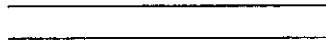


Initial

FINDS RECORD.

- 1: Iron object, from area 12
- 2: Metal nails(6), white flint fragment; from area 12, loose on surface.
- 3: Metal spear, protruding at approx angle 45 degrees.
- 4: Copper corrosion fragments from around the area of the ring pin(no 35).
- 5: Horn/bone playing piece?
- 6: Metal fragments (5) from middle area.
- 7: Soil sample; soil contact between body stain and clean sand.
- 8: Pelvic bone.
- 9: Soil sample; fibrous matter from area 12.
- 10: Bone? fragment.
- 11: Bronze object;
- 12: Soil sample from the S end
- 13: Flint tool; from matrix 12.
- 14: Bronze nail
- 15: Metal object; from matrix 12.
- 16: Horn/bone playing pieces(2), metal nails(2), bone(1), wood(1), flint(1), lying on the surface of matrix 12.
- 17: White ?quartz pebble; from matrix 12
- 18: Horn/bone playing pieces(6), flint(2).
- 19: Left hand fingerbones(3).
- 20: Left metacarpals.
- 21: Soil sample; contact of body stain and clean sand.
- 22: Left arm bones.
- 23: Right arm bones.
- 24: Upper body bones; ribs, spinal column.
- 25: Bone comb; from rear of skull;by neck, also where beads were.
- 26: Beads; one amber, one blue/white glass, one ?amber; from rear, base of skull
- 27: Issium(part of pelvis).

- 28: Bone fragment
- 29: Shield boss
- 30: Sword
- 31: Skull
- 32: Bone comb from base of rib cage.
- 33: Various bones etc, out of context.
- 34: Corrosion fragments, from shield boss
- 35: Ring pin
- 36: Strap end
- 37: Pelvic bone
- 38: Metal, playing piece, pumice, metal disc; from matrix 12



BALNAKEIL BAY, 1991. H NC 37 SE 002

Initial Finds Record

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THE VIKING BURIAL FROM BALNAKEIL, SUTHERLANDTHE HUMAN SKELETONYwonne Hallén

NMS ARU

CONTENTS

- Summary
- Description of the skeleton
- Age estimation:
 - epiphyseal fusion
 - tooth eruption
 - measurement of femur for a general age estimate
- Sex estimation
- Stature estimation
- Pathology
- Associated bones:
 - artifact with attached bone
 - animal bones
- Bibliography

SUMMARY

The post-cranial skeleton is incomplete, which may be due to the circumstances of its recovery. Of the hands and feet only one carpal phalange, which is attached to a wood fragment by corrosion, survives. The skull is damaged on both sides but has both mandibula and maxilla. The mandibula shows an almost complete adult dentition, with only the third molars not erupted. The maxilla is anomalous, since the permanent canines have not erupted. Two loose teeth with a much greater degree of attrition than the rest of the teeth are probably the deciduous canines. The roots of these teeth near the worn-down crown show signs of root infection. The third molars have not erupted. The rest of the teeth in the maxilla (some of which were found loose) are permanent teeth.

The dental development and the state of epiphyseal fusion suggest an age between 8 and 13 years. Less reliable evidence from the measurement of the femur suggests an age of 9-11 years.

Sexing young individuals is unreliable, and it can only be suggested that the remains are those of a male.

The height was around 4'9"-5' (146-154 cm), estimated from the total femur length with the epiphyses loosely fitted and 2 cm added to allow for fragmentation and the loss of cartilaginous growth plates.

There is irregular pitting proximally / anteriorly on the diaphyses of both humeri which may have been caused by a non-

The third molars and the permanent canines have not erupted, but are visible in the jaw due to fragmentation of the bone. The left permanent lateral incisor and the two central permanent incisors are loose but were found with the body along with two teeth that are interpreted as deciduous canines. These canines display a much greater degree of attrition than surrounding teeth, resulting in the cusps being flattened and dentine being exposed. Proximally on the roots of these teeth are signs of root infection. Small attrition facets where dentine is showing were noted on the mesio-buccal, disto-buccal and mesio-lingual cusps of the right first permanent molar and on the mesio-buccal, disto-buccal and disto-lingual cusps of the left first permanent molar.

