SKELETAL OBSERVATION OF A WILD CHIMPANZEE INFANT (*Pan troglodytes schweinfurthii*) FROM THE MAHALE MOUNTAINS, TANZANIA

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ABSTRACT A wild female chimpanzee infant whose date of birth and death were roughly documented died in the Mahale Mountains, Tanzania. Observation and measurements of its skeletal remains and dental investigation by radiograph were carried out. The results of the measurements and the condition of cranial sutures coincide with those of previous studies, but the calcification of the crowns of P_3^3 and P_4^4 have already started by 1.8–1.9 months of age. These calcifications are slightly earlier than previous records have stated. These data serve to correct the data obtained from specimens in captivity or in the wild whose exact ages are not known.

INTRODUCTION

Although there are numerous publications on the growth of the chimpanzee (e.g., Ashton & Zuckerman, 1952; Dean & Wood, 1981; Gavan, 1953, 1971; Krogman, 1930; Nissen & Riesen, 1945, 1949; Riopelle, 1963; Schultz, 1926, 1933, 1940, 1956, 1973; Spence & Yerkes, 1937; Zuckerman, 1928), skeletal measurements of chimpanzee infants are very scarce (Fenart & Deblock, 1973; Heintz, 1966) and lack some essential information for the study of growth. Well-documented specimens were obtained from zoos or research institutes in which effects of the artificial environment are great. In the case of specimens brought from their natural habitat, their exact ages were not known.

Long-term field research has made it possible to overcome these difficulties. In the present case, the material was brought by the team of The University of Tokyo Ape Expedition to Africa led by T. Nishida from the Mahale Mountains in Tanzania where Japanese researchers have observed wild chimpanzees since 1965 (Nishida, 1968). This had been observed mainly by Mr. and Mrs. T. Hasegawa (The Univ. of Tokyo) when it was alive. It died during field research in 1981. Usually it is impossible to find chimpanzee carcasses in the forest, but this one, fortunately, was found intact.

This paper presents nonmetrical and metrical description of this specimen.

MATERIAL AND METHODS

The specimen is female and had been called "Amina" by Japanese researchers. It was born by its mother, "Ndilo", between 6th and 28th March 1980 and died between 1st and 6th December 1981, so its age at death was 18–19 months (M. Hasegawa, pers. comm.). When it was dissected by Takahata, one of these authors, in the field, there were no contents in the stomach nor any subcutaneous fat, but the cause of death was unknown. It does not appear that the cause of death had hampered normal growth because it had behaved as other infants do before it died (M. Hasegawa, pers. comm.). The carcass was macerated and the dry bones were collected in the field. Some parts are missing (e.g., medial right upper incisor, some distal phalanges, and some epiphyses), but almost all bones were retrieved. The specimen's cranium, hip, and long bones were reconstructed using a wax-paraffin mixture which was also used to fill the gaps among cranial bones.

Measuring methods were based mainly on Martin & Saller (1957) and partly on Schultz (1930), Fenart & Deblock (1974), and Howells (1973), and the measurements were done on the left side. As for the phalanges, a bone of each part was measured but it is uncertain whether they belong to the left or right side. The curvature of bones was measured as the perpendicular distance of the highest point from the chord which joins the two lowest points of each end of bone. Some other measuring points were modified but these can readily be understood from their names in the tables. Measurements were taken twice using sliding calipers with vernier and tape, and read to a tenth of a millimeter in the case of the calipers. Dental observation was made using X-ray films of the type usually used at dental clinics.

OBSERVATION

Nonmetrical Traits

1) Cranium. All sutures of the neurocranial vault remain unfused, and the frontal, parietal, and squamosal part of the occipital are not separated from each other (Fig. 1). In the occipital, the basilar, lateral, and squamosal parts are not fused yet, but there is no vestige of the suture between interparietal and supraoccipital.

The facial cranium separates from the neurocranium and it is separated into two halves on the midsagittal plane. The internasal suture has fused except at its lower part and the maxillo-premaxillary sutures are visible from their origin in the nasal region to the upper quarter of the apertura piriformis in frontal view and the whole length on the palatal side. The zygomatics and the fused nasals have not united with other parts of the cranial bones.

