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Article

The First Dinosaur from the Kingdom of Cambodia: A Sauropod Fibula from the Lower Cretaceous of Koh Kong Province, South-Western Cambodia

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Abstract: The first discovery of a dinosaur bone from the Kingdom of Cambodia is reported in this paper. It consists of a sauropod fibula from a sandstone layer on Koh Paur island, in Koh Kong province, in south-western Cambodia. The dinosaur-bearing bed belongs to the non-marine Grès Supérieurs series and is apparently of Early Cretaceous age. On the basis of various characters, notably the development of the anteromedial crest, the dinosaur fibula from Koh Paur is referred to a euhelopodid titanosauriform. This first dinosaur discovery in Cambodia suggests that the thick non-marine formations which cover vast areas in the south-western part of the country are potentially an important source of continental Mesozoic vertebrates.

Keywords: Dinosauria; Sauropoda; Euhelopodidae; Cambodia; Early Cretaceous

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1. Introduction

In South-East Asia, dinosaurs were first reported from Cretaceous rocks in southern Laos by Hoffet [1]. Since then, beginning in the 1970s, abundant dinosaur specimens, ranging in age from the Late Triassic to the late Early Cretaceous, have been discovered in Thailand (e.g., [2]). More recently, dinosaur remains have also been reported from Malaysia [3]. Despite the fact that non-marine Mesozoic rocks crop out in several parts of Cambodia, however, no indisputable dinosaur remains had hitherto been reported from that country (possible dinosaur footprints were reported from Battambang province [4] but could not be found during a recent survey). Here, we describe the first dinosaur bone from Cambodia, a sauropod fibula from presumably Lower Cretaceous rocks in Koh Kong Province, in the south-western part of the country.

Institutional abbreviations: MC: musée de Cruzy, Hérault, France. MOEC: Cambodian Ministry of Environment, Phnom Penh.

2. Geographical and Geological Settings

The Koh Paur dinosaur bone was first examined and studied in July 2021 by the Fossil Study Team of the Department of Heritage Parks, Ministry of Environment, after receiving information from the Koh Kong Provincial Department of Environment.

The bone (MOEC-1) was found on the surface of a small rocky beach on the eastern shore of Koh Paur island, located between the Gulf of Thailand to the west and the Prek Kohpaur river to the east (Figure 1), a short distance by boat from the city of Koh Kong. The specimen, visible in lateral view, was embedded in very hard greyish-brown fine-grained sandstone. It was extracted in November 2022 and taken to Phnom Penh, where further preparation was carried out in March 2023.

