

Report on the Human Remains Recovered from Block 23CB on Colonial Williamsburg Property

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**Michael Blakey and Shannon Mahoney
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Background

During the summer of 2003, Dr. Michael Blakey, director of the Institute for Historical Biology, was contacted by the archaeologists at Colonial Williamsburg Foundation notifying him that they had located human remains at the intersection of Jamestown, Richmond and Boundary Roads. The remains were excavated by Colonial Williamsburg Foundation archaeologists and taken to their conservation lab until further notice. On 22 November 2003, Shannon Mahoney, a graduate research associate at the Institute for Historical Biology, contacted Andrew Edwards and Emily Williams of Colonial Williamsburg regarding the remains on Block 23 of the Colonial Williamsburg historic area.

On 12 January 2004, Blakey and Mahoney visited the conservation lab where Emily Williams described the recovery of the remains and the field methodology. During excavation at the site, Lucie Vinciguerra had removed the remains and wrapped them in foil and the foil packets were placed in a refrigerator to inhibit any further deterioration. Emily Williams cleaned the remains and mended a few of the elements with B-72, which were then placed in plastic bags and labeled with their original foil packet number.

A brief assessment of the remains at the conservation lab assured us that there were at least two individuals and that a rough age assessment would be possible. We notified Ms. Williams that population affiliation would not be possible with these remains given the lack of cranio-facial material. In order to take measurements and conduct a full inventory and assessment we arranged for the remains to be transferred to the Institute for Historical Biology on the College of William and Mary campus. Emily Williams brought the remains to the Institute on 14 January 2004, as agreed. The purpose of these assessments is to provide data to verify the identities of the remains and their correspondence, or lack thereof, to the individuals named on the adjacent grave markers. These identifications are to inform decisions regarding reburial.

The Institute for Historical Biology would like to thank the Colonial Williamsburg Foundation and Dr. Marley Brown III for encouraging us to examine these remains. Dr. Blakey supervised the project in its entirety. Shannon Mahoney a doctoral student in the Anthropology Department at the College of William and

Mary, conducted the identification and inventory of the remains with research assistant, Stephanie Lau.

Methodology

The human remains were brought to the Institute for Historical Biology on the College of William and Mary campus for identification and inventory. An inventory was created using a modified version of the "Inventory Recording Form for Commingled Remains and Isolated Bones" from the Chicago Standards (Appendix I). Each fragment was identified to element and side if possible. Some smaller fragments were sorted by broader categories (i.e. long bone, vertebral, cranial and unidentifiable fragments) but could not be sided. Each bag containing an element or sorted fragments was then assigned an inventory number. Each foil packet was fairly representative of a particular element as it had been removed in the field, however, the inventory numbering system allowed fragments to be removed and catalogued individually, as needed.

The inventory number, element and side information was written in the upper right hand corner of the plastic bag containing the element. Once the inventory was complete, the remains were examined for duplicated elements in order to assess a minimum number of individuals and each element was evaluated for its potential to contribute to the age and sex assessments. Soil that was dislodged during the examination and cleaning was saved and placed in a bag labeled with the site information and "soil." The remains were returned to the Colonial Williamsburg Foundation on 2 February 2003.

Assessment

Taphonomy

The remains are highly fragmented through general deterioration, cracking and splitting, and post-mortem disturbance. The cracking and splitting on the bones is similar to the deterioration seen in bone that has been through wet and dry episodes. Several post-mortem fractures appear to have occurred during recovery. Other fractures had occurred post-mortem but before recovery and probably resulted during a secondary burial and consolidation in which the commingled bones of these individuals came to be buried in a common burial shaft. Several of the long bones show slight post-mortem damage to the diaphyses from a blunt, straight-edge object similar to a shovel (Figure 1). Very few of the fragile elements, (such as the cranio-facial elements, sacrum, sternum, vertebra, feet or hand bones) of the skeleton remained.



Figure 1: Tibia fragment (Inventory #23 / Packet # 07) showing post-mortem damage to the bone with a flat, blunt object similar to a shovel. This damage probably occurred during secondary burial.