An incomplete bridge divides the left infraorbital foramen and there are two zygomaticofacial foramina on the left and one on the right. The supraorbital torus is slightly developed. The lacrimals meet the ethmoids in the orbitae and the temporals meet the frontals at the pterion on both sides. These conditions are common in *Pan troglodytes* (Schultz, 1971). In the basal view, a pit-like hypophyseal foramen opens, and both oval foramina are incomplete and open to the sphenopetrosal fissures by a narrow gap. The foramen magnum has a wide notch at its supraoccipital portion. This notch was possibly filled with cartilage in the living specimen.

In the mandible (Fig. 2), the upper half of the mental symphysis has not disappeared on the anterior and posterior surfaces. The occlusion of the upper and lower incisor is edge-to-edge.

2) Vertebral column and sternum. The numbers of cervical, thoracic, lumbar, and sacral vertebrae are 7, 13, 4, and 5, respectively. The coccygeal vertebrae may have been lost during preparation. The ventral arch of the atlas and the dens of the axis have not fused with other parts. The bodies and the vertebral arches in other cervical vertebrae have already united in their dorsal portions. The unfused ventral portions of these symphyses become larger from cranial to caudal vertebrae. All foramina transversaria except the right one of the 6th vertebra are incomplete. All vertebral arches in the thoracic vertebrae separate from their bodies but they have already fused with each other in the lumbar vertebrae. Schultz (1971) pointed

