

# Metric Data of Human Crania from the Tohoku Region, Honshu, Japan, Housed at the Department of Anatomy and Anthropology, Tohoku University School of Medicine

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## Introduction

The skeletons of 178 fetuses and the crania of 20 immatures and 191 adults with records for each individual showing the place and date of birth as well as the date and cause of death are curated at the Department of Anatomy and Anthropology, Tohoku University School of Medicine. These skeletal collections are derived from dissecting-room subjects.

Part of the adult cranial series from the Tohoku region was already measured and published by Yamasaki et al. (1967) and Hanihara (2002); however, these researchers measured the upper facial height not following the method of Martin (1914) but following the method of Howells (1973). This produces considerable confusion in comparison of cranial measurements between different local samples of the Japanese Islands (Dodo, 2001). To dispel such confusion, we report here the raw data of 18 measurements in all of the 156 adult crania (101 males and 55 females) from the Tohoku region, Honshu, Japan, without deformation due to disease or injury.

## Inventory of the Cranial Series

The identification number, provenience, sex, age at death, and date of death for each individual cranium of 101 males and 55 females are given in Table 1. A map of the Tohoku region in Honshu and that of individual prefectures within the Tohoku region are depicted in Figure 1.

The subjects are mostly derived from Miyagi Prefecture where Tohoku University is located (113 crania from Miyagi, 16 from Fukushima, 15 from Yamagata, 5 from Iwate, 4 from Aomori, and 3 from Akita). Photographs of representative male and female crania are given in Figures 2 and 3. The dates of birth range from 1814 to 1916, and the ages at death are from 20 to 90 years (the mean age at death is 48.9). Although the causes of death are not discussed, infectious diseases such as pulmonary tuberculosis are prevailing.

## Methods of Measurements

Cranial measurements were taken basically by the method of Martin (1914). Slightly different methods, i.e. that of Martin (1914) and that of Howells (1973), were applied to the measurement of upper facial height. The following are the numbers, measurement items, abbreviations of the item, and brief comments relevant to the Martin's method.

1. Maximum cranial length (L)
5. Cranial base length (BL): length from the basion to nasion
8. Maximum cranial breadth (B)
9. Minimum frontal breadth (FB)
17. Basion–bregma height (H)
40. Facial length (GL): length from the basion to prosthion
45. Bizygomatic breadth (J)
48. Upper facial height (GH(1)): length from the nasion to alveolare (Martin, 1914)
- 48'. Upper facial height (GH(2)): length from the nasion to prosthion (Howells, 1973)
51. Orbital breadth (OB)
52. Orbital height (OH)
54. Nasal breadth (NB)
55. Nasal height (NH)

Facial flatness measurements were taken after Yamaguchi (1973). The measurement items, abbreviations of the item, and brief comments are as follows:

- Frontal chord (FC): chord between the frontomalarial orbitalia
- Frontal subtense (FS): subtense of the nasion from the frontal chord
- Simotic chord (SC): minimum horizontal breadth of the nasal bones
- Simotic subtense (SS): minimum subtense from the median ridge of nasalium to the simotic chord
- Zygomaxillary chord (ZC): chord between the zygomaxillaria anteriora
- Zygomaxillary subtense (ZS): subtense of the subspinale from the zygomaxillary chord

**Table 1.** Inventory of the adult crania from the Tohoku region, Honshu, housed at the Department of Anatomy and Anthropology, Tohoku University School of Medicine

Skull number	Provenience	Sex	Age at death	Date of death
256	Miyagi	male	47	1900
266	Yamagata	male	40	1900
281	Miyagi	male	23	1901
283	Miyagi	male	81	1901
287	Miyagi	male	20	1901
290	Miyagi	male	38	1901
302	Miyagi	female	26	1901
320	Miyagi	male	35	1902
326	Miyagi	male	33	1902
327	Fukushima	male	40	1902
349	Yamagata	male	35	1903
353	Miyagi	female	90	1903
363	Miyagi	male	57	1903
364	Miyagi	male	24	1903
373	Miyagi	female	25	1903
387	Yamagata	female	25	1903
401	Miyagi	female	66	1904
407	Miyagi	male	60	1904
422	Miyagi	male	45	1904
423	Fukushima	female	31	1904
425	Miyagi	female	65	1904
435	Miyagi	male	56	1904
439	Miyagi	female	28	1905
442	Miyagi	female	73	1905
451	Miyagi	male	79	1905
453	Miyagi	female	38	1905
461	Miyagi	male	56	1905
468	Miyagi	male	52	1905
474	Miyagi	male	49	1905
478	Yamagata	female	31	1906
481	Miyagi	male	37	1906
484	Miyagi	male	40	1906
495	Miyagi	female	49	1906
497	Miyagi	male	55	1906
503	Miyagi	female	56	1906
510	Miyagi	female	39	1906
515	Miyagi	male	54	1906
516	Miyagi	female	70	1906
522	Miyagi	male	57	1907
585	Miyagi	male	31	1908
596	Miyagi	female	43	1908
620	Miyagi	male	42	1909
702	Miyagi	female	48	1910
726	Miyagi	male	69	1911
755	Iwate	male	27	1911
770	Miyagi	male	46	1911
788	Miyagi	female	63	1911
842	Miyagi	female	70	1912
874	Miyagi	female	74	1913
875	Yamagata	male	50	1913
891	Miyagi	male	53	1913
904	Miyagi	female	59	1913
905	Miyagi	male	39	1913
912	Miyagi	male	68	1913
925	Miyagi	male	51	1914
936	Miyagi	female	64	1914
937	Miyagi	female	59	1914
939	Miyagi	female	36	1914

Table 1. (Continued)

