

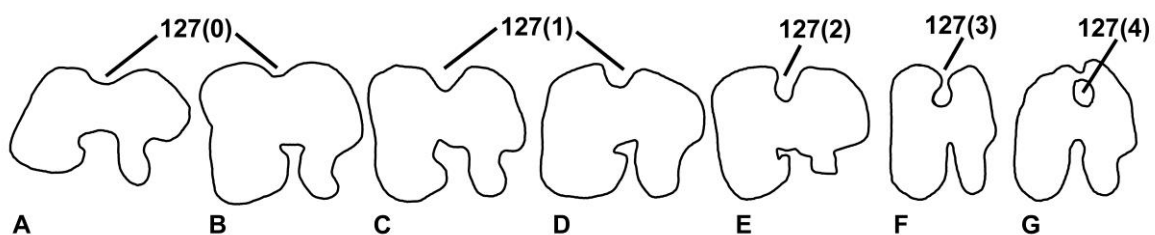
NEW MATERIAL OF *VALDOSAURUS CANALICULATUS* (ORNITHISCHIA:  
ORNITHOPODA) FROM THE LOWER CRETACEOUS OF SOUTHERN ENGLAND

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**ELECTRONIC SUPPLEMENTARY INFORMATION**

*Rescoring of character 127*

127. Femur, intercondylar extensor groove: broad, shallow 'V'-shaped, edges of groove meet at greater than 90 degrees to one another (0); tight, deep 'V'-shaped, edges of groove meet at less than 90 degrees (1); deep, narrow, 'U'-shaped with partial enclosure by slight expansion of medial condyle (2); 'U'-shaped groove partially enclosed by expansions of both medial and lateral condyles (3); canal fully enclosed by fusion of lateral and medial condyles (4) [ordered].



**Supplementary figure 1.** Distal left femur of selected iguanodontian ornithopods illustrating the morphology of the anterior intercondylar groove and the modified character state codings used for character 127 of the phylogenetic analysis. A, *Tenontosaurus tilletti* (after Forster

1990, fig. 19). B, *Dryosaurus altus* (after Galton 1981, fig. 13). C, *Dysalotosaurus lettowvorbecki* (after Galton 1981, fig. 14F). D, *Camptosaurus dispar* (after Galton 1980, fig. 4F). E, *Valdosaurus canaliculatus* (IWCMS 2007·4). F, *Nanyangosaurus zhugeii* (after Xu *et al.* 2000, fig. 2H). G, *Telmatosaurus transsylvanicus* (after Weishampel *et al.* 1993, fig. 6C).

*New characters (numbering of characters follows that used in McDonald et al. [2010])*

131. Premaxilla, dorsal process: does (0), or does not (1), form contact with nasal (Galton 1983; Sues and Norman 1990).
132. Ilium, brevis fossa, transverse width: narrow (0), very broad and expanding in width towards its posterior margin such that it appears triangular in dorsal or ventral view (1) (Galton 1981; Galton and Taquet 1982).
133. Ischium, obturator process, position: beyond (0), or within (1), the proximal 25 per cent of the length of the ischium (Galton 1981; Weishampel *et al.* 2003).
134. Femur, proximal end: absence (0), or presence (1), of a deep cleft separating the greater and anterior trochanters (Galton 1981).
135. Metatarsals III and IV, proximal ends, morphology in proximal view: absence (0), or presence (1), of a deep posterolateral notch on MT III for the reception of a prominent process of MT IV (new character).
136. Metatarsal I, size: robust, bears phalanges (0), or reduced to a vestigial splint or absent, does not bear phalanges (1) (Galton 1981; Sues and Norman 1990; Norman 2004; Butler *et al.* 2008).

*Characters rescored for Valdosaurus and Dysalotosaurus*

*Valdosaurus*: characters 94 ('?' to '0'), 113 ('?' to '0'), 114 ('?' to '0'), 115 ('?' to '0'), 116 ('?' to '0'), 119 ('?' to '2'), 125 ('1' to '0'), 129 ('?' to '0'), 130 ('?' to '0')

*Dysalotosaurus*: 116 ('?' to '0')

*New scores for characters 127 and 131–136*

References used to score taxa largely follow those used by McDonald *et al.* (2010), supplemented by pers. obs. on hadrosaurids by PMB and S. C. R. Maidment (pers. comm., 2010).

