Chapter 11

Skeletal Report on Human Remains from the Janaba Bay East Shell Mound, Farasan Island

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Hannah Koon

School of Archaeological Sciences

University of Bradford

Bradford

West Yorkshire

BD7 1DP, UK

Email: H.Koon@bradford.ac.uk

11.1 Introduction

This report examines the human skeletal remains recovered from the 2009 excavations at the shell mound of Janaba Bay East (JE0004) (Bailey et al. 2013). Between 5 and 40 cm from the top of the midden a small assemblage of human bone was discovered. Further excavation revealed the grave cut to be a small pit in which some fragmentary human bone had been inserted in an apparently disordered manner. Much of the bone was in very poor condition, and some consolidation work was done on it in situ and after excavation.

The skeletal remains consist of at least two individuals, a juvenile and an older adolescent. The latter skeleton was very incomplete and apart from some bones from the left hand, was represented almost exclusively by fragmented lower leg and foot bones. Due to the very poor condition of the remains and the absence of those elements that are considered diagnostic for age and sex determination, this individual could only be diagnosed as a late adolescent of undetermined sex. There were no pathological lesions observed on the bones present, but given the extensive cortical bone exfoliation from post-mortem degradation, any pathology might have been obscured. In situ consolidation of the knee joint suggests that the knee was in a bent position.

The juvenile remains were more complete but poorly preserved and very fragmentary. There was not a single intact bone and much of the skeletal material was in the form of unidentified small bone fragments < 10 mm in the largest dimension. The most intact remains are from the cervical and thoracic vertebrae, the mandible and the base of the skull. Fortunately, as some of the dentition remained intact it was possible to obtain a confident age-at-death estimate of 5 years ± 6 months. This is based on the degree of formation and eruption of the permanent dentition and the level of fusion of various cranial and post-cranial elements. Given the immature nature of the remains, no sex determination was attempted. There were no pathological lesions observed on the bones or teeth.

11.2 State of completeness and minimum number of individuals (MNI)

The skeletal assemblage consists of at least two individuals. Whilst there is no obvious duplication of elements, the difference in size and maturation of the two sets of remains indicates that they belonged to a young juvenile and an older adolescent.

‘Completeness’ refers not only to the proportion of the skeleton that is present but also the extent to which each element is intact. A summary of the parts of the skeleton that were represented for each individual can be seen as a visual summary (Figure 11.1 and 11.2). In addition, Table 11.1 details all skeletal material that could be identified to element and its percentage completeness.

The remains of the older individual were very incomplete and only comprised approximately 30% of the entire skeleton. The remains are solely comprised of lower limb bones including fragments from the right femur, the right patella (Figures 11.3 and 11.4), the left and right tibia and fibula, tarsal bones from the left foot, and some elements from the left hand. Whilst undoubtedly poor preservation will have led to fragmentation and loss of some skeletal elements, it is surprising that several of the more robust elements of the skeleton are absent – for instance the ischium of the pelvis, the vertebrae and the more dense bones of the skull, i.e., the petrous portion of the temporal and the mandible. Since the skeletal material was recovered from near the top of the shell mound it is possible that some material has been lost by later truncation of the mound surface.

The remains of the young juvenile were very fragmentary with no intact elements present. The skeletal material comprised approximately 45% of the entire skeleton. Of this material, approximately 10% of the sample comprised small fragments which could only be identified to ‘cranial’ or ‘post-cranial’, another 40% could be identified to type of element, i.e., cranial vault, rib, vertebral fragment but not to exact location within the skeleton. The remaining fragments had sufficient distinctive features to allow identification. The most intact remains are from the cervical and thoracic vertebrae, the mandible and the base of the skull.

