



Short Note

The first record of *Onchosaurus* (†Sclerorhynchidae) from the Late Cretaceous of northern Mexico

Ariel Armando Delgadillo-Escobar^{1,*}, Rubén A. Rodríguez-de la Rosa^{1,2},
Adriana Ivonne Saenz-Quñones³, Jesús Abraham Gutiérrez-Martínez³

¹ Museo del Desierto Chihuahuense, Calle 7ª sur y Av. Nuestra Gente, Fracc. Valle Verde, CP. 33093, Cd. Delicias, Chihuahua, México.

² Universidad Autónoma de Zacatecas, Unidad Académica de Ciencias Biológicas, Campus II, Zacatecas, Zacatecas, México.

³ Museo de sitio paleontológico y ecológico, Rancho Don Chuy, Aldama, Chihuahua, México.

* ariel.delgadillo@outlook.com

Abstract

The fossil record of sclerorhynchid elasmobranchs in Mexico has been relatively scarce. In this paper we report a partial rostral tooth assigned to the cosmopolitan genus *Onchosaurus* (†Sclerorhynchidae), originally preserved in a shell-bed matrix, collected at the Potrero del Llano locality, municipality of Aldama, Chihuahua, Mexico. The specimen most likely came from the Upper Cretaceous San Carlos Formation. The tooth has morpho-anatomical features that allow its attribution to the species *Onchosaurus* cf. *O. pharao*, which has been previously described from localities in Egypt, Niger, DR of Congo, Angola, Syria, Japan, U.S.A., Brazil, Colombia and Peru. The rostral tooth represents the first record of *Onchosaurus* in Mexico and the fourth in North America, thus expanding its paleobiogeographic distribution.

Keywords: Chihuahua, Cretaceous, Batoidea, Sclerorhynchidae, *Onchosaurus*.

Resumen

El registro fósil de elasmobranchios esclerorinquíidos en México ha sido relativamente escaso. En este trabajo reportamos un diente rostral parcial asignado al género cosmopolita *Onchosaurus* (†Sclerorhynchidae), conservado originalmente en un fragmento de coquina colectado en la localidad Potrero del Llano, municipio de Aldama, Chihuahua, México. El espécimen parece provenir de afloramientos de la Formación San Carlos, de edad Cretácico tardía. El diente tiene similitudes morfo-anatómicas que permiten su asignación a la especie *Onchosaurus* cf. *O. pharao*, la cual ha sido descrita previamente de localidades en Egipto, Nigeria, R.D. del Congo, Angola, Siria, Japón, E.U.A., Brasil, Colombia y Perú. Este diente rostral representa el primer registro del género *Onchosaurus* en México y el cuarto para Norte América; es así que se amplía su distribución paleobiogeográfica.

Palabras clave: Chihuahua, Cretácico, Batoidea, Sclerorhynchidae, *Onchosaurus*.

1. Introduction

Onchosaurus (Sclerorhynchidae) was a large elasmobranch batoid of cosmopolitan distribution related to modern pristids and pristiophorids (Wueringer *et al.*, 2009; Corral *et al.*, 2012). This group of fishes shows a modification of the rostrum, which consists in a projection of an elongated snout with “teeth” or lateral spines (Wueringer *et al.*, 2009; Corral *et al.*, 2012). The genus is represented by two valid species, *Onchosaurus radicalis* Gervais (1852) and *Onchosaurus pharao* Dames (1887a, 1887b) with a stratigraphic range from the Turonian to late Campanian of Europe, Africa, Asia, South America and North America (Gervais, 1852; Dames, 1887a; Dunkle, 1951; Cappetta, 1987; Lehman, 1989; Antunes and Cappetta, 2002; Spielmann and Lucas, 2006; Bourdon *et al.*, 2011; Corral *et al.*, 2012; Kriwet and Klug, 2012). Both species are considered to have been benthic inhabitants of shallow marine waters and near coastal environments; however, recent work analyzing the distribution of *Onchosaurus* through the Late Cretaceous, and its paleobiogeographic distribution pattern, indicates that these fishes may have been excellent long distance swimmers in open waters (Corral *et al.*, 2012; Kriwet and Klug, 2012).

