Supplementary Material 3: Morphology of Fossil Frog Ilia and Humeri from Langebaanweg

Characters: ilia	Genus				
	Hyperolius	***Kassina***	***Breviceps* sp. 1**	***Breviceps* sp. 2**	**Indet. 10**
Photo number (see Supplementary Material 1)	1.	2.	5.	6.	7.
Dorsal expansion of the dorsal prominence, 0 = absent; 1=developed but low; 2=well developed; 3=massive	1	1	1	2	3
Symmetry/shape of the dorsal prominence, 0=symmetrical; 1= asymmetric; 2=tubular, elongated	0	3	1	1	2
Position of the dorsal prominence relative to the acetabulum, 0=dorsal prominence anterior to the acetabulum; 1=at same level as acetabulum; 2=anterior portion of dorsal prominence at same level as acetabulum	2	0	1	1	2

(*Continued*)

Characters: ilia	Genus				
	Hyperolius	*Kassina*	*Breviceps* sp. 1	*Breviceps* sp. 2	Indet. 10
Dorsal crest on the shaft, 0=absent; 1=poorly developed; 2=extremely well developed; 3=there is bifurcation of ilial shaft	0	3	0	0	2
Constriction of the area between the shaft and the acetabular area, 0=not constricted; 1=constricted	1	1	0	0	1
Preacetabular fossa, 0=absent; 1=present	0	0	0	0	0
Supraacetabular fossa, 0=absent; 1=present	0	1	0	0	0
Angle between the supraacetabular expansion and the dorsal prominence 0=open (160 –180°); 1=closed (~90–100°)	0	0	0	0	1
Size of supraacetabular expansion, 0=absent; 1=small, 2=medium; 3=large	1	1	2	2	2

(*Continued*)

Characters: ilia	Genus				
	Hyperolius	***Kassina***	***Breviceps* sp. 1**	***Breviceps* sp. 2**	**Indet. 10**
Acetabulum dimensions, 0=restricted; 1=expanded, covering a large portion of the acetabular area and the supraacetabular expansion; 2=large	1	1	0	0	2
Acetabulum shape, 1=U-shaped; 2=heart-shaped; 3=rounded triangular shape; 4=semicircular; 5=semi-elliptical	4	2	5	5	5
Interiliac tubercle, 0=absent; 1=present	0	1	0	0	0
Comments	• The LBW specimen is comparable to *H. kivuensis* and *H. puncticulatus* in the shape and dimension of the acetabulum, and closely resembles *H. puncticulatus* in the angle between the ventral acetabular expansion and the ilial shaft, the shape of the supraacetabular and ventral acetabular expansions, and in	• A distinctive feature of this ilium is that the ilial shaft is markedly broad where it meets the proximal ilium, which is relatively small. The LBW *Kassina* was almost identical to the extant species *Kassina senegalensis* in all the features/characteristics tabulated above, with the exception of the shape of the	• The most marked difference between *Breviceps* sp. 1 and *Breviceps* sp. 2 is that the area between the acetabulum and the dorsal edge of the dorsal prominence and the supraacetabular expansion is much wider in the latter. Also, the dorsal prominence on *Breviceps* sp. 1 is situated more anteriorly to the acetabulum relative to *Breviceps* sp.		• The markedly robust dorsal prominence and ilial shaft form a V-shape where they join the acetabulum. The dorsal ilial crest is expansive but its extent is uncertain due to poor preservation. The angle between the ventral acetabular expansion and the ilial shaft is small, resulting

(*Continued*)

Characters: ilia	Genus				
	Hyperolius	***Kassina***	***Breviceps* sp. 1**	***Breviceps* sp. 2**	**Indet. 10**
	the positioning and shape of the dorsal prominence.	acetabulum which was slightly more semi-circular in shape. The LBW specimens showed signs of abrasion on the anterior of the acetabular fossa which may have affected acetabulum shape.	• As much of the postcranial skeleton of *Breviceps* is easily identifiable and is too distinctive to be confused with any other taxa the identification of the LBW *Breviceps* is indisputable. No attempt was made to identify the LBW *Breviceps* to species level due to lack of comparative material.		in a very expansive ilial crest as the crest stretches between the dorsal prominence and the ilial shaft

