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SUPPLEMENTARY DATA

A new dermatemydid (Testudines, Kinosternoidea) from the Paleocene–Eocene Thermal Maximum, Willwood Formation, southeastern Bighorn Basin, Wyoming

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TABLE S1. Shell bone and scute measurements for the holotype and referred specimens of *Gomphochelys nanus*. Mean values are shown for some peripheral and plastral bones where sets are preserved (for UF 225761 and UF 249085). Vertebral scute and plastral bone measurements were taken along the midline. All measurements in mm. **Institutional Abbreviation:** UF, Division of Vertebrate Paleontology, Florida Museum of Natural History, University of Florida, Gainesville, FL.

	UF 225761	UF 249085	UF 249081	UF 249086	UF 249059	UF 249055	UF 249057	UF 249058	UF 249078	UF 249080
carapace length	318	–	–	–	–	–	–	–	–	–
nuchal length	42.5	–	–	–	–	–	–	–	–	–
nuchal width	59.47	–	–	–	–	–	–	–	–	–
neural 1 length	27.57	–	–	–	–	–	–	–	–	–
neural 1 width	15.6	–	–	–	–	–	–	–	–	–
neural 2 length	24.97	28.5	–	–	–	–	–	–	–	–
neural 2 width	18.11	19.2	–	–	–	–	–	–	–	–
neural 3 length	31.13	30.2	–	–	–	–	–	–	29.9	–
neural 3 width	18.92	–	–	–	–	–	–	–	17.75	–
neural 4 length	29.44	~26.7	–	–	–	27.77	–	–	–	33.76
neural 4 width	17.58	16.92	–	–	–	17.92	–	–	–	19.97
neural 5 length	29.9	26.92	–	–	–	–	–	–	–	–
neural 5 width	20.11	17.48	–	–	–	–	–	–	–	–
neural 6 length	27	21.38	–	–	–	–	23.01	–	–	–
neural 6 width	20.11	18.58	–	–	–	–	17.69	–	–	–
neural 7 length	18.56	15.78	–	–	–	–	–	21.53	–	–

TABLE S1 (Continued)

vertebral 4 width	55.25	—	—	—	—	—	—	—	—	—
vertebral 5 length	67.45	—	—	—	—	—	—	—	—	—
vertebral 5 width	~70	—	—	—	—	—	—	—	—	—
plastron length	~186	—	—	—	—	—	—	—	—	—
plastron width	162.59	—	—	—	—	—	—	—	—	—
epiplastron length	14.44	—	—	—	—	—	—	—	—	—
epiplastron width	29.9	—	—	—	—	—	—	—	—	—
entoplastron length	29.3	31.25	—	—	—	—	—	—	—	—
entoplastron width	35.4	34.54	—	—	—	—	—	—	—	—
hyoplastron length	40.12	34.4	—	—	—	—	—	—	—	—
hyoplastron width	83.78	—	—	—	—	—	—	—	—	—
hypoplastron length	46.04	42.58	—	—	—	—	—	—	—	—
hypoplastron width	80.99	—	—	—	—	—	—	—	—	—
xiphiplastron length	—	52.42	—	—	—	—	—	—	—	—
xiphiplastron width	29.24	29.44	—	—	—	—	—	—	—	—
gular length	45.44	—	—	—	—	—	—	—	—	—
humeral length	34.95	35.74	—	—	—	—	—	—	—	—
abdominal length	19.21	~9.8	—	—	—	—	—	—	—	—
femoral length	44.2	~44.64	—	—	—	—	—	—	—	—
anal length	—	42.03	—	—	—	—	—	—	—	—
bridge length	70.93	66.35	—	—	—	—	—	—	—	—

TABLE S1 (Continued)

[illegible]

TABLE S1 (Continued)

TABLE S1 (Continued)

[illegible]

TABLE S1 (Continued)

APPENDIX S1. Description of 38 morphological characters used in the phylogenetic analysis for fossil and extant kinosternoids. **Abbreviations:** **C**, costal; **Ch.**, character; **IF**, inframarginal scute; **M**, marginal scute; **N**, neural; **P**, peripheral; **V**, vertebral scute.

