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NEW SPECIMEN OF *GIGANOTOSAURUS CAROLINII* (CORIA & SALGADO, 1995), SUPPORTS IT AS THE LARGEST THEROPOD EVER FOUND

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ABSTRACT: ***Giganotosaurus carolinii* CORIA & SALGADO, 1995 (MUCPv- Ch1) is considered the largest theropod in the world. Here we describe a new specimen of *G. carolinii*. In spite of the fact that the material is fragmentary (just a partial dentary), it is very important for its size. Comparisons between this new material with that of the holotype shows that this is the largest theropod specimen ever found. The new specimen of *G. Carolinii* is 8% bigger than the holotype.**

RESUMEN: ***Giganotosaurus carolinii* CORIA & SALGADO, 1995 (MUCPv- Ch1) es considerado el terópodo más grande del mundo. Aquí nosotros describimos un nuevo especimen de *G. carolinii*. A pesar de que el material es fragmentario (sólo una parte del dentario), este es muy importante por su tamaño. Comparaciones realizadas entre este nuevo material y el que corresponde al holotipo, muestra que éste es el especímen de terópodo más grande encontrado hasta ahora. El nuevo especimen de *G. carolinii* es un 8% más grande que el holotipo.**

INTRODUCTION

Theropod dinosaurs have been focus of many kind of studies including anatomical (MOLNAR, 1991), phylogenetic (GAUTHIER, 1986; HOLTZ, 1994), behavioral and physiological analyses (MOLNAR & FARLOW, 1990). Perhaps, one of the most interesting aspects of these vertebrates is that they involve the biggest land-living predators in Mesozoic Earth history. In this regard, the first theropod known for modern science was *Megalosaurus* BUCKLAND, 1824, formerly recorded upon a fragment of lower jaw and named because of its astonishing size. Half a century latter, the finding of *Tyrannosaurus rex* OSBORN, 1905, became the first well known theropod, which also was the largest carnivorous dinosaur in the world over almost 90 years. More recently, new studies and findings all around the world have increased our knowledge of giant theropods with the description of different forms such as *Acrocanthosaurus* STOVALL & LANGSTON, 1950; *Deinocheirus* OSMÓLSKA & RONIEWICZ, 1970; *Saurophagus* RAY, 1941, and *Carcharodontosaurus* STROMER, 1934 (SERENO *et al*., 1996). But in the last few years, the discussion about what was the biggest theropod came back with the discovery of two amazing specimens in both Africa (SERENO *et al*., 1996) and South America (CORIA & SALGADO, 1995). The South American form was proposed to be a new species *Giganotosaurus carolinii* CORIA & SALGADO, 1995 which was claimed as the biggest meat-eater dinosaur ever known, with a recently proposed skull length of 180 cm (CORIA & SALGADO, 1996). That specimen is an almost complete skeleton found near El Chocón town, at levels of Rio Limay Formation, Candeleros Member (Albian-Cenomanian).

On a fieldtrip made in 1987 to the Cerro Los Candeleros locality, 35 km Southwest Plaza Huincul, on Neuquen Province (Fig. 1) was found an isolated dentary (MUCPv-95) of a big theropod which was briefly described by CALVO (1989). The dentary is identical to that described by CORIA & SALGADO (1995) as part of the holotype of *Giganotosaurus carolinii* (MUCPv-CH-1).

In the present paper we describe in detail the dentary of the specimens MUCPv-Ch1 (holotype)