	127	131	132	133	134	135	136
<i>Lesothosaurus diagnosticus</i>	?	0	0	?	1	0	0
<i>Hypsilophodon foxii</i>	?	0	0	0	0	0	0
<i>Rhabdodon</i> sp.	?	?	?	0	?	?	?
<i>Zalmoxes robustus</i>	0	0	0	?	0	?	?
<i>Zalmoxes shqiperorum</i>	1	?	0	?	0	?	?
<i>Muttaborrasaurus langdoni</i>	0	?	0	1	0	0	0
<i>Tenontosaurus dossi</i>	0	0	0	?	?	?	0
<i>Tenontosaurus tilletti</i>	0	0	0	0	0	0	0
<i>Callovosaurus leedsi</i>	0	?	?	?	1	?	?
" <i>Camptosaurus</i> " <i>valdensis</i>	?	?	?	?	?	?	?
<i>Dryosaurus altus</i>	0	1	1	1	1	0	1
<i>Dysalotosaurus lettowvorbecki</i>	1	1	1	1	1	1	1
<i>Kangnasaurus coetzeei</i>	0	?	?	?	0	0	1
<i>Elrhazosaurus nigeriensis</i>	2	?	?	?	1	?	?
<i>Valdosaurus canaliculatus</i>	2	?	1	1	1	1	1
" <i>Camptosaurus</i> " <i>aphanoecetes</i>	1	?	0	1	1	0	?
<i>Camptosaurus dispar</i>	1	0	0	1	1	0	0
<i>Draconyx loureiroi</i>	?	?	?	?	1	?	?
<i>Cumnoria prestwichii</i>	1	?	0	1	1	?	0
<i>Owenodon hoggii</i>	?	?	?	?	?	?	?
NHMUK R8676	3	?	?	?	?	?	?

Utah taxon 2	?	?	?	?	?	?	?
Utah taxon 1	?	?	?	?	?	?	?
<i>Theiophytalia kerri</i>	?	0	?	?	?	?	?
<i>Cedrorestes crichtoni</i>	?	?	0	?	?	0	?
<i>Planicoxa venenica</i>	?	?	1	?	0	?	?
" <i>Camptosaurus</i> " <i>depressus</i>	?	?	?	?	?	?	?
<i>Dakotadon lakotaensis</i>	?	?	?	?	?	?	?
<i>Lurdusaurus arenatus</i>	?	?	?	?	?	?	?
<i>Barilium dawsoni</i>	?	?	0	1	?	?	?
<i>Hypselospinus fittoni</i>	3	?	0	?	?	?	?
NHMUK R1831	?	?	?	?	?	?	?
<i>Lanzhousaurus magnidens</i>	?	?	?	?	?	?	?
<i>Fukuisaurus tetoriensis</i>	?	?	?	?	?	?	?
NHMUK 28660	?	?	?	?	?	?	?
<i>Iguanodon bernissartensis</i>	3	0	0	1	0	0	1
<i>Doliodon bampingi</i>	3	0	0	1	0	0	1
<i>Mantellisaurus atherfieldensis</i>	?	0	0	1	0	0	1
<i>Ouranosaurus nigeriensis</i>	?	0	0	1	0	0	1
<i>Altirhinus kurzanovi</i>	?	0	0	1	?	?	?
<i>Jinzhousaurus yangi</i>	?	0	0	?	0	?	?
<i>Jintasaurus meniscus</i>	?	?	?	?	?	?	?
<i>Equijubus normani</i>	?	0	?	?	?	?	?
<i>Penelopognathus weishampeli</i>	?	?	?	?	?	?	?
" <i>Probactrosaurus</i> " <i>mazongshanensis</i>	3	?	?	?	?	?	?
<i>Probactrosaurus gobiensis</i>	3	0	0	1	0	0	?
<i>Eolambia caroljonesa</i>	3	?	?	1	?	?	?
<i>Jeyawati rugoculus</i>	?	?	?	?	?	?	?
<i>Protohadros byrdi</i>	?	0	?	?	?	?	?
<i>Shuangmiaosaurus gilmorei</i>	?	?	?	?	?	?	?
<i>Nanyangosaurus zhugeii</i>	3	?	?	?	?	0	1
<i>Bactrosaurus johnsoni</i>	4	?	0	1	0	?	1
<i>Gilmoreosaurus mongoliensis</i>	?	?	0	1	1	0	?
<i>Levnesovia transoxiana</i>	4	?	?	?	?	?	?
<i>Tanius sinensis</i>	4	?	0	?	0	?	?
<i>Tethyshadros insularis</i>	?	?	0	1	?	?	1
<i>Telmatosaurus transsylvanicus</i>	4	0	?	?	0	0	?

