

Human Skeletal Remains from the Teauma Site, Marakei Island, Gilbert Islands, Republic of Kiribati*

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Abstract

Several human skeletal remains excavated from Marakei Island, Republic of Kiribati in 1984 were examined. It was shown that these were recently buried and at least five individuals were recognizable. As to the cranial indices, one is meso-, hypsi- and acrocranial, and another is dolicho-, ortho- and acrocranial. All of the mandibles (three males and two females) have an ante-gonial notch, not exhibiting the so-called "rocker jaw". The postcranial skeletons were large for the males so that the estimated heights, calculated by Pearson's formula, were very tall (169.0 cm and 173.3 cm). Whereas the postcranial skeletons of the females were small and slender and the statures relatively short (149.7 cm and 155.5 cm). On several bones osteoarthritic changes and healed fracture were observed.

Introduction

The Gilbert Islands, including Marakei Island, are located at the easternmost end of Micronesia, bounded on the southeast by Polynesia and on the southwest by Melanesia (Fig. 1). The location of the Gilbert Islands is important to elucidate the origin of Polynesians as well as Micronesians. However, there have been few reports concerned with skeletal remains of the Gilbert Islanders, e. g. Krause (1881). In the present paper, we examine some skeletal materials obtained from Marakei Island, and discuss the relationships between them and those of other Oceanic populations.

Materials and Methods

The skeletal remains were excavated from the Teauma site, Marakei Island, the

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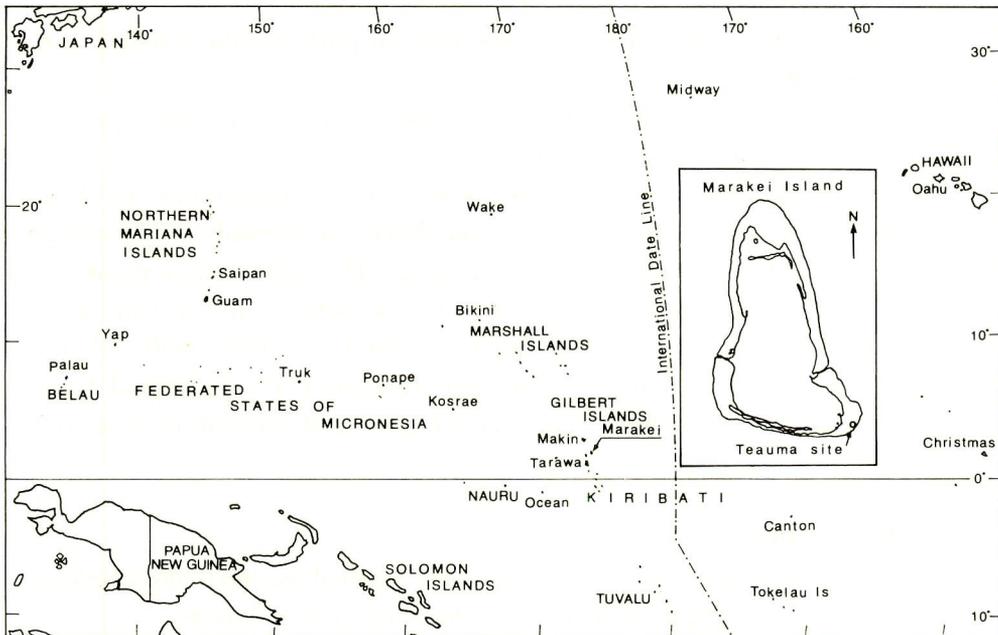


Fig. 1. Map of Micronesia showing location of Teama site, Marakei Island

Gilbert Islands in 1984. This site is located at the southeast part of the Marakei Atoll. It is a "Te Baro", a grave for the members of a family or a clan, about 80-100 years ago. The human skeletal materials were found in a jumbled state, so that they were reassembled into individuals according to the morphological characters and dimensions of bones. The measurements were carried out after Martin & Saller (1957).

Results

At least five individuals are recognized. The observations and measurements for those skeletons are as follows.

1. Cranium

Three calvariae (Nos. 1-3) and five mandibles (Nos. 1-5) can be measured. Although many fragments of crania are preserved, there were no complete ones to be measured. The upper facial skeletons were almost lost except for fragments of maxilla and zygomatic bones.

No. 1 calvaria and No. 1 mandible are supposed to belong to the same individual, whereas others are obscure. The measurements and indices are shown in Tables 1 and 2, and non-metric variations in Table 3.

No. 1 calvaria (Plate 1)

Sex : Male, from well-developed brow-ridges, mastoid processes and external occipital protuberance.

Age : Adult, from complete ossification of sphenoccipital synchondrosis and no occurrence of sutural obliteration.

Comment : Only cerebral cranium is preserved. Cranial dimensions are large in general. As measurements, maximum length is normal, while maximum breadth and basion-bregma height are large. The indices show meso- (77.3), hypsi- (76.8) and acrocranic (99.3). The breadth of the frontal region is narrow and the transverse frontoparietal index is rather small (64.3). As non-metric variations, hypoglossal canal bridging (1), supraorbital foramina (r, 1), parietal notch bone (1), occipital torus and parietal foramen (r) are found.

No. 2 calvaria (Plate 1)

Sex : Male, from well-developed brow-ridges and external occipital protuberance.

Age : Mature, from complete obliteration of the main cranial sutures.

Comment : Only cerebral cranium is preserved. As measurements, maximum length is fairly large, while maximum breadth is small and basion-bregma height is normal. The indices show dolicho- (70.5), ortho- (71.0) and acrocranic (100.7); considerably different from No. 1 calvaria. The frontal arc is longer than the parietal arc. Namely the frontoparietal index is small (96.3). As non-metric variations, supraorbital foramina (r, 1), precondylar tubercles (r, 1), occipital torus and parietal foramen (1) are found. Supramastoid crests are remarkably developed.