The dentition of the maxilla shows an anomaly compared to the mandibular teeth (see below). It deviates from the normal dental development in that the permanent canines have not erupted in the maxilla although all the other teeth (apart from the third molars) have erupted and show varying degrees of enamel polishing. The mandibula has all its permanent teeth, including canines, apart from the third molars.

Mandibula and teeth

The mandibula is fairly well preserved apart from slight fragmentation of the lateral part, from the teeth sockets down to the ramus, and fragmentation of the left condylar head.

Teeth present in the mandibula:

left - M2 M1 PM2 PM1 C I2 I1 / I1 I2 C PM1 PM2 M1 M2 - right

All the permanent teeth are present apart from the third molars which have not yet erupted (the left third molar was present in the jaw but was lost post-mortem). The roots of the second molars are exposed due to fragmentation and were still open. Small attrition facets where dentine was showing were noted on the mesio-buccal, disto-buccal, disto-lingual and mesio-lingual cusps of both the left and the right first permanent molars.

POSTCRANIAL SKELETON

Bones of the Vertebral Column

All the vertebrae are present with varied degrees of preservation. The atlas is complete. None of the secondary epiphyses, including the proatlas at the axis, are fused but primary fusion is complete for all the vertebrae.

Comment

The right clavicle, humerus and ulna seem enlarged compared to the same bones on the left hand side. This might be explained as asymmetrical development.

Hip Bone (Innominate)

The right and left ischii were identified as well as the right pubis and the right iliac blade. The rami of the pubis and ischii were fused, but the three bones on each side were not fused at the acetabulum and no secondary epiphyses at other locations on the bones were fused. The colour of the iliac blade is different (bleached white) from that of the rest of the skeleton, suggesting it has recently been exposed to weathering.

Femur

Both left and right bones are present. No epiphyseal fusion was noted on either the proximal or distal ends. The distal end of the right femur is partly fragmentary. The distal epiphyses and the proximal left epiphysis were recovered in varying degrees of preservation. On the left femur, anteriorly on the diaphysis, an area of copper corrosion products was present.

Tibia

Both left and right bones are present. No epiphyseal fusion was noted. The proximal ends are fragmentary.

Fibula

Only the diaphysis with a small part of the distal end of one fibula remains. No epiphyseal fusion had yet occurred on the distal end. It could not be ascertained whether it was the left or right fibula.

AGE ESTIMATION

The skeletal and dental ages are based on epiphyseal fusion, tooth eruption (dental development) and measurement of the femur. The table below shows the ages (in years) at which epiphyseal fusion for the postcranial skeleton normally occurs according to Bass (1987) and Brothwell (1981). The first age indicates the beginning of fusion and the second its completion. The abbreviations CV, TV and LV represent cervical, thoracic and lumbar vertebrae.

Tooth eruption (dental development)

As mentioned above the dental development in the maxilla seems to deviate from the normal dental development seen in the mandibula. The permanent canines have not erupted and teeth interpreted as deciduous canines were found in association with the skeleton.

Normal variation in eruption timing may be exceeded in some cases: premature or retarded eruption can occur. Deciduous teeth may fail to be shed, often where the succeeding tooth is not formed. Such retained teeth remain in the dentition and are more noticeable due to their much greater degree of attrition than surrounding teeth. The other common anomaly of eruption is the retention of teeth within the jaw. This is called impaction and in humans is most common in the canines and third molars. Both impaction and retention of deciduous teeth occur quite commonly in archaeological human material (Hillson 1986:320)

Disregarding the anomaly in the maxilla, the state of tooth eruption and dental development for this individual give a dental age of 12 years according to Brothwell (1981), and 12 years \pm 30 months, according to Bass (1987). This is based on the fact that all the teeth have erupted apart from the third molars that only show as small crown facets (the roots have not yet formed) and the roots of the second molars are not closed.

