

Material report: Two human skeletal remains suggesting the unique burials of the Jomon period excavated from the Nakatsu Shell Mound, Kurashiki City, Okayama Prefecture

Kazuhiro Sakaue

Department of Anthropology, National Museum of Nature and Science,
4–1–1 Amakubo, Tsukuba-city, Ibaraki 300–0005, Japan
E-mail: k-sakaue@kahaku.go.jp

Abstract The aim of this paper is to present the morphological descriptions and unique burial styles of human skeletal remains excavated from the Nakatsu shell mound, which is located at Tamashima kurosaki, Kurashiki City, Okayama Prefecture. The human skeletal remains of burial pit No.1 indicated that the bones of young individuals were buried in this pit, and the skull and long bones, except for forearms, had been removed intentionally. Those of burial pit No.2 was of a young adult female, and suggested the possibility of placing a pair of stones on the eyes of the deceased among the Jomon people that has never been reported earlier.

Key Words: Human skeletal remains, the Jomon period, collective secondary burial

Introduction

The social composition and customs of the Jomon period have been estimated mainly by analyses of burial systems, cemeteries, and settlements among archaeological sites (Harunai, 1973; Takahashi, 1991; Yamada, 1995, 2008). the discovery of a newly found burial system can provide clues to our understanding the society of the Jomon period.

This paper presents the morphological characteristics and unique burial styles of two individuals found at the same site. The site is the Nakatsu shell mound, which is located at Tamashima Kurosaki Kurashiki City, Okayama Prefecture. This site is also famous as the type site of Jomon pottery of the late Jomon period in western Japan. Two human skeletal remains were found as part of excavation research to confirm the area of the Nakatsu shell mound in 2018–2019 (Ono, 2020).

The burial pits No. 1 and No. 2 were close to each other, at a distance of approximately 1 m (Figure 1). Radiocarbon dating of the human skeletal remains of No. 1 indicated that it dates back to approximately 3,100 years, as the early stage of the final Jomon period (Seike *et al.*, 2021).

Description

The estimations for sex and age at death followed the criteria of Kajigayama and Sakaue (2014). Table 1 shows the results of the identification of bones found at the burial pit No.1 with the numbers that correspond to those in Figures 3, 5, and 6. Tables 2 and 3 indicate the cranial and postcranial measurements of the human skeletal remains of the burial pit No. 2. The definitions of all measurements followed Martin's (Baba, 1991) except for three measurements on the mid-shaft of the humerus. The mid-shaft position was defined as the lowest point of the deltoid tuberosity in this paper. The reference



Fig. 1. Two burial pits No. 1 and No. 2 in the Nakatsu shell mound.

data were quoted from the summarized data of many human skeletal remains of the middle to final Jomon periods (Ogata, 1981).

Figure 2 shows the human skeletal remains of the burial pit No.1 immediately after excavation. It appeared to have been a secondary burial because of the disturbance of its anatomical positions. The preservation state of this individual is shown in Figure 3. The remaining bones of the major part of the trunk, right and left forearms with hands, and right and left feet without cranium, the first cervical vertebra, majority of the right scapula and all left scapula, right and left humeri, majority of right innominate bone and all left one, right and left femurs, right and left tibias, and right and left fibula. It could be said that these bones belonged to one person because they had no duplicated elements, and the morphological traits of almost all the bones indicated those of a young individual. The category of age at the death of this individual was estimated as “Adolescent” (11–20 years of age) based on no fusion of distal epiphyseal bones of radius and ulna, and

ischial tuberosity (Scheuer and Black, 2000). The sex of the individual was unclear because there was no indication for estimation. The fourth and fifth vertebrae of the individual had the sagittal defects of cleft in the posterior part of the vertebral body without neural arch involvement (Figure 4). It can be thought to be a butterfly vertebra that is caused by failure of fusion of lateral chondrification centers during embryogenesis (Müller *et al.*, 1986). These changes in the adjacent vertebrae can result in scoliosis or kyphosis (Aufderheide and Rodriguez-Martin, 1998).

The skeletal assembly of No.1 could be divided into upper (Figure 5) and lower layers (Figure 6). The numbers in these pictures are in accordance with those in Table 1 and Figure 3. The bones painted in bluish shades indicated those on the right side, the reddish bones to those on the left side, and the grayish bones to vertebrae in these figures. As seen in Figure 5, the bones were dispersed without articulation except for the cervical vertebrae, and the bones on the right and left sides were commingled in the

Table 1. List of identification of No. 1 excavated from the Nakatsu shell mound.

