiyama, H. 2016. Changes in the perception of cattle and horses in ancient Japanese society. In *Coexistence and Cultural Transmission in East Asia*, ed. N. Matsumoto, H. Bessho, and M. Tomii, 141–161. Routledge.
- Shaw, E.B. 1940. Geography of mast feeding. *Economic Geography* 16: 233–249.
- Shennan, S. 2018. *The First Farmers of Europe: An Evolutionary Perspective*. Cambridge University Press.

- Shepherd, J.R. 1993. *Statecraft and Political Economy on the Taiwan Frontier, 1600–1800*. Stanford University Press.
- Sherratt, A. 1981. Plough and pastoralism: aspects of the Secondary Products Revolution. In *Pattern of the Past*, ed. I. Hodder, G. Isaac, and N. Hammond, 261–306. Cambridge University Press.
- Sherratt, A. 1999. Cash-crops before cash: Organic consumables and trade. In *The Prehistory of Food: Appetites for Change*, ed. Chris Gosden and Jon Hather, 13–34. Routledge.
- Shimizu, A. 2010. Meat eating in the Kōjimachi district of Edo. In *Japanese Foodways, Past and Present*, ed. E.C. Rath and S. Assmann, 92–107. University of Illinois Press.
- Shively, D. 1964. Sumptuary regulation and status in early Tokugawa Japan. *Harvard Journal of Asian Studies* 25: 123–164.
- Simoons, F.J. 1970. The traditional limits of milking and milk use in southern Asia. *Anthropos* 65: 547–593.
- Sivaramakrishnan, K. 2005. Introduction to 'Moral economies, state spaces, and categorical violence.' *American Anthropologist* 107: 321–330.
- Snellen, J. B. (transl.) 1937. *Shoku Nihongi. Chronicles of Japan, continued from 697–791 AD*. Vol. II. *Transactions of the Asiatic Society of Japan* 14: 209–278.
- Sørensen, M.L.S. 1997. Reading dress: The construction of social categories and identities in Bronze Age Europe. *Journal of European Archaeology* 5 (1): 93–114.
- Spengler, R.N. 2019. *Fruit from the Sands: The Silk Road Origins of the Foods We Eat*. University of California Press.
- Spengler, R.N., S. Stark, X. Zhou, D. Fuks, L. Tang, B. Mir-Makhamad, R. Bjørn, H. Jiang, L.M. Olivieri, A. Begmatov, and N. Boivin. 2021a. A journey to the west: The ancient dispersal of rice out of East Asia. *Rice* 14: e83.
- Spengler, R.N., A.V. Miller, T. Schmaus, G.M. Matuzevičiūtė, B.K. Miller, S. Wilkin, W.T.T. Taylor, Y. Li, P. Roberts, and N. Boivin. 2021b. An imagined past? Nomadic narratives in Central Asian archaeology. *Current Anthropology* 62 (3): 251–286.
- Spriggs, M. 2007. The Neolithic and Austronesian expansion within Southeast Asia and into the Pacific. In *From Southeast Asia to the Pacific: Archaeological Perspectives on the Austronesian Expansion and the Lapita Cultural Complex*, ed. S. Chin and C. Sand, 104–140. Taipei: Academia Sinica.
- Takahashi, R., N. Ishiguro, A. Matsui, T. Anezaki, and H. Hongo. 2012. Morphological and molecular phylogenetic characteristics of dwarf *Sus* specimens from the Noguni shell middens in the Ryukyu Islands. *Anthropological Science* 120 (1): 39–50.
- Tanaka, S. 1993. *Japan's Orient: Rendering Pasts into History*. University of California Press.
- Takeda, Sachiko 武田佐知子. 1984. *Kodai kokka no keisei to ifukusei* 古代国家の形成と衣服性 (Clothing and the Formation of the Ancient State). Tokyo: Yoshikawa Kōbunkan.
- Takeda, S. 2006. Roads in the *tennō*-centered polity. In *Capital and Countryside in Japan, 300–1180: Japanese Historians Interpreted in English*, ed. J.R. Piggott, 150–165. Ithaca: East Asia Program, Cornell University.
- Thiede, U. 1998. *Auf Haustierspuren zu den Ursprüngen der Japaner: Vor- und frühgeschichtliche Haustierhaltung in Japan*. Munich: iudicium.
- Thomas, J.A. 2001. *Reconfiguring Modernity: Concepts of Nature in Japanese Political Ideology*. University of California Press.
- Thomas, R. 2007. Chasing the ideal? Ritualism, pragmatism, and the later medieval hunt in England. In *Breaking and Shaping Beastly Bodies: Animals as Material Culture in the Middle Ages*, ed. A. Pluskowski, 125–148. Oxford: Oxbow.
- Toby, R.P. 1984. *State and Diplomacy in Early Modern Japan*. Princeton University Press.