The species *Onchosaurus radicalis* was reported from France and Spain in Europe, from Ecuador in South America and from the United States in North America, with a stratigraphic range that extends from the late Turonian to Campanian (Gervais, 1852; Dunkle, 1951; Spielmann and Lucas, 2006; Corral *et al.*, 2012). The second species, *O. pharao*, was described from different locations around the world, such as Egypt, Niger, DR of Congo, Japan, Brazil, U. S. A., Colombia, Angola, Syria and Peru. Its stratigraphic range extends from early Santonian to middle Campanian (Dames, 1887a; Lehman, 1989; Antunes and Capetta, 2002; Corral *et al.*, 2012; Kriwet and Klug, 2012).

In North America, specimens of *Onchosaurus*, mainly partial rostral teeth have been referred to both species; *O. pharao* is known from Texas (Lehman, 1989) and *O. radicalis* from New Mexico (Williamson *et al.*, 1989; Spielmann and Lucas, 2006; Bourdon *et al.*, 2011).

The fossil record of the extinct family Sclerorhynchidae in Mexico is restricted to a few specimens described from the Parras Shale and Cerro del Pueblo formations, both exposed in southeastern Coahuila, northern Mexico. These fossils were assigned to genera such as †*Schizorhiza* and †*Ischyrrhiza* (Kirkland and Aguillón-Martínez, 2002).

The specimen described in this paper represents the first record of *Onchosaurus* from Mexico, and the fourth known record of this taxon from North America, after *O. pharao* from Texas (Lehman, 1989) and *O. radicalis* from New Mexico (Williamson *et al.*, 1989; Spielmann and Lucas, 2006; Bourdon *et al.*, 2011). This record from the Late Cretaceous of Chihuahua state extends the paleobiogeographic distribution of the North American *Onchosaurus* to northern Mexico.

2. Institutional abbreviations

RDCH: Rancho Don Chuy Paleontological and Ecological Museum.

3. Age and locality

Late Cretaceous strata, belonging to formations such as San Carlos (Coniacian - Maastrichtian), and Picacho and Ojinaga (early Cenomanian - Maastrichtian) (Servicio Geológico Mexicano, 2009, 2010a, 2010b) crop out close to the town of Aldama, state of Chihuahua (Figure 1). The present specimen was collected at the locality of Potrero del Llano, which is located approximately 61 km west of the municipality of Aldama and 88 km northwest of the city of Chihuahua. However, it has been under erosion and was probably brought to this locality from outcrops belonging to the San Carlos Formation. Lehman (1989) described a series of specimens belonging to *Onchosaurus*, from the San Carlos Formation outcrops in Texas. The conglomerate, in which the specimens were found and described by Lehman (1989), is a bed of shells or coquina that it is intercalated with parallel laminated sandstones. It is similar to the sediment in which the specimen from Chihuahua is preserved. Also, Lehman (1989) describes a progradational sequence in which marine shales of the Ojinaga Formation overlies sandstones and coal from the San

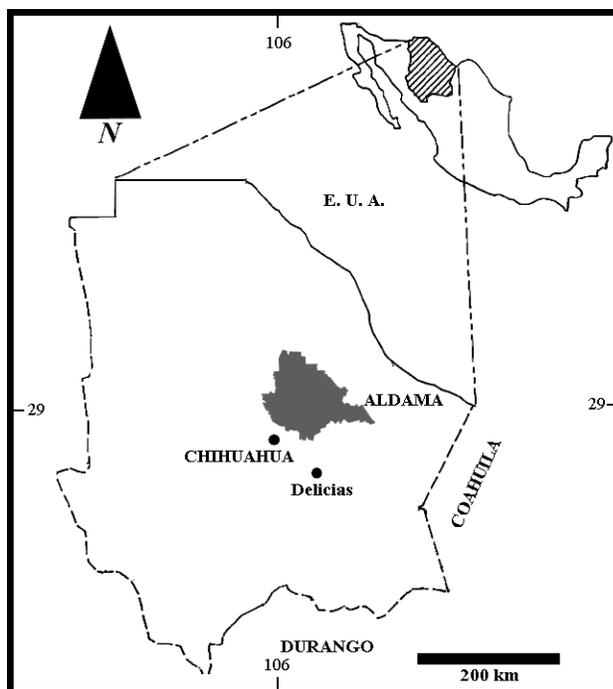


Figure 1. Geographic location of the municipality of Aldama, Chihuahua State, northern Mexico.

