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# Human Skeletal Remains of the Heian Period from the Tekiana Cave Site on Tobi-shima, Yamagata Prefecture

**Bin Yamaguchi[1] and Hajime Ishida[2]**

[1] Emeritus Anthropologist, National Science Museum, Tokyo,
3–23–1 Hyakunincho, Shinjuku-ku, Tokyo, 169–0073 Japan
[2] Department of Anatomy, Faculty of Medicine, University of the Ryukyus,
207 Uehara, Nishihara-cho, Okinawa, 903–0215 Japan

**Abstract** An almost complete adult male skull, two incomplete adult female crania, and several adult limb bones of the early historic time (the Heian period), discovered in the Tekiana cave site on Tobi-shima Island in the Sea of Japan, were measured and described. Comparison was made with the recent Japanese, protohistoric Japanese of the Kofun period, the Jomon remains, the recent Ainu in Hokkaido, and a nearly contemporary skeletal series from Troickoe in the Amur valley. The male skull showed the closest resemblance to the Jomon remains, and the two female crania were closest either to the protohistoric Kofun series or the recent Japanese, both in metric and morphological comparisons. This probably implies that there was some element retaining archaic Jomon-like morphological features among the population of early historic times in the northern part of Honshu Island.
**Key words:** Human remains, Heian Period, Tekiana cave, Tobi-shima, Jomon.

Tobi-shima is an island in the Sea of Japan, about 23 km off the shore of the northern part of Yamagata Prefecture. There is a natural cave at a small point in the middle of the southeastern coast of the island. It has been called 'Tekiana' (meaning 'the cave of aliens') by local people. The land register of the cave is 92 Kengamine, Nakamura, Tobi-shima, Sakata-shi, Yamagata Prefecture. The mouth of the cave, opening to the south, is about 1.5 m in width and height, and about 4.5 m above sea level.

Human skeletal remains were first discovered, with some shells and potsherds, by three schoolchildren in 1964. This led to an archaeological excavation by a team consisting of the staffs of Chido Museum in Tsuruoka, Yamagata University, Niigata University, and other institutions in 1969. The results of the excavation were reported by T. Sakai, R. Honma, T. Kawasaki, and S. Satō in 1971.

According to the description by Sakai (in Sakai, *et al.*, 1971), the tunnel-like cave is divided into the left and right branches at about 24 m from the entrance. The human skeletal remains and artifacts were discovered in a chamber, about 4 m wide, 8 m long, and 4 m high, in the left branch. There were marks of the flood of seawater, and all the remains were found in scattered conditions. No anatomical association was preserved for skeletal remains, with the only exception of the upper half of an

adult male skeleton. Nonhuman remains included some bones of birds and fish, and shells of abalone, oyster, mussel, turbo, and others. Artifacts included Haji and Sue vessels, a bone needle, and a few fragments of a metalware. The ages of the Haji vessels range from the end of the 8th century to the earlier half of the 10th century (Kawasaki, in Sakai, *et al.*, 1971).

The human skeletal remains were first examined by R. Honma at Niigata University (in Sakai, *et al.*, 1971). The materials were divided into two groups, *i.e.* those recovered from the surface layer and those from the second layer; and the minimum numbers of buried individuals were estimated as 10 and 12 in respective groups. Honma gave a brief description of major cranial and postcranial bones, and pointed out that the materials generally showed modern morphological characters but some bones had rather archaic characters. He interpreted the scattered condition as due to the action of flooding seawater.

Later on, one of the authors made a comparative analysis on the skull 1 (TA1), that is the only well-preserved skull from this cave site, and disclosed that it was closer to the Jomon skulls than to the Japanese skulls of the Kofun and later periods (Ishida, 1992). However, the original measurements of the Tekiana materials have not yet been published. In view of the scarcity of human skeletal remains of early historic times from the Tohoku district, especially from its western region, it seems very important to publish the standard measurements and descriptions of these materials.

The authors gratefully acknowledge Mr. T. Sakai, the former director of Chido Museum, where the materials are kept, for his kind offer of the opportunity of reexamining these remains to us.

## Number of Individuals

As stated above, Honma estimated the number of buried individuals from the fragmented and mixed skeletal remains as 10 in the surface layer and 12 in the second layer. However, since the stratigraphic distribution was not always clear-cut and the time span of both layers does not exceed two centuries, all the skeletal remains have been dealt with as one series in the present study.

The minimum number of the buried individuals based on the count of the petrous portion of the temporal is 9 (including 3 subadults), and that based on the femoral shaft remains is 12 (including 5 subadults). It can thus be concluded that the number of buried individuals in the Tekiana cave site was at least 12, and 5 of them were subadult.