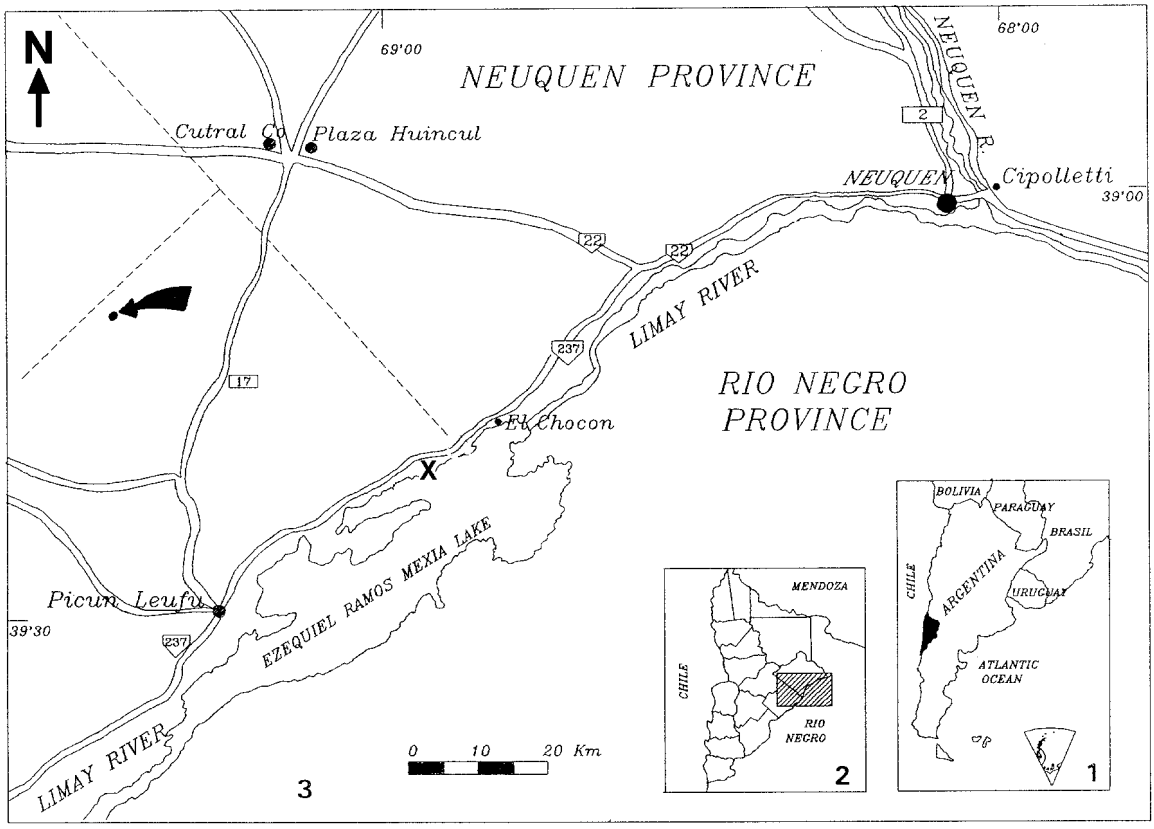

Fig. 1 - Map of Argentina (**1**) and the Neuquén Province (**2**) detailing the area where the new specimen of *Giganotosaurus carolinii* (CORIA & SALGADO, 1995), MUCPv-95, was collected (**3**). The arrow shows the place where MUCPv-95 was found. The X, 12 km SW to El Chocón locality, shows the place where *G. carolinii* (CORIA & SALGADO, 1995) (holotype) was found.

and MUCPv-95 which represents a new specimen of the species *Giganotosaurus carolinii* but bigger than the holotype, and we compare with other giant theropods in order to establish size-relationships.

SYSTEMATIC PALEONTOLOGY

Order Saurischia
Suborder Theropoda MARSH, 1881
Infraorder Tetanurae GAUTHIER, 1986
Family Carcharodontosauridae
SERENO *et al.*, 1996

Genus *Giganotosaurus*
CORIA & SALGADO, 1995

Giganotosaurus carolinii
CORIA & SALGADO, 1995

Fig. 3-6

Material: MUCPv-95 (Museo de la Universidad Nacional del Comahue). A left dentary with some unworn teeth.

Horizon and Locality: The site of this specimen is located 35 km Southwest of Plaza Huincul, at the Cerro Los Candeleros locality. The rocks are characterized by being red sandstones of the Candeleros Member, Rio Limay Formation (Albian-Cenomanian) (Fig. 2).

Diagnosis: Anterior end of the dentary dorsoventrally expanded with flattened symphysial surface, bearing a ventral process.

