Supplementary Material 1

**Methods: Measurements**

Below are the definitions of the measurements taken on each element or element portion in the ecomorphological analyses. They are adapted from previously published bovid ecomorphological models (Kovarovic and Andrews, 2007) and Kovarovic (unpublished data). These measurements include many standard archaeological and palaeontological measures of length and the diameters of the distal and proximal ends, as well as measurements targeted at capturing dimensions of the articular surfaces. See also Supplementary Material for Figures S1-S18 for images of the measurements taken.

Humerus (distal)

H13 width of the trochlea and capitulum

H14 anterior-posterior diameter of the distal end

H15 shortest measure of the distal trochlea, taken at the midpoint

H16 transverse diameter of the trochlea

H17 width of the trochlea in posterior view

H18 length of trochlea in posterior view

Radius

R2 functional length of the radius, taken on the lateral side

R3 anterior-posterior diameter of the proximal end

R4 transverse diameter of the proximal end

R5 transverse width of the articular surface of the proximal end

R6 width of articulation for the medial trochlea or the humerus

R7 anterior-posterior diameter of the distal end

R8 transverse diameter of the distal end

R9 transverse diameter of the articular surface of the distal end

R10 length of the scaphoid-lunar articular margin

R11 anterior-poster mid-shaft diameter

R12 transverse mid-shaft diameter

Metacarpal

MC2 functional length of the metacarpal, taken on the lateral side

MC3 anterior-posterior diameter of the proximal end

MC4 anterior-posterior measure of magnum facet

MC5 transverse diameter of the proximal end

MC6 transverse measure of magnum facet

MC7 anterior-posterior diameter of the distal end

MC8 transverse diameter of the distal end

MC9 measure of the distance between the medial and lateral verticillus

MC10 minimum diameter of the medial trochlea

MC11 maximum diameter of the medial trochlea

MC12 greatest transverse width of the medial trochlea

MC13 measure of the distance between the medial and lateral epicondyle at the most proximal point

MC14 measure of the distance between the medial and lateral epicondyle at the most distal point

MC15 anterior-posterior mid-shaft diameter

MC16 transverse mid-shaft diameter

MC17 anterior-posterior diameter of proximal shaft

MC18 transverse diameter of proximal shaft

MC19 anterior-posterior diameter of distal shaft

MC20 transverse diameter of distal shaft

Femur (proximal)

F3 anterior-posterior diameter of the proximal end

F4 transverse diameter of the proximal end

F5 measure of the distance between the tip of the greater trochanter and the tip of the lesser trochanter

F6 measure of the distance between the tip of the lesser trochanter and the tip of the head

F7 greatest anterior-posterior diameter of the femoral head

F8 minimum diameter of femoral head, where it "constricts"

F9 greatest anterior-posterior diameter of the greater trochanter

F10 transverse diameter of the femoral head

Femur (distal)

F11 anterior-posterior diameter of the distal end, medial side

F12 anterior-posterior diameter of the distal end, lateral side

F13 transverse diameter of the distal end

F14 measure of the width of the anterior trochlea

F15 measure of the width of the inferior trochlea

F16 anterior-posterior measure of the entire articular surface of the distal trochlea

Tibia (proximal)

T3 anterior-posterior diameter of the proximal end

T4 transverse diameter of the proximal end

T6 measure of the width of the articular surface of the lateral condyle

T7 measure of the width of the articular surface of the medial condyle

T8 measure of the distance between the articular surfaces of the lateral and medial condyles

Metatarsal

MT2 functional length of the metatarsal, taken on the lateral side

MT3 anterior-posterior diameter of the proximal end

MT4 anterior-posterior measure of external & middle cuneiform facet

MT5 anterior-posterior measure of anterior naviculo-cuboid facet

MT6 transverse diameter of the proximal end

MT7 long axis of the posterior naviculo-cuboid facet

MT8 short axis of the posterior naviculo-cuboid facet

MT9 anterior-posterior diameter of the distal end

MT10 transverse diameter of the distal end

MT11 measure of the distance between the medial and lateral verticillus

MT12 minimum diameter of the medial trochlea

MT13 maximum diameter of medial trochlea

MT14 transverse width of the medial trochlea

MT15 measure of the distance between the medial and lateral epicondyle at the most proximal point

MT16 measure of the distance between the medial and lateral epicondyle at the most distal point

MT17 anterior-posterior mid-shaft diameter

MT18 transverse mid-shaft diameter

MT19 anterior-posterior diameter of proximal shaft

MT20 transverse diameter of proximal shaft

MT21 anterior-posterior diameter of distal shaft

MT22 transverse diameter of distal shaft

Astragalus (talus)

TA1 length of the medial side

TA2 length of the lateral side

TA3 measure of the distance from the distal base to the most inferior aspect of the medial articular surface

TA4 measure of the distance from the talar notch to the talar head, taken in medial view

TA5 width of distal articular surface

TA6 intermediate width of the anterior surface

TA7 width of the proximal articular surface, not including the non-articular lateral process

TA8 shortest length of the talus

TA9 measure of the distance from the mid-point of the trochlear pit to the end of the proximal articular surface

TA10 width of the inferior articular surface

TA11 length of the inferior articular surface

Calcaneus

C1 greatest length of the calcaneus

C2 length of the posterior extension from the end of the talar articular surface to the end of the calcaneus

C3 greatest length of the articular surface for the medial malleolus of the tibia

C4 greatest depth of the articular surface for the talus

C5 length of the sustentaculum talus, up to and including the top of the talar articular surface