Carapace

- (1) Costal carination (Hutchison and Bramble, 1981:Ch. 11; Hutchison, 1991:Ch. 13; Iverson, 1991:Ch. A; modified from Knauss et al., 2010:Ch. 1): absent (0); present as weakly to moderately developed ridge (1); present as well-developed prominent keel (2)
- (2) Medial keel (modified from Hutchison and Bramble, 1981:Ch. 11; modified from Iverson, 1991:Ch. A; modified from Knauss et al., 2010:Ch. 2): absent (0); present as weakly to moderately developed ridge (1); present as well-developed prominent keel (2).
- (3) Extent of costiform processes (Hutchison and Bramble, 1981:Ch. 12; Iverson, 1991:Ch. D; modified from Knauss et al., 2010:Ch. 4): span P1 and insert into P2 (0); insert into P1 (1); absent (2).
- (4) Position of C1–2 suture relative to peripheral series (Hutchison, 1991:Ch. 17; Knauss et al., 2010:Ch. 5): contacts P3 (0); contacts P4 (1).
- (5) Position of C2–3 suture relative to peripheral series (Hutchison and Bramble, 1981:Ch. 14; Hutchison, 1991:Ch. 34; Knauss et al., 2010:Ch. 6): contacts P4 (0); contacts P5 (1).
- (6) Position of C3–4 suture relative to peripheral series (Hutchison and Bramble, 1981:Ch. 34; Hutchison, 1991:Ch. 35; Knauss et al., 2010:Ch. 7): contacts P6 (0); contacts P5 (1).
- (7) Terminus of distal C1 rib end (Hutchison, 1991:Ch. 32; Knauss et al., 2010:Ch. 8): terminates in P3 (0); may enter P3, but terminates in P4 (1).
- (8) C8 proximal rib end contact (Hutchison, 1991:Ch. 7; Knauss et al., 2010:Ch. 9): medially contacts vertebral column (0); lack of contact (1).
- (9) Number of neurals present (Hutchison and Bramble, 1981:Ch. 9, 25, 48; Hutchison, 1991:Ch. 3; Iverson, 1991:Ch. F; Knauss et al., 2010:Ch. 10): 8 (0); 7 (1); 6 or less (2).
- (10) Number of suprapyrgals present (Hutchison and Bramble, 1981:Ch. 44; Hutchison, 1991:Ch. 12; Knauss et al., 2010:Ch. 11): 2 (0); 1 (1).
- (11) Anterior contacts of N2 (Hutchison, 1991:Ch. 14; Knauss et al., 2010:Ch. 12): C1–2 (0); C2 only (1).
- (12) Anterior contacts of N3 (Hutchison, 1991:Ch. 9; Knauss et al., 2010:Ch. 13): C3 only (0); C2–3 (1).
- (13) Anterior contacts of N4 (Hutchison, 1991:Ch. 25; Knauss et al., 2010:Ch. 13): C3–4 (0); C4 only (1).
- (14) Anterior contacts of N5 (Hutchison, 1991:Ch. 28; Knauss et al., 2010:Ch. 15): C5 only (0); C4–5 (1).
- (15) Presence and extent of anterior musk duct groove (Hutchison and Bramble, 1981:Ch. 26, 45, 49; Hutchison, 1991:Ch. 11, 18; Iverson, 1991:Ch. K; modified from Knauss et al., 2010:Ch. 16): absent (0); present with terminus on P1 (1); present with terminus on P2 (2).
- (16) Number of peripherals (Hutchison and Bramble, 1981:Ch. 27; Hutchison, 1991:Ch. 1; Knauss et al., 2010:Ch. 17): 11 pairs (0); 10 pairs (1).

APPENDIX S1 (Continued).