11.3 State of preservation

Shell mounds are often considered advantageous environments for bone preservation as the shell buffers the pH of the deposit. In addition, it has been suggested that shell mounds can protect delicate bones by sheltering them under a shell ‘umbrella’, which sheds water and protects them from mechanical damage (Reitz and Wing 1999, p. 117). Perhaps it is because the skeletal remains were located near the top of the shell mound that in this instance burial within the midden did not lead to good preservation. In texture the bones were chalky and friable suggesting that most if not all of the organic fraction had been lost. In addition in situ images of the shell mound excavation show that the skeletal remains were densely packed within layers of shell, which, rather than shielding the bones, may have added to the fragmentation of more delicate elements, i.e., the flat bones of the skull, scapula, ribs and pelvis and hollow shafts of the long bones.

As described above, the majority of the skeletal elements that were recovered were in a very fragmented state. There was a significant proportion of unidentifiable small bone flakes and bone powder associated with other debris such as shell and fish bone. In addition, the larger bone fragments exhibited some degree of cortical exfoliation and in extreme cases the outer cortical layer had been completely lost, leaving only the underlying trabecular bone. This extensive state of degradation is consistent with a taphonomic alteration rating of grade 5 described by McKinley (2004, p. 16) as 'heavy erosion across whole surface completely masking normal surface morphology, with some modification of profile' (McKinley 2004, p. 16).

11.4 Age at death

11.4.1 Older adolescent

This individual has been assessed as being between 15 and 20 years at death. However, for reasons explained below, this assessment should be regarded as very tentative. Age-at-death estimates for adult remains are typically based on the degree of union of late-forming epiphyses, the extent of dental attrition and alterations in the morphology of certain joint surfaces (O'Connell 2004). Unfortunately, for this individual, the majority of the late fusing epiphyses could not be assessed. There are, however, two fragments that indicate that the individual was in late adolescence at the time of death. The first is the distal portion of the right femur, which, although very fragmented, appears to display incomplete fusion of the distal epiphysis (between the distal portion of the shaft and the condyles). Unfortunately, due to the extensive cortical exfoliation and the later consolidation work that was applied to the knee joint, the level of fusion was difficult to assess by eye. Studies of the age-of-fusion of this epiphysis provide an upper age range of 17–22 years depending on sex and the population under study (O'Connor et al. 2008, table 1).

In addition, there is an unfused femoral head fragment that would indicate an age-at-death of 15–20 years (Schaefer et al. 2009, p. 275). There is, however, some uncertainty regarding the context of this fragment; the femoral head was bagged with material associated with the juvenile (from location 14FA) rather than with the rest of the knee fragments associated with the adolescent (15FA). Given the diameter of the femoral head (45 mm), it is clearly too large to belong to the juvenile skeleton and is consistent in size with the adolescent skeleton.

Lastly, there is some corroborative evidence that this individual was at least not an older adult. In old age, osteoarthritic changes appear at the articulating joint surfaces throughout the skeleton. Of the fragments present, there are a few which have intact or nearly intact articular surfaces. None of these show signs of wear, which suggests that this individual does not fall into the older adult ageing category of 60+ years.

11.4.2 Juvenile

This individual has been given an age-at-death assessment of approximately 5 years ± 6 months. Methods for ageing juvenile remains are based on the size and degree of fusion of skeletal elements and the formation and eruption of the deciduous and permanent dentition (Schaefer et al. 2009). Unfortunately, due to the incomplete and fragmentary nature of the remains, age-at-death estimates based on metrics could not be applied. However, dental development is seen as the most accurate approach for ageing juveniles up to the age of 12 (Hillson 1996, p. 118). The remains of this individual include a large mandibular fragment with some associated dentition and a number of loose deciduous and permanent teeth (see Figures 11.5–6 and Figures 11.7–9.

Uberlaker's (1979) combined formation and eruption chart puts the age-at-death for this individual as 5 years ± 16 months. This developmental stage was chosen based primarily on the partial root formation of the permanent canine and the almost complete formation of the crowns of the premolars. The Uberlaker chart was developed for studies of Native Americans. However, it is a recognized standard throughout the world. An additional age-at-death estimate utilizing Smith's (1991) method based on permanent lower molar formation suggests a consistent age-at-death estimate of 5 years and 6 months ± 4 months.