<i>Claosaurus agilis</i>	?	?	0	?	?	?	?
<i>Lophorhothon atopus</i>	?	?	?	1	?	?	?
<i>Hadrosaurus foulkii</i>	4	?	0	?	0	0	?
<i>Edmontosaurus annectens</i>	4	0	0	1	0	0	1
<i>Corythosaurus casuarius</i>	4	0	0	1	0	?	1

## REFERENCES (not already cited in main text)

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- GALTON, P. M. 1980. *Dryosaurus* and *Camptosaurus*, intercontinental genera of Upper Jurassic ornithopod dinosaurs. *Mémoires de la Société géologique de France, nouvelle série*, **139**, 103–108.
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- XU XING, ZHAO XI-JIN, LÜ JUN-CHANG, HUANG WANG-BO, LI ZHAN-YANG and DONG ZHI-MING. 2000. A new iguanodontian from Sangping Formation of Neixiang, Henan and its stratigraphical implication. *Vertebrata PalAsiatica*, **38**, 176–191 (in Chinese with English summary).

**TABLE 1.** Measurements of selected elements of *Valdosaurus canaliculatus* (all in millimetres).

**NHMUK R184 (*Valdosaurus canaliculatus* holotype)**

Total femur length = 139 mm

Mediolateral width of proximal end = 31 mm (greater trochanter to head, excludes anterior trochanter).

Anteroposterior length of greater trochanter = 21.5 mm

Anteroposterior length of **anterior** trochanter at midheight = 8 mm

Mediolateral width of **anterior** trochanter at midheight = 6 mm

Distance from greater trochanter to base of fourth trochanter = 62 mm

Minimum transverse width of shaft at midlength = 14.5 mm

Maximum transverse width of distal end = 29.5 mm

Anteroposterior length of medial condyle/epicondyle (abraded) = 22.5 mm

Ratio between **anterior** trochanter width and length = 0.75

Distance to base of fourth trochanter from proximal end as a percentage of total femur length = 44.6%

Ratio of **anterior** to greater trochanter anteroposterior length = 0.37

**NHMUK R185 (*Valdosaurus canaliculatus* holotype)**

Total femur length = 140 mm

Mediolateral width of proximal end = 31 mm (greater trochanter to head, excludes anterior trochanter).

Anteroposterior length of greater trochanter = 22.5 mm

Anteroposterior length of **anterior** trochanter at midheight = 8 mm

Mediolateral width of **anterior** trochanter at midheight = 6.5 mm

Distance from greater trochanter to base of fourth trochanter = 63 mm

Minimum transverse width of shaft at midlength = 15.5 mm

Maximum transverse width of distal end = 30.5 mm

Anteroposterior length of medial condyle/epicondyle = 26 mm

Ratio between **anterior** trochanter width and length = 0.81

Distance to base of fourth trochanter from proximal end as a percentage of total femur length = 45%

Ratio of **anterior** to greater trochanter anteroposterior length = 0.36

**IWCMS 2007.4 (*Valdosaurus canaliculatus* referred)**

Femur

Total femur length = 430 mm

Mediolateral width of proximal end = 92 mm (greater trochanter to head, excludes the **anterior** trochanter: head slightly eroded).

Anteroposterior length of greater trochanter = 66 mm  
Anteroposterior length of **anterior** trochanter at midheight = 27.5 mm  
Mediolateral width of **anterior** trochanter at midheight = 19 mm  
Distance from greater trochanter to base of fourth trochanter = 190 mm  
Minimum transverse width of shaft at midlength = 48.5 mm  
Maximum transverse width of distal end = 98.5 mm  
Anteroposterior length of medial condyle/epicondyle = 88 mm  
Ratio between **anterior** trochanter width and length = 0.69  
Distance to base of fourth trochanter from proximal end as a percentage of total femur length = 44.2%  
Ratio of **anterior** to greater trochanter anteroposterior length = 0.42

### Tibia\*

Length = 498 mm  
Transverse width of shaft at midlength = 44 mm

\*Total length is a minimum value as the proximalmost part of the tibia is broken. Proximal and distal ends are too broken for useful measurements.

### Fibula\*

Minimum length (as preserved) = 303 mm\*  
Anteroposterior length of proximal end = 64 mm  
Mediolateral width of proximal end = 23 mm

\*Distal end missing.

### Metatarsus

Mediolateral width of articulated metatarsus = 91 mm  
Metatarsus width/length metatarsal III = 0.41.  
Proximal end mediolateral width metatarsal III/length metatarsal III = 0.17.