| Number | Side | Identification | Number | Side | Identification |
|--------|-------|---------------------------------|--------|-------|---|
| 1 | right | upper central incisor | 75 | right | distal epiphysis of ulna |
| 2 | left | upper central incisor | 76 | left | ulna |
| 3 | right | upper lateral incisor | 77 | right | scaphoid |
| 4 | left | upper lateral incisor | 78 | left | scaphoid |
| 5 | right | upper 1st premolar | 79 | right | lunate |
| 6 | left | upper 1st premolar | 80 | left | lunate |
| 7 | right | upper 2nd premolar | 81 | right | trapezium |
| 8 | left | upper 2nd premolar | 82 | left | trapezium |
| 9 | | greater horn of hyoid bone | 83 | right | trapezoid |
| 10 | | 2nd cervical vertebra | 84 | left | trapezoid |
| 11 | | 3rd cervical vertebra | 85 | right | capitate |
| 12 | | 4th cervical vertebra | 86 | left | capitate |
| 13 | | 5th cervical vertebra | 87 | right | hamate |
| 14 | | 6th cervical vertebra | 88 | left | hamate |
| 15 | | 7th cervical vertebra | 89 | left | triquetrum |
| 16 | right | clavicle | 90 | right | 1st metacarpal |
| 17 | left | clavicle | 91 | left | 1st metacarpal |
| 18 | right | acromial epiphysis | 92 | right | 2nd & 3rd metacarpal |
| 19 | | manubrium of sternum | 93 | left | 2nd metacarpal & proximal phalanx bones |
| 20 | | body of sternum | 94 | left | 3rd metacarpal bone |
| 21 | | body of sternum | 95 | right | 4th metacarpal bone |
| 22 | | body of sternum | 96 | left | 4th metacarpal bone |
| 23 | right | 1st rib | 97 | right | 5th metacarpal bone |
| 24 | left | 1st rib | 98 | left | 5th metacarpal bone |
| 25 | right | 2nd rib | 99 | left | 1st proximal phalanx bone of hand |
| 26 | left | 2nd rib | 100 | left | 1st proximal phalanx bone of hand |
| 27 | right | 3rd rib | 101 | right | 2nd proximal phalanx bone of hand |
| 28 | left | 3rd rib | 102 | right | 2nd middle phalanx bone of hand |
| 29 | right | 4th rib | 103 | right | 2nd distal phalanx bone of hand |
| 30 | left | 4th rib | 104 | left | 2nd proximal phalanx bone of hand |
| 31 | right | 5th rib | 105 | left | 2nd middle phalanx bone of hand |
| 32 | left | 5th rib | 106 | left | 3rd proximal phalanx bone of hand |
| 33 | right | 6th rib | 107 | left | 3rd middle phalanx bone of hand |
| 34 | left | 6th rib | 108 | left | 4th proximal phalanx bone of hand |
| 35 | right | 7th rib | 109 | right | 4th middle phalanx bone of hand |
| 36 | left | 7th rib | 110 | right | 4th distal phalanx bone of hand |
| 37 | right | 8th rib | 111 | left | 4th middle phalanx bone of hand |
| 38 | left | 8th rib | 112 | left | 5th proximal phalanx bone of hand |
| 39 | right | 9th rib | 113 | right | patella |
| 40 | left | 9th rib | 114 | left | patella |
| 41 | right | 10th rib | 115 | right | calcaneus |
| 42 | left | 10th rib | 116 | left | calcaneus |
| 43 | right | 11th rib | 117 | right | talus |
| 44 | left | 11th rib | 118 | left | talus |
| 45 | right | 12th rib | 119 | right | navicular |
| 46 | left | 12th rib | 120 | left | medial cuneiform |
| 47 | | 1st thoracic vertebra | 121 | right | intermediate cuneiform |
| 48 | | 2nd thoracic vertebra | 122 | left | intermediate cuneiform |
| 49 | | 3rd thoracic vertebra | 123 | right | lateral cuneiform |
| 50 | | 4th thoracic vertebra | 124 | left | lateral cuneiform |
| 51 | | 5th thoracic vertebra | 125 | right | cuboid |
| 52 | | 6th thoracic vertebra | 126 | left | cuboid |
| 53 | | 7th thoracic vertebra | 127 | right | 1st metatarsal bone |
| 54 | | 8th thoracic vertebra | 128 | left | 1st metatarsal bone |
| 55 | | 9th thoracic vertebra | 129 | right | 2nd metatarsal bone |
| 56 | | 10th thoracic vertebra | 130 | left | 2nd metatarsal bone |
| 57 | | 11th thoracic vertebra | 131 | right | 3rd metatarsal bone |
| 58 | | 12th thoracic vertebra | 132 | left | 3rd metatarsal bone |
| 59 | | 1st lumbar vertebra | 133 | right | 4th metatarsal bone |
| 60 | | 2nd lumbar vertebra | 134 | left | 4th metatarsal bone |
| 61 | | 3rd lumbar vertebra | 135 | right | 5th metatarsal bone |
| 62 | | 4th lumbar vertebra | 136 | left | 5th metatarsal bone |
| 63 | | 5th lumbar vertebra | 137 | right | 1st proximal phalanx bone of foot |
| 64 | | 1st sacral vertebra | 138 | right | 1st distal phalanx bone of foot |
| 65 | | 2nd sacral vertebra | 139 | left | 1st proximal phalanx bone of foot |
| 66 | | 3rd sacral vertebra | 140 | left | 1st distal phalanx bone of foot |
| 67 | | 4th sacral vertebra | 141 | right | 2nd proximal phalanx bone of foot |
| 68 | | epiphysis of iliac crest | 142 | left | 2nd proximal phalanx bone of foot |
| 69 | | epiphysis of ischial tuberosity | 143 | left | 2nd middle phalanx bone of foot |
| 70-71 | right | radius | 144 | left | 3rd proximal phalanx bone of foot |
| 72-73 | left | radius | 145 | left | 3rd middle phalanx bone of foot |
| 74 | right | ulna | | | |