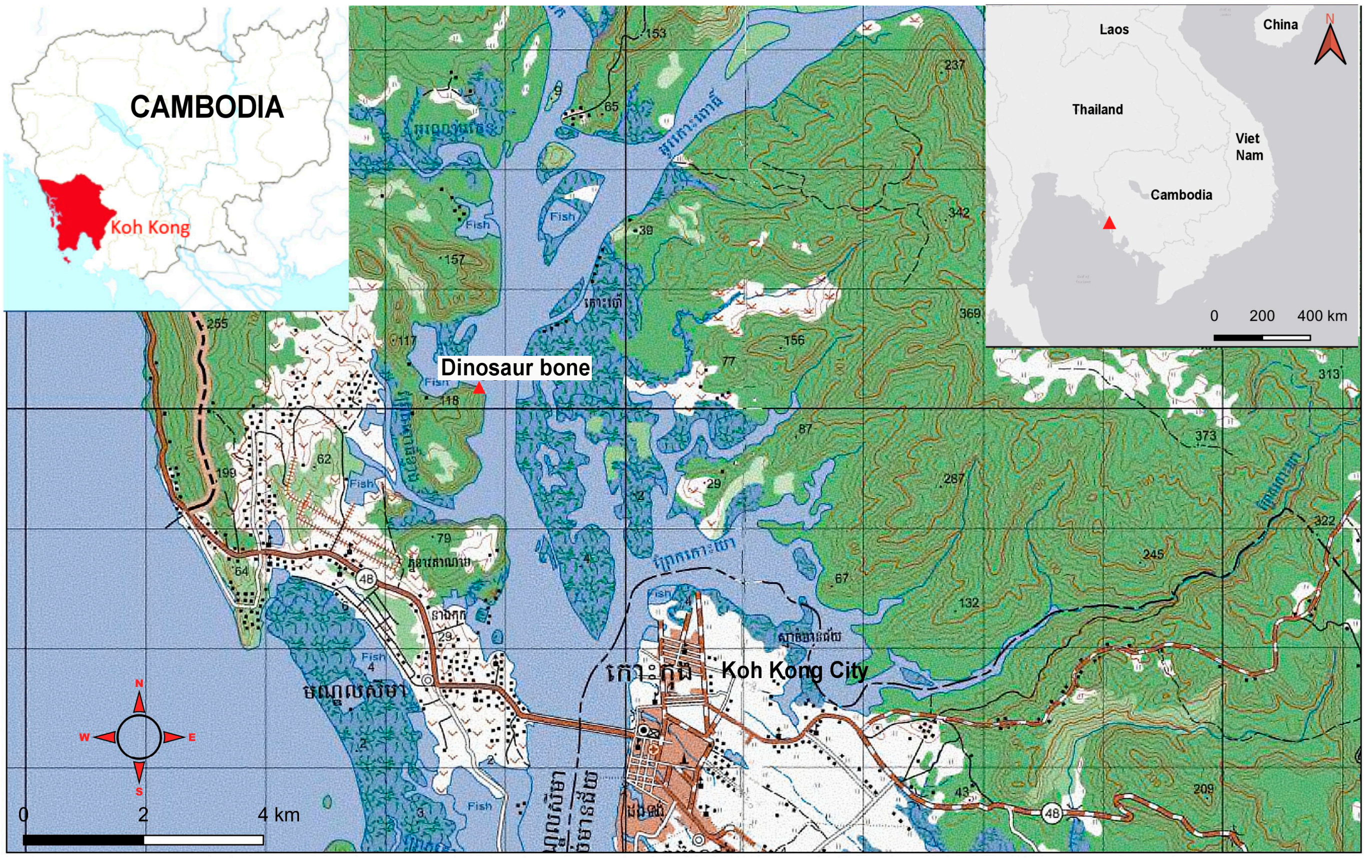

Figure 1. Location map showing the dinosaur bone locality at Koh Paur. Upper right insert: location in South-East Asia. Upper left insert: location of Koh Kong province within Cambodia.

Although the sandstone outcrop where the bone was found is of a limited extent and not part of an extensive stratigraphic section, its place in the local geological succession is clear enough. As shown by the Koh Kong sheet of the 1/200,000 reconnaissance geological map of Cambodia, the rocks in the area (Figure 2) belong to the Grès Supérieurs ("Upper Sandstones"), or Indosinias supérieures series [5]. The concept of "Grès Supérieurs" was developed by French geologists working in Indochina in the 1920s to designate a thick succession of non-marine sedimentary rocks capping the Mesozoic succession in various parts of South-East Asia (see [6], for a brief review). Because relatively few fossils have been reported from the Grès Supérieurs, their age has long been rather uncertain, although they have usually been referred to the Late Jurassic/Early Cretaceous [7]. However, palynological and palaeobotanical evidence from Cambodia provides useful hints about the age of the Koh Paur dinosaur (see below).