Number of Individuals

Once the remains had been inventoried (Appendix 1), they were then laid out by element in order to assess the minimum number of individuals. Several of the sided long bones in the arms and legs were well preserved for one individual and could be paired up based on midshaft measurements, similar muscular hypertrophies and general robusticity. Long bones with the diaphyses in nearly complete condition were easily paired together. Measurements of the humerii and tibiae at midshaft confirmed that they were properly paired. The remaining long bones had no duplicates consistent with no more than two people. Once the remains were laid out, several characteristics of the two individuals stood out in comparison to one another.

Individual 1 is significantly larger and more robust than Individual 2. Measurement of the humeral and tibial diaphyses established that there was a significant size difference. The long bones for Individual 1 tended to have 75% or more of the diaphysis and remained in better condition than the second individual.

Individual 2 is highly fragmented with smaller long bone diaphyses. The surface of the bone also tended to be darker in color although the coloration of the bones of Individuals 1 and 2 was often similar due to their common matrix.

In summary, the results indicate that there are at least two individuals (Table 1).

Table 1: Listing of remains by proposed individuals.

Individual 1			Individual 2		
Inventory #	Foil Packet #	Element	Inventory #	Foil Packet #	Element
002	02	L. Humerus	003	20	R. Humerus
005	03	L. Radius	004	05	L. Humerus
006	16	R. Radius	007	12	Radius (unside)
009	12	R. Ulna	011	26	L. Ulna
010	17	L. Ulna	023	07	L. Tibia
017	01	R. Femur	024	15	R. Tibia
018	10	L. Femur	025	11	R. Femur
019	13	L. Tibia	008	22/25	Fibula (unside)
020	06	R. Tibia	028	34	Sciatic Notch
021	31	Mandible (probably male)	022	09	Mandible (Probably Female)
026	23	R. Femur Condyles			
027	24	L. Femur Condyles			
031	29	R. Scapula			
034	38	Occipital			

Age

Epiphyseal fusion (the union of the end of the long bones at ages of completed maturation) allows us to determine the age of individuals based on the degree of union on fusions. The long bones themselves appear to be fully developed. Although the bones tended to fragment near the point of fusion, a temporary mending of the remains indicated that fusion was complete for all the long bones on which the epiphyses were observable. This places both individuals in the 30 + year old range.

Dentition and dental wear can also serve as a useful age indicator. In this case, although no teeth or maxillae were recovered, the two mandibles provided substantial information. Both mandibles are edentulous (complete tooth loss) and exhibit significant alveolar resorption. Alveolar resorption occurs after the loss of a tooth (or teeth) as the bone rebuilds closing the tooth socket. Tooth loss can be attributed to a number of different factors including infection, periodontitis, a

harsh diet and / or old age. “Given the similarities between clinical populations and archaeological remains in location and pattern of tooth loss – usually commencing with the posterior mandibular dentition – tooth loss in archaeological contexts is linked closely to periodontal disease” (Larsen 2002:79). Comparable to this description, both individuals have complete resorption of the sockets for their molars and the sockets for the mandibular incisors in a state of resorption (Figure 2). These individuals had been toothless for the later period of their lives, consistent with advanced age (geriatrics). As the sockets resorb, the height of the alveolar bone is reduced. As described by Aufderheide and Rodriguez-Martin: “(g)eneralized periodontitis usually affects all teeth and is characterized by a horizontal reduction in alveolar bone height, the crestal margins being roughly perpendicular to the long axis of the affected teeth” (1998:401). Severe tooth wear in archaeological populations is often attributed to the 30+ year-old age category (Bass 1995). Combining the factors of complete mandibular tooth loss and the stages of resorption, both individuals can be placed in a 45+ year-old age range.



Figure 2: Superior shot of mandible (Inventory #22 / Packet #09) showing complete alveolar resorption in the posterior portion and significant resorption in the anterior region.