Table 2. Cranial measurements of No. 2 individual excavated from the Nakatsu shell mound.

| Martin's No. | Variables | No. 2 | | Martin's No. | Variables | No. 2 | |
|--------------|----------------------------------|--------|------------------------------|----------------|------------------------------------|--------|------------------------------|
| | | Female | Middle to Final Jomon Female | | | Female | Middle to Final Jomon Female |
| 1 | Maximum length | 183.1 | 176.6 | 67 | Bimental breadth | 47.7 | 58.9 |
| 5 | Basion-Nasion length | 99.6 | | 69 | Height of mandibular symphysis | 34.0 | 30.4 |
| 7 | Foramen magnum length | 34.6 | | 69(1) | Mandibular body height | 31.6 | 28.5 |
| 8 | Maximum breadth | 144.3 | 140.6 | 69(2) | Mandibular body height at M2 | 28.3 | |
| 9 | Least frontal breadth | 93.1 | 96.6 | 69(3) | Mandibular body breadth | 14.5 | 12.6 |
| 10 | Maximum frontal breadth | 121.3 | 118.5 | 69b | Mandibular body breadth at M2 | 16.9 | |
| 11 | Biauricular breadth | 129.0 | 123.4 | 70 | Height of mandibular ramus | 60.8 | 55.7 |
| 12 | Biasterionic breadth | 116.3 | | 71a | Minimum width of ramus | 37.5 | |
| 13 | Mastoid width | 111.2 | | 71(1) | Condylar-cornoid breadth | 36.7 | 35.6 |
| 14 | Minimum cranial breadth | 70.2 | | | Mandibular condyle breadth (right) | 22.4 | |
| 16 | Foramen magnum breadth | 32.0 | | | Mandibular condyle breadth (left) | 22.9 | |
| 17 | Basion-Bregma height | 133.9 | 137.4 | 72 | Total profile angle | 79.5 | |
| 23 | Horizontal circumference | 523.0 | 507.4 | 73 | Nasal profile angle | 47.6 | |
| 24 | Transverse arc | 302.0 | 308.8 | 74 | Alveolar profile angle | 66.0 | |
| 25 | Total sagittal arc | 374.0 | 362.6 | 79 | Mandibular angle | 120.1 | |
| 26 | Frontal sagittal arc | 119.0 | | | | | |
| 27 | Parietal sagittal arc | 128.0 | | 8/1 | Cranial index | 78.8 | 79.5 |
| 28 | Occipital sagittal arc | 127.0 | | 17/1 | Index | 73.1 | 78.0 |
| 29 | Frontal sagittal chord | 108.3 | | 17/8 | Index | 92.8 | 97.7 |
| 30 | Parietal sagittal chord | 113.8 | | (1 + 8 + 17)/3 | SchadelModulus | 153.7 | 151.5 |
| 31 | Occipital sagittal chord | 106.0 | | 9/10 | Index | 76.8 | 81.5 |
| 40 | Basion-Prosthion length | 100.6 | 100.1 | 9/8 | Index | 64.5 | 69.0 |
| 43 | Outer biorbital breadth | 106.8 | 106.7 | 8/12 | Index | 124.1 | |
| 43a | Bifrontal breadth | 102.2 | | 40/5 | Index | 101.1 | |
| | Nasion subtense (calculated) | 11.8 | | 16/7 | Index | 92.5 | |
| 44 | Biorbital breadth | 102.7 | 99.2 | 27/26 | Index | 107.6 | |
| 45 | Bizygomatic breadth | 135.9 | 134.2 | 28/26 | Index | 106.7 | |
| 46 | Bimaxillary breadth (zm) | 104.8 | 97.9 | 29/26 | Index | 91.0 | |
| 46b | Bimaxillary breadth (zm:a) | 104.7 | | 30/27 | Index | 88.9 | |
| | Subspinale subtense (calculated) | 20.7 | | 31/28 | Index | 83.4 | |
| 48 | Upper facial height | 65.7 | 64.0 | 43/8 | Index | 74.0 | |
| 48H | Upper facial height (Howells) | 61.5 | | 46/45 | Index | 77.1 | 73.2 |
| 48d | Malar height | 22.1 | | 48/45 | Index | 48.4 | |
| 49a | Interorbital breadth | 21.4 | | 48/46 | Index | 62.7 | 65.5 |
| 50 | Anterior interorbital breadth | 16.5 | | 9/45 | Index | 68.5 | 72.5 |
| 51 | Orbital breadth | 44.5 | 39.3 | 45/8 | Index | 94.2 | |
| 52 | Orbital height | 32.1 | 33.1 | 50/44 | Index | 16.1 | |
| 54 | Nasal breadth | 27.0 | 25.3 | 52/51 | Index | 72.2 | 84.1 |
| 55 | Nasal height | 43.9 | 46.4 | 54/55 | Index | 61.4 | |
| 57 | Least nasal breadth | 9.1 | | 61/60 | Index | 131.2 | |
| | Nasal subtense (calculated) | 3.1 | | 63/62 | Index | 92.8 | 83.1 |
| 60 | External palate length | 51.4 | | 68/65 | Index | 56.2 | 58.9 |
| 61 | External palate breadth | 67.4 | | 69(3)/69(1) | Index | 45.7 | 44.4 |
| 62 | Internal palate length | 47.5 | 43.2 | 69b/69(2) | Index | 59.8 | |
| 63 | Internal palate breadth | 43.8 | 35.8 | 71/70 | Index | 61.6 | 61.7 |
| 65 | Bicondylar breadth | 129.5 | | | Frontal index of flatness | 11.6 | |
| 66 | Bigonial breadth | 93.1 | 97.5 | | Zygomatic index of flatness | 19.8 | |
| 68 | Projective length of mandible | 72.8 | 70.0 | | Simotic index | 33.6 | |
| 65(1) | Bicononoid breadth | 97.1 | 97.4 | | | | |