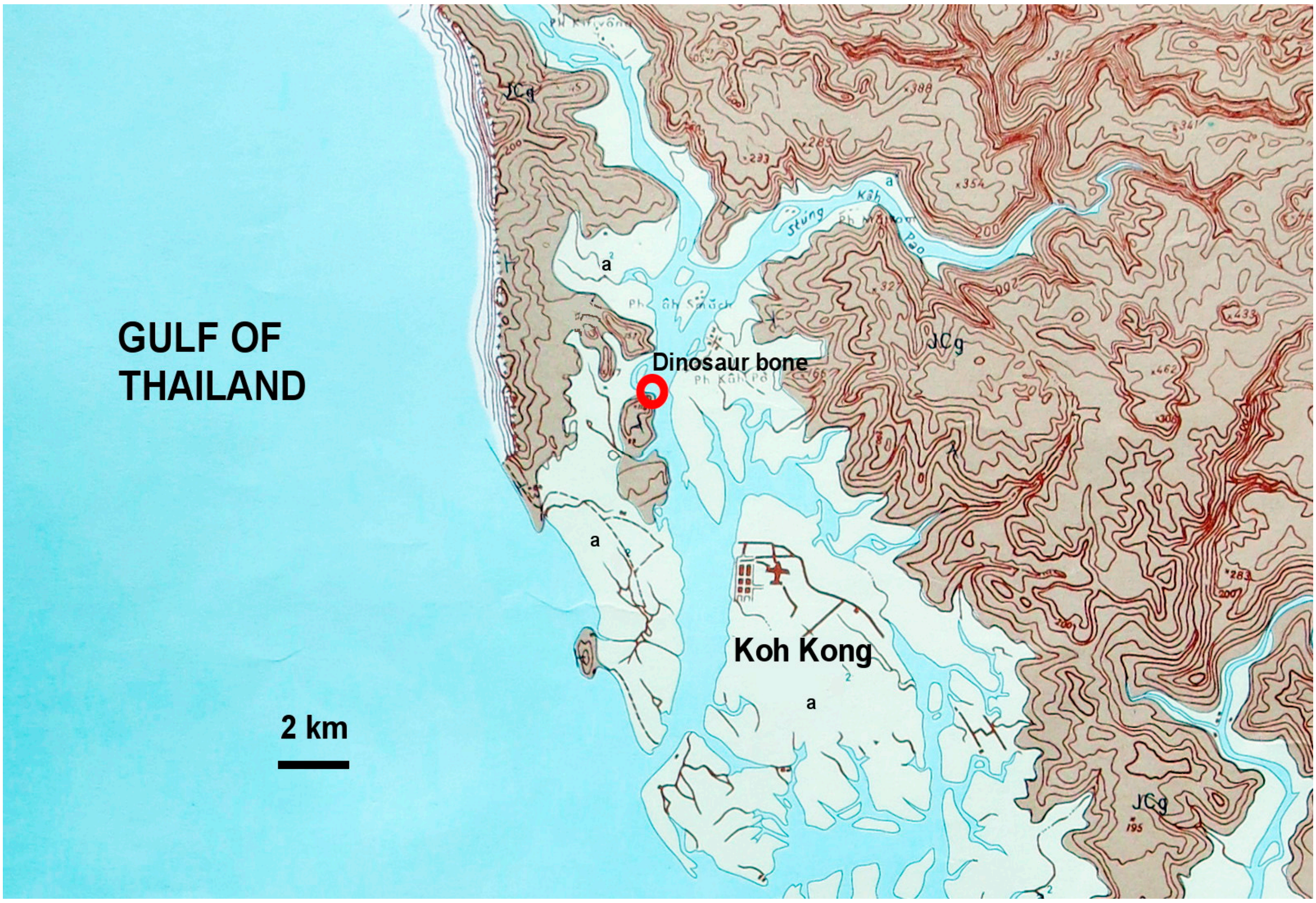

Figure 2. Geological map of the Koh Kong area, showing the location of the Koh Paur dinosaur locality. Geology after [5]: JCg (brown): Late Jurassic to Early Cretaceous Grès Supérieurs, a (light grey): alluvium.

The sedimentary succession of the Grès Supérieurs in the Koh Kong area was described by Fleuriot de Langle [5], who reported a thick sandstone series with clayey intercalations. Fontaine and Workman [7] described the succession farther east, in the Bokor mountains near Kampot, with conglomerates and sandstones at the base, followed by shales and clays containing plant remains, overlain by yellowish-white fine sandstones, themselves capped by conglomerates and coarse sandstones. As our field investigations showed, basically the same sedimentary succession is found in the Koh Kong area. The stratigraphic position of the dinosaur-bearing sandstone at Koh Paur can be roughly deduced from its topographical position in an area with no significant tectonic deformation. As mentioned above, the bone was found on a beach, in a tidal estuary, where it was sometimes covered by water at high tides and, therefore, at a very low elevation above sea level, which suggests that the bone-bearing sandstone bed is in the lower part of the Grès Supérieurs, the upper parts of which can be seen in quarries and roadcuts in the surrounding hills, where plant-bearing greenish clays overlain by yellowish-white fine sandstones can be observed.

Although it has been suggested that the Grès Supérieurs of south-western Cambodia (Cardamome Mountains, Bokor-Kampot area) could be a lateral equivalent of the Khorat Group of north-eastern Thailand [8,9], a detailed examination of the lithostratigraphic succession in this region of Cambodia shows that precise correlations are difficult. The non-marine Mesozoic beds of the Dangrek range in northern Cambodia correspond to the southern rim of the Khorat Plateau, and the formations of the Khorat Group are, therefore, easily recognizable there, but the situation is different in south-western Cambodia, where paleocurrents suggest that deposition took place in a separate basin (N. Sattayarak, pers. com.). Although the western Cambodian Grès Supérieurs may be chronostratigraphic equivalents of at least some of the formations of the Khorat Group [10], it seems impossible to find clear lithostratigraphic equivalents of the Thai formations in that part of Cambodia. Fortunately, palynological and palaeobotanical evidence from the Bokor area yields important stratigraphic information about the age of the local Grès Supérieurs. From a locality along the road from Kampot to Bokor, Corsin and Desreumaux [6] described a "Neocomian" (basal Cretaceous) flora, comprising indeterminate conifers, possible cycads and the ferns *Gleichenoides*, *Leckenbya* and *Sphenopteris*. This assemblage, from a level of grey-green silty clays, was correlated with a basal Cretaceous flora from Malaysia. Palynological evidence from a clay level close to the plant locality confirms an Early Cretaceous age. A few kilometres from there, at "Phnom Krakès", palynomorphs indicate a Middle Jurassic to Early Cretaceous age. A third locality in the same area, in the upper part of the Grès Supérieurs at the Popokvil waterfall, has yielded an Early Cretaceous microflora which may be slightly younger (Barremian or even Aptian) because of the presence of *Diadites spinosa*. Corsin and Desreumaux [6] concluded that the age of the Grès Supérieurs was, in all likelihood, Early Cretaceous, although there was no solid evidence about that of their basal-most part, which, however, could not be earlier than the latest Jurassic. As mentioned above, the dinosaur bone from Koh Paur was apparently found in the lower part of the Grès Supérieurs, which would suggest a basal Cretaceous age.