Measurement of femur for a general age estimate

Less reliable but confirmatory evidence of age can be obtained from the length of the femur. There is always an uncertainty when dealing with archaeological material where one or both epiphyses may be missing and where the cartilaginous growth plate between the epiphysis and diaphysis is almost always absent. For this age estimation, the left femur was used with its proximal and distal epiphyses loosely fitted onto the articulation surfaces, in order to get the full length. Measured with a steel measuring tape, the full length was 35 cm. To allow for the loss of the cartilaginous growth plate and fragmentation, 2 cm was added to this, giving an overall length of 37 cm.

AGE	Mean	Standard deviation
9	34.36	1.933
10	36.29	2.057
11	38.16	2.237

Table 35 in Bass (1987) was used, after Anderson *et al* (1964:1197-1202), which gave femur length for children from ages 1 to 18 taken from roentgenograms.

ASSOCIATED BONESArtifact with attached bone

In association with the skeleton, a skeletal fragment stuck to a piece of wood (shield handle ?) was found. From its morphology this is probably the diaphysis of a phalange from the first row in the hand (side undetermined).

Animal bones

Seven animal bones were found in proximity to the skeleton. These are a different colour (bleached white) from the skeleton.

- complete tibia from a dog or wolf. Epiphyses fused.
- complete ulna from a dog or wolf. Epiphyses fused.
- part of the right mandibula of a young sheep or goat, with the second and the third deciduous molar still in their sockets
- fragmentary rib, probably from a bovine (Bos taurus)
- spine of a vertebra, probably from a bovine (Bos taurus)
- fragment of unidentified bone
- fragment of a longbone (species unidentified)

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TT 416: Balnakeil, Sutherland: Viking burial

List of artefactual material (as provided by T. Skinner) and summary of skeletal report (as provided by Y. Hallén), 15.5.92

ARTEFACTUAL MATERIAL

Metal/composite metal-and-organic objects

Sword and fragmentary scabbard

Shield, represented by iron boss (and see below, under "Miscellaneous")

Spear, represented by spearhead and part of shaft (and see below, under "Miscellaneous")

Ring pin

Possible strap end

Small pin found attached to skull: possible shroud pin?

12 miscellaneous nails, maximum surviving length c. 30 mm

2 indeterminate metal objects

Organic items

1 bone comb

14 complete and fragmentary playing pieces, antler

Miscellaneous

Fragment of mineralised wood, resembling either shield grip or spear shaft, with human finger bone attached

Fragment of mineralised wood, stuck to a fragment of mineralised spear shaft; possibly a fragmentary playing board

3 beads: one amber, one probably amber, one blue and white glass

1 needle case, mineralised, with possible needles inside it (as revealed poorly on an X-ray)

1 small lump of pumice

1 small flint flake

1 white quartz/ite pebble

2 unidentified fragments, possibly not artefacts, not flint as per Highland Regional Archaeologist's initial report

TT 416: Viking burial from Balnakeil Bay, Sutherland: summary of additional information obtained by NMS

- The body is that of a boy, aged between 8-13 years, height c. 4'11".
- However, the grave goods are those of an adult male warrior: adult-sized sword, shield, spear; plus accessories - bone comb, set of playing pieces, beads, needle case, ring pin and strap end, lump of pumice, flint flake.
- Details of the grave and body treatment are unclear. The body had been laid on its right side, and the presence of a thin stain around the body was tentatively interpreted by the excavators as evidence for a coffin. The presence of a small pin attaching to the skull suggested the possibility of a shroud, but this is not consistent with fact that a finger bone was found attached to a mineralised piece of wood which may be the shield grip or spear shaft. This suggests that the corpse was buried grasping his shield or spear.
- The excavators have suggested that the disposition of artefacts indicates that the shield may have been placed over the head, as if to protect it.

THE VIKING BURIAL FROM BALNAKEIL, SUTHERLAND

THE HUMAN SKELETON

Ywonne Hallén

- Summary
- Description of the skeleton
- Age estimation:
 - epiphyseal fusion
 - tooth eruption
 - measurement of femur for a general age estimate
- Sex estimation
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SUMMARY

The post-cranial skeleton is incomplete, which may be due to the circumstances of its recovery. Of the hands and feet only one carpal phalange, which is attached to a wood fragment by corrosion, survives. The skull is damaged on both sides but has both mandibula and maxilla. The mandibula shows an almost complete adult dentition, with only the third molars not erupted. The maxilla is anomalous, since the permanent canines have not erupted. Two loose teeth with a much greater degree of attrition than the rest of the teeth are probably the deciduous canines. The roots of these teeth near the worn-down crown show signs of root infection. The third molars have not erupted. The rest of the teeth in the maxilla (some of which were found loose) are permanent teeth.