### Metatarsal II\*

Proximal end maximum anteroposterior length = 61 mm  
Proximal end maximum mediolateral length = 23 mm  
Distal end maximum anteroposterior length = 39 mm  
Distal end maximum mediolateral length = 28 mm

\*Broken, so no total length available

### Metatarsal III

Length = 224 mm  
Proximal end maximum anteroposterior length = 49 mm  
Proximal end maximum mediolateral length = 39 mm  
Distal end maximum anteroposterior length = 39 mm  
Distal end maximum mediolateral length = 51 mm  
Transverse shaft width at midlength = 31 mm

#### Metatarsal IV

Length = 191 mm  
Proximal end maximum anteroposterior length = 44 mm  
Proximal end maximum mediolateral length = 40 mm  
Distal end maximum anteroposterior length = 35 mm  
Distal end maximum mediolateral length = 24 mm  
Transverse shaft width at midlength = 27 mm

#### Phalanx III.1

Length = 71 mm  
Maximum mediolateral width of proximal end = 51 mm  
Dorsoventral height of proximal end = 41 mm  
Mediolateral width of distal end (ventral margin) = 40 mm\*  
Dorsoventral height of distal end = 25 mm

\*Partially restored.

#### Phalanx IV.1

Length = 52 mm  
Mediolateral width of proximal end (ventral margin) = 29 mm  
Dorsoventral height of proximal end = 35 mm  
Mediolateral width of distal end (ventral margin) = 28 mm  
Maximum dorsoventral height of distal end = 24 mm

#### **MIWG.6879 (*Valdosaurus canaliculatus* referred)**

#### Femur

Total femur length = 432 mm (but distal end missing)  
Mediolateral width of proximal end = 104 mm (greater trochanter to head, excludes **anterior** trochanter: head slightly abraded)  
Anteroposterior length of greater trochanter = 82 mm  
Anteroposterior length of **anterior** trochanter at midheight = 33.5 mm



Mediolateral width of **anterior** trochanter at midheight = 28.5 mm  
Distance from greater trochanter to base of fourth trochanter = 210 mm  
Minimum transverse width of shaft at midlength = 56.5 mm  
Maximum transverse width of distal end = N/A  
Anteroposterior length of medial condyle/epicondyle = N/A  
Ratio between **anterior** trochanter width and length = 0.85  
Distance to base of fourth trochanter from proximal end as a percentage of total femur length = 48.6% (this is a maximum estimate due to incomplete distal end, true value would be lower).  
Ratio of **anterior** to greater trochanter anteroposterior length = 0.41

### Tibia\*

Anteroposterior length of proximal end = 119 mm  
Mediolateral width of proximal end (including fibular condyle) = 75 mm  
Mediolateral width of distal end = 116 mm  
Transverse width of shaft at midlength = 55 mm

\*Total length cannot be assessed due to the missing segment of the shaft. The top of the tibia is abraded, so proximal measurements are minima.

### Metatarsal II

Length = 208 mm  
Proximal end maximum anteroposterior length = 54 mm\*  
Proximal end maximum mediolateral length = 27 mm  
Distal end maximum anteroposterior length = 47 mm  
Distal end maximum mediolateral length = 33 mm  
Transverse shaft width at midlength = 18 mm\*\*

\*Broken posteriorly.

\*\*Partially restored in this region.

### Metatarsal III

Length = 246 mm\*  
Proximal end maximum anteroposterior length = 54 mm\*  
Proximal end maximum mediolateral length = 43 mm\*  
Distal end maximum anteroposterior length = 43 mm  
Distal end maximum mediolateral length = 58 mm  
Transverse shaft width at midlength = 36 mm

\*Incomplete proximally.

#### Metatarsal IV

Length = 213 mm

Proximal end maximum anteroposterior length = 41 mm\*

Proximal end maximum mediolateral length = 41 mm\*

Distal end maximum anteroposterior length = 43 mm

Distal end maximum mediolateral length = 36 mm

Transverse shaft width at midlength = 32mm

\*Damaged proximally.

#### Phalanx II.1\*

Length = 97 mm

Mediolateral width of proximal end (at midheight) = 40 mm

Dorsoventral height of proximal end = 49 mm

Dorsoventral height of distal end = 22 mm

Proximal width/length ratio = 0.41.

\*Ventral margins of proximal and distal ends broken.

#### Phalanx III.1

Length = 75 mm

Maximum mediolateral width of proximal end = 56 mm\*

Dorsoventral height of proximal end = 49 mm

Mediolateral width of distal end (ventral margin) = 46 mm

Dorsoventral height of distal end = 31 mm

\*Broken laterally.