C6 length of the muscle attachment on sustentaculum talus

C7 greatest length of the articular surface for naviculo-cuboid

C8 anterior-poster mid-body diameter

C9 transverse mid-body diameter

Naviculo-cuboid

N1 dorsal-palmar length of the naviculo-cuboid, taken in distal view

N2 length of the larger lateral articular surface for the metatarsal on the distal end

N3 length of the smaller lateral articular surface for the metatarsal on the distal end

N4 length of the lateral aspect of the articular surface for the cuneiform

N5 length of the adjoining articular surfaces for the cuneiform and metatarsal

N6 length of the medial edge of the articular surface for the cuneiform

N7 width of the medial articular surface on the distal end

N8 width of the naviculo-cuboid, taken in proximal view

N9 width of the talar articular surface

N10 length of the articular surface for the calcaneus

N11 length of the most medial talar extension

N12 width of the medial surface

N13 depth of the most medial proximal talar extension, from the articular surface to the tip

N14 depth of the smaller proximal talar extension, from the articular surface to the tip

N15 width of the lateral surface

External and middle cuneiform

E1 length of the external and middle cuneiform

E2 width of the external and middle cuneiform

E3 length of the distal articular surface

E4 width of the distal articular surface

E5 width of the proximal articular surface

E6 length of the medial aspect of the proximal articular surface

E7 greatest length of the proximal articular surface

E8 width of the medial surface

Magnum

M1 greatest transverse width of magnum

M2 greatest dorsal-palmar length of magnum

M3 greatest dorsal-palmar length of articular surface

M4 greatest transverse width of articular surface

M5 transverse width of the articular surface at the midpoint

M6 greatest dorsal-palmar length of the medial aspect of the proximal scaphoid articular surface

M7 dorsal-palmar length of the lateral margin of the proximal surface where it articulates with the lunar

M8 width of the dorsal surface at the lateral edge

M9 width of the dorsal surface where it is joined by the proximal articular surface ridge

M10 width of the dorsal surface at the medial edge

Unciform

U1 greatest transverse width of the unciform

U2 greatest dorsal-palmar length of the unciform

U3 greatest dorsal-palmar length of the distal articular surface

U4 greatest transverse width of the distal articular surface

U5 greatest dorsal-palmar length of the medial aspect of the proximal lunar articular surface

U6 dorsal-palmar length of the lateral aspect of the proximal cuneiform articular surface

U7 width of the dorsal surface at the lateral edge

U8 width of the dorsal surface where it is joined by the proximal articular surface ridge

U9 width of the dorsal surface at the medial edge

Lunar

L1 greatest transverse width of the proximal articular surface of the lunar

L2 dorsal-palmar length of the lateral proximal surface of the lunar

L3 greatest dorsal-palmar length of the lunar in proximal view

L4 dorsal-palmar length of the medial margin of the distalcuneiform articular surface

L5 dorsal-palmar length of the distal surface where it articulates with the magnum and unciform

L6 dorsal-palmar length of the medial margin of the distal surface

L7 length of the lateral surface where it articulates distally with the cuneiform

L8 length of the dorsal margin of the lateral surface

L9 dorsal-palmar length of the medial surface where it articulates distally with the scaphoid

L10 dorsal-palmar length of the medial surface where it articulates proximally with the scaphoid

Cuneiform

CU1 greatest dorsal-palmar length of the cuneiform

CU2 length of the distal surface where it articulates with the unciform

CU3 length of the medial surface where it articulates distally with the lunar

CU4 length of the dorsal margin of the medial surface where it articulates with the lunar

CU5 length of the palmar articular surface

Proximal phalanges

PP1 greatest length of the proximal phalanx taken in palmar view with the shaft parallel to the calipers

PP2 length at dorsal midline

PP3 transverse diameter of distal end, taken in palmar view

PP4 transverse width of the distal articular surface, taken in distal view

PP5 dorsal-palmar length of the distal articular surface

PP6 transverse width of the proximal end, taken in palmar view

PP7 transverse width of the proximal articular surface, taken in proximal view

PP8 dorsal-palmar length of the proximal articular surface

PP9 dorsal-palmar mid-shaft diameter

PP10 transverse mid-shaft diameter

Intermediate phalanges

IP1 greatest length of the intermediate phalanx, taken in dorsal view

IP2 transverse diameter of distal end, taken in palmar view

IP3 transverse width of the distal articular surface, taken in distal view

IP4 dorsal-palmar length of the distal articular surface

IP5 transverse width of the proximal end, taken in palmar view

IP6 transverse width of proximal articular surface, taken in proximal view

IP7 dorsal-palmar length of the proximal articular surface

IP8 dorsal-palmar mid-shaft diameter

IP9 transverse mid-shaft diameter

Distal phalanges

DP1 greatest length of the distal phalanx

DP2 length from distal tip to midline of proximal articular surface

DP3 dorsal-palmar height of the phalanx including the dorsal, non articular tubercle

DP4 dorsal-palmar height of phalanx to the top of the articular surface (not including the non-articular tubercle)

DP5 dorsal-palmar measure of the proximal articular surface

DP6 transverse width of the proximal articular surface

DP7 dorsal-palmar height at the mid-point

DP8 transverse width at the mid-point

LITERATURE CITED

Kovarovic, K., and P. Andrews. 2007.Bovid postcranial ecomorphological survey of the

Laetoli paleoenvironment. Journal of Human Evolution 52:663-680.