upper layer of this burial pit. However, in the lower layer, it can be said that many bones had remained their side. Bone alignment from the 12th thoracic vertebra to the 5th lumbar vertebra with the right and left ribs, left hand, and left foot bones with small finger bones had been retained in anatomical position. The right and left hand bones were adjacent to the feet bones on the same sides, which meant that the deceased had

been buried without lying on its back but in squatting posture while holding its spine vertically or dorsal position with raising its back a little in this pit as its primary burial. It seemed that the disturbance of its anatomical position in the upper layer occurred later.

In the upper layer, two bone alignments of cervical vertebrae from 2nd to 3rd and from 4th to 6th were found away in each lump while main-

Table 3. Postcranial Measurements of No. 2 individual excavated from the Nakatsu shell mound.

| Martin's No. | Variables | No. 2 | | Middle to Final Jomon | Martin's No. | Variables | No. 2 | | Middle to Final Jomon |
|----------------|-----------------------------------|-------|-------|-----------------------|---------------|---|-------|-------|-----------------------|
| | | right | left | Female (right) | | | right | left | Female (right) |
| HUMERUS | | | | | 8/1 | Robusticity index | 19.3 | 18.9 | 20.1 |
| 5 | Maximum diameter of mid-shaft | 18.2 | 17.3 | 21.0 | 8/2 | Index | 515.0 | 524.8 | |
| 6 | Minimum diameter of mid-shaft | 14.2 | 13.1 | 15.2 | 10 | Sagittal diameter of upper-shaft | 23.3 | 22.4 | 22.1 |
| 6/5 | Index | 77.9 | 75.9 | 73.1 | 9 | Transverse diameter of upper-shaft | 28.2 | 27.8 | 28.2 |
| 7a | Circumference of mid-shaft | 52.0 | 49.0 | 60.7 | 10/9 | Index | 82.6 | 80.5 | 78.4 |
| 7 | Least circumference | 52.0 | 49.0 | | 16 | Sagittal diameter of neck | 27.8 | 25.8 | 22.6 |
| 12 | Width of articular surface | 40.1 | 39.0 | | 15 | Vertical diameter of neck | 32.4 | 28.8 | 26.7 |
| 13 | Trochlea depth | 23.7 | 24.0 | | 16/15 | Index | 86.1 | 89.8 | 85.0 |
| 14 | Width of fossa olecrani | 24.1 | 24.7 | | 18 | Sagittal diameter of head | 43.6 | 43.9 | 39.4 |
| RADIUS | | | | | 19 | Vertical diameter of head | 44.1 | 44.1 | 39.4 |
| 3 | Least circumference | 34.0 | 34.0 | | 21 | Bicondylar breadth | 71.4 | 72.9 | 69.3 |
| 4 | Maximum transverse shaft diameter | 15.0 | 15.0 | 14.5 | 23 | Length of lateral condyle | 60.2 | 59.8 | 54.3 |
| 5 | Minimum sagittal shaft diameter | 9.7 | 9.4 | 10.8 | 24 | Length of medial condyle | 60.4 | 60.2 | 54.0 |
| 5/4 | Index | 64.5 | 62.7 | 72.0 | 28 | Torsion angle | 10.9 | 11.1 | 22.3 |
| 4(1) | Transverse head diameter | 21.5 | | | 29 | Collo-diaphyseal angle | 137.0 | 139.0 | 122.8 |
| 5(1) | Sagittal head diameter | 23.0 | 30.1 | | 30 | Condylo-diaphyseal angle | 79.3 | 79.6 | 81.0 |
| ULNA | | | | | TIBIA | | | | |
| 1 | Maximum length | | 240.0 | 231.7 | 3 | Breadth of proximal epiphysis | 68.3 | | 64.5 |
| 3 | Least circumference | 31.5 | 31.0 | | 8 | Maximum diameter of mid-shaft | 26.4 | 26.5 | 28.1 |
| 6(1) | Breadth of proximal epiphysis | 21.0 | 21.1 | | 9 | Minimum diameter of mid-shaft | 17.6 | 18.2 | 19.5 |
| 7 | Depth of olecranon | 21.8 | 21.6 | | 9/8 | Index | 66.6 | 68.7 | 69.8 |
| 7(1) | Trochlear notch height | 20.1 | 20.9 | | 8a | Maximum diameter at nutrient foramen | 29.6 | 28.6 | 30.2 |
| 11 | Sagittal shaft diameter | 12.1 | 11.9 | 12.6 | 9a | Transverse diameter at nutrient foramen | 20.1 | 19.9 | 20.6 |
| 12 | Transverse shaft diameter | 15.4 | 15.3 | 14.1 | 9a/8a | Index | 67.8 | 69.6 | 68.0 |
| 11/12 | Index | 78.6 | 77.2 | 80.7 | 10 | Circumference of mid-shaft | 72.0 | 70.5 | 75.9 |
| 11a | Sagittal head diameter | | 17.2 | | 10a | Circumference at nutrient foramen | 80.0 | 76.0 | |
| 12a | Transverse head diameter | 16.1 | 15.8 | | FIBULA | | | | |
| FEMUR | | | | | 1 | Maximum length | 335.0 | 337.0 | 313.4 |
| 1 | Maximum length | 415.0 | 415.0 | 392.5 | 2 | Maximum diameter of mid-shaft | 12.2 | 11.9 | 14.2 |
| 2 | Physiological length | 412.0 | 412.0 | | 3 | Minimum diameter of mid-shaft | 10.1 | 10.2 | 10.2 |
| 6 | Sagittal diameter of mid-shaft | 26.1 | 25.0 | 26.2 | 3/2 | Index | 82.9 | 85.6 | 72.3 |
| 7 | Transverse diameter of mid-shaft | 25.8 | 26.2 | 23.8 | 4 | Circumference of mid-shaft | 35.0 | 35.0 | 42.6 |
| 6/7 | Index | 101.2 | 95.4 | 110.6 | 4(1) | Medio-lateral diameter of head | | 26.6 | |
| 8 | Circumference of mid-shaft | 80.0 | 78.5 | 79.8 | | | | | |