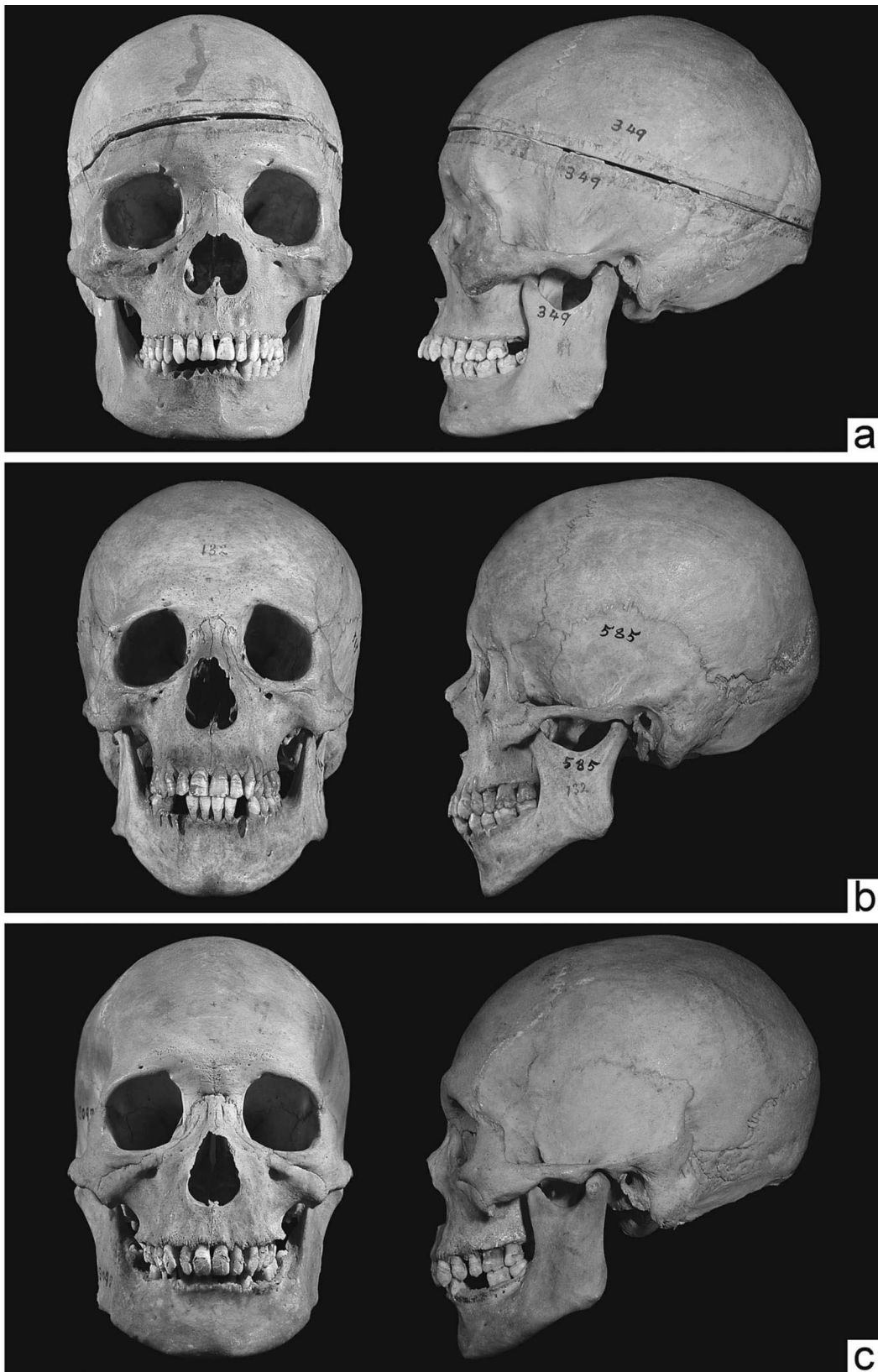
Skull number	Provenience	Sex	Age at death	Date of death
965	Miyagi	male	68	1914
1004	Miyagi	female	90	1914
1039	Miyagi	female	35	1915
1049	Miyagi	male	30	1915
1058	Iwate	male	26	1915
1066	Yamagata	male	52	1915
1139	Miyagi	female	28	1916
1152	Miyagi	male	47	1916
1183	Miyagi	male	34	1916
1184	Fukushima	male	39	1916
1199	Miyagi	male	32	1916
1203	Miyagi	female	31	1916
1204	Miyagi	male	31	1916
1211	Miyagi	female	52	1916
1216	Yamagata	male	36	1916
1221	Miyagi	female	73	1916
1231	Miyagi	male	46	1917
1261	Miyagi	male	60	1917
1286	Miyagi	female	21	1917
1299	Yamagata	male	24	1917
1315	Miyagi	male	52	1917
1316	Miyagi	female	79	1917
1330	Miyagi	female	61	1917
1342	Miyagi	male	27	1918
1346	Miyagi	male	33	1918
1350	Miyagi	female	73	1918
1352	Yamagata	male	47	1918
1382	Miyagi	female	62	1918
1394	Yamagata	male	50	1918
1397	Miyagi	male	68	1918
1414	Miyagi	male	52	1918
1440	Miyagi	female	52	1918
1443	Miyagi	male	28	1918
1468	Miyagi	male	65	1919
1513	Iwate	male	28	1919
1517	Fukushima	female	46	1919
1553	Miyagi	male	65	1919
1573	Miyagi	male	43	1920
1627	Yamagata	male	29	1920
1630	Fukushima	male	37	1920
1695	Yamagata	male	33	1921
1742	Aomori	male	27	1921
1755	Miyagi	male	50	1922
1957	Yamagata	male	55	1925
2088	Miyagi	male	34	1927
2163	Miyagi	male	85	1928
2164	Miyagi	female	33	1928
2239	Miyagi	male	43	1929
2242	Miyagi	male	64	1929
2319	Miyagi	female	21	1930
2324	Iwate	male	66	1930
2457	Miyagi	male	58	1931
2458	Miyagi	female	61	1931
2480	Fukushima	female	49	1932
2490	Miyagi	male	59	1932
2506	Miyagi	female	39	1932
2539	Akita	male	30	1932
2542	Fukushima	female	28	1932
2544	Aomori	male	22	1932
2547	Miyagi	female	80	1932