## Cranial Remains

**The adult male skull** (TA1, Honma's skull 1)

Almost completely preserved skull of an adult male (Fig. 1). Measurements and

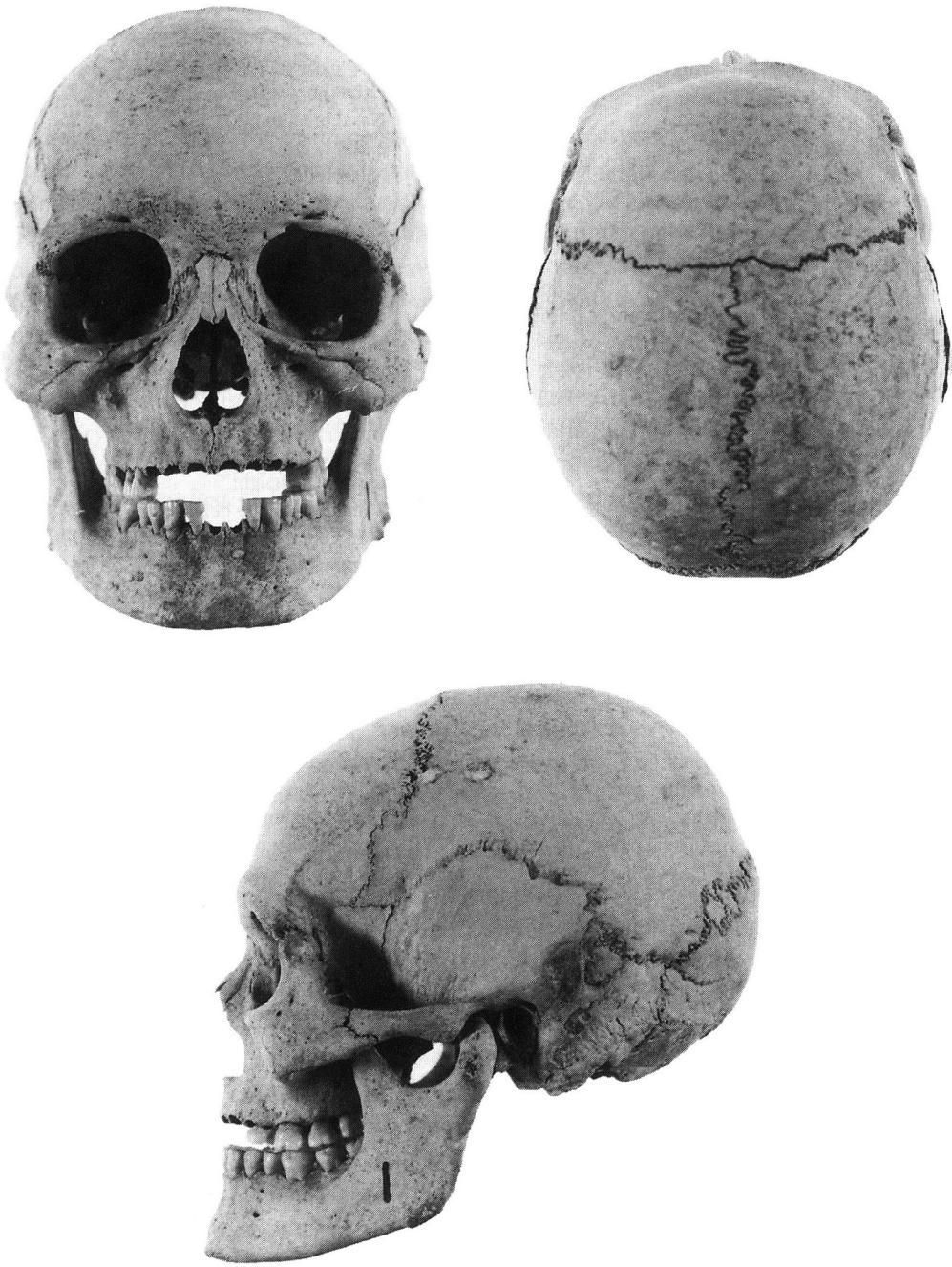

Fig. 1. Adult male skull from the Tekiana cave site (TA1).

Table 1. Measurements of the adult male skull TA1.

| | | | | | |
|---|---|---|---|---|---|
| 1 | Max. cranial length | 176 | 52 | Orbital height (L) | 33 |
| 5 | Basal length | 102 | 52:51 | Orbital index (L) | 77.6 |
| 8 | Max. cranial breadth | 143 | 54 | Nasal breadth | 25 |
| 8:1 | Length-breadth index | 81.3 | 55 | Nasal height | 50 |
| 9 | Min. frontal breadth | 99 | 54:55 | Nasal index | 50.0 |
| 9:8 | Transv. fronto-parietal index | 69.2 | 57 | Min. nasal breadth | 8 |
| 17 | Basi-bregmatic height | 128 | 57 (2) | Upper breadth of nasal bones | 11 |
| 17:1 | Length-height index | 72.7 | 60 | Maxillo-alveolar length | 54 |
| 17:8 | Breadth-height index | 89.5 | 61 | Maxillo-alveolar breadth | 68 |
| 20 | Auriculo-bregmatic height | 110 | 61:60 | Maxillo-alveolar index | 125.9 |
| 23 | Horizontal circumference | 519 | 65 | Bicondylar breadth | 138 |
| 24 | Transverse arc | 305 | 66 | Bigonial breadth | 114 |
| 25 | Total sagittal arc | 353 | 67 | Bimental breadth | 49 |
| 26 | Frontal sagittal arc | 117 | 68 | Mandibular body length | 78 |
| 27 | Parietal sagittal arc | 122 | 68:65 | Mandibular index | 56.5 |
| 28 | Occipital sagittal arc | 114 | 69 | Symphysis height | 31 |
| 29 | Frontal sagittal chord | 104 | 69 (1) | Mandibular body height (L) | 30 |
| 29:26 | Sagittal frontal index | 88.9 | 69 (3) | Mandibular body thickness (L) | 14 |
| 30 | Parietal sagittal chord | 108 | 70 | Mandibular ramus height (L) | 65 |
| 30:27 | Sagittal parietal index | 88.5 | 71 | Mandibular ramus breadth (L) | 34 |
| 31 | Occipital sagittal chord | 96 | 71:70 | Index of mandibular ramus (L) | 52.3 |
| 31:28 | Sagittal occipital index | 84.2 | 71a | Min. breadth of mand. ramus (L) | 33 |
| 32 | Frontal profile angle | 82 | 72 | Facial profile angle | 82 |
| 40 | Facial profile length | 104 | 73 | Midfacial profile angle | 83 |
| 40:5 | Gnathic index | 102.0 | 74 | Alveolar profile angle | 83 |
| 45 | Bizygomatic breadth | [141] | 79 | Mandibular angle | 126 |
| 46 | Bimaxillary breadth | 103 | FC | Frontal chord (43 (1)) | 100.5 |
| 47 | Total facial height | 110 | FS | Frontal subtense (43c) | 13.8 |
| 47:45 | Kollmann's total facial index | [78.0] | FS:FC | Frontal index of flatness | 13.7 |
| 47:46 | Virchow's total facial index | 106.8 | SC | Simotic chord (57) | 8.3 |
| 48 | Upper facial height | 66 | SS | Simotic subtense (57a) | 4.2 |
| 48:45 | Kollmann's upper facial index | [46.8] | SS:SC | Simotic index | 50.6 |
| 48:46 | Virchow's upper facial index | 64.1 | ZC | Zygomaxillary chord (46b) | 104.1 |
| 50 | Anterior interorbital breadth | 19 | ZS | Zygomaxillary subtense (46c) | 22.0 |
| 51 | Orbital breadth (L) | 42.5 | ZS:ZC | Zygomaxill. index of flatness | 21.1 |