- Totman, C. 1986. Tokugawa peasants: Win, lose, or draw? *Monumenta Nipponica* 41 (4): 457–476.
- Totman, C. 1993. *Early Modern Japan*. University of California Press.
- Uchiyama, J. 1992. San'ei-chō and meat-eating in Buddhist Edo. *Japanese Journal of Religious Studies* 19: 299–303.
- Uetsuki, M. 植月学. 2018. Tōgoku ni okeru ushi uma no riyō 東国における牛馬の利用. *Kikan Kōkōgaku* 144: 47–50.
- Umehara, T. 1999. The civilization of the forest. *New Perspectives Quarterly* (1999 special issue): 40–48.
- Uzawa, Kazuhiro 鶴澤和宏. 2008. Nikushoku no henshen 肉食の変遷 (Changes in meat-eating). In *Hito to dōbutsu no Nihonshi 1: dōbutsu no kōkōgaku*, ed. T. Nishimoto, 147–175. Tokyo: Yoshikawa Kōbunkan.
- Valenti, M., and F. Salvadori. 2007. Animal bones: Synchronous and diachronic distribution as patterns of socially determined meat consumption in the Early and High Middle Ages in central and northern Italy. In *Breaking and Shaping Beastly Bodies: Animals as Material Culture in the Middle Ages*, ed. A. Pluskowski, 170–188. Oxford: Oxbow.
- Vaporis, C.N. 1986. Post station and assisting villages: Corvée labour and peasant contention. *Monumenta Nipponica* 41 (4): 377–414.
- Vlastos, S. 1998. Agrarianism without tradition: the radical critique of prewar Japanese modernity. In *Mirror of Modernity: Invented Traditions of Modern Japan*, ed. S. Vlastos, 79–94. Berkeley: University of California Press.
- von Verschuer, C. 2016. *Rice, Agriculture, and the Food Supply in Premodern Japan*. Routledge.
- von Verschuer, C. 2017. *Illustrated Debate over Wine and Rice (Shuhanron emaki): Dining and socializing in late Muromachi Japan*. *Monumenta Nipponica* 72: 189–222.
- Vries, P., and A. Vries. 2020. *Atlas of Material Life: Northwestern Europe and East Asia, 15th to 19th Century*. Leiden University Press.
- Walker, B.L. 2001. *The Conquest of Ainu Lands: Ecology and Culture in Japanese Expansion, 1590–1800*. University of California Press.
- Walthall, A. 2012. Peace dividend: agrarian developments in Tokugawa Japan. In *Japan Emerging: Premodern History to 1850: 391–401*, ed. K.F. Friday. Boulder: Westview.
- Watanabe, Kōji 渡部浩二. 2009. Edo no butanikushoku 江戸のブタ肉食 (Pork consumption in Edo). In *Hito to dōbutsu no Nihonshi 2: rekishi no naka no dōbutsutachi* 人と動物の日本史2: 歴史のなかの動物たち (People and animals in Japanese history 2: animals in history), ed. K. Nakazawa, 161–162. Tokyo: Yoshikawa Kōbunkan.
- Watanabe, S. 1989. *The Peasant Soul of Japan*. New York: St. Martin's Press.
- Watanabe, Z. 2005. The end of a 1,200-year-old ban on the eating of meat: The meat-eating culture of Japan at the beginning of Westernization. *Kikkoman Food Culture* 9: 2–8.
- Watanobe, T., et al. 2001. Ancient Mitochondrial DNA reveals the origin of *Sus scrofa* from Rebus Island, Japan. *Journal of Molecular Evolution* 52: 281–289.
- Watson, A.M. 1983. *Agricultural Innovation in the Early Islamic World*. Cambridge University Press.
- Watson, B. (Trans.) 2013. *Records of Miraculous Events in Japan: the Nihon Ryōiki*. New York.
- Wilkin, S., et al. 2020. Dairy pastoralism sustained eastern Eurasian steppe populations for 5,000 years. *Nature Ecology & Evolution* 4: 346–355.
- Wilson, C.A. 1984. *Food and Drink in Britain: From the Stone Age to Recent Times*. Penguin.
- Yasuda, Y. 2006. Sustainability as viewed from an ethos of rice cultivation and fishing. In *Cultural Diversity and Transversal Values: East-West Dialogue on Spiritual and Secular Dynamics*, ed. UNESCO, 106–110. Paris: UNESCO.
- Yasuda, Y. 2013. The great East Asian fertile triangle. In *Water Civilization: From Yangtze to Khmer Civilizations*, ed. Y. Yasuda, 427–458. Tokyo: Springer.
- Yeomans, L. 2007. The shifting use of animal carcasses in medieval and post-medieval London. In *Breaking and Shaping Beastly Bodies: Animals as Material Culture in the Middle Ages*, ed. A. Pluskowski, 98–115. Oxford: Oxbow.