Characters: ilia	Genus			
	Tomopterna	*Xenopus* sp. 1 *Xenopus* sp. 2	*Amietophrynus*	Indet. 7
Photo number (see Supplementary Material 1)	9.	11.	14.	19.
Dorsal expansion of the dorsal prominence, 0 = absent; 1=developed but low; 2=well developed; 3=massive	3	3	2	2
Symmetry/shape of the dorsal prominence, 0=symmetrical; 1= asymmetric; 2=tubular, elongated	2	1	1	1
Position of the dorsal prominence relative to the acetabulum, 0=dorsal prominence anterior to the acetabulum; 1=at same level as acetabulum; 2=anterior portion of dorsal prominence at same level as acetabulum	2	1	2	1
Dorsal crest on the shaft, 0=absent; 1=poorly developed; 2=extremely well developed; 3=there is bifurcation of ilial shaft	0	0	0	0

(*Continued*)

Characters: ilia	Genus			
	Tomopterna	***Xenopus* sp. 1** ***Xenopus* sp. 2**	***Amietophrynus***	**Indet. 7**
Constriction of the area between the shaft and the acetabular area, 0=not constricted; 1=constricted	0	0	1	?0
Preacetabular fossa, 0=absent; 1=present	1	1	0	1
Supraacetabular fossa, 0=absent; 1=present	1	0	0	?
Angle between the supraacetabular expansion and the dorsal prominence 0=open (160 –180°); 1=closed (~90–100°)	1	N/A	0	?
Size of supraacetabular expansion, 0=absent; 1=small, 2=medium; 3=large	2	N/A	2	?
Acetabulum dimensions, 0=restricted; 1=expanded, covering a large portion of the acetabular area and the supraacetabular expansion; 2=large	2	N/A	1	1

(*Continued*)

Characters: ilia	Genus			
	Tomopterna	***Xenopus* sp. 1** ***Xenopus* sp. 2**	***Amietophrynus***	**Indet. 7**
Acetabulum shape, 1=U-shaped; 2=heart-shaped; 3=rounded triangular shape; 4=semicircular; 5=semi-elliptical	4	1	3	6
Interiliac tubercle, 0=absent; 1=present	0	1	0	?
Comments	• The dorsal prominence is considerably more developed than in the extant *T. cryptotis*, but closely resembled as yet unidentified *Tomopterna* ilia recovered from an undated west coast archaeological site in Ysterfontein which contained Middle Stone Age stone tools and faunal remains.	• Besides size differences noted in the text, the LBW *Xenopus* ilia do not show any obvious visual differences to the ilia of extant *X. laevis*.	• The dorsal prominence was variable in terms of symmetry, with some showing asymmetry, while others were roughly symmetrical. Acetabulum shape, as well as supraacetabular and subacetabular expansion shape and size were very similar to that of *A. regularis regularis* and *A. brauni*.	• Only two incomplete specimens of this taxa have been recovered to date which hampered description of certain features. The ilia were characterised by marked asymmetry of the acetabular fossa which was expanded over the ventral acetabular expansion.

Note: '?' indicates that this feature could not be evaluated with certainty due to lack of preservation of relevant features.

	Genus							
Characters: humerus	***Hyperolius***	***Breviceps* sp. 1**	***Breviceps* sp. 2**	***Tomopterna***	***Heleophryne***	***Cf. Amietophrynus* sp. 1**	***Cf. Amietophrynus* sp. 2**	***Amietophrynus* cf. *pantherinus***
Photo number (see Supplementary Material 1)	1(b).	3.	4.	10.	13.	15.	16.	17.
Humerus shaft, 0=slender; 1= of medium thickness; 2=thick	0	1	2	1	1	1	1	2
Curvature of shaft in medial view, 0= slight curvature (proximal and distal ends of humerus are approximately in line with each other in medial view); 1=curvature of the shaft is pronounced	0	0	1	1	1	1	1	?1
Development of ventral crest, 0= extends along proximal third of	1	2	2*	0	1	2	2	?