As a person ages, cranial sutures are in a constant state of change until they reach a stage of complete obliteration (Buikstra and Ubelaker 1994). The cranial elements seem to have fractured, to some extent, along the suture lines. One of the cranial fragments, however, (Inventory #34, Packet #38) represents the lambda anatomical landmark (the juncture of the lambdoidal and sagittal sutures) and mends with the occipital bone fragments. The suture shows significant closure on the ectocranial surface and is nearing the realm of complete obliteration on the endocranial surface. This fragment, mends to the occipital bone that has been assigned to Individual #1.

Some of the elements had evidence of osteoarthritis and / or slight arthritic lipping. Osteoarthritis, most commonly, is the result of repeated “stress and physical activity” in an aging individual (Larsen 2002:163). Individual 2 exhibits moderate to severe osteoarthritis in the proximal end of the ulna (Inventory #11/ Packet #26) as well as slight arthritic lipping on the distal end of the left humerus (elbow joint). Individual #1 has evidence of slight arthritic lipping on the glenoid cavity of the right scapula (shoulder joint) (Inventory #3 / Packet #29) as well as the distal end of the femur (knee joint) (Inventory #27 / Packet #24).

Both individuals appear to have completed all stages of epiphyseal fusion and achieved full growth placing both individuals in a 30+ year-old age category. Indicators of older age such as osteoarthritis in the elbow and shoulder joints and complete tooth loss in the mandible, as well as cranial suture closure place the individuals in an age category of 45 years and older.

Sex

One of the most useful anatomical features for determining sex in the human skeleton is the greater sciatic notch located on the innominate bone (pelvis). Inventory #28 (Packet #34) contained two fragments, which mended to form about $\frac{1}{4}$ of the greater sciatic notch for one of the individuals. We suspect that the angle of the notch in its entirety is broad, consistent with a female (Figure 3). However, given incompleteness it is not possible to be certain. Using general robusticity and other characteristics, these fragments would have come from Individual 2.



Figure 3: The two fragments of the Greater Sciatic Notch (Inventory # 028 / Packet #34) shown in comparison to a comparative female cast for the ilium.

The mandibles, which exhibit characteristics indicative of sex, were assessed separately from the other remains. Females tend to have a more rounded chin with a point in the middle and males tend to have a squarer chin (Bass 1995) (Figure 4). The mandibles do have some of these characteristics although observation was slightly difficult given fragmentation and the amount of alveolar resorption, which contributed significantly to mandibular remodeling. Mandible #22 was slightly smaller and had a slightly curved horizontal ramus. Mandible #21 had a wider arch, slightly larger and a straighter horizontal ramus (Figure 5). The mandibles not only affirmed the results from the inventory of the postcranial skeleton that there were two individuals but they also indicated that there was one female and one male. Inventory #21 (Packet 31) exhibited more of the male characteristic and Inventory #22 (Packet #9) exhibited more of the female characteristics. The mandibles were then assessed relative to the postcranial remains in terms of robusticity. Mandible #21, the probable male, was more rugose and tended to fall into the same general category as Individual 1 and the more gracile features of Mandible #22 were assigned to Individual 2.



Figure 4: Frontal view of both mandibles showing the general characteristics of a male on the left (Inventory#21 / Packet #31) and a female on the right (Inventory #22 / Packet #09).



Figure 5: Lateral views of the mandibles showing the general characteristics of a male (Inventory #21 / Packet #31) on the left and a female (Inventory #22 / Packet #09) on the right. Note that the front of the mandible (chin) is facing outward on both sides so that you are seeing the left side of the mandible on the left and the right side of the mandible on the right.

The occipital bone (Inventory #34, Packet #38), which had also been used to assess age, had a pronounced nuchal crest on the posterior surface, which falls into the Chicago Standards range of ambiguous to probable male (Buikstra and Ubelaker 1994). Given the overall general robusticity of the occipital bone, the cranial elements can be assigned to the more robust, Individual 1.



Figure 6: Lateral view of the occipital bone (Inventory #34 / Packet #38) showing the pronounced nuchal crest.

Given the combination of the three indicators for sex and the assessment for number of individuals, the remains represent one probable male (Individual 1) and one probable female (Individual 2).