The occipital bone located posterior and inferior in the cranium is formed from four parts: the pars basilaris, two pars lateralis, and the squamous, which become fused between the ages of 3 and 7 years. There was a large fragment of the occipital portion of the skull present in the assemblage. This displays fusion of pars lateralis to squama and formation of the hypoglossal canal, but not fusion of basilaris to pars lateralis. This developmental stage puts the age between 4 and 7 years

(Schaefer et al. 2009, p. 15).

In the post-cranial skeleton, the degree of epiphyseal fusion of some of the long bones and the vertebrae provide further corroboratory evidence of the age-at-death of this individual. The proximal ends of the left tibia and humerus and the left distal end of the radius were all present and unfused. This level of skeletal union confirms that the individual was a juvenile and at least younger than 14 years at the time of death (McKern and Stewart 1957, p. 51, Ogden et al. 1978). Three of the cervical vertebrae (between C3 and C6) present in the assemblage displayed fusion of the neutral arches to the vertebral bodies. This observation confirms the lower age-at-death estimate because this union is complete by 4 years (Schaefer et al. 2009, p. 120).

11.5 Sex determination (older adolescent)

Sex could not be assessed for this individual. Sex determination is based on size, robusticity and morphological differences that exist between the adult male and female skeleton. Unfortunately, the elements that display the greatest sexual dimorphism, the skull and the pelvis, are absent. In addition, due to the fragmentary nature of the remains, only a couple of measurements could be taken accurately, the intracondylar notch width of the distal right femur (14 mm) and the maximum diameter of the right patella (41 mm). There is evidence that these features display a degree of sexual dimorphism (Introna et al. 1998, Shelbourne et al. 2007. However, these sex indicators are based on modern American and Italian populations and thus cannot be directly compared to the Farasan individual.

11.6 Stature

There were no intact long bones from which to obtain estimates of stature

11.7 Pathologies

No pathological lesions were observed on either set of remains.

11.8 Race

Techniques used for race estimation are predominantly based on metric and morphological differences within the skull, or else require intact post-cranial elements on which to conduct metric analyses. Due to the very incomplete nature of the assemblage, race assessments could not be conducted for either set of remains.

11.9 Suggestions for Further Analyses

11.9.1 Radiographs

As discussed above, it was difficult to assess the level of epiphyseal fusion of the distal femur. However, this might be achievable by taking a radiograph of the consolidated knee fragment (Figures 11.5 and 11.6), thus providing a more accurate age estimate.

11.9.2 Chemical analyses of the organics

The skeletal material from both individuals was very friable and chalky, which would suggest that most if not all of the organic portion of the bone has been lost. The partially formed adult dentition from the juvenile also appears to be very porous, but the deciduous dentition looks to be in a better state of preservation. The best target, therefore, for the extraction of intact DNA or collagen would be the left mandibular 1st or 2nd deciduous molars. If DNA were present, then sex could be determined for the juvenile. Collagen from the dentine could be used to obtain a radiocarbon date. In addition carbon and nitrogen stable isotopic analysis of the dentine could provide interesting information about diet, This is DISPERSE contribution no. 57.

