

Interdisciplinary Research

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Here are some outstanding archaeological research reports, focusing on natural scientific methods that were published during fiscal 2012. For dating, there was a study using carbon obtained from plant opals (Udatsu, T. *et al.* “Study on Age Determination by Carbon in Plant Opal Collected from Ancient Agricultural Field”), (Oobayashi, J. & Okouchi, T. *Dendrochronologia* 31: 52–57). As for paleoclimatology, reconstruction of precipitation using oxygen isotope ratios of growth rings on trees was remarkable [Nakatsuka, T. *Kankyo no Nihonshi 1 (Environmental Japanese History Volume 1)*]. *Environmental Changes and Human Occupation in East Asia during OIS3 and OIS2* (BAR International Series 2352) analyzed climate changes in the core of Lake Nojiri in the past 72 000 years, as well as calibrated radiocarbon dates from Upper Paleolithic culture with previously calibrated radiocarbon dates from Japan’s pottery emergence phase. This paper also discussed mammals in the Japanese islands.

As for archeobotany, Itoh, T. and Yamada, M. eds. *Ki no Kokogaku: Shutsudo Mokuseihin Yozai Deetabeesu (Archaeology of Trees: Timber Database of Excavated Wooden Objects)* was published. It is the latest database with explanations on identification, preservation, regional characteristics in use of timber, and woodworking techniques. Accumulation of examples progressed further for analysis of seed impressions or starch remains on pottery. Examples were reported on detection of starch remains on stone tools from Incipient to Early Jomon (Shibutani, A. *Japanese Journal of Historical Botany* 21: 55–66), and a tool used to peel horse chestnuts (Kamijou, N. & Nakazawa, M. *Cultura Antiqua* 64: 340–354). On the study of pottery impression, discussions were exchanged on impressions of rice, foxtail millet, and millet in pottery from the latter half of Final Jomon in Tokai region [Nakazawa, M. & Matsumoto, Y. *Jomon Jidai (Jomon Period)* 23: 143–161] and utilization of foxtail millet and millet in the final phase of the Jomon Period in the highlands of Chubu [Nakayama, S. & Sano, T. *Yamanashiken Kokogaku Kyokaishi (Bulletin of Yamanashi Prefectural Archaeological Association)* 21: 85–97]. It was proposed that cultivation of red beans was started in various parts of Japan and the Korean peninsula more than 2000 years before the emergence of cultivated

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species of red beans, based on excavated examples in East Asia (Lee, G. *The Holocene* 23-3: 453–459). It was also reported that enlargement of red beans due to cultivation was detected in morphological characteristics of red bean residue in Final Jomon (Nishimoto, T. *et al. Zoo-archaeology* 29: 45–53). Plant material excavated from Torihama shell midden from Incipient Jomon was confirmed as sumac, and it was dated 12 600 cal BP by C-14 dating measurement. Although it is much older than the oldest Chinese lacquered object, the researcher cautiously concludes that sumac grew wild in Japan (Suzuki, M. *et al. Japanese Journal of Historical Botany* 21: 67–71).

The 20th anniversary issue (vol. 30) of *Zoo-archaeology* was published. It contains various themes such as subsistence, animal domestication, manufactured objects, and methodology and so on, indicating the spread of interest and development of methodology in the past 20 years. There were theses on paleopathology, geometric morphological measurement, and paleomicrobiology for which there are only few examples in Japanese zooarchaeology. Remains of a wild boar excavated from Noguni shell midden in Okinawa had different characteristics from modern wild boars in Okinawa both in morphology and mtDNA, and it was discussed that the boar remains contained larger genetic variability than boars from other regions (Takahashi, R. *et al. Anthropological Science* 120-1: 39–50). There was also a study that discussed historical fluctuation of Japanese eel population on the Sea of Japan coast, based on collected remains of Japanese eels, documents, and research collection of leptocephalus (Kojima, H. *et al. Zoo-archaeology* 29: 1–17).

As for anthropology, there were paleopathological studies such as on linear enamel hypoplasia among Jomon period foragers (Temple, D. *et al. American Journal of Physical Anthropology* 152: 230–238), study on the relationship between labor and spinal osteoarthritis in human bones of Okhotsk culture (Shimoda, Y. *et al. Anthropological Science* 120: 1–21), discussion on the cause of a nutritional gender gap in children in the modern era observed in linear enamel hypoplasia (Oyamada, J. *et al. Anthropological Science* 120: 97–101), and so on. On isotope analysis of Jomon skeletal remains, there was a study that discussed the low ratio of immigrants and differences in tooth ablation based on strontium isotope analysis (Kusaka, S. *et al. Journal of Anthropological Archaeology* 31: 551–563), a study on dietary difference based on gender and tooth ablation type from analysis of carbon and nitrogen isotope and strontium isotope (Kusaka, S. *Quarterly of Archaeological Studies* 59-1: 92–101), and a study that discussed migration of people in multiple groups, based on comparison between tooth crown measurement and strontium isotope (Morita, W. *et al. Anthropological Science* 120: 167–177). Carbon and nitrogen isotope analysis on epi-Jomon skeletal remains distinguished between groups with different weaning times and foods (Tsutaya, T. *et al. Journal of Archaeological Science* 40: 3914–3925).

As for material and production site analysis, there was a study on model dating of lead isotopes used for bronze object production site assessment (Mabuchi, H. *Archaeology and Natural Science* 63: 1–27), a study on arsenic-rich ironware and iron ores excavated from Japan and South Korea (Takatsuka, H. *et al. Bulletin of the National Museum of Japanese History* 177: 107–126), a study on negotiation history between the west and the east based on non-destructive chemical analysis of excavated glass using a portable X-ray fluorescent analysis device on site (Nakai, I. & Shindo, Y. *Modern Methods for Analyzing Archaeological and Historical Glass*: 445–457), a study on the transition from Chinese cinnabar to Japanese cinnabar during the Yayoi to Kofun period based on sulfur isotope analysis (Nishino, M. *et al. Kodaigaku Kenkyu (Quarterly of Archaeological Studies)* 196: 33–36), and so on.

Also, *Archaeological Journal* had special featured articles on site survey (No. 629), archaeological science of skeletal remains (No. 630), dating measurement (No. 632), and ancient DNA (No. 633). Outstanding articles were on the difference between C-14, calibrated, and historical dates (Oda, H. 632: 5–10), and on quality control of ancient DNA as a preliminary examination to decide the amount of specimen destruction required to gain expected results (Ohta, H. 630: 22–26).