

Supplementary Information

Appendix A. : *Cynthiacetus peruvianus* nov. sp. (holotype MNHN XX). Cranial measurements.

Cynthiacetus peruvianus nov. sp. (holotype MNHN XX) *Mensurations du crâne.*

Measurement	Mm	Measurement	mm
condylobasal length	1170	nasal length at midline	210
bizygomatic breadth	477,8	parietal length	195
rostrum breadth at C1	113	occipital height	200
rostrum breadth at P1	130	nuchal crest breadth	189,7
rostrum breadth at P4	264	intercondylar breadth	128
postorbital process width	395	foramen magnum width	30
pre-orbital process width	335	foramen magnum height	79
supra-orbital process width	357	inter-paraoccipital breadth	395
orbit length (R/L)	102 / 115	auditory bulla length (R/L)	94,3 / 92,3
frontal length	205	dentary length	1040

Appendix D. List of the characters used in the phylogenetic analysis.

Liste de caractères utilisés dans l'analyse phylogénétique.

1. Skull length (ordered) (Geisler et al., 2005): (0) short, length < 700% of condylar width; (1) moderate, 700% < length < 800% of condylar width; (2) elongate, >800% condylar width.
2. Anterior margin of external nares (ordered) (modified from Geisler et al., 2005): (0) anterior to I2; (1) dorsal to I2; (2) dorsal or immediately posterior to I3; (3) dorsal to P1-P2 diastema; (4) posterior to the canine.
3. Rostrum width (modified from Uhen & Gingerich, 2001): width at the level of the latest upper teeth (0) moderate: > 140% and < 200% the condylar width; (1) narrow: < 120% the maximum width across the occipital condyles; (2) wide: > 200% the condylar width.
4. Palate narrows (ordered) (Geisler et al., 2005; Uhen & Gingerich, 2001): (0) posterior to M3; (1) at M3; (2) at M1; (3) at P4.
5. Anterior projection of the frontal separating medially the posterior end of the nasal: (0) absent; (1) small, the base of the anterior projection being at this level narrower than the nasal width; (2) large, the base of the projection being wider than the nasal.
6. Lateral edge of the nasal: (0) straight and posteromedially oblique, the nasal tapers posteriorly; (1) roughly parallel to the midline, both anterior and posterior edge of the nasal has approximately the same width; (2) posterolaterally oblique on its anterior half with the nasal tapering anteriorly.
7. Width of the skull at the supra-orbital processes of the frontal: (ordered) (0) slender than the base of the rostrum; (1) between 100% and 140% the width of the base of the rostrum; (2) >140% the width of the base of the rostrum.
8. Orbit (ordered) (modified from Geisler et al., 2005; Uhen & Gingerich, 2001): (0) elevated well above tooth row; (1) elevated slightly above tooth row; (2) at the level to the tooth row.
9. Anterior edge of orbit (ordered) (Geisler et al., 2005): (0) above or posterior to M3; (1) above M2 or M2/M3 division; (2) over M1 or M1/M2 division; (3) above P4 or P4/M1 division.
10. Pterygoid sinus (ordered) (Geisler et al., 2005; Uhen & Gingerich, 2001): (0) absent; (1) present but obscured in ventral view by the bulla, occupies region between anterior

end of involucrem and alisphenoid portion of pterygoid ridge; (2) breaches posterior wall of tube for foramen ovale and extends slightly anterior to the anterior edge of the tympanic bulla; (3) enlarged, forms a deep anteroposterior trough which approaches the internal nares.