**Table 1.** (Continued)

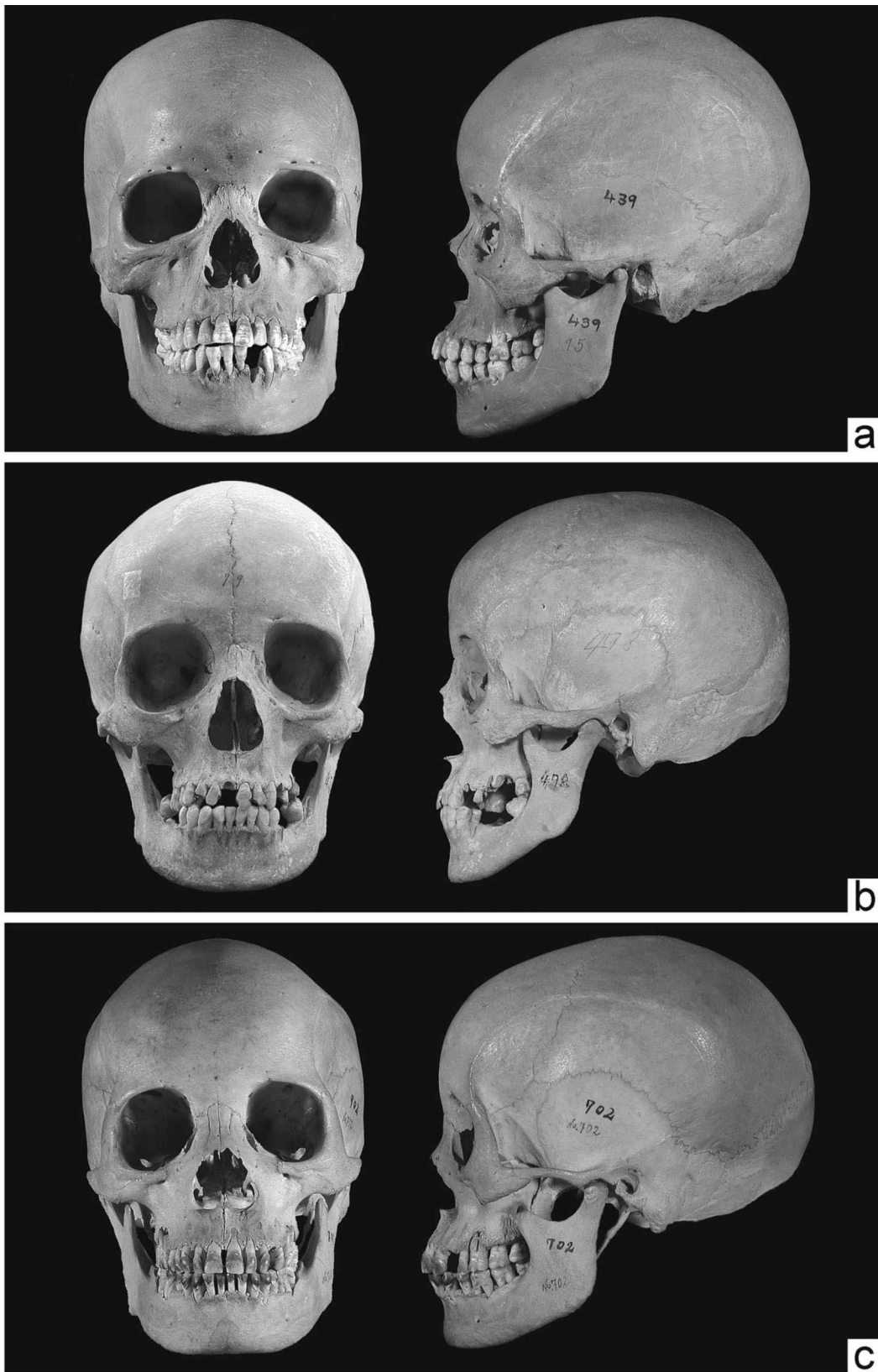
Skull number	Provenience	Sex	Age at death	Date of death
2564	Miyagi	female	58	1932
2593	Miyagi	female	77	1933
2601	Yamagata	male	27	1933
2612	Miyagi	female	75	1933
2614	Fukushima	female	64	1933
2619	Miyagi	male	48	1933
2711	Miyagi	male	51	1934
2742	Miyagi	male	25	1934
2760	Fukushima	female	67	1934
2777	Miyagi	male	41	1934
3097	Miyagi	male	35	1938
3114	Miyagi	male	56	1938
3134	Miyagi	female	72	1939
3197	Fukushima	female	59	1939
3212	Miyagi	male	59	1940
3226	Aomori	male	33	1940
3237	Akita	male	33	1940
3261	Miyagi	female	88	1940
3264	Miyagi	male	40	1940
3265	Fukushima	male	44	1941
3267	Miyagi	female	70	1941
3271	Fukushima	male	57	1941
3278	Aomori	male	26	1941
3282	Miyagi	male	70	1941
3285	Yamagata	female	85	1941
3290	Miyagi	male	35	1941
3296	Fukushima	male	56	1941
3303	Miyagi	male	68	1941
3307	Iwate	male	44	1941
3313	Fukushima	male	62	1941
3332	Akita	male	31	1942
3334	Miyagi	male	76	1942
3341	Miyagi	male	66	1942
3362	Miyagi	male	46	1942
3363	Fukushima	female	32	1942
3375	Miyagi	male	55	1942
3391	Miyagi	male	56	1942
3466	Fukushima	male	39	1943



**Figure 1.** Maps of the Tohoku region, Honshu, Japan, and each individual prefectures within the Tohoku region.



**Figure 2.** Photographs of male crania of the Tohoku Japanese series.  
a : No. 349 (35 years old) b : No. 585 (31 years old) c : No. 3097 (35 years old)



**Figure 3.** Photographs of female crania of the Tohoku Japanese series.  
a: No. 439 (28 years old) b: No. 478 (31 years old) c: No. 702 (48 years old)