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Figures

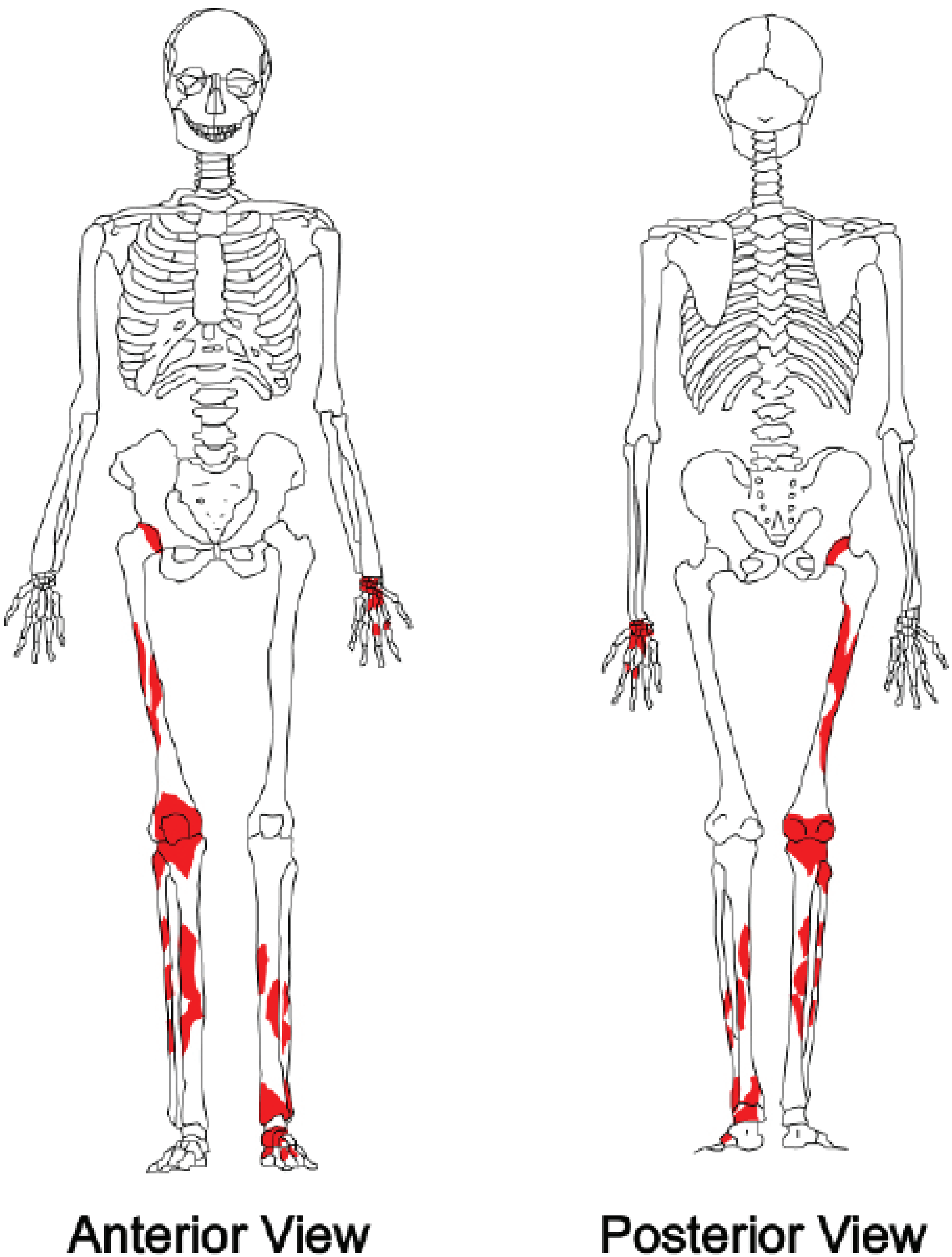

Figure 11.1. Visual representation of the anatomical elements present in the adolescent individual. Anterior view, left; posterior view, right. Re-drawn by Geoff Bailey from an original by the author.