11. Lateral wall of pterygoid sinus (Uhen & Gingerich, 2001): (0) absent; (1) present.
12. Sagittal crest: (0) as long as or longer than the nasal; (1) shorter than the nasal or absent.
13. Position of the vertex in dorsal view: (0) well posterior to the level of the foramen magnum; (1) slightly posterior or dorsal to the foramen magnum; (2) anterior to the level of the foramen magnum.
14. Orientation of the nuchal crest in dorsal view: (0) posteriorly oriented; (1) dorsally oriented; (2) anteriorly to slightly anterolaterally oriented.
15. Transversal constriction in the occipital shield, at the level of the ventral edge of the supraoccipital: (0) present; (1) absent.
16. Transversal constriction in the occipital shield, at the level of the ventral edge of the supraoccipital: (0) pronounced, the transversal constriction breadth is narrower than the intercondylar breadth; (1) moderate: the transversal constriction breadth is almost the same or wider than the intercondylar breadth.
17. Accessory cusps on posterior premolars and molars (lowers and uppers) (ordered) (modified from Uhen & Gingerich, 2001): (0) absent; (1) present
18. Accessory cusps on posterior premolars and molars (lowers and uppers) (ordered) (modified from Uhen & Gingerich, 2001): (0) small; (2) large.
19. Number of roots in p1: (0) two; (1) one.
20. Upper molar roots (ordered) (Geisler et al., 2005; Uhen & Gingerich, 2001): (0) three completely separated; (1) three partially fused: the posterior roots are connected and only their apical portion are separated; (2) two anterior and posterior roots.
21. M3 (ordered) (Geisler et al., 2005; Uhen & Gingerich, 2001): (0) present and roughly equal in size to M2 ; (1) present but small, maximum mesodistal , < 60% the length of M2 ; (2) absent.
22. Dorsal edge of the neural canal in the atlas, neural arc of the atlas: (0) flat; (1) dorsally convex; (2) forming a high and massive dome-shaped arc.
23. Vertebrarterial foramen in the axis: (0) ovale and wide; (1) rounded, moderate-to-small; (2) very small or absent.

24. Ventral expansion of the transverse processes in C3-C5 (ordered): (0) very large and facing laterally; (1) moderated anteriorly facing; (2) reduced to absent.
25. Vertebral foramen of transverse processes in C3-C7: (0) moderate; (1) small; (2) very large.
26. Cervical vertebra anteroposterior compression, length of the centrum vs height (ordered): (0) absent: length equal or longer than height; (1) slightly compression: length shorter (60%-90%) than height; (2) pronounced compression, length much shorter (>50%) than height.
27. Number of thoracic vertebrae: (0) 13; (1) 14; (2) 15-18; (3) >18.
28. Spinous process at T5: (0) steeply inclined posteriorly from the axial plane >30°; (1) gently inclined <15°-5°; (2) almost vertical position.
29. Number of lumbar vertebrae (modified from Geisler et al. 2005): (0) 6-7; (1) 8; (2) 10-14; (3) >14.
30. Radius (Uhen & Gingerich 2001): (0) circular to slightly ovoid in cross section; (1) flattened mediolaterally, highly elliptical in cross section.
31. Femur (ordered) (Geisler et al. 2005, Uhen & Gingerich 2001): (0) large; (1) moderate; (2) small.

Appendix E. Character–taxon matrix used in the phylogenetic analysis.

Matrice caractère-taxon utilisée dans l'analyse phylogénétique.

Taxon / Character	1	1111111112	222222223	3
	1234567890	1234567890	1234567890	1
Pakicetidae	?0?aa0?0?0	000?000?10	0????0?0?0	0
Ambulocetidae	??00??000?	0?????0?0?	0?????02010	0
Remingtonocetidae	2b00101100	0000??0?0b	1?0000????	?
<i>Protocetus atavus</i>	a21?11112a	0000000?00	0?????10000	1
<i>Maiacetus innus</i>	121?011120	?00?000???	1001110?00	0
<i>Georgiacetus vogtlensis</i>	1211111112	1000001001	0?????1001?	?
<i>Ancalacetus simonsi</i>	?3???????3	1???0?1102	2011122???1	?
<i>Zygorhiza kochi</i>	1312a12133	10120?1112	2021122131	?
<i>Chrysocetus healyorum</i>	13?????13?	?0??0?111?	?02112????1	?
<i>Dorudon atrox</i>	1313222133	1011011102	2121122131	2
<i>Saghacetus osiris</i>	2313012?33	1011011112	201202102?	?
<i>Cynthiacetus maxwelli</i>	23?31221??	?011011102	222222????1	?
<i>Cynthiacetus peruvianus</i>	2313122133	1011011102	2222223231	2
<i>Basilosaurus isis</i>	2313222133	10110111?2	2111122131	2
ChM PV5720	24200??203	112?1?1112	?12???2????	?
<i>Simocetus rayi</i>	14?0131203	11221?1002	???????????	?

a=0+1 ; b= 1+2