Measurements in brackets are estimated values.

incidence of nonmetric variants are given in Tables 1, 2, and 5. Standard measurements have been taken in accordance to the definitions given by Bräuer (1988). For the facial flatness measurements and the nonmetric variants, definitions by Yamaguchi (1973) and by Dodo (1974, 1975, 1986) have been followed.

The neurocranium is brachycranic, and its horizontal contour is ovoid in shape, with rather indistinct frontal and parietal tubers. Major sutures of the vault are rela-

tively complicated and show no sign of closure on the external surface. In the occipital view, the maximum breadth of the braincase is at the level of the supramastoid crest. There are marked vestiges of the biasterionic suture on both ends. The external occipital protuberance and the transverse occipital torus are not pronounced. In the mid-sagittal contour, the prominence of the glabella corresponds to Broca's grade 4. Sagittal curvature of the occipital planum is moderate. The temporal lines are indistinct but the supramastoid crests are well-developed. The parietal notch bones are present on both sides in the deep notches. A feeble sign of aural exostosis is observed on the anterior wall of the right meatus. Marked suprameatal spines and fossae are formed on both sides. The occipital condyles are weakly curved and show marginal lippings. The hypoglossal canals are not divided. The basi-occipital is completely fused with the sphenoid. The mandibular fossae are deep and the lateral part of the articular eminence is porotic on both sides. There is a tendency toward formation of the pterygospinous foramen on both sides of the sphenoid but the bony bridging is incomplete. There is no indication of mid-parietal keeling in the frontal view. The transverse frontoparietal index is eurymetopic. The metopic suture is closed. Brow ridges project more than the glabella, and the supra-orbital trigonum is well-developed in the lateral part of the supra-orbital region.

Facial indices are meso- and chamaeprosopic, and upper facial indices are euryene and hyperchamaeprosopic. The supra-orbital margins are slightly inclined and the supra-orbital foramen is present on each side. The orbital margin is oblong and the index is mesoconch. The frontonasal suture is deepset, and the nasal bones protrude in the midline, forming a triangular horizontal contour with acute-angle apex. The profile of the nasal bones is concave in the upper half and convex in the lower half. The anterior surface of the frontal process of the maxilla faces antero-laterally. The piriform aperture is relatively narrow, with mesorrhine nasal index, and the lower margin is not sharp. The anterior surface of the body of maxilla is depressed, and there are infra-orbital sutures on both sides. The infrazygomatic crest forms a deep notch in frontal view, and the zygomaxillary tuberble is well-developed at its lateral end. A very short vestige of the transverse zygomatic suture is present on the left side. The alveolar process of the maxilla is extremely low and barely prognathic. A weak palatine torus is formed in the posterior part of the bony palate. The medial and lateral palatine canals are present only on the right side.

The mandible is also well-preserved. The mental tubercles are well-developed but the mental protuberance is rather indistinct. The body is uniformly low from the symphysis to the posterior end. The mental foramen is accompanied with an accessory foramen on both sides. The base of the body is convex, but the mandible, with the well-developed angles, does not rock on a level surface. The ramus is low and inclined. Muscle attachment areas on the inner and outer surfaces of the angle are well-developed, and the left angle is slightly everted. Pre-angular notch is absent. A rough-surfaced tubercle is present on the lateral surface of the condylar process on both

Table 2. Measurements of the right teeth of TA1 (male).