- (17) Shape of V2–4 (Hutchison and Bramble, 1981:Ch. 29; Hutchison, 1991:Ch. 5; modified from Knauss et al., 2010:Ch. 18): rectangular, at least 1.5 times longer than wide (0); distinctly hexagonal (1).
- (18) Elevation of M9 to M10 (modified from Hutchison, 1991:Ch. 6; Knauss et al., 2010:Ch. 19): ~ equal in height (0); M9 taller than M10 (1); M10 taller than M9 (2).
- (19) Pygal carination: lack of keel (0); presence of keel (1).
- (20) C7 pair: lack medial contact (0); medially contact (1).
- (21) C8 pair: lack medial contact (0); medially contact (1).
- (22) Upper borders of M4–9: do not protrude above plane of the pleurals (0); protrude above pleurals, forming a step (1).
- (23) Free border of posterior peripherals: smooth rounded edge (0); sharp edge (1).

Plastron

- (24) Posterior plastral lobe shape (Hutchison and Bramble, 1981:Ch. 20; Hutchison, 1991:Ch. 20; Knauss et al., 2010:Ch. 20): tapers posteriorly to distinct point (0); rounded posteriorly, caudal notch absent (1); rounded posteriorly, caudal notch present (2).
- (25) Visceral extension of hyoplastral buttress (Hutchison and Bramble, 1981:Ch. 15; Knauss et al., 2010:Ch. 21): extensive process absent (0); extensive process present that terminates on peripherals (1); extensive process present that terminates on costals (2).
- (26) Visceral extension of hypoplastral buttress (Hutchison and Bramble, 1981:Ch. 13, 37; Hutchison, 1991:Ch. 8; Iverson, 1991:Ch. J; Knauss et al., 2010:Ch. 23): extensive process absent (0); extensive process present that terminates on P7 (1); extensive process present that terminates on P8 (2); extensive process present that terminates on P9 (3).
- (27) Posterior extension of external hypoplastral bridge (Hutchison and Bramble, 1981:Ch. 13, 37; Hutchison, 1991:Ch. 8; Iverson, 1991:Ch. J; Knauss et al., 2010:Ch. 24): P6 (0); P7 (1); P8 (2).
- (28) Entoplastron (Hutchison and Bramble, 1981:Ch. 52; Hutchison, 1991:Ch. 31; Iverson, 1991:Ch. M; Knauss et al., 2010:Ch. 25): present (0); absent (1).
- (29) Entoplastron proportions: approximately as wide as long (0); wider than long (1); longer than wide (2).
- (30) Number of inframarginals (modified from Hutchison and Bramble, 1981:Ch. 5, 10, 19; Hutchison, 1991:Ch. 4; Knauss et al., 2010:Ch. 26): 3–4 pairs (0); 2 pairs (1); 5 pairs (2).
- (31) Overlap of hyo-hypoplastral suture by inframarginal series (Hutchison and Bramble, 1981:Ch.6; Knauss et al., 2010:Ch. 27): axillary overlap (0); IF1 or 2 overlap (1); inguinal overlap (2).
- (32) Intergular (Hutchison and Bramble, 1981:Ch. 22; Hutchison, 1991:Ch. 19; Knauss et al., 2010:Ch. 28): absent (0); present (1).
- (33) Abdominals (Hutchison and Bramble, 1981:Ch. 23, 28; Hutchison, 1991:Ch. 2; Knauss et al., 2010:Ch. 30): absent (0); present, lacking medial contact (1); present, with partial medial contact (2); present, with extensive medial contact (3).
- (34) Contribution of abdominal to the axillary notch (Knauss et al., 2010:Ch. 31): present (0); absent (1).

APPENDIX S1. (Continued).

(35) Anal scutes (Hutchison and Bramble, 1981:Ch. 33; Knauss et al., 2010:Ch. 32): paired (0); fused (1).

(36) Orientation of epi-hyoplastral suture (Hutchison and Bramble, 1981:Ch. 35, 40, 50; Hutchison, 1991:Ch. 21; Knauss et al., 2010:Ch. 33): sloped posterolaterally (0); transversely straight (1).

(37) Alignment of the gular/humeral sulcus with the epi-ento-hyoplastral suture (Hutchison, 1991:Ch. 33; Knauss et al., 2010:Ch. 34): sulcus does not align with suture (0); sulcus lies along suture (1).