#### Phalanx III.2

Length = 48 mm

Maximum mediolateral width of proximal end = 39 mm

Dorsoventral height of proximal end = 31 mm

Mediolateral width of distal end (ventral margin) = 33 mm

Dorsoventral height of distal end = 24 mm

#### Phalanx IV.1

Length = 61 mm

Mediolateral width of proximal end (ventral margin) = 31 mm

Dorsoventral height of proximal end = 44 mm

Mediolateral width of distal end (ventral margin) = 27 mm

Dorsoventral height of distal end = 31 mm

#### Phalanx IV.2

Length = 35 mm

Maximum mediolateral width of proximal end = 26 mm

Dorsoventral height of proximal end = 26 mm

Mediolateral width of distal end (ventral margin) = 26 mm

Dorsoventral height of distal end = 18 mm

#### Ungual phalanx

Length = 60 mm

Maximum transverse width = 35 mm

#### **MIWG-6438** (*Valdosaurus canaliculatus*, referred)

##### Femur

Length of femur (as preserved) = 146 mm\*

Minimum transverse width of shaft at midlength = 17 mm

Maximum transverse width of distal end = 39 mm

Anteroposterior length of medial condyle/epicondyle = 29 mm

\*Proximal end missing.

##### Ischium

Length of ischium (as preserved) = 114 mm\*

\*Proximal end and small section of distal end missing.

##### Pubis

Combined anteroposterior length of prepubic process and central plate = 42 mm\*

Combined dorsoventral length of central plate and pubic rod = 67 mm\*\*

\*Proximal tip of prepubic process missing

\*\*Distal part of pubic rod missing

#### **BELUM K17051** (*Valdosaurus canaliculatus*, referred)

##### Femur

Minimum length (as preserved) = 415 mm\*  
Minimum transverse width of shaft at midlength = 51 mm  
Maximum transverse width of distal end = 97 mm  
Anteroposterior length of medial condyle/epicondyle = 99 mm

\*The proximal end is detached, with a section of the proximal shaft missing. Other measurements are not worthwhile due to damage to the trochanters. Some crushing, which has affected most measurements.

### Tibia\*

Anteroposterior length of proximal end = 122 mm\*  
Mediolateral width of proximal end (including fibular condyle) = 76 mm  
Mediolateral width of distal end = 109 mm  
Transverse width of shaft at midlength = 37 mm

\*Missing a small section of the shaft, so the overall length is unknown. The proximal end is slightly abraded.

### Metatarsus

Mediolateral width of articulated metatarsus = 96 mm  
Metatarsus width/length metatarsal III = 0.42  
Proximal end mediolateral width metatarsal III/length metatarsal III = 0.16

### Metatarsal II

Length = 184 mm  
Proximal end maximum anteroposterior length = N/A\*  
Proximal end maximum mediolateral length = 25 mm  
Distal end maximum anteroposterior length = 47 mm  
Distal end maximum mediolateral length = 34 mm  
Transverse shaft width at midlength = 17 mm

\*Broken in part.

### Metatarsal III

Length = 228 mm  
Proximal end maximum anteroposterior length = 60 mm  
Proximal end maximum mediolateral length = 36 mm  
Distal end maximum anteroposterior length = 48 mm  
Distal end maximum mediolateral length = 52 mm

Transverse shaft width at midlength = 29 mm

#### Metatarsal IV

Length = 207 mm

Proximal end maximum anteroposterior length = 42 mm

Proximal end maximum mediolateral length = 46 mm

Distal end maximum anteroposterior length = 47 mm

Distal end maximum mediolateral length = 29 mm

Transverse shaft width at midlength = 31 mm

#### Phalanx II·1

Length = 92 mm

Maximum mediolateral width of proximal end = 37 mm

Dorsoventral height of proximal end = 46 mm

Mediolateral width of distal end (ventral margin) = 33 mm

Dorsoventral height of distal end = 30 mm

#### Phalanx III·1

Length = 85 mm

Maximum mediolateral width of proximal end = 57 mm

Dorsoventral height of proximal end = 45 mm

Mediolateral width of distal end (ventral margin) = 43 mm

Dorsoventral height of distal end = 31 mm

#### Phalanx IV·1

Length = 60 mm

Mediolateral width of proximal end (ventral margin) = 34 mm

Dorsoventral height of proximal end = 41 mm

Mediolateral width of distal end (ventral margin) = 33 mm

Maximum dorsoventral height of distal end = 29 mm