Description: The preserved portion of the dentary is 61 cm in length and lacks its posteriormost extreme. There are 15 alveoli preserved, but it is possible that at least one or two more were present (Fig. 3). All teeth are broken except those unworn. In lateral view, the symphysis is the highest part of the dentary being 18 cm high (Fig. 4B, 5B, 6B). The shortest part is at the level of the 8th alveolus, where is 14 cm high. The ventral border is concave. The lateral side is slightly convex dorsoventrally with a longitudinal groove that supports the nutritious foramina (Fig. 4B). This groove is coincident in place with another one from the medial side. Anteriorly, the bone surface is rugose, bearing many foramina

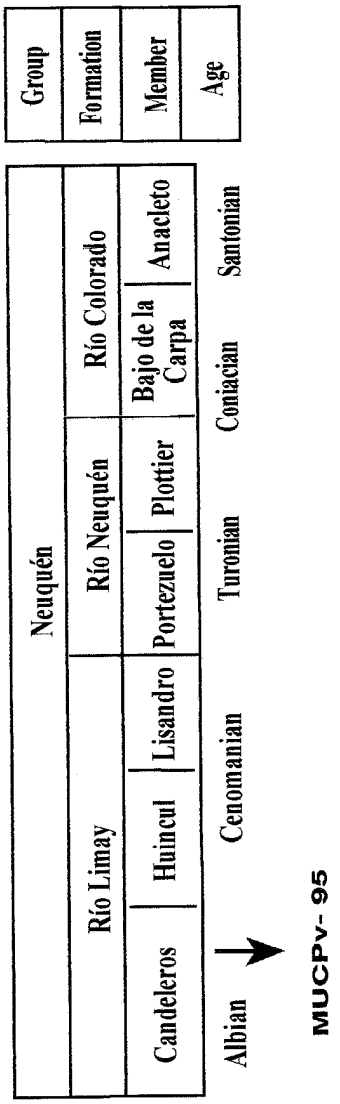

Fig. 2 - Scheme of the Neuquén Group sequence to show the stratigraphic position of the Specimen (MUCPv-95).

placed along three main lines, upper, middle and lower lines. Both upper and lower ones are continuous along the whole dentary. The same condition is observed in the holotype specimen.

The medial side, well preserved, shows fused interdental plates (Fig. 4A; 5A). Below them, a similar groove to that described from the lateral side, marks the inferior limit of the interdental plate row, where every tooth has one nutritional foramen. The mandibular symphysis is not well preserved in MUCPv-95, but it is in the holotype. There, a flat articular surface can be observed, showing a rather subrectangular shape. The Meckelian channel is parallel to the ventral border (Fig. 4B, 5B). In its anterior portion it curves abruptly to the anteroventral border, where an anteroventral concavity is developed (Fig. 6A). This depression is present in MUCPv95 but not in MUCPv-Ch1. In dorsal view the dentary shows a wide curvature to the internal plane. This begins between the 9th and the 10th alveolus and in regular shape reaches the symphysis region. This character, together with the reduced simphysis, suggest that both mandibles would build a wide mouth. At the current preparation stage, from the 15th alveolus, only three have functional teeth (4, 8 and 9), one is in advanced eruption (7) and four are on an early stage of eruption (1, 5, 10 and 12). Most of the alveoli seem to be of similar shape and size. Except for the first one, which is the smallest one (2.5 cm anteroposteriorly), the other ones are aproximatelly 3.5 cm long. This feature indicates as very likely no major differences among dental size and shape all along the lower jaws. The laterally compressed functional teeth are oval in cross-section being constricted in the middle, which allows distinguishing of both crown and root. They have the typical theropod features with serrated anterior and posterior borders. The erupted teeth are exposed only on their tips, but they are similar in shape to the functional ones preserved in the holotype.