No. 3 calvaria

Sex : Female, from small size in general.

Age : Adult, from slight occurrence of the main sutural obliteration.

Comment : Only cranial vault is preserved, lacking cranial base and face. A few items can be measured. Maximum cranial breadth is somewhat broad. It appears mesocranic on observation and resembles No. 1 calvaria in norma lateralis. Inca bone and parietal foramina (r, 1) are found.

No. 1 mandible (Plate 2)

Sex : Male, from large dimensions and rugged appearance.

Age : Adult, from slight attrition of teeth and condition of $\overline{8} \mid 8$.

Dentition : $\overline{8 \ 7 \ 6 \ 5 \ 4 \ \bigcirc \ \bigcirc \ \bigcirc \ \bigcirc \ \bigcirc \ \bigcirc \ 4 \ 5 \ 6 \ 7 \ \odot}$
 (\bigcirc post-mortem loss; \odot almost impacted tooth)

Comment : This mandible is preserved nearly intact except post-mortem loss of six anterior teeth. It is robust and mental protuberance is developed. Attrition

Table 1. Measurements (in mm.) and indices of calvariae

Martin's No.		No. 1 male	No. 2 male	No. 3 female
1	Maximum cranial length	185	193	-
3	Glabella-lambda length	182	186	-
5	Nasion-basion length	102	110	-
7	Length of foramen magnum	-	36.5	-
8	Maximum cranial breadth	143	136	137
9	Minimum frontal breadth	92	96	95
10	Maximum frontal breadth	115	118	-
11	Biauricular breadth	126	121	-
12	Maximum occipital breadth	113	111	-
16	Breadth of foramen magnum	28	34.5	-
17	Basion-bregma height	142	137	-
20	Porion-bregma height	116	117	-
23	Horizontal circumference	527	532	-
24	Transverse arc	317	323	-
25	Sagittal arc	383	397	-
26	Frontal arc	126	134	-
27	Parietal arc	136	129	126
28	Occipital arc	121	134	-
29	Frontal chord	113	116	-
30	Parietal chord	117	113	113
31	Occipital chord	99	108	-
8/1	Length-breadth Index	77.3	70.5	-
17/1	Length-height I.	76.8	71.0	-
17/8	Breadth-height I.	99.3	100.7	-
20/1	Auriculo-vertical I.	62.7	60.6	-
20/8	Auriculo-transverse I.	81.1	86.0	-
17/23	Circumference-height I.	26.9	25.8	-
11/24	Transverse curvature I.	39.7	37.5	-
9/10	Transverse frontal I.	80.0	81.4	-
9/8	Transverse fronto-parietal I.	64.3	70.6	-
12/8	Transverse parieto-occipital I.	79.0	81.6	-
27/26	Fronto-parietal I.	107.9	96.3	-
28/26	Fronto-occipital I.	96.0	100.0	-
28/27	Parieto-occipital I.	89.0	103.9	-
26/25	Fronto-sagittal I.	32.9	33.8	-
27/25	Parieto-sagittal I.	35.5	32.5	-
28/25	Occipito-sagittal I.	31.6	33.8	-
29/26	Frontal curvature I.	89.7	86.6	-
30/27	Parietal curvature I.	86.0	87.6	89.7
31/28	Occipital curvature I.	81.8	80.6	-
16/7	Index of foramen magnum	-	94.5	-
(1+8+17)/3	Cranial module	156.7	155.3	-

Table 2. Measurements and indices of mandibles

Martin's No.		No. 1 male	No. 2 male	No. 3 female	No. 4 female	No. 5 male
65	Bicondylar breadth	125	-	-	-	-
66	Bigonial breadth	105	-	87	-	-
67	Anterior mandibular breadth	56	-	44	-	-
68	Mandibular length	80	(84)	74	-	-
68(1)	Mandibular length	112	-	-	98	-
69	Symphyseal height	32	(30)	-	-	-
69(1)	Mandibular body height	34	32	25	-	-
69(3)	Mandibular body thickness	13	11	10	9	-
70	Ramal height	74	-	-	(49)	-
70(1)	Anterior ramal height	-	69	52	-	62
70(2)	Minimum ramal height	56	54	-	(33)	(56)
70a	Condylar height	69	-	-	-	-
71	Ramal breadth	35	-	-	-	-
71a	Minimum ramal breadth	33.5	35.5	-	-	36
79	Gonial angle	115°	-	-	143°	-
68/65	Breadth-length I.	64.0	-	-	-	-
71/70	Ramal I.	47.3	-	-	-	-
71a/70(2)	Ramal I.	59.8	65.7	-	-	(64.3)
66/65	Mandibular breadth I.	84.0	-	-	-	-
69(3)/69(1)	Body height-thickness I.	38.2	34.4	40.0	-	-

Note: The estimated values are in parentheses.

2. Postcranial Skeleton (Plates 3 and 4)

Many shafts of long bones and fragments are preserved (Table 4). At least three males (A, B and C) and two females (D and E) are recognized. Measurements and indices are shown in Tables 5-10. Identification of each individual according to the morphological characters of bones are as follows:

Individual A

Material: A left humerus (H-1), a left radius (R-1), a left ulna (U-1), shafts of the femora (F-1, 2) and a shaft of the left tibia (T-1).

Sex: Male, from bone dimensions.

Age: Mature (?)