Pathology

Pathologies that may aid in the determination of age (e.g. osteoarthritis) and pathologies that were noticed during the assessment were noted in the inventory. Analysis of the pathologies will not be conducted pending further notification and permission from the most likely descendants. Pathology analysis can indicate the kind of work a person did from day to day through muscular hypertrophies, the injuries or illnesses they suffered in various stages in their life and congenital defects.

Population Affiliation

Cranial observations and measurements are the only reliable morphological indicators of population affiliation in human remains. These remains did not have enough cranial elements available for assessments therefore we cannot assign a population affiliation to these remains. It would be best for this determination to be made on the historical context for the burials.

Summary

In conclusion, the remains represent two individuals, one probable male (Individual 1) and one probable female (Individual 2). Both individuals were most likely over 45 years old and probably fall into an older age range given the tooth loss, resorption and osteoarthritis.

The remains were returned to Emily Williams at the Colonial Williamsburg Foundation on 2 February 2004.

Resources

Aufderheide, Arthur C. and Conrado Rodriguez-Martin

1998 The Cambridge Encyclopedia of Human Paleopathology Cambridge University Press: Cambridge

Bass, William

1995 Human Osteology: A Laboratory and Field Manual Fourth Edition. Missouri Archaeological Society: Missouri.

Buikstra, Jane E. and Douglas H. Ubelaker eds.

1994 Standards: For Data Collection From Human Skeletal Remains Arkansas Archaeological Survey Research Series No. 44: Arkansas

Larsen, Clark Spencer

2002 Bioarchaeology: Interpreting Behavior From the Human Skeleton Cambridge University Press: Cambridge

Williams, Peter ed.

1995 Gray's Anatomy Thirty-Eight Edition. Churchill Livingstone:London

Time Sheet

Assessment Stage	Hours
Identification and Inventory of Remains	24
Photography / Report Write Up	48
Total (without compensation)	72

Appendix I

Inventory #	Packet #	Frag. Count	Bone (Element)	Side	Segment / Aspect	Completeness	Mended ?	Age	Sex	Comments
009	12	3	Ulna	R	Diaphysis: P 1/3 M 1/3 D 1/3	1 >75%	Yes			Pairs with 010
010	17	1	Ulna	L	Diaphysis: P 1/3	2 25-75%	No			Pairs with 009
011	26	4	Ulna	L	Diaphysis: P 1/3	2 25-75%				Osteoarthritis – proximal end
012	08	3	Clavicle	L	Lateral 1/3	2 25-75%	Yes			Both clavicles (12 and 13) most likely paired. Both are very little curvature, similar shape, robusticity etc. -Hypertrophy – deltoid / trapezius
013	25	7	Clavicle	R	Lateral 2/3	1 >75%	Yes			Very little curvature (see 012) Hypertrophy – deltoid / trapezius
014	18	1	Rib	NS	-	-	No			
015	19	1	Rib	NS	-	-	No			
016	28	1	Rib	NS	-	-	No			
017	01	15	Femur	R	Diaphysis: P 1/3 M 1/3 D 1/3	1 >75%	No			-Hypertrophy of Gluteus maximus Abductor magnus Abductor longus Abductor brevis pectineus
018	10	14	Femur	L	Diaphysis: P 1/3 M 1/3 D 1/3	1 >75%	No			_Enthsiopathy of gluteus maximus -Hypertrophy of Gluteus maximus Abductor magnus Abductor longus Abductor brevis pectineus
019	13	16	Tibia	L	Diaphysis: M 1/3 D 1/3	2 25-75%	No			Hypertrophy of tibialis anterior
020	06	16	Tibia	R	Diaphysis: P 1/3 M 1/3 D 1/3	1 >75%	No			Hypertrophy of tibialis anterior