Giganotosaurus carolinii CORIA & SALGADO, AS THE LARGEST THEROPOD EVER FOUND

The comparisons of the specimen MUCPv-95 are restricted because of its limited condition; however there are no doubts about the fact that it corresponds to the species *Giganotosaurus carolinii*. The morphology of the whole bone overlaps with no differences with that known from the holotype MUCPv-Ch-1. The presence of a squared anterior end, with a

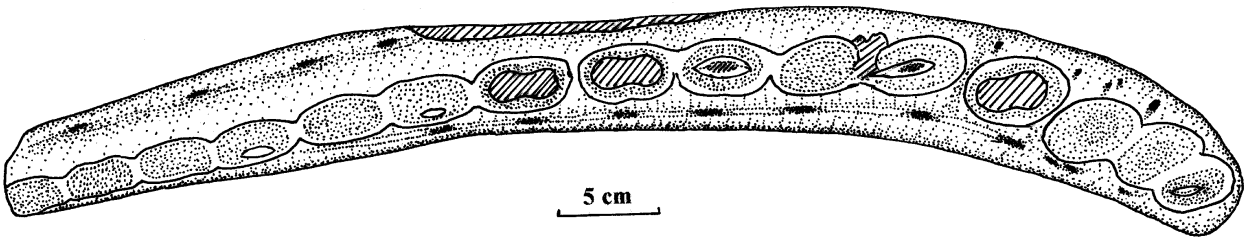

Fig. 3 - *Giganotosaurus carolinii* (CORIA & SALGADO, 1995) (MUCPv-95) dentary in dorsal views.