Comment: Materials show large dimensions in general. Osteoarthritic bone lipping and pitting occur in the articular facets of the left elbow joint. Capitulum of humerus and head of radius are eburnated and show the ivory polish (Plate 5). The femora exhibit well-developed pilastering (Fig. 2) and tend to be platymeric (platymeric indices: r 87.5, l 84.4). The tibia is not platycnemic (cnemic index: 78.9) and the soleal line is well-developed. The height is

Table 3-1. Non-metric variations (calvariae)

Traits	No. 1		No. 2		No. 3	
	r	l	r	l	r	l
Hypoglossal canal bridging	-	+	-	-	/	/
Condylar canal absent	/	/	-	-	/	/
Foramen of Huschke	-	-	-	/	/	/
Supraorbital foramen	+	+	+	+	/	/
Metopism	-		-		-	
Biasterionic suture trace or Inca bone	-		-		+	
Parietal notch bone	-	+	-	-	/	/
Precondylar tubercle	-	-	+	+	/	/
Occipital torus		+		+	/	
Jugular foramen bridging	/	/	-	-	/	/
Aural exostosis	-	-	-	-	/	/
Foramen of Vesalius	/	/	-	-	/	/
Parietal foramen	+	-	-	+	+	+
Bregmatic bone	-		-		-	
Ossicle at lambda	-		-		-	
Lambdoid ossicle	-	-	-	-	/	/
Ossicle at asterion	-	-	-	-	-	-
Occipito-mastoid ossicle	-	-	-	-	-	-
Epipteric bone	-	-	-	-	/	/
Foramen ovale incomplete	/	/	-	-	/	/
Mastoid foramen absent	-	-	-	-	/	/

+ : present - : absent / : unknown

Table 3-2. Non-metric variations (mandibles)

Traits	No. 1		No. 2		No. 3		No. 4		No. 5	
	r	l	r	l	r	l	r	l	r	l
Mylohyoid bridging	-	-	/	-	/	/	-	-	/	-
Accessory mental foramen	-	-	/	-	-	-	/	-	/	/
Mandibular torus	-	-	/	-	-	-	/	-	/	/

estimated to be 173.3 cm (Table 11). It seems that No. 2 calvaria belongs to this individual.

Individual B

Material : Shafts of the humeri (H-2, 3), portions of the radii (R-2, 3) and ulnae (U-2, 3), portion of the left femur (F-3), an almost complete left tibia (T-2) and a shaft of the left fibula (Fb-1).

Table 4. Postcranial skeletal remains

Bone	Remains
Vertebra	many fragments
Sternum	a fragment
Rib	many fragments
Scapula	some fragments
Clavicle	some fragments
Humerus	five shafts and fragments H-1 : left (A, male) : head is broken H-2 : right (B, male) : shaft only H-3 : left (B, male) : shaft only H-4 : right (E, female) : shaft only H-5 : left (E, female) : shaft only
Radius	seven shafts and fragments R-1 : left (A, male) : complete R-2 : right (B, male) : portion of the shaft R-3 : left (B, male) : portion of the shaft R-4 : right (C, male) : almost complete R-5 : left (D, female) : shaft only R-6 : right (E, female) : shaft only R-7 : left (E, female) : shaft only
Ulna	six shafts and fragments U-1 : left (A, male) : complete U-2 : right (B, male) : shaft only U-3 : left (B, male) : portion of the shaft U-4 : right (D, female) : portion of the shaft U-5 : right (C, male) : almost complete U-6 : left (C, male) : almost complete
Pelvis	many fragments
Femur	six shafts and fragments F-1 : right (A, male) : shaft only F-2 : left (A, male) : shaft only F-3 : left (B, male) : lower portion only F-4 : left (D, female) : almost complete F-5 : right (E, female) : shaft only F-6 : left (E, female) : almost complete
Patella	a right one
Tibia	four shafts and fragments T-1 : left (A, male) : shaft only T-2 : left (B, male) : almost complete T-3 : left (C, male) : shaft only T-4 : left (E, female) : shaft only
Fibula	a shaft and fragments Fb-1 : left (B, male) : shaft only
Others	some carpal bones, metacarpal bones, tarsal bones, metatarsal bones and so on

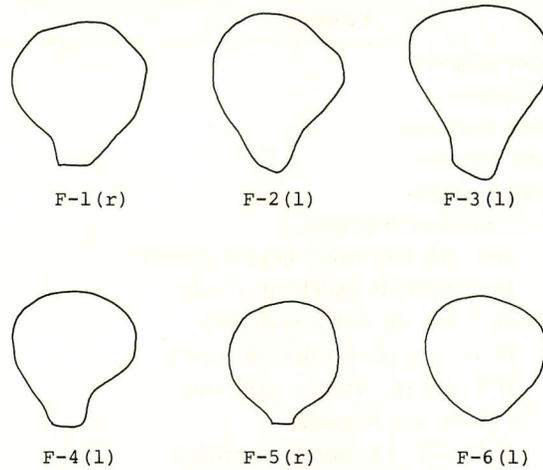


Fig. 2. Cross-sectional shape of the midshaft of femur

Sex : Male, from bone dimensions.

Age : Adult (?)

Comment : Since the long bones have large dimensions and strong muscle marks, this individual should be a big and strong man. The femur shows considerably developed pilastering (Fig. 2). The pilasteric index (125.9) is large. The tibia is not so platycnemic (cnemic index : 66.7) and development of the soleal line is moderate. The fibula is robust. The height is estimated to be 169.0 cm (Table 11). It seems that No. 1 calvaria belongs to this individual.

Individual C

Material : A right radius (R-4), ulnae (U-5, 6) and a shaft of the left tibia (T-3).

Sex : Male, from bone dimensions.

Age : Adult (?)

Comment : The ulnae are robust. The tibia exhibits strong muscle marks and medial bowing at the midshaft and is not so platycnemic (cnemic index : 64.9).

Individual D

Material : A shaft of the left radius (R-5), a portion of the right ulna (U-4) and an almost complete left femur (F-4).

Sex : Female, from bone dimensions,

Age : Mature (?)