Inventory #	Packet #	Frag. Count	Bone (Element)	Side	Segment / Aspect	Completeness	Mended ?	Age	Sex	Comments
021	31	3	Mandible	U	Left Portion	2 25-75%	No	>45 (Bass 1995:301)	PM (Buikstra and Ubelaker 1994))	-Wide angle -Straight ramus -Square chin -Wider mental eminence -Can be designated ambiguous to probably male -Significant alveolar resorption -(Left side only) closed tooth sockets for molars -Tooth sockets for incisors, canines and premolars in mid-stage of resorption
022	09	2	Mandible	U	Right Portion	2 25-75%	No	>45	PF (Buikstra and Ubelaker 1994)	-Very prominent mental spines (genioglossal and geniohyoid muscles) -Curved ramus -Rounded chin -Small angle -Small mental eminence -Can be designated ambiguous to probably female -Significant alveolar resorption -(Right side only) Tooth sockets for premolars and molars are closed. -Sockets for incisors and canines in mid-stage resorption
023	07	4	Tibia	L	Diaphysis: M 1/3	2 25-75%	No			Postmortem shovel marks
024	15	1	Tibia	R	Diaphysis: M 1/3 Anterior fragment	3 <25%	No			
025	11	2	Femur	R	Diaphysis: P 1/3 Medial portion	3 <25%	No			Postmortem cuts below femoral head; while bone was still green (ligaments still attached?)
026	23	1	Femur	L	D 1/3	3 <25%	No			Medial condyle
027	24	4	Femur	R	D 1/3	3 <25%	No			-Medial and Lateral condyles -ARLP on lateral condyle
028	34	2	Ilium	R	Greater Sciatic Notch		No, but can be		PF	Key element for sexing – only about ¼ of needed notch – tentative female
029	27	4	Ilium	NS	Posterior Lateral	3 <25%	Yes			

Inventory #	Packet #	Frag. Count	Bone (Element)	Side	Segment / Aspect	Completeness	Mended ?	Age	Sex	Comments
030	35	8	Vertebra	U	-	-	No			
031	29	16	Scapula	R	-	3 <25%				Lateral border, part of glenoid cavity, scapular notch. Evidence of ARLP on glenoid cavity
032	39	7	Long bone fragments	-	-	-	No			
033	014	1	Tibia	NS	Diaphysis: M 1/3 Posterior portion	3 <25%	No			Nutrient foramen
034	38	12	Occipital and parts of the left parietal	NS	-	1 >75%	No, but can be		ambiguous PM	Strong nuchal crest – from ambiguous to probably male 1 fragment shows the juncture of the lambdoidal and sagittal sutures (lambda) with significant closure ectocranially and complete obliteration endocranially *note – the occipital was cleaned and removed from other associated fragments during the assessment.
035	30	16	Frontal	-	-	2 25-75%	No			
036	38	1	Parietal	-	-	2 25-75%	No, but can be			Mends with Inventory #35 (Frontal material)
037	32	10	Long bone fragments	-	-	-	No	-	-	
038	32	05	Unidentified fragments	-	-	-	No	-	-	Probably vertebral fragments
039	33	1	Eye Orbit / Frontal Bone	Left	-	-	No	-	-	
040	33	8	Cranial fragments	-	-	-	No	-	-	
041	33	2	Long Bone Fragments	-	-	-	No	-	-	
042	23	1	Cervical (Atlas) Condyle	-	-	-	No	-	-	
043	36	29	Long Bone Fragments	-	-	-	No	-	-	
044	36	13	Vertebral Fragments	-	-	-	No	-	-	

Inventory #	Packet #	Frag. Count	Bone (Element)	Side	Segment / Aspect	Completeness	Mended ?	Age	Sex	Comments
045	36	8	Cranial Fragments	-	-	-	No	-	-	
046	36	6	Innominate Fragments	-	-	-	No	-	-	
047	36	24	Unidentified Fragments	-	-	-	No	-	-	
048	36	1	Eye Orbit / Frontal Bone	Right	-	-	No	-	-	
049	26	1	Long Bone Unidentified	-	-	-	No	-	-	
050	38	1	Long Bone Unidentified	-	-	-	No	-	-	Originally in with cranial material / not cleaned, too fragile
051	21	6	Unidentified Fragments	-	-	-	Yes / partial	-	-	