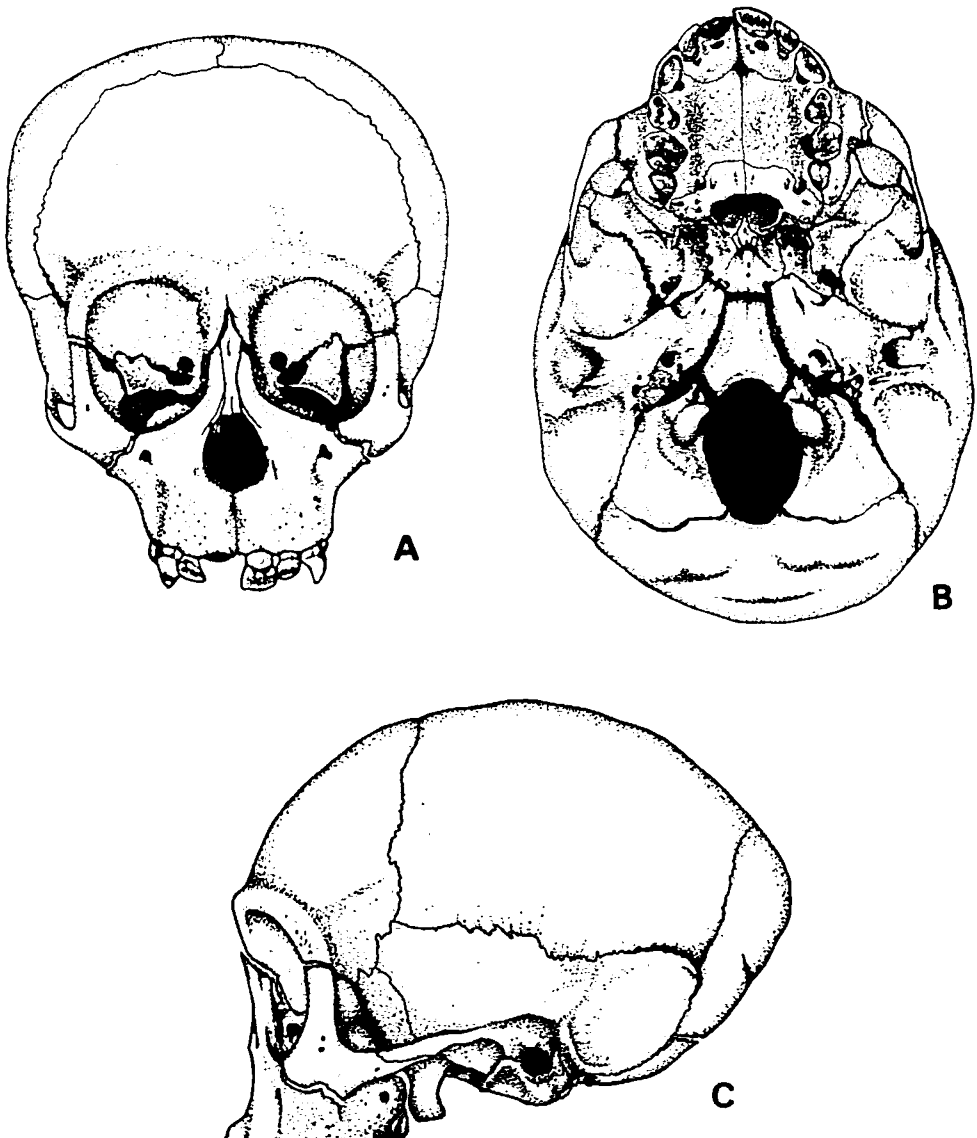

Fig. 1. Frontal (A), basal (B), and left lateral (C) views of the skull.

out that this fusion occurs later in the lumbar part than in thoracic part, but in this specimen, this is not the case. Each sacral vertebra separates and only the first one has a complete vertebral arch. The symphyses between the costal portions and vertebral arch in the first sacral vertebra have not fused, but the body and three other parts, both costal parts and the vertebral arch, have partly fused.

The manubrium and three spherical ossified centers of the body could be identified in the sternum.

3) Anterior limb. The caputs of the humeri, the coracoid processes of the scapulae, and the

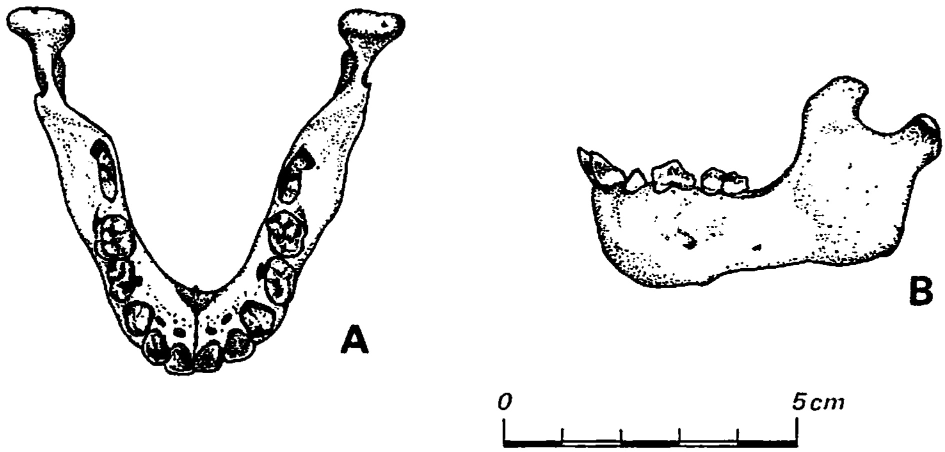

Fig. 2. Occlusal (A) and left lateral (B) views of the mandible.

Table 1. Measurements of the skull.