Carlos Formation, and shales and continental sandstones of the Picacho Formation in Presidio County in Texas, which is also similar to the sequence found at the locality of Potrero del Llano, in Aldama, Chihuahua (Formación Ojinaga, Burrows, 1910, in Servicio Geológico Mexicano, Léxico Estratigráfico de México [on-line]; Formación Picacho, Vivar, 1925, in Servicio Geológico Mexicano, Léxico Estratigráfico de México [on-line]; Formación San Carlos, Vaughan, 1900, in Servicio Geológico Mexicano, Léxico Estratigráfico de México [on-line]).

4. Systematic paleontology

Order SCLERORHYNCHIFORMES Kriwet, 2004
 Suborder SCLERORHYNCHOIDEI Cappetta, 1980
 Family SCLERORHYNCHIDAE Cappetta, 1974
 Genus *ONCHOSAURUS* Gervais, 1852

Species *Onchosaurus* cf. *O. pharao*
 (Figure 2)

Type species — *O. radicalis* Gervais, 1852, Late Cretaceous of Meudon, near Paris, France.

Material — RDCH18M, isolated partial rostral tooth.

Locality and horizon — Rancheria Potrero del Llano, Aldama, Chihuahua. San Carlos Formation. Late Cretaceous (Campanian).

Referred Species — *O. pharao* (Dames, 1887a, 1887b).

4.1. Description

The specimen (RDCH18M) was found preserved in a 85.2 mm thick shell bed (coquina) and comprises the proximal portion of a sclerorhynchid rostral spine, from its base to a small portion of the crown. This specimen has a sub-triangular shape and a length of 44.3 mm, as preserved (Figure 2).

The peduncle is complete, dorso-ventrally compressed, distally narrow and widening towards the base (Figure 2).

In anterior view the outline is sub-triangular and distally retaining a small portion of enamel. It measures 12.4 mm in length along the anterior carina. This portion of enamel in contact with the osteodentine forms a nearly straight line, in dorsal as well as in ventral views. The peduncle, in posterior view, has a sub-triangular outline and retains a longitudinal depression in its middle portion. This peduncle is covered longitudinally by grooves that extend over its first third at the dorsal and ventral surfaces (Figure 2A, 2E). In proximal view, it presents a sub-rectangular outline and is 30.7 mm long and 16.4 mm wide. The proximal face of the peduncle is shallowly excavated and the periphery of this is slightly crenulated due to the aforementioned grooves (Figure 2C). The lack of a pulp cavity is evident in the eroded section in the distal portion of the specimen.

5. Discussion

Within the group of Sclerorhynchids, Cappeta (1987) makes a clear division into two groups according to the rostral teeth dental histology: those with a cap formed by osteodentine and absence of a pulp cavity and those with a cap formed by orthodentine and with a pulp cavity. *Onchosaurus*, *Pucapristis* and *Schizorhiza* are within the group that shares the feature of a cap made up of osteodentine and the absence of a pulp cavity (Cappeta, 1975, 1987). These three genera have evident morpho-anatomical characteristics that differentiate them. *Pucapristis* rostral teeth differ mainly in that they are long and slender, asymmetrical; the peduncle is wide at its base and has a rhombic contour (Cappeta, 1987). On the other hand, *Schizorhiza* rostral teeth are small (1.5 cm high) with a cap shorter than the peduncle, the crown is symmetrical and triangular like the “point of an arrow”, and the peduncle is long and consists of two strongly divergent lobes (Cappeta 1987).