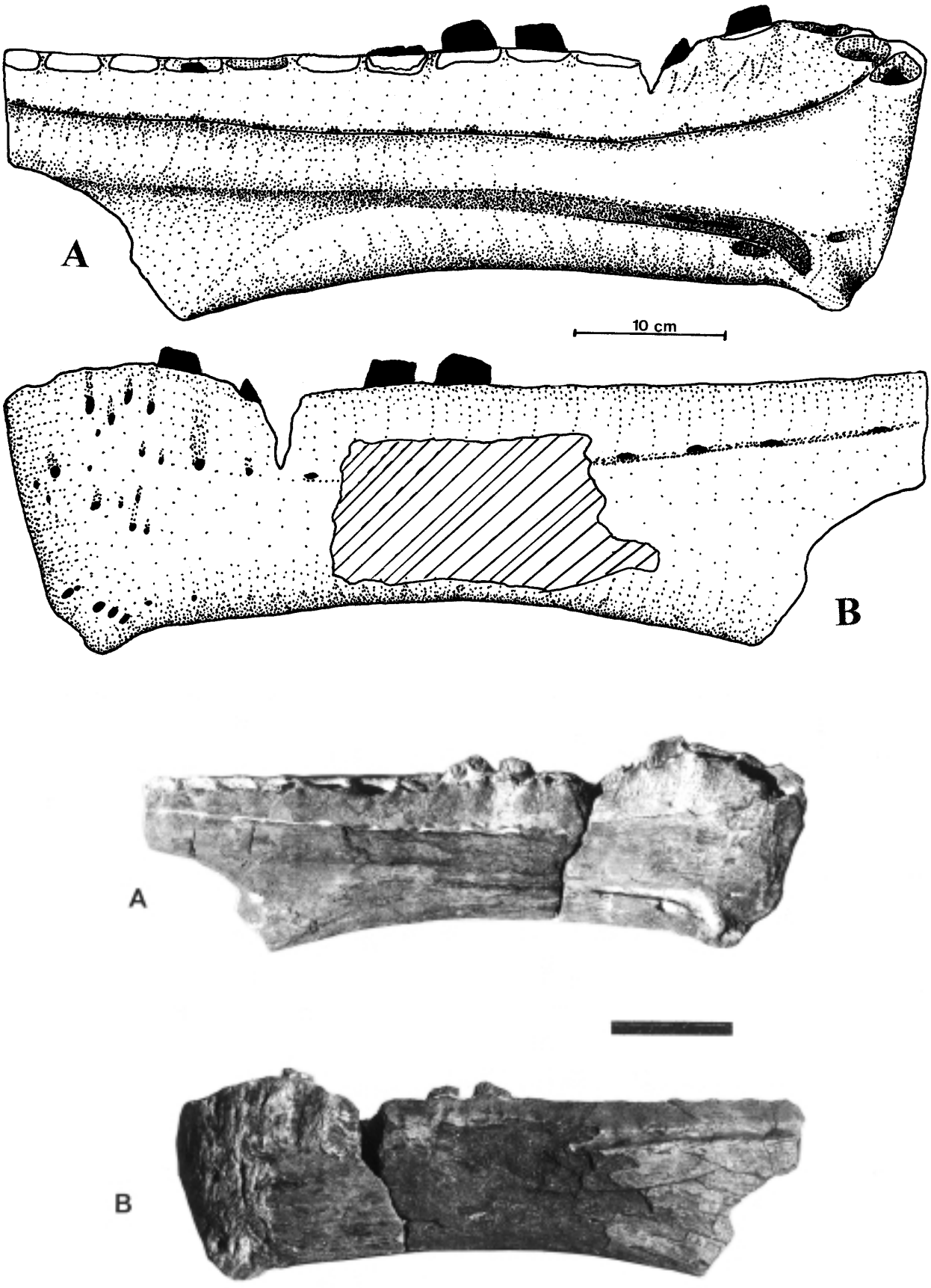

Fig. 5 - *Giganotosaurus carolinii* (CORIA & SALGADO, 1995) (MUCPv-95) dentary. **A** - Medial view. **B** - Lateral view. Scale bar 10 cm.

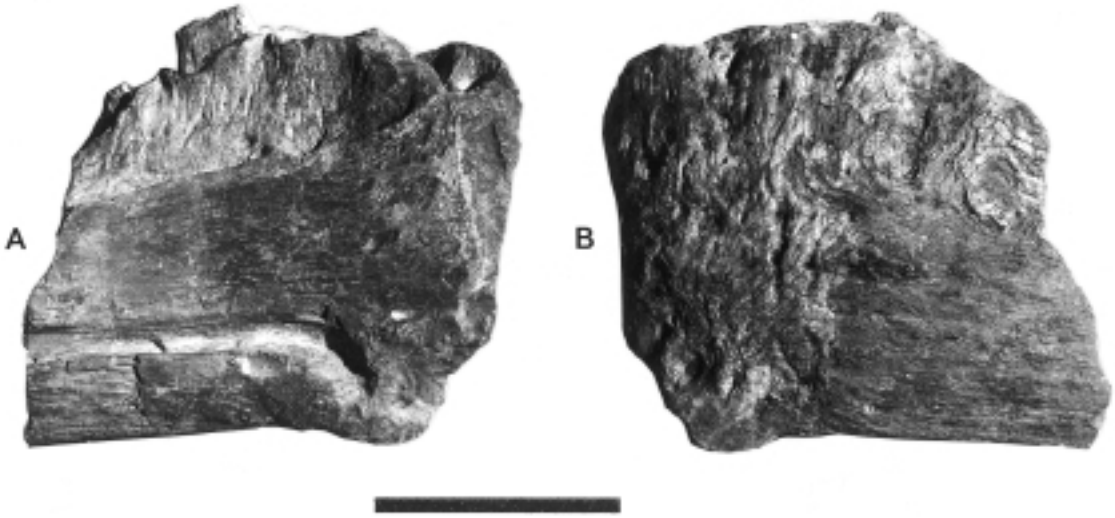

Fig. 6 - *Giganotosaurus carolinii* (CORIA & SALGADO, 1995) (MUCPv-95) anterior portion of the dentary. **A** - Medial view. **B** - Lateral view. Scale bar 10 cm.