Neurocranium		Facial cranium	
Maximum cranial length (g-op)	109.4	Facial length (ba-pr)	71.5
Nasion-inion length (n-i)	105.5	Lower facial length (ba-gn)	61.5
Glabella-lambda length (g-l)	101.8	Upper facial breadth (fmt-fmt)	66.0
Length of basicranium (n-ba)	68.1	Bi-ektokonchion breadth (ek-ek)	58.5
Length of foramen magnum (ba-o)[1]	(28.8)	Bi-zygomatic breadth (zy-zy)	75.4
Maximum cranial breadth (eu-eu)	88.1	Middle facial breadth (zm-zm)	51.1
Minimum frontal breadth (ft-ft)	63.4	Facial height (n-gn)	75.5
Maximum frontal breadth (co-co)	77.4	Upper facial height (n-pr)	51.0
Bi-auricular breadth (au-au)	76.6	Bi-maxillo-frontal breadth (mf-mf)	6.0
Maximum occipital breadth (ast-ast)	67.5	Orbital breadth (mf-ek)	29.0
Bi-mastoid breadth (ms-ms)	53.8	Orbital height	27.3
Basion-bregmatic height (ba-b)	76.5	Maximum nasal breadth	13.1
Horizontal cranial circumference	318	Nasal height (n-ns)	39.1
Transverse cranial arc length (po-po)	205	Height of apertura piriformis (rhi-ns)	15.0
Midsagittal arc length (n-o)[1]	(186)	Distance between maxillo-malar points situated on orbital rims (l.b.s.o)[2]	36.0
Midsagittal frontal arc length	63	Alveolar length of maxilla	36.5
Midsagittal parietal arc length	66.5	Alveolar breadth of maxilla	42.0
Midsagittal occipital arc length[1]	(58)	Palatal length (ol-sta)	32.1
Midsagittal frontal chord length	58.0	Palatal breadth (dp4-dp4)	21.9
Midsagittal parietal chord length	62.2	Internal bi-fronto-malar breadth (f.m.i)[2]	57.7
Midsagittal occipital chord length[1]	(48.5)	External bi-molar breadth (between dp3 and dp4) (b.m.e.p)[2]	38.0
Nasion-sphenobasion length (n-sphba)	53.6	Bi-maxillo-incisive breadth (b.m.i)[2]	25.7
Sphenobasion-basion length (sphba-ba)	15.0	Antherior bi-zygomatic breadth (b.z.a)[2]	65.4
Bi-porion breadth (po-po)	57.2	Mesio-distal width of upper canine (l.c.s)[2]	8.1
Nasion-opisthion length (n-op)	92.8	Anterior palatal breadth	24
Auricular radius of bregma[3]	71.8	Palatal height	5.5
Auricular radius of glabella[3]	64.9	Total profile angle	78.0°
Auricular radius of nasion[3]	61.8	Nasal profile angle	82.5°
Auricular radius of prosthion[3]	66.0	Angle of alveolar profile	62.0°
Angle of frontal obliqueness	48.5°		
Angle of foramen magnum obliqueness	+10.5°		

1) measured hard part; 2) based on Fenart & Deblock (1981); 3) based on Howells (1973) and others based on Martin & Saller (1957).

Table 2. Measurements of the mandible.

Bi-condylar breadth (kdl-kdl)	68.7
Bi-angular breadth (go-go)	54.8
Midsagittal mandibular length[1]	62.0
Mental height (id-gn)	20.7
Height of mandibular ramus	23.0
Breadth of mandibular ramus	21.2
Mandibular thickness at mental foramen	9.5
Upper oblique breadth of mandibular ramus (Aa)[2]	23.0
Whole mandibular length (AB)[2]	61.8
Distance between kondilion and infradentale (BE)[2]	67.0
Thickness at mental symphysis (bl)[2]	10.7
Condylar height on alveolar plane (EF)[2]	15.8
Condylar height on mandibular plane (EF')[2]	28.0
Distance between gnathion and kondilion (EL')[2]	62.3
Oblique breadth of mandibular ramus (Hg)[2]	25
Bi-mental foramen breadth (t.m.)[2]	32.0
Mandibular height at mental foramen (I'J')[2]	7.2
Height of mandibular notch	7.5
Breadth of mandibular notch	14.2
Mandibular angle	119°
Weight of mandible including all teeth (pt)[2]	13.2g

1) Martin No. 68(1); 2) based on Fenart & Deblock (1981).

Table 3. Measurements of the vertebrae.

	Max. body diameter	Min. body diameter	Max. body height	Max. diameter of vertebral foramen	Min. diameter of vertebral foramen
Atlas				18.3	
Axis	10.6	5.8	8.0	12.9	10.8
c.v.3	9.8	6.0	3.5	13.0	9.4
c.v.4	10.2	5.9	3.4	13.0	9.2
c.v.5	10.3	6.1	3.7	12.8	9.2
c.v.6	11.1	6.3	4.0	12.8	9.2
c.v.7	14.6	6.7	4.0	12.2	8.9
t.v.1	14.8	7.3	4.4	11.3	7.0
t.v.2	14.2	7.7	5.2	8.8	8.2
t.v.3	12.3	8.0	5.4	8.3	8.2
t.v.4	11.7	8.1	5.7	8.2	8.5
t.v.5	11.3	8.6	5.7	8.4	8.4
t.v.6	11.3	8.4	5.8	8.6	8.3
t.v.7	12.0	8.9	5.5	9.0	8.4
t.v.8	12.3	8.8	5.6	9.3	8.5
t.v.9	12.7	8.6	6.0	9.0	9.0
t.v.10	12.7	8.8	5.7	9.7	8.7
t.v.11	13.2	8.4	6.4	10.1	9.6
t.v.12	14.3	8.9	6.9	10.5	10.0
t.v.13	15.7	9.7	7.6	10.6	10.1
l.v.1	16.2	10.1	8.2	10.5	10.4
l.v.2	16.9	10.1	8.6	10.9	10.4
l.v.3	17.3	9.9	8.6	10.6	9.0
l.v.4	15.3	9.0	8.8	10.0	8.1