The dental development and the state of epiphyseal fusion suggest an age between 8 and 13 years. Less reliable evidence from the measurement of the femur suggests an age of 9-11 years.

Sexing young individuals is unreliable, and it can only be suggested that the remains are those of a male.

The height was around 4'11" (150.4 cm) [PUT IN RANGE], estimated from the total femur length with the epiphyses loosely fitted and 2 cm added to the length to allow for fragmentation and the loss of cartilaginous growth plates.

There is irregular pitting proximally / anteriorly on the diaphyses of both humeri which may have been caused by a non-specific infection. The inside of the cranial vault on the frontal bone shows an area of irregular pitting and porosity.

The right clavicle, humerus and ulna seem enlarged compared to the left side.

Seven animal bones, of a different colour from the skeleton (bleached white), were found in proximity to the burial. These were identified as coming from dog/wolf, bovine, and sheep/goat.

DESCRIPTION OF THE SKELETON

The postcranial skeleton is not complete, which might be due to the circumstances of its recovery: although all the tarsal and carpal bones, metacarpals and metatarsals are missing and only one phalange survives, all the ribs and all the vertebrae are represented in varying degrees of preservation. Also missing are the right fibula, both patellae, the sternum, right radius, left ilium blade and pubis. The skull is somewhat fragmentary, but has both mandibula and maxilla.

THE SKULL

The skull is damaged on both sides. On the right side there is a hole above the temporal lines of the parietal bone caused by post-depositional damage. The lambdoidal suture orally, on the right side, shows ossicles (or Wormian bones). The occipital bone is fragmented on the left hand side at the lambdoidal suture, where there is a hole due to post-depositional damage. Most of the zygomatic bone is missing on both sides and only fragments of the zygomatic arch remain. The mastoid processes are damaged on both sides. The sutures are unfused apart from the metopic. It was also noted that the left eye orbit is higher than the right (asymmetrical). Anteriorly on the frontal bone is an area of copper corrosion products. A small sample of metal, still stuck to the bone, was removed for study and turned out to be a copper alloy pin-like object.

Maxilla and teeth

The sutures identified at the maxilla are: intermaxillary suture, palatomaxillary suture and interpalatine suture. The state of fusion of the sutures is a general age indicator along with the surface pattern of the palate of the maxilla. For this individual the general age implied would be between subadult and adult, following Bass (1987).

Teeth present in the maxilla:

left - M2 M1 PM2 PM1 - - - / - - - PM1 PM2 M1 M2 - right

The third molars and the permanent canines have not erupted, but are visible in the jaw due to fragmentation of the bone. The left permanent lateral incisor and the two central permanent incisors are loose but were found with the body along with two teeth that are interpreted as deciduous canines. These canines display a much greater degree of attrition than surrounding teeth, resulting in the cusps being flattened and dentine being exposed. Proximally on the roots of these teeth are signs of root infection. Small attrition facets where dentine is showing were noted on the mesio-buccal, disto-buccal and mesio-

lingual cusps of the right first permanent molar and on the mesio-buccal, disto-buccal and disto-lingual cusps of the left first permanent molar.

The dentition of the maxilla shows an anomaly compared to the mandibular teeth (see below). It deviates from the normal dental development in that the permanent canines have not erupted in the maxilla although all the other teeth (apart from the third molars) have erupted and show varying degrees of enamel polishing. The mandibula has all its permanent teeth, including canines, apart from the third molars.

Mandibula and teeth

The mandibula is fairly well preserved apart from slight fragmentation of the lateral part, from the teeth sockets down to the ramus, and fragmentation of the left condylar head.

Teeth present in the mandibula:

left - M2 M1 PM2 PM1 C I2 I1 / I1 I2 C PM1 PM2 M1 M2 - right

All the permanent teeth are present apart from the third molars which have not yet erupted (the left third molar was present in the jaw but was lost post-mortem). The roots of the second molars are exposed due to fragmentation and were still open.