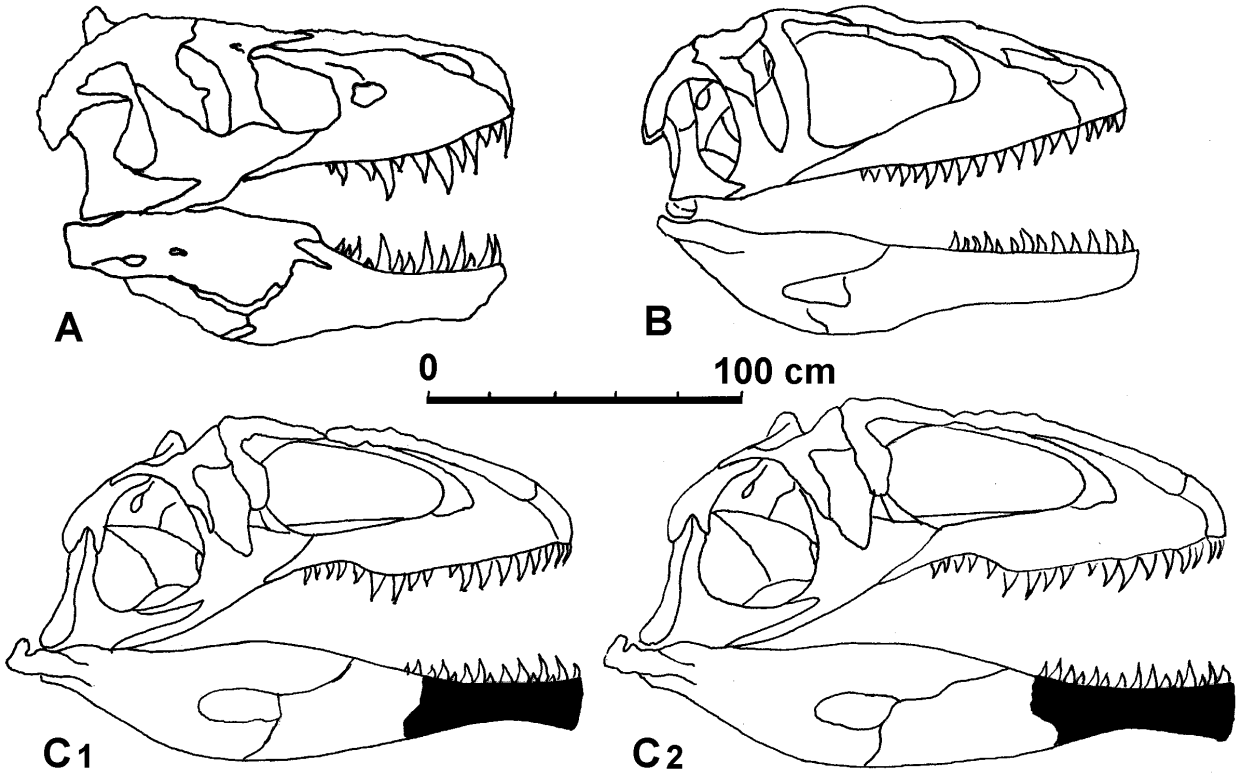

Fig. 7 - Skull´s comparisons among the biggest known theropods. **A** - *Tyrannosaurus rex* OSBORN 1905. **B** - *Carcharodontosaurus saharicus* (SERENO *et al*., 1996). **C** - *Giganotosaurus carolinii* (CORIA & SALGADO, 1995); C_1 - holotype, MUCPv-Ch1; C_2 - MUCPv-95. Dentary preserved marked in black.

flat symphysial surface, and an anteroventral process, mentioned by CALVO, 1989 for MUCPv-95, are shared by both specimens, and this is a combination of derived characters only reported in *Giganotosaurus* CORIA & SALGADO, 1995. Also, the geologic horizon is the same for both specimens. The only difference between the dentary here described and the holotype is that the former is 8% bigger than the later. The skull of *Giganotosaurus carolinii* (CORIA & SALGADO, 1995) is aproximatelly 80% preserved. So far, the only cranial information that we do not know of *Giganotosaurus* is regarding the posteroventral part of the skull (jugal and quadratojugal) and most of the palate. Nevertheless, it has been possible to propose a skull length of 180 cm for this South American dinosaur. Other big-sized theropod dinosaurs, such as *Tyrannosaurus rex* OSBORN, 1905 and *Carcharodontosaurus saharicus* STROMER, 1934 seem to have been quite smaller than *Giganotosaurus* (Fig .7). LARSON (1991) reported the largest specimen of *Tyrannosaurus rex* up to date from South Dakota; the skull length is more than 140 cm. Recently, new skull information of *Carcharodontosaurus* has been reported (SERENO *et al*., 1996). There, a new skull of the African form, lacking premaxilla, quadratojugal, quadrate and squamosal appears to represent a skull less than 160 cm long (Fig. 7). The new material described here is on average 8% larger than that of the holotype of *Giganotosaurus* MUCPv-Ch.1. In this regard, if we consider the skull length proposed for the type specimen of *Giganotosaurus carolinii* as 180 cm, the new specimen here described would be indicating a skull length of 195 cm. There is no other theropod published with such a long skull.

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