Fig. 2. The human skeletal remains at the burial pit No. 1 immediately after excavation.

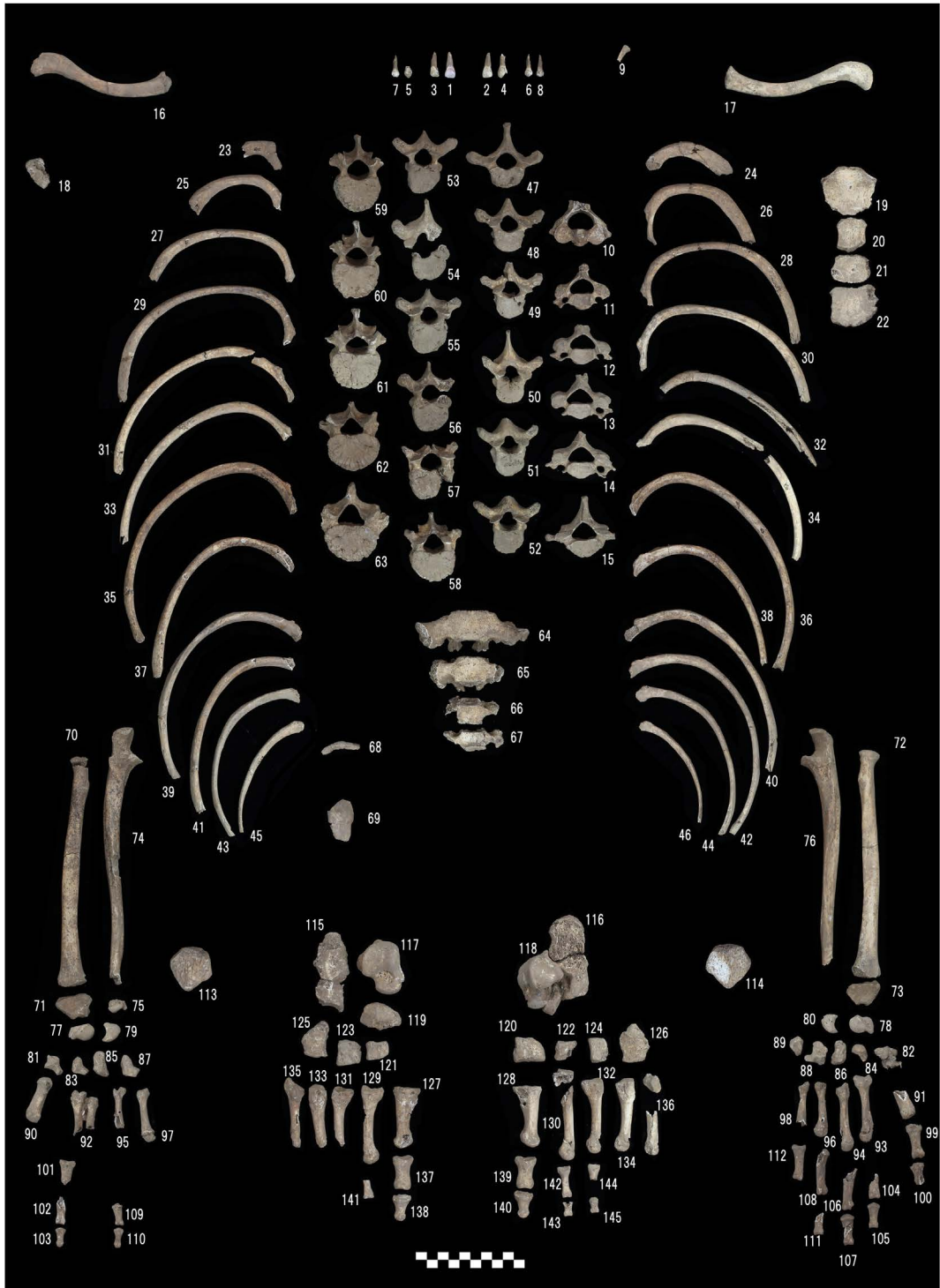


Fig. 3. Photographs of human skeletal remains at No. 1. The numbers beside the bones correspond to those in Table 1 and Figures 3, 5, and 6.

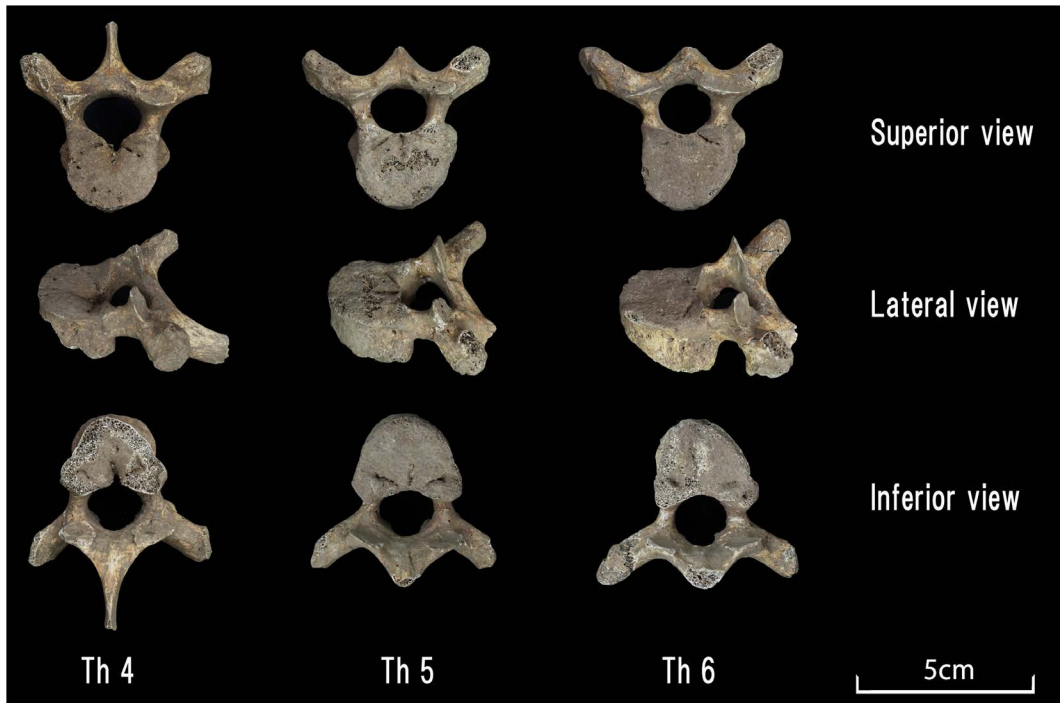


Fig. 4. some views of the fourth, fifth, and sixth thoracic vertebrae at No. 1. The fourth and fifth vertebrae had sagittal defects of the cleft in their vertebral bodies.

taining their articulations (10·11 and 12·13·14, respectively, in Figure 5). Furthermore, the 1st cervical vertebra was missing because it might have been articulated with its cranium when disturbed. This indicated that this disturbance of burial may have occurred when almost all the soft tissues except for some ligaments had been decayed.

In the lower layer, the sacral vertebrae maintained their articulations with some disturbances. In contrast, the right and left innominate bones that had been articulated with these sacral vertebrae had disappeared. The right and left patellae (113 and 114 in Figure 6) were found on the same sides of the pit, which assumed that the knee joint had been located at this point. Nonetheless, the right and left long leg bones (femur, tibia, and fibula) also disappeared. Although the left radius had been disarticulated and moved to the upper layer (72 in Figure 5), it was left in keeping with its distal epiphysis. These incidents

suggest that the bones that disappeared should have been intentionally picked up by someone.

The human skeletal remains of the burial pit No. 2 maintained the anatomical position as seen in Figure 7. This individual was buried and laid on the back by folding the knees. The preservation state of this individual is shown in Figures 8 and 9. The sex of the individual was identified as female based on the morphological characteristics of the greater sciatic notch and the existence of the preauricular sulcus of the innominate bone (Buikstra and Ubelaker, 1994). The age at death was classified as “Young adult” (age 20–30). The estimated stature was 150.3 cm using the formulae developed by Fujii (1960). No pathological changes were observed. The upper and lower canines of both sides were extracted during her lifetime, which is believed to be of a ritual tooth ablation during the Jomon period.