**Table 2.** Measurements of the adult male crania from the Tohoku region, Honshu (mm)

No.	L	BL	B	FB	H	GL	J	GH(1)	GH(2)	OB	OH	NB	NH	FC	FS	SC	SS	ZC	ZS
256	182	104	148	103	141	99	-	79	77	44	39	26	55	94.0	12.9	5.8	3.4	99.3	23.1
266	177	103	139	96	139	104	141	66	63	40	33	27	47	99.4	12.7	5.0	1.5	108.5	22.4
281	173	103	136	90	139	89	-	73	72	39	33	25	55	90.2	18.2	6.2	1.8	88.4	23.5
283	187	104	135	100	140	-	135	-	-	44	34	24	50	102.3	18.4	11.3	2.4	97.6	23.9
287	179	91	139	94	133	91	-	66	65	40	35	24	48	93.5	14.2	6.6	0.6	88.3	25.1
290	177	102	134	96	133	100	137	81	80	44	35	25	55	98.0	13.6	6.9	2.2	101.9	20.6
320	175	98	134	92	132	97	132	69	67	38	31	24	49	92.4	12.5	6.5	2.1	93.0	21.2
326	-	95	-	88	-	91	133	73	70	43	36	25	54	91.1	12.6	4.4	2.3	93.9	22.2
327	185	105	138	93	137	96	130	72	70	41	33	28	51	95.7	18.6	8.9	2.7	97.6	20.0
349	190	106	139	95	141	102	138	69	67	40	34	30	49	98.0	17.6	10.6	3.4	108.2	20.5
363	180	99	137	94	-	-	131	-	-	41	34	27	53	95.8	15.0	8.0	2.6	94.6	23.7
364	182	107	139	96	139	100	135	70	69	42	34	23	53	96.6	18.3	3.8	2.4	98.2	28.3
407	192	113	141	97	152	112	138	76	73	45	39	29	55	101.7	19.5	5.0	1.8	102.4	25.4
422	177	103	139	95	140	100	130	68	67	42	35	23	52	97.1	18.9	7.5	2.1	89.6	26.1
435	188	102	142	95	136	96	128	75	72	41	36	23	55	96.6	16.5	6.7	3.5	92.5	21.6
451	178	108	142	94	-	-	127	-	-	43	34	23	45	95.7	14.8	6.9	1.3	91.6	22.1
461	187	102	-	90	133	97	135	75	72	44	38	26	53	97.3	14.4	5.0	1.6	94.3	24.9
468	182	108	140	103	141	107	138	76	73	46	37	25	55	104.0	18.2	6.8	3.9	97.7	23.2
474	189	99	139	98	140	95	138	75	74	43	37	27	56	96.4	13.5	8.1	2.9	101.9	26.1
481	191	103	142	95	143	100	144	73	69	42	37	29	54	102.0	15.8	8.4	3.9	106.2	19.2
484	179	107	141	88	142	102	133	68	67	44	34	25	50	94.1	17.4	6.2	3.1	88.2	23.1
497	-	98	-	91	-	-	130	-	-	42	35	23	53	94.9	14.3	5.9	2.8	103.5	25.7
515	173	96	138	95	-	89	129	65	64	43	35	26	51	90.9	19.0	5.7	1.7	93.4	19.9
522	182	106	134	90	142	103	140	75	72	44	37	30	57	97.3	16.1	7.5	1.7	100.5	23.0
585	176	101	139	92	134	98	127	73	72	38	32	24	52	86.6	15.4	7.5	3.6	94.5	23.5
620	180	101	134	92	139	97	130	66	65	41	34	22	45	94.7	17.0	3.4	2.8	99.5	26.0
726	184	102	143	94	132	-	131	-	-	41	35	22	51	91.9	17.0	9.2	1.5	93.2	20.0
755	-	104	-	101	-	104	139	76	74	41	33	27	53	101.5	18.4	6.1	2.0	106.1	28.0
770	175	103	139	94	142	99	134	76	75	47	35	26	53	100.5	14.3	7.2	2.5	98.7	19.1
875	184	103	140	94	-	91	132	73	71	41	33	26	51	93.2	11.1	8.1	2.9	90.4	17.4
891	173	97	133	93	-	-	129	-	-	39	34	27	45	97.2	14.4	6.5	0.8	91.8	21.7
905	186	99	139	94	138	-	131	-	-	43	35	26	47	99.7	12.5	9.1	2.9	96.0	-
912	186	101	141	94	132	-	135	-	-	42	34	24	56	94.0	17.1	9.8	1.9	97.9	22.6
925	168	94	136	91	125	98	127	71	70	41	36	27	50	92.7	13.6	4.9	1.7	96.7	20.8
965	179	104	129	87	135	98	129	72	71	42	33	26	53	91.0	16.9	5.8	2.6	94.1	19.5
1049	171	95	131	87	130	85	124	73	70	40	33	22	54	91.3	20.0	9.3	2.7	95.4	24.7
1058	177	103	141	88	132	99	139	68	67	42	34	25	52	90.0	13.4	5.5	1.5	97.3	22.5
1066	187	97	140	93	-	97	135	73	71	42	36	27	48	94.1	12.9	7.5	2.1	100.2	25.0
1152	178	99	137	97	-	99	126	66	64	40	32	25	48	91.3	15.3	6.3	1.1	94.3	21.5
1183	182	93	136	93	138	96	128	77	74	42	34	23	54	92.2	12.2	3.8	0.6	93.2	24.2
1184	185	104	142	91	140	100	135	69	68	41	35	24	50	91.4	14.0	7.2	2.5	98.0	22.9
1199	195	107	134	94	135	106	142	75	74	43	35	26	55	102.6	15.2	9.9	3.2	104.6	21.1
1204	179	104	137	97	137	98	130	70	67	41	36	27	53	97.1	17.5	7.1	2.6	97.2	25.7
1216	164	95	138	95	127	85	-	64	63	43	32	24	50	93.2	17.8	5.7	1.9	-	-
1231	182	104	134	91	136	103	-	77	76	42	35	27	58	95.8	17.7	8.8	5.2	100.5	26.6
1261	182	-	140	94	135	-	128	-	-	45	33	27	51	98.8	16.1	8.8	3.2	102.4	22.3
1299	171	89	127	82	125	89	117	69	67	38	35	22	50	84.3	13.0	6.1	2.1	85.2	21.9
1315	184	101	132	94	136	96	131	66	64	39	33	34	49	94.8	14.4	5.3	2.0	92.7	23.3
1342	181	98	133	89	132	95	129	75	72	39	36	23	55	90.7	13.6	3.7	2.2	92.5	21.8
1346	178	95	135	88	132	100	132	73	72	42	32	26	49	96.3	14.4	8.4	2.0	96.6	20.6
1352	188	105	141	103	143	-	-	-	-	45	35	26	54	99.6	15.5	7.3	3.3	95.9	17.7
1394	176	102	141	90	-	100	132	68	65	42	32	25	50	98.9	19.5	9.4	4.0	95.2	18.9
1397	184	103	145	89	137	-	135	-	-	42	36	29	54	99.2	14.9	10.6	4.7	98.1	23.5
1414	184	104	134	97	136	98	132	77	74	42	35	24	55	99.0	18.9	9.6	1.9	99.1	28.7
1443	178	98	138	89	130	99	125	69	67	37	32	24	51	92.0	19.1	6.8	2.3	97.6	26.5
1468	189	107	149	101	147	-	-	-	-	45	36	28	57	101.1	15.4	10.0	3.6	99.4	22.8
1513	173	91	137	88	-	91	129	73	72	41	35	22	52	91.2	13.1	4.4	1.5	95.2	20.5
1553	186	109	132	97	140	102	-	65	63	42	32	25	49	97.1	17.3	8.9	3.6	-	-
1573	-	112	-	94	-	-	-	-	-	44	34	27	56	100.5	18.2	5.6	1.2	94.7	21.3
1627	179	102	136	94	-	91	136	78	76	40	36	23	59	93.6	17.5	8.5	2.3	106.0	20.3



Table 2. (Continued)