3. Material and Methods

The specimen, a sauropod left fibula, was extracted from a hard sandstone bed at Koh Paur, near Koh Kong, in November 2022. The final preparation of the specimen took place in Phnom Penh in March 2023. The bone belongs to the collection of the Cambodian Ministry of Environment, under number MOEC-1.

4. Systematic Paleontology

Dinosauria Owen, 1842
Saurischia Seeley, 1888
Sauropoda Marsh, 1878
Titanosauriformes Salgado, Coria & Calvo, 1997
Somphospondyli Wilson & Sereno, 1998
Euhelopodidae Romer, 1956

4.1. Description

The left fibula from Koh Paur is nearly complete but was broken into several sections when found (Figure 3), and its surface had suffered more or less severe abrasion in several areas, probably first during transport prior to burial and then on the lateral side, which was exposed to weathering and erosion before the specimen was excavated. In lateral and medial views, the bone shows a sigmoid curvature (Figure 4A,C), the cranial margin being slightly convex in its proximal part and concave in its distal part, while the caudal margin shows the reverse condition.

Figure 3. The sauropod fibula as it appeared in situ on the rocky beach in Koh Kong, before it was excavated. The weathered lateral face is exposed.

The proximal part of the bone is remarkable because of its mediolateral thickness, which contrasts with the thinness of the shaft (Figure 4B,D). The proximal margin is only very slightly convex proximally. The proximal articular surface shows the corrugations frequently seen on the articular surfaces of sauropod limb bones, presumably indicating a well-developed cartilage layer. In proximal view, the articular surface is more or less rectangular in outline (Figure 4E), with a slight triangular protrusion in the caudolateral corner. The lateral surface of the proximal region is smoothly convex craniocaudally. Its medial surface shows strong reliefs (Figure 4C). A well-marked ridge, the tip of which is incomplete, close to the cranial margin and well visible in proximal view (Figure 4E), apparently corresponds to the "anterior crest" described by Wilson and Upchurch [11] in *Euhelopus zdanskyi* and various other Titanosauriformes. A less marked ridge extends obliquely from the proximocaudal corner of the bone. Together, the ridges enclose a concave area which may have provided a contact area for the tibia.

The shaft is remarkably thin mediolaterally, but this thinness is partly due to abrasion of both the medial and lateral surfaces. On the distal part of the lateral surface, in particular, a longitudinal scoop-shaped depression apparently corresponds to an area where a fairly thick splinter has been detached from the bone. The shaft shows a slight sigmoid curvature in the mediolateral plane (Figure 4B,D). Its cranial and caudal margins are thin and sharp. The lateral process usually present on the lateral surface of the fibular shaft of sauropods is not clearly visible here because of the abrasion of the bone surface. In cross-section, the shaft is subtriangular near the proximal end and becomes lens-shaped more distally.

The distal end of the bone is expanded both mediolaterally and craniocaudally. The distal articular surface, which is much weathered, is ovoid in distal view (Figure 4F). Its medial margin overhangs the shaft, forming a kind of prominent "lip", as in many sauropods.

Figure 4. Sauropod left fibula from Koh Paur (MOEC-1) in lateral (**A**), cranial (**B**), medial (**C**), caudal (**D**), proximal (**E**) and distal (**F**) views. amc: anteromedial crest. Scale bar: 10 cm.

4.2. Measurements

Overall length:	700 mm
Minimum craniocaudal width of shaft:	85 mm
Craniocaudal length of proximal articular surface:	185 mm
Mediolateral width of proximal articular surface:	90 mm
Craniocaudal length of distal articular surface:	152 mm
Mediolateral width of distal articular surface:	76 mm