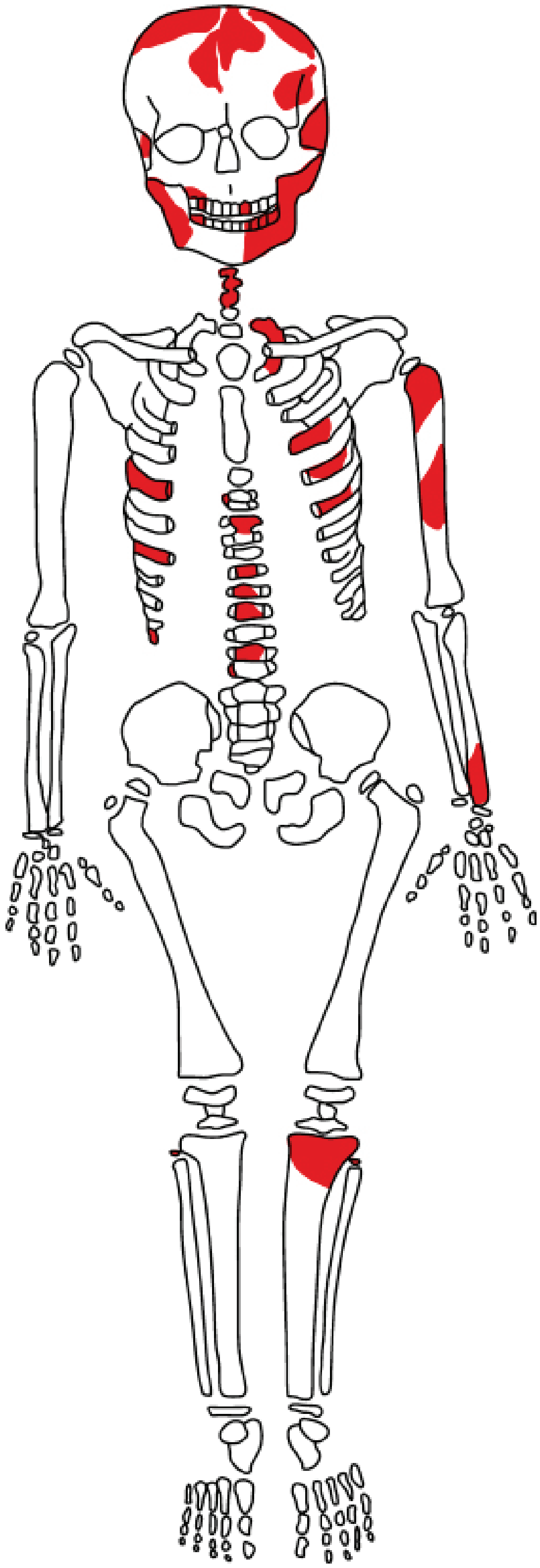

Figure 11.2. Visual representation of the anatomical elements present in the juvenile individual. Re-drawn by Geoff Bailey from an original by the author.

Figure 11.3. Lateral view of knee fragment, comprising the distal epiphysis of the femur and part of the patella, from the adolescent individual

Figure 11.4. Anterior view of the knee fragment from the adolescent individual.