Comment : The radius is slender but extension of interosseous crest is well marked. The ulna has an old healed fracture on the shaft and osteoarthritic lipping on the proximal end. The femur is pilasteric (Fig. 2). The height is estimated

Table 5. Measurements and indices of humerus

Martin's No. .	H-1(1) male	H-2(r) male	H-3(1) male	H-4(r) female	H-5(1) female
5 Max. dia. midshaft	24	26	27	21	20
6 Min. dia. midshaft	19	20	20	15	15
7 Least girth of shaft	65	70	73	56	54
7a Girth in middle	70	75	76	59	57
6/5 Cross section I.	79.2	76.9	74.1	71.4	75.0

Table 6. Measurements and indices of radius

Martin's No.	R-1(1) male	R-2(r) male	R-3(1) male	R-4(r) male	R-5(1) female	R-6(r) female	R-7(1) female
1 Maximum length	267	-	-	-	-	-	-
2 Physiological length	252	-	-	240	-	-	-
3 Least girth of shaft	43	47	-	44	37	-	32
4 Trans. dia. of shaft	17	-	19	17	18	13	14
4a Trans. dia. in middle	17	-	-	16	13	-	-
5 Sag. dia. of shaft	14	-	13	14	10	10	10
5a Sag. dia. in middle	14	-	-	14	11	-	-
5(5) Girth in middle	46	-	-	46	37	-	-
3/2 Length-thickness I.	17.1	-	-	18.3	-	-	-
5/4 Cross section I.	82.4	-	68.4	82.4	55.6	76.9	71.4

Table 7. Measurements and indices of ulna

Martin's No.	U-1(1) male	U-2(r) male	U-3(1) male	U-4(r) female	U-5(r) male	U-6(1) male
1 Maximum length	297	-	-	-	-	-
2 Physiological length	250	-	-	-	-	233
3 Least girth of shaft	40	-	36	-	38	38
11 Ant.-post. diameter	15	-	-	11	15	14
12 Transverse diameter	18	19	-	16	20	19
13 Upper transverse dia.	-	-	-	16	20	20
14 Upper ant.-post. dia.	29	-	-	23	27	30
3/2 Length-thickness I.	16.0	-	-	-	-	16.3
11/12 Cross section I.	83.3	-	-	68.8	75.0	73.7
13/14 Platolenic I.	-	-	-	69.6	74.1	66.7

Table 8. Measurements and indices of femur

Martin's No.	F-1(r) male	F-2(1) male	F-3(1) male	F-4(1) female	F-5(r) female	F-6(1) female
1 Maximum length	-	-	-	425	-	(395)
2 Physiological length	-	-	-	421	-	(388)
6 Sag. dia. midshaft	29	30	34	26	24	24
7 Trans. dia. midshaft	26	26	27	25	22	23
8 Girth in middle	84	86	96	81	72	72
9 Upper trans. dia. shaft	32	32	-	28	30	28
10 Upper sag. dia. shaft	28	27	-	24	24	21
13 Upper breadth	-	-	-	87	-	-
14 Head length	-	-	-	58	-	-
15 Vertical dia. neck	-	-	-	28	-	25
16 Sagittal dia. neck	-	-	-	25	-	-
17 Girth of neck	-	-	-	92	-	-
23 Max. length lat. cond.	-	-	-	61	-	-
25 Post. height lat. cond.	-	-	-	36	-	-
29 Neck-shaft angle	-	-	-	135°	-	-
8/2 Length-thickness I.	-	-	-	19.2	-	(18.6)
6/7 Plasteric I.	111.5	115.4	125.9	104.0	109.1	104.3
10/9 Platymeric I.	87.5	84.4	-	85.7	80.0	75.0
16/15 Cross section I. neck	-	-	-	89.3	-	-

Table 9. Measurements and indices of tibia

Martin's No.	T-1(1) male	T-2(1) male	T-3(1) male	T-4(1) female
1 Total length	-	373	-	-
1a Maximum length	-	380	-	-
3 Upper breadth	-	70	-	-
6 Lower breadth	-	50	-	-
7 Sag. dia. of lower epiph.	-	38	-	-
8 Max. dia. in middle	32	34	34	26
8a Max. dia. in nut. foramen	38	39	37	30
9 Trans. dia. in middle	23	23	23	20
9a Trans. dia. in nut. foramen	30	26	24	20
10 Girth of shaft	86	92	87	72
10a Girth in nut. foramen	-	102	93	79
10b Least girth of shaft	78	80	78	63
9a/8a Cnemic I.	78.9	66.7	64.9	66.7
9/8 Cross section I.	71.9	67.6	67.6	76.9
10/1a Length-thickness I.	-	24.2	-	-

Table 10. Measurements and indices of fibula

Martin's No.	Fb-1(1) male
2 Max. dia. in middle	19
3 Min. dia. in middle	13
4 Girth in middle	54
3/2 Cross section I.	68.4

Table 11. Estimated stature according to Pearson's formula

Individual	Sex	Bone examined	Estimated stature (cm)
A	male	l. radius	173.3
B	male	l. tibia	169.0
D	female	l. femur	155.5
E	female	l. femur	149.7

to be 155.5 cm (Table 11). It seems that No. 3 mandible belongs to this individual.

Individual E

Material: Shafts of the humeri (H-4, 5) and radii (R-6, 7), almost complete femora (F-5, 6) and a shaft of the left tibia (T-4).

Sex: Female, from bone dimensions.

Age: Old (?)

Comment: As the long bones have small dimensions and weak muscle marks, this individual seems to be a small and gracile woman. The femora are not very pilasteric (Fig. 2). The tibia is not very platycnemic (cnemic index: 66.7). The height is estimated to be 149.7 cm (Table 11). It seems that No. 4 mandible belongs to this individual.

Discussion

Although the Teuma crania lack an upper face, the main measurements and indices of Nos. 1 and 2 calvariae (both male) could be compared with the available data of other Oceanic populations (Table 12).