5. Discussion

Specimen MOEC-1 shows a few characters that may help to determine its affinities with some precision. Its slightly sigmoid shape, with craniocaudally somewhat enlarged articular ends and a mediolaterally compressed shaft, shows that it belongs to a sauropod [12]. In sauropods, the position, extent and morphology of the "external trochanter", a protrusion on the lateral face of the shaft for the attachment of a muscle (see [13] for a discussion of the identification of this muscle), differ among various taxa. Unfortunately, in MOEC-1 this area has undergone such severe abrasion that very little can be said about the external trochanter, which is marked only by a slight rise of the surface of the shaft. However, the morphology of the proximal part of the bone shows interesting characters that warrant a comparison with other sauropods. In many sauropods, especially Jurassic forms, there is a distinct contact area for the tibia on the medial face of the fibula, in its proximal region. Wilson and Sereno [13] describe it as "a well defined, rugose, triangular area that occupies the full width of the fibula near its proximal articular end…" and consider it as characteristic of a group comprising *Barapasaurus*, *Omeisaurus* and Neosauropoda. However, as noted by D'Emic [14], this "corrugated triangular scar" is absent in Titanosauriformes. The fibula from Koh Paur does not exhibit a corrugated triangular scar in the proximal part of its medial face; instead, it shows strong ridges, the cranial-most one forming an anteromedially directed process. As mentioned above, this process apparently corresponds to the "anterior crest" described by Wilson and Upchurch [11] in *Euhelopus*, which inserts into a notch behind the cnemial crest of the tibia. As noted by Wilson and Upchurch [11], this relationship between the proximal parts of the tibia and the fibula is present in various other Titanosauriformes, including *Erketu* [15], *Gobititan* [16], *Tangvayosaurus* [17] and an Indian titanosaur [18]. Mannion et al. [19] note that this anteromedial crest is present in several somphospondylans and also in *Diplodocus*. However, the development and position of this crest seem to vary among sauropods (Figure 5). In *Diplodocus*, for instance (Figure 5F), it appears to be simply a craniomedial prolongation of the proximal articular surface of the fibula [20]. In several Cretaceous taxa, the condition seems to be somewhat different: the crest issues from the medial surface of the bone, some distance below the proximal end, and is not a direct cranial prolongation of the proximal articular surface. This is associated with a thickening of the proximal end of the fibula which is clearly visible in proximal, cranial and caudal views. An increased thickness of the proximal end of the fibula in titanosaurs was noted by Huene as early as 1927 [21]. This thickening is absent in some Jurassic sauropods, such as *Mamenchisaurus* [22] (Figure 5I). In others, such as *Camarasaurus* [23] (Figure 5L) and *Apatosaurus* [24] (Figure 5J), the proximal articular surface is more or less crescentic but does not show a well-developed anteromedial crest. *Giraffatitan* shows an unusual semicircular outline [25] (Figure 5K). As mentioned above, the Koh Paur sauropod fibula shows a thickened proximal region with an anteromedial crest, and, in this respect, it is reminiscent of various Cretaceous Titanosauriformes, including the above-mentioned Early Cretaceous Asian forms *Euhelopus* [26] (Figure 5B), *Erketu* [15], *Gobititan* [16] (Figure 5C) and *Tangvayosaurus* [17], to which can be added *Phuwiangosaurus* [27] (Figure 5H). The anteromedial crest is developed as a thin projection in the Early Cretaceous Titanosauriformes *Tastavinsaurus* [28] (Figure 5G) and *Paluxysaurus* [29]. In Late Cretaceous titanosaurs such as *Opisthocoelicaudia* [30], *Neuquensaurus* [31] and *Bonitasaura* [32] (Figure 5A), as well as in undescribed specimens from the Upper Cretaceous of southern France (personal observations on specimens in the Cruzy Museum, MC-MN 481, MC-

MN 99bis, Figure 5E), the anteromedial crest tends to be well marked, protruding from the medial surface. Although the evolution of this character and its distribution among various taxa are not completely clear, a prominent anteromedial crest seems to be especially developed in somphospondylan Titanosauriformes, a group to which the Koh Paur dinosaur in all likelihood belongs. It should be noted that the anteromedial crest of the Koh Paur bone is somewhat abraded, so that its exact original length cannot be estimated with complete accuracy. It may have been relatively long, as in *Tastavinsaurus*, which also exhibits a sigmoid curvature of the shaft of the fibula [28] reminiscent of what is seen in the Cambodian specimen.