(*Continued*)

Characters: humerus	Genus							
	Hyperolius	*Breviceps* sp. 1	*Breviceps* sp. 2	*Tomopterna*	*Heleophryne*	*Cf. Amietophrynus* sp. 1	*Cf. Amietophrynus* sp. 2	*Amietophrynus* cf. *pantherinus*
the diaphysis; 1= extends from proximal to mid diaphysis; 2= extends from proximal to past midway on diaphysis								
Cubital fossa; 0=distinct; 1=absent	0	0	0	0	0	0	0	0
Mesial crest, 0=absent; 1=present, small; 2=present, medium; 3=present, large	1	0	0	0	0	3	2	2–3*
Lateral crest, 0=absent; 1=present	1	0	0	0	0	0	0	1

(*Continued*)

Characters: humerus	Genus							
	Hyperolius	*Breviceps* sp. 1	*Breviceps* sp. 2	*Tomopterna*	*Heleophryne*	*Cf. Amietophrynus* sp. 1	*Cf. Amietophrynus* sp. 2	*Amietophrynus* cf. *pantherinus*
Relative size of medial epicondyle and radial epicondyle, 0=medial epicondyle larger than radial epicondyle; 1=medial epicondyle marginally larger than radial epicondyle	0	0	0	1	0	0	0	0
Size of distal condyle relative to size of distal humerus; 1=small; 2=medium; 3=large	2	3	3	3	3	1	2	2
Position of distal condyle, 0=bent laterally; 1=in line with the diaphysis of the humerus	1	1	0	1	0	0	1	

(*Continued*)

Characters: humerus	Genus							
	Hyperolius	***Breviceps* sp. 1**	***Breviceps* sp. 2**	***Tomopterna***	***Heleophryne***	***Cf. Amietophrynus* sp. 1**	***Cf. Amietophrynus* sp. 2**	***Amietophrynus* cf. *pantherinus***
Comments	• The slender shaft, presence of a small lateral crest extending to midway along the diaphysis, the relatively large medial epicondyle, and distinctive shape of the distal humerus distinguished this taxa as *Hyperolius*. In all these features it closely resembled those of the extant comparative *Hyperolius kivuensis*.	• The ventral crest extends further down the diaphysis on *Breviceps* indet. sp. 2 relative to *Breviceps* indet. sp. 1. These curved, stout humeri are clearly distinguishable as *Breviceps*. In terms of size they were substantially smaller than *B. gibbosus*.		• The characteristic dorsal prominence, and shape and positioning of the ventral crest, which is small and confined to the proximal third of the humerus, was typical of *Tomopterna*.	• These humeri were identified as *Heleophyrne* on the basis of the shape and positioning of the ventral crest, the relatively short and stout aspect of the humerus, and the general shape and aspect of the distal humerus which closely resembled photographs taken of *Heleophryne* (species undetermined) by EVD.	• *Amietophrynus* sp. 1 closely resembled a comparative *A. gutturalis* specimen (HMCZ 22207) in all aspects of the ventral crest, diaphysis and distal humerus. • All the LBW taxa identified as *Amietophrynus* (excepting *A*. cf. *pantherinus* which could not be assessed due to breakage) had a ridge for muscle attachment situated to the medial side of the ventral crest – this feature was noted in modern *A. gutturalis, A. pantherinus, A. brauni, A. regularis regularis*, *Vandijkophrynus angusticeps* and *V. gariepensis*. Assessing further comparative material should confirm if this feature is common to the Bufonidae. • *Amietophrynus* sp. 2 closely resembled a comparative *A. regularis regularis* specimen (HMCZ 85182) in all aspects of the ventral crest, diaphysis and distal humerus. • The LBW *Amietophrynus* cf. *pantherinus* is almost identical to that of modern specimens photographed by EVD in the long frilled mesial crest, round distal condyle, and large forward projecting medial epicondyle. Variation in the size of the mesial crest in the LBW taxa which resemble *Amietophrynus* cf. *pantherinus* is attributed to sexual dimorphism.		