No. 1 calvaria is meso-, hypsi- and acrocranial, and the frontal region is narrow,

Table 12. Comparison of main cranial measurements and indices (Male)

Martin's No.	Micronesia										Melanesia			Polynesia	
	Teauma		Gilbert Is.	Saipan	Guam	New Britain	Fiji	Auckland Maori	Mokapu						
	No. 1	No. 2	n=16	n=5	n=27	n=229	n=13	n=90	n=139						
1	185	193	182.8	185.0	180.5	184.3	192.6	185.9	184.3			184.3			
8	143	136	136.8	143.8	140.5	132.4	134.2	135.7	132.4			145.0			
9	92	96	-	97.2	96.8	93.3	96.5	94.0	93.3			95.6			
10	115	118	-	118.0	-	112.4	-	110.5	112.4			117.6			
17	142	137	141.9	144.3	143.6	-	138.1	137.9	-			143.0			
23	527	532	-	529.2	511.8	518.7	526.9	525.0	518.7			523.2			
24	317	323	-	323.6	316.7	304.1	314.0	313.0	304.1			334.4			
25	383	397	-	381.8	378.9	374.5	370.4	377.0	374.5			380.2			
26	126	134	-	136.6	-	124.5	-	130.1	124.5			135.9			
27	136	129	-	131.4	-	132.5	-	126.6	132.5			126.1			
28	121	134	-	113.2	-	117.5	-	119.9	117.5			118.2			
8/1	77.3	70.5	74.8	77.8	78.5	71.9	69.6	73.0	71.9			79.2			
17/1	76.8	71.0	77.6	77.9	79.6	-	71.7	74.2	-			77.7			
17/8	99.3	100.7	103.7	100.3	102.2	-	97.2	101.8	-			98.3			
9/10	80.0	81.4	-	82.0	-	83.0	-	85.2	83.0			81.8			
9/8	64.3	70.6	-	66.4	68.9	70.5	71.9	69.5	70.5			66.3			
27/26	107.9	96.3	-	96.1	-	106.4	-	97.9	106.4			92.8			
28/26	96.0	100.0	-	83.3	-	94.4	-	92.4	94.4			87.0			
Author			Krause (1881)	Sarai (1951)	Marshall & Snow (1956)	Bonin (1936)	Marshall & Snow (1956)	Shima & Suzuki (1967)							

whereas No. 2 calvaria is dolicho-, ortho- and acrocranic, and the parietal arc is short. The characteristics of No. 1 resemble those of Saipan and Mokapu. On the other hand, those of No. 2 resemble Fiji and Auckland Maori. The narrowness of the frontal region is characteristic in Polynesians (Shima & Suzuki, 1967). Whether it is also characteristic in the Teama population is obscure since only three remains have been examined. All of the mandibles have an ante-gonial notch, not the so-called "rocker jaw" which is the most frequent form of Polynesian mandible (Marshall & Snow, 1956). Thus the characteristics of the Teama crania are not uniform from one to another.

The postcranial skeletons have large dimensions and strong muscle marks in the male. The femur tends to be pilasteric in both sexes. Those of Mokapu also possess the primitive characteristics in limb bones, for example, the pilaster formation of femora (Snow, 1974).

From the pathological point of view, osteoarthritic changes on several bones and healed fracture of the ulna can be seen.

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References

- Bonin, G. von, 1936: On the craniology of Oceania. Crania from New Britain. *Biometrika* 2: 123-148.
- Krause, R., 1881: Ein Beitrag zur Kunde der Südsee-Völker. Die ethn-anthrop. Abteilung des Museum Godeffroy. Hamburg.
- Marshall, D. S. & C. E. Snow, 1956: An evaluation of Polynesian craniology. *Am. J. Phys. Anthrop.* 14: 405-426.
- Martin, R. & K. Saller, 1957: *Lehrbuch der Anthropologie*. Gustav Fischer, Stuttgart.
- Sarai, C., 1951: *Mikuroneshia-jin Togaikotsu no Jinruigaku-teki Kenkyu* (Anthropological study on the Micronesian skulls). *Tokyo Jikeikai Ikadaigaku Kaibogakukyoshitsu Gyosekishu* (Rep. Dep. Anat., Jikei Univ. Sch. Med.) 4: 1-57 (in Japanese).
- Shima, G., 1966: The physical anthropology of the Polynesians. *Acta Anatomica Nipponica* 41: 139-141 (in Japanese).
- Shima, G., 1968: Das Verhältnis der Polynesier zu den Mikronesiern in Betracht der Kephaldimensionen und Kephalingizes. *Osaka City Medical Journal* 14: 31-48.

Shima, G. & M. Suzuki, 1967 : Problems of race formation of the Maori and Moriori in terms of skulls. *Osaka City Medical Journal* 13 : 9-54.

Snow, C. E., 1974 : *Early Hawaiians*. University Press of Kentucky, Lexington, Kentucky.

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Explanations of Plates

- Plate 1 No. 2 calvaria (A~D) and No. 1 calvaria (E~H).
- Plate 2 Mandibles. No. 1 (A), No. 2 (B), No. 3 (C), No. 4 (D) and No. 5 (E).
- Plate 3 Skeletons of the upper limb. Humeri (H-1~H-5), ulnae (U-1~U-6) and radii (R-1~R-7).
- Plate 4 Skeletons of the lower limb. Femora (F-1~F-6), tibiae (T-1~T-4) and fibula (Fb-1).
- Plate 5 Osteoarthritic changes at the left elbow joint (A), the cervical vertebra (B-a), the right fibula (B-b) and the right talus (B-c).