POSTCRANIAL SKELETON

Bones of the Vertebral Column

All the vertebrae are present with varied degrees of preservation. The atlas is complete. None of the secondary epiphyses, including the proatlas at the axis, are fused but primary fusion is complete for all the vertebrae.

Sacrum

The five sacral vertebrae of the sacrum are well preserved. The coccyx is missing. No fusion has occurred within the sacrum and the secondary epiphyses on each body have not fused, but the primary fusion is complete.

Scapula

Both the left and right scapulae are present, and both are fragmented along the medial or vertebral border and on the body itself. No fusion of secondary epiphyses has occurred on the acromion, coracoid or glenoid cavity (other locations for epiphyses have been destroyed).

Clavicle

The right clavicle is present in distal and proximal parts: the distal part seems slightly enlarged compared to the left clavicle. Of the left clavicle only the distal part remains. Both clavicae show unfused epiphyses.

Ribs

All twelve ribs are present in varying degrees of preservation. No fusion of epiphyses has yet occurred on the head or the tubercle. The left hand ribs are more fragmented than the right hand ribs.

Humerus

Both the left and right bones are present. No epiphyseal fusion at either the proximal or distal end has occurred. The bones are fragmentary at both the proximal and distal ends. The right humerus is fragmented to a greater extent along the proximal posterior of the diaphysis and on the proximal articulation surface. The left proximal epiphysis is in a poor condition. Both left and right humeri show signs of disease on the anterior of the diaphysis just below the proximal end, where irregular pitted surfaces are present. The right humerus is enlarged along the diaphysis compared to the left humerus.

Radius

Only the left radius was recovered. No epiphyseal fusion was noted on either the proximal or distal end. The distal end is partly fragmentary.

Ulna

Both the left and right bones are present. No epiphyseal fusion was noted on the proximal ends. The distal parts are either too fragmentary to be identified or are missing. Only the proximal part of the right ulna remains and it appears to be enlarged in comparison to the left ulna.

Comment

The right clavicle, humerus and ulna seem enlarged compared to the same bones on the left hand side. This might be explained as asymmetrical development.

Hip Bone (Innominate)

The right and left ischii were identified as well as the right pubis and the right iliac blade. The rami of the pubis and ischii were fused, but the three bones on each side were not fused at the acetabulum and no secondary epiphyses at other locations on the bones were fused. The colour of the iliac blade is different (bleached white) from that of the rest of the skeleton, suggesting it has recently been exposed to weathering.

Femur

Both left and right bones are present. No epiphyseal fusion was noted on either the proximal or distal ends. The distal end of the right femur is partly fragmentary. The distal epiphyses and the proximal left epiphysis were recovered in varying degrees of preservation. On the left femur, anteriorly on the diaphysis, an area of copper corrosion products was present.

Tibia

Both left and right bones are present. No epiphyseal fusion was noted. The proximal ends are fragmentary.

Fibula

Only the diaphysis with a small part of the distal end of one fibula remains. No epiphyseal fusion had yet occurred on the distal end. It could not be ascertained wheter it was the left or right fibula.

AGE ESTIMATION

The skeletal and dental ages are based on epiphyseal fusion, tooth eruption (dental development) and measurement of the femur. The table below shows the ages (in years) at which epiphyseal fusion for the postcranial skeleton normally occurs according to Bass (1987) and Brothwell (1981). The first age indicates the beginning of fusion and the second its completion. The abbreviations CV, TV and LV represent cervical, thoracic and lumbar vertebrae.

	Brothwell	Bass
CV, TV, LV: fusion of 2ndary epiphyses starts around puberty, and is completed by (proatlas on the axis fuses with the odontal peg around 12 (Gray 1973:xxx))		17-25
Sacrum : 2ndary epiphyses and fusion within sacrum starts around puberty, and is completed by		18-25
Scapula		
glenoid cavity	17-22	15-18
coracoid	17-22	15-18
acromion	17-22	16-22
Clavicle	18-30	c.25
Ribs: head and tubercle		18-24
Humerus		
Proximal	16-25	c.24
Distal	13-19	17-18

Radius		
Proximal	13-19	15-18
Distal	15-23	17-19
Ulna		
Proximal	13-19	c.19
Hip Bone		
fusion at acetabulum	13-16	12-17
rami pubis and iscii		7-8
other epiphyses	16-25	16-23
Femur		
Proximal	15-20	14-19
Distal	16-23	later than proximal part
Tibia		
Proximal	16-23	16-23
Distal	16-20	14-20
Fibula		
Distal	16-20	14-15

Comment:

As no epiphyseal fusion has started on any bone the skeletal age implied is under 13 years. The right rami pubis and os ischii have fused which implies a skeletal age of over 8 years.