| | Mesiodistal diameter | | | Buccolingual diameter | | |
|---|---|---|---|---|---|---|
| | TA1 | Jomon | Kofun | TA1 | Jomon | Kofun |
| UP1 | **7.1** | 6.90 | 7.47 | **8.5** | 9.27 | 9.77 |
| UP2 | **6.5** | 6.46 | 7.11 | **8.2** | 9.00 | 9.65 |
| UM1 | **10.6** | 10.28 | 10.60 | **11.2** | 11.78 | 12.10 |
| UM2 | **9.4** | 9.12 | 9.92 | **10.5** | 11.45 | 11.77 |
| UM3 | **8.8** | | | **10.0** | | |
| LI2 | **5.9** | 5.72 | 6.19 | **6.2** | 6.20 | 6.40 |
| LC | **7.2** | 6.73 | 7.16 | **7.8** | 7.44 | 7.99 |
| LP1 | **6.8** | 6.91 | 7.38 | **7.4** | 7.79 | 8.24 |
| LP2 | **7.3** | 6.94 | 7.48 | **7.1** | 8.33 | 8.61 |
| LM1 | **11.5** | 11.61 | 11.67 | **10.7** | 11.23 | 11.28 |
| LM2 | **10.4** | 10.80 | 11.21 | **9.4** | 10.47 | 10.79 |
| LM3 | **10.2** | | | **9.4** | | |

Jomon and Kofun averages are cited from Matsumura (1994).

sides. There is no mylohyoid bridging nor mandibular torus. The genioglossal spines are well-developed but the spines of both sides are almost fused together.

Preservation of the dentition is as follows (○=postmortem loss).

| | |
|---|---|
| M M M P P ○ ○ ○ | ○ ○ ○ ○ ○ M M M |
| M M M P P C I ○ | ○ I C P P M M M |

Tooth attrition is slight to medium, corresponding to Broca's grade 1 or 2. The pattern of wear in the maxillary teeth is between the phases D and F (20–35 years) of Lovejoy (1985) and that in the mandibular teeth is between E and G (24–40 years). Only one small caries pit is observed on the occlusal surface of the left upper first molar. Teeth are smaller than the averages in Kofun people and generally close to those in the Jomon remains (see Table 2). A small Carabelli's tubercle is observed in the upper first molar of both sides. In view of the level attrition in the lower incisors and canines, it is inferred that the occlusion was edge-to-edge form. Calculus is deposited on the lower anterior teeth.

Key measurements of TA1 skull are compared with the averages of recent and protohistoric Japanese from eastern Japan, the Jomon and the Hokkaido Ainu, and the Troickoe series of the 3rd to 9th centuries in the Amur valley in Table 3. As the shape distances (Penrose, 1953–'54, Constandse-Westermann, 1972), given in the bottom row in the table, show, TA1 is closest to the Jomon, followed by the Ainu and protohistoric Kofun people, and rather remote from recent Japanese and especially from the Troickoe series in the Russian Far East.

Table 3. Comparison of the cranial measurements of TA1 (male).

| | | TA 1 | Recent Japanese[1] | Proto-historic[2] | Troickoe[3] | Jomon[4] | Ainu[5] | S.D.[1] |
|---|---|---|---|---|---|---|---|---|
| 1 | Maximum length | 176 | 181.21 | 182.1 | 181.6 | 184.2 | 185.9 | 6.03 |
| 5 | Basal length | 102 | 101.48 | 101.5 | 101.9 | 103.2 | 105.4 | 4.81 |
| 8 | Maximum breadth | 143 | 139.53 | 143.5 | 144.5 | 144.8 | 141.3 | 5.06 |
| 9 | Min.frontal breadth | 99 | 94.14 | 94.5 | 90.5 | 97.3 | 96.2 | 4.30 |
| 17 | Basi-bregma. height | 128 | 136.30 | 136.3 | 134.5 | 135.8 | 138.1 | 4.54 |
| 40 | Facial length | 104 | 97.51 | 100.2 | 95.1 | 102.6 | 105.0 | 5.07 |
| 45 | Bizygomatic breadth | 141 | 133.40 | 141.6 | 139.7 | 141.3 | 137.3 | 5.84 |
| 46 | Bimaxillary breadth | 103 | 98.56 | 102.5 | 103.2 | 104.0 | 102.1 | 5.28 |
| 48 | Upper facial height | 66 | 68.97 | 71.2 | 73.7 | 65.6 | 69.7 | 4.17 |
| 51 | Orbital breadth | 42.5 | 40.22 | 42.8 | 43.3 | 43.0 | 43.6 | 2.04 |
| 52 | Orbital height | 33 | 35.13 | 34.3 | 34.2 | 33.3 | 34.3 | 1.77 |
| 54 | Nasal breadth | 25 | 25.66 | 27.0 | 27.0 | 26.6 | 25.7 | 2.46 |
| 55 | Nasal height | 50 | 52.02 | 51.5 | 54.9 | 48.3 | 50.5 | 3.07 |
| FC | Frontal chord | 100.5 | 97.8 | 98.9 | 98.9 | 99.6 | 99.5 | 4.29 |
| FS | Frontal subtense | 13.8 | 16.3 | 15.0 | 11.8 | 16.4 | 16.9 | 2.08 |
| SC | Simotic chord | 8.3 | 7.2 | 7.5 | 6.7 | 10.2 | 8.7 | 1.91 |
| SS | Simotic subtense | 4.2 | 2.7 | 2.3 | 2.1 | 4.6 | 3.7 | 0.97 |
| ZC | Zygomaxillary chord | 104.1 | 97.9 | 100.7 | 101.7 | 102.8 | 101.4 | 5.19 |
| ZS | Zygomax. subtense | 22.0 | 23.6 | 19.4 | 19.4 | 22.9 | 22.7 | 2.89 |
| Shape distances to TA1 | | | 1.0768 | 0.8206 | 1.3669 | 0.3893 | 0.6515 | |

Sources of the comparative data for standard measurements: 1) Yamasaki, *et al.* (1967); 2) Yamaguchi (1988); 3) Alekseev (1980); 4) Kiyono & Miyamoto (1926) and Kintaka (1928) combined; 5) Koganei (1893), supplemented by Yamaguchi (1988). Sources of the comparative data for facial flatness measurements: 1), 5) Yamaguchi (1973); 4) Yamaguchi (1980).