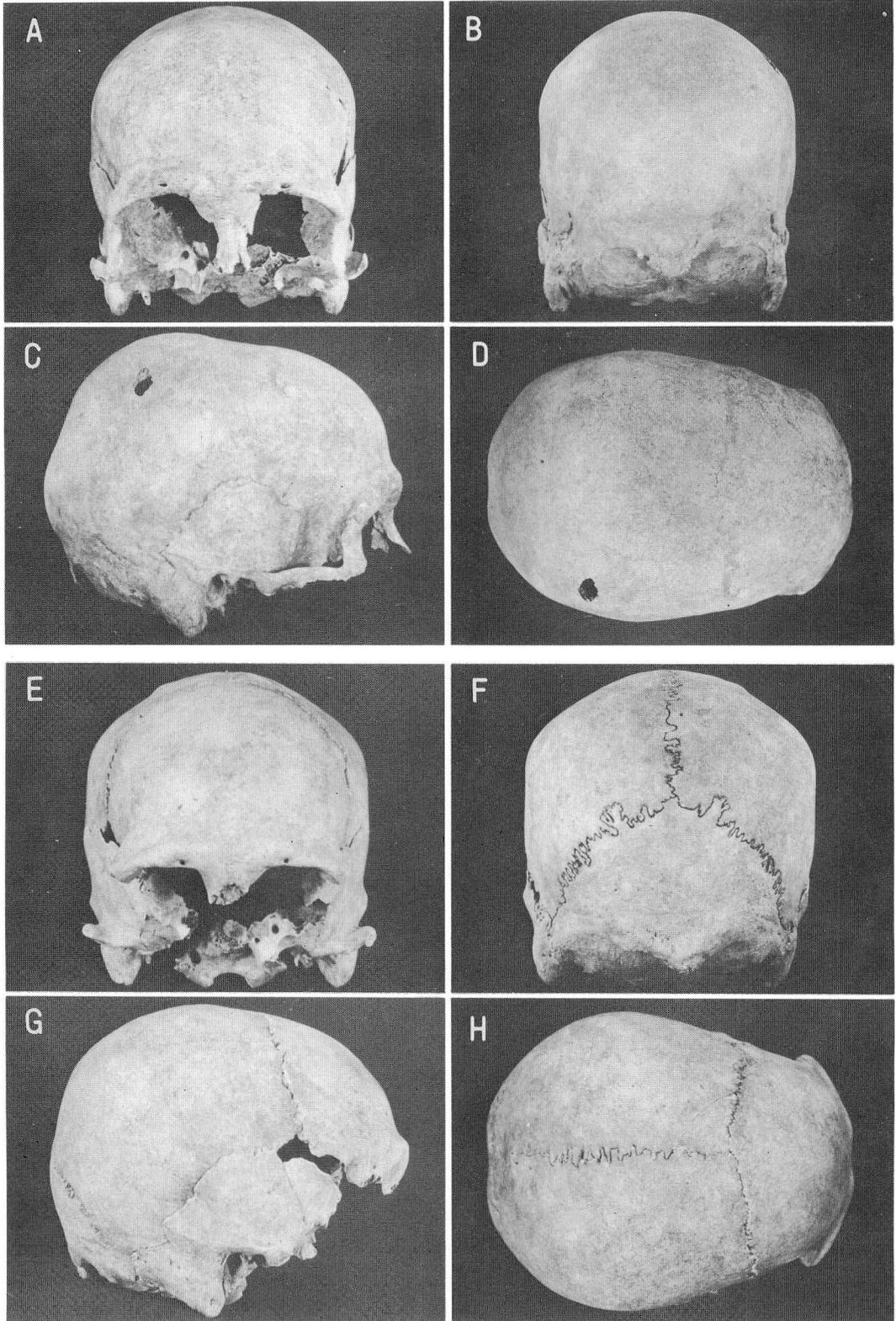


Plate 1

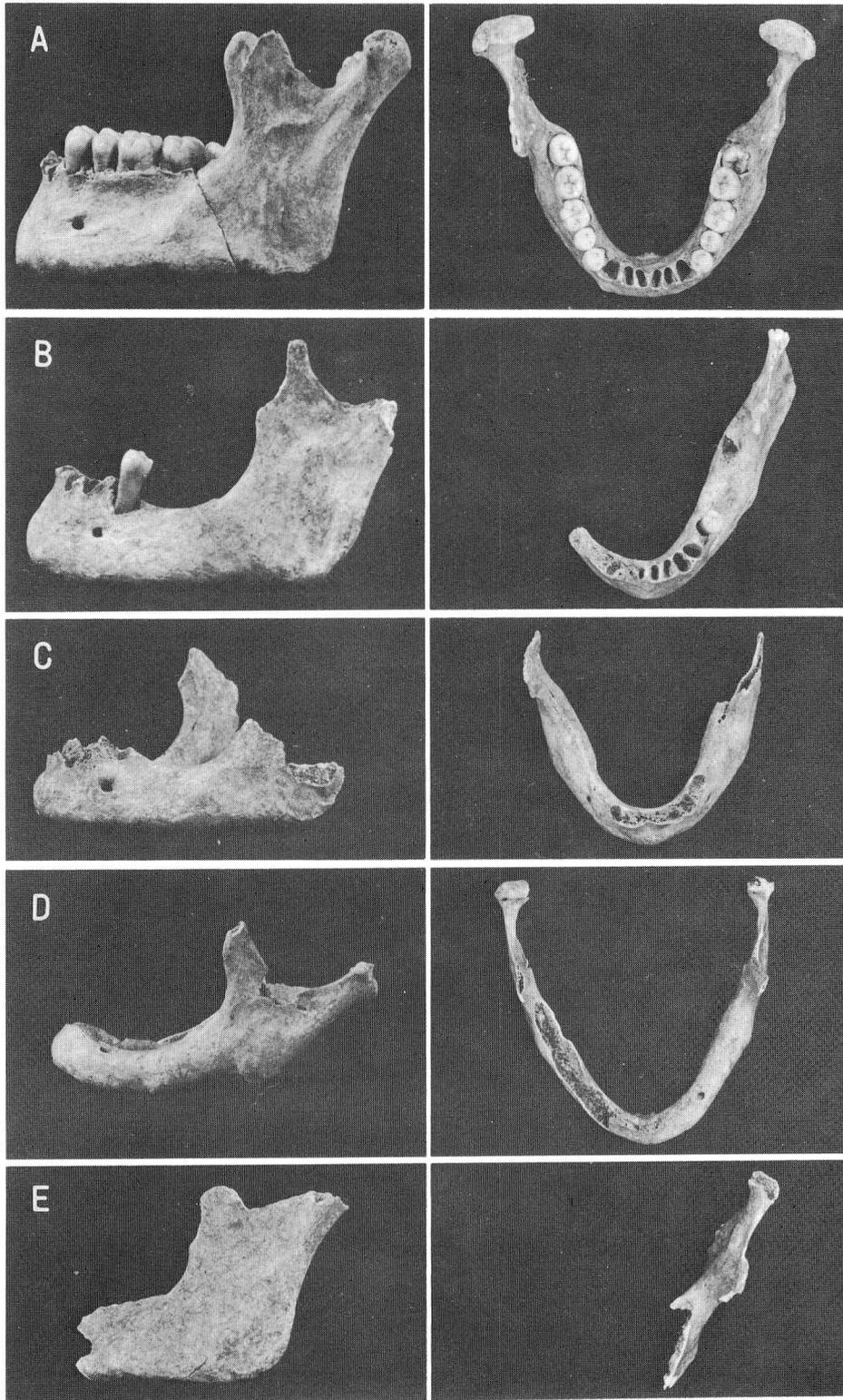