(38) Position of humeral/femoral sulcus (Hutchison and Bramble, 1981:Ch. 53; Hutchison, 1991:Ch. 26, 36; Iverson, 1991:Ch. O; Knauss et al., 2010:Ch. 35): situated on hyo-hyoplastral suture (0); anteriorly to midway on the hypoplastron (1); situated along or just anterior to the hypo-xiphiplastral suture (2).

APPENDIX S2. Character-taxon matrix of fossil and Recent Kinosternoidea used for phylogenetic analysis. **A**, (0,1); **B**, (1,2); **?**, unscored character.

Taxon	1 0										2 0									
<i>Agomphus pectoralis</i>	0	0	2	0	0	0	1	?	A	?	0	1	0	1	?	0	0	0	0	0
<i>Baltemys staurogastros</i>	1	2	0	1	1	0	1	1	2	1	1	0	0	1	1	1	0	1	1	
<i>Notomorpha garmanii</i>	2	2	0	0	A	0	0	?	0	0	0	1	0	1	0	0	0	1	1	0
<i>Gomphochelys nanus</i>	2	2	0	0	0	A	0	0	0	0	0	1	0	1	0	0	0	1	0	0
<i>Baptemys wyomingensis</i>	0	1	1	0	0	A	0	0	0	0	0	1	0	1	0	0	0	1	1	0
<i>Claudius angustatus</i>	1	1	0	0	0	0	0	1	1	1	0	A	A	A	1	1	1	2	0	1
<i>Dermatemys mawii</i>	0	0	1	0	0	0	0	0	B	A	0	1	0	1	0	0	0	0	0	1
<i>Hoplochelys clark</i>	2	2	0	A	A	A	1	?	0	?	1	1	0	1	?	0	0	0	?	0
<i>Hoplochelys crassa</i>	2	2	0	0	1	A	?	0	0	0	A	1	A	1	?	0	0	0	0	0
<i>Kinosternon flavescens</i>	0	0	A	0	1	0	0	1	2	1	1	0	A	1	2	1	1	0	0	1
<i>Staurotypus triporcatus</i>	2	2	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	0	1	0
<i>Sternotherus carinatus</i>	0	1	1	0	1	0	0	1	2	1	A	0	1	0	2	1	1	2	1	1
<i>Xenochelys</i>																				
<i>lostcabinensis</i>	1	1	0	1	1	0	1	1	2	1	1	0	0	1	2	1	1	2	1	1
<i>Xenochelys formosa</i>	0	1	0	1	1	0	1	?	2	1	1	0	1	0	2	1	1	2	1	1

APPENDIX S2 (Continued)

										3 0										3 8	
0	0	0	0	0	?	1	0	0	0			2	0	2	1	0	0	0	1		
1	1	1	0	0	0	1	0	2	1			2	0	0	?	0	0	0	1		
0	1	0	0	2	2	2	0	1	0			2	0	2	1	0	A	0	1		
0	1	0	0	2	2	2	0	0	0			B	0	2	1	0	0	A	1		
0	1	0	1	2	3	2	0	1	0			B	0	2	1	0	0	0	1		
1	1	1	0	0	0	0	0	2	?			0	1	?	?	1	0	1	0		
1	0	1	2	2	3	2	0	1	2			1	1	3	1	0	A	0	1		
?	1	1	0	1	2	1	0	0	0			2	0	1	0	0	0	0	1		
0	1	1	0	1	2	1	0	0	0			2	0	1	0	0	0	0	0		
1	1	1	B	0	0	1	1	?	1			2	1	0	?	0	1	0	2		
0	1	1	0	0	0	1	0	2	1			2	0	0	?	1	0	1	1		
1	1	1	2	0	0	1	1	?	1			2	0	0	?	0	1	0	1		
1	1	1	2	0	0	1	0	2	1			2	1	0	?	0	1	0	1		
?	1	1	2	0	0	1	0	2	1			2	1	0	?	0	1	0	1		

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