



Presence of the extinct sawfish, *Onchosaurus* (Neoselachii, Sclerorhynchiformes) in the Late Cretaceous of Peru with a review of the genus

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ABSTRACT

In this paper we report the first Peruvian record of the extinct giant sclerorhynchiform sawfish, *Onchosaurus pharao*. The single specimen consists of a characteristic rostral spine, which was recovered from nodular limestone in the West-Peruvian Trough of the central Andean Basin, close to the city of Cajamarca. The fossil-bearing strata belong to the lower part of the Celendin Formation, which is of middle–late Coniacian age. This specimen is the first Coniacian record of *Onchosaurus pharao* and constitutes the third known record of this sclerorhynchiform taxon in South America filling previous gaps in the stratigraphic and geographic distribution of this species. A review of the distribution patterns of both species assigned to *Onchosaurus* reveals that the genus originated in circum-Equatorial, tropical waters and subsequently dispersed along different pathways south- and northwards. Based on its palaeogeographic distribution and the size of the rostral spines, both *Onchosaurus* spp. are considered large, bottom-dwelling sclerorhynchiforms primarily inhabiting shallow marine, near-coastal environments. The palaeogeographic distribution nevertheless indicates that they were powerful swimmers and able to cross wide, open marine distances. The reason for the disappearance of *Onchosaurus* in the Campanian remains unknown. In the early Maastrichtian, *Dalpiazia* seemingly replaced *Onchosaurus* ecologically. However, we hypothesize that the different histologies of rostral spines of *Onchosaurus* and *Dalpiazia* are of minor taxonomic importance. *Dalpiazia* thus might represent a derived onchosaur rather than a distinct taxon.

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1. Introduction

Mesozoic chondrichthyans from Peru still are very scarce and only few Cretaceous records have been published up to now. The lamniform shark *Priscusurus adruptodontus* described from middle? Albian sediments of north-western Peru by Kriwet (2006) is the only known Early Cretaceous Peruvian chondrichthyan to date. Late Cretaceous chondrichthyans were also only reported from localities in the North of Peru. Mourier et al. (1988) represented an overview of Late Cretaceous – Paleogene fossils from the Bagua Basin in the northern Andes including two small shallow marine neoselachian assemblages. The stratigraphically older association is from the middle Campanian (uppermost Celendin Formation) and comprises teeth of orectolobiforms, triakids, and sclerorhynchids. The second one is probably of late Campanian age (lower Bagua Formation) and

includes remains of lamniforms, triakids, sclerorhynchids, and rhombodontids. Sclerorhynchiform batoids seemingly are important components of these two associations. In the course of an ongoing project on Mesozoic and Cenozoic fishes from the Southern Hemisphere, we found a rostral spine of a sclerorhynchiform fish from Peru in the collections of the American Museum of Natural History, New York, U.S.A.

The intention of this paper is to describe the first record of the giant sclerorhynchiform *Onchosaurus pharao* (Dames, 1887a, b) from Peru, present revised diagnoses of the genus *Onchosaurus* and the species *O. pharao*, respectively, shortly discuss the Maastrichtian sclerorhynchid *Dalpiazia stromeri* Checchia-Rispoli, 1933 and its affinities to *Onchosaurus*, and consider the distribution of *Onchosaurus* sp.

1.1. Institutional abbreviations

AMNH: American Museum of Natural History, New York, U.S.A.; BMNH: The Natural History Museum London (UK); MNHN: Muséum National d'Histoire Naturelle, Paris (France).

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2. Locality and stratigraphic setting

The single specimen that forms the focus of this study is embedded in a yellowish–brownish, massive, and very nodular limestone. It was recovered from Quebrada Otuzco, ca. three miles west of the city of Cajamarca, Department of Cajamarca, in the north-western highlands of Peru according to the accompanying label (Fig. 1). The fossiliferous section, which yielded the specimen, thus is located in the West-Peruvian Trough of the central Andean Basin. This basin is a backarc, pericratonic basin located on the Peruvian–Ecuadorian active margin, in which Late Cretaceous shallow-marine sediments were accumulated representing several transgressive and regressive cycles (Dhondt and Jaillard, 2005; Jaillard et al., 2005). Major transgressive events are recognized in the middle Cenomanian, early Turonian, and early Coniacian (e.g., Jacay, 2005). The final marine cycles comprise sediments of the Cajamarca (Turonian) and Celendin (Coniacian–Campanian) formations of the Otuzco Group (Benavides-Caceres, 1956). The matrix in which the specimen is embedded indicates that the specimen comes from the Celendin Formation according to the available information on the sedimentology of this formation.