Plate 2

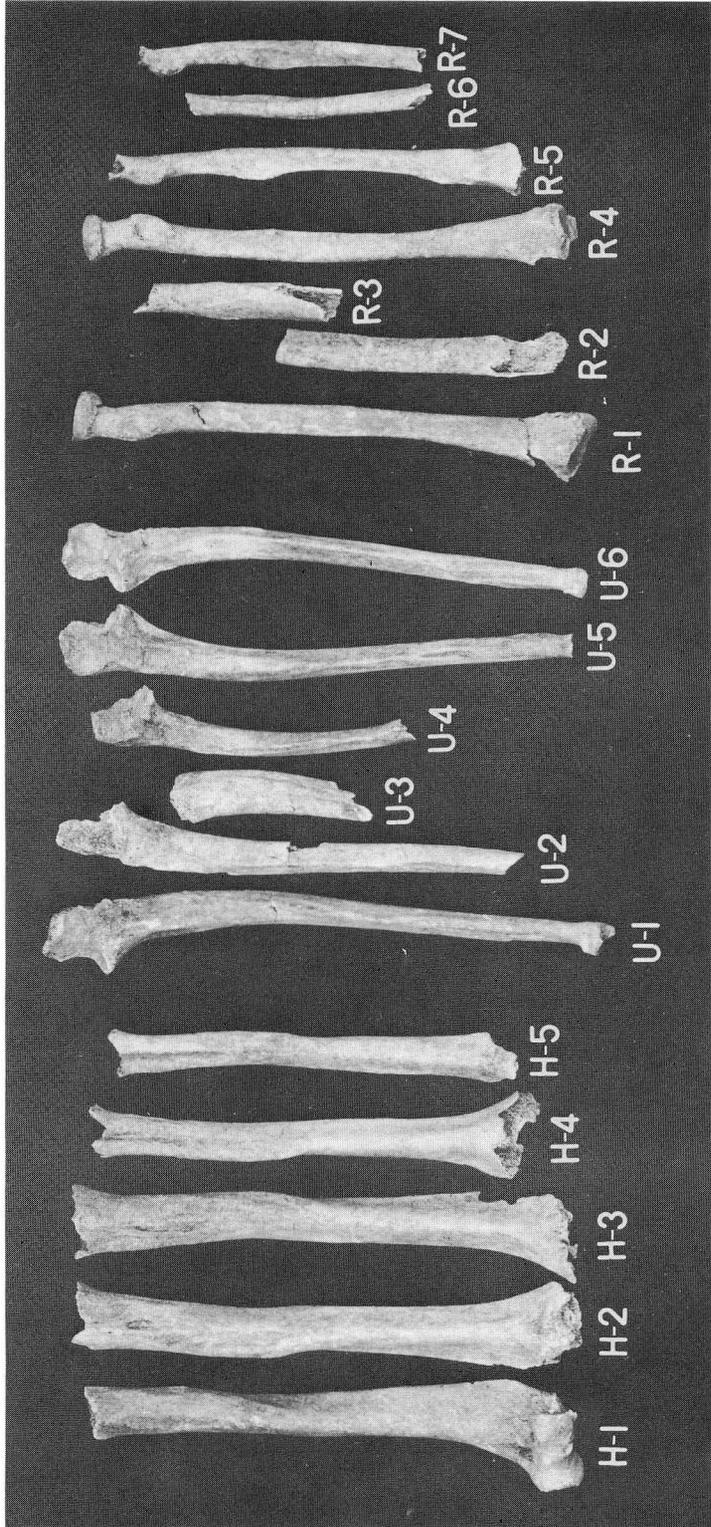


Plate 3