No.	L	BL	B	FB	H	GL	J	GH(1)	GH(2)	OB	OH	NB	NH	FC	FS	SC	SS	ZC	ZS
1630	177	102	138	95	135	103	135	77	74	45	37	24	55	101.3	18.0	8.3	2.8	95.4	23.1
1695	176	99	145	89	138	89	-	74	72	39	35	23	51	93.5	15.2	8.2	1.7	-	-
1742	182	108	151	92	142	100	-	69	67	43	35	26	48	98.4	18.5	8.5	2.9	102.3	24.8
1755	180	103	140	90	138	102	137	72	69	39	33	23	50	92.2	12.1	4.7	0.7	104.1	22.4
1957	188	102	143	101	140	-	140	-	-	43	36	26	53	99.3	16.0	9.1	2.7	98.9	22.2
2088	179	107	136	89	137	104	136	70	69	42	35	25	51	95.8	15.4	7.8	3.0	101.6	21.6
2163	174	99	-	93	133	97	128	74	72	41	37	23	55	93.1	14.1	6.3	1.1	99.7	24.3
2239	170	89	132	88	136	-	119	-	-	39	35	22	47	92.2	16.0	6.4	2.8	88.5	25.8
2242	194	104	141	98	142	-	131	80	-	41	34	26	57	98.0	17.7	8.0	2.7	91.8	23.2
2324	187	104	139	92	-	100	135	78	76	44	32	27	57	95.0	9.8	4.4	0.6	100.1	20.5
2457	177	95	138	89	136	92	127	69	66	38	36	22	46	90.9	10.9	6.9	-	95.3	23.4
2490	-	97	-	-	-	97	126	68	65	40	34	24	49	93.5	16.3	7.0	2.0	94.0	18.1
2539	173	95	150	96	-	90	133	74	73	42	39	22	57	94.4	14.7	9.0	2.2	92.8	25.3
2544	182	102	143	98	138	96	131	71	70	45	34	25	52	95.5	12.5	-	-	102.9	23.0
2601	190	99	143	89	129	-	-	-	-	40	36	25	54	88.9	14.2	5.3	1.7	-	-
2619	175	95	136	99	130	86	-	65	61	40	32	23	48	91.0	15.6	6.4	1.3	-	-
2711	177	99	131	93	131	-	127	-	-	41	35	26	52	96.0	14.7	8.8	3.6	94.4	20.8
2742	-	104	-	-	-	107	130	71	69	44	34	25	51	96.8	16.5	7.9	3.1	93.6	24.8
2777	195	107	147	96	133	106	137	74	72	46	37	27	50	102.9	17.5	3.3	1.3	98.5	25.9
3097	195	106	141	96	143	104	140	74	71	43	34	26	53	100.4	17.5	6.7	2.0	107.3	31.3
3114	182	101	141	95	-	96	136	69	67	45	35	24	54	96.1	14.2	6.0	1.1	93.0	19.4
3212	185	-	142	98	-	-	-	73	72	46	37	27	55	103.0	19.2	8.1	2.3	101.6	23.2
3226	182	105	135	94	140	-	131	-	-	42	37	25	53	94.4	18.4	11.0	2.8	96.8	20.6
3237	190	105	143	101	138	-	140	-	-	43	37	22	52	102.0	15.7	5.2	2.6	106.7	26.0
3264	177	98	138	89	134	91	-	65	63	41	34	24	50	92.7	-	7.2	2.5	99.4	25.3
3265	177	102	144	96	136	98	140	75	74	43	36	27	57	100.5	13.4	8.3	0.9	104.5	20.6
3271	180	102	136	94	-	99	141	69	66	41	33	26	51	95.7	12.7	8.2	2.8	95.6	19.7
3278	173	98	130	88	-	104	133	63	62	40	31	28	48	92.7	11.5	5.8	1.1	98.6	16.8
3282	181	103	138	98	138	98	140	74	71	43	36	25	55	96.0	14.5	3.5	0.0	101.1	23.4
3290	192	103	151	100	-	96	140	74	71	43	34	22	52	102.9	16.7	6.9	1.7	98.2	22.1
3296	181	106	134	94	-	-	132	-	-	38	34	27	56	100.9	13.0	12.6	2.8	105.0	21.5
3303	185	106	144	94	-	103	134	74	72	41	33	25	52	95.6	13.2	8.5	3.5	102.0	26.3
3307	186	-	145	99	-	-	141	71	70	43	36	25	50	101.3	16.9	9.6	3.7	97.5	22.3
3313	187	102	138	97	-	96	134	70	66	43	34	27	51	100.0	15.3	6.9	2.3	101.6	22.0
3332	182	106	142	90	139	98	143	74	71	42	36	23	55	94.8	14.9	8.0	3.5	98.4	25.4
3334	177	106	149	98	-	-	141	-	-	41	38	26	52	98.4	15.5	9.3	2.3	100.7	25.7
3341	185	105	132	99	137	-	135	-	-	42	32	27	55	101.1	19.0	7.2	2.4	100.5	25.3
3362	177	95	140	87	-	91	127	77	75	42	34	25	54	90.8	11.2	7.0	3.0	93.6	25.5
3375	178	111	140	103	140	105	137	74	74	43	33	27	53	101.8	18.2	13.7	3.1	100.4	24.8
3391	-	106	-	99	-	103	135	73	71	43	34	24	53	100.0	18.3	9.5	3.6	84.4	25.3
3466	174	99	145	97	130	96	134	71	68	41	35	23	52	96.6	20.1	4.9	2.1	93.5	16.6

**Table 3.** Measurements of the adult female crania from the Tohoku region, Honshu (mm)

No.	L	BL	B	FB	H	GL	J	GH(1)	GH(2)	OB	OH	NB	NH	FC	FS	SC	SS	ZC	ZS
302	182	101	126	92	-	98	130	71	70	43	35	26	48	97.9	19.4	9.4	3.0	91.1	22.0
353	174	95	126	88	-	-	128	-	-	40	37	24	47	92.8	14.3	-	-	95.3	19.8
373	165	90	140	84	133	87	126	64	62	37	32	25	47	89.9	10.2	5.8	2.3	93.5	21.7
387	175	97	136	93	-	96	122	66	64	37	32	23	46	90.9	16.2	7.9	1.7	89.4	16.9
401	172	91	133	83	127	-	117	-	-	38	35	25	46	87.7	11.2	4.8	0.9	82.7	24.1
423	175	97	137	90	128	95	124	71	70	41	35	25	50	92.9	13.8	7.1	2.7	97.3	23.7
425	165	92	133	87	136	-	129	-	-	43	38	22	50	92.5	10.6	6.3	1.8	91.5	19.7
439	173	98	135	95	137	101	129	65	64	41	33	26	47	95.2	13.8	8.2	3.1	98.0	22.3
442	175	94	136	88	120	-	125	-	-	40	35	24	49	-	-	3.6	1.5	-	-
453	171	101	130	88	129	94	130	65	63	40	33	25	49	93.8	10.2	6.9	1.5	85.8	18.8
478	163	91	136	92	127	83	120	63	62	42	36	24	47	93.0	18.8	5.9	1.4	81.2	19.1
495	176	101	133	93	-	95	125	75	73	45	39	24	55	99.3	17.4	7.9	3.5	89.9	24.4
503	176	99	135	91	141	-	123	-	-	40	33	25	44	92.2	13.4	7.1	2.1	91.2	27.6
510	178	100	130	96	132	-	126	-	-	41	36	25	52	97.1	14.3	7.3	2.1	90.0	21.9
516	187	101	143	94	-	94	135	64	60	42	33	25	47	98.6	14.7	8.6	0.9	97.3	13.5
596	166	97	131	85	130	-	121	-	-	39	32	24	47	91.7	11.2	8.0	3.0	88.2	20.7
702	169	95	129	84	125	92	121	61	60	38	33	27	45	85.5	11.2	8.0	1.3	94.6	17.3
788	164	95	135	83	-	-	126	-	-	40	35	24	52	88.6	13.5	7.1	2.8	92.8	22.1
842	172	101	139	87	-	98	125	77	76	40	39	22	54	88.4	13.8	7.7	3.0	88.5	24.1
874	158	88	132	85	121	-	118	-	-	42	34	25	43	91.9	12.4	5.8	1.6	84.9	16.5
904	180	97	133	90	135	-	124	-	-	39	32	27	50	91.9	15.8	7.2	2.7	95.3	28.0
936	170	100	132	85	-	-	130	-	-	41	34	24	55	90.9	15.0	8.3	2.2	84.8	27.7
937	174	100	128	89	135	99	125	65	64	40	32	26	50	92.0	13.2	8.1	2.6	88.4	22.7
939	179	98	137	92	-	-	127	-	-	42	36	23	50	96.9	16.9	7.7	1.7	93.5	22.7
1004	180	101	130	90	-	-	130	-	-	39	34	24	49	96.5	15.1	12.2	3.8	95.5	21.2
1039	170	91	131	90	129	89	122	67	66	41	36	24	49	88.6	7.9	6.1	1.0	93.5	25.0
1139	190	107	138	98	129	103	131	75	72	42	35	26	57	96.3	15.7	7.5	3.1	102.7	24.6
1203	168	88	138	90	129	90	120	61	60	37	32	21	45	88.7	13.1	2.9	1.4	85.3	24.6
1211	172	93	132	87	127	-	-	-	-	38	34	25	45	92.4	8.4	3.2	1.1	97.7	24.6
1221	170	95	138	90	123	95	120	69	67	42	34	25	50	91.9	15.5	8.0	3.1	89.8	22.7
1286	-	98	-	-	-	95	-	68	66	40	33	24	50	96.3	17.3	10.3	0.0	95.9	22.3
1316	179	105	134	92	130	-	-	-	-	45	37	27	50	100.8	20.7	5.6	2.0	93.0	25.4
1330	171	92	138	91	-	-	119	-	-	41	35	24	49	90.2	10.2	6.4	2.6	85.9	18.1
1350	168	97	130	85	130	98	-	69	67	43	35	25	49	90.3	14.6	7.7	4.1	-	-
1382	168	100	135	84	131	-	131	-	-	42	35	25	54	91.2	14.5	7.5	0.0	-	-
1440	165	93	130	85	131	93	-	68	67	37	35	22	47	87.6	16.9	7.9	3.7	81.5	20.3
1517	177	105	143	92	142	-	129	-	-	42	35	-	-	88.9	13.3	7.5	2.0	-	-
2164	-	93	-	89	-	-	118	-	-	40	34	23	50	88.1	16.0	6.9	1.9	87.8	22.2
2319	172	99	130	90	129	100	131	70	68	42	35	26	50	95.4	14.8	8.1	1.7	100.0	21.8
2458	-	93	-	89	-	-	119	-	-	40	34	25	45	89.3	11.7	7.2	2.5	90.0	21.0
2480	167	93	135	79	124	94	120	70	68	41	37	22	47	90.7	11.1	5.3	1.5	82.5	17.1
2506	173	95	145	90	-	96	130	68	66	39	33	25	48	93.0	14.5	7.7	2.8	95.8	23.0
2542	160	94	132	88	129	86	124	65	64	36	35	21	45	89.8	13.7	5.2	0.5	82.5	15.7
2547	165	95	142	88	-	-	127	-	-	40	35	25	48	91.8	11.4	5.5	0.9	101.6	22.7
2564	165	89	127	86	-	91	120	73	71	40	35	24	51	91.4	11.8	5.2	2.3	87.2	23.3
2593	181	102	129	85	128	-	122	-	-	41	36	23	52	94.6	15.1	6.2	1.0	88.0	19.2
2612	-	95	-	90	-	-	124	-	-	40	31	25	48	88.4	15.2	3.4	1.1	90.2	18.6
2614	160	97	129	77	127	-	124	-	-	38	35	25	51	86.3	14.0	7.1	2.1	89.7	20.3
2760	179	101	132	94	126	98	126	73	71	43	35	23	52	97.3	17.5	7.4	2.4	95.4	25.9
3134	172	100	140	90	137	-	132	-	-	42	36	25	46	93.8	14.2	9.0	2.3	98.7	19.7
3197	176	101	133	91	-	97	125	65	64	39	34	24	50	92.2	15.2	8.4	1.7	93.9	19.8
3261	170	103	134	99	134	-	125	-	-	40	33	27	50	95.7	16.8	12.1	1.8	96.8	22.0
3267	177	100	137	88	-	-	129	-	-	42	37	25	57	93.1	13.6	7.7	0.9	98.4	24.0
3285	162	90	125	82	-	88	121	64	-	41	36	22	45	87.1	13.9	5.8	0.9	84.9	23.2
3363	177	96	132	96	133	-	119	-	-	42	34	30	51	95.3	15.5	7.0	2.3	95.2	28.8