distal epiphyses of the radii could be identified but any carpal bones could not. The ulnae, claviculae, all metacarpals and identified phalanges have their primary epiphyseal surfaces. 4) Posterior limb. Three parts of the hip bones are separated from each other at the acetabulum but the pubis and ischium have already fused at their rami on both sides. The caputs and distal epiphyses of the femora, and the proximal epiphyses of the tibiae could be identified. The proximal epiphyses of the fibulae seem to have partly fused with their diaphyses. Among the tarsal bones, only calcanei were identified. All metatarsals and identified phalanges have their primary epiphyseal surfaces.

Metrical Characters

The results are set out in tables 1 to 7. Craniometrical studies including the infant stage

Table 4. Measurements of the sternum, ribs and sacrum.

Sternum	
Manubrium length	15.5
Maximum breadth of manubrium	19.2
Minimum breadth of manubrium	12.5
Manubrium thickness	3.9
Number of segments of body	3 pieces were found
Ribs	
Maximum height of 1st rib	5.9
Maximum height of 2nd rib	5.2
Maximum height of 7th rib	4.9
Thickness of 1st rib	2.2
Thickness of 2nd rib	2.2
Thickness of 7th rib	2.5
Maximum length of 1st rib	27.8
Maximum length of 2nd rib	46.2
Maximum length of 7th rib	82.0
Sacrum	
Sacral length	39
Sacral breadth	26
Breadth of articular surface of body	15.9
Length of articular surface of body	7.3

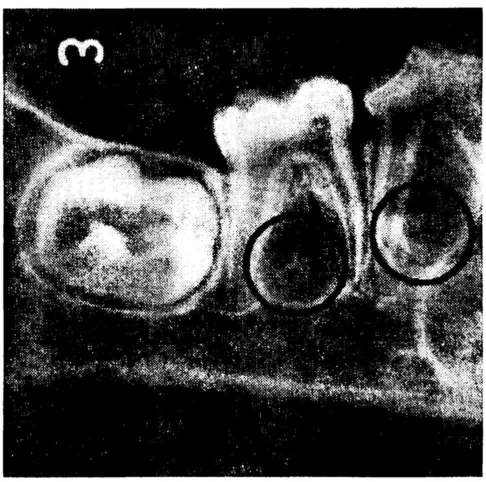

Fig. 3. Radiograph of the left mandibular body to show the calcified crowns of P_3 and P_4 in circles.

Table 5. Measurements of the anterior limb bones.

Clavicle	
Maximum length of clavicle	54.6
Height of body curvature	11.4
Vertical diameter at midpoint	3.6
Sagittal diameter at midpoint	4.3
Circumference at midpoint	13
Scapula	
Morphological breadth[1]	57.3
Morphological length[1]	43.0
Length of distal margin	51.5
Breadth of subspinal fossa[1]	29.0
Breadth of supraspinal fossa[1]	18.6
Maximum spinal length	53.5
Maximum breadth of acromion	7.4
Length of glenoid fossa	14.3
Breadth of glenoid fossa	10.4
Angle between distal margin and spinal axis[1]	20°
Humerus	
Maximum length of humerus (including caput)	117
Maximum length of humerus (without caput)	112
Maximum diameter at midpoint	10
Minimum diameter at midpoint	9
Circumference at midpoint	31
Maximum breadth of distal end	26
Radius	
Maximum length of radius (including epiphysis)	112
Maximum length of radius (without epiphysis)	106
Transv. diameter at midpoint	7.0
Sagittal diameter at midpoint	5.5
Circumference at midpoint	21
Transv. diameter of collum	8.5
Sagittal diameter of collum	6.8
Circumference of collum	26
Breadth of distal end	16
Transv. curvature of body	11
Sagittal curvature of body	11
Ulna	
Maximum length of ulna (without epiphysis)	116
Circumference at midpoint	16
Sagittal curvature of body	18
Height of trochlear notch (without epiphysis)	13.5
Breadth of olecranon	9.5