Morphological characters, such as the low and broad face, protruding glabella and nasal bones, deep-set frontonasal suture, edge-to-edge bite, absence of the preangular notch, and small teeth, also indicate the resemblance of TA1 to the Jomon skulls.

**The incomplete adult female cranium** (TA2, Honma's skull 2)

The right side of the cranial vault, the basal part of the occipital, and the zygomatic arches are partially missing (Fig. 2). Measurements and incidence of nonmetric variants are given in Tables 4 and 5.

Horizontal contour is ovoid in shape, and the cranial and transverse frontoparietal indices are mesocranic and stenometopic. The frontal and parietal tubers are not very distinct. Vault sutures are mostly unfused at least on the external lamina. The lambdoid suture is fairly complex. The glabellar prominence is Broca's grade 3 and

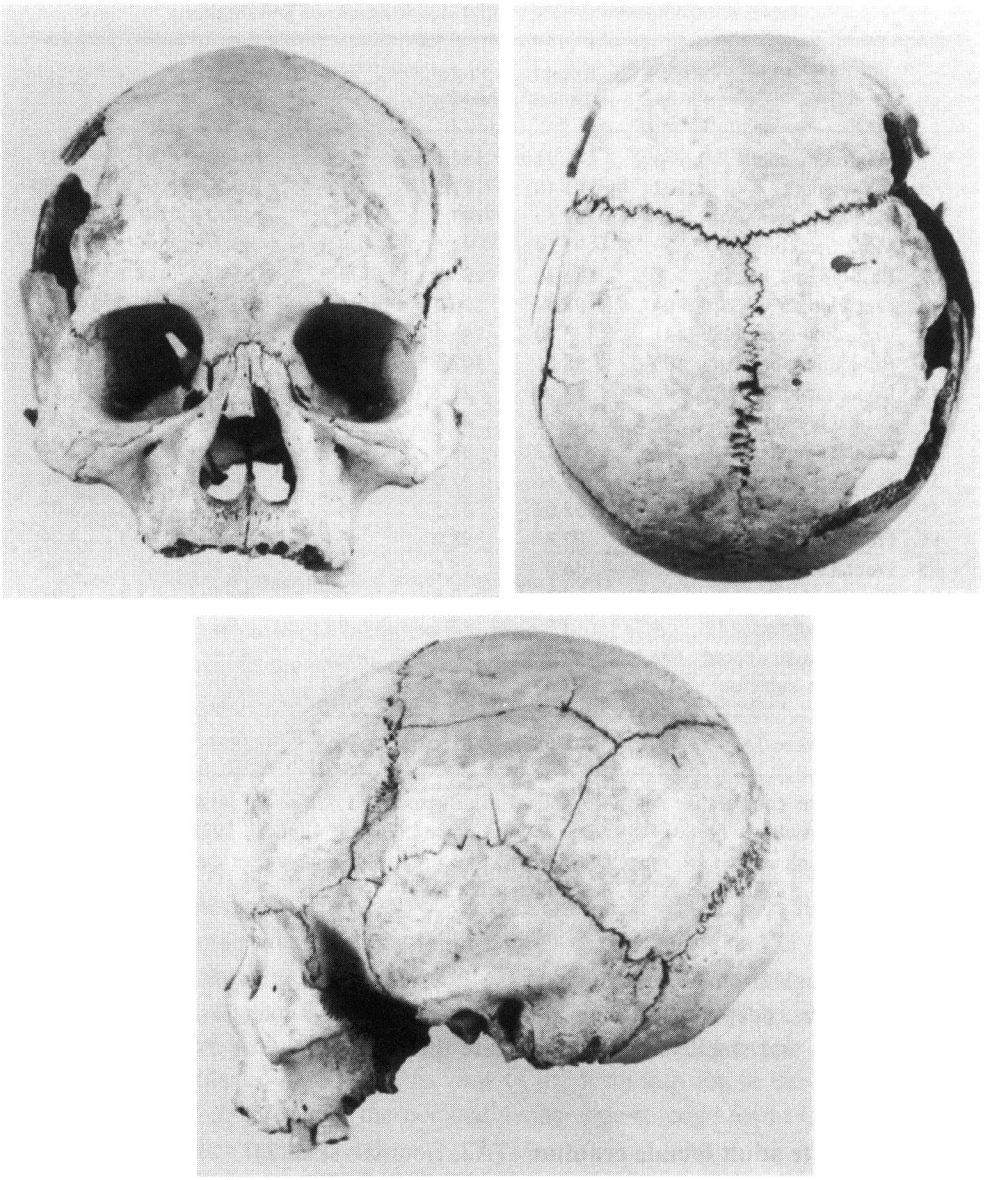

Fig. 2. Adult female cranium from the Tekiana cave site (TA2).