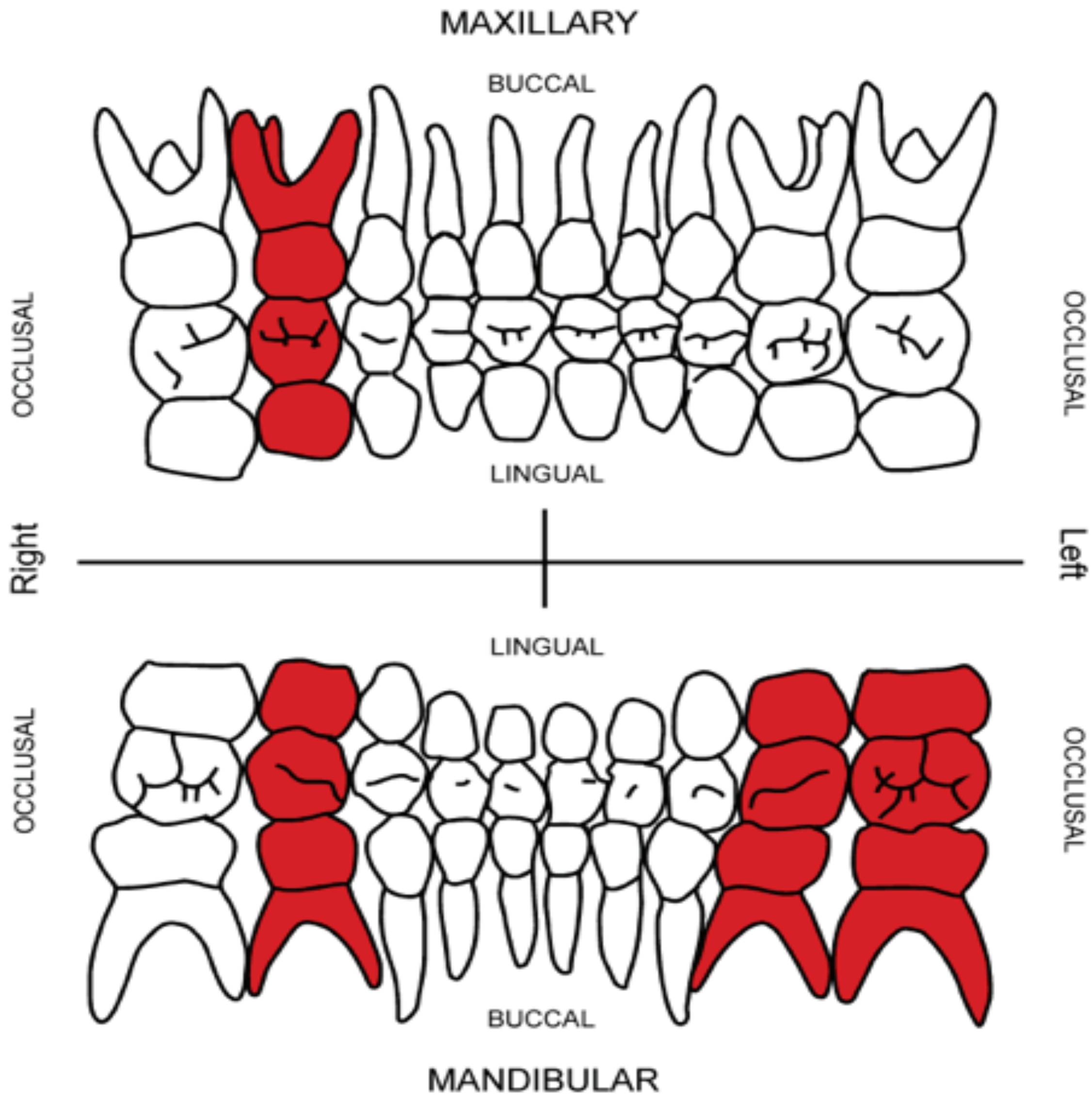

Figure 11.5. Deciduous (juvenile) teeth in the juvenile individual. The diagram shows, for each tooth, the occlusal surface in the centre and the outer (buccal) and inner (lingual) above and below. Teeth present are shown in red and are the upper right first premolar, the lower right first premolar, and the lower left first and second premolar. Re-drawn by Geoff Bailey from an original by the author.