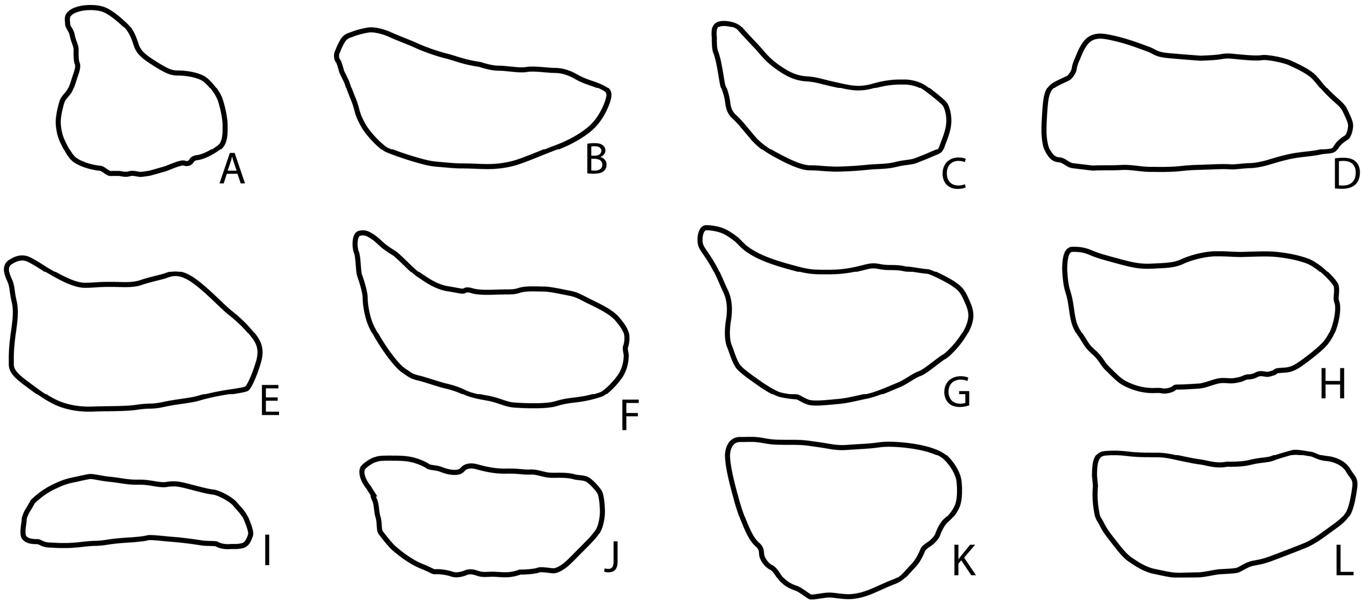

Figure 5. Outline of the proximal articular surface of the fibula in various sauropods, showing variable development of the anteromedial crest. All the specimens, redrawn from various authors, are shown as being left fibulae (mirror images have been used when needed), with the medial face facing upward. Not to scale. (**A**)—*Bonitasaura* (after [31]); (**B**)—*Euhelopus* (after [25]); (**C**)—*Gobititan* (after [15]); (**D**)—Koh Paur sauropod; (**E**)—Indeterminate titanosaur (Late Cretaceous of Cruzy, France, MC-MN 99bis); (**F**)—*Diplodocus* (after [19]); (**G**)—*Tastavinsaurus* (after [27]); (**H**)—*Phuwiangosaurus* (after [26]); (**I**)—*Mamenchisaurus* (after [21]); (**J**)—*Apatosaurus* (after [23]); (**K**)—*Giraffatitan* (after [24]); and (**L**)—*Camarasaurus* (after [22]).

Because of the lack of a triangular medial scar and of the development of an anteromedial crest, the Koh Paur fibula is, therefore, referred to a non-titanosaurian somphospondylan. The closest similarities seem to be with various Early Cretaceous forms from eastern Asia, including (to mention only the taxa in which the fibula is known) *Euhelopus zdanskyi* [26] and *Gobititan shenzhouensis* [16] from China, *Erketu ellisoni* from Mongolia [15], *Phuwiangosaurus sirindhornae* [27] from Thailand and *Tangvayosaurus hoffeti* [17] from Laos. The Cambodian fibula differs from that of *Tangvayosaurus* in having a sigmoid rather than straight shaft. In this respect, it is closer to *Phuwiangosaurus* but differs from it in the position and shape of the anteromedial crest which, in the Thai form, is an extension of the craniomedial angle of the proximal articular surface, while it arises from the medial face of the bone in the Cambodian specimen. The same difference can be seen between *Gobititan* and the Cambodian form. Closer similarities in the shape and position of the anteromedial crest seem to exist with *Erketu* and, possibly, *Euhelopus.* The above-mentioned eastern Asian taxa are sometimes considered as belonging to a clade of non-titanosaurian somphospondylans, the Euhelopodidae [33,34]—although alternative conceptions of the Euhelopodidae, based on a different placement of *Euhelopus* in a more basal phylogenetic position, have been put forward [35]. We refer the Koh Paur sauropod dinosaur to the

Somphospondyli and possibly the Euhelopodidae. Although it cannot be excluded that it belongs to a new taxon, a more precise identification is not possible on the basis of a single fibula.

With a length of 700 mm, the fibula from Koh Paur is longer than that of *Euhelopus zdanskyi* (618 mm), which had an estimated body length of 10.5 m [36]. The Koh Paur dinosaur may, thus, have been about 11 to 12 m long.

6. Conclusions

The Koh Paur sauropod fibula is the first dinosaur bone to have been reported from Cambodia. Since sauropod dinosaurs are already known from various parts of South-East Asia, the occurrence of one of them in the thick succession of non-marine Mesozoic rocks which covers a sizeable area of south-western Cambodia is not unexpected. However, as noted above, these continental formations appear to have been deposited in a basin that was distinct from the Khorat basin of eastern Thailand and southern Laos, where most of the currently known South-East Asian dinosaurs have been found. The fibula from Koh Paur shows similarities with those of several basal somphospondylan Titanosauriformes from the Early Cretaceous of eastern Asia and may belong to the family Euhelopodidae. More material is needed for a better assessment of this first Cambodian dinosaur, and it is hoped that a search for fossil localities in south-western Cambodia may shed light on the Mesozoic fossil vertebrate assemblages of that promising area.