Tooth eruption (dental development)

As mentioned above the dental development in the maxilla seems to deviate from the normal dental development seen in the mandibula. The permanent canines have not erupted and teeth interpreted as deciduous canines were found in association with the skeleton.

Normal variation in eruption timing may be exceeded in some cases: premature or retarded eruption can occur. Deciduous teeth may fail to be shed, often where the succeeding tooth is not formed. Such retained teeth remain in the dentition and are more noticeable due to their much greater degree of attrition than surrounding teeth. The other common anomaly of eruption is the retention of teeth within the jaw. This is called impaction and in humans is most common in the canines and third molars. Both impaction and retention of deciduous teeth occur quite commonly in archaeological human material (Hillson 1986:320)

Disregarding the anomaly in the maxilla, the state of tooth eruption and dental development for this individual give a dental age of 12 years according to Brothwell (1981), and 12 years \pm 30 months, according to Bass (1987). This is based on the fact that

all the teeth have erupted apart from the third molars, [???] that only show as small crown facets (the roots have not yet formed) [?? don't understand] and the roots of the second molars are not closed.

Measurement of femur for a general age estimate

Less reliable but confirmatory evidence of age can be obtained from the length of the femur. There is always an uncertainty when dealing with archaeological material where one or both epiphyses may be missing and where the cartilaginous growth plate between the epiphysis and diaphysis is almost always absent. For this age estimation, the left femur was used with its proximal and distal epiphyses loosely fitted onto the articulation surfaces, in order to get the full length. Measured with a steel measuring tape, the full length was 35 cm. To allow for the loss of the cartilaginous growth plate and fragmentation, 2 cm was added to this.

AGE	Mean	σ
9	34.36	1.933
10	36.29	2.057
11	38.16	2.237

Table 35 in Bass (1987) was used, after Anderson *et al* (1964:1197-1202), which gave femur length for children from ages 1 to 18 taken from roentgenograms.

SEX ESTIMATION

From the age estimation the skeletal remains come from a subadult. Since the sexual characteristics do not manifest themselves skeletally until puberty any determination is largely a guess (Bass 1987:19). The sex estimation is based on the distinguishing characteristics in Bass (1987:81, 200ff) for the skull and the hip bone.

- The supraorbital ridges are slightly prominent. Prominent ridges are a male characteristic.
- The mandibula does not show any typical male characteristics apart from being robust.
- The posterior end of the zygomatic process extends as a crest, which is a male characteristic.
- The subpubic angle of the pubic bone was narrow, which is a male characteristic.

STATURE ESTIMATION

As mentioned above, the measuring of bones from an

archaeological context has its drawbacks, in particular when measuring subadult bones where the epiphyses have not yet fused. This stature estimation is made only to serve as a general indicator of height. Because the studies of Trotter and Gleser (1952, 1958, 1977) are said to be the most reliable (Bass 1987) their formula for estimating the height from the femur for white males is used here. A measurement of 37 cm for the left femur was used as determined above.

Formulae: $2.32 \times \text{femur} + 65.53 \pm 3.94$

Given a femur (white male) that measures 37.0 cm

$$= 2.32 \times 37.0 + 65.53$$
$$= 84.84 + 65.53$$

$$= 150.37 \text{ cm (mean)}$$

$$\text{Range } 150.37 \pm 3.94 = 146 - 154 \text{ cm}$$
$$(4'9'' - 5')$$

PATHOLOGY

Both humeri show areas of irregular pitting proximally and anteriorly on the diaphysis, which may have been caused by a non-specific bone inflammation (osteomyelitis), a bacterial infection (Manchester 1983:35). It was also noted that the right humerus is enlarged along the diaphysis compared to the left humerus. There is an area of irregular pitting and porosity on the inside of the vault of the frontal bone, but not on the outside. These pathological changes require further diagnosis.