The remarkable characteristics of this individual are in her burial style. As demonstrated in



Fig. 7. The human skeletal remains at the burial pit No. 2 immediately after excavation.

Figures 7 and 10, a piece of stone was stuck at the lower margin of the right orbit when she was found. In order to unearth this stone and skull, the skull embedded with soil was carried to the anthropological laboratory of the National Museum of Nature and Science, Tokyo. While cleaning carefully, the other stone could also be found in the left orbit (Figure 10). The stone stuck in the right orbit was assumed to have a cuboid shape with a maximum length of 18.9 mm, maximum breadth of 9.2 mm, and maximum thickness of 3.5 mm. It has a large and flat surface and two relatively keen edges, which look like a flake of stone tool probably made of Sanukite (left side of Figure 11). The stone contained in the left orbit was assumed to be of a triangular prism shape with the maximum length of 12.7 mm, maximum breadth of 11.7 mm, and

maximum thickness of 9.2 mm (right side of Figure 11). These stones could fall into her orbits occasionally. However, no stone over 3 mm in diameter was found in the soil around her skull, except for these two stones in the orbits after cleaning. These stones were found inside each orbit, which may have been caused by the entry of a small amount of soil into the orbits after the corruption of the eyeball. Therefore, it is possible that these stones were located intentionally on the right and left eyelids or eyeballs when she was buried. Even so, it is unclear whether the stone sticking into the margin of the right orbit is artificial or not.

Discussion

The aim of this paper is to present two unique burial styles of skeletal remains excavated from the Nakatsu shell mound. The human skeletal remains found at the burial pit No. 1 indicated that some bones were remaining after some were removed for the collective secondary burial. Those found at the burial pit No. 2 seemed to show the possibility of placing a pair of stones on the eyes of the deceased among the Jomon people that had never been reported before.

The similarity of the removed bones of the burial pit No. 1 individual can be seen in bones formed by the “Banjo-shuseki bo,” which was the collective secondary burial with long bones collected from some individuals piled in square or pentagon that contained some skulls and upper limbs bones inside. Mizushima *et al.* (2004) pointed out that the bone elements of the “Banjo-shuseki bo” found in the Hobi shell mound were composed of skulls, upper limb bones with scapulae, and lower limb bones with innominate bones, and biased toward a higher representation of the lower limb bones. Although the human skeletal remains of the burial pit No. 1 of the Nakatsu shell mound was restricted to an individual, all long bones of the lower limbs were removed in contrast with the long bones of the forearms left. Interestingly, these collective secondary burials have been reported in the Kanto,



Fig. 8. Photographs of the skull at No. 2.

Tohoku, and Chubu districts, but never in the Chugoku district of Japan.

Extraordinary burials, such as multiple burial and collective secondary burial, were recognized after the late Jomon period, which had been discussed in relation to the changes in their socio-

cultural structure in the Kanto district (Yamada, 1995, 2008; Ishikawa, 2014). The burial style of No.1 suggests that the Jomon people after the late Jomon period had widely shared the idea that the same type of bone elements was collected for the secondary burial.



Fig. 9. Photographs of the postcranial bones at No. 2.

The burial custom of placing objects on the eyes can be seen in ancient Egypt and Greece. Although there is no clear evidence at burial pit No. 2 that the Jomon people also had this custom, this possibility cannot be denied. This will likely require further archaeological discoveries.

Acknowledgements

I wish to thank Ms. A. Nakatsuka and Ms. M. Kajigayma (The National Museum of Nature and Science, Tokyo) for their excellent preparation and reconstruction of specimens, and extensive support. I also wish to express my sincere grati-