**Table 4.** Comparison of means of the Tohoku Japanese cranial measurements between different researchers (Male).

Measurement		Kawakubo et al. (present study)	Yamasaki et al. (1967)	Hanihara (2002)
1. L	n	94	61	48
	m	181.2	181.2	182.7
	sd	6.33	6.03	6.91
5. BL	n	98	65	48
	m	101.7	101.5	102.7
	sd	4.80	4.81	5.16
8. B	n	92	60	47
	m	138.9	139.5	138.7
	sd	4.90	5.06	5.09
9. FB	n	99	65	48
	m	94.0	94.1	94.1
	sd	4.27	4.30	4.08
17. H	n	71	60	48
	m	136.6	136.3	137.6
	sd	4.86	4.54	5.12
40. GL	n	76	59	48
	m	97.8	97.5	100.2
	sd	5.48	5.07	5.23
45. J	n	86	52	46
	m	133.2	133.4	133.9
	sd	5.30	5.84	5.48
48. GH(1)	n	79	-	-
	m	71.9	-	-
	sd	4.04	-	-
48'. GH(2)	n	78	58	48
	m	69.8	69.0	70.5
	sd	3.98	4.17	3.98
51. OB	n	101	64	48
	m	41.9	40.2	42.3
	sd	2.04	2.04	2.33
52. OH	n	101	63	47
	m	34.7	35.1	34.3
	sd	1.76	1.77	2.10
54. NB	n	101	64	48
	m	25.2	25.7	25.2
	sd	2.13	2.46	2.24
55. NH	n	101	63	48
	m	52.2	52.0	51.9*
	sd	3.07	3.07	2.76

\*Howells (1989)

**Table 5.** Comparison of means of the Tohoku Japanese cranial measurements between different researchers (Female).

Measurement		Kawakubo et al. (present study)	Yamasaki et al. (1967)	Hanihara (2002)
1. L	n	51	21	15
	m	172.0	173.1	174.0
	sd	6.80	7.14	8.11
5. BL	n	55	23	15
	m	96.7	95.8	97.7
	sd	4.49	4.77	5.88
8. B	n	51	21	15
	m	133.8	134.3	135.9
	sd	4.61	5.33	5.44
9. FB	n	54	22	15
	m	88.9	89.9	91.3
	sd	4.40	4.27	4.65
17. H	n	34	21	15
	m	130.1	130.3	131.3
	sd	5.06	4.16	5.07
40. GL	n	27	22	15
	m	94.3	94.5	95.5
	sd	4.80	5.19	5.33
45. J	n	50	20	15
	m	124.9	125.5	125.9
	sd	4.39	5.63	6.65
48. GH(1)	n	27	-	-
	m	67.9	-	-
	sd	4.29	-	-
48'. GH(2)	n	26	22	15
	m	66.3	65.4	65.6
	sd	4.21	4.08	4.97
51. OB	n	55	23	15
	m	40.5	39.3	40.7
	sd	1.94	1.96	2.19
52. OH	n	55	23	15
	m	34.6	34.7	34.2
	sd	1.76	1.40	2.01
54. NB	n	54	23	15
	m	24.5	24.9	25.5
	sd	1.63	1.66	1.92
55. NH	n	54	23	15
	m	49.1	49.5	48.7*
	sd	3.16	3.20	3.98

\*Howells (1989)

**Table 6.** Cranial measurements of the Japanese series from the Tohoku region and other regions of the Japanese archipelago (Male).