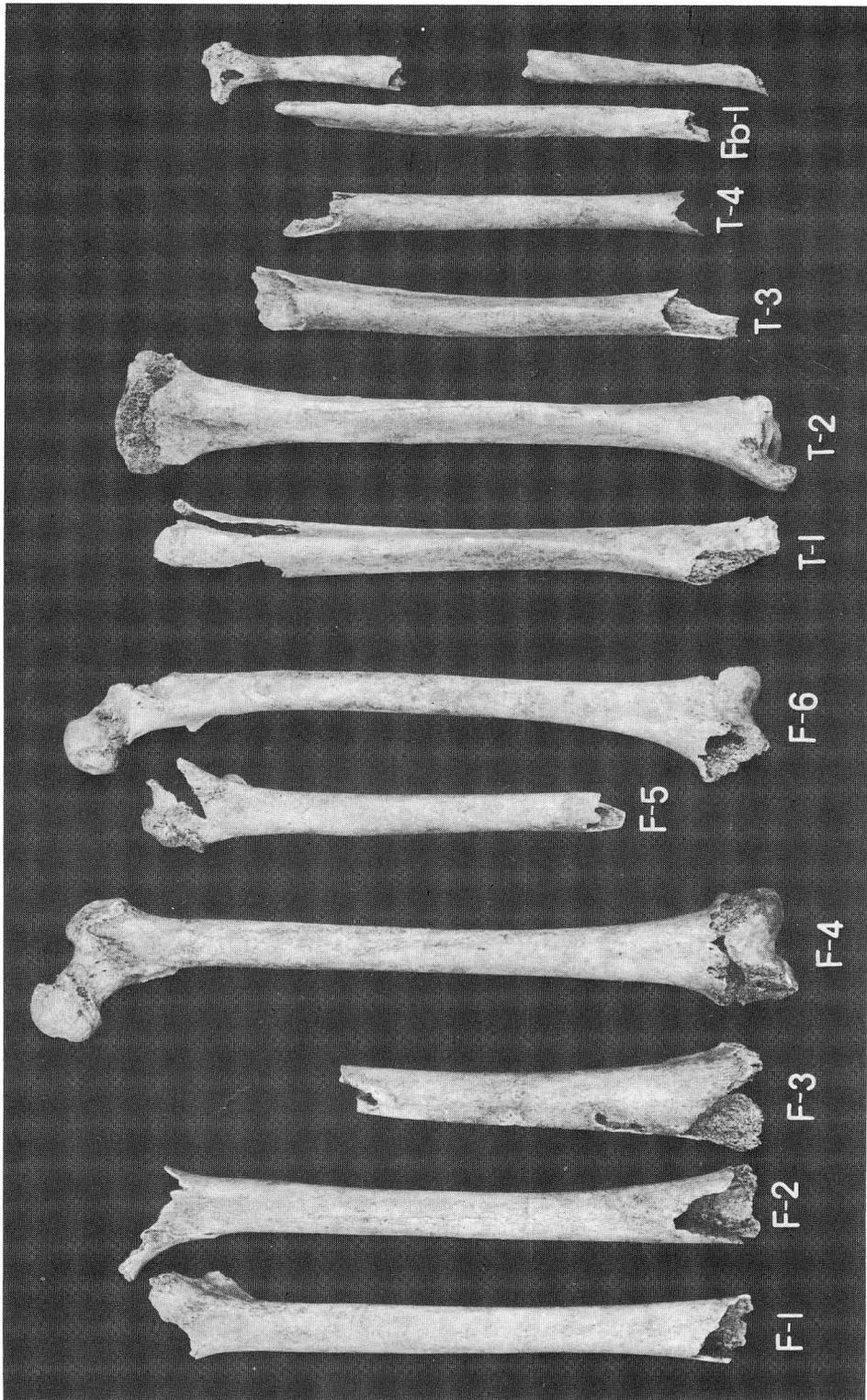


Plate 4

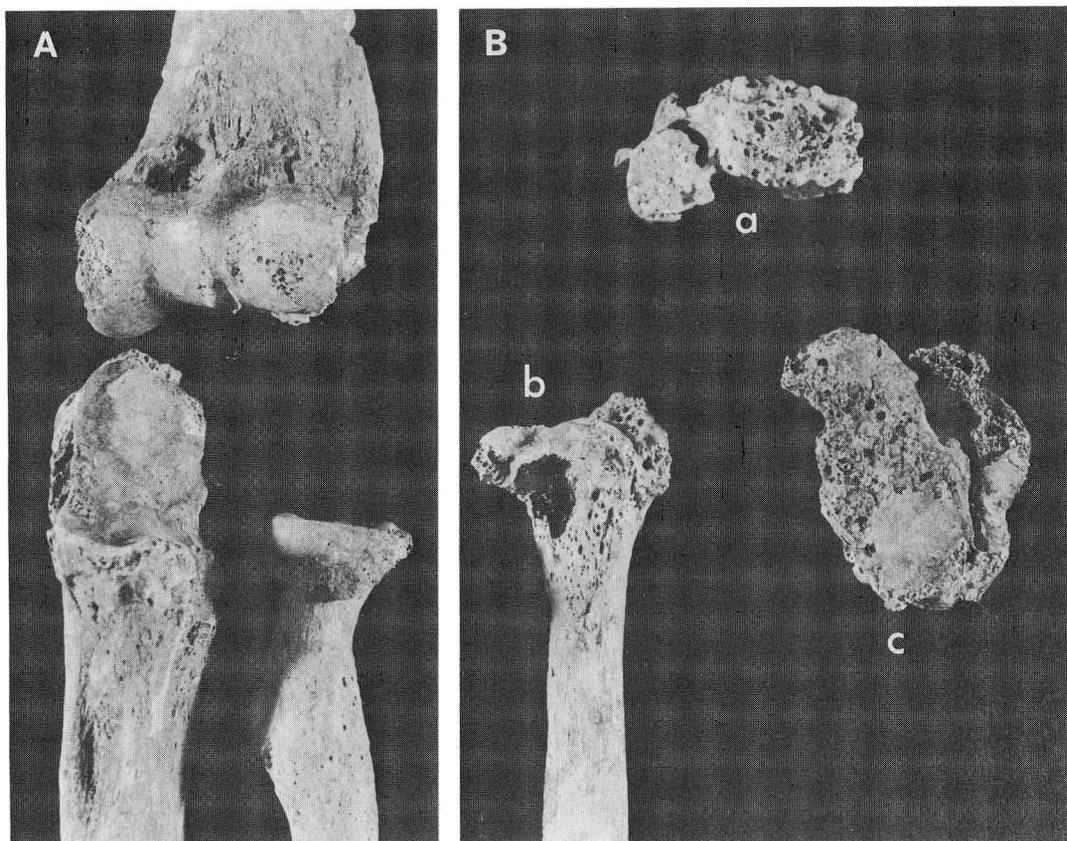


Plate 5