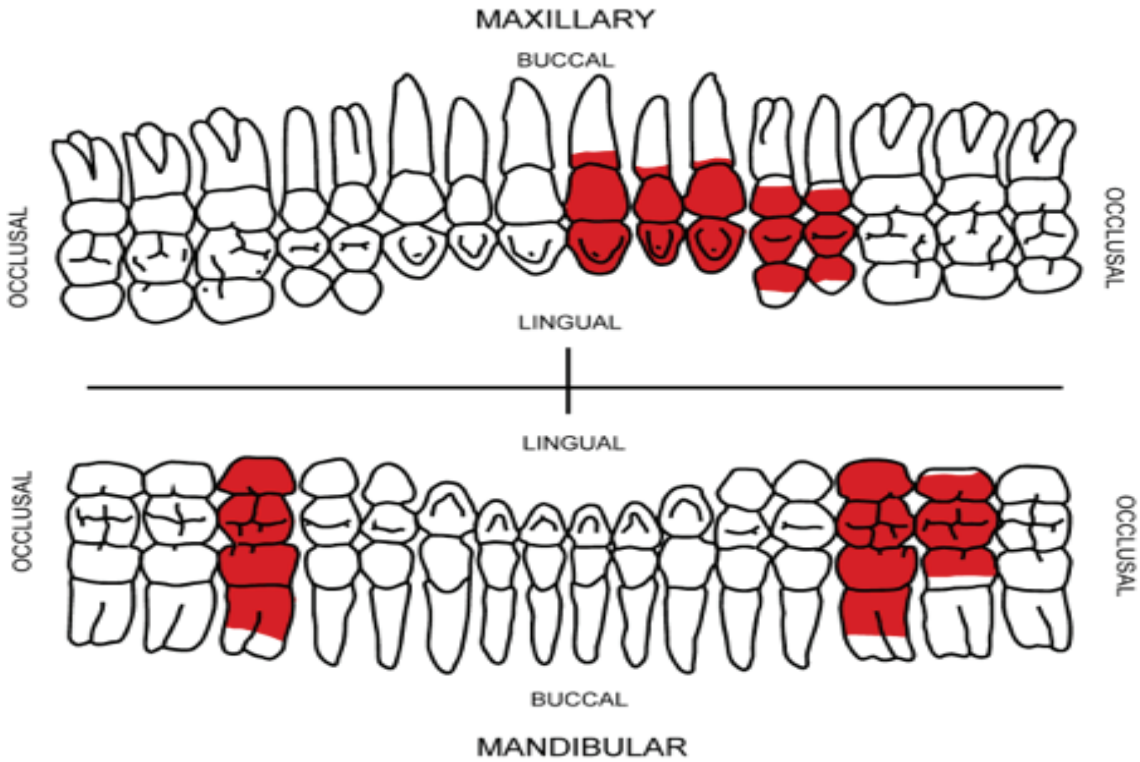

Figure 11.6. Permanent (adult) teeth present in the juvenile individual. Conventions are the same as in Figure 11.5. Teeth present are in red and are the upper left first and second incisor, the upper left canine and the upper left first and second premolar. The lower teeth present are the right first molar and the left first and second molar. Note the limited root development of the permanent molars Re-drawn by Geoff Bailey from an original by the author.

Figure 11.7. Photograph of some of the partially formed upper permanent teeth of the adolescent individual. From left to right: second incisor, canine, and first and second premolar

Figure 11.8. Lower left mandible of the adolescent individual. From left to right: the first and second deciduous premolars, the first molar, and the socket for the second molar with the loose crown placed above it.

Table 11.1. Inventory of identifiable skeletal elements

Element	Side	Percentage completeness
Adolescent		
Postcranial upper limb		
Lunate	L	85
Scaphoid	L	85
Hamate	L	40
Capitate	L	60
Metacarpals (min. 2)	L	30
Postcranial lower limb		
Femur	R	40
Patella	R	90
Tibia	L	25
Tibia	R	30
Fibula	L	25
Fibula	R	45
Talus	L	80
Cuboid	L	50
Navicular	L	80
Lateral cuneiform	L	85
Metatarsal (min. 4)	L	40
Juvenile		
Cranial and axial		
Occipital		75
Temporal	L	90
Temporal	R	70
Frontal		25
Parietal	L	50
Parietal	R	70
Sphenoid		25
Mandible		60
Cervical vert (min 6)		50
Thoracic vert (min 9)		50
Sternum		30

Element	Side	Percentage completeness
Ribs (min 5)		30
Postcranial upper limb		
Humerus	L	45
Radius	L	25
Postcranial lower limb		
Tibia	L	25