the external occipital protuberance is almost indiscernible. A slight aural exostosis is present on the posterior wall of the meatus of each side. The hypoglossal canal is divided at least on the right side. The articular surface of the mandibular fossa is intact. The coronal contour of the parietals is angled at the vertex. The glabella and supercil-

Table 4. Comparison of the cranial measurements of TA2 and TA3 (females).

| | | TA 2 | TA 3 | Recent Japanese | Proto-historic | Troickoe | Jomon | Ainu | S.D. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Maximum length | 176 | | 173.14 | 174.4 | 177.9 | 176.3 | 177.2 | 7.14 |
| 5 | Basal length | [92] | | 95.78 | 96.9 | 98.6 | 96.9 | 99.9 | 4.77 |
| 8 | Maximum breadth | 139 | | 134.33 | 138.2 | 136.6 | 141.8 | 136.9 | 5.33 |
| 9 | Min. frontal breadth | 88 | 90 | 89.86 | 91.7 | 90.7 | 95.6 | 92.4 | 4.27 |
| 17 | Basi-bregma. height | [131] | | 130.33 | 131.2 | 131.9 | 129.8 | 133.3 | 4.16 |
| 40 | Facial length | 91 | | 94.50 | 94.2 | 96.1 | 95.6 | 100.2 | 5.19 |
| 45 | Bizygomatic breadth | [134] | | 125.50 | 132.6 | 129.5 | 132.9 | 130.1 | 5.63 |
| 46 | Bimaxillary breadth | 95 | [98] | 94.09 | 96.1 | 101.2 | 99.8 | 96.5 | 5.63 |
| 48 | Upper facial height | 57 | 69 | 65.36 | 66.0 | 70.9 | 62.2 | 65.6 | 4.08 |
| 51 | Orbital breadth | 40 | 40 | 39.26 | 41.3 | 41.7 | 41.7 | 41.8 | 1.96 |
| 52 | Orbital height | 32 | 35 | 34.70 | 33.6 | 34.8 | 32.7 | 33.5 | 1.40 |
| 54 | Nasal breadth | 27 | 26 | 24.87 | 26.6 | 26.1 | 25.5 | 24.8 | 1.66 |
| 55 | Nasal height | 45 | 48 | 49.48 | 47.8 | 52.1 | 45.0 | 47.4 | 3.20 |
| FC | Frontal chord | 90.8 | 94.2 | 92.6 | 93.5 | 94.5 | 97.6 | 94.7 | 3.51 |
| FS | Frontal subtense | 10.3 | 12.4 | 14.3 | 13.3 | 13.1 | 14.4 | 15.5 | 2.23 |
| SC | Simotic chord | 6.6 | 9.2 | 7.4 | 8.2 | 7.8 | 9.3 | 8.4 | 1.40 |
| SS | Simotic subtense | 1.2 | 3.1 | 2.2 | 1.8 | 2.2 | 3.2 | 3.0 | 0.77 |
| ZC | Zygomaxillary chord | 92.7 | | 93.6 | 93.1 | 99.0 | 101.0 | 95.6 | 5.01 |
| ZS | Zygomax. subtense | 15.7 | | 22.3 | 19.6 | 19.8 | 21.8 | 22.2 | 2.28 |
| Shape distances to TA2 | | | | 1.3939 | 0.4824 | 1.0189 | 1.0042 | 1.1786 | |
| Shape distances to TA3 | | | | 0.4267 | 0.5180 | 0.5254 | 1.0785 | 0.5873 | |

See the footnotes of Table 2 for the sources of comparative data.

iary arches are fused and form a wide swelling. The metopic suture and supra-orbital foramen are absent.

The facial skeleton is low, with the upper facial indices being euryene and hyperchamaeprosopic. The orbit is oblong, with mesoconch index value. The nasal bones are narrow and flat, and the anterior surface of the frontal process of the maxilla is almost coronal in direction. The nasal index is hyperchamaerrhine. The lower margin of the piriform aperture is blunt and the nasal spine is small. The canine fossa is deep. The infrazygomatic crest is concave and bounded by the zygomaxillary tubercle. The alveolar process of the maxilla is very low and prognathic. Indices of facial flatness are considerably lower than female means of the Kofun people. Palatine torus and canals are absent.

Of the maxillary dentition, only the left first and second molars are preserved. All the rest are lost postmortem leaving the alveoli empty. Attrition of the two molars is grade 2. None of them show signs of caries.

TA2 has some resemblance to the Ainu crania in its antero-posteriorly elongated vault, extremely low face, and the bulging glabellar region, but her flat nasal bones strongly suggest the close affinity to the Japanese of the Kofun and early historic times. The shape distance based on 19 measurements also confirms the resemblance to the protohistoric Kofun series, as shown in Table 4.

**The anterior part of an adult female cranium** (TA3, Honma's skull 3)

The frontal, maxillae, nasalia, right zygomatic, and palatine bones are well preserved, but the rest of the cranium was eroded, and the mandible is missing. Measurements and incidence of nonmetric variants are given in Tables 4 and 5.