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References

1. Hoffet, J.H. Découverte du Crétacé en Indochine. *C. R. Acad. Sci. Paris* **1936**, *102*, 1867–1870.
2. Buffetaut, E.; Suteethorn, V.; Tong, H. Dinosaur assemblages from Thailand: A comparison with Chinese faunas. In *Papers from the 2005 Heyuan International Dinosaur Symposium*; Lü, J., Kobayashi, Y., Huang, D., Lee, Y.N., Eds.; Geological Publishing House: Beijing, China, 2006; pp. 19–37.
3. Sone, M.; Hirayama, R.; He, T.; Yoshida, M.; Komatsu, T. First dinosaur fossils from Malaysia: Spinosaurid and ornithischian teeth. In Proceedings of the Second International Symposium on Asian Dinosaurs, Bangkok, Thailand, 19–20 November 2015; Nakhon Ratchasima Rajabat University: Nakhon Ratchasima, Thailand; Department of Mineral Resources: Bangkok, Thailand, 2015; p. 18.
4. Liard, T. *Preliminary Report on Vertebrate Footprints from Ratanak Mondul District, Battambang Province, Cambodia on 19–20 of August 2016*; Sirindhorn Museum, Department of Mineral Resources: Sahat Sakhan, Thailand, 2016; 11p.
5. Fleuriot de Langle, P. *Koh Kong. Carte Géologique de Reconnaissance à 1/200 000*; Editions du Bureau de Recherches Géologiques et Minières; Service National des Mines, de la Géologie et du Pétrole: Paris, France, 1972; 9p.
6. Corsin, P.; Desreumaux, C. Découverte d′une flore néocomienne dans les «grès supérieurs» de Bokor (Cambodge méridional). *Ann. Soc. Géol. Nord* **1972**, *92*, 199–212.
7. Fontaine, H.; Workman, D.R. Review of the geology and mineral resources of Kampuchea, Laos and Vietnam. In Proceedings of the Third Regional Conference on Geology and Mineral Resources of Southeast Asia, Bangkok, Thailand, 14–18 November 1978; Nutalaya, P., Ed.; Asian Institute of Technology: Bangkok, Thailand, 1978; pp. 540–601.

