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## The pustulated temnospondyl revisited—a plagiosternine plagiosaurid from the Lower Triassic of Brazil

SÉRGIO DIAS-DA-SILVA and ANDREW R. MILNER

A recent contribution published in this journal (Dias-da-Silva and Ilha 2009) reported a dermal skull fragment indicating the presence of a putative plagiosauroid temnospondyl in the Lower Triassic Sanga do Cabral Formation of the Paraná Basin, Southern Brazil. The taxonomic assignment of this specimen was necessarily tentative as it was based on circumstantial evidence, specifically the presence of a dense pustular ornamentation over four partial dermal skull bones, consideration of the described taxa known to bear such ornamentation, and the stratigraphic and paleobiogeographic range of such taxa. Therefore, Dias-da-Silva and Ilha (2009) could not be totally certain about the plagiosauroid affinities of the new specimen and ascribed it to ?Plagiosauridae. It was particularly difficult to make a precise osteological identification of the specimen and six alternative osteological interpretations were made in comparison to both *Gerrothorax* and *Peltobatrachus* (see Dias-da-Silva and Ilha 2009: fig. 2). In spite of the poor taxonomic resolution, the new specimen raised interesting questions regarding the presence of plagiosauroid stereospondyls in western Gondwana, as well as their evolutionary patterns, biostratigraphic and paleobiogeographic implications. After Dias-da-Silva and Ilha's (2009) contribution was published, new data from Damiani et al. (2009) raised the possibility of narrowing down the taxonomic identity of the plagiosauroid from Brazil. Accordingly, this brief report provides a more precise taxonomic assignation for this material.

### Introduction

After Dias-da-Silva and Ilha (2009) went to press, Damiani et al. (2009) published a description of new material of the German plagiosaur *Plagiosuchus pustuliferus*. Incorporated in the comparative section of this paper was a new reconstruction of the skull of another German plagiosaur, *Plagiosternum granulosum*, prepared by Stephanie Gastou (as part of an unpublished degree project; Gastou 2008). This reconstruction, based on new material, included details of the bone arrangements around the cheek and suspensorium that were not previously available (see Warren 1995; Hellrung 2003), and thus allows a more precise taxonomic assignation of the Brazilian plagiosauroid material (under collection number MCN PV 1999) as a plagiosternine plagiosaurid.

*Institutional abbreviations.*—MCN PV, Paleovertebrates collection, Museu de Ciências Naturais da Fundação Zoobotânica do Estado do Rio Grande do Sul, Porto Alegre, Brazil; SMNS, Staatliches Museum für Naturkunde, Stuttgart, Germany.

### Systematic paleontology

Temnospondyli von Zittel, 1888  
Stereospondylomorpha Yates and Warren, 2000  
Stereospondyli von Zittel, 1888  
Plagiosauridae Abel, 1919  
Plagiosterninae Shishkin, 1986  
Incertae sedis

*Locality and horizon:* 6.4 km from the beginning of the BR 158 (a federal highway), that connects the municipalities of Santa Maria and Rosário do Sul (Coordinates S29°42'59.45" W53°54'01.76"). *Lystrosaurus* Assemblage Zone, Sanga do Cabral Formation, Lower Triassic, Brazil.

*Material.*—MCN PV 1999, a dermal skull fragment including four dorsoventrally compressed partial bones (Fig. 1C).

### Discussion

**Morphological identity.**—The new published figure of the skull of *Plagiosternum granulosum* (Damiani et al. 2009: fig. 8C) shows the shape and sutures of the cheek region and suspensorium for the first time in this taxon. Previous authors had to speculate about the exact relationships of the bones in this region (Warren 1995; Hellrung 2003). Comparison of the bone arrangement of the right cheek of *P. granulosum* with the elements in MCN PV 1999 shows an almost exact correspondence (Fig. 1). MCN PV 1999 comprises apparently the almost complete quadratojugal, the posterior half of the jugal, the anterior half of the squamosal, and the lateral part of the postorbital. The lateral margin of the jugal and most of the entire margin of the quadratojugal are preserved, while the remaining edges of the specimen are incomplete. Therefore, bone structure in the preserved fragment allows clear identification as part of a plagiosternine skull roof. However, there still remains the problem of the distribution of the dermal ornament types within the Plagiosauridae.