The metopic suture is fused. The frontal tubers are distinct. Glabellar region is flat, and the supra-orbital margins are devoid of foramen. The orbit is nearly square, with hypsiconch index value, and slightly inclined. The nasal bones are medium in width and slightly convex in horizontal contour. As the anterior surface of the frontal process of the maxilla is directed almost coronally, the interorbital region gives an impression of the so-called pinched nasal bones. There is no notch at the nasion in the sagittal glabello-nasal contour. The nasal index is chamaerrhine. The lower margin of the piriform aperture is extremely sharp and the anterior nasal spine is well pronounced. The infrazygomatic crest is deeply concave, and bounded by the zygomaxillary tubercle at its lateral end. The alveolar process of the maxilla is medium in height and is markedly prognathic. Both the right and left zygomatic bones are divided by a horizontal suture. Index of frontal flatness is slightly lower than the average of the Kofun people, but simotic index is slightly higher. Neither the palatine torus nor the palatine canals are present.

Preserved teeth are as follows.

$$\frac{\bigcirc\ M\ M\ P\ P\ C\ \bigcirc\ \bigcirc}{\bigcirc\ \bigcirc\ C\ P\ P\ M\ M\ \bigcirc}$$

Table 5. Presence (+) and absence (−) of nonmetric cranial variants in Tekiana skulls.

| | TA1 (male) | | | TA2 (female) | | | TA3 (female) | | |
|---|---|---|---|---|---|---|---|---|---|
| | R | M | L | R | M | L | R | M | L |
| Metopism | | − | | | − | | | − | |
| Supraorbital nerve groove | − | | − | − | | − | − | | + |
| Supraorbital foramen | + | | + | − | | − | − | | − |
| Ossicle at the lambda | | − | | | − | | | / | |
| Biasterionic suture trace | + | | + | / | | − | / | | / |
| Asterionic ossicle | − | | − | / | | ? | / | | / |
| Occipitomastoid ossicle | − | | − | / | | − | / | | / |
| Parietal notch bone | + | | + | / | | − | / | | / |
| Condylar canal | / | | + | − | | / | / | | / |
| Precondylar tubercle | − | | − | / | | / | / | | / |
| Paracondylar process | − | | − | / | | / | / | | / |
| Hypoglossal canal bridging | − | | − | + | | / | / | | / |
| Tympanic dehiscence | − | | − | − | | − | / | | / |
| Foramen ovale incomplete | − | | − | − | | − | / | | / |
| Foramen of Vesalius | − | | − | − | | − | / | | / |
| Pterygospinous foramen | − | | − | − | | − | / | | / |
| Medial palatine canal | + | | − | − | | − | − | | − |
| Transv. zygomatic sut. trace | − | | − | − | | − | + | | + |
| Clinoid bridging | − | | − | − | | − | / | | / |
| Mylohyoid bridging | − | | − | / | | / | / | | / |
| Mandibular torus | − | | − | / | | / | / | | / |
| Jugular foramen bridging | − | | − | − | | / | / | | / |
| Sagittal groove left | | − | | | − | | | / | |

The alveoli of the right and left upper third molars are small. Only the first molars show attrition of grade 2, and the rest of teeth show grade 1. The attrition pattern as a whole corresponds to Lovejoy's phase B2 (16–20 years). Calculus is deposited on some teeth. Small caries cavity is observed in the middle of the occlusal surface of the second molars of both sides.

The shape distances, based on a limited number of measurements, show the closest resemblance to the recent Japanese, followed by the protohistoric Japanese and the Troickoe series (Table 4). In morphological observation, TA3 is somewhat different from the average Kofun females in slightly higher upper face and orbit, less flat nasal bones, and sharper lower margin of the piriform aperture.

**Other cranial fragments**

There are seven more relatively major cranial fragments.

a. Cranial vault of a mature male, consisting of the right and left parietals and

the occipital squama.

b. Right posterior part of the braincase of an adult male (?), preserving the right half of the occipital, the right temporal, and postero-lateral part of the right parietal.

c. Vault fragment of an adult male, consisting of the right parietal, the upper frontal squama, and a part of the left temporal.

d. Vault of an adult female, comprising parts of the frontal and parietals.

e. Vault fragment of a mature individual of unknown sex, consisting of the frontal squama and anterior portions of the parietals.

f. Vault fragments of an infant, consisting of the right and left parietals.

g. Right parietal of an infant.

In addition to these, there are 3 fragmentary right temporals, 6 fragmentary left temporals (including 3 immature bones), a pair of maxillae (adult or older, with low and prognathic alveolar process), two sets of the right maxilla and zygomatic bone (both with low alveolar process and one with alveolar prognathism), left maxilla of an infant (younger than 1 year), left zygomatic bone of another infant (older than 2 years), and several small vault and occipital fragments.

**Mandibles**

In addition to the mandible of TA1, there are six mandibles of adult individuals and two of immature individuals (juvenile and infant). Relatively well preserved are the following four.

a. Almost complete mandible of an adult female. Possibly associated with TA2. The body is extremely low (26 mm on the left side) and the lower border is straight and stable. There is no pre-angular notch. The ramus is short and relatively broad (37 mm in breadth and 52 mm in height on the left side). Tooth attrition is slight, corresponding to Lovejoy's phase E (24–30 years).

b. Complete mandible of an adult. The body is low (30 mm at the symphysis and 30 mm on the left side) and stable with the pre-angular notch. The ramus is rather slender (35 mm/61 mm on the left side). Tooth attrition is in the phase E.

c. Complete mandible of an adult or juvenile female (?). Most teeth were lost postmortem. Body is thick and low (approximately 30 mm at the symphysis), and is stable with the pre-angular notch. The mental foramen is divided on the right side. The eminentia lateralis is well-developed at the junction of the body and ramus. The ramus is low (34 mm/57 mm on the left side) and inclined.

d. Incomplete mandible of an adult female. Most of the teeth are lost postmortem and the rami of both sides are broken. The body is low (the symphysis height and the right body height are 29 mm and 30 mm).