3. Systematic paleontology

The morphological terminology used herein is based on Kriwet (1999) and Kriwet et al. (2009). The systematic scheme adopted is that of Kriwet (2004) following strict cladistics principles. The emended diagnoses presented here are based on the new Peruvian specimen and syntypes of *Onchosaurus pharao* (Dames, 1887a, b) housed in the Museum für Naturkunde Berlin, Germany (MB.f.11217a–c and MB.f.11223), and the holotype of *Onchosaurus radicalis* Gervais, 1852 housed in the Muséum National d'Histoire Naturelle Paris, France (MNHN-CTE 196).

Class CHONDRICHTHYES Huxley, 1880

Subclass ELASMOBRANCHII Bonaparte, 1838

Infraclass NEOSELACHII Compagno, 1977



Fig. 1. Geographic location of Quebrada Otuzco, ca. 3 miles West of the city of Cajamarca, Department of Cajamarca, which yielded the specimen of *Onchosaurus pharao* (Dames, 1887a, b) described here.

Superorder BATOMORPHII Cappetta, 1980
Order SCLERORHYNCHIFORMES Kriwet, 2004
Family SCLERORHYNCHIDAE Cappetta, 1974
Genus *Onchosaurus* Gervais, 1852

Type species – *O. radicalis* Gervais, 1852 from the Campanian of Meudon near Paris, France.

Referred species – *O. pharao* (Dames, 1887a, b).

Diagnosis (emended) – Sclerorhynchiform only known by isolated rostral spines; rostral spines large and dorso-ventrally flattened; dorsal peduncle face slightly convex in anterior and posterior views forming an obtuse downwardly inclined angle with peduncle basal face; ventral peduncle face concave in anterior and posterior views; cusp low in relation to peduncle, smooth, and asymmetrical triangular with well-developed cutting edge; anterior margin of crown oblique, slightly sigmoidal and basally extending on peduncle; posterior margin of crown straight and almost vertical, may bear a single basally directed barb; dorsal crown face with very shallow basal depression; crown-peduncle junction well-marked and obliquely directed; peduncle high with flaring and strongly folded base, otherwise smooth; base rectangular with median depression in basal view; posterior margin of peduncle concavely notched along its entire length.

ONCHOSAURUS PHARAO (Dames, 1887a, b)

1887a *Titanichtys pharao* Dames, p. 69, Figs. 1–2.

1887b *Gingantichtys pharao* (Dames, 1887a, b), p. 137.

1917 *Onchosaurus pharao* (Dames, 1887a, b), Eastman, p. 95.

1921 *Onchosaurus pharao* (Dames, 1887a, b), Stromer, p. 121, Fig. 11.

1940 *Onchosaurus pharao* (Dames, 1887a, b), Arambourg, p. 142, Fig. 4, pl. 3, Figs. 6–9.

1943 *Onchosaurus pharao* (Dames, 1887a, b), Arambourg and Joleaud, p. 33, Fig. 1, pl. 1, Figs. 1–7, 12.

1943 *Onchosaurus pharao* (Dames, 1887a, b), Dartevelle and Casier, p. 166, pl. 14, Fig. 9.

1951 *Onchosaurus pharao* (Dames, 1887a, b), Dunkle, p. 346.

1986 *Ischyrhiza iwakiensis*, Uyeno and Hasegawa, p. 68, Figs. 1–2.

1987 *Onchosaurus pharao* (Dames, 1887a, b), Cappetta, p. 154.

1989 *Onchosaurus pharao* (Dames, 1887a, b), Lehman, p. 553, Fig. 1.1.

2003 *Onchosaurus pharao* (Dames, 1887a, b), Al Maleh and Bardet, p. 392, 398.

2004 *Onchosaurus pharao* (Dames, 1887a, b), Suarez and Cappetta, p. 93.

2006 *Onchosaurus pharao* (Dames, 1887a, b), Jacobs et al., p. 95, tab. 1.

2006 *Onchosaurus pharao* (Dames, 1887a, b), Cappetta, p. 179.

2012 *Onchoprists pharao* Dames, 1887a, b, Martill and Ibrahim, Fig. 4.

Syntypes – MB.f.11217a–c and MB.f.11223 (Museum für Naturkunde Berlin, Germany) from the Santonian (Late Cretaceous) of Gizeh, Egypt.

Diagnosis (emended) – A species of *Onchosaurus* characterized by a very asymmetric triangular cusp with posterior, basally directed barb(s).

Material – A single rostral spine housed in the American Museum of Natural History New York, U.S.A. under collection number AMNH FF20273.

Description – The single specimen (AMNH FF20273), which forms the focus of this paper is an almost completely preserved rostral spine still embedded in calcareous matrix (Fig. 2). The tip of the crown and the antero-basal portion of the peduncle are lacking, of which the latter was restored. The outline of the crown-apex is preserved as imprint in the matrix allowing reconstructing the complete outline of the crown.

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