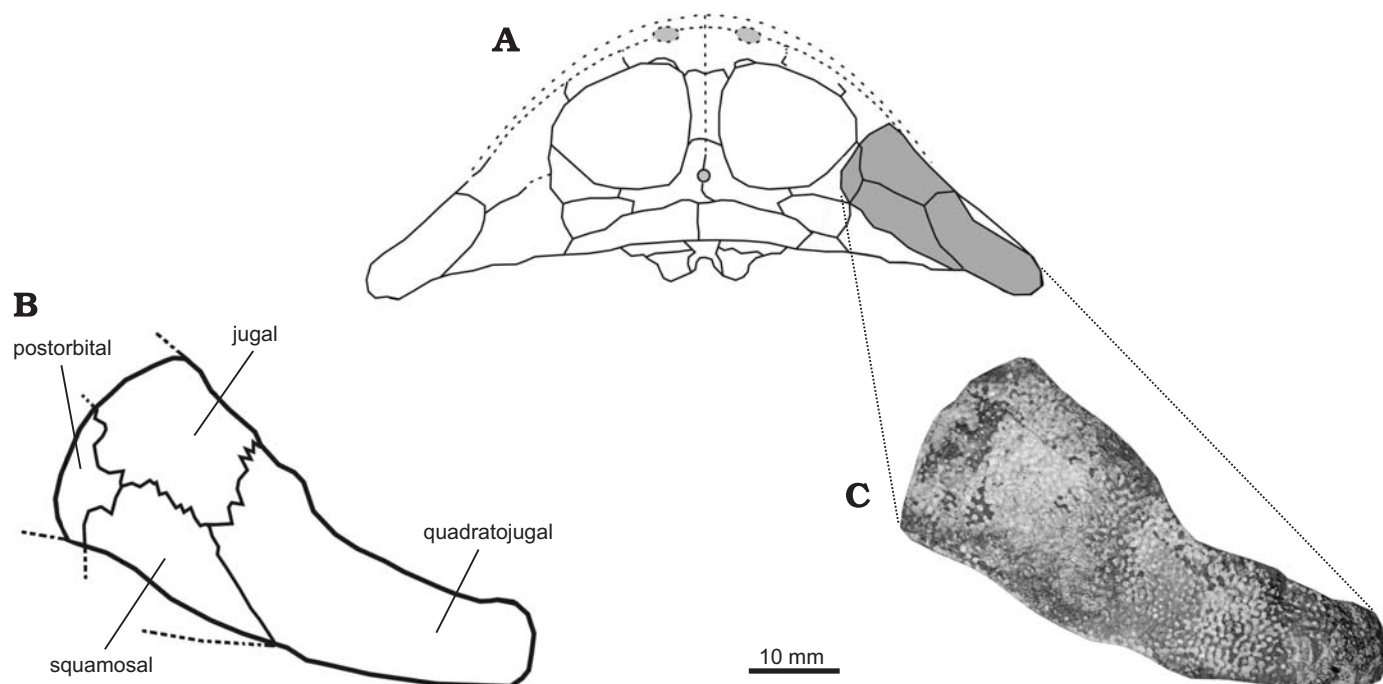


Fig. 1. Plagiosaurid *Plagiosternum granulosum* Frass, 1889 from the Middle Triassic of Germany. **A.** Schematic line drawing, modified from Damiani et al. (2009); the gray area shows the presumable anatomic correspondence between MCN PV 1999 and *P. granulosum*. Not to scale. **B.** Line drawing of MCN PV 1999, Plagiosterninae indet. from the Lower Triassic Sanga do Cabral Formation (Paraná Basin, Southern Brazil). **C.** Photograph of MCN PV 1999 with its presumable anatomic correspondence to *P. granulosum*.

**Dermal ornamentation.**—Dias-da-Silva and Ilha (2009) reported MCN PV 1999 as a plagiosaurid based upon its pustular ornamentation, but could not assign the specimen to any subfamily within the Plagiosauridae. Recent workers (Shishkin 1987; Schoch and Werneburg 1998; Warren 2000; Hellrung 2003) have recognized up to three plagiosaur subfamilies and, according to Hellrung (2003), two of these, Plagiosaurinae and Plagiosuchinae, were characterized by pustular ornamentation, while the Plagiosterninae retained reticular ornamentation—the general temnospondyl condition. Based upon this statement, Dias-da-Silva and Ilha (2009) suggested that MCN PV 1999 might belong to either Plagiosaurinae or Plagiosuchinae, since this Brazilian specimen clearly shows a pustular pattern of ornamentation. However, observations by Stephanie Gastou (personal communication 2009) and ARM on material housed in the collections at SMNS, indicate that the pattern of ornamentation within plagiosaurids is not as strict within subfamilies as stated by Hellrung (2003). In *Plagiosternum*, the ornamentation of the central region of the skull is primitively reticulate, but towards the suspensorium there are pustules on the intersections between the reticular ridges. Moreover, some specimens seem to be more pustular whereas others are more reticulate. For instance, the ornamentation present in *Plagiosternum* specimen SMNS 82002 includes both reticulate and pustular, the latter particularly developed in the cheek region, but its posterolateral bones are an almost perfect match to MCN PV 1999, assuming the above morphological interpretation is correct. The quadratojugal of *Melanopelta antiqua* (Shishkin 1967: fig. 2), interpreted as a plagiosternine from the Lower Triassic of Russia

(Shishkin 1987) also shows pustular ornamentation superimposed on a reticulate base. Nevertheless, MCN PV 1999 does differ from the described European and Russian specimens of *Plagiosternum* in the greater extent of the pustular ornamentation. The fragment is insufficiently diagnostic to permit critical generic diagnosis, for example between *Plagiosternum* and *Melanopelta*, and we therefore restrict its identification as a Plagiosterninae *incertae sedis*. The subfamily Plagiosterninae Shishkin, 1986 comprises *Plagiosternum* (Middle Triassic of Germany and Russia), *Melanopelta*, and *Aranetsia* (Lower and Middle Triassic of Russia, respectively). Unfortunately, plagiosternine specimens are “largely represented by scant cranial and postcranial remains” (Damiani et al. 2009: 349). The stratigraphic age of MCN PV1999 falls within this range (Lower to Middle Triassic) although the paleogeographical range is a significant extension from that known previously for this subfamily. The paleobiogeographic implications of the presence of plagiosauroids in Western Gondwana have already been discussed by Dias-da-Silva and Ilha (2009) and repetition is unnecessary. Even so, depositional units from South America are providing new information regarding the distribution of temnospondyls across the Permo-Triassic boundary, mainly because of an increase in prospecting efforts, particularly in the last ten years. In conclusion, field work in South American units from Argentina, Uruguay, and Brazil must be an ongoing task in order to find more complete and diagnostic temnospondyls in this region of Gondwana.

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