**Isolate teeth**

Forty-nine isolate teeth including a few deciduous teeth had been collected.

Table 6. Maximum length of left long bones and estimated stature.

| | Male | Estimated Stature | | Female | Estimated Stature | |
|---|---|---|---|---|---|---|
| | | F[1] | P[2] | | S[3] | P[2] |
| Humerus | **296** | 1567 | 1575 | **277** | 1458 | 1492 |
| Radius | **237** | 1616 | 1644 | **209** | 1475 | 1517 |
| Ulna | **240** | 1572 | | **226** | 1477 | |
| Femur | **423** | 1593 | 1608 | **[382]** | 1445 | 1472 |
| Tibia | **353** | 1609 | 1618 | **313** | 1457 | 1470 |

Regression equations used for stature estimation are those of 1) Fujii (1960), 2) Pearson (1899), and 3) Sasou & Hanihara (1998).

Most of the isolate upper incisors show shovelling in more or less degree.

## Long Limb Bones

Since few bones of each individual skeleton were associated with each other and the long bones of the left side were generally better preserved than those of the right side, only the measurements of the left bones are presented below. Immature bones have been left out.

The maximum length could be measured in only one male and one female sample of each long limb bone except the fibula. Table 6 gives the maximum lengths of five male and five female bones, together with the estimated stature obtained by the formulae of Fujii (1960), Pearson (1899), and Sasou and Hanihara (1998). Three out of four lower limb bones are slightly shorter than the averages of the Kofun people in eastern Japan (Yamaguchi, 1986). Male statures are not much different from the averages in the Kofun period (Hiramoto, 1972; Yamaguchi, 1986), but all the female statures are more or less shorter.

Table 7 gives the shaft index at the subtrochanteric level (platymeric index) and at the middle of the femur (pilastric index) and the midshaft index of the tibia for each bone. Indices of the three male femora are moderately high, but the other two femora (one female and one sex-indeterminable) are considerably flattened anteroposteriorly. In 5 out of the 6 tibiae, the midshaft index is either mesocnemic or eurycnemic, leaving only one case with a platycnemic index value. These findings on the shaft indices of the lower limb bones are generally in accordance with the characteristics of the skeletons of the Kofun period (Yamaguchi, 1986).

Two male tibiae and 4 female tibiae of the left side could be examined for the squatting facet on the anterior margin of the distal articular surface. One female tibia lacks the facet, but all the rest show either moderate facet or a trace of facet.

Of the 4 left ulnar shafts observed, only one is platycubitonic, a shape where the

Table 7. Shaft indices of the left femora and tibiae.

| Femur | | Platymeric index | | Pilaster index |
|---|---|---|---|---|
| | M | 85.7 (27/31.5) | eurymeric | 109.1 (30/27.5) |
| | M | 80.6 (25/31) | platymeric | 107.4 (29/27) |
| | M | | | 107.7 (28/26) |
| | ? | 71.0 (22/31) | hyperplatymeric | 92.3 (24/26) |
| | F | 72.4 (21/29) | hyperplatymeric | 92.0 (23/25) |
| Tibia | | Midshaft index | | |
| | M | 78.3 (23.5/30) | eurycnemic | |
| | M | 71.9 (23/32) | eurycnemic | |
| | M | 61.1 (22/36) | platycnemic | |
| | M | 73.8 (22.5/30.5) | eurycnemic | |
| | F | 65.6 (21/32) | mesocnemic | |
| | F | 91.3 (21/23) | eurycnemic | |

M=male; F=female; ?=sex indeterminable.

maximum diameter is between the interosseous and posterior borders and the minimum diameter is between the anterior border and the posterior surface, as is often the case with the Jomon ulnae.

## Summary and Conclusion

Skeletal remains of at least twelve individuals of the early historic time (Heian period) were discovered in the Tekiana cave site on Tobi-shima Island in Yamagata Prefecture. The cave had been disturbed by seawater and all the skeletons were dissociated and in more or less fragmentary condition. However, an almost complete adult male skull, two adult female partial crania, and several adult limb bones are preserved in fairly good condition. Morphological descriptions of these materials are given in the text and the measurements and incidence of nonmetric variants are shown in Tables 1 through 7.

Comparison was made with the recent Japanese, protohistoric Japanese of the Kofun period, the Jomon remains, the recent Ainu in Hokkaido, and a nearly contemporary skeletal series from the Troickoe site in the Amur valley. The male skull (TA1) showed the closest resemblance to the Jomon remains, and the two female crania (TA 2 and TA3) were closest either to the protohistoric Kofun series or to the recent Japanese, both in metric and morphological comparisons (Tables 3 and 4). This probably implies that some portion of the population of early historic times in the northern part of Honshu Island still retained archaic Jomon-like morphological features. It should also be emphasized that no particular resemblance was disclosed be-

tween the Tekiana remains and the Troickoe series in the Russian Far East.

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