One of the major limitations in the study of *Onchosaurus* is the lack of complete material for study and the usual finding of only isolated rostral teeth. *Onchosaurus* is only

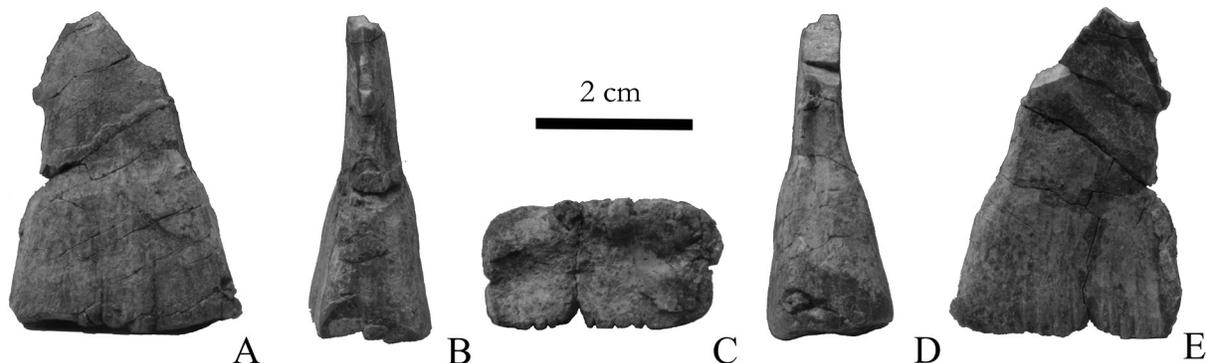


Figure 2. Rostral tooth of *Onchosaurus pharao* (RDCH18M) from the Late Cretaceous of Aldama, Chihuahua. (A) Lateral view; (B) anterior view; (C) basal view; (D) posterior view; (E) lateral view. Scale bar equals 2 cm.

known by its rostral teeth or spines. Bourdon *et al.* (2011) recently reported oral teeth from the Santonian of New Mexico that probably belong to this genus. Nevertheless, their study is limited because generally there are only poorly preserved or eroded, isolated specimens, lacking the crown and therefore enamel, which are diagnostic features for identification at species level.

Although there are two distinctive nominal species of *Onchosaurus*, several authors have proposed the possibility that *O. pharao* and *O. radicalis* are synonymous due to their morpho-anatomical similarities, in addition to sharing a close stratigraphic range (Lehman, 1989; Antunes and Cappeta, 2002).

However, Corral *et al.* (2012) and Kriwet and Klug (2012) have justified the separation of the two species based on morphological and anatomical features, such as rostral teeth of *O. pharao* being significantly more robust, with a triangular tip and a horizontal basal margin. They also have a less curved posterior peduncle margin than *O. radicalis*.

The specimen from Chihuahua shares more morpho-anatomical features with *O. pharao* than with *O. radicalis*. Amongst these features are: the peduncle has a sub-triangular outline with almost straight posterior and anterior edges; a characteristic elongate and straight depression of the posterior face, unlike *O. radicalis*, where it is poorly developed; the proximal face of the specimen has a sub-rectangular outline with a depression in its middle portion, and dimensions (30.7 mm X 16.4 mm wide), which are quite similar to those observed in the syntype of *O. pharao* (Dames, 1887a, 1887b), whereas in *O. radicalis*, the proximal face is of oval contour. The line of contact between the enamel and the osteodentine in *O. pharao* is straight, whereas the contact is curved in *O. radicalis*, in which it presents longitudinal grooves and lacks a pulp cavity, thus setting it apart from any other genus of Sclerorhynchidae.

The specimen from the Late Cretaceous (Campanian) of Aldama, Chihuahua, extends the paleobiogeographic range of North American *Onchosaurus* into northern Mexico. However, it is still an isolated and incomplete specimen, thus it is necessary to conduct additional paleontological fieldwork in the area of Aldama. The Chihuahuan specimen certainly bears a strong resemblance to those reported from Texas by Lehman (1989) in that it shares morphological and anatomical features with *Onchosaurus pharao* Dames (1887a, b) and it is herein referred to this species of extinct sclerorhynchid.

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