ASSOCIATED BONES

Artifact with attached bone

In association with the skeleton, a skeletal fragment stuck to a piece of wood (shield handle ?) was found. From its morphology this is probably the diaphysis of a phalange from the first row in the hand (side undetermined).

Animal bones

Seven animal bones were found in proximity to the skeleton. These are a different colour (bleached white) from the skeleton.

- complete tibia from a dog or wolf. Epiphyses fused.
- complete ulna from a dog or wolf. Epiphyses fused.
- part of the right mandibula of a young sheep or goat, with the second and the third deciduous molar still in their sockets
- fragmentary rib, probably from a bovine (Bos taurus)
- spine of a vertebra, probably from a bovine (Bos taurus)
- fragment of unidentified bone
- fragment of a longbone (species unidentified)

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SEX ESTIMATION

From the age estimation the skeletal remains come from a subadult. Since the sexual characteristics do not manifest themselves skeletally until puberty any determination is largely a guess (Bass 1987:19). The sex estimation is based on the distinguishing characteristics in Bass (1987:81, 200ff) for the skull and the hip bone.

- The supraorbital ridges are slightly prominent. Prominent ridges are a male characteristic.
- The mandibula does not show any typical male characteristics apart from being robust.
- The posterior end of the zygomatic process extends as a crest, which is a male characteristic.
- The subpubic angle of the pubic bone is narrow, which is a male characteristic.

STATURE ESTIMATION

As mentioned above, the measuring of bones from an archaeological context has its drawbacks, in particular when measuring subadult bones where the epiphyses have not yet fused. This stature estimation is made only to serve as a general indicator of height. Because the studies of Trotter and Gleser (1952, 1958, 1977) are said to be the most reliable (Bass 1987) their formula for estimating the height from the femur for white males is used here. A measurement of 37 cm for the left femur was used as determined above.

Formulae: $2.32 \times \text{femur} + 65.53 \pm 3.94$

Given a femur (white male) that measures 37.0 cm

$$2.32 \times 37.0 + 65.53$$

$$= 84.84 + 65.53$$

$$= 150.37 \text{ cm (mean)}$$

$$\text{Range } 150.37 \pm 3.94 = 146 - 154 \text{ cm}$$

$$(4'9'' - 5')$$

PATHOLOGY

Both humeri show areas of irregular pitting proximally and anteriorly on the diaphysis, which may have been caused by a non-specific bone inflammation (osteomyelitis), a bacterial infection (Manchester 1983:35). It was also noted that the right humerus is enlarged along the diaphysis compared to the left humerus. There is an area of irregular pitting and porosity on the inside of the vault of the frontal bone, but not on the outside. These pathological changes require further diagnosis.

	Brothwell	Bass
CV, TV, LV: fusion of 2ndary epiphyses starts around puberty, and is completed by (proatlas on the axis fuses with the odontal peg around 12 (Warwick et al. 1973).		17-25
Sacrum : 2ndary epiphyses and fusion within sacrum starts around puberty, and is completed by		18-25
Scapula		
glenoid cavity	17-22	15-18
coracoid	17-22	15-18
acromion	17-22	16-22
Clavicle	18-30	c.25
Ribs: head and tubercle		18-24
Humerus		
Proximal	16-25	c.24
Distal	13-19	17-18
Radius		
Proximal	13-19	15-18
Distal	15-23	17-19
Ulna		
Proximal	13-19	c.19
Hip Bone		
fusion at acetabulum	13-16	12-17
rami pubis and iscii		7-8
other epiphyses	16-25	16-23
Femur		
Proximal	15-20	14-19
Distal	16-23	later than proximal part
Tibia		
Proximal	16-23	16-23
Distal	16-20	14-20
Fibula		
Distal	16-20	14-15

Comment:

As no epiphyseal fusion has started on any bone the skeletal age implied is under 13 years. The right rami pubis and os ischii have fused which implies a skeletal age of over 8 years.