8. Racey, A. Mesozoic red bed sequences from SE Asia and the significance of the Khorat Group of NE Thailand. *Geol. Soc. London Spec. Pub.* **2009**, *315*, 41–67. [CrossRef]
9. Buffetaut, E.; Lim, V.; Sophady, H. First dinosaur bone from Cambodia: A sauropod fibula from the Late Mesozoic of Koh Kong Province. In Current Studies on Past Biodiversity in Southeast Asia, Abstracts Volume. *J. Ass. Paleont. Fr. Num. Sp.* **2021**, *1*, 11.
10. Carò, F.; Polkinghorne, M.; Douglas, J.G. Stone materials used for lintels and decorative elements of Khmer temples. *Metrop. Mus. Stud. Art Sci. Technol.* **2014**, *2*, 51–68.
11. Wilson, J.A.; Upchurch, P. Redescription and reassessment of the phylogenetic affinities of *Euhelopus zdanskyi* (Dinosauria: Sauropoda) from the Early Cretaceous of China. *J. Syst. Palaeont.* **2009**, *7*, 199–239. [CrossRef]
12. McIntosh, J.S. Sauropoda. In *The Dinosauria*; Weishampel, D.B., Dodson, P., Osmólska, H., Eds.; University of California Press: Berkeley, CA, USA, 1990; pp. 345–401.
13. Wilson, J.A.; Sereno, P.C. Early evolution and higher level phylogeny of sauropod dinosaurs. *Soc. Vert. Paleont. Mem.* **1998**, *5*, 1–68.
14. D'Emic, M.D. The early evolution of titanosauriform sauropod dinosaurs. *Zool. J. Linn. Soc.* **2012**, *166*, 624–671. [CrossRef]
15. Ksepka, D.T.; Norell, M.A. *Erketu ellisoni*, a long-necked sauropod from Bor Guve (Dornogov Aimag, Mongolia). *Am. Mus. Nov.* **2006**, *3508*, 1–16. [CrossRef]
16. You, H.; Tang, F.; Luo, Z. A new basal titanosaur (Dinosauria: Sauropoda) from the Early Cretaceous of China. *Acta Geol. Sin.* **2003**, *77*, 424–429.
17. Allain, R.; Taquet, P.; Battail, B.; Dejax, J.; Richir, P.; Véran, M.; Limon-Duparcmeur, F.; Vacant, R.; Mateus, O.; Sayarath, P.; et al. Un nouveau genre de dinosaure sauropode de la Formation des Grès supérieurs (Aptien-Albien) du Laos. *C. R. Acad. Sci. Paris Sci. Terre Plan.* **1999**, *329*, 609–616. [CrossRef]
18. Swinton, W.E. New discoveries of *Titanosaurus indicus* Lyd. *Ann. Mag. Nat. Hist.* **1947**, *14*, 112–123. [CrossRef]
19. Mannion, P.D.; Upchurch, P.; Barnes, R.N.; Mateus, O. Osteology of the Late Jurassic Portuguese sauropod dinosaur *Lusotitan atalaiensis* (Macronaria) and the evolutionary history of basal titanosauriforms. *Zool. J. Linn. Soc.* **2013**, *168*, 98–206. [CrossRef]
20. Hatcher, J.B. *Diplodocus* (Marsh): Its osteology, taxonomy, and probable habits with a restoration of the skeleton. *Mem. Carnegie Mus.* **1901**, *1*, 1–63. [CrossRef]
21. Huene, F. von. Sichtung der Grundlagen der jetzigen Kenntnis der Sauropoden. *Eclog. Geol. Helvet.* **1927**, *20*, 444–470.
22. Ouyang, H.; Ye, Y. *The First Mamenchisaurian Skeleton with Complete Skull: Mamenchisaurus Youngi*; Sichuan Science and Technology Press: Chengdu, China, 2002; 111p.
23. Osborn, H.F.; Mook, C.C. *Camarasaurus*, *Amphicoelias* and other sauropods of Cope. *Mem. Am. Mus. Nat. Hist.* **1921**, *3*, 247–387. [CrossRef]
24. Gilmore, C.W. Osteology of *Apatosaurus* with special reference to specimens in the Carnegie Museum. *Mem. Carnegie Mus.* **1936**, *11*, 175–300. [CrossRef]
25. Janensch, W. Die Gliedmaszen und Gliedmaszengürtel der Sauropoden der Tendaguru-Schichten. *Palaeontogr. -Suppl.* **1961**, *3*, 177–235.
26. Wiman, C. Die Kreide-Dinosaurier aus Shantung. *Palaeont. Sin. C* **1929**, *6*, 1–67.
27. Martin, V.; Suteethorn, V.; Buffetaut, E. Description of the type and referred material of *Phuwiangosaurus sirindhornae*, Martin, Buffetaut & Suteethorn, 1994, a sauropod from the Lower Cretaceous of Thailand. *Oryctos* **1999**, *2*, 39–91.
28. Canudo, J.I.; Royo-Torres, R.; Cuenca-Bescós, G. A new sauropod: *Tastavinsaurus sanzi* gen. et sp. nov from the Early Cretaceous (Aptian) of Spain. *J. Vert. Paleont.* **2008**, *28*, 712–731. [CrossRef]
29. Rose, P.J. A new titanosauriform sauropod (Dinosauria: Saurischia) from the Early Cretaceous of central Texas and its phylogenetic relationships. *Palaeont. Electr.* **2007**, *10*, 1–65.
30. Borsuk-Bialynicka, M. A new camarasaurid sauropod *Opisthocoelicaudia skarzynskii* gen. n., sp. n. from the Upper Cretaceous of Mongolia. *Palaeont. Polon.* **1977**, *37*, 5–64.
31. Otero, A. The appendicular skeleton of *Neuquensaurus*, a Late Cretaceous saltasaurine sauropod from Patagonia, Argentina. *Acta Palaeont. Polon.* **2010**, *55*, 399–426. [CrossRef]
32. Gallina, P.A.; Apesteguia, S. Postcranial anatomy of *Bonitasaura salgadoi* (Sauropoda, Titanosauria) from the Late Cretaceous of Patagonia. *J. Vert. Paleont.* **2015**, *35*, e924957. [CrossRef]
33. Mannion, P.D.; Upchurch, P.; Jin, X.; Zheng, W. New information on the Cretaceous sauropod dinosaurs of Zhejiang Province, China: Impact on Laurasian titanosauriform phylogeny and biogeography. *R. Soc. Open Sci.* **2019**, *6*, 191057. [CrossRef]
34. Poropat, S.F.; Frauenfelder, T.G.; Mannion, P.D.; Rigby, S.L.; Pentland, A.H.; Sloan, T.; Elliott, D.A. Sauropod dinosaur teeth from the lower Upper Cretaceous Winton Formation of Queensland, Australia and the global record of early titanosauriforms. *R. Soc. Open Sci.* **2022**, *9*, 220381. [CrossRef]

35. Moore, A.J.; Upchurch, P.; Barrett, P.M.; Clark, J.M.; Xu, X. Osteology of *Klamelisaurus gobiensis* (Dinosauria, Eusauropoda) and the evolutionary history of Middle–Late Jurassic Chinese sauropods. *J. Syst. Palaeont.* **2020**, *18*, 1299–1393. [CrossRef]
36. Mazzetta, G.V.; Christiansen, P.; Fariña, R.A. Giants and Bizarres: Body size of some southern South American Cretaceous dinosaurs. *Hist. Biol.* **2006**, *16*, 71–83. [CrossRef]