Measurement		Modern Jpn in the Tohoku region <sup>1)</sup>	Modern Jpn in the Kanto region <sup>2)</sup>	Early Modern Ainu in Hokkaido <sup>3)</sup>	Early Modern Ryukyuan in Amami/Okinawa <sup>4)</sup>	Protohistoric Kofun in the Kanto and Tohoku regions <sup>5)</sup>	Prehistoric Yayoi in northern Kyushu/ westernmost Honshu <sup>6)</sup>	Prehistoric Jomon in Hokkaido, Honshu, and Kyushu <sup>7)</sup>
1. L	n	94	53	68	37	41	82	62
	m	181.2	181.8	186.8	178.9	182.6	183.4	182.8
	sd	6.33	5.81	5.30	5.55	5.76	5.30	6.95
5. BL	n	98	53	68	37	25	62	59
	m	101.7	103.5	105.8	101.1	101.6	102.4	103.7
	sd	4.80	4.38	4.08	3.18	4.49	4.04	5.61
8. B	n	92	53	68	37	28	82	62
	m	138.9	141.6	141.8	139.8	143.1	142.3	144.4
	sd	4.90	5.66	3.47	4.76	5.32	4.35	6.17
9. FB	n	99	53	68	37	35	82	61
	m	94.0	95.6	96.7	92.1	94.5	96.0	98.4
	sd	4.27	4.80	3.72	3.84	4.10	5.19	5.16
17. H	n	71	53	68	37	30	62	59
	m	136.6	139.8	138.6	135.8	136.6	137.6	139.4
	sd	4.86	4.62	4.58	4.84	5.15	4.42	6.48
40. GL	n	76	53	68	37	13	62	59
	m	97.8	100.9	104.6	100.6	100.1	100.9	101.2
	sd	5.48	5.42	5.18	4.23	3.09	4.92	5.72
45. J	n	86	53	68	37	16	82	61
	m	133.2	136.1	137.2	134.6	141.6	140.3	142.3
	sd	5.30	4.84	5.13	4.75	3.97	4.82	5.58
48. GH(1)	n	79	53	68	-	22	82	61
	m	71.9	72.4	69.6	-	71.0	74.0	68.1
	sd	4.04	4.23	4.52	-	3.14	3.89	3.96
48'. GH(2)	n	78	-	-	37	-	-	-
	m	69.8	-	-	66.0	-	-	-
	sd	3.98	-	-	4.41	-	-	-
51. OB	n	101	53	68	37	32	82	62
	m	41.9	42.2	43.5	41.5	42.9	43.3	44.0
	sd	2.04	1.96	1.72	1.92	1.91	1.60	1.77
52. OH	n	101	53	68	37	33	82	62
	m	34.7	34.5	34.2	33.4	34.3	34.5	33.2
	sd	1.76	2.11	1.83	2.24	1.94	1.98	1.95
54. NB	n	101	53	68	37	30	82	61
	m	25.2	25.7	25.6	26.2	27.1	27.1	26.7
	sd	2.13	1.71	1.75	1.79	1.55	2.04	1.99
55. NH	n	101	53	68	37	29	82	61
	m	52.2	52.5	50.6	50.7	51.4	52.8	49.5
	sd	3.07	3.31	2.69	2.72	2.58	2.97	2.83
FC	n	101	53	68	37	20	62	59
	m	96.0	98.0	99.5	96.3	98.8	100.8	101.5
	sd	4.04	4.23	3.53	3.63	3.47	3.65	3.73

Table 6. (Continued)

Measurement		Modern Jpn in the Tohoku region <sup>1)</sup>	Modern Jpn in the Kanto region <sup>2)</sup>	Early Modern Ainu in Hokkaido <sup>3)</sup>	Early Modern Ryukyuan in Amami/Okinawa <sup>4)</sup>	Protohistoric Kofun in the Kanto and Tohoku regions <sup>5)</sup>	Prehistoric Yayoi in northern Kyushu/ westernmost Honshu <sup>6)</sup>	Prehistoric Jomon in Hokkaido, Honshu, and Kyushu <sup>7)</sup>
FS	n	100	53	68	37	20	62	59
	m	15.6	16.7	17.0	14.0	15.2	14.9	16.0
	sd	2.38	2.26	2.32	2.18	2.08	2.06	2.69
SC	n	100	52	68	37	37	59	44
	m	7.3	7.1	8.4	8.5	7.4	8.5	10.1
	sd	2.00	1.78	1.59	1.76	1.75	1.61	1.78
SS	n	99	52	68	37	37	59	44
	m	2.4	2.8	3.7	2.5	2.3	2.4	4.3
	sd	0.94	1.00	0.95	0.87	0.89	0.76	1.01
ZC	n	96	53	58	37	14	58	50
	m	97.5	97.7	100.5	99.5	100.9	104.5	103.5
	sd	5.05	5.23	5.65	4.04	5.47	4.36	5.99
ZS	n	95	53	58	37	14	58	50
	m	22.9	23.8	22.6	20.9	20.3	21.7	22.5
	sd	2.72	3.05	2.22	2.75	3.42	3.08	2.73

1) present study ; 2) measured by K. Mitsuhashi and B. Yamaguchi ; 3) Koganei (1893) supplemented by B. Yamaguchi ; 4) Dodo et al. (2001) ; 5) Yamaguchi (1987) ; 6) Nakahashi and Doi (1988) ; 7) measured by Y. Dodo, H. Matsumura, T. Nakahashi, and N. Doi

Table 7. Cranial measurements of the Japanese series from the Tohoku region and other regions of the Japanese archipelago (Female).

Measurement		Modern Jpn in the Tohoku region <sup>1)</sup>	Modern Jpn in the Kanto region <sup>2)</sup>	Early Modern Ainu in Hokkaido <sup>3)</sup>	Early Modern Ryukyuan in Amami/Okinawa <sup>4)</sup>	Protohistoric Kofun in the Kanto and Tohoku regions <sup>5)</sup>	Prehistoric Yayoi in northern Kyushu/ westernmost Honshu <sup>6)</sup>	Prehistoric Jomon in Hokkaido, Honshu, and Kyushu <sup>7)</sup>
1. L	n	51	24	46	34	27	56	24
	m	172.0	173.2	178.3	173.5	174.9	176.4	179.6
	sd	6.80	5.32	6.00	4.81	4.87	5.00	6.00
5. BL	n	55	25	46	34	22	56	20
	m	96.7	96.3	100.5	96.5	97.2	96.7	100.7
	sd	4.49	4.63	3.75	3.67	3.96	3.84	5.33
8. B	n	51	24	46	34	21	56	24
	m	133.8	136.3	136.4	137.1	138.3	138.1	141.7
	sd	4.61	4.72	3.32	3.80	5.09	4.85	5.69
9. FB	n	54	25	46	34	22	56	24
	m	88.9	90.5	92.8	90.0	91.5	92.6	99.5
	sd	4.40	4.06	4.55	4.46	4.19	4.27	4.08
17. H	n	34	24	46	34	26	55	20
	m	130.1	131.8	133.3	131.7	131.3	130.2	135.5
	sd	5.06	4.20	3.95	4.69	3.50	5.00	4.72
40. GL	n	27	13	46	34	11	54	20
	m	94.3	93.7	99.5	95.9	94.9	96.3	99.2
	sd	4.80	3.50	5.15	3.64	4.25	5.25	4.79
45. J	n	50	25	46	34	9	54	24
	m	124.9	125.8	129.3	125.9	131.8	131.9	135.0
	sd	4.39	4.88	4.34	5.25	5.61	4.62	5.27

Table 7. (Continued)