Sacrum

The five sacral vertebrae of the sacrum are well preserved. The coccyx is missing. No fusion has occurred within the sacrum and the secondary epiphyses on each body have not fused, but the primary fusion is complete.

Scapula

Both the left and right scapulae are present, and both are fragmented along the medial or vertebral border and on the body itself. No fusion of secondary epiphyses has occurred on the acromion, coracoid or glenoid cavity (other locations for epiphyses have been destroyed).

Clavicle

The right clavicle is present in distal and proximal parts: the distal part seems slightly enlarged compared to the left clavicle. Of the left clavicle only the distal part remains. Both clavicles show unfused epiphyses.

Ribs

All twelve ribs are present in varying degrees of preservation. No fusion of epiphyses has yet occurred on the head or the tubercle. The left hand ribs are more fragmented than the right hand ribs.

Humerus

Both the left and right bones are present. No epiphyseal fusion at either the proximal or distal end has occurred. The bones are fragmentary at both the proximal and distal ends. The right humerus is fragmented to a greater extent along the proximal posterior of the diaphysis and on the proximal articulation surface. The left proximal epiphysis is in a poor condition. Both left and right humeri show signs of disease on the anterior of the diaphysis just below the proximal end, where irregular pitted surfaces are present. The right humerus is enlarged along the diaphysis compared to the left humerus.

Radius

Only the left radius was recovered. No epiphyseal fusion was noted on either the proximal or distal end. The distal end is partly fragmentary.

Ulna

Both the left and right bones are present. No epiphyseal fusion was noted on the proximal ends. The distal parts are either too fragmentary to be identified or are missing. Only the proximal part of the right ulna remains and it appears to be enlarged in comparison to the left ulna.

specific infection. The inside of the cranial vault on the frontal bone shows an area of irregular pitting and porosity.

The right clavicle, humerus and ulna seem enlarged compared to the left side.

Seven animal bones, of a different colour from the skeleton (bleached white), were found in proximity to the burial. These were identified as coming from dog/wolf, bovine, and sheep/goat.

DESCRIPTION OF THE SKELETON

The postcranial skeleton is not complete, which might be due to the circumstances of its recovery: although all the tarsal and carpal bones, metacarpals and metatarsals are missing and only one phalange survives, all the ribs and all the vertebrae are represented in varying degrees of preservation. Also missing are the right fibula, both patellae, the sternum, right radius, left ilium blade and pubis. The skull is somewhat fragmentary, but has both mandibula and maxilla.

THE SKULL

The skull is damaged on both sides. On the right side there is a hole above the temporal lines of the parietal bone caused by post-depositional damage. The lambdoidal suture orally, on the right side, shows ossicles (or Wormian bones). The occipital bone is fragmented on the left hand side at the lambdoidal suture, where there is a hole due to post-depositional damage. Most of the zygomatic bone is missing on both sides and only fragments of the zygomatic arch remain. The mastoid processes are damaged on both sides. The sutures are unfused apart from the metopic. The inside of the cranial vault on the frontal bone shows an area of irregular pitting and porosity. It was also noted that the left eye orbit is higher than the right (asymmetrical). Anteriorly on the frontal bone is an area of copper corrosion products. A small sample of metal, still stuck to the bone, was removed for study and turned out to be a copper alloy pin-like object.

Maxilla and teeth

The sutures identified at the maxilla are: intermaxillary suture, palatomaxillary suture and interpalatine suture. The state of fusion of the sutures is a general age indicator along with the surface pattern of the palate of the maxilla. For this individual the general age implied would be between subadult and adult, following Bass (1987).

Teeth present in the maxilla:

left - M2 M1 PM2 PM1 - - - / - - - PM1 PM2 M1 M2 - right

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ASS. DCS

CB/LC

25 May 1993

Dear Bob,

Thank you for your letter and enclosure concerning the death of young Vikings. I don't think we will have any problems referring to her in the publication of the Balnakeil material, but there really is nothing in her contribution which I didn't have already. However, the thought was kind and the intention helpful.

The Viking Congress volume is now away at the printers, so we hope for publication before the next Congress in Stockholm in late August.

Yours,

Dr Colleen Batey
Curator of Archaeology