1) based on Schultz (1930).

were conducted by Heintz (1966) and Fenart & Deblock (1973), in which they divided the materials into age groups based on the dental condition of the materials. The present specimen falls into the range of the group in which deciduous dentition is complete. Although many data of body measurements were published by Schultz (e.g., 1940), they were not comparable with measurements of the present specimen because they were obtained from body surface and most are presented as indices.

Dental Observation

All deciduous teeth except the lower canines have fully erupted and the crowns of upper and lower first permanent molars can be seen in their crypts. The lower canines have erupted to about half the height of their crowns. An X-ray film is shown in figure 3. Dean & Wood (1981) studied the dental development of the great apes mixing three genera and presented the results on a graphical chart. According to them, the crowns of P3 and P4 in both jaws do not appear until 2.5 years of age, but, especially in the mandible, they had apparently started to calcify in this specimen. Even if individual variation is taken into consideration, the calcification of P^3_3 and P^4_4 would be earlier than their results considering that the eruption of the lower canines is incomplete in this specimen. Slight attrition could be observed in the upper and lower dp3.

Table 6. Measurements of the posterior limb bones.

Coxa	
Length of ilium[1)]	72
Length of ischium[1)]	34
Length of pubis[1)]	25
Breadth of ilium[1)]	40.5
Breadth of ischial tuber	12
Height of coxa	103.5
Length of foramen obturatum	19
Breadth of foramen obturatum	14
Maximum diameter of acetabulum	21
Femur	
Maximum length of femur (including caput and condyle)	124
Maximum length of femur (without caput and condyle)	112.5
Sagittal diameter at midpoint	9.4
Transv. diameter at midpoint	9.0
Circumference at midpoint	29
Length of collum and caput	10.5
Vertical diameter of collum	11.0
Maximum breadth of distal end	27.4
Body curvature of femur	16
Tibia	
Length of tibia (including epiphysis)	102
Length of tibia (without epiphysis)	96.2
Maximum breadth of proximal end	23
Maximum breadth of distal end	14
Maximum diameter at midpoint	8
Transv. diameter at midpoint	6.5
Circumference at midpoint	24
Body curvature of tibia	19
Fibula	
Maximum length of fibula (including epiphysis)	93
Maximum length of fibula (without epiphysis)	88.5
Maximum diameter at midpoint	4.7
Minimum diameter at midpoint	3.6
Circumference at midpoint	14
Calcaneus	
Maximum length	24.8
Maximum breadth	11.6
Height of tuber calcanei	11.0

1) based on Schultz (1930).

Table 7. Measurements of the hand and foot bones.

		Maximum length	Transv. diameter at midpoint	Sagittal diameter at midpoint
Hand				
Metacarpal	I	16.5	3.5	3.5
	II	39.0	4.2	3.6
	III	38.2	4.1	4.2
	IV	35.3	3.4	3.9
	V	32.0	3.4	3.4
Proximal phalanx	I	15.0	2.7	2.5
	II	28.7	6.0	3.0
	III	29.6	6.6	3.6
	IV	24.0	5.4	3.2
	V	19.9	5.2	2.3
Middle phalanx	II	12.9	3.4	2.2
	III	21.4	5.3	2.4
	IV	14.4	4.0	2.0
	V	12.1	3.5	2.2
Foot				
Metatarsal	I	22.9	5.4	4.8
	II	31.6	3.0	3.6
	III	29.0	3.0	4.2
	IV	27.7	3.1	3.5
	V	26.5	3.0	3.2
Proximal phapanx	I	13.0	4.0	3.3
	II	20.4	3.8	2.9
	III	21.2	3.6	3.5
	IV	20.6	3.9	3.0
	V	18.0	3.2	2.6
Middle phalanx	II	8.0	2.9	2.1
	III	13.5	3.3	2.0
	IV	12.3	3.0	2.1
	V	7.8	2.3	1.9

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