Measurement		Modern Jpn in the Tohoku region <sup>1)</sup>	Modern Jpn in the Kanto region <sup>2)</sup>	Early Modern Ainu in Hokkaido <sup>3)</sup>	Early Modern Ryukyuan in Amami/Okinawa <sup>4)</sup>	Protohistoric Kofun in the Kanto and Tohoku regions <sup>5)</sup>	Prehistoric Yayoi in northern Kyushu/ westernmost Honshu <sup>6)</sup>	Prehistoric Jomon in Hokkaido, Honshu, and Kyushu <sup>7)</sup>
48. GH(1)	n	27	13	46	-	16	56	22
	m	67.9	69.0	65.6	-	66.7	69.8	65.3
	sd	4.29	4.53	4.24	-	3.68	4.01	3.61
48'. GH(2)	n	26	-	-	34	-	-	-
	m	66.3	-	-	61.9	-	-	-
	sd	4.21	-	-	2.78	-	-	-
51. OB	n	55	25	46	34	24	56	25
	m	40.5	40.0	41.8	40.1	41.2	41.6	43.0
	sd	1.94	1.59	1.64	1.68	1.29	1.87	1.97
52. OH	n	55	25	46	34	22	56	24
	m	34.6	35.0	33.5	32.4	33.6	33.9	34.3
	sd	1.76	1.72	1.57	1.37	1.47	1.78	2.17
54. NB	n	54	25	46	34	18	55	22
	m	24.5	25.6	25.2	25.7	26.6	26.4	24.6
	sd	1.63	2.16	1.94	2.02	1.04	1.61	1.87
55. NH	n	54	25	46	34	17	56	22
	m	49.1	49.8	47.7	47.7	48.3	49.2	46.7
	sd	3.16	2.52	1.93	2.55	2.17	2.56	2.97
FC	n	54	25	46	34	12	44	23
	m	92.3	92.8	95.2	91.7	93.7	97.1	99.3
	sd	3.51	3.39	3.51	4.11	3.86	3.78	3.94
FS	n	54	25	46	34	12	44	23
	m	14.1	14.5	15.9	13.1	13.2	13.5	14.5
	sd	2.61	2.10	2.45	2.02	1.73	2.44	2.52
SC	n	54	25	45	34	27	39	18
	m	7.1	7.9	8.5	8.1	8.1	7.9	9.8
	sd	1.81	1.42	1.77	1.89	1.25	1.58	1.53
SS	n	54	25	45	34	27	39	18
	m	2.0	1.9	2.9	1.9	1.8	1.8	3.1
	sd	0.93	0.87	0.97	0.81	0.80	0.77	0.79
ZC	n	51	25	37	34	6	42	18
	m	91.5	94.0	95.4	94.0	95.0	99.5	100.3
	sd	5.46	4.39	4.78	4.56	5.68	4.19	3.27
ZS	n	51	25	37	34	6	42	18
	m	21.9	22.5	21.8	19.0	19.7	20.0	21.3
	sd	3.25	2.45	2.59	2.03	2.38	2.02	2.18

1) present study ; 2) measured by Y. Kawakubo ; 3) Koganei (1893) supplemented by B. Yamaguchi ; 4) Dodo et al. (2001) ; 5) Yamaguchi (1987) ; 6) Naka-hashii and Doi (1988) ; 7) measured by Y. Dodo and H. Matsumura.

### Craniometric Raw Data

Table 2 shows the raw data of 18 cranial and facial flatness measurements for the 101 males and Table 3 shows those for the 55 females. The sample size, mean, and standard deviation of each individual measurement are given in Tables 4 and 5.

### Comparison of Measurements between Different Researchers

The number of crania (*n*), mean measurement (*m*), and its standard deviation (*sd*) are compared between the present study, Yamasaki *et al.* (1967), and Hanihara (2002) in Table 4 for males and Table 5 for females. The latter two researchers did not record upper facial height defined by Martin (1914) and facial flatness measurements. With the exception of these measurements, the mean measurements given by the three different researchers are fairly consistent with each other; however, we recommend the data of the present study should be used for comparison, because the sample size is large and measurements were taken with great care.

We demonstrated that in a modern Japanese cranial series the differences between the upper facial heights measured by the Martin's method and that of Howells (1973) were on average 2.6 mm for males and 2.0 mm for females, and postulated that the upper facial height measurements taken by the two different methods should not be compared with each other (Dodo, 2001). In the present cranial series, the differences are 2.0 mm in males (*n*=78, mean=2.0, *sd*=0.98) and 1.7 mm in females (*n*=26, mean=1.7, *sd*=0.75).

### Cranial and Facial Flatness Measurement Data in Several Japanese Samples

Publications of craniometric data including those of facial flatness measurement have been, to date, very limited. The data of seven Japanese samples from prehistoric to modern times are compiled in Tables 6 and 7. These samples are the cranial series of the prehistoric Jomon (10,000 B.C. to 500 B.C.) from the Japanese main-islands, the prehistoric Yayoi (500 B.C. to 300 A.D.) from the western-most Honshu and northern Kyushu, the protohistoric Kofun (300 A.D. to 700 A.D.) from the Kanto and southern Tohoku regions in Honshu, the early modern Ryukyuan (17th to 19th century) from the Okinawa and Amami islands, the early modern Ainu (17th to

19th century) from Hokkaido, the modern Japanese (19th to 20th century) from the Kanto region in Honshu, and the modern Japanese (19th to 20th century) from the Tohoku region in Honshu.

These data should be helpful in understanding secular changes and regional variations of the Japanese Islanders in terms of cranial metric features.

### References

- Dodo Y., 2001: Different measuring methods for the upper facial height significantly influence the results of craniometric analyses: metric studies of the Ainu and Ryukyuan crania. *Anthropological Science* (Japanese series), 108: 133-141 (in Japanese).
- Dodo Y., Doi N., and Kondo O., 2001: Metric data of the Ryukyuan crania. *Anthropological Science*, 109: 183-190.
- Hanihara K. ed., 2002: *Metric Data of the Modern and Edo Era Japanese Crania*. The University Museum, The University of Tokyo, Material Reports No. 47, Tokyo.
- Howells W.W., 1973: *Cranial Variation in Man*. Peabody Museum of Archaeology and Ethnology, Harvard University, Cambridge, Massachusetts.
- Koganei Y., 1893: Beiträge zur physischen Anthropologie der Aino. I. Untersuchungen am Skelet. *Mitteilungen aus der Medicinischen Facultät der Kaiserlich-Japanischen Universität*, II: 1-249.
- Martin R., 1914: *Lehrbuch der Anthropologie*. Gustav Fischer, Jena.
- Nakahashi T. and Doi N., 1988: Metric data of the Yayoi crania. In: Department of Anatomy, Faculty of Medicine, Kyushu University (ed.) *The Formation of Japanese People and their Culture* (2): *Anthropological Data File on the Excavated Human Skeletons Kept at the Department of Anatomy, Faculty of Medicine, Kyushu University*. Rokko-shuppan, Tokyo, pp.125-172, 418-425.
- Yamaguchi B., 1973: Facial flatness measurements of the Ainu and Japanese crania. *Bulletin of the National Science Museum*, 16: 161-171.
- Yamaguchi B., 1987: Metric study of the crania from protohistoric sites in eastern Japan. *Bulletin of the National Science Museum, Tokyo, Series D*, 13: 1-9.
- Yamasaki M., Yamasaki M., Kanda S., and Kurisu K., 1967: Craniometrical study of the Tohoku Japanese skulls. *Journal of the Anthropological Society of Nippon*, 75: 94-99.