	Genus					
Characters: humerus	***Amietophrynus* cf. *gutturalis***	**Indet. 5**	**Indet. 6**	**Indet. 8**	**Indet. 9**	**Indet. 10**
Photo number (see Supplementary Material 1)	18	20	21	22	23	8
Humerus shaft, 0=slender; 1= of medium thickness; 2=thick	1	2	1	1	1	1
Curvature of shaft in medial view, 0= slight curvature (proximal and distal ends of humerus are approximately in line with each other in medial view); 1=curvature of the shaft is pronounced	1	1	?	1	?1	1
Development of ventral crest, 0= extends along proximal third of the diaphysis; 1= extends from proximal to mid diaphysis; 2= extends from proximal to past midway on diaphysis	2	1	?0	2	0	1

(*Continued*)

Characters: humerus	Genus					
	Amietophrynus* cf. *gutturalis	**Indet. 5**	**Indet. 6**	**Indet. 8**	**Indet. 9**	**Indet. 10**
Cubital fossa; 0=distinct; 1=absent	0	0	0	0	0	0
Mesial crest, 0=absent; 1=present, small; 2=present, medium; 3=present, large	0	1	1	2	2	3
Lateral crest, 0=absent; 1=present	0	0	1	0	0	0
Relative size of medial epicondyle and radial epicondyle, 0=medial epicondyle larger than radial epicondyle; 1=medial epicondyle marginally larger than radial epicondyle	0	0	1	0	0	0
Size of distal condyle relative to size of distal humerus; 1=small; 2=medium; 3=large	2	3	3	2	3	1
Position of distal condyle, 0=bent laterally; 1=in line with the diaphysis of the humerus	1	0	0	1	1	0

(*Continued*)

	Genus					
Characters: humerus	***Amietophrynus* cf. *gutturalis***	**Indet. 5**	**Indet. 6**	**Indet. 8**	**Indet. 9**	**Indet. 10**
Comments	• The fossil taxa was considerably smaller than the two modern *A. gutturalis* to which it was compared, though it was visually morphologically indistinguishable.	• The large distal condyle which was bent laterally, and the roughly triangular shape of the distal humerus distinguished this taxon.	• The presence of a relatively large lateral crest and large round distal condyle were distinguishing features of this taxon.	• The relatively large size, and rounded shape, of the mesial crest characterise the distal humerus.	• This taxon was distinguished by the relatively small distal humerus, with small radial and medial epicondyles dominated by the relatively large, round distal condyle. • Development of a long, thin mesial crest varies between specimens and may reflect sexual dimorphism.	• The elongated triangular shape of the distal humerus, a small distal condyle, and the long, narrow mesial crest distinguished this taxon.

	Genus			
Characters: humerus	**Indet. 11**	**Indet. 12**	**Indet. 13**	**Indet. 15**
Photo number (see Supplementary Material 1)	24	25	26	28
Humerus shaft, 0=slender; 1= of medium thickness; 2=thick	1	1	1	1
Curvature of shaft in medial view, 0= slight curvature (proximal and distal ends of humerus are approximately in line with each other in medial view); 1=curvature of the shaft is pronounced	1	1	1	1
Development of ventral crest, 0= extends along proximal third of the diaphysis; 1= extends from proximal to mid diaphysis; 2= extends from proximal to past midway on diaphysis	0	?	2	2
Cubital fossa; 0=distinct; 1=absent	0	0	0	0
Mesial crest, 0=absent; 1=present, small; 2=present, medium; 3=present, large	0	2	0	2
Lateral crest, 0=absent; 1=present	0	0	0	0
	0	0	1	0

(*Continued*)

Characters: humerus	Genus			
	Indet. 11	Indet. 12	Indet. 13	Indet. 15
Relative size of medial epicondyle and radial epicondyle, 0=medial epicondyle larger than radial epicondyle; 1=medial epicondyle marginally larger than radial epicondyle				
Size of distal condyle relative to size of distal humerus; 1=small; 2=medium; 3=large	3	2	2	2
Position of distal condyle, 0=bent laterally; 1=in line with the diaphysis of the humerus	1	0	0	0
Comments	• This taxon had a notable large cubital fossa and reduced radial and medial epicondyles, with a large distal condyle. The small ventral crest confined to the proximal third of the diaphysis was another feature.	• The long curved radial epicondyle which extends from approximately half-way up the diaphysis, and is situated medially, roughly opposite the mesial crest, is a feature of these humeri.	• This taxon was unusual in that the medial epicondyle was only marginally larger than the radial epicondyle. There were no lateral or medial crests on this humerus.	• A mesial crest that varied in development (this was attributed to sexual dimorphism) was present in this taxon which had a medium sized distal condyle which was bent laterally. The distal humerus was relatively wide due to its triangulated shape.