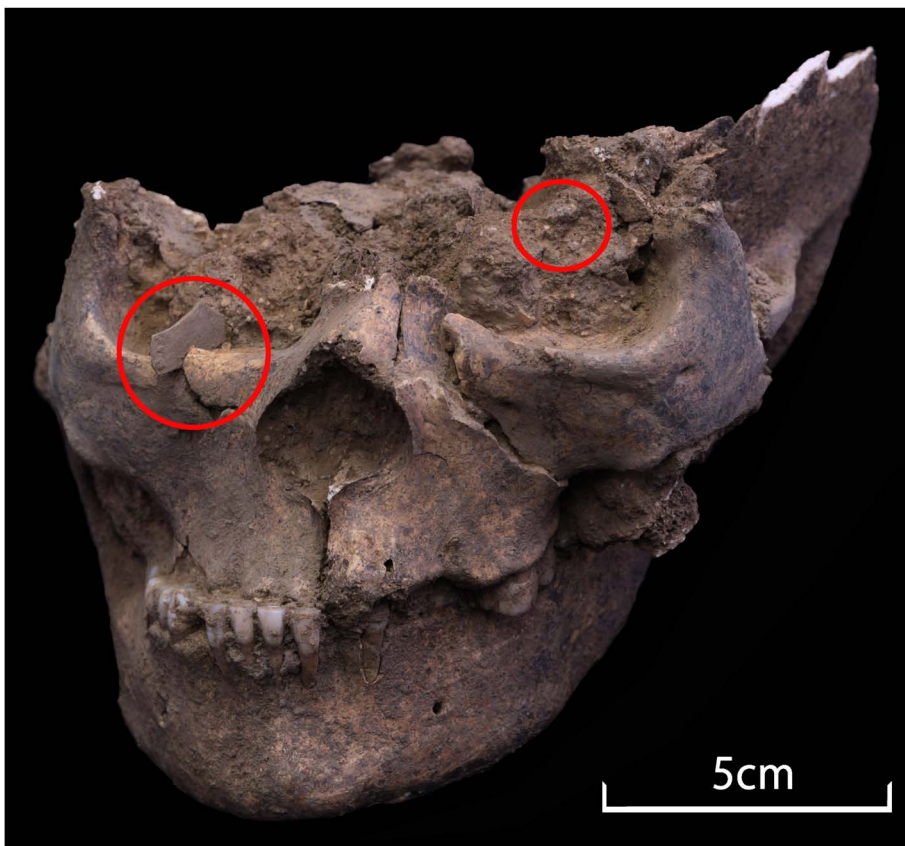


Fig. 10. Frontal view of the face at No. 2.
Circles indicate the stones in each orbit.



Fig. 11. Stones found in each orbit.
The photos on the left show the stone found in the right orbit, and the photos on the right show the stone in the left orbit.

tude to Dr. N. Adachi, professor at the University of Yamanashi, and Mr. M. Ono, senior curator of the Kurashiki Archaeological Center, for their helpful suggestions.

Reference

- Aufderheide, A. C. and C. Rodriguez-Martin (1998) *The Cambridge encyclopedia of Human paleopathology*. Cambridge University Press, Boston.
- Baba, H. (1991) *Anthropology. Additional volume 1, II: Osteometry*. Yuzankaku, Tokyo. (in Japanese).
- Buikstra, J. E. and D. H. Ubelaker (1994) *Standards for datacollection from human skeletal remains. Research Series. Arkansas Archaeological Survey, Fayetteville* 44.
- Fujii, A. (1960) *Sisikotutyou no nagasa to sintyoutonokankeinituite (Relationship between long bones and stature)*. *Juntendou daigaku taiikugakubu kiyou (Bulletin of the School of Physical Education, Juntendo)* 3: 49–61.
- Harunari, H. (1973) *Bashi no igi (1) (The significance of ritual tooth ablations (1))*. *Quarterly of Archaeological Studies* 20: 25–48 (in Japanese).
- Ishikawa, T. (2014) *Social complexity in the Late Jomon period: The constitution of the Shimo'ota shell mound cemetery of the Boso Peninsula, eastern Kanto, Japan*. *Japanese Journal of Archaeology* 2: 3–33.
- Kajigayama, M. and K. Sakaue (2014) *Material Report: Human skeletal remains newly added in the 2013 academic year to the Human osteological collection at the department of Anthropology, National Museum of Nature and Science, Tokyo*. *Bulletin of the National Science Museum Series D* 40: 25–42.
- Mizushima, S., K. Sakaue and G. Suwa (2004) *Human bones of the Latest Jomon period Hobi shell mound "Banjo-shuseki" burials*. *Anthropological Science (Japanese series)* 112: 113–125 (in Japanese with English summary).
- Müller F., R. O'Rahilly and D. R. Benson (1986) *The early origin of vertebral anomalies, as illustrated by a 'butterfly vertebra.'* *Journal of Anatomy* 149: 157–169.
- Ogata, T. (1981) *Jomon Jidai jinkotsu (Human skeletal remains of the Jomon period)*. In Ogata, T. (ed.), *Jinruigaku Koza, 5: Nihonjin, I. Yuzankaku, Tokyo*, pp. 27–55 (in Japanese).
- Ono, M. (2020) *Nakatsu kaiduka hani kakuninchosagaiyo (Overview of the excavation research to confirm the area of the Nakatsu shell mound)*. *The Annual Report of Kurashiki Archaeological Center* 17: 36–38.
- Scheuer, L. and S. Black (2000) *Developmental juvenile-osteology*. Elsevier Academic Press, London.
- Seike, A., M. Sakamoto and M. Takigami (2021) *Archaeological report on the chronology of a humanbone of the Jomon periodexcavated at Nakatsu Shell Mound, Kurashiki-shi, Okayama pref.* *Bulletin of the National Museum of Japanese History* 228: 341–344.
- Takahashi, R. (1991) *Jomon jidai no bousei (Mortuary practices of the Jomon Period)*. In Yamagishi, R. (ed.) *Mortuary practices of primeval and ancient*. Douseisha, Tokyo, pp. 48–84 (in Japanese).
- Yamada, Y. (1995) *Tasugassourei no igi (Significance of mortuary cases of multiple-individual burials)*. *Quarterly of Archaeological Studies* 42: 52–67 (in Japanese).
- Yamada, Y. (2008) *Jinkotsushutudorei ni miru jomon no bousei to shakai (Mortuary practices and society of the Jomon Period as seen from skeletal remains)*. Douseisha, Tokyo (in Japanese).